The Bairoil Archaeological Project:

7500 Years of Prehistory in the Bairoil Area,

Carbon and Sweetwater Counties, Wyoming.

By Thomas Reust, Darryl Newton, Rick Weathermon, William Harding and Craig Smith

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THE BAIROIL ARCHAEOLOGICAL PROJECT: 7,500 YEARS OF PREHISTORY IN THE BAIROIL AREA, CARBON AND SWEETWATER COUNTIES, WYOMING

Prepared for

Amoco Production Company
Bairoil, Wyoming

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FOREWORD

We are proud to present the eighth volume in the Bureau of Land Management's ongoing cultural resource monograph series. This report is the results of the data recovery phase of the Bairoil Archaeological Project conducted by Mariah Associates, Inc. The project was sponsored by Amoco Prodution Company in conjunction with their Enhanced Oil Recovery project in the Wertz and Lost Soldier oil fields in the vicinity of Bairoil, Wyoming. The project area was within the Rawlins District of the Bureau of Land Management.

The initial phase of the two-part Bairoil Archaeological Project consisted of evaluative test excavations of 16 archaeological sites in 1989. The data recovery phase -- the excavation in 1990 of nine archaeological sites totalling 873 square meters (described herein) -- represents the second phase of the Bairoil Archaeological Project. Both phases of investigations were conducted under the Data Recovery Plan of Historic Properties at Bairoil, which is a component of the Bairoil Cultural Resources Management Plan to be prepared by the Bureau of Land Management.

In all, 16 components were encountered at seven of the nine sites. 35 radiocarbon age estimates were obtained from these sites, and the age of the 16 components ranged from terminal Paleoindian to Protohistoric. A large number of features (232) was identified within the block excavations. The results of the investigation are provided in considerable detail. The investigators present an impressive body of data on settlement patterns, subsistence, and paleoenvironment, in a geographical area long a fertile ground for research, but which heretofore has been the object of little systematic data recovery.

The report is an important contribution to the discipline of archaeology and should serve as a useful reference for archaeological research in years to come. We hope the publication proves to be a valuable addition to the library of the professional and amateur archaeologist alike.

Raymond C. Leicht, Ph.D.
Series Editor
Bureau of Land Managememt
Wyoming State Office

ACKNOWLEDGMENTS

The Bairoil Archaeological Project was sponsored by Amoco Production Company in conjunction with their Enhanced Oil Recovery project in the Wertz and Lost Soldier oil fields. Joe Deschamp and Dave Soule of Amoco closely monitored all phases of the project, and their cooperation was invaluable. The Bureau of Land Management was the supervising agency; the initial stages of the project were inspected by Tom Zale and Alice Bronsdon; data recovery excavations were monitored by John Husband; and report preparation was coordinated with Tim Nowak and Gary DeMarcay.

The report was written by a number of individuals: Sections 1, 13, and 14 were authored by Thomas Reust and Craig Smith; Section 2 by William Harding and Thomas Reust; Sections 3, 6, 8, 9, and 10 by Thomas Reust; Sections 4 and 11 by Rick Weathermon; and Sections 5, 7, and 12 by Darryl Newton.

Completion of the fieldwork for the project was possible through the efforts and hard work of the field crew. The field crew consisted of Steve Adamson, Liz Amos, Don Badon, Barbara Barrows, Marty Boudreau, Kurt Braun, Jennifer Cole, Jeff Crenshaw, Chris Finley, Marcus Grant, Craig Hadley, Bruce McClelland, Lance McNees, Darryl Newton, Jamie Peterson, Sheila Powley, Thomas Reust, Julie Schablitsky, Rusty Smith, Tripp Smith, Steve Stathakis, Becky Sterling, Homer Thiel, Marcia Vehling, Rick Weathermon, Cindy Webb, Eugene Wegener, Scott White, and Heather Wright.

Various lab and cataloging tasks were performed by Barbara Barrows, Diane Harding, William Harding, Bruce McClelland, and Sheila Powley. The figures in the report were drafted by Suzanne Luhr, Darryl Newton, and Phyllis Ranz. Darryl Newton illustrated the artifacts. The report was edited by Sharon Breitweiser, Nancy Ford, and Craig Smith. Christopher Lintz provided useful comments. Report formatting and typing were done by Julie Storer and Kelly Heinrich.

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1.0 INTRODUCTION

This document details the results of the data recovery phase of the Bairoil Archaeological Project conducted by Mariah Associates, Inc. (Mariah) for Amoco Production Company (Amoco). The data recovery phase consisted of block excavations at nine archaeological sites and represented the second phase of archaeological investigations conducted under the Data Recovery Plan for Historic Properties (DRP) at Bairoil (Zale 1989). This DRP is a component of the Bairoil Cultural Resource Management Plan to be prepared by the Bureau of Land Management (BLM). The DRP was designed to direct a data recovery effort in connection with the treatment of various archaeological remains discovered since 1987 as a result of Amoco's Bairoil CO_2 Spur Pipeline and Enhanced Oil Recovery Projects at Bairoil.

1.1 PROJECT LOCATION

The Amoco Bairoil Archaeological Project is located in the vicinity of Bairoil in Carbon, Sweetwater, and Fremont Counties, Wyoming (Figure 1.1). The project area is west of U.S. Highway 287 about 65 km north of Rawlins, Wyoming. Two (Tower and Bald Knob sites) of the nine sites excavated during this phase of the investigations are located along Amoco's Bairoil CO_2 Spur Pipeline in Fremont and Sweetwater Counties (Figure 1.1). The other sites are situated in Amoco's Lost Soldier and Wertz oil fields near Bairoil in Sweetwater and Carbon counties (Figure 1.2). The oil fields are in T26N, R89W and T26N, R90W. The U.S. Geological Survey (USGS) 7.5' quadrangle maps that encompass the well field area are Lamont (1961, photorevised 1981), Bairoil (1961, photorevised 1981), Muddy Gap (1962, photorevised 1981), and Whiskey Peak (1962, photorevised 1981). The project area is within the Rawlins District of the BLM.

1.2 PROJECT BACKGROUND

Amoco's Bairoil Enhanced Oil Recovery Project is a long-term effort to increase oil and gas production in the Lost Soldier and Wertz oil fields. These fields have been in production for over 70 years. Amoco is injecting CO_2 into the Tensleep and Madison formations to increase production. For the Enhanced Oil Recovery Project, Amoco has constructed the CO_2 Spur Pipeline, a gas processing plant, and a number of ancillary and field facilities. These field facilities include pipeline trenches, new well locations, and access roads. Excavation of the pipeline trenches was generally accomplished using backhoes or trackhoes, and well pads were constructed using bulldozers and road graders.

The Lost Soldier and Wertz oil fields were originally inventoried for cultural resources in 1977 (Larson 1978). Since then, numerous archaeological inventories have been conducted in the area. The most intensive inventory was conducted by the BLM and Amoco when a large portion of the area was resurveyed in 1984 (Bies et al. 1985). These inventories and subsequent archaeological investigations associated with Amoco's Bairoil Enhanced Oil Recovery Project have shown that most of the extensive archaeological remains in the area are buried with no surface indications of these remains (Moore et al. 1987, Greer and Greer 1989).

Because surface inventories of the area often failed to detect the buried cultural resources, the BLM issued construction monitor and post-construction inspection stipulations on some construction permits for Amoco's Enhanced Oil Recovery Project in 1987 and 1988. As a result of these archaeological monitoring activities, hundreds of subsurface cultural features and other remains were recorded throughout the two well fields. The results of the 1987 and 1988 investigations are summarized in Greer and Greer

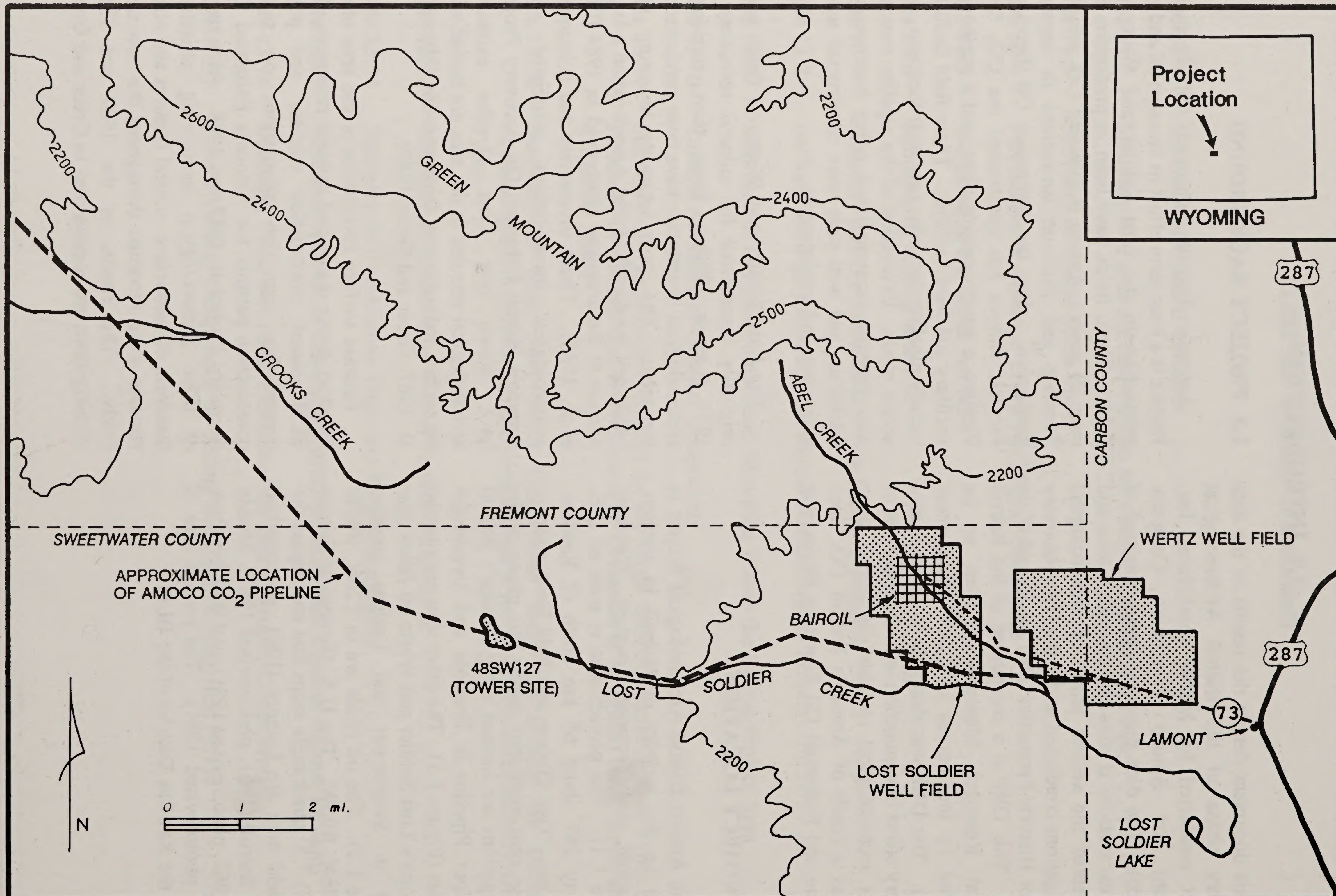


Figure 1.1 Location of Project Area.

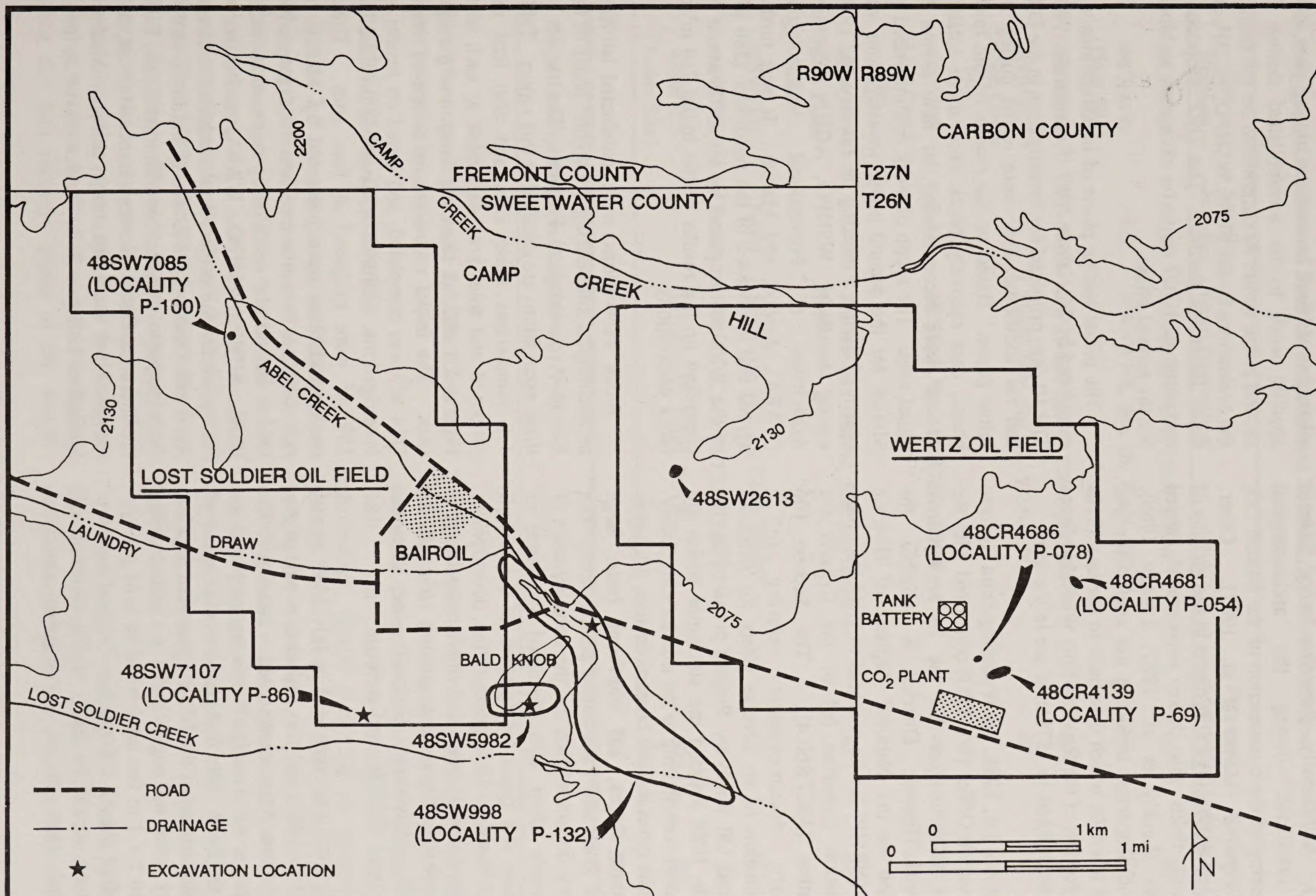


Figure 1.2 Location of Investigated Archaeological Sites within the Lost Soldier and Wertz Oil Fields.

(1989). Additionally, numerous buried features were recorded during the archaeological monitoring of the construction of the Bairoil CO_2 Spur Pipeline (Moore et al. 1987). Other, unrelated archaeological projects in the vicinity of the well fields also have encountered buried features (Latady et al. 1987, Latady 1989). Historic properties including the well fields and Bairoil townsite which date back to the late 1910s and a portion of the Rawlins-Fort Washakie Stage Road established in 1878 also are in the area.

On April 6, 1988, the Wyoming State Historic Preservation Office (WSHPO) concurred with the BLM's determination that the 24 km^2 Bairoil Prehistoric/Historic District is eligible for inclusion on the National Register of Historic Places (NRHP) for its potential to yield important information (criterion [d] of the Criteria for Evaluation [36CFR60.4]). The Section 106 summary documentation relating to a determination of no adverse effect for Amoco's Enhanced Oil Recovery Project prepared by the BLM in 1988 detailed the site types which are considered contributing to the district's eligibility. These site types include human remains, housepits and house floors, kill sites/bone beds, large ceramic sites, and Paleoindian period sites. The summary documentation for the determination of no adverse effect also stipulated avoidance of significant site types, completion of the Bairoil Cultural Resource Management Plan, development of a data recovery plan, and implementation of a Programmatic Agreement among the BLM, WSHPO, Advisory Council on Historic Preservation (ACHP), and Amoco.

The DRP was completed in July 1989 by the BLM (Zale 1989) and was included as part of the Programmatic Agreement signed in January 1990. Two phases of investigations were proposed as part of the DRP. The first phase would consist of subsurface testing of the 10 sites proposed for data recovery using soil augers and 1 x 1 m test units. Up to 10 1 x 1 m test units could be used per site for the first phase. Information obtained from the first phase would be used in the selection of additional sites to be investigated and the allocation of block excavations among sites. The specific work to be accomplished during the second phase would be determined on the basis of the evaluations by the BLM, WSHPO, ACHP, and other interested parties. The DRP proposed a maximum of 1,100 m^2 to be excavated as blocks for the second phase.

The initial testing phase of investigations was completed by Mariah in 1989 (Reust et al. 1990). The 10 sites proposed for investigation in the DRP and six additional sites were tested during the initial phase. Based on the results of the initial phase, data recovery block excavations totaling 714 m^2 were recommended for nine of the 16 tested sites. The scope of work recommended by Mariah for the second phase investigations was approved during a meeting on January 16, 1990, among the BLM, WSHPO, ACHP, Wyoming Association of Professional Archaeologists (WAPA), Amoco, and Mariah. It was further agreed that excavation of the remainder (386 m^2) of the 1,100 m^2 proposed by the DRP would be dependent on the results of the initial 714 m^2 of block excavations.

Block excavations were conducted at nine archaeological sites during the second phase of the Bairoil Archaeological Project. The results of these excavations are detailed in this report. Table 1.1 summarizes these sites and also lists the proposed and total area excavated at each site. Figures 1.1 and 1.2 show the location of the nine sites. The initial recommended scope of work (714 m^2) was completed, and based on results of investigations, additional excavations that totalled 159 m^2 were proposed at four sites. These recommendations were presented by Mariah in July 1990, at a conference and field inspection held at Bairoil and attended by representatives of BLM, ACHP, WSHPO, WAPA, and Amoco. Fieldwork for the project was conducted between April and October 1990. Craig Smith served as the principal investigator, and Thomas Reust, Rick Weathermon, Darryl Newton, Lance McNees, and Homer Thiel were the crew chiefs. Michael McFaul of LaRamie Soils Service served as the

Table 1.1 Legal Locations of Sites Investigated and Summary of Area Excavated.

Site Number	Locality Number	Legal Description[1]	Proposed Area (m^2)	Excavated Area (m^2)
48CR4681	P-054	SENESE, Sec. 7, T26N, R89W	90	90
48CR4139 (Plant Site)	P-069	NWNWNE, Sec. 18, T26N, R89W	200	192
48CR4686	P-078	SWSWSE, Sec. 7, T26N, R89W	60	60
48SW2613 (Stone Circle Site)	--	SENWNW, Sec. 12, T26N, R90W	50	100
48SW998 (Abel Creek Site)	P-132	NESESE, Sec. 11, T26N, R90W	40	70
48SW5982 (Bald Knob Site)	--	NWNE and NENW, Sec. 14, T26N, R90W	132	185
48SW7107	P-086	SENENE, Sec. 15, T26N, R90W	88	122
48SW7085	P-100	NENESW, Sec. 3, T26N, R90W	24	24
48SW127 (Tower Site)	--	SE, Sec. 10, T26N, R91W	30	30
Total			714	873

[1] Legal Descriptions from Reust et al. (1990).

project geomorphologist, and Jannifer Gish was project palynologist.

1.3 STRUCTURE OF REPORT

Section 2.0 presents background information on the geographic and environmental setting of the project area, an outline of the cultural history of the project area, and a summary of the research objectives proposed for the Bairoil Archaeological District (Zale 1989). Section 3.0 outlines the field and laboratory methods used during site excavations and analysis. Sections 4.0-12.0 provide descriptive reports that detail the results of block excavations at the nine sites investigated during the data recovery phase of the Bairoil Archaeological Project. Section 13.0 summarizes the results of investigations at the nine sites and addresses the research questions outlined in the DRP. It includes subsections discussing chronology, spatial patterning of remains and activity area analyses, subsistence patterns, settlement patterns, paleoenvironmental reconstructions, and questions pertaining to resource management. Section 14.0 provides a summary of investigations and a management summary. Section 15.0 lists references cited in this document.

Appendix A presents the geomorphological report submitted by LaRamie Soils Service based on field inspections and sediment analyses of a number of the excavated sites. Appendix B includes the palynological report prepared by Jannifer Gish.

2.0 BACKGROUND INFORMATION

This section provides background information for the Bairoil Archaeological Project. Section 2.1 summarizes the environmental context of the project area, and Section 2.2 outlines the cultural setting for south-central Wyoming. Section 2.3 summarizes the research goals and questions proposed for the Bairoil Archaeological Project (Zale 1989).

2.1 ENVIRONMENTAL SETTING

The Bairoil Archaeological Project is in south-central Wyoming near the north end of the Great Divide Basin. The Great Divide Basin is part of the Wyoming Basin, which lies between the Southern and the Middle Rocky Mountain provinces. The Wyoming Basin is a plateau country merging by narrow passages with the Great Plains on the east and the Colorado Plateau on the south (Fenneman 1931). The basin is internally drained and, as a whole, is not a single topographic depression, but contains several alkali lakes and playas. The Great Divide Basin, like other structural and topographical basins within the Wyoming Basin, was created in the late Mesozoic and early Cenzoic, during the Laramide Orogeny. In the Wyoming Basin during this episode, Precambrian, Paleozoic, and Mesozoic rock was folded, faulted, and uplifted, forming a series of mountain ranges. During the Tertiary, the mountains were uplifted and eroded several times, and the basins accumulated sediments thousands of meters thick (Moore et al. 1987). The sediments were deposited through montane, volcanic, lacustrine, and paludal processes. During the late Cenzoic, an additional uplift resulted in considerable erosion of the basin fill and developed the modern stream systems and topography of the Wyoming Basin.

The project area is bounded on the north by Green Mountain, the Ferris Mountains are to the northeast, Separation Rim and the Rawlins Uplift are to the south, and the Sweetwater Arch borders to the south. Perennial streams in the immediate project area originate on the south slope of Green Mountain. The streams include Crooks Creek, Abel Creek, and Lost Soldier Creek. The North Platte River is approximately 48 km to the east.

The primary bedrock geology of the area is Tertiary basin fill (Moore et al. 1987). Fenneman (1931) notes that this strata is generally soft and, in part, lightly colored. This sediment yields a light clay soil of red color, which is responsible for the appellation of the Red Desert, to the south. The bedrock of the project area is part of the Battle Springs formation, which was formed during the Paleocene and Eocene epochs approximately 58 million years ago (Lageson and Spearing 1988). The bedrock of the northern portion of the project area, and Green Mountain, is the Crooks Gap Conglomerate, which is a disconfirmity overlying the lower Battle Springs formation. Green Mountain is an erosional remnant of the regional basin fill dating to the Tertiary period (Moore et al. 1987). The immediate area around the town of Bairoil rests on bedrock formed during the Cretaceous and Tertiary periods. These rocks form a series of cuestas (wolds) and hogbacks called the Separation Rim or Lost Soldier Divide. This feature defines the east boundary of the Great Divide Basin topographically and marks the west flank of the Rawlins Uplift structurally. In addition, the divide marks the present edge of the Battle Spring formation exposure and the western margin of the Ferris Dune field (Gaylord 1982, 1983).

The topography of the project area is characterized by relatively level valleys and terraces, high ridges and cuestas, and low sand and clay dunes. Some playas are also present. Generally, the valleys and terraces are associated with, or are adjacent to, Abel and Lost Soldier Creeks. Surficial and buried aeolian sheet deposits, as well as dunes, occur near the two oil fields. Colluvial deposits occur on flats and ridge slopes. Alluvial terraces occur adjacent to small streams. On the whole, the majority of the project area is low, rolling plains broken by an occasional stabilized sand dune. On the northern portion of the project area, near Green Mountain and north of the town of Bairoil, the topography exhibits more relief in the form of cuestas and ridges divided by drains containing ephemeral drainages. The drainages originate on the southern slope of Green Mountain. Elevations range from approximately 2,073 m in the Wertz oilfield to a maximum of approximately 2,292 m near Twin Buttes along the pipeline route to the west. The mean elevation of the northern Great Divide Basin is 2,073 m.

The climate of the project area is semiarid. The summers are relatively mild and cool while the winters are long and cold, typical of a steppe climate (Martner 1986). Average precipitation for the northern Great Divide Basin is 23.8 cm with a 14.5 cm annual average for the southern portion. The majority of precipitation occurs as rain or snow during the spring and early summer. The low precipitation is attributable to the Wind River Mountains to the west, which act as a barrier to the moisture-laden air transported from the Pacific coast.

July and August mark the period of high temperatures within the project area. Maximum temperatures attain 80°F to 90°F with low temperatures of -20°F to -30°F occurring in January and February. The mean average temperature of the Great Divide Basin is 42°F. Prevailing winds are from the west-southwest, with a mean velocity of 7.2 km per hour. The number of frost-free days ranges between 90 and 106.

The project area is within the Upper Sonoran life zone (Cary 1917), and the vegetation is comprised of low-growing shrubs and grasses. Nine plant communities were previously identified along or near the CO_2 pipeline (Moore et al. 1987). The communities consisted of very limited willow-wet meadows, upland grassland, sagebrush grassland (the predominant type), big sagebrush-bitterbrush shrubland, greasewood-saltbush shrubland, sand dune shrubland (not present within the current project area), aspen groves, timber pine woodland, and lodgepole pine forest at the highest elevations. The latter three types are found on Green Mountain. The vegetation type boundaries are not distinct, and the biotic diversity includes a number of edible plants in a relatively small area.

Dunal and aeolian sheet deposits are characterized by big sagebrush-western wheatgrass associations with a mixture of low shrubs including big sagebrush, silver, sagebrush, rabbitbrush, other shrubs, low native grasses, and forbs. Nuttal's saltbush, sagebrush, and sparse low grasses dominate poorly drained flats and high ridges. Along perennial drainages, Gardners saltbush dominates poorly drained areas, with better drained areas typified by tall stands of black greasewood that intergrade with big sagebrush communities. Willows, dense grasses and sedges, and diverse forbs are present within riparian communities. The high diversity of flora supports a wide range of animal species.

Thirty-four edible taxa were observed within the communities (Latady 1989). Edible species available include wild onion, biscuitroot, spring parsley, scarlet globemallow, American vetch, stonecrop, greasewood, goosefoot, povertyweed, plains prickly pear, and princes plume. These plants are available from spring through fall. Plants available from mid to late summer, bearing seeds and fruit, include sagebrush, Gardners saltbush, shadscale, goosefoot, prairie sunflower, wheatgrass, prairie junegrass, Indian ricegrass, and alkali sacaton. In addition, the available exploitable fruits are skunkbush sumac, bastard toadflax, and plains prickly pear. Available roots include wild licorice and silver cinquefoil. Mountain snowberry and woods rose are available in the fall.

A large assortment of wildlife occurs throughout the northern portion of the Great Divide Basin. Pronghorn are abundant throughout the project area, with elk and mule deer present in higher elevations along Green Mountain. The drainage and valley bottoms provide habitat for a large variety of smaller mammals, birds, reptiles, and amphibians. Other annual species present within the project area include coyote, jackrabbit, ground squirrel, prairie dog, red fox, badger, sagegrouse, and various rodents. Because the project area adjoins the Great Plains physiographic provence (Fenneman 1931), large numbers of bison were present in the past.

2.2 CULTURAL SETTING

Several cultural historical chronologies are pertinent to evaluating prehistoric occupations within south-central Wyoming. Frison's (1978) chronology for the Northwestern Plains divides occupations from early to late into the Paleoindian, Early Plains Archaic, Middle Plains Archaic, Late Plains Archaic, Late Prehistoric, and Protohistoric periods. In this report, the Plains designation within the Early, Middle, and Late Archaic periods has been deleted. Metcalf (1987) proposes a sequence for parts of southern Wyoming within the Wyoming Basin based on patterns in frequencies of radiocarbon dated components. From earliest to latest, he divides the prehistoric chronology into the Paleoindian, Great Divide, Green River, Pine Spring, Deadman Wash, Uinta, and Firehole phases. The Bairoil Archaeological Project area is near the northeast edge of the area considered by Metcalf (1987) in the development of his chronology.

Figure 2.1 includes the known temporal range of occupation represented in the Bairoil vicinity and compares the chronology proposed by Metcalf (1987) for southern Wyoming with that proposed by Frison (1978) for the Northwestern Plains. Also shown is the radiocarbon age frequency curve for sites in southern Wyoming used by Metcalf (1987) in developing his sequences. It is assumed that the frequency of dates reflects the general trends in intensity of occupation in the region.

2.2.1 Paleoindian Period

The Paleoindian period dates from about 13,000 to 7,000 years ago and includes the Clovis, Folsom, Agate Basin, Hell Gap, Alberta, and Cody complexes (Frison 1978). Each of these complexes is correlated with a distinctive projectile point style. The Paleoindian period is thought to be synonymous with "big game hunters" who exploited megafauna such as bison and mammoth. Evidence of the use of vegetal resources is noted at only a few Paleoindian sites.

Few Paleoindian period sites have been investigated near the project area. The Casper site is a Hell Gap complex bison kill located to the northeast near the city of Casper (Frison 1974). Site 48CR3815, located on Sage Creek south of Rawlins, yielded features and flaked stone artifacts dating to the late Paleoindian period (Latady et al. 1984). The Rattlesnake Pass site is a recently investigated Folsom bison processing site located near Elk Mountain (Smith and McNees 1990).

2.2.2 Early Archaic Period

The Early Archaic period dates from about 7,000 to 5,000-4,500 years ago. Projectile point styles reflect the change from large lanceolate types that characterize the earlier Paleoindian complexes to smaller, side- or corner-notched types. Subsistence patterns reflect exploitation of a broad spectrum of resources, with a much diminished utilization of large mammals. Groundstone tools are common, indicating the importance of wild plant resources, and animals exploited were mostly small mammals such as jackrabbit, cottontail, and ground squirrel.

In recent years, numerous Early Archaic period sites with habitation structures (housepits) have been investigated in the Wyoming Basin. In the general area, multiple housepits were excavated near Split Rock (Eakin 1987), and housepits also were noted at the Crooks site (McKern 1987), Medicine House site (McGuire et al. 1984), and Sinclair site (Reust 1989, Smith and Reust 1992).

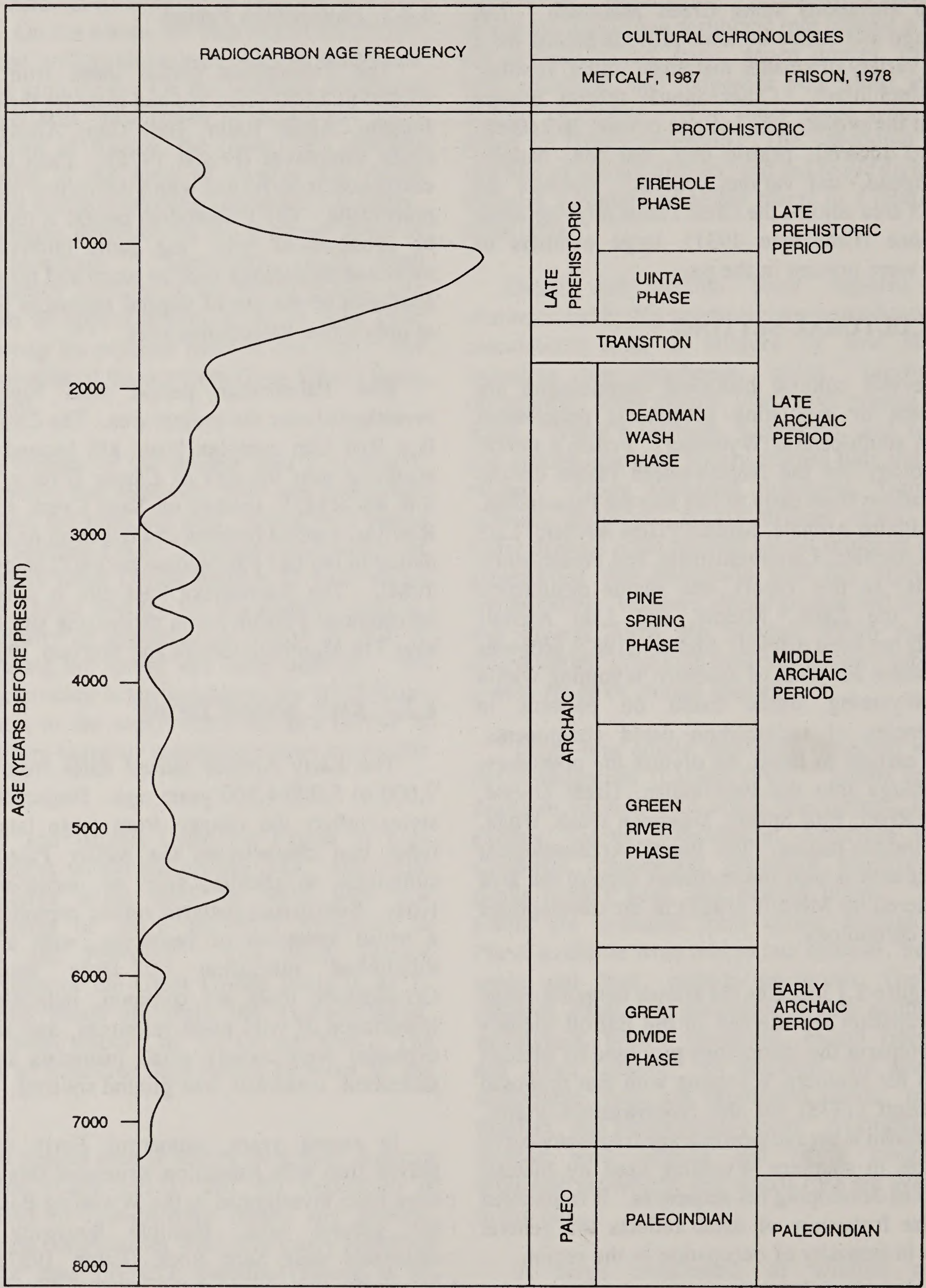


Figure 2.1 Metcalf's (1987) Cultural Chronology for Southern Wyoming and Frison's (1978) Cultural Historical Chronology for the Northwestern Plains.

Metcalf's (1987) sequence divides the Early Archaic period into the Great Divide and Green River phases. Recent evaluation of Metcalf's chronology has attributed housepits primarily to the Green River phase, and it has been suggested that the Green River phase be redesignated as the Opal phase (McKibbon et al. 1989).

2.2.3 Middle Archaic Period

The Middle Archaic period extends from about 4,500 to 3,000 years ago and is referred to as the McKean complex on the Northwestern Plains (Frison 1978). This complex is characterized by a variety of indented base, stemmed or lanceolate projectile points including Duncan, Hanna, Mallory, and McKean Lanceolate types. McKean complex sites on the Northwestern Plains are usually associated with bison hunting (Frison 1978). Generally, in southern Wyoming this period is characterized by a mixed hunting/plant gathering economy with a reliance on large mammals other than bison (Wheeler et al. 1986). In Metcalf's (1987) scheme, the Pine Spring phase is equated with the Middle Archaic period.

Housepits have been investigated at several Middle Archaic period sites, including the Crooks site which is just west of the Bairoil project area (McKern 1987). Other investigated Middle Archaic period sites in the general area include the Scoggin site--a bison kill, located east of the city of Rawlins (Lobdell 1973)--and a short-term dunal camp--Site 48CR2200, located just west of Rawlins (Creasman et al. 1983).

2.2.4 Late Archaic Period

This period dates from 3,000 to 1,600 years ago and is characterized mostly by medium to large corner-notched projectile points. This point type is ascribed to the Pelican Lake complex on the Northwestern Plains and is similar to Elko Corner-notched types from the eastern Great Basin. Subsistence patterns are less well documented for the Late Archaic period than for succeeding and preceding periods in southern Wyoming. The Deadman Wash phase corresponds with the Late Archaic period in Metcalf's (1987) scheme.

Bison and pronghorn appear to have been the primary animals exploited during this phase, though smaller animals were exploited at some sites. Except for the recovery of groundstone implements at a few sites, little information exists concerning the use of plant foods at Deadman Wash phase sites in southwest Wyoming. The only components from this phase which have produced significant quantities of charred seeds are from the Taliaferro site (Smith and Creasman 1988).

2.2.5 Late Prehistoric Period

The Late Prehistoric period extends from 1,600 years ago to the Protohistoric period and represents a period of intensified occupation throughout the region as indicated by the number of radiocarbon dated sites. There is a general switch from a reliance on dart-based hunting technology to the use of the bow and arrow at the beginning of this period.

Metcalf (1987) divides this period into the Uinta phase (1,600 to 900 years ago) and Firehole phase (900 to 300-200 years ago). Most Late Prehistoric period sites in southern Wyoming fall within the Uinta phase, which is identified mostly by Rose Spring Corner-notched projectile points and occasionally ceramics. Ceramics, although not common, are generally Fremont types (Bower et al. 1986, Greer and Greer 1989). The Firehole phase is characterized by small side-notched arrow points similar to Desert Side-notched and Plains Side-notched types, and Intermountain Ware ceramics.

Numerous sites dating to the Late Prehistoric period within the Northwestern Plains reflect bison kill or processing activities (Frison 1978). Within the Wyoming Basin, a broader based subsistence pattern has been documented, with extensive utilization of seeds from weedy plant species and exploitation of a wide variety of large and small game animals. Pronghorn processing sites occurred throughout the Late Prehistoric period as indicated at the Austin Wash site (Schroedl 1985), Oyster Ridge site (Zier 1982), Firehole Basin II site (Zier et al. 1983), and Eden Farson site (Frison 1971). Extensive utilization of bison is evidenced at the Wardell Bison Trap (Frison 1973) and Inman Bison site (Latady et al. 1984). A diverse range of animal taxa was processed at many Uinta phase sites including the Taliaferro site (Smith and Creasman 1988). Evidence of extensive seed processing activities comes from the many Uinta phase sites such as the Taliaferro site (Smith 1988) and Buffalo Hump site (Harrell 1989).

2.2.6 Protohistoric Period

The Protohistoric period corresponds to the arrival of Europeans on the continent, and in the Wyoming Basin this period extended from approximately 450 to 150 years B.P. (Metcalf 1987). Few Protohistoric sites have been investigated in the region, although surface finds of trade goods are not uncommon. The Skull Point site near Kemmerer, Wyoming dates to approximately 300 years ago is a rockshelter site with an associated rock art panel of probably Shoshonean affiliation (McGuire 1977). The Eden-Farson site is a Protohistoric campsite that dates to 230 years B.P. that had a number of associated lodges with intensive antelope processing activities represented. No European trade goods were collected from either site.

2.3 RESEARCH GOALS

The overall goal of the Bairoil Archaeological Project was to obtain data pertinent to understanding the lifeways of the prehistoric inhabitants of the project area and region. The research design prepared by Zale (1989) focused on topics pertinent to this overall goal, and research topics include identification of different types of activity areas, refinement of the cultural chronology and delineation of settlement and subsistence patterns represented within the project area, reconstruction of paleoenvironmental conditions, and evaluation of changes in settlement and subsistence patterns relative to paleoenvironmental fluctuations in the area. A final topic to be discussed relates to resource management and includes addressing whether excavation of large block areas around cultural features provides more information than feature-specific excavations, and evaluation of criteria for recognizing housepits and/or house floors.

The proposed activity area analysis, with three hypothesized idealized types (animal processing, floral processing, and residential), is based on Creasman et al.'s (1985) formulation of hypothetical activity area types for southwest Wyoming. As proposed, each of the three types should be characterized by specific attributes as represented by differing artifact and feature associations. Definition of different activity areas within components will facilitate determination of site functions which is necessary for developing and evaluating settlement and subsistence models.

The delineation of an accurate and detailed cultural historical chronology has long been a major research interest within the region (Mulloy 1958, Frison 1978, Zier et al. 1983) and is a major goal of the current project. The project area is located near the contact of two major cultural areas, the Great Plains (Northwestern Plains) and Great Basin, and the cultural history of the area may reflect influences from both regions, as well as localized developments. The development of a comprehensive project area (and regional) chronology is an important step to allow comparisons of components from different sites to evaluate settlement and subsistence patterns, and for evaluation of cultural change through time.

An initial step in analysis of settlement and subsistence patterns in the Bairoil vicinity is understanding the types of activities represented by individual cultural components, which will facilitate interpretation of site function, and determination of season of occupation of each component. The excavation of components from a range of environmental settings at Bairoil should provide information concerning differential seasonal and functional utilization of these settings.

Reconstructing paleoclimatic conditions and determining the relationship of these conditions with settlement and subsistence patterns are major goals of the project. Climatic changes can affect such critical resources as water and animal and plant communities; therefore, to assess human adaptation in the region, an understanding of past environmental conditions is important.

Past cultural resource management projects in the Bairoil vicinity have recorded hundreds of cultural features including possible housepits and housefloors, although past investigations have generally been feature-specific with areas outside of the features uninvestigated. One goal of the Bairoil Archaeological Project that relates to resource management is to determine whether excavation of larger areas around features provides more information than excavation of only features. Another goal is to assess criteria for the recognition of housepits and house floors.

3.0 METHODS

The field and laboratory methods used during data recovery excavations at nine archaeological sites are described below. Similar field and laboratory methods were used for the nine sites and for sites tested previously during the first phase of the Bairoil Archaeological Project (Reust et al. 1990).

3.1 FIELD METHODS

Standard archaeological field procedures were followed during block excavations at the nine sites. Horizontal control for each excavation block was established on a Cartesian grid system referenced from a single block datum which was designated as 100N 100E with all horizontal proveniences referenced from this datum. For excavation blocks located adjacent to a pipeline trench, the horizontal grids were oriented relative to the trench associated with each block. The grids for blocks not situated adjacent to pipeline trenches were oriented to true or magnetic north. For all blocks, the northerly axis was arbitrarily designated as Grid North. The vertical grid for each block was established relative to a vertical datum arbitrarily designated as either 10.0 m or 100.0 m in elevation, with all elevations referenced to this datum.

The basic excavation unit was a 1 x 1 m square. As a rule, each unit was excavated in arbitrary 10 cm levels established in even 10 cm increments from datum. An exception pertained to housepit excavation, with each housepit excavated as a cultural layer but still by 10 cm increments. Excavation levels were numbered using a system in which the first was labeled Level 1, the second was designated Level 2, etc. Each 1 x 1 m by 10 cm level was excavated separately using shovels and trowels. All excavated material was screened through 1/8 inch hardware cloth, with feature fill screened through 1/16 inch hardware cloth.

The basic horizontal documentation unit was a 2 x 2 m unit. These units were labeled using the coordinates of their southeast corner. Individual 1 x 1 m excavation units were labeled as quadrants (NW¼, NE¼, SE¼, SW¼) of the 2 x 2 m unit within which they were included. An Excavation Level form, with spaces for recording specific data from each quadrant as well as stratigraphic and other descriptive information for the larger unit, was filled out for each excavated level of each 2 x 2 m unit.

Tools found in situ were plotted with exact horizontal and vertical provenience, and each tool was bagged separately and given a different field specimen (FS) number. Debitage, bone, and tools recovered during screening were provenienced by 1 x 1 m unit and 10 cm level. All tools were bagged separately. Debitage was bagged as a lot for each level, as was bone. Each bag of debitage and bone and each tool were given a separate field specimen number. This information was recorded on a Field Specimen Record form and the Excavation Level form completed for each 10 cm level. Radiocarbon, pollen, phytolith, and flotation samples were also recorded on the Excavation Level form and on a Sample Record form.

The entire area of each block was excavated simultaneously. Heat-altered rock, sandstone slabs, and other large remains were mapped in place and basal elevations recorded. This technique was used to facilitate the delineation of site activities and activity areas.

All features encountered during the block excavations were exposed horizontally and then recorded with a plan view map and/or photographs. After the delineation of the plan view, pit features were cross sectioned to determine their morphology and the presence or absence of any internal stratification. Drawings were made of the resulting profile, with the remainder of the fill then removed. Samples for plant macrofossil (flotation), phytolith, pollen, and radiocarbon analyses were taken from all pit features, with four pollen and phytolith samples collected at cardinal directions (north, south, east, and west) 50 cm outside of individual pit features. Pollen, phytolith, and flotation samples were also collected at 50 cm intervals from housepit floors. All pollen, phytolith, radiocarbon, and flotation samples were assigned sequential numbers on a Sample Record form. After the features were completely excavated, they were again mapped and photographed. All pertinent information--including number, weight, and type of rock; presence or absence of oxidation; feature fill characteristics; dimensions; etc.--was recorded on a Feature Record form.

Heat-altered rocks encountered in sites were plotted vertically and horizontally on unit or feature maps. As with features, some concentrations of heat-altered rock were left in place for complete exposure during future block excavations. Rocks that were not left in place were counted, weighed, and measured by material type and recorded on Heat-altered Rock Level Summary forms and/or Feature Record forms.

Stratigraphic profiles were drawn for at least two walls of each of the excavation blocks. The color, particle size, and calcium carbonate content of the deposits for each stratum were recorded on the field drawings and Stratigraphic Record forms. Michael McFaul, LaRamie Soils Service, provided input during the recording of the stratigraphic profiles. Sediment, pollen, and phytolith samples were taken at 10 cm intervals from a column from excavation blocks deemed to have the potential to yield significant paleoenvironmental information.

3.2 LABORATORY METHODS

After completion of fieldwork, all collected materials, including tools, debitage, bone, bulk sediment samples, and field records, were taken to the Mariah office in Laramie, Wyoming, for laboratory analysis. All artifacts and animal remains were processed and cataloged for curation at the University of Wyoming. Each tool was assigned a separate catalog number. Debitage and bone were given catalog numbers by lot for each 1 x 1 m excavation unit and 10 cm level. The field specimen numbers recorded in the field were cross-referenced with the University of Wyoming catalog numbers on Field Specimen forms. Artifacts collected at each site were assigned consecutive catalog numbers beginning with the county abbreviation and site number (SW5982, SW7107, etc.). Several artifacts from Site 48CR481 and the Bald Knob site were lost or stolen during the site inspection. These artifacts are recorded in the report log by their FS number, and their descriptions are based on field notes.

Analyses conducted on recovered remains included feature, artifact, faunal, plant macrofossil, sediment, pollen, and radiocarbon analyses, and the analysis of the spatial relationships between the various types of remains. Each type of analysis is discussed below.

3.2.1 Feature Analysis

Excavated features were classified into types using characteristics including morphology, surface area, volume, and the presence or absence of heat-altered rock and oxidation. Functional interpretations were made based on morphology, content of fill, and associated archaeological debris such as heat-altered rock, flaked stone tools, bone, charred seeds, and groundstone. This analysis provided information on feature types for comparison by temporal periods, and the functional interpretations were used to help determine past site activities.

3.2.2 Artifact Analysis

All artifact analyses were performed by Mariah archaeologists at the Mariah laboratory in Laramie, Wyoming. All artifacts, excavation forms, field notes, laboratory analysis forms, analysis records, animal remains, and plant macrofossils will be curated at the University of Wyoming.

As used in this report, the term "artifact" refers to tools, cores, debitage, groundstone, hammerstones, and bone tools and adornments. Flaked stone tools and debitage were classified as flaked stone artifacts. Flaked stone artifacts from which more than three flakes have been removed or which exhibit wear indicative of utilization were classified as flaked stone tools; this term should not be taken to imply that all of these artifacts were actually used as tools, because some of these artifacts represent broken, discarded, or lost intermediate manufacturing stages. All other flaked stone artifacts--including pebbles, cobbles, and pieces of raw material from which fewer than three flakes have been removed and which do not exhibit evidence of use--were classified as debitage. Flaked stone tools, hammerstones, groundstone, bone tools, and ceramics were classified as tools.

Flaked stone tools were analyzed within a technological scheme which groups artifacts according to the kind and relative amount of reduction which they have undergone. This reduction continuum includes sequential steps from the collection of raw materials to the completion of the final implement. Each stage in the sequence is considered a separate artifact type defined by certain technological and morphological attributes. This technological approach facilitates the examination of the nature of the tool kit(s) represented and the types of reduction activities conducted at a site. Previous research has shown that products of certain reduction sequences or portions thereof characterize various site types (Smith and Creasman 1988). This information, in turn, can contribute to the overall interpretation of site function and the role of the site within the general settlement system.

Three reduction sequences resulting in different idealized end products are evident in the artifact assemblages from southern Wyoming: 1) the retouching or use of flakes that were removed from a nodule or core; 2) the expedient modification of cobbles or pebbles for tools; and 3) the reduction of bifaces into implements.

The artifact classes resulting from the flake tool reduction sequence are cores and utilized and retouched flakes. Cores are chunks of raw material exhibiting scars and prepared striking platforms resulting from the removal of flakes to obtain those flakes for additional utilization. Instead of being discarded, some cores were further reduced into bifaces within the biface reduction continuum. Flakes having intentional retouch along one or more edges were classified as retouched flakes. Some retouched flakes were classified as scrapers. Flakes that display clear evidence of use wear but not of deliberate retouch were classified as utilized flakes.

Artifacts resulting from the expedient modification of cobbles or pebbles for use as tools were classified as modified cobbles. This artifact type can exhibit bifacial flaking along one or more edges, but in contrast to artifacts in the bifacial reduction sequence, flake scars extend less than halfway across the cobble face. These artifacts often exhibit evidence of chopping and battering along the modified edge.

The continuum of biface manufacture as illustrated by Holmes (1919:Figure 49) is divided, from first to last stages, into preblanks, blanks, preforms, and end products. Based on size and form, the end products are classified further into projectile points, hafted knives, and drills. Preblanks, representing the first bifacial reduction stage, are thick and blocky in cross section and display much of the shape and form of the original cobble pebble or flake. Blanks are thinner and less blocky in cross section than preblanks but thicker, less regular, and less definitely shaped than preforms. Bifacially flaked stone artifacts that have regular outlines, generally thin cross sections, and little or no cortex were classified as preforms. End products with notches or other modification for hafting were classified as projectile points or hafted knives, depending on size and edge characteristics. Drills are end products with long, narrow distal ends.

These classes are intended to characterize bifacial artifacts by the amount and general character of reduction and, hence, by stage in the reduction sequence. Artifacts at any stage in this reduction sequence could be and were used as tools with or without edge retouch.

A primary focus of the analysis of flaked stone tools was the examination of significant changes through time in the relative proportions of the various tool classes. These can indicate changes in tool kits or resources exploited. These changes can in turn indicate changes in subsistence strategies (Binford 1980).

For projectile points, the major concern of the analysis was the delineation of morphological types for chronological purposes. Based on morphological attributes, including overall size, form of notch, and shape of base, the points were grouped into descriptive categories, which were then compared to similar morphological and technological types detailed in the literature of the Great Basin, northern Colorado Plateau, and Northwestern Plains.

Debitage consists of the unutilized waste material and by-products of flaked stone reduction activities. Pebbles, cobbles, or chunks of raw material from which 1-3 flakes were removed and which did not exhibit signs of utilization were classified as tested material; such artifacts generally represent tested samples of raw material collected for manufacturing tools but discarded prior to use.

Flakes and shatter are the material detached from a piece of stone during the various stages of tool manufacture. Based on their characteristics, flakes can be grouped to correspond roughly with the reduction stage in which they were produced. The initial flakes removed from a piece of raw material generally have considerably more cortex than those resulting from later steps in the reduction sequence, though even flakes resulting from the final stages can retain cortex depending on the shape and size of the raw material. Conversely, flakes without cortex are usually the result of thinning or tool finishing activities during the later stages of tool manufacture. In addition to being discarded as waste material, flakes can be produced for use as unmodified tools, retouched to produce a suitable edge, or reduced in the bifacial reduction sequence.

Debitage containing a striking platform, bulb of force, or other flake attributes is grouped as either primary, secondary, or tertiary flakes, depending on the amount of cortex on the dorsal surface. Those pieces classified as primary flakes have at least 90% cortex, secondary flakes have 1-90% cortex, and tertiary flakes lack cortex. Microflakes are tertiary flakes that are less than 1 cm in diameter. Pieces of debitage that are blocky and lack the attributes of flakes were classified as shatter. Shatter is produced during most stages of tool manufacture; larger pieces of shatter are most commonly the result of the failure of a core or a biface in an early stage of the reduction sequence. All debitage was assigned to one of five size classes, as shown in Figure 3.1, based on the maximum dimension of individual flakes.

All flaked stone tools and debitage were analyzed in terms of material type by category. The relative proportions of different material types represented in different components and artifact classes can be used to examine changes in the selection of different raw material types through time. The distribution of debitage consisting of the different material types was also examined for each component to help discern the patterning of discrete prehistoric activity areas within those components.

For descriptive purposes, the silicates represented in the sample were all classified as chert or chalcedony. The chert category was further divided into red, white, tan, or other chert based on material type color. Phosphoria cherts are also identified. Other material types distinguished during analysis included quartzite, Morrison quartzite, petrified wood, quartz crystals, siltstone, quartz, obsidian, ignimbrite, moss agate, and granite. Although detailed analysis of project area lithic sources was not undertaken, the occurrence of toolstone quality

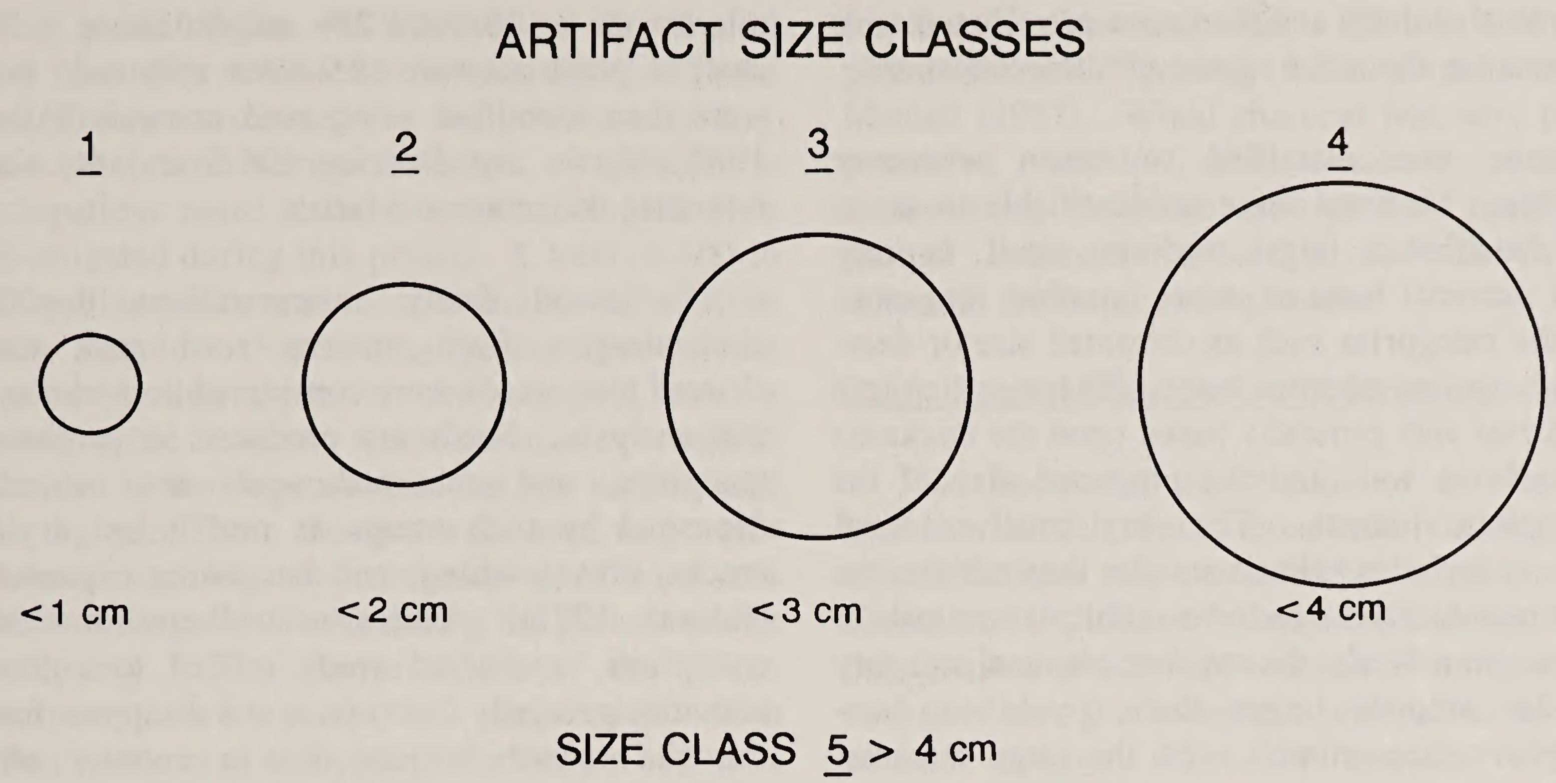


Figure 3.1 Debitage Size Classes.

raw material in the vicinity of the project area appears to be very limited. The higher gravel-covered ridges such as Camp Creek Hill contain numerous granite cobbles, with a very low density of chert, quartzite, siltstone, or chalcedony pebbles or cobbles.

Cobbles which display evidence of battering on one or more edges and exhibit flakes resulting from accidental flake removal were classified as hammerstones. Some large battered cobbles were classified as anvil stones. Pieces of sandstone or quartzite that are ground or pecked were classified as groundstone. Groundstone was further divided into manos, metates and abraders. Also one ceramic sphere was recovered from the Stone Circle site.

Bone specimens exhibiting deliberate modification for use as tools or ornaments were also classified as artifacts. In addition to the standard analyses performed on all bone specimens, these specimens were further examined for type, location, and extent of cultural modification. This information was then used to determine the types of processes involved in the modification of the bone and the nature of the artifact represented.

3.2.3 Analysis of Animal Remains

Animal remains recovered from the block excavations were analyzed by Michael Bergstrom, project faunal analyst. The analysis was conducted to obtain information regarding the kinds of animals consumed, processing activities, relative importance of hunting, and time of year of site occupation. The recorded attributes included count, size, weight, taxonomic classification, anatomical element, portion of element present, side of body, preservation, and degree of epiphyseal union.

The types and numbers of animals represented, the types and amount of cultural modification (e.g., burning and bone reduction), and the spatial distributions of the various classes of animal remains were then analyzed by component to help reconstruct subsistence patterns as well as the types and distributions of activities at the sites during each of the occupations. Degree of epiphyseal union was also used to suggest age of the animal at death and, hence, to provide tentative information about the season of site occupation.

Bone was classified to taxon whenever possible. Mammal bone unidentifiable to taxon was classified as large, medium, small, or very small mammal bone or, when possible, into more specific categories such as cottontail size or deer-pronghorn size mammal bone. Placement in these categories was generally based upon the thickness of the bone wall and the projected size of the incomplete element. The very small mammal category includes animals smaller than rabbits, the small mammal class includes rabbit size animals to coyote size animals, the medium mammal category includes animals larger than coyote to deer-pronghorn size animals, and the large mammal classification refers to animals larger than pronghorn or deer such as bison or elk.

Recent rodent bone was considered intrusive and noncultural. It was not included in the component analyses or discussions. Bone specimens were judged to be intrusive and recent on the basis of relative preservation, the number of elements represented, the absence of breakage or other modifications, stratigraphic context, and other attributes.

3.2.4 Plant Macrofossil Analysis

The plant macrofossil analysis was conducted by Craig Smith and Barbara Barrows of Mariah. At least 1.5-2.0 liters of fill from each selected pit features or housepits were floated and examined for charred plant remains. The bulk samples were processed using the water flotation technique outlined by Bohrer and Adams (1977). This consisted of slowly pouring the bulk samples into a bucket of water, stirring to allow the organic material to float to the surface, and then skimming off the floating debris with a fine cotton cloth. This process was repeated several times for each sample to ensure complete recovery of macrofossils.

The residue from each sample was air dried and examined under a binocular dissecting microscope at 10x and 20x magnification. The charred plant macrofossils were removed; they were then identified using seed manuals (Albee 1980, Martin and Barkley 1961) and the seed reference collection at Mariah.

To avoid faulty interpretations due to contamination from modern seed rain, only charred plant seeds were considered prehistoric in this analysis. Seeds are produced in enormous quantities, and unburned seeds are naturally deposited by such means as root holes, drying cracks, downwashing, and burrowing organisms (Keepax 1977). Under normal environmental conditions, uncharred seeds related to cultural activities generally decompose and disappear from the site record in less than a century after deposition (Minnis 1981).

The presence (or absence) of charred seeds was used to help interpret the functions of specific features and feature types, the types of resources exploited at the site, and the nature and function of the site in general. The range of seed maturation dates for the species represented was also used to help provide tentative interpretations of season of site occupation.

3.2.5 Sediment Analysis

The sediment samples were analyzed by Michael McFaul, LaRamie Soil Service. Samples were taken from stratigraphic columns at 10 cm levels at the conclusion of excavations by Mariah, with additional samples collected and analyzed by LaRamie Soils Services (Appendix A). Analysis included the assessment of grain size populations, total carbonates, and pH. The analysis provided data for the interpretation of the depositional and soil formation histories of individual sites, which in turn was used for the reconstruction of the paleoenvironmental conditions for the project area.

3.2.6 Pollen Analysis

The pollen analysis was performed by Jannifer Gish, project palynologist. Pollen samples taken in 10 cm increments from columns within the south block of Site 48SW998 (Abel Creek site) and from Site 48CR4681 were analyzed. These two sites were selected for analysis because they span the total temporal range of prehistoric occupations noted at the nine archaeological sites investigated during this project. A total of 100 to 200 pollen grains was counted and identified from each sample. Fluctuating percentages of the various pollen types in the samples from a stratigraphic column were assumed to reflect changes in the vegetation in the site vicinity and the region. These changes were used to provide clues concerning environmental conditions and shifts in the paleoclimate during the periods of site occupancy. The interpretations of the pollen analyses were used in conjunction with interpretations of analyses performed on sediment samples.

Pollen samples were also analyzed from a number of discrete thermal, nonthermal, and housepit features at Site 48CR4686, the Plant site, and the Bald Knob site to obtain information pertinent to reconstructing subsistence activities. Preservation of pollen was very poor within discrete pit features and due to the ashy nature of the feature matrix, sufficient pollen counts for analysis were not obtained from any of the discrete pit features (Appendix B).

3.2.7 Radiocarbon Analysis

Charcoal samples from pit features were dated using the radiocarbon method. They were processed at Beta Analytic, Inc. (Beta) of Coral Cables, Florida. Multiple age estimates obtained for a single component were tested for contemporaneity (or lack of contemporaneity), using the procedure outlined by Long and Rippeteau (1974). All radiocarbon age estimates were corrected (calibrated) using a program outlined by Pearson et al. (1986). Uncorrected radiocarbon ages are used int he text and calibrated dates are shown in the tables detailing the radiocarbon results. Radiocarbon age estimates were used to establish the temporal order of the various excavated components and to assign them to the appropriate cultural-historical periods for the Northwestern Plains (Frison 1978) or phases for the Wyoming Basin as proposed by Metcalf (1987). Wood charcoal was very poorly preserved within most cultural features, necessitating the submission of bulk samples of stained sediment to obtain radiocarbon age estimates from most components.

3.2.8 Spatial Distribution of Remains

The horizontal distribution of the features, heat-altered rock, flaked stone tools, debitage, and animal remains was examined by component. To obtain a clear picture of these distribution patterns, the densities of debitage and animal remains were smoothed using a technique referred to as trend surface analysis when the samples were of sufficient size (Hodder and Orton 1976). This method smoothes local variations in density, creating graduated contours of densities indicating general surface (areal) trends. For this analysis, the 4 m^2 averaging method was employed using densities per 1 x 1 m excavation units as the basic unit of data. The relationships among the spatial distributions of the various classes of remains were used to help determine the kinds and patterning of activities and types of activity areas represented in each of the components.

3.2.9 Component Analysis

As used in this report, the term "cultural component" refers to the smallest archaeologically definable temporal unit of artifacts and other cultural remains which can be analytically distinguished within a site. Features, artifacts, and animal remains were distinguished and grouped by components on the basis of stratigraphic evidence and discrete horizontal and vertical distribution patterns. The cultural component constituted the basic unit for the analysis of the composition of assemblages, subsistence patterns, and the spatial distributions of cultural remains.

4.0 SITE 48CR4681 (Locality P-054)

This section presents the results of block excavations completed at Site 48CR4681 (Locality P-054) during the second phase of the Bairoil Archaeological Project. One 90 m^2 excavation block was completed, with five prehistoric components identified which dated from approximately 7,500 to 1,500 years B.P. The site setting, stratigraphy, results of excavations, and summary of results are discussed in the following subsections.

4.1 SITE SETTING

Site 48CR4681 is preserved in aeolian sheet sands of the historic Wertz oil field (Figures 1.1 and 1.2). Located several hundred meters south of Camp Creek Hill and due north of Wertz camp at an elevation of approximately 2,036 m, the locality is contained in a relatively flat-lying, buried sand dune. Modern vegetation consists mainly of low sagebrush, short forbs, native shortgrasses, and prickly pear cactus. The remnants of an old stream drainage trend west to east approximately 100 m to the north through the remains of what appears to have been a small playa lake. A portion of an old terrace tread is evidenced by segments of a gravel bench approximately 1 m in height visible northwest of the site along the same paleostreambed. Vegetational diversity appears to increase toward the playa with grasses and forbs increasing in frequency and type. Within the playa remnant, plant diversity drops drastically, probably due to the alkaline soil conditions created by the playa lake itself when extant. Figures 4.1 and 4.2 provide views of the general setting of the excavation block and Site 48CR4681.

Site 48CR4681 was discovered during monitoring of the Wertz 164 flowline trench excavation in March 1988. Noted in the profile of the trench were six features, tentatively identified as roasting pits, firepits, ash stains, and a possible housepit (Greer, Greer, and Zettel 1989a). Recorded depths of the features indicated a possible multiple component site with hearths buried up to 130 cm below ground surface. Investigations were not initiated at the time due to frozen ground conditions.

Testing of Site 48CR4681 deposits by Mariah indicated that a significant amount of undisturbed cultural material lay to the north of the trench ROW. Flaked stone debitage and burned bone were recovered within test units. An intact feature (Feature 7) was located within Test Unit 4, with another probable feature located by auger testing approximately 5.0 m north of that test unit. Cultural materials were encountered within the first level (10 cm) of test units with indications of intact deposits to approximately 130 cm below the present ground surface (Reust et al. 1990). Investigation of cultural remains was recommended involving excavation of a 90 m^2 block encompassing the newly discovered Feature 7 and the probable feature located in the auger test (Figures 4.3 and 4.4).

Intensive data recovery at Site 48CR4681 involved excavation of a contiguous block centered around Feature 7. Figure 4.4 shows the grid designations for the block with horizontal locations referenced from a single point located at near the southeast corner of the excavation block. Vertical measurements were referenced from a single datum point established on a metal drill pipe marking the location of the pipeline. The datum point for vertical control was established at 101.53 m on this pipe. Excavation methodology followed standard archaeological procedures as outlined in Section 3.0 of this report.

4.2 STRATIGRAPHY

Nine distinct natural strata, and seven substrata that represent depositional or erosional episodes within the major strata, were identified within the excavation block at Site 48CR4681 (Figures 4.5 and 4.6). Located within the natural stratigraphy of the site are at least five cultural components,

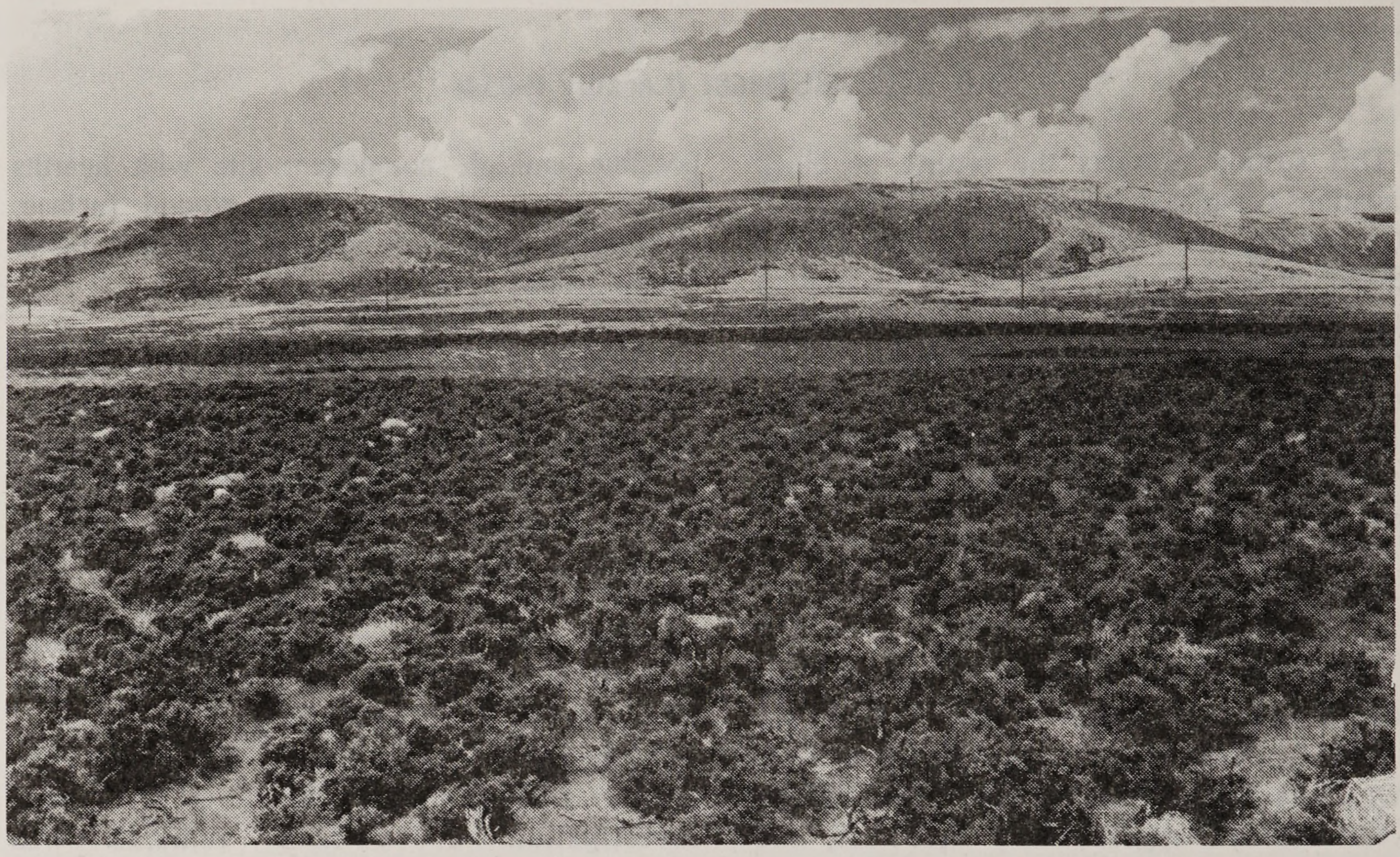


Figure 4.1 Playa with Camp Creek Hill in the Background, Looking North, Site 48CR4681 (Locality P-054).

Figure 4.2 Site Setting During Excavations Looking Northeast, Site 48CR4681 (Locality P-054).

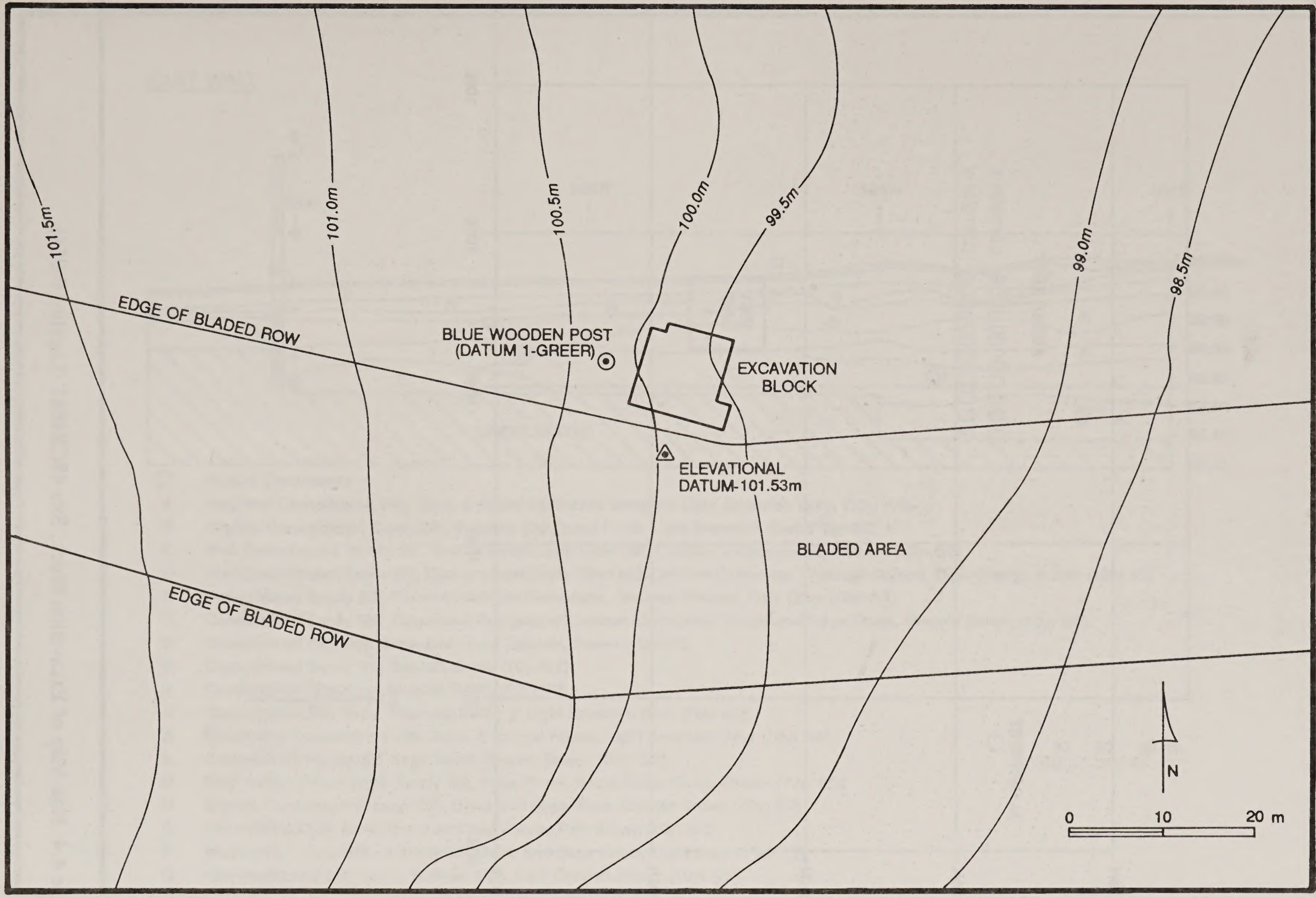


Figure 4.3 Contour Map of Site 48CR4681 (Locality P-054).

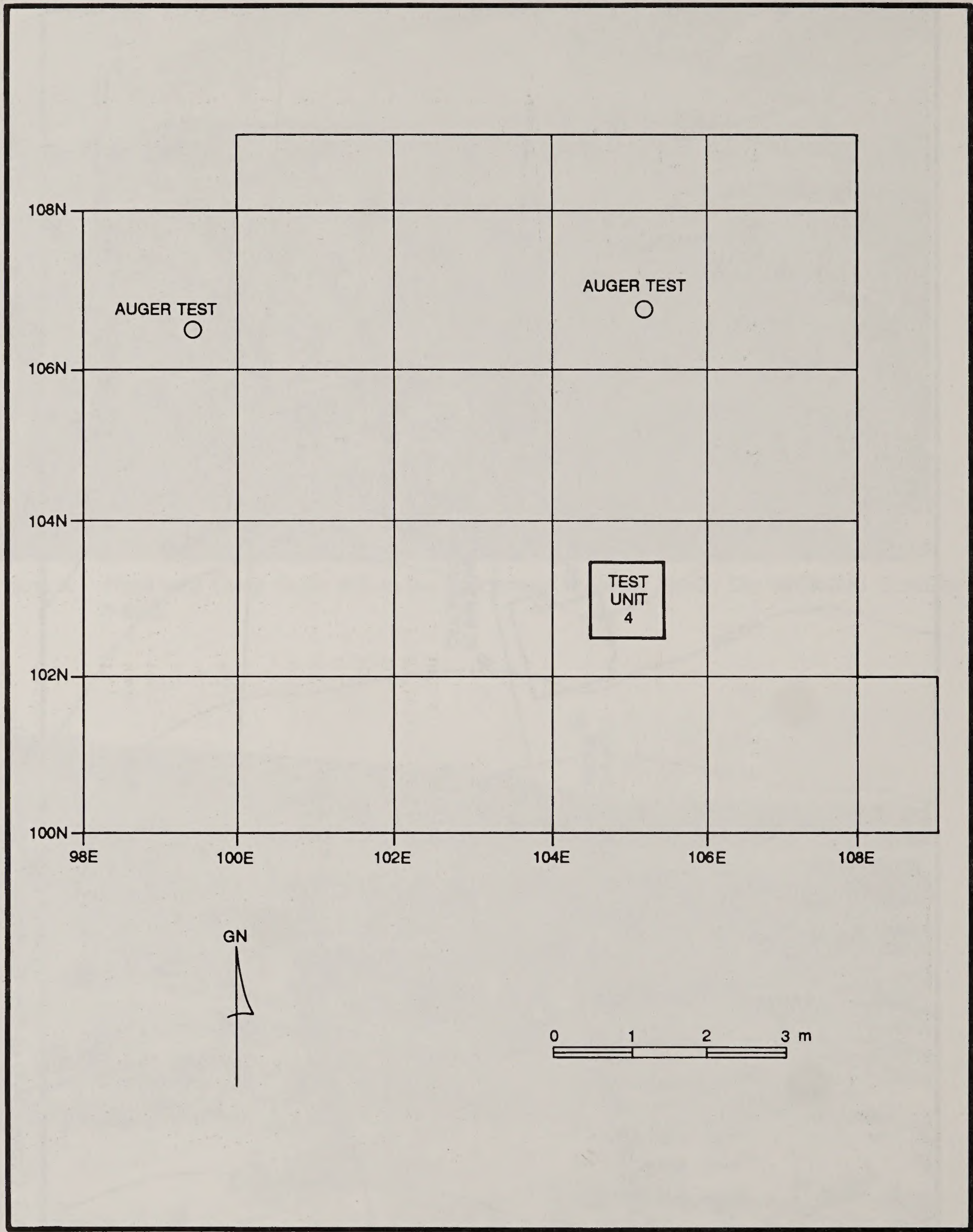
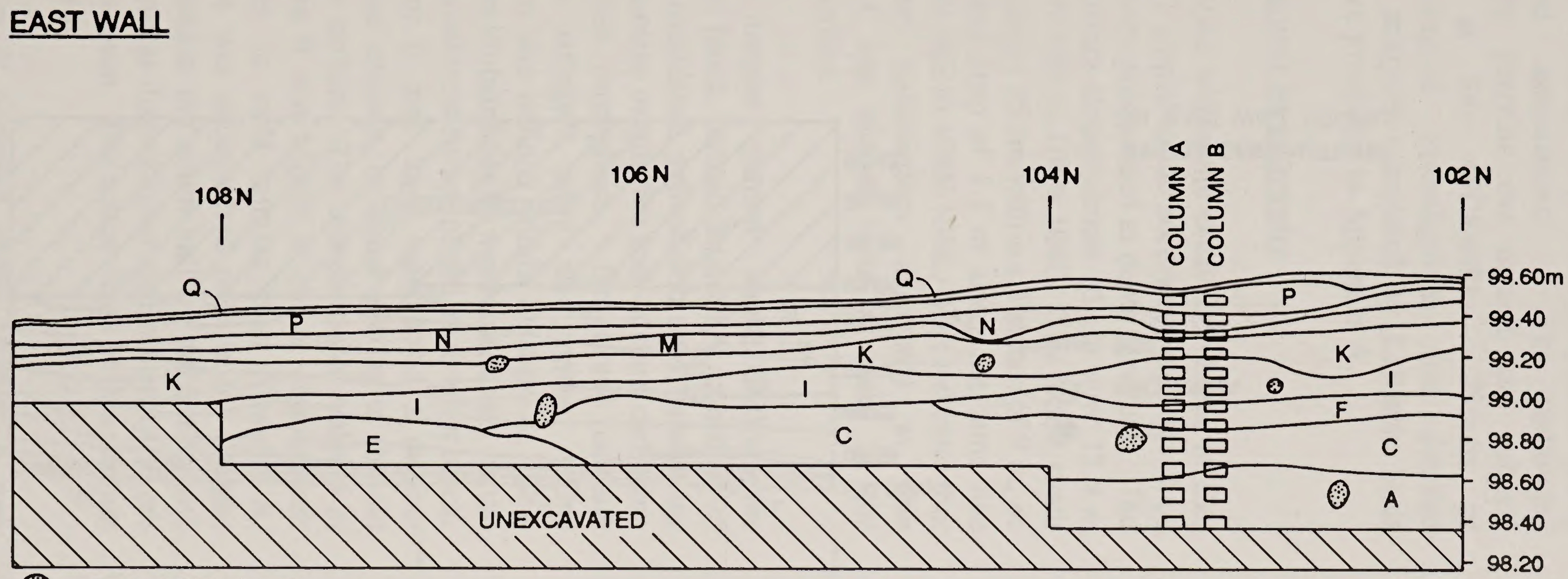


Figure 4.4 Plan Map of Excavation Block, Site 48CR4681 (Locality P-054).



Rodent Disturbance
A Very Well Consolidated Silty Sand, Calcium Carbonate Stringers, Light Brownish Grey, (10yr 6/2)
B Slightly Consolidated Sandy Silt, Possible Old Dunal Facie, Light Brownish Grey (10yr 6/2)
C Well Consolidated Sandy Silt, Root or Insect Casts Filled with Calcium Carbonate, Pale Brown (10yr 6/3)
D Well Consolidated Sandy Silt, Root or Insect Casts Filled with Calcium Carbonate, Charcoal Stained, Dark Greyish Brown (10yr 4/2)
E Consolidated Sandy Silt, Flecks of Calcium Carbonate, Charcoal Stained, Dark Grey (10yr 4/1)
F Consolidated Sandy Silt, Occasional Stringers of Calcium Carbonate, Occasional Sage Roots, Greyish Brown (10yr 5/2)
G Consolidated Silt, May Represent Wash Episode, Brown (10yr 5/3)
H Consolidated Sandy Silt, Greyish Brown (10yr 5/2)
I Consolidated Silty Sand, Greyish Brown (10yr 5/2)
J Consolidated Silty Sand, Charcoal Staining, Light Brownish Grey (10yr 6/2)
K Moderately Consolidated Silty Sand, Charcoal Flecks, Light Brownish Grey (10yr 6/2)
L Consolidated Sandy Silt, Sage Roots, Greyish Brown (10yr 5/2)
M Moderately Consolidated Sandy Silt, Sage Roots, Some Grass Roots, Brown (10yr 5/3)
N Slightly Consolidated Sandy Silt, Grass and Sage Roots, Greyish Brown (10yr 5/2)
O Consolidated Silty Sand, Grass and Sage Roots, Pale Brown (10yr 6/3)
P Moderately Consolidated Sandy Silt, Grass and Sage Roots, Light Grey (10yr 7/2)
Q Unconsolidated Silty Sand, Surficial Duff, Dark Greyish Brown (10yr 4/2)

0 30 60 90 cm

Figure 4.5 Profile of South wall of Excavation Block, Site 48CR4681 (Locality P-054).

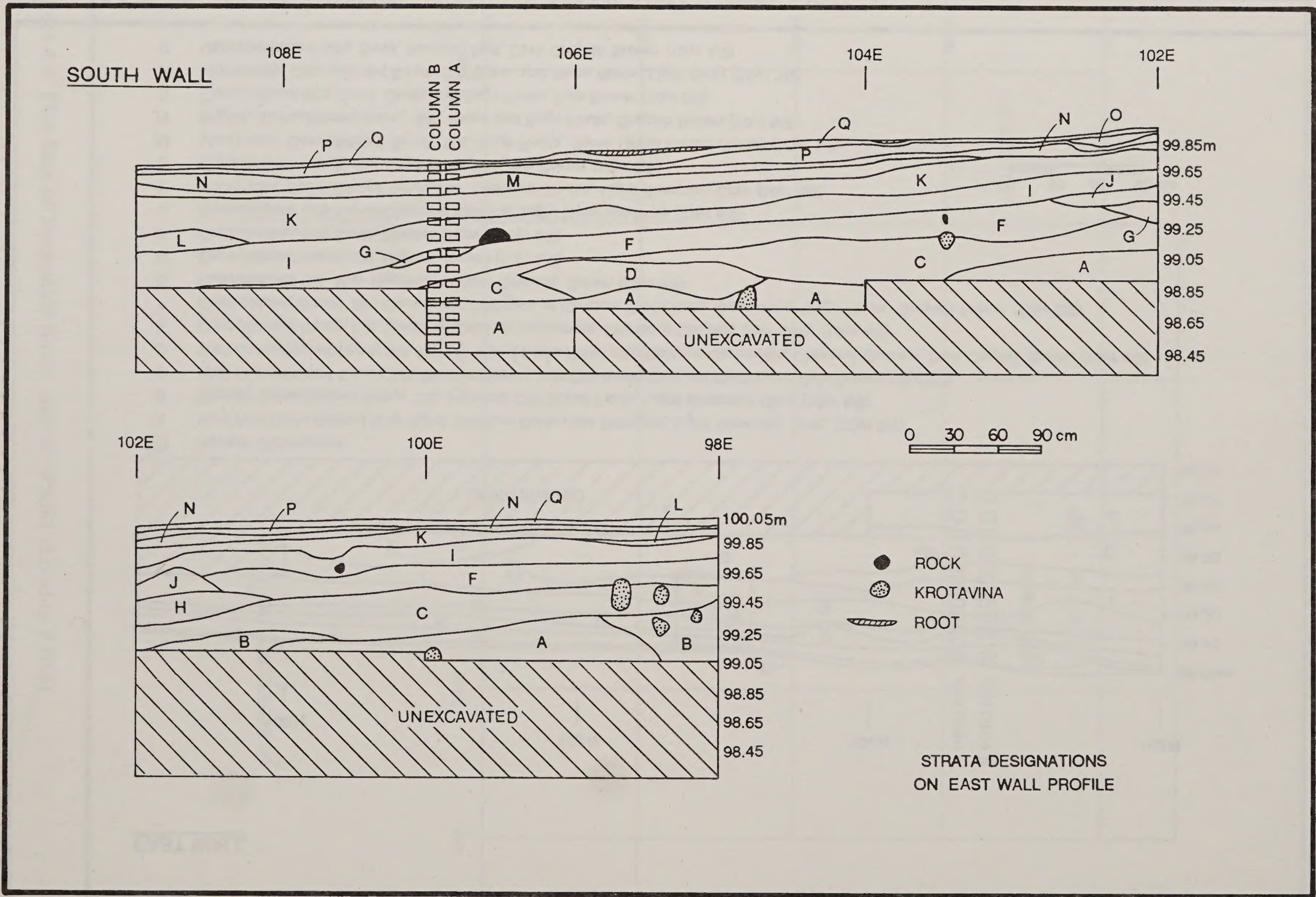


Figure 4.6 Profile of South wall of Excavation Block, Site 48CR4681 (Locality P-054).

dating from 7490±70 years B.P. to approximately 1,500 years B.P., based on radiocarbon age estimates (Table 4.1) and projectile point typological associations. The following subsections describe the natural and cultural deposits at Site 48CR4681. Results of geomorpological investigations and detailed sediment analyses completed by LaRamie Soils Service are presented in Appendix A.

4.2.1 Natural Stratigraphy

All strata within the excavation block of Site 48CR4681 sloped to the northwest, and this slope became more pronounced as depth increased. The current surface slopes almost 65 cm over 12.8 m from 100N 98E to 108N 108E. The oldest strata dropped almost 75 cm within a distance of 9 m, or an estimated drop of 1.1 m along the same line from 100N 98E to 108N 108E. This indicates that the oldest paleosurface excavated at Site 48CR4681 was almost twice as steep as the modern surface.

The deepest natural strata within the excavation block, termed Stratum A, consisted of a very consolidated, yellowish brown, sandy clay loam of aeolian origin that had calcium carbonate disseminated throughout. Occasional calcium carbonate stringers were also noted. One substratum was defined within Stratum A. This substratum (Substratum B) was located only on the extreme southwest corner of the excavation block. Substratum B may have represented a distinct depositional episode, or dunal overlay of the old sand dune surface. The compositional makeup of Substratum B was higher in silt or clay content and lower in sand content than Stratum A. Stratum A was encountered only in the deepest sections within the south half of the block, and excavation was discontinued approximately 30 cm into this stratum. The actual depth of this stratum is unknown.

Stratum C occurred above Stratum A and consisted of a fine aeolian deposit with a high percentage of silt or clay. This brownish grey stratum was very consolidated and had a very high calcium carbonate content in the form of stringers and balled masses. These masses may have been root or insect burrow casts filled with calcium carbonate with an average diameter of about 1.5 cm and approximately 3 to 4 cm long. Two substrata, termed D and E, were defined within Stratum C. Substratum D was defined on the basis of culturally related charcoal staining, and Substratum E may have represented another dunal overlay, with minor amounts of charcoal flecking noted. Stratum C was noted within the majority of the excavation block, with the exception of the very northernmost units. This stratum was between 20 and 35 cm thick.

Stratum F overlay Stratum C and was encountered only in the southern portions of the excavation block. This stratum thinned and finally dissipated near the 105N line. The stratum consisted of well-consolidated, yellowish brown, fine silt and sand of aeolian origin with occasional small carbonate stringers. Occasional sage roots were also noted within this level. Two substrata (G and H) were noted within Stratum F. These appeared to represent erosional wash or colluvial episodes, as both were somewhat laminated and appeared to be lenticular-shaped water-lain deposits. The thickness of Stratum F ranged between 10 and 30 cm.

Stratum I was identified over most of the excavation block, with the exception of the northernmost units, and covered Strata C and F, depending upon location within the block. This deposit consisted of an aeolian sand, clay, and silt mixture, light brown, well-consolidated, with little or no calcium carbonate noted. A single substratum (J) was defined within Stratum I and may have represented a wash episode. Small flecks of charcoal were noted within Substratum J. Stratum I varied between 7 and 35 cm in thickness.

Stratum K consisted of an aeolian, light brown, sandy loam. Intermittent charcoal staining was noted throughout the stratum, with no calcium carbonate present. This stratum was encountered over the entire excavation block directly above

Table 4.1 Uncorrected Radiocarbon Age Estimates, Site 48CR4681 (Locality P-054).

	Feature				Calibrated Age Estimate (Years B.P.)[1]		
Component	Number	Type	Lab No. (Beta-)	Age Estimate (Years B.P)	Intercept(s)[2]	Range (one sigma)	Sample Type
IV	7	Hearth	41521	3,520±90	3831, 3789, 3782	3963-3687	Sediment
II	15	Hearth	41522	6,050±100	6892	7149-6794	Sediment
III	16	Hearth	41523	4,840±90	5591	5723-5470	Sediment
IV	20	Hearth	41524	3,750±80	4148, 4104, 4092	4258-3985	Sediment
III	28	Hearth	41525	4,670±70	5455, 5376, 5328	5556-5307	Sediment
I	29	Hearth	41526	4,550±90[3]	5290	5322-5047	Sediment
I	34	Hearth	41527	7,490±70	8334, 8247, 8211	8377-8136	Sediment
I	44	Hearth	41528	7,230±100	8035	8099-7929	Sediment
III	45	Hearth	41529	4,340±80	4871	5021-4851	Sediment
I	46	Hearth	41530	7,110±100	7927	8029-7792	Sediment

[1] Calibration based on Pearson et al. (1986).
[2] If the estimate has more than three intercepts, the largest, middle, and smallest intercepts are included.
[3] Data rejected as too recent.

Stratum I. A single substratum (L) was noted in the extreme southeast corner of the block and may have represented the edge of another dune facies. Sage root intrusion was noted throughout Stratum K. The approximate thickness of this stratum was between 5 and 35 cm.

Stratum M consisted of aeolian sediments that contained a high percentage of silts and clays. This deposit occurred above Stratum K. Yellowish brown in color, the stratum extended over the west half of the block and terminated near the 103E line. The sediments were well-consolidated and contained no calcium carbonate deposition. Sage root penetration and small amounts of grass roots were noted throughout the stratum. Total estimated depth of this deposit varied between 5 and 12 cm.

Stratum N was a light yellowish brown, aeolian, sandy loam that occurred above Stratum M, and a small portion of Stratum K in the southwest corner of the block. This stratum was fairly consolidated and contained no calcium carbonate. The deposit itself was relatively loose, compared to the strata immediately above and below it. Sage and grass root penetration was fairly extensive throughout this stratum. Stratum N varied between 5 and 10 cm in estimated total thickness.

Stratum O consisted of hard-packed, laminated, sandy silt deposits. These sediments were very limited in extent and may have represented distinct wash episodes between Stratum N and Strata P and Q.

Stratum P was of a hard-packed, aeolian deposit with some colluvial activity. These sediments extended over the entire excavation block, overlying Stratum N. Microwash lenses were noted on the contact point between this stratum and the overlying deposit. Sagebrush and grass root penetration was extensive throughout the block in this level. Approximate thickness of Stratum P varied between 3 and 10 cm.

Stratum Q represented the unconsolidated present site surficial duff. This stratum was marked by loose inorganic and organic matter in the form of twigs, roots, grass stems, and rodent and deer-pronghorn scat, intermixed with aeolian silts and sands. Overlying the entire excavation block, this stratum varied in approximate total depth between 3 and 25 cm, with the deepest portions occurring around sage clumps and grass tussocks.

4.2.2 Cultural Stratigraphy

Cultural remains from Site 48CR4681 were divided into five components based on feature location and depth, artifact distributions, and natural stratigraphy. Each component may have represented more than one occupational episode, with commingled remains of several episodes comprising the artifact and feature assemblage recovered. This may have been due, at least in part, to postdepositional factors of erosion or deflation of surfaces, trampling of the site area during and after specific occupations, and artifact movement due to root actions or animal disturbance. As the remains of cultural levels are mixed due to these postdepositional forces, "... demonstrably associated things may never have occurred together as an organized body of material during any given occupation" (Binford 1982:17-18). Given that postdepositional factors affect the location of recovered artifacts in relation to their primary deposition location (see Binford 1981a), analysis of specific artifact types and lithic material types can alleviate some of the confusion by showing direct association between individual artifacts. It is on this basis that fairly specific activity loci can be defined, even though artifactual materials from several occupational episodes may be commingled within the level, and the artifacts themselves may be slightly removed from their original depositional location. For the most part, features can be considered "de facto" artifacts (Schiffer 1976), that is, unremoved from their original functional location.

Component I was located in the south half of the excavation block within Stratum A. Cultural material assigned to this component was recovered from 33 m^2 of the block with eight cultural features associated. Cultural affiliation of Component I, as indicated by three radiocarbon dates and a temporally diagnostic projectile point, appeared to be terminal Paleoindian/Early Archaic period. At least two occupational episodes were suggested for this component, based on radiocarbon age estimates of 7,490±70, 7,230±100, and 7,110±100 years B.P. Rather than exclusive big game hunting, it appears that the site occupants during this period were involved in a more archaic style hunting and gathering lifestyle.

Component II was located within Stratum C, and dated to the Early Archaic period (Great Divide phase). A single radiocarbon age estimate of 6,050±100 years B.P. was obtained from this component. Component II was encountered south of the 106N line, with a total of 60 m^2 encountering cultural material. Six features were associated with this component. The cultural remains suggest a continuation of the hunting and gathering lifeway suggested in Component I, perhaps with an increasing emphasis on seed grinding tools.

Component III was identified within Strata F and I and covered the entire excavation block. Three radiocarbon age estimates seemed to indicate at least two occupational episodes within this component. Features 16 and 28 were dated to 4,840±90 and 4,670±70 years B.P., respectively, and may have represented a single occupation, or two closely spaced occupations of the same area. A third age estimate of 4,340±80 years B.P. was returned on Feature 45 and probably represents a separate occupation. Stratigraphically, the three hearths represented the same cultural level and no separation into individual components was possible. Component III deposits likely represented a palimpsest of at least two occupational episodes upon a relatively stable land surface. Cultural remains and radiocarbon dates indicated that Component III represented a Middle Archaic period (Pine Spring phase) McKean complex occupation(s) of the site. A broad-spectrum hunting and gathering economy was suggested.

Component IV was associated with Stratum K, and cultural material was recovered from all excavation units. Projectile point types within the component are reminiscent of Late Archaic period side- and corner-notched varieties. A very low side- to corner-notched type is reminiscent of later Yonkee style points. The range of points recovered from this component also includes varieties which generally resemble Pelican Lake styles. Radiocarbon age estimates obtained from hearth features within the component returned dates of 3,520±90 and 3,750±80 years B.P., which fall well within the known temporal range for the Middle Archaic period-McKean complex on the Northwestern Plains. While no McKean complex projectile points were recovered from this component, cultural features and artifacts were recovered in good context and association. This set of occupations (Component IV) may have represented little known cultural groups which appeared within the terminal Middle Archaic period (see Frison 1991). Cultural remains do not indicate a significant change in subsistence strategies from Component III, although an increased emphasis is seen on projectile point manufacture.

Materials of Component V were recovered from Strata N, O, and P. No cultural features were associated with Component V. A date of approximately 2,000 to 1,500 years B.P. was suggested for this occupation based on projectile point typology. A single Besant dart point and two possible Besant point fragments were recovered from the northeast corner of the excavation block. The most complete point has very low side notches, with the haft element lightly to moderately ground. This specimen had apparently been reworked and is slightly asymmetrical. The Besant cultural complex on the Northern Plains is generally seen as a sophisticated bison hunting adaptation (Frison 1991:105). While Component V remains were recovered from the entire block, very little groundstone was recovered, which may indicate that this locale was more oriented toward hunting than plant food procurement.

4.3 COMPONENT I RESULTS

Component I dated to the transitional phase between the terminal Paleoindian and the Early Archaic periods and was the oldest component identified at Site 48CR4681. More than one occupation was suggested for this component, with radiocarbon age estimates of 7,490±70 years B.P., 7,230±100 years B.P., and 7,110±100 years B.P. obtained from Features 34, 44, and 46 (Beta-41527, 41528, and 41530), respectively. Feature 34 may have represented one occupational episode with Features 44 and 46 representing a second occupation (with an average age of 7,170±70 years B.P.). Unfortunately, no separation could be made between occupational episodes based on artifactual materials or stratigraphic location. A fourth radiocarbon age estimate was obtained from Feature 29, which was stratigraphically equivalent to or below Features 34 and 44. An anomalous estimate of 4,550±90 years B.P. obtained from a Feature 29 sediment sample was rejected as incorrect, possibly due to sample contamination.

Component I was associated with Stratum A and was noted in the deepest excavation units in the south part of the excavation block (Figures 4.5 and 4.6) with most remains recovered between 99.2 and 98.6 m. Materials assigned to this cultural component were recovered from a 33 m^2 area of the block, concentrated south of the 104N line. Cultural remains include eight cultural features, three flaked stone tools, one groundstone tool, 144 pieces of debitage, and occasional bone fragments, and indicate a broad-spectrum subsistence base that is essentially archaic in aspect.

<u>4.3.1 Cultural Features and Heat-altered Rock</u>

Eight basin features and a small amount of heat-altered rock were recorded within Component I deposits. Morphologically, four distinct categories of cultural features were represented. Morphological characteristics of the features are listed in Table 4.2.

<u>4.3.1.1 Beveled Basin</u>

Feature 34 was the only beveled feature excavated within the site, and it contained 29.9 liters of fill (Table 4.2). The fill was slightly darker than the surrounding grey level stain but did not become distinct until excavation of the south half of 100N 104E had progressed below the general level stain. Feature 32, an unoxidized basin, was located within 30-40 cm to the southwest of Feature 34 (Figure 4.7). Fourteen bone fragments were retrieved from within the feature. Thirteen of these are very small carbonized fragments and represent rodent to rabbit size animals, while the remaining bone fragment is unburned and from a medium mammal, possibly deer-pronghorn. Also recovered from within the basin were 11 microflakes of various materials. None of the flakes appear to be heat-fractured or spalled, and like the unburned bone, they probably were introduced into the fill after use as a hearth. While the fill was homogeneous, dark, and organic, there did not appear to be any oxidation in or around the feature itself, another indication of a possible secondary function as a storage or cleanout basin. A fill sample of 3.0 liters was floated with no charred seeds recovered. Although this may indicate that little or no seed plant processing occurred in the immediate area of Feature 34, the lack of macroscopic flora may reflect the age of the deposit. A bulk sediment sample from this feature returned a radiocarbon age estimate of 7,490±70 years B.P. (Beta-41527).

<u>4.3.1.2 Rock-covered Basins</u>

Two rock-covered basin features were located within Component I of the excavation block. Feature 29 (Figure 4.8) and Feature 42 (Figure 4.9) were located within 60 cm of each other in the southeast part of the excavation. Both were shallow basins filled with dark, organic soil and covered with granite and sandstone rock.

Table 4.2 Characteristics of Cultural Features, Component I, Site 48CR4681 (Locality P-054).

Feature No.	Excavation Unit	Feature Type	Cross Section	Dimensions (cm)[1] L	W	D	Area (cm^2)	Volume (liters)	Oxidation	Rocks Type	No.	Wt. (kg)	Remarks
29	102N 107E	Rock-covered basin	Hemisphere	43	34	13	495	10.1	Absent	Granite sandstone	23	10.65	Heavily charcoal stained
32	100N 105E	Unoxidized basin	Hemisphere	61	56	13	2,688	23.3	Absent	Sandstone	1	.1	Heavily charcoal stained
34	100-101N 104E	Beveled basin	Beveled	67	57	26	3,019	29.9	Absent	--	--	--	Heavily charcoal stained
36	102N 104-105E	Unoxidized basin	Hemisphere	51	41	14	1,662	15.5	Absent	--	--	--	Heavily charcoal stained
42	103N 107E	Rock-covered basin	Hemisphere	31	32	18	779	9.4	Absent	Granite sandstone	22	19.25	Heavily charcoal stained
43	103N 104E	Oxidized basin	Hemisphere	44	37	9	1,288	7.2	Present	--	--	--	Heavily charcoal stained
44	103N 104E	Unoxidized basin	Hemisphere	58	45	15	2,083	20.8	Absent	--	--	--	Heavily charcoal stained
46	102N 99-100E	Unoxidized basin	Hemisphere	75	82	17	4,840	54.8	Absent	--	--	--	Heavily charcoal stained

[1] L = length, W = width, D = depth.

Figure 4.7 Features 32 and 34 After Excavation, Component I, Site 48CR4681 (Locality P-054).

Feature 29 was covered with over 10 kg of rock while Feature 42 was blanketed with more than 19 kg of rock, with very few dispersed rocks located within the fill of each feature. Features 29 and 42 each contained very similar amounts of tabular sandstone. Based on the position of the sandstone within each feature (on the periphery) and its relatively flat surface in comparison to the granite, the function of these specific stones was probably food preparation or cooking. Tabular sandstone fragments from the Early Archaic period Yarmony Pithouse site in northern Colorado have been similarly interpreted and were referred to as kitchen slabs or "comals" (Metcalf and Black 1991:133).

A feature fill sample of 3.5 liters from Feature 29 was floated with no plant macrofossils recovered. No artifacts were recovered from within either feature. A small burrow transected Feature 42 and several vole bones, mandibles, and crania (CR4681-1120, Montane or long-tailed vole) were retrieved from this area. Both features appeared to have been excavated, a fire built within the excavated area, and rock placed on the top of the fire. All rock recovered from the two features was oxidized and fragmented, apparently by intense heat. Features 29 and 42 appeared to have functioned as hearths. As noted previously, a radiocarbon age estimate of 4,550±90 radiocarbon years B.P. obtained from Feature 29 appeared to be inaccurate. Unrecognized rodent intrusions from an overlying hearth or contamination may explain this anomalous date.

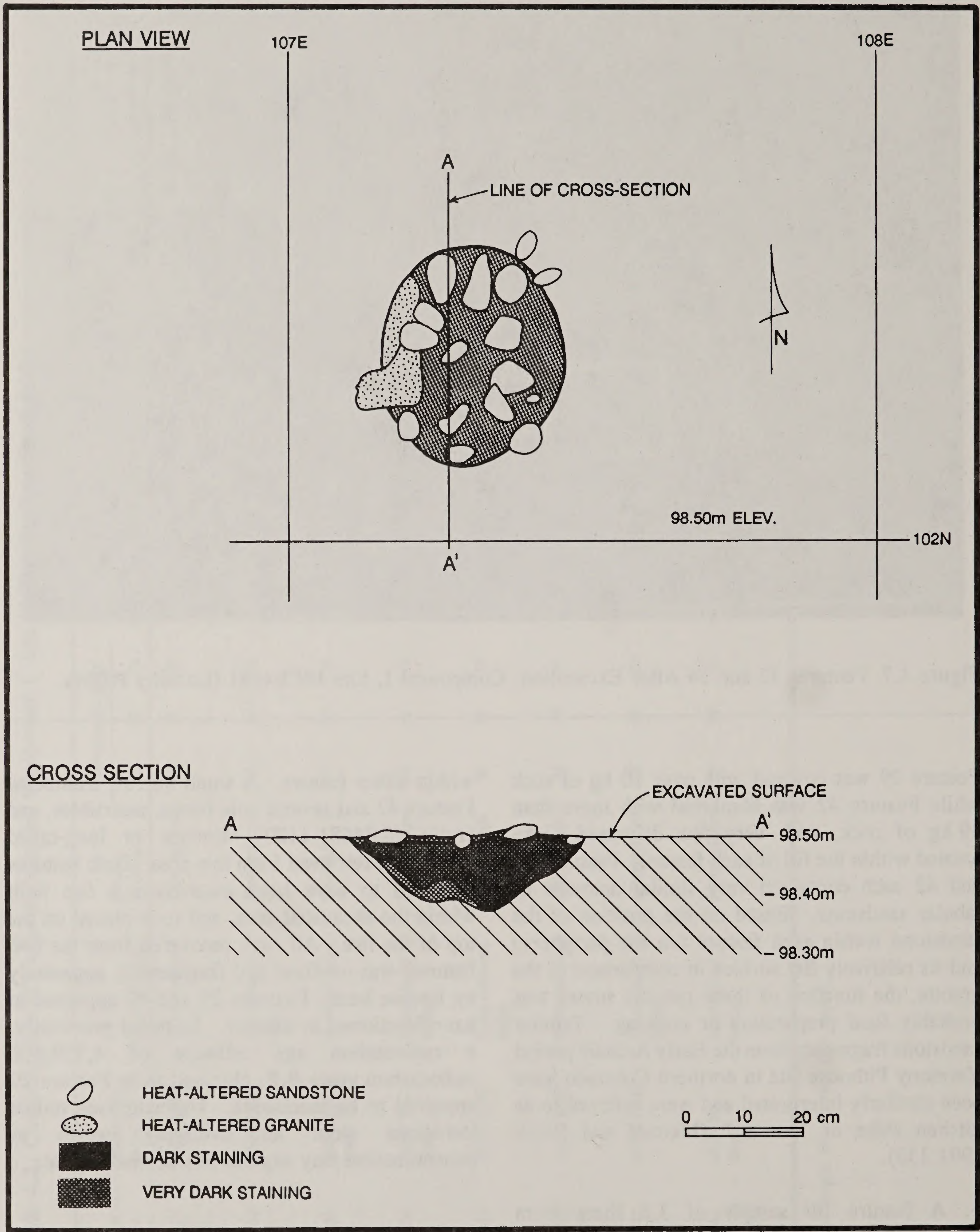


Figure 4.8 Plan View and Cross Section of Feature 29, Component I, Site 48CR4681 (Locality P-054).

Figure 4.9 Feature 42 After Excavation, Component I, Site 48CR4681 (Locality P-054).

4.3.1.3 Oxidized Basin

Oxidation of Component I pit features was uncommon, with Feature 43 representing the only oxidized feature. A pinkish tint was noted in the bottom of the feature, with less tinting occurring along the sides and rim. Oxidation of sediment in this context usually represents exposure to intense heat, indicating that the function of this feature was probably as a hearth (Frison 1978: 355). Feature fill consisted of darkly stained soil with occasional small, solid carbon flecks. No artifacts were recovered from within the feature.

4.3.1.4 Unoxidized Basins

Four features (32, 36, 44, and 46) were represented in this category. Feature 46 was the largest (4,840 cm^2) in area (Figures 4.10 and 4.11). Feature fill consisted of darkly stained sediment and minute charcoal flecks. Seven pieces of debitage, one retouched flake (CR4681-1247), and 14 pieces of bone were recovered from within the fill of Feature 46. The debitage includes three material types, and two of these types appear to have been heat-altered. The bone includes six small burned fragments of a deer-pronghorn size animal and eight unburned fragments (seven of these fragments represent an animal larger than

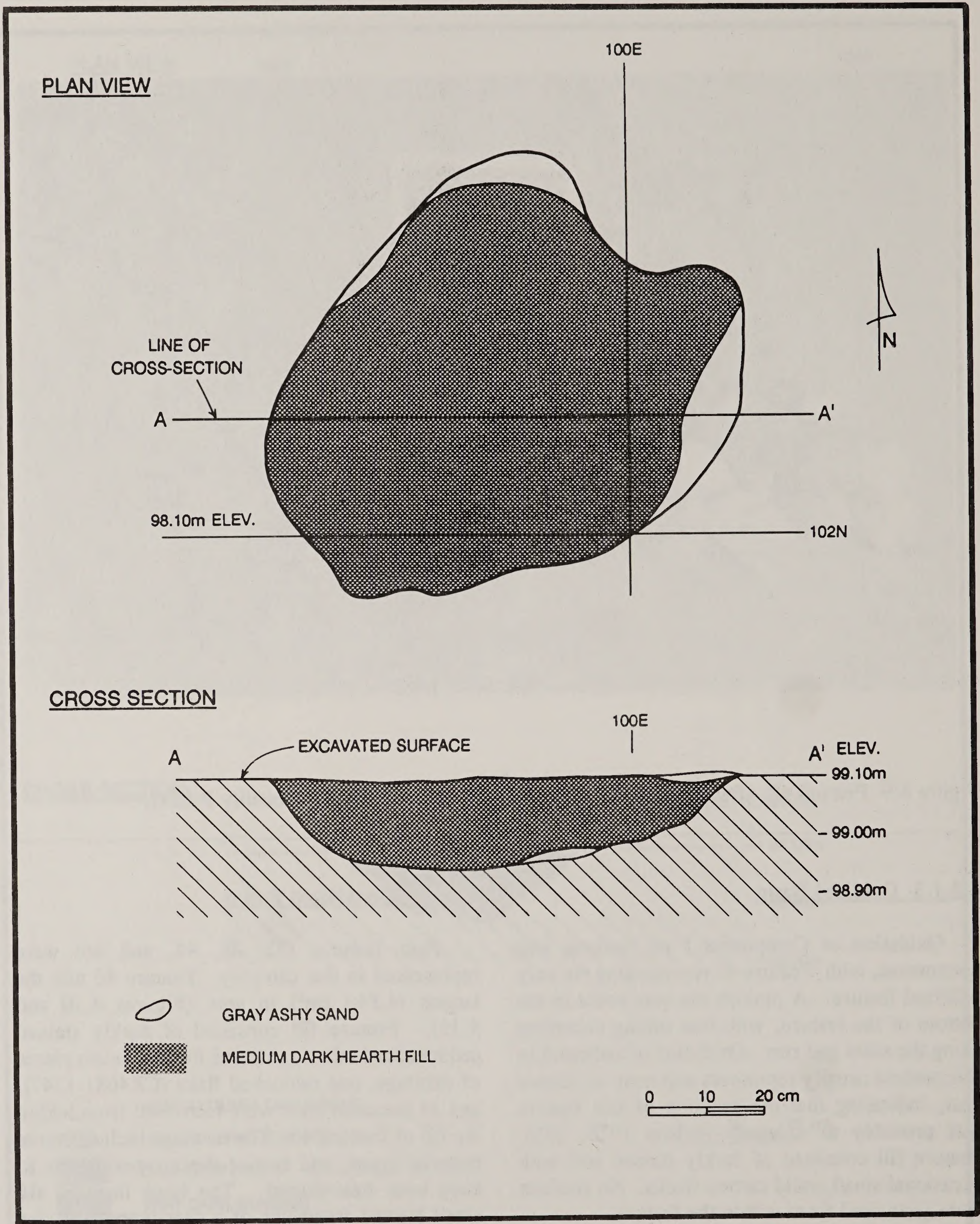


Figure 4.10 Plan View and Cross Section of Feature 46, Component I, Site 48CR4681 (Locality P-054).

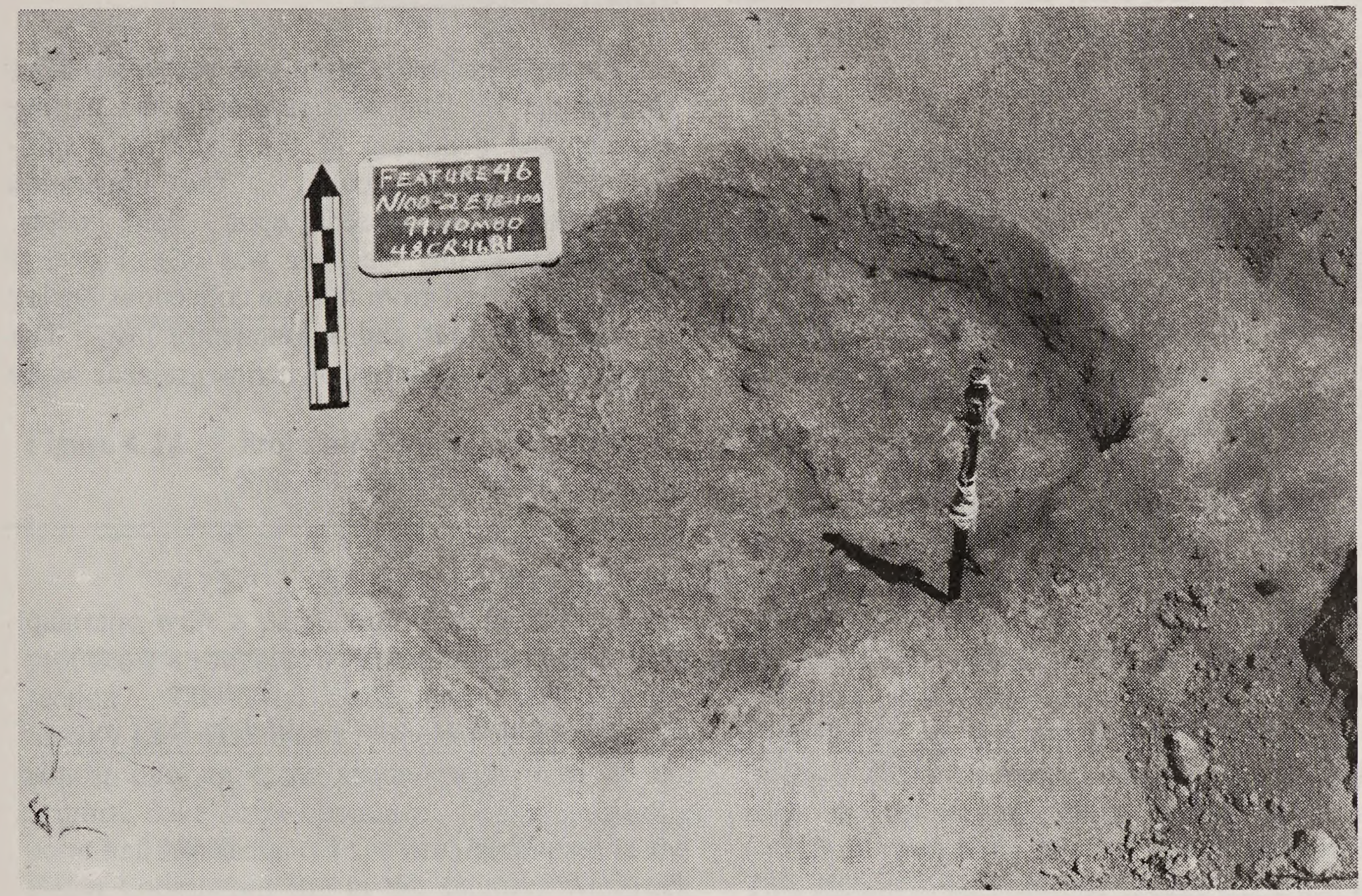


Figure 4.11 Feature 46 After Excavation, Component I, Site 48CR4681 (Locality P-054).

rabbit, and one fragment appears to be the distal end of a phalange of a medium artiodactyl). A split-stemmed projectile point was recovered adjacent to Feature 46. A radiocarbon age estimate of 7,110$\pm$100 years B.P. was obtained from a sediment sample from this feature. Due to the presence of the heat-altered flaked stone artifacts and burned bone, the function of this feature was probably that of a hearth.

Features 32, 36, and 44 were relatively shallow, excavated depressions that probably served as hearths. All contained darkly stained sediment. Feature 44 was devoid of artifacts, while flaked stone and bone artifacts were recovered Features 32 and 36. The three pieces of debitage recovered from Feature 32 were all microflakes and represented three material types: white quartzite, tan chert, and clear chalcedony. The bone recovered from the fill of Feature 32 represents at least one rodent to rabbit size animal, and one medium mammal. The smaller animal bone is entirely carbonized and fragmented, while the larger is not burned. The two bones from Feature 36 are unburned fragments of rabbit size long bones. Two microflakes of siltstone and ignimbrite were also recovered from the fill of Feature 36. A radiocarbon age estimate of 7,230$\pm$100 years B.P. was obtained from a bulk sediment sample from Feature 44.

4.3.1.5 Heat-altered Rock

Heat-altered rock from Component I is summarized in Table 4.3. Very little heat-altered rock was located outside of the two rock-covered features. Granite appears to have been specifically selected for use in hearths, possibly due to its proximity to the site, or for some functional characteristic that made it preferable to the softer sandstone.

4.3.2 Flaked Stone Artifacts

Three fragmentary flaked stone tools and 144 pieces of debitage were recovered from Component I deposits. The tools include two retouched flakes and a fragmentary projectile point. The morphological characteristics of the tools are summarized in Table 4.4.

4.3.2.1 Projectile Point

A single projectile point was recovered from Component I. This tool represents the hafting element and a portion of the blade of a split-stemmed projectile point. The illustration (Figure 4.12) is based upon field notes. Unfortunately, this specimen was one of several artifacts removed from the site collections during an inspection tour and subsequently lost. The point was manufactured of a fine-grained, white

Table 4.3 Summary of Heat-altered Rock, Component I, Site 48CR4681 (Locality P-054).

Material Type	No. of Rocks	Weight (kg)	Average Weight (kg)
Sandstone	7	1.75	0.25
Granite	43	28.85	0.671
Quartzite	1	.05	0.05
Total	51	30.65	0.324

Table 4.4 Characteristics of Flaked Stone Tools, Component I, Site 48CR4681 (Locality P-054).

Catalog No.	Excavation Unit	Classification	Condition	Dimensions (mm)[1] L	W	T	Material Type	Remarks
1244	100N 105E	Retouched flake	Fragment	23.1	20.7	3.5	Phosphoric chert	Biface reduction flake, two retouched lateral margins
1247	102N 99E	Retouched flake	Fragment	18.7	11.7	5.9	Clear chalcedony	Core reduction spall, retouched on distal end
FS1100	102N 98E	Projectile point	Hafting element and portal blade	40.0	15.0	7.0	Fine-grained, white quartzite	Stemmed split base, possible Pryor Stemmed

[1] L = length; W = width; T = thickness.

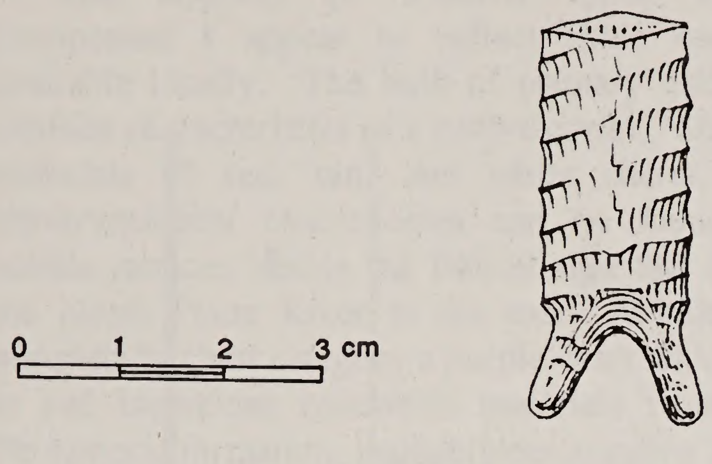


Figure 4.12 Projectile Point, Component I, Site 48CR4681 (Locality P-054).

quartzite with a parallel-oblique flaking pattern, producing a roughly rhomboid shaped blade cross section. The distal blade, base, and ears are heavily ground, the ears to the extent that they are almost oval in cross section with most of the original flake scars obscured. Similar projectile point hafting elements have been recovered in the Helen Lookingbill site in the southern Absaroka mountains of Wyoming. This point type dates to the terminal Paleoindian to Early Archaic period (Frison 1991:74). Frison describes this point as a "fishtail" form but declines to name a specific type until more is understood about the complex. A comparable hafting element is seen in an illustration of the Larson Cache (Ingbar and Frison 1987:462, Figure A6.1 H). The authors tentatively assigned that projectile point morphology to the Pryor Stemmed tradition (see also Husted 1969, Frison 1973). The Pryor Stemmed point type has been dated to approximately 8500 to 7000 years B.P. (Frison 1978:24-27).

4.3.2.2 Retouched Flakes

Two retouched flakes were identified from this component (Table 4.4). A retouched flake (CR4681-1247) was recovered from within the fill of Feature 46. The tool represents the distal end of a flake which terminates in a hinge fracture. The material is a semitranslucent chalcedony and appears to have been heated. The flake has a slight red to pink sheen. A small bit of the original cortex is present on the dorsal portion and appears to be a cobble exterior. Utilization appears in the form of small flake scars (< 1 mm) along the lateral edge of the flake. The use retouch is at a fairly obtuse angle and is apparent only on the dorsal surface. This use flake pattern is consistent with a scraping function rather than a cutting usage (Reher 1985:116).

A second retouched flake (CR4681-1249) was recovered a short distance from Feature 46. This tool is complete except for the extreme distal end and has no cortex. The material represented is a grainy, white, opaque chalcedony. Retouch is evident along one margin and use wear appears along both lateral margins of the flake. The more excurvate edge contains small retouch flake scars and very small step-fractures (<0.5 mm) at a steep angle on the dorsal side when examined under a 20x microscope. The relatively straight edge opposite has very small flake scars (<0.5 mm) on both the dorsal and ventral sides. This margin is very oblique in edge angle and may represent some sort of cutting activity (Reher 1985:116).

4.3.2.3 Debitage

A total of 144 pieces of debitage was recovered from Component I. A minimum of nine broad categories of material types are represented, with smaller subcategories discernible within each. Table 4.5 presents the cross-tabulation of debitage type by material type for the assemblage.

Nonspecific chert types comprise 52.1% of the total debitage, with another 12.5% of various quartzites, 12.5% black siltstone, 4.2% various other siltstones, and 9.7% semitranslucent chalcedony. Specific chert categories include tan chert at 2.1%, red chert with 3.5%, and white chert representing 2.8% of the total. A tan to grey silicified wood is also present, but in very small amounts (< 1.0%). Also recovered were two microflakes of ignimbrite, a black, vitreous stone similar in composition to obsidian.

Table 4.5 Cross-Tabulation of Debitage Type by Material Type, Component I, Site 48CR4681 (Locality P-054).

Debitage Type	Quartzite	White Chert	Red Chert	Clear Chalcedony	Tan Chert	Black Siltstone	Other Chert	Other Siltstone	Petrified Wood	Total
	Material Type									
Primary Flake										
Number	1	0	0	0	0	0	5	0	0	6
Row %	16.7	0	0	0	0	0	83.3	0	0	
Column %	5.6	0	0	0	0	0	6.7	0	0	4.2
Secondary Flake										
Number	0	1	0	2	0	7	11	1	0	22
Row %	0	4.5	0	9.1	0	31.8	50.0	4.5	0	
Column %	0	25.0	0	14.3	0	38.9	14.7	16.7	0	15.3
Tertiary Flake										
Number	8	2	1	1	2	6	34	4	0	58
Row %	13.8	3.4	1.7	1.7	3.4	10.3	58.6	6.9	0	
Column %	44.4	50.0	20.0	7.1	66.7	33.3	45.3	66.7	0	40.3
Microflake										
Number	8	1	3	11	1	4	15	1	0	44
Row %	18.2	2.3	6.8	25.0	2.3	9.1	34.1	2.3	0	
Column %	44.4	25.0	60.0	78.6	33.3	22.2	20.0	16.7	0	30.7
Shatter										
Number	1	0	1	0	0	1	10	0	1	14
Row%	7.1	0	7.1	0	0	7.1	71.4	0	7.1	
Column %	5.6	0	20.0	0	0	5.6	13.3	0	100	9.7
Total										
Number	18	4	5	14	3	18	75	6	1	144
Row %	12.5	2.8	3.5	9.7	2.1	12.5	52.1	4.2	0.7	

The majority of material types within Component I appear to reflect lithic sources available locally. The bulk of primary debitage exhibits characteristics of a cobble cortex. Similar materials of red, tan, and white cherts, and semitranslucent chalcedonies can be found on cobble terraces within the Bairoil area and along the North Platte River to the east. Within the nonspecific chert category a purple chert with blue to red inclusions resembles materials from the Phosphoria formation, probably outcropping along or within the Ferris Mountain range immediately to the north and east of the site. The black siltstone material type is also represented in the cobble beds, with an extensive cobble formation of this material near the Rattlesnake Creek drainage several kilometers to the south of the site. Ignimbrite does not appear to occur in the cobble terraces. Ignimbrite sources are located to the southwest in Utah, and also to the northwest in and along Wyoming's Yellowstone Park, and in Idaho.

Due to the low percentage of primary flakes (4.2%), it appears that most initial lithic reduction sequences occurred away from the excavation area, possibly on the cobble benches during procurement of raw materials. Further reduction of cores or bifaces is represented by the secondary flakes and shatter with 15.3% and 9.7% of the total debitage count, respectively (Prentiss and Romanski 1988). Tertiary flakes make up 40.3%, which indicates an intermediate to final biface reduction sequence. Final biface manufacture and tool sharpening are represented by microflakes with 30.7% of the total debitage within the component. Low densities of flaked material overall within the component suggest that site function was not primarily a lithic procurement or manufacture orientation. High percentages of tertiary and microflakes (>71.0%) may indicate orientation toward maintenance of tools rather than actual manufacture of new tools.

4.3.3 Groundstone

A single piece of groundstone was recovered from Component I. The piece is made of granite, oval in cross section (see Figure 4.13), and subrectangular in outline. In general, it resembles single-hand manos from later time periods. However, magnification under a 20x microscope failed to detect any pecking or striations on the broad faces, as would usually be expected from later time period style plant or seed processing tools. Rather, both faces are relatively smooth, with the remaining edges showing evidence of heavy grinding, and the lateral edges in particular appearing faceted. Possible functions for this type of edge-ground cobble are plant processing, meat preparation, or processing of small animals which could include pulverizing rodents and other very small mammals (Frison 1978:355, 1991).

4.3.4 Animal Remains

A total of 282 bone and burned bone fragments was recovered from Component I at Site 48CR4681 (Table 4.6). Most are very small fragments unidentifiable beyond general animal size. Several identifiable elements were recovered from the excavation area, however, and these provide some insights not only into human utilization at the site, but also micro-paleoclimatic conditions during or shortly after occupation.

Two crania, a set of mandibles, and several long bone elements were recovered from a paleo-krotavina located in Feature 42. The mandibles were identified as a montane or long-tailed vole (personal communication, Dr. Danny N. Walker, 1991). This animal is still extant within the state, within suitable habitats (Long 1965:655) which are generally more mesic than those of the site area today. The area apparently preferred by modern montane voles consists of mountain boreal forests to juniper-grassland zones and has been found in riparian habitats along the transition zone (Turner 1975:108-109).

Also recovered during excavation of Component I were bone fragments identified as belonging to pronghorn, ground squirrel, and jackrabbit (see Table 4.6). All species are still represented in the general locality today.

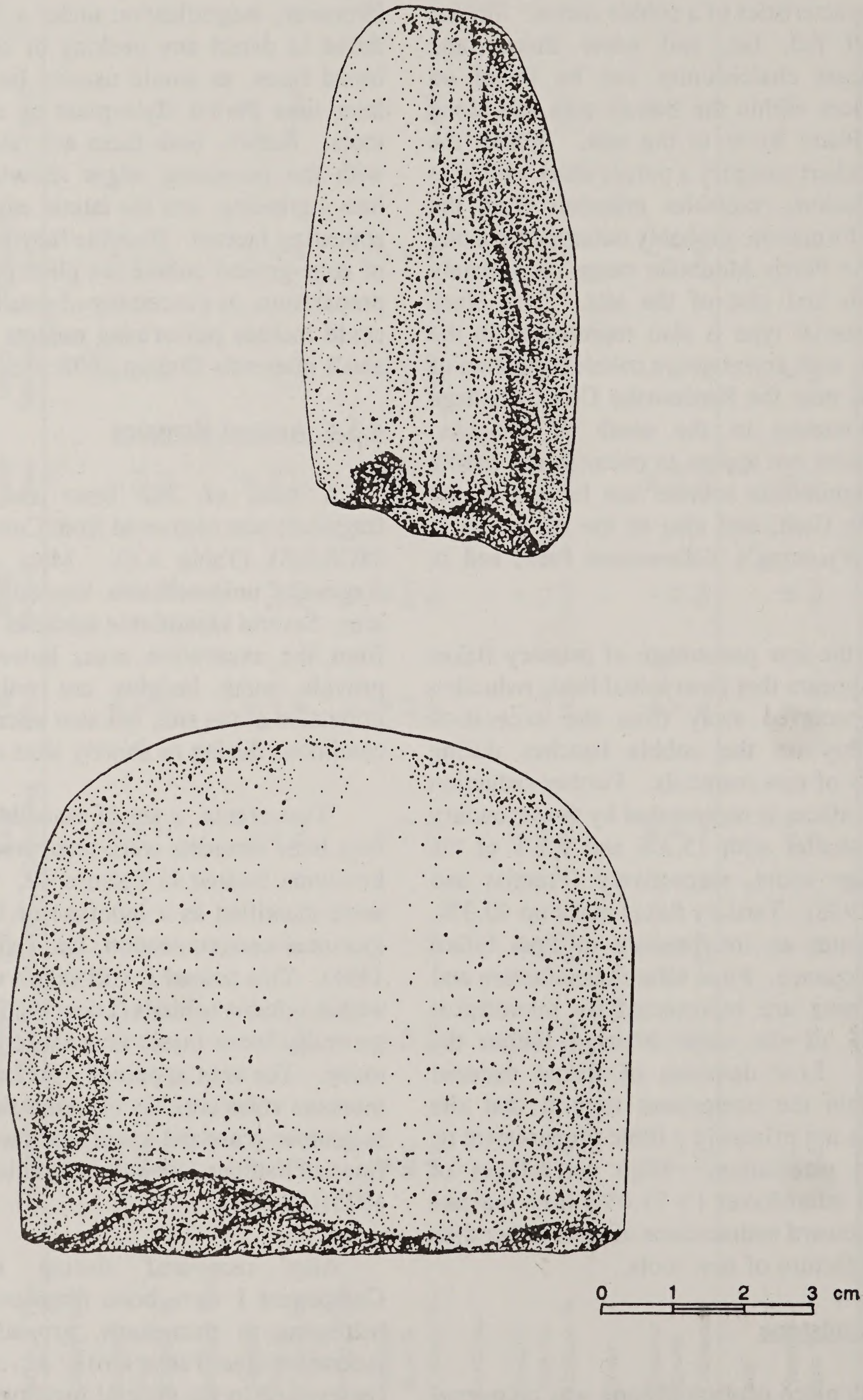


Figure 4.13 Groundstone Tool, Component I, Site 48CR4681 (Locality P-054).

Table 4.6 Summary of Animal Remains, Component I, Site 48CR4681 (Locality P-054).

Animal Size Category	Total Specimens No.	Total Specimens Wt.(g)	Burned Specimens No.	Burned Specimens %	Identifiable Elements
Pronghorn	1	2.7	--	--	3rd phalanx
Jackrabbit	3	1.6	--	--	Ulna, tibia, molar
Large mammal	1	1.9	--	--	Caudal vertebra
Small mammal	133	15.7	21	15.8	Mandible fragment, calcaneous
Small-medium mammal	31	22.5	4	12.9	--
Very small-small mammal	98	4.3	33	33.6	2 phalanges, tooth fragments, vertabra astragalus
Ground squirrel	3	0.3	1	33.3	Maxilla, mandibles
Very small-medium mammal	7	0.1	--	--	--
Montane vole	4	0.1	--	--	Crania, mandibles
Deer-pronghorn size	1	0.1	--	--	--
Total	282	49.3	59	20.9	

A total of 4% of the faunal remains was identified at least to the genus level. Of the remaining 96%, unidentified very small to small mammals (rodent to near coyote size animals) represent 34.8%, the unidentified small to medium mammal category (coyote to mule deer size) contains 11.0%, unidentified very small to medium size mammals (rodent to mule deer size) make up 2.5%, while unidentified small mammals (rabbit to coyote size) constitute 47.2%. Unidentified large mammals (larger than mule deer to bison size) constitute less than 0.1% of the total count. Burned bone constitutes 20.9% of the total faunal collection for Component I. Of the 59 burned bone elements recovered, small to medium mammal (rodent to mule deer size) bone constitutes 55.9%, and very small to small mammals (rodent to coyote size) make up less than 7.0%. Medium mammals (rabbit to coyote size) make up 35.6% of the total burned bone. A single identified mandible from a ground squirrel was also noted as burned, indicating the use of this species by human groups. Several other bone fragments within the very small to small mammal category are of the general body size to be from ground squirrel and may reflect more than one individual.

While bone assigned to the deer-pronghorn size category is not well represented, several other fragments within the small to medium mammal category probably represent deer-pronghorn size animals. One element recovered during excavation of this component may represent a bison size animal. A single caudal (tail) vertebra represents the large mammal category.

While not all faunal material can be directly attributed to human occupation of the site area, burned bone in conjunction with other artifacts indicates that human agencies were responsible for these specific items. Another indication of human utilization appears in the form of spiral fractures or green bone breaks, usually produced while breaking the bone for marrow extraction or bone grease manufacture (Hughes 1986:111, Binford 1981b). Use of several different animal species is indicated by the recovered remains, representing a wide variety of body sizes, and possibly requiring different hunting strategies. Animal sizes ranging from bison to ground squirrel are represented. No direct evidence of seasonality can be obtained from the faunal materials; however, ground squirrels were probably more available during the late spring to early fall time frame. Modern species of these animals hibernate over most of the cold winter months.

4.3.5 Plant Macrofossils

Flotation samples were processed from five of the basin features associated within Component I (Table 4.7). A total of 12.0 liters of fill was floated to recover charred seeds. No charred seeds were recovered by this technique which may indicate that plant foods, especially seeds, were not utilized. However, it is possible that plant remains have not been preserved over the last 7,000 to 8,000 years at this locality.

4.3.6 Spatial Distribution of Cultural Remains

Distributions of Component I features and tools are shown in Figure 4.14. Tools which were not point plotted are provenienced to the nearest definable location (e.g., the center) within the excavation unit. Organization of artifactual materials can indicate specific areas of activity. Multiple occupations within the site area may tend to obscure actual activity areas, but broad patterns within specific artifact and material type distributions should yield information on general areas and activities.

Table 4.7 Plant Macrofossils Recovered from Feature Fill, Component I, Site 48CR4681 (Locality P-054).

Feature No.	Sample No.	Volume (liters)	No. of Seeds	Taxa
29	215	2.0	0	--
29	220	1.5	0	--
32	260	2.0	0	--
34	284	3.0	0	--
36	294	1.5	0	--
46	341	2.0	0	--

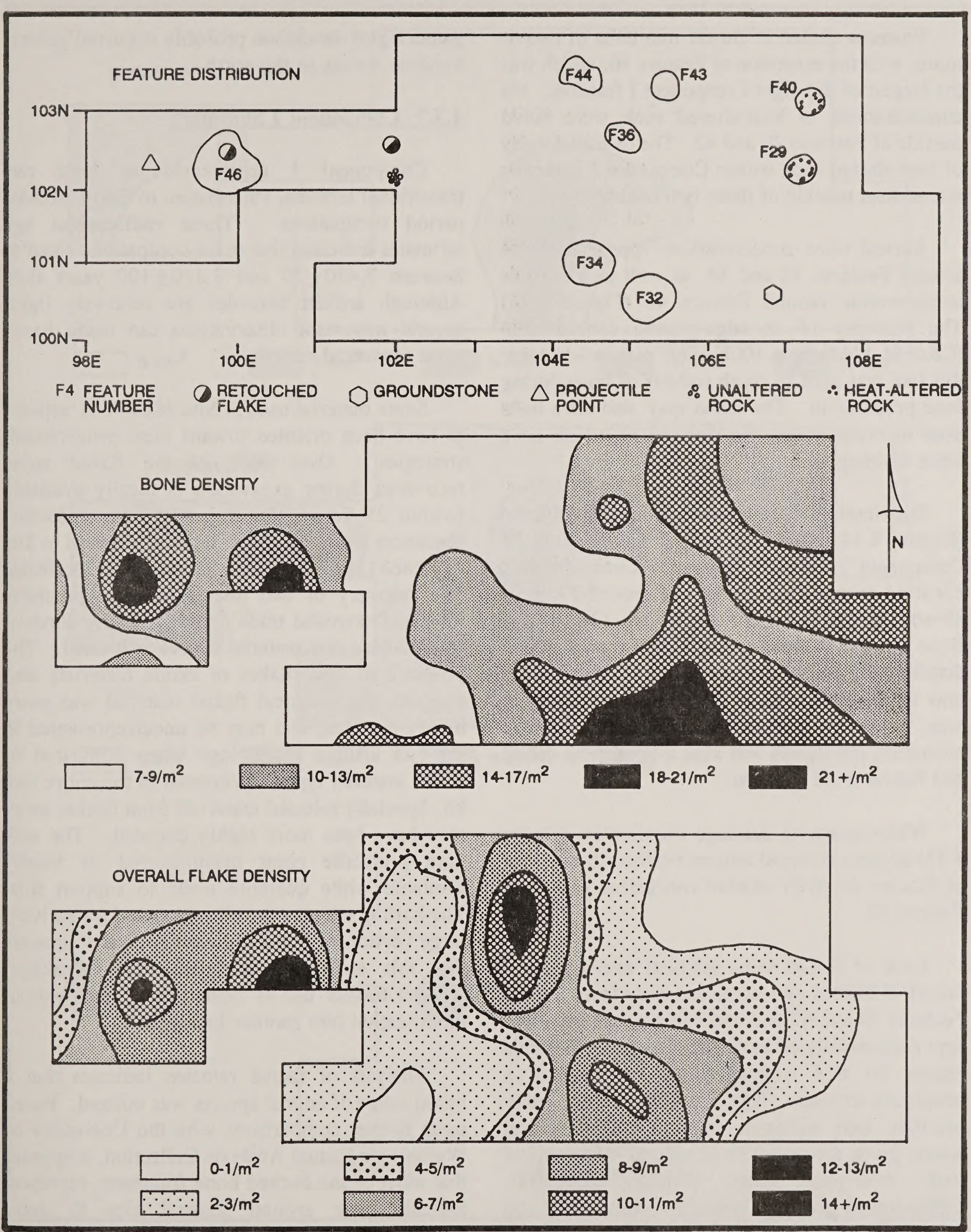


Figure 4.14 Distribution Map for Recovered Remains, and Trend Density Map for the Total Bone and Total Debitage, Component I, Site 48CR4681 (Locality P-054).

Features tended to cluster into units of two or more, with the exception of Feature 46, which was the largest of the eight Component I features. No concentrations of heat-altered rock were noted outside of Features 29 and 42. The overall density of heat-altered rock within Component I is almost nonexistent outside of these two features.

Burned bone concentrations appear centered around Features 32 and 34, as well as a smaller concentration around Feature 46 (Figure 4.15) The recovery of an edge-ground cobble/mano (CR4681-1164) from 100N 106E may indicate that this tool was used to crush rodents or bone during food preparation. The mano may also have been used to crush seeds, the remains of which have since disintegrated.

Distributions of total debitage and bone (Figure 4.14) generally reflect the location of Component I cultural features. Concentrations occurred around Feature 46, and around Features 32 and 34, and around Features 36, 43, and 44. Bone and flaked stone artifacts were only sparsely distributed around Features 29 and 42 areas. This may indicate the edge of the general occupational area, or it may be an indication of a specific habitation area which was kept free of camp debris and flaked stone materials.

White quartzite debitage distribution (Figure 4.15) appears centered around Feature 46 and west of Feature 44, with another concentration around Feature 32.

Lack of flaked stone artifacts and a general falloff of burned and unburned bone from around Features 29 and 42 may indicate that this area was kept purposefully clean of camp trash. A possible reason for this would be the presence of a temporary structure. The two hearths could easily maintain heat within a small area for several hours, given the presence of several kilograms of rock overlying them (Frison 1978:358). Collection of granite cobbles for Features 29 and 42 probably involved selection and retrieval from erosional areas very near the camp, while gathering of sandstone probably occurred several hundred meters to the north.

4.3.7 Component I Summary

Component I represented at least two transitional terminal Paleoindian to Early Archaic period occupations. Three radiocarbon age estimates indicated that these occupations dated to between 7,490$\pm$70 and 7,110$\pm$100 years B.P. Although artifact densities are relatively light, several important observations can made based upon recovered materials.

Stone material used at Site 48CR4681 appears to have been oriented toward local procurement strategies. Over 98% of the flaked stone recovered during excavation is locally available (within 25 km). For the most part, reduction sequences were apparently initiated external to Site 48CR4681, possibly at the procurement localities. The recovery of two microflakes of ignimbrite indicated extended trade or travel to the north or south where that material source is located. The presence of microflakes of exotic materials also suggests that nonlocal flaked material was more highly currated, and may be underrepresented in the site artifact assemblage when compared to actual material types represented in the entire tool kit. Specially selected materials from farther away may have been more highly currated. The split base projectile point manufactured of locally available white quartzite tends to support this. The hafting element is still intact, and a relatively large portion of the blade remains, yet it appears that this tool was discarded upon breakage, without further use or resharpening and without modification into another tool type.

Analysis of faunal remains indicates that a broad range of animal species was utilized. Based upon further comparisons with the University of Wyoming's Faunal Analysis Collection, it appears that most of the burned bone fragments represent animals from ground squirrel size to deer-pronghorn size.

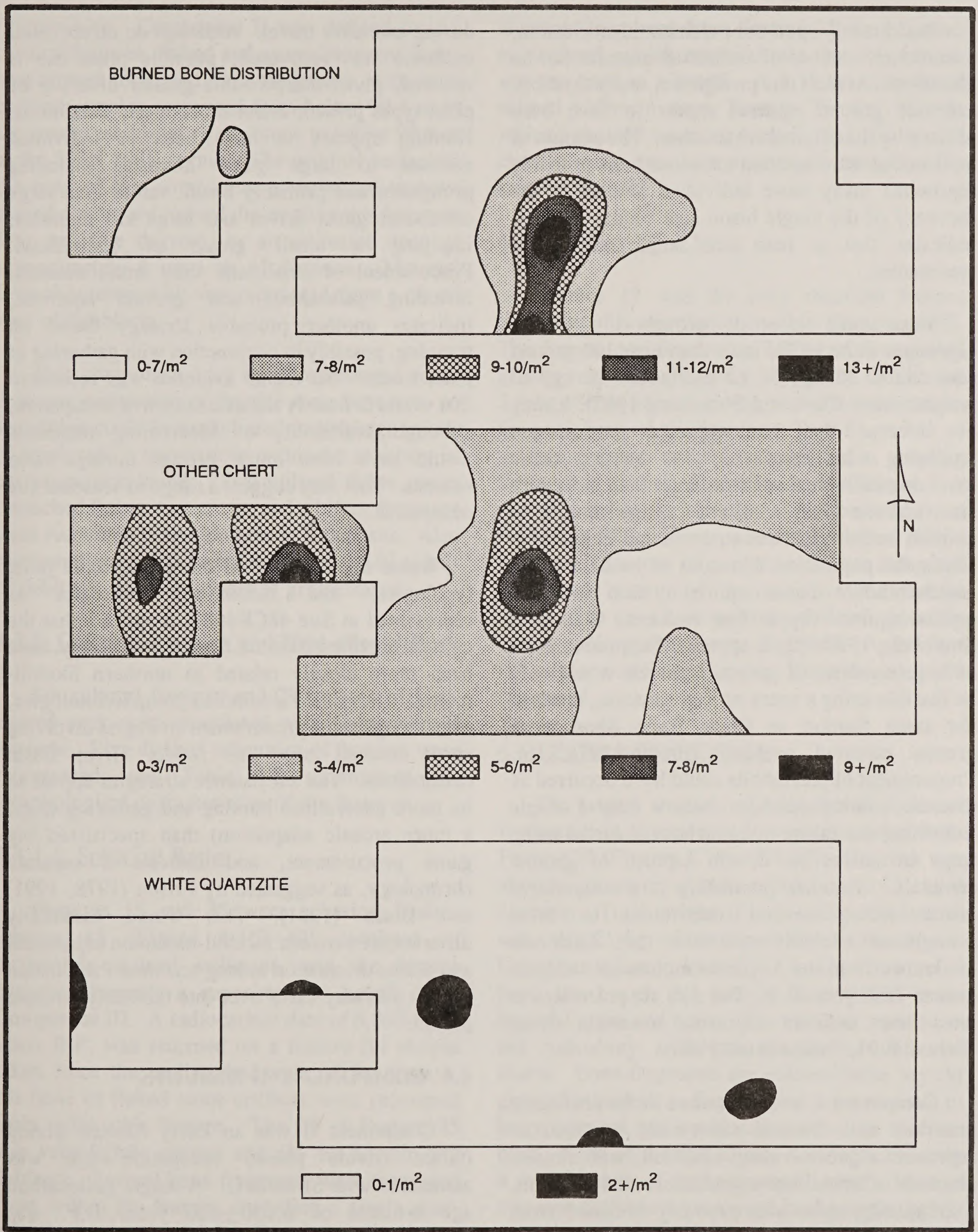


Figure 4.15 Trend Density Maps for Burned Bone, Other Chert Debitage, and White Quartzite Debitage, Component I, Site 48CR4681 (Locality P-054).

Based solely upon bone element identification, a minimum number of individual animals can be identified. At least one pronghorn, one jackrabbit, and one ground squirrel appear to have been utilized by the original inhabitants. The amount of unidentifiable burned and unburned bone probably represents many more individual animals. The recovery of the single bison size caudal vertebra indicates that at least one large mammal is represented.

Since even a small pronghorn (40 kg) represents more edible mass than over 100 ground squirrels (0.26 kg) or 12 jackrabbits (3 kg, all weights from Clark and Stromberg 1987), it may be inferred that two separate procurement strategies were employed, one hunting tactic involving individual animals larger than jackrabbit size, and the other involving capture of smaller animals including ground squirrels and jackrabbits. Given the population dynamics of modern fauna and the amount of area required by each individual ground squirrel (up to four hectares, Clark and Stromberg 1987:99), it appears that procurement of large numbers of ground squirrels would only be feasible using a snare or trap situation, much in the same fashion as Great Basin Shoshonean groups captured packrats (Frison 1978:276). Procurement of jackrabbits could have occurred as discrete hunting episodes, where only a single individual was taken, or could have occurred using traps or snares as in the capture of ground squirrels. Another possibility is a cooperative effort among several individuals to drive pronghorns or rabbits into a net or trap. Such nets are known from the Absaroka mountains dating to around 7500 years B.P. The nets are postulated to have been used in capturing mountain sheep (Frison 1991; Frison et al. 1986).

Component I, as represented in the artifactual materials and features recovered, appeared to represent a general camp situation, with limited amounts of stone tool manufacture and curation. Tool quality stone was probably obtained from nearby cobble terraces, and some highly currated items (as represented by the ignimbrite flakes) were transported into the area, or brought in during extensive travel. Although no direct floral evidence was recovered, possible plant use is inferred, given the probable greater diversity of plant types present under more mesic conditions. Hunting appears to have been of individual medium to large game animals, including pronghorn and probably bison, rather than large communal game drives and large kill numbers, implying a small group of individuals. Procurement of small and very small animals, including jackrabbits and ground squirrels, indicates another probable strategy based on trapping, possibly in conjunction with gathering of plant foods. No faunal evidence was recovered that would definitely indicate season of occupation, although availability of hibernating mammals would have been much greater during warm seasons. This may suggest a range of seasonal site occupation.

Based upon correlated dates, projectile point typologies, and subsistence strategies as represented at Site 48CR4681, it appears that the cultural manifestation of Component I may have been more closely related to northern foothill-mountain terminal Paleoindian group technologies, even though some procurement strategies involving small animals seem to reflect Great Basin orientations. The subsistence strategies appear to be more generalized hunting and gathering (e.g., a more archaic adaptation) than specialized big game procurement, and indicate a separate chronology, as suggested by Frison (1978, 1991) and Black (1991). This would essentially differentiate between foothill-mountain adjustment and plains orientation among terminal Paleoindian groups that may carry over into the Early Archaic period.

4.4 COMPONENT II RESULTS

Component II was an Early Archaic period (Great Divide phase) occupation that was associated with Stratum C. A single radiocarbon age estimate of 6,050±100 years B.P. was obtained from Component II. Artifacts associated with this component were recovered within the excavation block south of the 106N line

(Figure 4.4). Component II was defined by six cultural features, flaked and groundstone artifacts, heat-altered rock, and bone fragments, with most cultural remains recovered from below 99.4 m in the southwest corner of the block to below 98.8 m at the 105N 108E corner. The original surface at the time of this component is estimated to have sloped downward toward the northwest at between four and five degrees, or an estimated drop of approximately 6 cm/1 m of distance. Material from this component was recovered from a 60 m^2 area of the block.

This component may have represented more than one occupation of the site area; however, no separation could be made based on debitage counts or stratigraphic associations within the arbitrary 10 cm excavation levels. Two utilized flakes, three retouched flakes, two cores, and a biface fragment were recovered from Component II deposits. Also recovered were 466 faunal specimens, 282 pieces of debitage, and five pieces of groundstone.

4.4.1 Cultural Features and Heat-altered Rock

Six cultural features and 270 pieces of heat-altered rock were associated with Component II deposits. Five distinct categories of features were represented, and Table 4.8 summarizes the morphological characteristics of the features.

4.4.1.1 Spherical Basins

Features 15 and 35 were spherical basins. Feature 15 (Figure 4.16) fill consisted of moderately stained sediment, and the feature occurred beneath a superimposed hearth from Component III. A radiocarbon date of 6,050 ± 100 years B.P. was returned on a feature fill sample taken from the undisturbed area of the feature. No bone or flaked stone artifacts were recovered from within this feature. The fill of Feature 35 was very lightly stained and did not contain any debitage. Several bone fragments were recovered from within the feature, including a single deer-pronghorn size long bone fragment exhibiting a spiral fracture and three long bone fragments of a rabbit size animal or medium bird. None of the elements recovered from Feature 35 were burned or calcined, which may indicate that this feature was not used as a hearth. A 1.75 liter sample of stained sediment from Feature 35 was floated, with no charred seeds recovered. This absence of charred seeds may be a product of the age of the cultural deposits.

4.4.1.2 Rock-filled Basin

Feature 13 was the only recorded feature exhibiting this morphology within Component II. The feature contained over 7.0 kg of fire-spalled granite cobbles (Figure 4.17). An additional 2.0 kg of heat-altered sandstone were recovered on the periphery of the feature. Two fragments of sandstone appear to have been utilized as grinding slabs prior to their deposition in the feature. A partial mandible of a mouse was recovered from within the fill. Fill was moderately stained with a very small amount of oxidation evident along the sides and bottom of the basin. The feature appeared to have been partially deflated, possibly due to prolonged exposure after use. A 2.0 liter fill sample was floated, and no charred seeds were recovered.

4.4.1.3 Rock-filled Cylinder

The largest amounts of heat-altered rock and feature fill in Component II were recovered from Feature 30 (Figures 4.18 and 4.19). The rock was almost exclusively granite cobbles up to 13 cm in diameter. Total weight of rock within this feature was over 21 kg. Staining within the hearth was light to medium in intensity. Artifacts recovered from the hearth fill include four flaked stone material types and bone. The material types are a red chalcedony, a tan quartzite, and two different cherts. Bone fragments are unidentifiable beyond general animal size. Represented are a medium to large mammal and a rabbit size animal or medium bird. None of the flaked stone artifacts and only a small amount of the bone were burned. Most of these artifacts were recovered in the upper lightly stained area of the feature. The lightly stained nature of the upper fill indicated a partial deflation of the feature after its abandonment. Based on the

Table 4.8 Characteristics of Cultural Features, Component II, Site 48CR4681 (Locality P-054).

Feature No.	Excavation Unit	Feature Type	Cross Section	Dimensions[1] L	W	D	Area (cm^2)	Volume (liters)	Oxidation	Rocks Type	No.	Wt. (kg)	Remarks
13	103N 107E	Rock-filled basin	Hemisphere	36	30	12	885	6.8	Absent	Granite sandstone	76	9.3	Moderately charcoal stained
15	100N 107E	Unoxidized basin	Spherical	30	28	20	661	8.8	Absent	--	--	--	Moderately charcoal stained
30	101-102N 107-108E	Rock-filled cylinder	Cylindrical	47	44	37	1,626	60.2	Absent	Granite cobble	73	21.1	Lightly charcoal stained
31	100N 108E	Rock concentration	Platform	95	88	6	8,360	56.1	Absent	Granite cobble	40	20.1	Unstained
35	102-108N 101E	Unoxidized basin	Spherical	40	40	20	1,257	16.8	Absent	--	--	--	Lightly charcoal stained
37	101N 103-104E	Unoxidized cleanout	Fan	30	30	7	707	1.7	Present	--	--	--	Lightly charcoal stained

[1] L = length, W = width, D = depth.

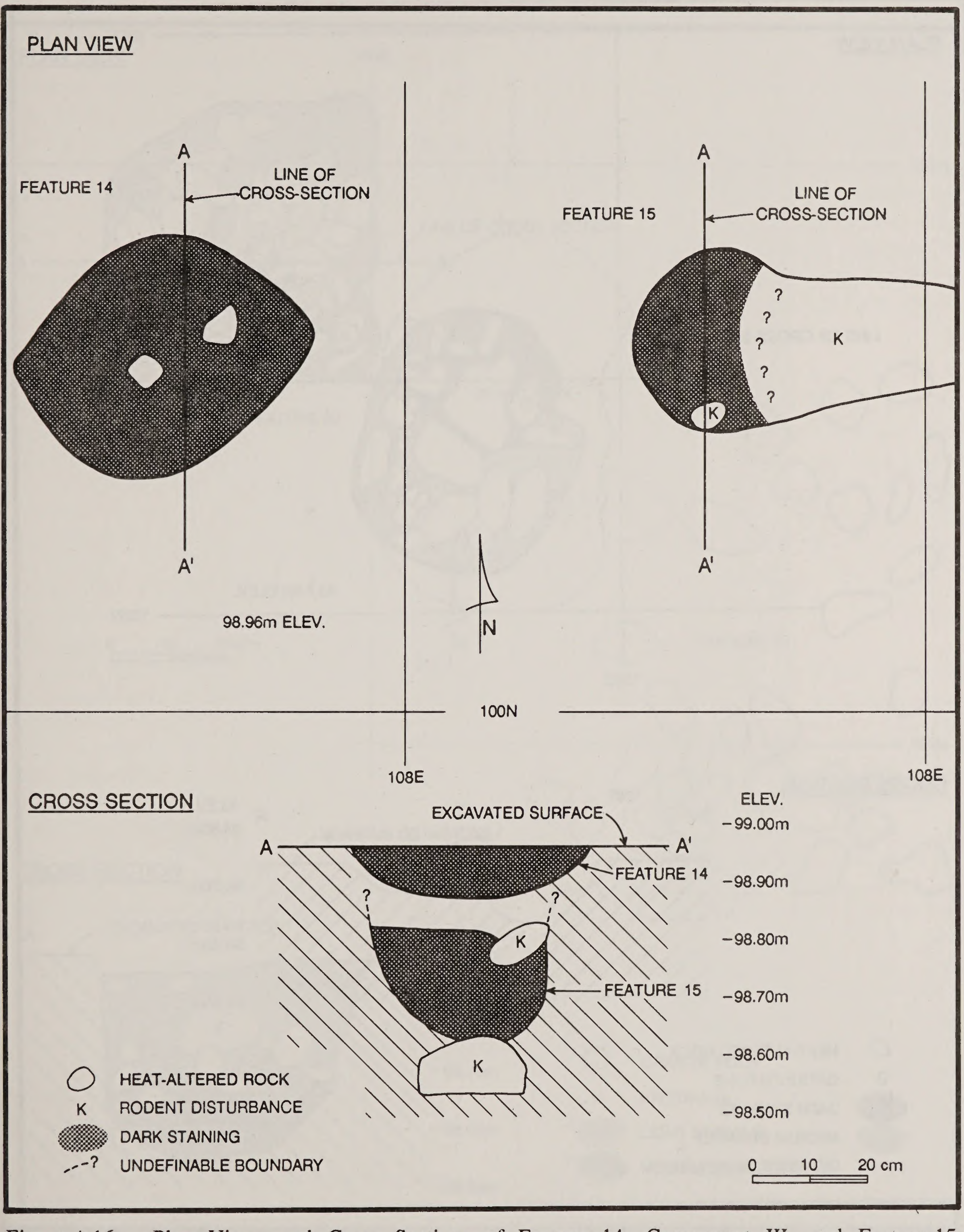


Figure 4.16 Plan Views and Cross Sections of Feature 14, Component III, and Feature 15, Component II, Site 48CR4681 (Locality P-054).

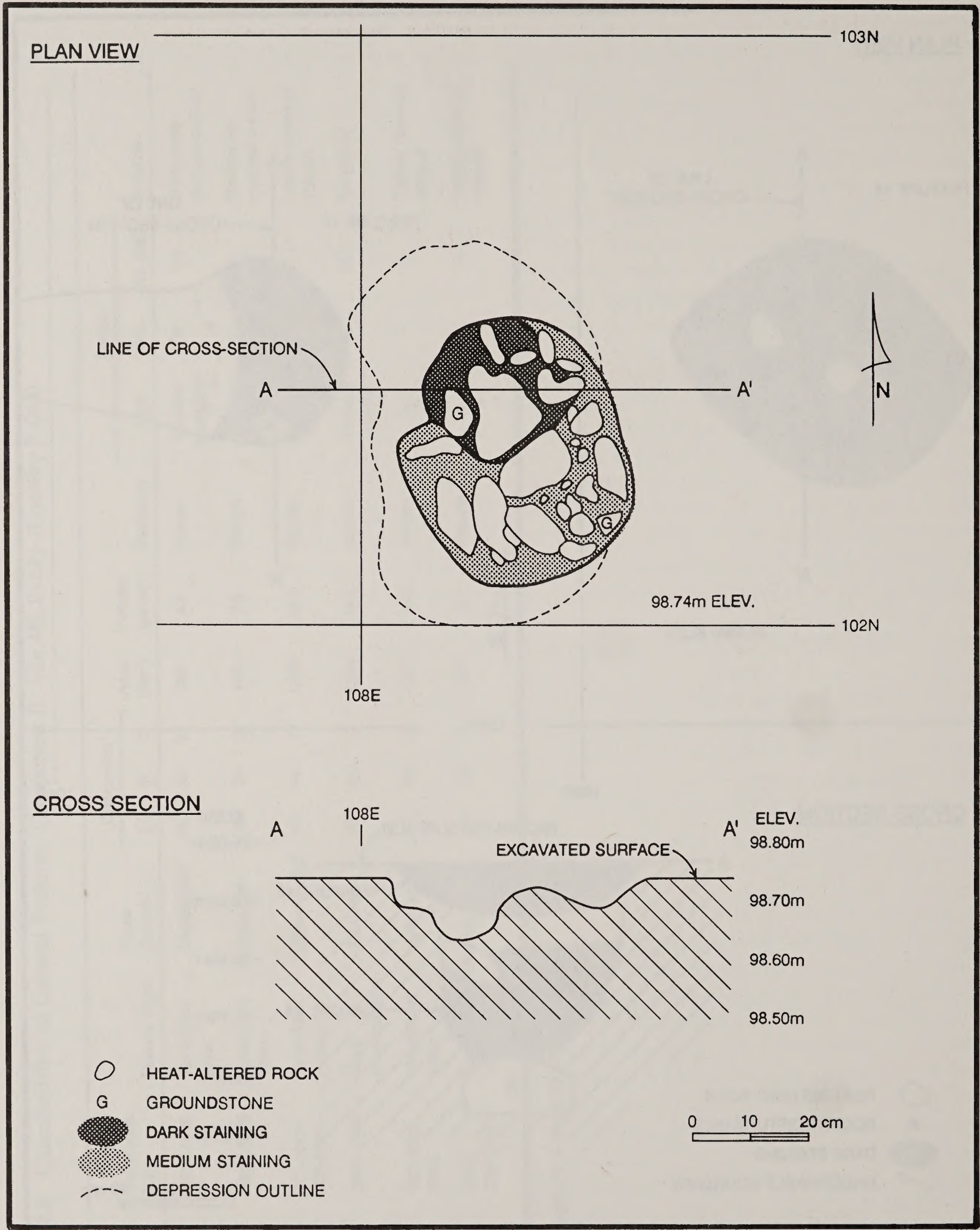


Figure 4.17 Plan View and Cross Section of Feature 13, Component II, Site 48CR4681 (Locality P-054).

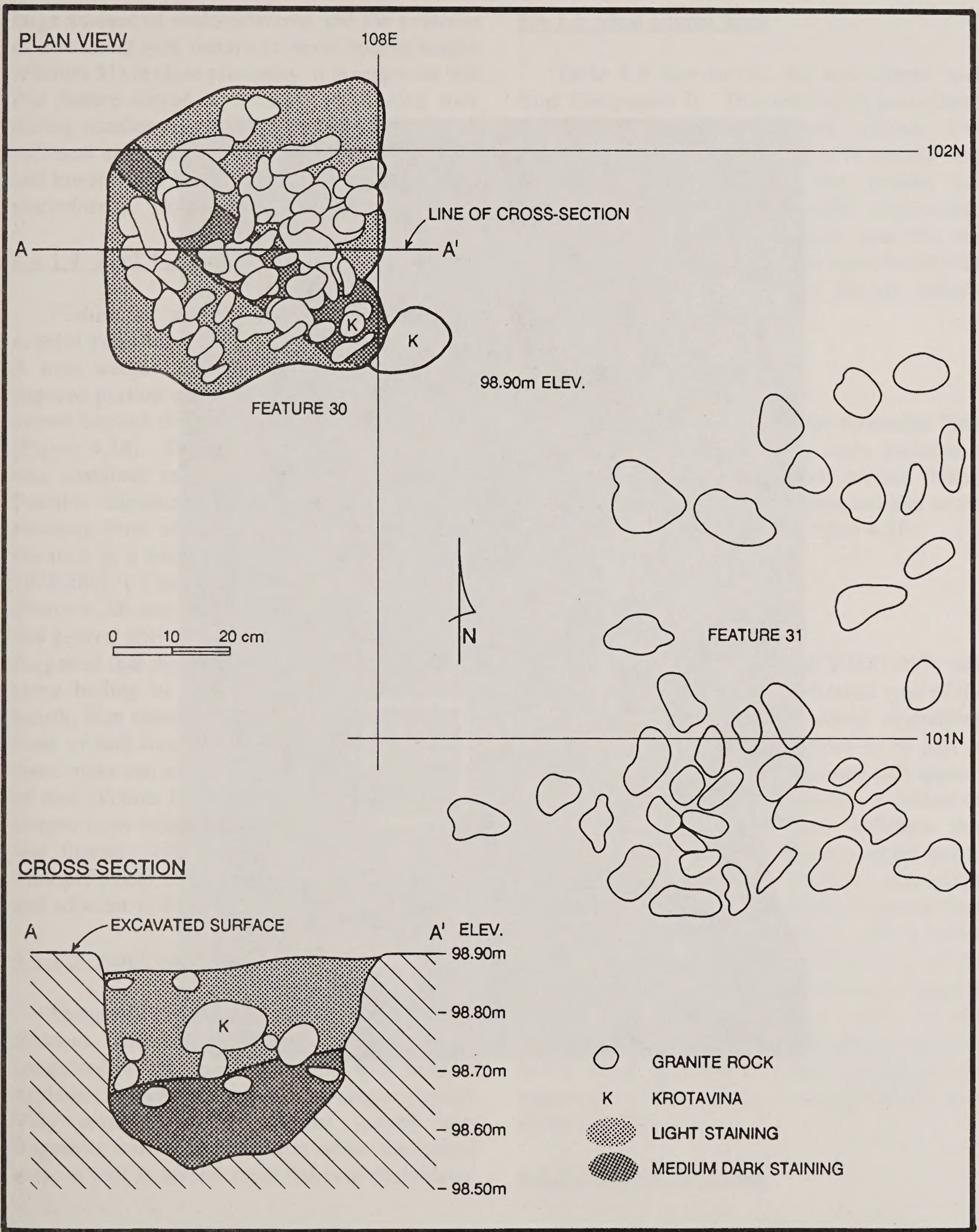


Figure 4.18 Plan Views of Features 30 and 31 and Cross Section of Feature 30, Component II, Site 48CR4681 (Locality P-054).

Figure 4.19 Feature 30 After Excavation, Component II, Site 48CR4681 (Locality P-054).

large amount of rock recovered and the presence of a roasting type feature or stone boiling scatter (Feature 31) in close proximity, it is suggested that this feature served as a hearth for heating rock during roasting or stone boiling activities. Two sediment samples (2.5 liters total) from the upper and lower fill of Feature 30 were floated for plant macrofossils. No charred seeds were recovered.

4.4.1.4 Rock Platform

Feature 31 was a dense scatter of granite cobbles recorded 1.5 m southeast of Feature 30. A total weight of 20 kg was recorded for the exposed portion of the feature which appeared to extend beyond the excavation limits of the block (Figure 4.18). The matrix surrounding the rocks was unstained to very lightly charcoal stained. Possible functions included a scatter of rock resulting from stone boiling activities, or use of the rock as a heat source during roasting (Frison 1978:286). Close proximity to a heat source (Feature 30) and the same type (granite cobbles) and general size of rock (up to 16 cm in diameter) suggested that these two features were related. In stone boiling or roasting, rock is heated in a hearth, then removed and used as a heat source to roast or boil food. When covered by sediment, these rocks can retain heat for an extended period of time (Frison 1978:355). A 2.0 liter sediment sample from within the perimeter of the platform was floated, with no charred seeds recovered. Multiple pieces of debitage were recovered within and adjacent to Feature 31.

4.4.1.5 Ash Concentration

Feature 37 represented a small hearth dump or cleanout. This feature was very dispersed and was comprised of light charcoal staining with lumps of oxidation in a very amorphous fan-shaped deposit. Very small to small mammal burned bone fragments were recovered from within the stained area, as well as several small flakes of chalcedony.

4.4.1.6 Heat-altered Rock

Table 4.9 summarizes the heat-altered rock from Component II. The majority of heat-altered rock was comprised of granite cobbles, with significantly less sandstone. Use of granite may reflect differences between the granite and sandstone with regard to task-specific uses, or may reflect the availability of granite near the site location. Less than 25% of the heat-altered rock was recovered from outside of the six cultural features.

4.4.2 Flaked Stone Artifacts

Eight flaked stone tools were recovered from Component II deposits. The tools included a biface fragment, two cores, two utilized flakes, and three retouched flakes. Characteristics of the flaked stone tools are listed in Table 4.10.

4.4.2.1 Biface Fragment

A single biface fragment (CR4681-257) was recovered near Feature 13. Material type of the tool is a clear dendritic chalcedony resembling moss agate. The fragment appears to be part of the proximal end of a biface, and one side appears to have been heat-spalled. Patination is evident on all areas of the artifact and indicates that fragmentation of the biface is not a recent event. Examination under a 20x binocular microscope revealed rounding and polishing of the lateral flake margins and biface edges, along with a minor amount of step-fracturing on both sides of the edge. This indicates that the piece was utilized as a tool, or that one of the steps in the manufacturing process was the heavy grinding of lateral edges, possibly a platform preparation or rejuvenation feature prior to removal of the next series of flakes.

4.4.2.2 Retouched Flakes

Three retouched flakes manufactured from two types of chert were recovered from Component II deposits. Artifact CR4681-544 is the distal end of

Table 4.9 Summary of Heat-Altered Rock, Component II, Site 48CR4681 (Locality P-054).

Material Type	No. of Rocks	Weight (kg)	Average Weight (kg)
Sandstone	22	2.70	0.123
Granite	248	45.35	0.183
Quartzite	0	0	0
Total	270	48.05	0.178

Table 4.10 Characteristics of Flaked Stone Tools and Other Tools, Component II, Site 48CR4681 (Locality P-54).

Catalog No.	Excavation Unit	Classification	Condition	Dimensions (mm)[1] L	W	T	Material Type	Remarks
22	100N 99E	Utilized flake	Fragment	27.1	24.0	3.5	Black siltstone	Biface thinning flake, two utilized lateral margins
255	102N 107E	Retouched flake	Complete	31.2	20.0	4.8	Opaque white chalcedony	Biface reduction flake, one retouched lateral margin
257	102N 107E	Biface	Fragment	25.3	16.6	6.5	Opaque dendritic chalcedony	Lateral edge and base, slight patina, possibly heat-altered
541	101.24N 101.36	Residual Core	Complete	51.7	43.6	28.8	Black siltstone	Flakes 635 and 1098 refit to core
544	100N 101E	Retouched flake	Fragment	29.7	24.4	8.7	Tan chert	Core reduction spall, distal end, one lateral edge and distal end retouched
793	100N 108E	Retouched flake	Complete	33.5	27.9	5.4	Phosphoria chert	Biface reduction flake, lateral edge and distal end retouched
1117	103N 107E	Residual core	Complete	47.2	29.7	26.2	Black siltstone	Exhausted numerous fracture planes
1161	102N 101E	Anvil stone	Complete	135.7	111.1	62.2	Quartzite	Battered on flat face
1240	100N 105E	Retouched flake	Complete	17.9	10.4	3.5	Phosphoria chert	Core reduction type spall, distal end retouched

[1] L = length, W = width, T = thickness.

a large core reduction flake or spall of tan mottled chert. The distal edge has been unifacially retouched, producing an edge angle of approximately 65°. Examination of this edge under 20x magnification showed a general polish of the working bit, and rounding of flake scars. Use as some sort of scraping implement is suggested by the morphology and wear on the artifact.

Artifact CR4681-793 is made of a Phosphoria type chert, lavender to purple with red to blue incursions. The bulb is cortex covered, the cortex appearing to be of a concretionary nodule. One edge of this flake has been unifacially retouched, with another showing utilization. The distal end of the flake is the longest edge and has a very steep retouched facial angle (70°). This edge reveals overlapping step-fractures when examined under magnification. A small amount of rounding of protruding flake scars is evident. The second retouched margin is lateral and has a relatively oblique edge angle. Very small flake scars (<0.5 mm) are evident under magnification along both the dorsal and ventral side of this margin.

Artifact CR4681-1240 is the proximal half of a Phosphoria type chert flake. The tool is relatively small (see Table 4.10), and cortex covers approximately one-third of the surface. Retouch is evident along the lateral edge of the ventral surface and consists of multiple small overlapping flake scares (<2.5 mm), forming a very steep angle (75°+). No evidence of rounding on exposed flake scars is evident under 20x magnification.

4.4.2.3 Utilized Flakes

Two utilized flakes were recovered from the southern part of the block. Two material types are represented by the utilized flakes.

Artifact CR4681-22 is the proximal end of a dark grey to black siltstone flake. This flake exhibits no cortex and appears to be a large biface reduction or thinning flake. The platform shows heavy grinding, probably a preparation step prior to removal from the biface. Small flake scars (< 1 mm) are evident along both lateral edges, and both edge angles are oblique.

Artifact CR4681-255 is a secondary flake of opaque white chalcedony. Use wear is present along one lateral margin toward the distal end. This edge is at a relatively steep angle and has small (< 1 mm) flake scars on the dorsal side. The cortex of the flake appears to be that of a wind- or water-polished cobble.

4.4.2.4 Cores

Two residual cores were located within Component II. Both are a dark grey to black silicified siltstone available on the local cobble benches and also along the Rattlesnake Creek drainage several kilometers to the south. The first (CR4681-1117) is angular, with multiple flake scars on all sides. Cleavage planes within this core appear to be erratic, and flake scars reveal multiple hinge fractures, shear facies, and unpredictable traverses. The second core (CR4681-541) is somewhat larger but exhibits the same characteristics. Two halves of a medially split flake (CR4681-1098) and a fragment of shatter (CR4681-635) were refitted to this core (Figure 4.20). All were retrieved within a 2 m perimeter surrounding the core, on opposite sides of Feature 35. Several small pieces of shatter and broken flakes of the same material were also recovered from the area.

4.4.2.5 Debitage

Table 4.11 provides a cross-tabulation of debitage type by material type for the 282 pieces of debitage attributed to Component II. Cryptocrystalline cherts and chalcedonies dominate the debitage sample with over 62% of the total. Silicified siltstones comprise 21.1%, and quartzites make up 16.7%. Silicified petrified wood and quartz crystal represent less than 1.0% each of the total. The majority of the material types represented in the Component II collection are available on the cobble terraces around the Bairoil area. The moss agate recovered appears to be a

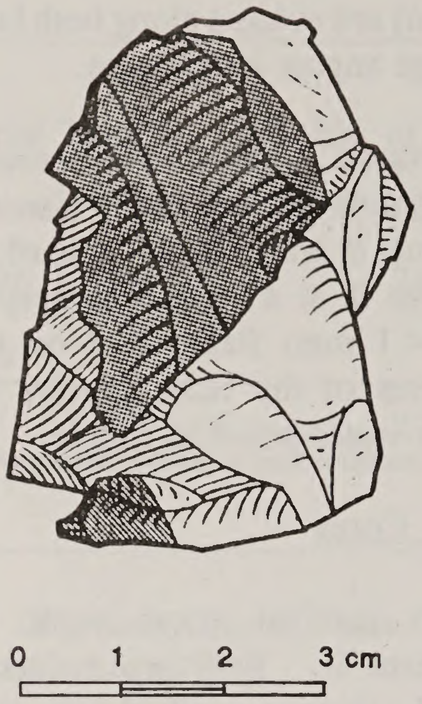


Figure 4.20 Refitted Core (CR4681-541), Component II, Site 48CR4681 (Locality P-054).

variation of the clear chalcedony with very minor amounts of brown to black dendrites deposited within a clear matrix. Quartz rock crystal does not appear to be available on the terrace system around Bairoil. While metaquartzite is obtainable within a short distance from the site, the structure of metaquartzite does not lend itself to the formation of crystal-clear fragments. The flake of quartz recovered from excavation may represent another highly curated item from outside the site area.

The majority of the material types within the assemblage contain very low percentages of primary or secondary decortication flakes which may indicate that a reduction sequence in tool manufacture was initiated away from the site. Initial reduction of cobbles or nodules may have occurred at the procurement location, to reduce transportation costs by reducing weight. The white chert and other chert categories contain significantly higher percentages of secondary flakes than the other categories. This may reflect a difference in procurement area, size availability, or differences in tool types being manufactured. The exterior of the white chert material appears to be a wind-polished cobble type. This category is also extensively heat-treated, as evidenced by the amount of fire-spalling observed on the flakes.

4.4.3 Groundstone

Five fragments of groundstone were recovered from Component II. The fragments are remnants of broken metates or grinding slabs manufactured of sandstone, and all fragments are heat-altered. Four different grinding implements are represented by these five artifacts (Table 4.12).

The largest fragment (CR4681-1163) measures 17.6 cm long by 12.9 cm wide and is 2.9 cm thick at the edge. Multiple laminations of sandstone are evident within the artifact, with some sand grains as large as 0.5 mm. The sandstone consists of poorly sorted cemented sand grains, with numerous plagioclase and orthoclase feldspar crystals in a quartz matrix. This piece exhibits a marked concavity probably caused by the abrasion or grinding of foodstuffs. The concavity measures 0.7 cm deep. This piece of groundstone represents one of two pieces recovered from Feature 13. The fragment is oxidized to a red-orange color and is extremely friable. The one remaining long axis edge appears to have been intentionally spalled. Large, coarse fragments of sandstone have been removed along the ventral face, apparently by hard hammer percussion. This may have been done to shape the grinding slab and also to reduce its weight. The nearest sandstone available is several hundred meters to the north where many different laminated layers of sandstone outcrop near the foot of Camp Creek Hill. Based on the known weight of the recovered sandstone fragment (858 g) and the fact that the recovered piece represents a proximal or distal fragment, a minimum diameter of 28 cm and a minimum weight of 4.47 kg can be extrapolated by utilizing a tangential arc measurement developed for analysis of ceramic vessel rim diameters (Rice 1987). The sandstone slab involved represents a fair expenditure of effort to

Table 4.11 Cross-Tabulation of Debitage Type by Material Type, Component II, Site 48CR4681 (Locality P-054).

	Material Type											
Debitage Type	Quartzite	White Chert	Red Chert	Clear Chalcedony	Tan Chert	Black Siltstone	Other Chert	Other Siltstone	Moss Agate	Petrified Wood	Crystal Quartz	Total
Primary Flake												
Number	0	1	0	1	0	0	1	0	0	0	0	3
Row %	0	33.3	0	33.3	0	0	33.3	0	0	0	0	
Column %	0	4.5	0	2.4	0	0	0.9	0	0	0	0	1.1
Secondary Flake												
Number	0	5	2	0	0	4	15	3	0	0	0	29
Row %	0	17.2	6.9	0	0	13.8	51.7	10.3	0	0	0	
Column %	0	22.7	14.3	0	0	19.0	13.4	30.0	0	0	0	10.3
Tertiary Flake												
Number	26	6	8	23	3	10	67	5	1	2	1	152
Row %	17.1	3.9	5.3	15.1	2.0	6.6	44.1	3.3	0.7	1.3	0.7	
Column %	55.3	27.3	57.1	56.1	33.3	47.6	59.8	50.0	33.3	100	100	53.9
Microflake												
Number	14	7	3	16	6	2	17	2	1	0	0	68
Row %	20.6	10.3	4.4	23.5	8.8	2.9	25.0	2.9	1.5	0	0	
Column %	29.8	31.8	21.4	39.0	66.7	9.5	15.2	20.0	33.3	0	0	24.1
Shatter												
Number	7	3	1	1	0	5	12	0	1	0	0	30
Row%	23.3	10.0	3.3	3.3	0	16.7	40.0	0	3.3	0	0	
Column %	14.9	13.6	7.1	2.4	0	23.8	10.7	0	33.3	0	0	10.6
Total												
Number	47	22	14	41	9	21	112	10	3	2	1	282
Row %	16.7	7.8	5.0	14.5	3.2	7.4	39.7	3.5	1.1	0.7	0.4	

Table 4.12 Characteristics of Groundstone Tools, Component II, Site 48CR4681 (Locality P-054).

Catalog No.	Excavation Unit	Classification	Condition	Dimensions (mm)[1] L	W	T	Weight (kg)	Material Type	Remarks
292	103N 107E	Metate	Fragment	43	29	17	0.03	Sandstone	Bifacial, slight concavity, refits #293
293	102.50N 106.76E	Metate	Fragment	46	42	17	0.05	Sandstone	Bifacial, slight concavity, pecked, shaped edge, refits #292
346	102.16N 107.65E, Feature 13	Metate	Fragment	127	63	15	0.19	Sandstone	Unifacial, slight concavity, pecked
856	103N 103E	Metate	Fragment	88	62	21	0.14	Sandstone	Unifacial, oxidized red to black
1163	102.35N 107.25E, Feature 13	Metate	Fragment	176	129	29	0.85	Sandstone	Unifacial, marked concavity, shaped edge, oxidized red

[1] L = length, W = width, T = thickness.

shape and transport, and may indicate an extended occupation or an intention to reoccupy the site. It may also be interpreted to mean that subsistence resources (seeds, other plant material, possibly rodents) were available in sufficient amounts to warrant the time and energy expenditure required to manufacture and transport the metate.

The second groundstone tool recovered from Feature 13 (CR4681-346) is 12.7 cm long, 6.3 cm wide, and 1.5 cm thick. This tool has a slight concavity on one face along with a minor amount of pecking. This fragment is reduced to a reddish black and is much harder than the first piece. The sandstone also appears to be much finer grained, although still poorly sorted. Muscovite mica is present in relatively high amounts among an angular quartz matrix. These two fragments appear to represent two different grinding slabs.

Two other fragments of groundstone were also recovered from near Feature 13. These two pieces (CR4681-292 and 293) refit to form a fragment of a third grinding slab. The sandstone used for this grinding slab is very fine-grained, is well-sorted, and is oxidized to a slight pinkish color. The fragments contain a low percentage of orthoclase feldspar, intermixed in an angular (subcrystalline) white quartz matrix. This grinding slab is bifacially ground, with pecking on one face. The remaining portions are slightly concave (<0.5 cm), and one edge appears to have been purposefully shaped, probably during initial manufacture or use. The long axis of the refitted pieces is 6.35 cm, with a short axis of 4.7 cm.

The fifth piece of groundstone (CR4681-856) is very friable. Use appears to have been unifacial. Sand grains are rounded, well-sorted quartz with low percentages of orthoclase and plagioclase feldspar. This piece probably represents a fragment of a fourth grinding slab.

4.4.4 Anvil Stone

A single anvil stone (CR4681-1161) was recovered (Table 4.10). Material type is a metacrystalline milky quartz, and cobbles of this type were noted in the deeper arroyos near the site. This tool is relatively flat and subrectangular in outline. The largest face on this artifact appears to have been used as a striking platform, and it exhibits flattening of the crystalline facets possibly due to repeated blows with another hard material. Additionally, portions of the same surface appear to have been pecked, with small craters or pits in evidence. This face lacks any evidence of grinding, as might be expected on a mano or metate. Rather, fragments of the face have been removed, probably through use attrition resulting from repeated striking. The net effect is that the utilized face has a very rough and undulating appearance, rather than the smoothed (even if pecked) aspect of a grinding stone. One margin of the anvil stone has been spalled; the resultant negative bulb of force is exaggerated which may indicate a hard hammer impact. A negative bulb could have been produced by striking the anvil stone near the edge with another stone. The purpose of this artifact is unclear, but it may be related to processing of plant or animal remains.

4.4.5 Animal Remains

A total of 466 bone or tooth fragments was recovered from this component (Table 4.13). The remains are so fragmentary that over 98% are unidentifiable beyond general body size. Over 68.0% of the recovered bone represents animals smaller than coyote size, while the small to medium mammal category (coyote to mule deer size) contains 28.1%. Approximately 2.0% of the bone was unidentifiable beyond a general body size of smaller than mule deer. Based on a high number of articulated elements attributed to the ground squirrel category, it is probable that this group of bones is intrusive and noncultural. No cultural modification was noted on any of the elements, nor was there any calcium carbonate deposition noted on the bone. As a result, these remains have been eliminated from the analysis.

At least three species or animals were probably utilized during Component II occupations. A single pronghorn is represented by a complete astragalus, and possibly several long bone fragments. Jackrabbit is represented by a tooth fragment. Ground squirrel remains were also recovered, and several long bone fragments that are approximately of this size are burned. Over 35.0% (167 pieces) of the assemblage was burned or calcined (Table 4.13). Of the burned bone, 47.3% is from animals in the very small to small size category (rodent to almost coyote size), while bone judged to be from animals from cottontail to coyote size makes up approximately 18.0% of the assemblage. Small to medium mammals (larger than coyote size to deer-pronghorn size) represent 34.7% of the burned bone. The proportion of body sizes in the burned bone category of very small to small and small mammals when compared to the small to medium and medium mammals indicates that smaller and larger animals were treated differently as far as processing for food. The overall proportion of bone from various animal sizes indicates that smaller animals were important as a food item. Absence of larger animal bone may be a factor of preservation, although smaller bone should not logically preserve as well as larger bone, based on overall density of osseous material. Lack of large animal bone may also be an indication that the animals were hunted farther from the base camp. As a transportation cost reduction strategy, the larger animals may have been boned at the kill site to reduce bulk and weight. The amount of work required to return bone to the camp may have been deemed excessive in comparison to the food value gained. A single medium animal probably represents more caloric input than all of the very small to small mammals represented. Small to very small animal bone may represent rodents and rabbit (cottontail and jackrabbit) size animals collected during foraging around the camp area, in conjunction with the collection of plant foods.

A single canine from a small predator about the size of a weasel was recovered from the excavation block in this component. No cultural modification was noted, so this may be an intrusive specimen.

A single fragment of a mouse mandible was recovered from the fill of Feature 35. This bone appears to be the same age as other bone in the deposit, but no cultural modification is evident.

Table 4.13 Summary of Animal Remains, Component II, Site 48CR4681 (Locality P-054).

Animal Size Category	Total Specimens No.	Total Specimens Wt.(g)	Burned Specimens No.	Burned Specimens %	Identifiable Elements
Pronghorn	1	14.3	--	--	Astragalus
Jackrabbit size	5	3.1	--	--	Alveolus, mandible, ulna
Jackrabbit	1	0.1	--	--	Tooth
Small mammal	154	19.7	30	19.5	--
Small-medium mammal	132	42.9	58	43.9	Tooth enamel
Medium mammal	1	8.6	--	--	--
Very small-small mammal	139	5.4	79	56.8	Tibia, femur
Ground squirrel	9	0.2	--	--	Mandible/maxilla
Very small mammal	9	0.2	--	--	--
Deer-pronghorn size	5	16.5	--	--	Humerus fragment, phalanx, tooth enamel
Very small-medium mammal	10	0.6	--	--	--
Total	466	111.6	167	35.8	

This bone may represent a contemporaneous noncultural occurrence of locally available species.

4.4.6 Plant Macrofossils

Flotation of matrix samples from five of the six Component II features were processed in an effort to recover charred seeds or other plant remains associated with the occupations. A total of 11.25 liters of fill was floated for plant remains (Table 4.14). No charred seeds or other plant elements were recovered, possibly due to the age of the occupation.

4.4.7 Spatial Distribution of Cultural Remains

Distribution of cultural features, heat-altered rock, tools, and refits from Component II deposits is shown in Figure 4.21. Features were generally distributed around and along the 102N line in the southern part of the block.

Heat-altered rock was fairly sparse, with most rock concentrated in the east part of the block near Features 30 and 31. No distinctive patterns were noted in the dispersed rock.

Distributional patterns represented by the debitage indicate concentrations around features

Table 4.14 Plant Macrofossils Recovered from Feature Fill, Component II, Site 48CR4681 (Locality P-054).

Feature No.	Sample No.	Volume (liters)	No. of Seeds	Taxa
13	24	2.0	0	--
15	64	1.75	0	--
30	231	1.5	0	--
30	232	1.0	0	--
31	239	2.0	0	--
35	272	1.0	0	--
Amorphous stain 100N 104E	36	2.0	0	--
Total		11.25	0	

(Figures 4.22 and 4.23). An interesting concentration appears along the 100E line between 100N and 101N. Based on concentrations around most other hearths in the component, this concentration may indicate that additional hearths are present in unexcavated area to the south of the block.

Quartzite is distributed around and south of Feature 35 in very low densities (Figure 4.23). At least two different quartzite types are represented including a light pink coarse-grained variety and a second type that resembles grey Morrison quartzite. Higher concentrations that include both types of quartzite occur near the features in the southeast corner of the block. Also present in small amounts is a yellow, fine-grained quartzite. Quartzite flakes from both areas are very small (< 1 cm) and appear to be resharpening flakes rather than biface reduction flakes. Activities within these areas with regard to quartzite appeared to center around maintenance of existing tools rather than manufacture of new implements.

Clear chalcedony concentrations appear to the south of Feature 35 and around Feature 37 (Figure 4.23). This material grades from very clear and colorless to clear with a slight pinkish to reddish hue. Most are very small flakes, with complete bulbs and platforms, probably representing fine pressure flaking. Rather than an actual reduction sequence, these flakes appear to be from maintenance and final retouch of already manufactured tools much like the quartzites.

Black siltstone is concentrated around Feature 35 (Figure 4.23). A residual core was recovered south of the feature; three other pieces of debitage have been refit to this core. According to Larson (1991) a conjoined artifact is one that has been broken, with no reduction sequence involved. Two fragments of a medially split flake were recovered north of the feature and were conjoined to make one complete flake. This complete flake was then refit to the core. An additional piece of shatter was recovered approximately 1 m to the southwest, and this piece was also refit to the core. Spatial distribution of these artifacts can be

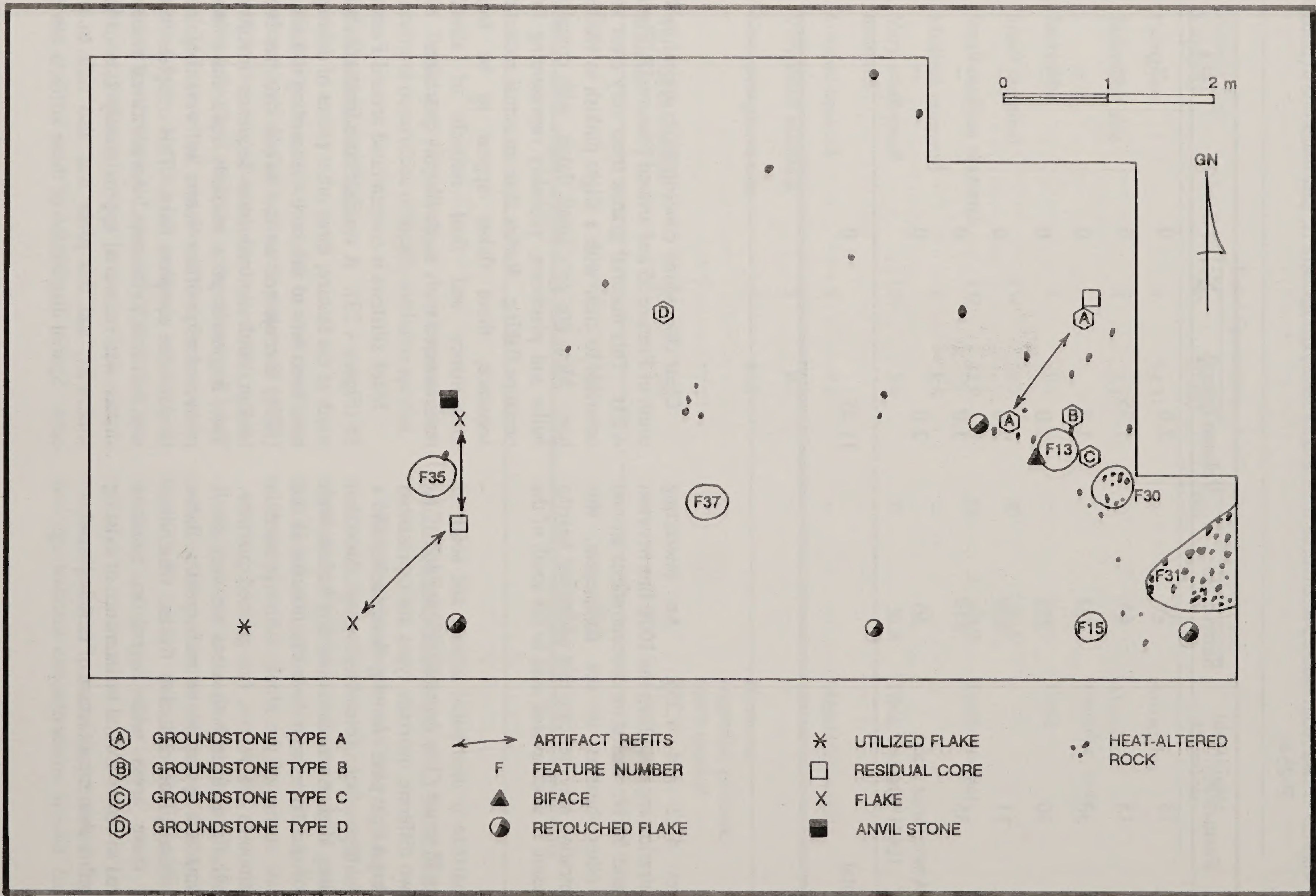


Figure 4.21 Distribution of Cultural Features, Tools, and Heat-altered Rock, Component II, Site 48CR4681 (Locality P-054).

Figure 4.22 Trend Density Maps for Total Debitage, Total Bone, and Burned Bone, Component II, Site 48CR4681 (Locality P-054).

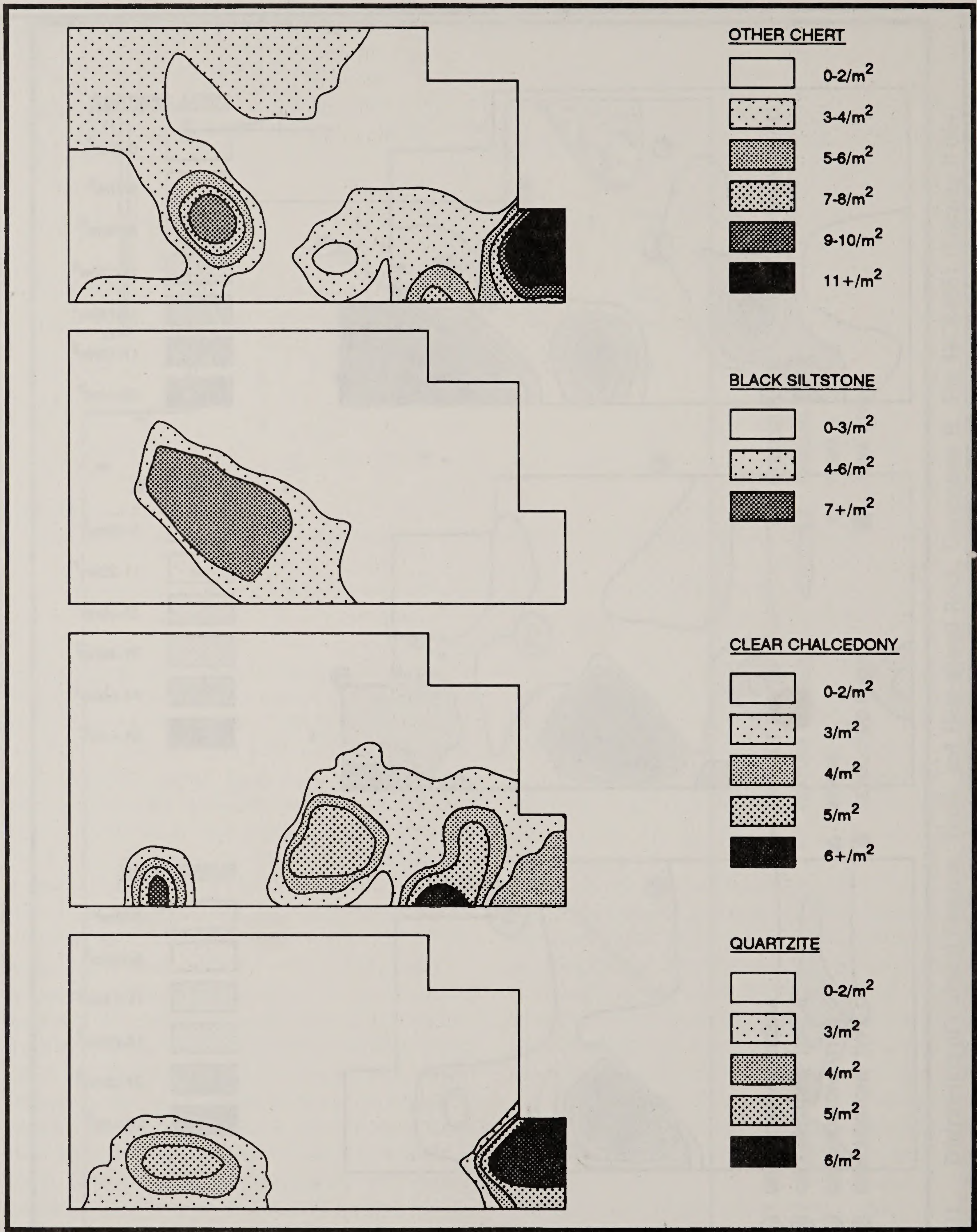


Figure 4.23 Trend Density Maps for Other Chert, Black Siltstone, Clear Chalcedony, and Quartzite Debitage, Component II, Site 48CR4681 (Locality P-054).

seen in Figure 4.21. The concentration of this black siltstone around Feature 35 suggests that this area was the locus of a reduction episode involving at least two distinct cobbles or cores of this material type.

Other cherts were highly concentrated around Features 31 and 35, with a secondary focus around Feature 15 (Figure 4.23). Since this is a rather broad category, no direct prediction of number of reduction episodes involved can be made. However, it appears that these three features were the loci of at least one reduction episode each.

Other material types (white, red, and tan cherts, other siltstones, moss agate, petrified wood, and quartz crystal) have very small counts or are rather equally distributed throughout the component. These material types were not illustrated because no distinct concentrations or loci could be defined.

Four morphologically distinct grinding implements were located in the block; three of the four were concentrated around Feature 13.

Total bone distribution is shown in Figure 4.22. Five distinctive concentrations are noted throughout the block. Three of these concentrations appear to be associated with features. The highest frequency of bone occurs around Feature 37, which appears to be a hearth cleanout. Immediately north of the feature, the frequency drops to almost nothing. Located immediately east of this feature was a dark, carbon stained area that had no distinctly definable shape. This area may have represented a centralized activity locus for the processing or disposal of food items and the disposal of hearth refuse. Repeated use of this area for discard of hearth and activity debris may have produced the amorphous staining as the charcoal and other materials were repeatedly trampled into the soft sand of the area by the occupants.

The distribution of burned bone around Feature 37 reflects the same pattern as the unburned bone (Figure 4.22). Other concentrations of bone occur around Features 31 and 35, although in much smaller amounts. Faunal remains recovered around Feature 31 contain very little burned bone, while burned bone appears to concentrate to the north of Feature 35.

Two other distinctive concentrations are located in the western area of the block, not adjacent to any hearths or other definable features. One area, located on the 98E line around 102N, has a fairly high concentration of bone and may represent a dump for processed bone, although none of the recovered bone is burned. The second bone concentration appears around 100E and 104N-105N. When the burned bone plot is examined, it appears to connect with the burned bone concentration located north of Feature 35. This area probably represents a hearth cleanout or bone processing dump from the associated feature.

4.4.8 Component II Summary

Component II represented an Early Archaic period (Great Divide phase) occupation with a radiocarbon age of 6,050$\pm$100 years B.P. No temporally diagnostic artifacts were recovered. While Component II may have represented more than one occupational episode, several distinct activity loci were discerned, based on the association and distinct morphology of recovered materials.

Flaked tool stone utilization within Component II appears to have been oriented toward locally available materials. Notably, 20.9% of the entire debitage sample from this component is comprised of siltstone. This may indicate direction of travel or may indicate greater use of the area of Separation Flats to the south during hunting/gathering or lithic procurement. This appears to correspond with the earlier Component I use and percentage of siltstone, but to contrast with later periods. The one identified exotic stone material type recovered from this component is a single tertiary flake of clear quartz. Tools of this material type may have been highly curated by the owners, resulting in very low occurrence of deposition, and hence limited recovery in the archaeological record.

No diagnostic tools or projectile points were recovered during excavation from this component. The one recovered biface appears to be a tool or manufacturing failure fragment. The edges remaining on this artifact were heavily ground, either in use or for the purpose of platform preparation prior to the next flake removal sequence. Of the four utilized flakes recovered, one is of black siltstone and may have been used in a cutting type manner, due to its very oblique edge angle and the very small flakes removed during use. The other three flake tools are of chert or chalcedony and have very steep utilized edges, possibly indicating use in a scraping operation.

Perhaps more indicative of site activities during this occupational episode are the remains of at least three separate probable seed grinding or plant processing artifacts, although the use of these implements for bone or very small animal processing cannot be ruled out. Pollen analysis results indicate that the environment during this occupation may have been more mesic (see Appendix B) than the current situation. Given a greater availability of water, the plant diversity available within a reasonable foraging distance would probably increase.

The artifact assemblage recovered from Component II is interesting in that it appears to reepresent a considerable amount of faunal processing, at least as reflected in bone and burned bone distribution patterns. Recovery of fragments of at least three different grinding slabs also indicates that some sort of food processing was occurring within the component. Postulated uses for grinding implements include preparation of plant foods (e.g., cracking hulls and grinding seeds to make them more digestible) and the grinding of rodent bone (and possibly larger species) or insects into edible pastes (Frison 1978:355, 1991:339).

At least three animal species are represented by the faunal remains recovered from this component. At least one jackrabbit, one ground squirrel, and one pronghorn are represented. The recovered unidentifiable bone fragments probably represent additional individuals. While species cannot be assigned to the single canine recovered within the component, it appears that a weasel size carnivore was also present. The recovery of a partial mandible from a mouse in Feature 35 indicates the presence of this species on site, but it is unknown whether these last two specimens are related to the occupation or are part of the background fauna of the period.

Component II, as represented in the artifactual remains, appeared to be a general camp situation, with increasing emphasis on grinding implements. Lack of projectile points may indicate that there was little hunting of larger game animals at this locale. However, the sample recovered from this area of the excavation may simply be biased toward other activities, with weapon manufacture and maintenance occurring in another area of the original occupation. The patterning of bone and debitage recovered indicates a dumping type situation, with several localized activity areas related to stone tool maintenance and food processing.

Overall, the patterning, faunal remains, and recovered artifacts including at least four grinding slabs indicate that the occupants of this component were involved in an archaic lifeway and were utilizing numerous localized resources. This would appear to be a continuation of the lifestyle indicated in the older Component I occupation.

4.5 COMPONENT III RESULTS

Component III radiocarbon age estimates and diagnostic artifact types place this series of occupations within the Middle Archaic period (Pine Springs phase). Projectile points representative of the McKean complex were recovered in association with radiocarbon dated features. Cultural materials related to this component were associated with Strata F and I and were collected from the entire 90 m^2 excavation block. Component III cultural remains were recovered between 99.6 and 98.6 m, depending on location within the excavation block and the tip of the strata.

At least two and possibly three separate occupational episodes were suggested by the dated features. Feature 16 returned a radiocarbon date of 4,840±90 years B.P., while Feature 45 was dated by the same method to 4,340±80 years B.P. Feature 28 was radiocarbon dated to 4,670±70 years B.P. Stratigraphically, all three hearths were equal, and no distinct levels could be discerned between the different occupational events. This may have been due to a very stable land surface during this time frame. Feature 45 was superimposed along one edge of Feature 28 and returned a younger date, but both were located within a 5 cm gradient of each other.

Sixteen cultural features, 20 flaked stone tools, 13 groundstone tool fragments, 795 pieces of debitage, and 735 faunal specimens were recovered from Component III deposits. The cultural remains are consistent with the interpretation that Component III represented a small McKean complex base camp. Artifact analysis indicates a generalized hunting and gathering economy.

4.5.1 Cultural Features and Heat-altered Rock

A total of 16 cultural features was located within Component III. Eight distinct forms of features were represented within the sample. Characteristics of the 16 features are listed in Table 4.15.

4.5.1.1 Unoxidized Basins

Three features were assigned to this category. These features were shallow, basin-shaped pits whose construction required a minimum of preparation.

Feature 14 was a shallow basin directly overlying Feature 15 of Component II (Figure 4.16). This feature contained two very small fragments of heat-altered granite. Several fragments of burned very small to small mammal bone were recovered from the fill of this feature. The fill was moderately charcoal stained and may have represented a hearth type feature.

Feature 21 was a large, shallow, stained depression. The profile of this feature showed an undulating floor within the depression. Bone fragments recovered from the fill of this feature are both burned and unburned and represent rodent to jackrabbit size animals. The fill of the feature was only lightly charcoal stained.

Feature 26 was a shallow, stained depression. The feature contained very darkly stained sediment, and no artifacts were associated. This feature was directly overlain by and partially truncated by Feature 23.

All features in this group may have represented fire hearths that required a minimum of preparation. A short-term or single use event use may be indicated by the lack of oxidation which may be produced by extended exposure to high heat.

4.5.1.2 Very Small Unoxidized Basins

Feature 9 was the smallest feature located within the entire excavation block. It was defined by a small, circular area of stained sediment. The stain did not appear to be rodent-caused, it was basin-shaped in cross section and filled with stained sediment, and no krotavina were located in the immediate area. The function of this feature was difficult to determine. The area represented was extremely small for a hearth yet was filled with stained sediments. The feature may have been the remnant of a post, but no additional posthole-like depressions were located near the feature. No artifacts were recovered from the fill of this feature. Feature 9 was located approximately 1.5 m east of the multiple-use Feature 16.

Table 4.15 Characteristics of Cultural Features, Component III, Site 48CR4681 (Locality P-054).

Feature No.	Excavation Unit	Feature Type	Cross Section	Dimensions (cm)[1] L	W	D	Area (cm^2)	Volume (liters)	Oxidation	Rocks Type	No.	Wt. (kg)	Remarks
8	100-101N 101-102E	Oxidized basin	Hemisphere	75	55	14	3,318	61.9	Present	Granite cobble	1	0.02	Heavily charcoal-stained
9	101N 102-103E	Unoxidized basin	Hemisphere	15	12	7	45.5	0.7	Absent	--	--	--	Moderately charcoal-stained
10	108N 104E	Unoxidized rock concentration	Mound	29	25	12	725	4.4	Absent	Granite cobble	10	1.5	Unstained
11	108N 105E	Oxidized cylinder	Cylindrical	42	40	9	1,320	11.9	Present	Granite cobble	23	9.3	Heavily charcoal-stained
14	100N 107E	Unoxidized basin	Hemisphere	49	41	8	1,590	8.5	Absent	Granite cobble	1	0.2	Moderately charcoal-stained
16	101-102N 104-105E	Oxidized cylinder	Cylindrical	61	57	42	2,734	114.8	Present	--	--	--	Heavily charcoal-stained
17	104-105N 100E	Oxidized basin	Hemisphere	64	62	15	3,117	31.2	Present	--	--	--	Lightly charcoal-stained
18, 39, 40, 41, 47	104-105N 100E	Oxidized basin	Hemisphere	67	62	30	3,267	65.3	Present	--	--	--	Moderately charcoal-stained
19	100N 101E	Unoxidized cleanout	Fan	60	48	6	2,290	4.6	Absent	Granite cobble	3	0.4	Lightly charcoal-stained
21	104-105N 98E	Unoxidized basin	Hemisphere	110	65	15	6,013	233.0	Absent	--	--	--	Lightly charcoal-stained
23	105N 99E	Oxidized cylinder	Cylindrical	40	35	13	1,104	14.4	Present	--	--	--	Lightly charcoal-stained
24	105N 99E	Unoxidized basin	Spherical	15	15	14	177	0.9	Absent	Quartzite	1	0.01	Moderately charcoal-stained
26	105N 99E	Unoxidized basin	Hemisphere	42	33	10	1,104	7.5	Absent	--	--	--	Heavily charcoal-stained
28	105N 99-100E	Oxidized basin	Hemisphere	70	60	20	3,318	442	Present	--	--	--	Heavily charcoal-stained

Table 4.15 (continued)

Feature No.	Excavation Unit	Feature Type	Cross Section	Dimensions (cm)[1]			Area (cm^2)	Volume (liters)	Oxidation	Rocks			Remarks
				L	W	D				Type	No.	Wt. (kg)	
38	102-103N 99E	Oxidized basin	Hemisphere	57	38	22	772	26.0	Present	--	--	--	Lightly charcoal-stained
45	105N 100E	Rock-filled basin	Hemisphere	47	35	17	1,320	15.0	Present	Granite cobble	12	5	Heavily charcoal-stained

[1] L = length, W = width, D = depth.

Feature 24 was similar to Feature 9 but had a spherical cross section and was slightly deeper. Circumferences of the two features differed by less than 6 cm, with Feature 24 being the larger. Several attributes of Feature 24 indicated that it may have been the remnants of a posthole socket. The cross section of the feature revealed a rounded bottom with vertical sides as would be expected of a post type hole. The only rock recovered from the feature occurred along the margin of the feature. This small, angular fragment of quartzite may have been used to brace a pole in the socket. The sediments immediately surrounding the feature were very compacted while the fill of the feature itself was darkly stained and less compact. The sediments lying farther away from the feature were also less compacted. The pattern of compactness surrounding this feature suggested that a post was placed in the feature and the area immediately surrounding was perhaps pounded to tighten the post in the socket. These attributes implied that a fair amount of energy was expended in bringing the wood to the site, constructing the socket, and compacting the sediments to hold the post in place. This feature was recorded near Features 21, 23, and 26 and approximately 1.5 m east of the multiple-use Feature 17-18. The original function may have been as some sort of drying rack, a cooking rack, or possibly part of a constructed windbreak.

4.5.1.3 Oxidized Basins

The four oxidized basins represented relatively shallow prepared basins. The predominant characteristic of this type of feature was the presence of oxidation along some portion of the prepared surface. This oxidation typically caused a change in the sediments, reflected as a slightly pink to deep red color variation on the boundaries of the feature. This color change may be interpreted to mean that the area was exposed for extended periods of time to intense heat. This may also indicate multiple uses of the feature for a fire hearth, or that a fire was maintained in the feature for extended periods of time.

Feature 38 was represented by a small portion of the original feature. Most of the fill of this probable hearth had been removed by rodent disturbance prior to discovery. A small section of an oxidized wall and a portion of a lightly charcoal-stained basin were located in 101N 99E, with several krotavina containing stained sediments leading away from the location. Estimates of overall size and volume were based on the remaining portion of the feature.

Feature 28 contained darkly stained sediments with evidence of an oxidation ring around approximately 60% of the basin. This oxidation extended below the surface of the hearth rim for approximately 5 cm. After the construction of Feature 28, the east edge of the feature was partially removed by the construction of Feature 45. These two features were stratigraphically equal, with Feature 28 constructed before Feature 45. Feature 28 was radiocarbon dated to 4,670±70 years B.P. A utilized flake (CR4681-928) and five pieces of debitage were recovered from the fill of the feature. Several unidentifiable bone fragments representing rodent to jackrabbit size animals were also recovered from the feature fill. Identified fragments include the proximal portion of a jackrabbit ulna and the distal portion of a jackrabbit humerus. Both of the identified elements are burned.

Feature 8 contained one small piece of heat-altered granite within a matrix of very darkly stained sediment. The shape of this feature was rather elongated, with the bottom of the feature being irregular. Oxidation was present along the north edge but was not noted in the base or other sides of this probable hearth. This feature may have been partially deflated prior to being buried. Four fragments of rodent to coyote size mammal bone were recovered from the fill of Feature 8. The rodent size bone had been calcined, indicating a relatively high temperature. Also recovered from the fill of the feature were two heat-altered pressure flakes of clear chalcedony and mottled red chert.

Feature 17 represented the top of a multiple-use feature. Feature numbers 18, 39, 40, 41, and 47 were assigned to this stained area. As this feature was uncovered, it was believed that several hearths were superimposed upon one another. After further consideration, it appeared that there may have been only one original excavated area and that the feature was repeatedly cleaned out and reused. Separate oxidation rinds were located for each of the cleanout episodes, within the mixture of dark charcoal stained sediments and the intermixed sand. Due to the presence of the oxidation rinds for each of the cleanouts, it appears that this area of the site may have been occupied for an extended period of time. It may also suggest that the site was reoccupied on numerous occasions. At least six distinct episodes of use were evident for this feature. No artifacts or faunal material was recovered from the fill of the feature.

4.5.1.4 Rock-filled Basin

Feature 45 was the only feature in this category in Component III and was intruded into Feature 28. This feature was radiocarbon dated to 4,340±80 years B.P. and was stratigraphically equal to Feature 28, which was dated to 4,670±70 years B.P. Feature 45 contained very dark charcoal-stained sediments. Five kilograms of baseball to softball size heat-altered granite cobbles were located in the fill. Oxidation was present on the northern and south perimeters of the feature, with the oxidation ring extending almost to the base of the feature. No artifacts or faunal remains were recovered from the fill of this feature.

4.5.1.5 Oxidized Cylinders

The predominant characteristics of this type of feature included the presence of an oxidation rind and vertical sides. This type of feature appeared to require more preparation than the hemispherical style. All of the cylindrical features in this component were oxidized, possibly an indication of extended use.

Feature 23 was a relatively shallow cylinder filled with lightly charcoal-stained sediments. This feature was superimposed over a portion of Feature 26. Both features were stratigraphically indistinguishable, with Feature 23 discovered slightly above Feature 26. Artifacts and faunal remains recovered from the fill of Feature 23 include two small bone fragments of rodent to jackrabbit size animals, as well as what may be the distal end of a coyote size metapodial. One fragment of a coyote size burned long bone fragment was also recovered. Two flake fragments were retrieved from the fill of the feature. Both are extensively heat-spalled and probably were originally a white chert.

Feature 16 contained the largest volume of fill of any feature within the excavation (Figure 4.24). This feature was over 40 cm deep, with vertical sides. The top 20 cm of the hearth walls were oxidized to a thickness of 2 to 3 cm, while the bottom 23 cm lacked any indication of oxidation. At least two episodes of use were suggested for this feature, with at least one of those episodes involving high heat in the upper half of the feature for an extended period. Sediments within the feature were very darkly stained, with a slight color differentiation between the two use episodes. The lower of the two distinguishable levels of this feature was radiocarbon dated to 4,840±90 years B.P. Artifacts and faunal materials recovered from the feature are distinguished between the initial (lower) fill and the upper fill with oxidation. The lower fill (98.9-98.67 m) contained many fragments of eggshell and a right carpometacarpus fragment and a femur fragment from a sage grouse size bird. In addition to the identified bone, 11 fragments of burned bone from rodent to rabbit size animals or birds were retrieved. Four very small fragments of heat-altered white chert, three flakes of heat-altered chalcedony, and the lateral edge and hafting element of a large Middle Archaic style hafted knife were recovered from the lower levels of the feature. This knife is extensively heat-spalled and appears to be manufactured of a creamy white chert. The breakage pattern on this hafted biface and lack of

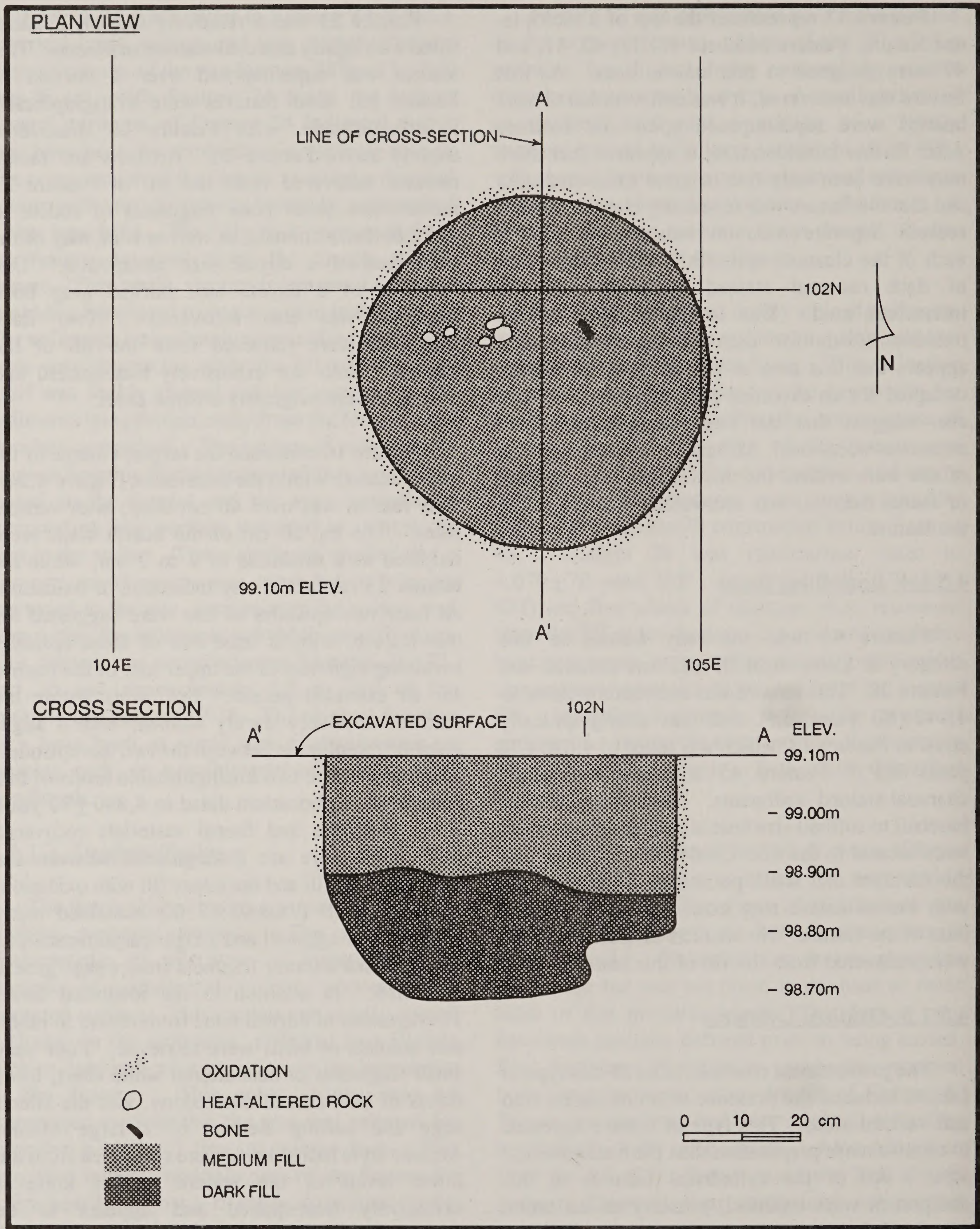


Figure 4.24 Plan View and Cross Section of Feature 16, Component III, Site 48CR4681 (Locality P-054).

additional portions suggest that this tool was discarded into the feature after breakage.

The upper level of Feature 16 (99.1-98.90 m) contained 46 fragments of rodent to jackrabbit size bone including 30 burned fragments. Debitage recovered from the upper fill includes three fragments of a milky chalcedony, pressure flake fragments of red chalcedony and grey quartzite, and a distal flake fragment of pink quartzite. The material diversity within the upper feature fill is much higher than in the lower fill, another indication of different use episodes. In addition, the upper fill contained several small fragments of oxidized tabular sandstone weighing less than 15 g.

4.5.1.6 Rock-filled Cylinder

Feature 11 was a shallow, vertically-sided basin containing moderately charcoal-stained sediments and approximately 9.3 kg of fist size granite cobbles (Figure 4.25). The cobbles were heat-altered and showed a slight reddish tint. The oxidation rind surrounded the entire feature and included portions of the feature base. This feature was probably associated with a small number of heat-altered rocks (Feature 10) of approximately the same size. Similar features are described by Frison (1991) as being utilized during stone boiling, for food preparation, or for bone grease extraction. Although no evidence of an additional pit for boiling was located near the features, several other methods besides pit boiling may have been utilized, including stone boiling in suspended hide or paunch containers or pitch-lined basketry. No faunal remains or artifacts were recovered from the fill of Feature 11.

4.5.1.7 Rock Concentration

Feature 10 was a small pile of heat-reddened granite cobbles approximately 1 m east of Feature 11. No staining of surrounding sediments was associated with this feature. The ten cobbles probably represented an expended heat source for stone boiling and were either removed from a boiling container and were awaiting reheating, or represented discards which had disintegrated beyond acceptable limits during the same process.

4.5.1.8 Ash Concentration

Feature 19 appeared to represent a hearth cleanout dump, possibly from Feature 8, which was located less than 30 cm to the northeast. The general plan view shape of the feature was a rough fan, within a very shallow (<7 cm) depression. This depression may have been purposefully excavated to contain the hearth dump; however, no formalized preparation of the area was indicated. Very little effort was represented if the feature was intentionally excavated. The fill of the feature contained isolated oxidized fragments of sediment within the lightly stained fill. These appeared to have been excavated from outside of the feature and deposited at their recovery location. No oxidation was noted around the perimeter or along the sides or base of the feature. Three fragments of heat-spalled granite were recovered from the fill. The fill also contained one fragment of rabbit size, unburned bone and two extensively heat-spalled red chert flakes. No internal structure was noted within the fill of the feature. The overall jumbled condition of the contents of the feature support the interpretation of a hearth cleanout or dump.

4.5.1.9 Heat Altered Rock

A summary of heat-altered rock from Component III deposits is presented in Table 4.16. There were many fragments of heat-altered rock recovered outside of the hearths in this component, possibly an indication of the multiple use of the area. As with Components I and II, granite cobbles were the preferred stone, with significantly less amounts of sandstone and quartzite.

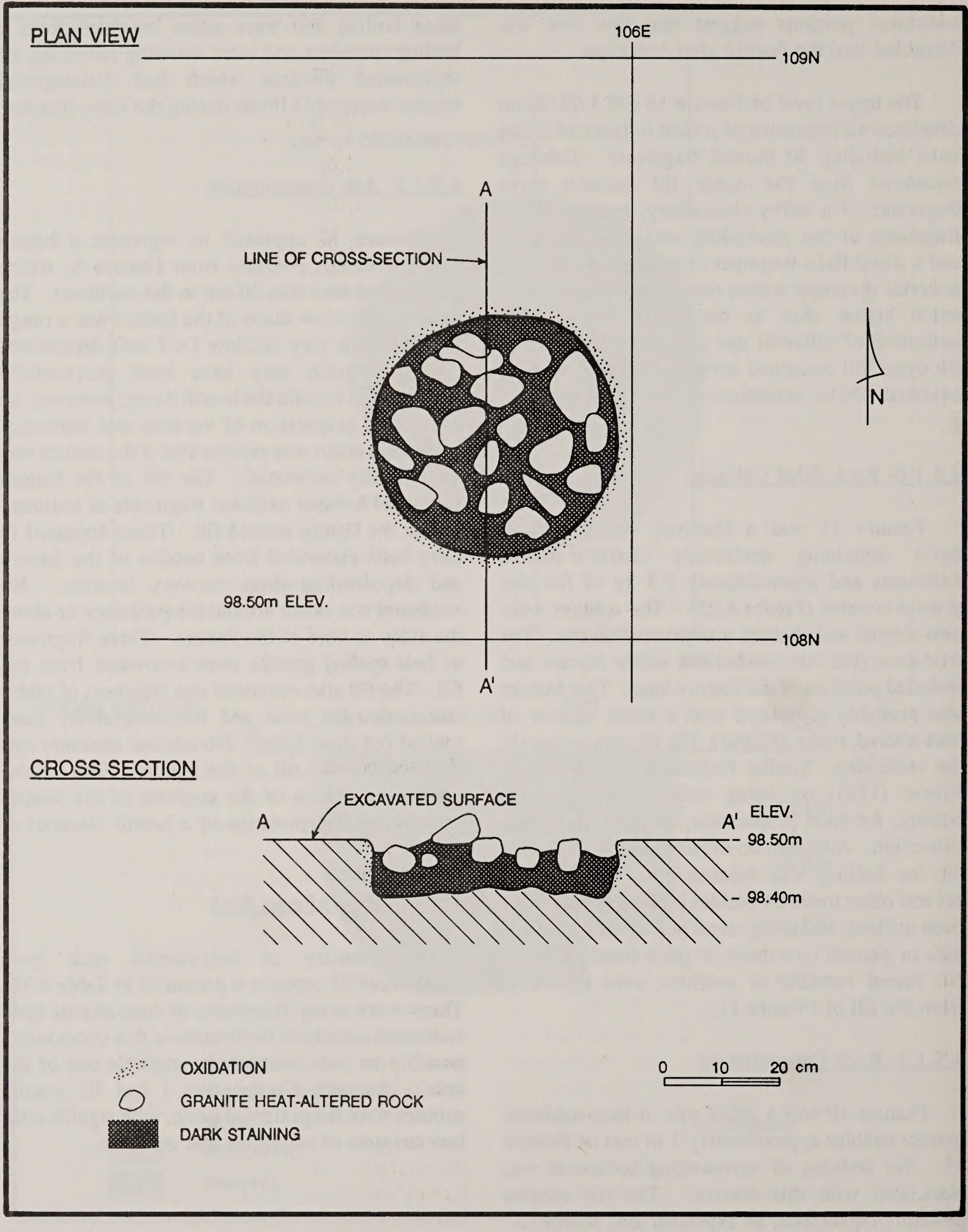


Figure 4.25 Plan View and Cross Section of Feature 11, Component III, Site 48CR4681 (Locality P-054).

Table 4.16 Summary of Heat-altered Rock, Component III, Site 48CR4681 (Locality P-054).

Material Type	No. of Rocks	Weight (kg)	Average Weight (kg)
Sandstone	27	2.65	0.098
Granite	292	51.07	0.175
Quartzite	14	1.25	0.089
Total	333	54.97	0.165

4.5.2 Flaked Stone Artifacts

A total of 20 flaked stone tools and 795 pieces of debitage was recovered from Component III. All but one of the recovered artifacts reflect locally available materials. The flaked stone tools include four projectile points, a hafted knife, three bifaces, a chopper, five utilized flakes, and six retouched flakes. Table 4.17 summarizes the characteristics of the flaked stone tools.

4.5.2.1 Projectile Points

Four diagnostic projectile points were recovered from excavated contexts within this component. All of the projectile points appear to be types recognized as diagnostic of the Middle Archaic period McKean complex.

Projectile point CR4681-360 is a portion of the distal blade and hafting element of a stemmed point closely resembling the Hanna point as defined by Wheeler (1954). The artifact was manufactured of a mottled brown to tan chert and appears to have been extensively reworked (Figure 4.26, A). Artifact FS#178 represents a more complete form of this type of point (Figure 4.26, B). The material of manufacture is a coarse-grained, yellow quartzite. This specimen shows much less evidence of reworking. Unfortunately, this artifact was removed from site collections during an inspection tour and was subsequently lost. Artifacts CR4681-476 and CR4681-1231 are hafting elements also recovered from the component. These artifacts appear to represent fragments of McKean lanceolate points. The first (Figure 4.26, C) is a complete base made of a grey, fine-grained stone resembling Morrison quartzite. This artifact has a snap-type break with a burin-like spall removed from one lateral edge. The second hafting element appears to be the lateral edge and basal portion of a McKean lanceolate point made of a milky chalcedony. This artifact may be heat-spalled as indicated by the latticed appearance and irregular edges.

4.5.2.2 Hafted Knife

A fragment of a large hafted biface (FS#476) was recovered from the fill of Feature 16 (Figure 4.26, D). The portion recovered is the lateral edge of the proximal blade and hafting element. The artifact is extensively heat-spalled, with numerous pot-lid structures removed. The material appears to be a creamy white chert, but the extensive heat alteration may have changed the artifact's original color and texture. This artifact resembles large hafted bifacial knives which are

Table 4.17 Characteristics of Flaked Stone Tools, Component III, Site 48CR4681 (Locality P-054).

Catalog No.	Excavation Unit	Classification	Condition	Dimensions (mm)[1] L	W	T	Material Type	Remarks
19	102N 101E	Retouched flake	Fragment	52.6	50.5	15.5	Morrison quartzite	Core reduction flake, two lateral edges steeply retouched
214	105N 104E	Utilized flake	Complete	25.4	20.0	8.9	Phosphoric type chert	Core rejuvenation flake, one utilized edge
262	102N 104E	Utilized flake	Fragment	29.9	17.7	4.4	Clear chalcedony	Proximal biface reduction flake, utilized on two lateral edges
266	101N 103E	Retouched flake	Complete	25.5	22.0	4.5	White/tan mottled chert	Formalized plano-convex scraper
320	100N 101E	Utilized flake	Complete	34.3	32.0	6.5	Grey siltstone	Core reduction flake, utilized on one lateral edge
360	105N 104E	Projectile point	Fragment	17.5	16.2	5.8	Tan/brown mottled chert	Hafting element, Hanna point
433	104N 100E	Biface	Fragment	31.5	19.0	6.2	White mottled chert	Lateral edge of biface, probable manufacture break
476	103N 103E	Projectile point	Fragment	12.3	16.6	5.5	Morrison quartzite	Hafting element, McKean lanceolate
535	100N 101E	Biface	Fragment	22.0	18.2	8.5	Pink chalcedony	Lateral edge, possible heat alteration
587	102N 101E	Modified cobble	Complete	116.5	117.0	54.0	Quartz	Chopper-like, bifacial flaking
873	102N 104E	Biface	Complete	27.3	13.8	3.9	Basalt	Small triangular biface
928	105N 100E	Retouched flake	Fragment	37.1	23.2	10.5	Mottled red chert	Core reduction flake, one lateral edge retouched
1226	100N 98E	Utilized flake	Complete	20.3	14.8	3.6	Clear chalcedony	Biface reduction flake, utilized on one lateral edge
1227	108N 101E	Retouched flake	Fragment	23.1	13.6	3.2	Brown mottled chert	Distal flake, retouched with graver tip
1231	106N 98E	Projectile point	Fragment	9.8	13.1	4.0	Mottled tan chalcedony	Proximal base, probable McKean lanceolate
1235	100N 106E	Utilized flake	Fragment	22.5	10.8	2.9	Tan/red bonded chert	Split biface reduction flake, utilized on lateral edge
1239	101N 105E	Retouched flake	Fragment	18.2	15.3	2.2	Brown chalcedony	Notched edge on distal flake fragment

Table 4.17 (continued)

Catalog No.	Excavation Unit	Classification	Condition	Dimensions (mm)[1] L	W	T	Material Type	Remarks
1246	100N 103E	Retouched flake	Complete	43.7	35.4	5.7	Grey/blue chert	Retouch on distal edge, biface reduction flake, use wear on lateral edges
FS178	100N 103E	Projectile point	Complete	45*	23*	6.5*	Yellow quartzite	Probable Hanna point
FS476	102N 104E	Hafted knife	Fragment	31*	18*	7.0*	White chert	Fire spalled

[1] L = length, W = width, T = thickness; * = estimated.

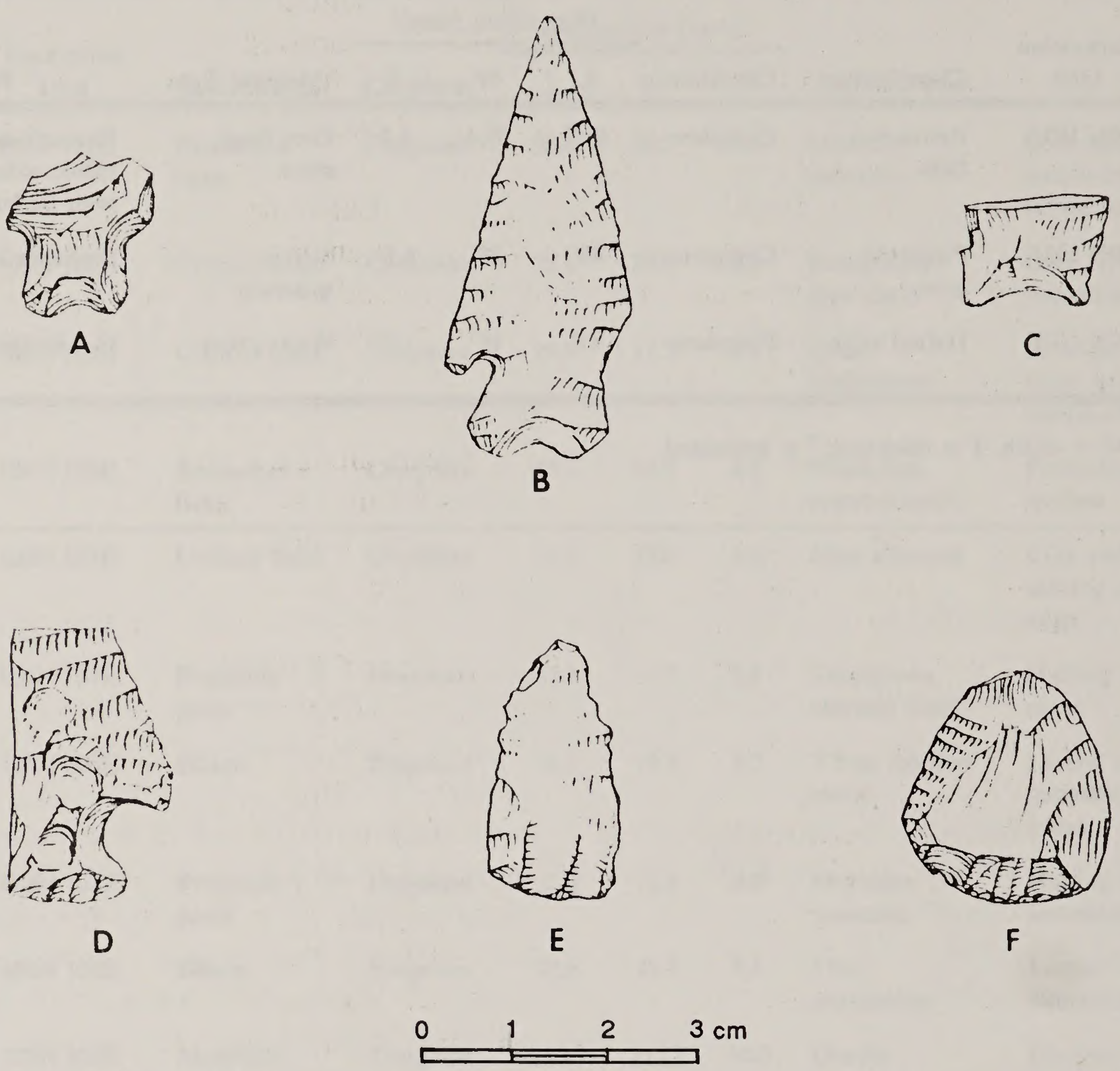


Figure 4.26 Selected Artifacts, Component III, Locality P-054 (Site 48CR4681). A) CR4681-360; B) FS#178; C) CR4681-476; D) FS#476; E) CR4681-873; F) CR4681-266.

occasionally recovered from Middle Archaic period sites (see Frison 1991). This artifact was lost from site collections during an inspection tour of the locality.

4.5.2.3 Preform

A small, complete biface (CR4681-873, Figure 4.26, E) was recovered in good context from Component III deposits. This artifact is somewhat problematical, in that it very closely resembles arrow point preforms from much later time periods and is much too small to be considered a preform for a Middle Archaic period dart point. No use wear is evident along the margins of this pressure flaked biface. The material of manufacture is a black, very fine- grained basalt. No other artifacts or debitage of this material type were recovered within the excavation block of Site 48CR4681, nor does there appear to be any of this material in the lag cobbles of the surrounding terrace system.

4.5.2.4 Biface Fragments

Two fragmentary portions of bifaces were recovered from Component III. Both are edge fragments of early stage reduction blanks.

Artifact CR4681-433 evidences bifacial flaking patterns which appear to be the result of soft hammer reduction. This artifact is manufactured of a mottled white chert. The fragment probably represents the lateral edge of a biface which was removed during a reduction sequence from a much larger core or blank.

Artifact CR4681-535 also contains bifacial flake scars. This artifact appears to have been heat-treated, with heat crazing fractures evident within the translucent red matrix of the material. The breakage pattern of the artifact suggests that the artifact broke along several of the heat fractures. This may have occurred while trying to heat treat the material to improve its knapping characteristics, or may have occurred when the already broken artifact was discarded into a fire hearth.

4.5.2.5 Chopper

Artifact CR4681-587 is a bifacially worked cobble of metaquartzite. The artifact is roughly an equilateral triangular in outline with the flaking pattern suggesting hard hammer reduction of the original cobble. Edge angles along the bifacial portion are approximately 70°. Battering and flattening of the edge along one rounded apex suggest that this artifact was utilized as a chopper. Cobbles of this type of quartzite are locally available.

4.5.2.6 Retouched Flakes

Six retouched flakes were recovered from Component III deposits. All materials represented are locally available within the lag cobble deposits of the area.

One of the retouched flakes (CR4681-266) is a complete formalized plano-convex end scraper (Figure 4.26, F). This artifact is made of a white and tan mottled chert with red dendrites. The tool was manufactured on a flake, with the bulb of percussion removed by bifacial pressure flaking. The bifacial flaking pattern continues along both lateral edges, with a very steep unifacial edge pressure flaked into the distal end or bit of the scraper. Examination under a 40x microscope revealed rounding of flake scars and a general polish around all flaked edges. This may indicate that this artifact was not hafted. Rather, it appears that the tool was utilized on all edges--as a scraping tool as indicated by the rounding of the flake scars along the unifacially retouched bit, and also as a knife, as indicated by the rounding of the flake scars on both sides of the bifacially worked lateral edge.

Artifact CR4681-19 is the proximal end and bulb of a large core reduction or rejuvenation flake of very fine-grained, grey/yellow Morrison-like quartzite. This artifact was damaged during excavation but still retains both lateral reworked edges. The edges are steeply retouched, one to approximately an 85° angle, the other to about a 70° angle. The steeper angle appears to be battered and shows numerous small step-fractures, while the more oblique angle shows rounding of flake scars and a slight polish along the edge.

Artifact CR4681-928 is a proximal core reduction or rejuvenation flake of a deep red chert. One lateral edge has been unifacially retouched along its entire length, producing an edge angle of approximately 27°. An edge angle of this degree should provide a very sturdy cutting edge, or a less durable scraping edge.

Artifact CR4681-1246 is a complete secondary (biface reduction) flake of a bluish grey coarse chert. The distal edge has been retouched to produce a steep edge angle (approximately 70°). The lateral edges appear to have been utilized also, with one edge evidencing very small (<0.5 mm) flake scars along the dorsal side. The opposite edge bears the same scar type but is evident only along the distal half of the flake.

Artifact CR4681-1227 is a split distal flake fragment of a dendritic, reddish brown chert. The one remaining original edge has been retouched to approximately 80°, resulting in a denticulate form. The proximal edge of the split has been shaped into a needle or fine graver tip and shows evidence of polish when viewed under 40x magnification.

Artifact CR4681-1239 is a relatively small, probably soft hammer produced, biface reduction flake of a tan mottled chalcedony. The distal edge has been retouched to an approximate angle of 70° along the dorsal margin. One lateral edge has been retouched to produce a notch approximately 1.0 mm deep and 5.5 mm wide. The interior of the notch shows rounding of flake scars and polish. Overall shape is semicircular. Logically, the artifact was used in a scraping motion on some rounded object. Calculation of the maximum diameter of objects which would fit entirely within the notch was based on the formula for calculating diameters of ceramic vessels (Rice 1987). This formula indicated that the objects being scraped had a diameter of around 1.0 cm., approximately the same width as the hafting elements of the Duncan/Hanna points recovered from the same levels. One possible function for this tool was as a wood plane, utilized in the manufacture of dart shafts.

4.5.2.7 Utilized Flakes

Five utilized flakes were recovered from the Component III deposits. As with the vast majority of the tools from this component, all materials represented are available within 50 km of the site, mostly in lag cobble from near the Platte River or the terraces of the immediate area.

Artifact CR4681-214 is a core reduction or rejuvenation flake of red to tan chert. This artifact shows attrition along one lateral edge. This edge angle is approximately 45° and appears to have wear on only one face.

Artifact CR4681-262 is a proximal biface reduction flake of clear to light yellow chalcedony. The flake appears to have been soft hammer produced. Use attrition is apparent along both lateral margins. Angles of both lateral edges are approximately 10°, producing a very thin tool. Use wear is apparent on both the dorsal and ventral sides, indicating a possible cutting function. This artifact and CR4681-1226 are likely from the same biface, based on overall material morphology.

Artifact CR4681-320 is a complete core reduction or secondary flake. The material is a light grey very fine-grained siltstone. One lateral edge of this artifact shows attrition on the ventral side only. The edge angle of the utilized area is approximately 20°. Cortex on this artifact shows a limestone origin.

Artifact CR4681-1226 is a complete biface reduction flake of clear to light yellow chalcedony. This artifact is likely from the same biface as artifact CR4681-262. Artifact 1226 also appears to be soft hammer produced, terminating in a hinge fracture. One lateral edge shows use attrition on both the dorsal and ventral sides and was possibly used in a cutting motion.

Artifact CR4681-1235 is a small split biface reduction flake of a heat-treated tan and brown banded chert. The remaining lateral edge exhibits use wear in the form of very small (>0.1 mm) flake scars along the dorsal side. The edge itself is sinuous, being concavo-convex in outline. Edge angle on the working edge is approximately 12°.

4.5.2.8 Debitage

Component III contained a total of 795 pieces of debitage. Table 4.18 provides a cross-tabulation of debitage type by material type for the assemblage. These categories probably reflect available sources within the vicinity of Site 48CR4681. These sources include the cobble terraces and probable Phosphoria formation cherts located in the Ferris Mountains. No exotic material types were noted. No debitage of a basaltic nature was recognized even though a complete biface of fine-grained basalt was recovered.

Table 4.18 Cross-Tabulation of Debitage Type by Material Type, Component III, Site 48CR4681 (Locality P-054).

	Material Type										
Debitage Type	Quartzite	White Chert	Red Chert	Clear Chalcedony	Tan Chert	Black Siltstone	Other Chert	Other Siltstone	Moss Agate	Petrified Wood	Total
Primary Flake											
Number	0	3	0	4	0	0	4	1	0	0	12
Row %	0	25.0	0	33.3	0	0	33.3	8.3	0	0	100
Column %	0	4.2	0	2.4	0	0	1.3	3.8	0	0	1.5
Secondary Flake											
Number	4	16	6	16	6	5	42	5	4	0	104
Row %	3.8	15.4	5.8	15.4	5.8	4.8	40.4	4.8	3.8	0	100
Column %	5.3	22.2	13.4	9.7	17.1	18.5	13.3	19.2	16.7	0	13.1
Tertiary Flake											
Number	41	26	28	82	10	15	163	14	11	6	396
Row %	10.4	6.6	7.1	20.7	2.5	3.8	41.2	3.5	2.8	1.5	100
Column %	54.7	36.1	60.9	49.7	28.6	55.6	51.4	53.8	45.8	75.0	49.8
Microflake											
Number	18	10	10	55	18	5	73	2	5	1	197
Row %	9.2	5.1	5.1	27.9	9.1	2.5	37.1	1.0	2.5	0.5	100
Column %	24.0	13.9	21.7	33.3	51.4	18.5	23.0	7.7	20.8	12.5	24.8
Shatter											
Number	12	17	2	8	1	2	35	4	3	1	85
Row%	14.1	20.0	2.4	9.4	1.2	2.4	41.8	4.7	3.5	1.2	100
Column %	16.0	23.6	4.3	4.8	2.9	7.4	11.0	15.4	12.5	12.5	10.7
Tested Material											
Number	0	0	0	0	0	0	0	0	1	0	1
Row %	0	0	0	0	0	0	0	0	100	0	100
Column %	0	0	0	0	0	0	0	0	4.2	0	0.1

Table 4.18 (continued)

Debitage Type	Material Type										
	Quartzite	White Chert	Red Chert	Clear Chalcedony	Tan Chert	Black Siltstone	Other Chert	Other Siltstone	Moss Agate	Petrified Wood	Total
Total											
Number	75	72	46	165	35	27	317	26	24	8	795
Row %	9.4	9.1	5.8	20.7	4.4	3.4	39.9	3.2	3.0	1.0	100

Cryptocrystalline cherts and chalcedonies dominate the assemblage, comprising over 84% of the recovered materials. Various siltstones constitute 7.7%, while quartzites (including Morrison quartzites) make up approximately 9.4%. The clear chalcedony category contains 20.7%, while a similar material containing black dendrites (moss agate category) contains 3.0% of the of the total. Nonspecific cherts (other cherts, including the Phosphoria types) constitute 39.9%, while specific chert categories include white chert with 9.1% and red and tan cherts with 5.8% and 4.4%, respectively. Petrified wood makes up 1.0% of the total debitage recovered.

The majority of the material types within the assemblage contain very low percentages of primary or secondary decortication flakes which may indicate that the initial reduction sequence was initiated away from the site. Initial reduction of cobbles or nodules may have occurred at the procurement location to reduce transport weight.

The white chert category contains higher percentages of primary and secondary flakes than the other categories. This category also contains the highest percentage of shatter (23.6%). This indicates that the initial manufacture of tools from this type of material was initiated at the site location, rather than at the procurement area. This may also indicate that the procurement area was very near the recovery area.

The categories of other siltstone, moss agate, and white chert contain less than 60% tertiary flakes and microflakes, while all the other categories contain around 75% or above of the same classifications. The relative percentages of tertiary flakes and microflakes to primary and secondary flakes and shatter may be taken as a rough indicator of stage of reduction. It appears that the higher the percentage of the interior flakes (tertiary and micro), the more likely that the artifact of origin was brought to the site in a reduced form. The categories of quartzite, red chert, clear chalcedony, tan chert, black siltstone, and petrified wood fit into this scheme, indicating that initial reduction occurred away from the site location, with continuing reduction at the site.

4.5.3 Groundstone

A total of 13 fragments of groundstone was recovered from Component III. Table 4.19 summarizes the characteristics of these artifacts. All of the recovered fragments appear to represent metates or expedient grinding slabs. Six fragments, or approximately 46%, show evidence of heat alteration. At least three different types of sandstone are represented within the groundstone assemblage. The presence of at least five different metates is indicated.

Artifact CR4681-221 is a fragment of the lateral edge of a formalized sandstone metate. This artifact shows no evidence of having been heat-altered, remaining a light tan to white color. The artifact has been ground along the lateral margin to produce a rounded, smooth appearance, while the actual working surface is very smooth. The working face of the metate has been ground through, probably causing the breakage. The sandstone itself is relatively fine, with a high percentage of white, angular quartz grains. The sandstone also contains a relatively high amount of orthoclase feldspar. This type of sandstone was probably available in the sedimentary rock outcrops immediately to the north and east of the site locale. The amount of wear on the working face and the added effort to shape and smooth the lateral margin may indicate that this area was returned to on a regular basis. Since metates are not easily transported, due primarily to their size and weight, this artifact was likely stored at the site and used repeatedly. Selection of a specific (or at least different) sandstone to manufacture a more formalized metate might indicate that the characteristics of this type of stone were more suited to the processing of specific types of materials than those available very near the site location. Artifacts CR4681-324, 340, 393, and 501 appear to be of the same material type. These artifacts are smaller fragments with grinding evident on one face, and two fragments (CR4681-393 and 501) are heat-altered. At least two

Table 4.19 Characteristics of Groundstone Tools, Component III, Site 48CR4681 (Locality P-054).

Catalog No.	Excavation Unit	Classification	Condition	Dimensions (cm)[1] L	W	T	Weight (kg)	Material Type	Remarks
188	100N 107E	Metate	Fragment	35	32	15	0.03	Sandstone	Unifacial, pecked, oxidized red, ocherous
221	101N 107E	Metate	Fragment	79	74	24	0.18	Sandstone	Unifacial, pecked, marked concavity
230	103.90N 100.35E	Metate	Fragment	87	78	17	0.15	Sandstone	Unifacial, slight concavity
250	104.85N 100.83E	Metate	Fragment	70	60	20	0.11	Sandstone	Unifacial, slight concavity
265	101.90N 103.05E	Metate	Fragment	98	77	18	0.16	Sandstone	Unifacial, pecked, oxidized red
299	102.05N 102.07E	Metate	Fragment	58	45	6	0.02	Sandstone	Unifacial, oxidized red, ocherous, friable
324	104N 105E	Metate	Fragment	39	36	24	0.04	Sandstone	Unifacial, pecked, shaped edge, well ground
326	101.35N 103.77E	Metate	Fragment	98	77	18	0.16	Sandstone	Unifacial, pecked, oxidized red
340	103N 102E	Metate	Fragment	27	25	16	0.01	Sandstone	Unifacial
393	100.67N 107.68E, Feature 14	Metate	Fragment	73	53	17	0.10	Sandstone	Unifacial, oxidized black, pecked, slight concavity
399	101.63N 103.50E	Metate	Fragment	91	62	22	0.20	Sandstone	Unifacial, pecked, slight concavity
501	101.41N 104.72E	Metate	Fragment	73	53	17	0.10	Sandstone	Unifacial, oxidized black, pecked, slight concavity
874	103N 104E	Metate	Fragment	87	54	10	0.04	Sandstone	Unifacial, ocherous stain on grinding surface

[1] L = length, W = width, T = thickness.

metates are indicated, CR4681-221 representing one, and CR4681-393 another. The remaining artifacts may be fragments of these two or may represent an additional unidentified slab.

Artifacts CR4681-230, 250, 299, 399, and 874 represent another type of sandstone that is locally available in rock outcrops north and east of the site. This type of sandstone is much finer-grained, with individual crystalline grains much smaller than 0.1 mm. The sandstone is poorly sorted, with a notable percentage of Muscovite mica in an angular, cemented quartz matrix. At least two grinding slabs are present, based on overall thickness and laminations within the recovered artifacts. CR4681-299 and 874 may be from the same slab. Both fragments are heat-altered to a dull red color. Both appear to have an appreciable iron content in the cement of the sandstone, producing a slight ocherous staining when streaked. Both contain differentially sorted laminations. Artifacts CR4681-230, 250, and 399 are not heat-altered and are much thicker, with thicker laminations evident. No evidence of formalized shaping was noted on any of these artifacts.

Artifacts CR4681-188, 265, and 326 represent a third type of sandstone. This type is very fine-grained and well-sorted, with rounded grains of quartz. Orthoclase and Plagioclase feldspar are present in low percentages. No distinctions could be made among the artifacts which would indicate more than one grinding slab of this material. Artifacts CR4681-188 and 326 have been heat-altered to a dull brick red color. A moderate amount of iron appears to be present in the cement of this sandstone, based on the ocherous streaking of the material. No formalized shaping is evident on any of the fragments.

4.5.4 Animal Remains

Table 4.20 summarizes animal remains from Component III deposits, with 735 fragments recovered. The remains are very fragmentary, and identification beyond general body size was impossible for more than 95% of the remains. Greater than 79% of the fragments represent animals coyote size or smaller. Approximately 7% of the total represents avian species, including numerous fragments of eggshell recovered from the fill of Feature 16.

At least four species are identified as being utilized during the Component III occupation of the area. A single bison is represented by two second phalanx fragments. One-half of a mussel (*Lampsilius* sp) shell was recovered near Feature 16. This type of bivalve was probably available seasonally in the North Platte River south and east of the site location. A single bird is represented by the fragmentary remains of a humerus and carpometacarpus. Positive identification could not be made due to the fragmentary nature of the bone, but the remaining portions closely resemble a large sage grouse. Eggshell fragments recovered from Feature 16 may also be from this species, although again the fragmentary nature prevents any positive identification. Ground squirrel was identified by the presence of a mandible and partial maxilla. Numerous fragments of burned long bones are also of the same general body size as the ground squirrel, but no positive identification could be made. These bone fragments were included in the very small or very small-small mammal category.

Additional animals are suggested by the presence of distinctive size classes of bone, even though no positively identifiable elements are present. Jackrabbit size bone was recovered but is so fragmentary that positive identification is impossible. The same is true for deer-pronghorn size bone. A single burned fragment of a metapodial was recovered which closely resembles canid metatarsals but is too fragmentary to positively identify. Included in the very small mammal category are numerous mouse size bone fragments. None are identifiable beyond general body size, and they may represent young or immature individuals of larger rodent-type animals.

The faunal makeup of Component III indicates a broad subsistence base. Utilization of micromammals through bison, birds, and freshwater bivalves appears to support the theory that Middle Archaic period groups, and McKean complex groups in particular, were generalized hunters and gatherers, rather than oriented toward procurement of a specific animal species.

Processing of bone does not appear to have been differential based on body size. All sizes of

Table 4.20 Summary of Animal Remains, Component III, Site 48CR4681 (Locality P-054).

Animal Size Category	Total Specimens No.	Total Specimens Wt. (g)	Burned Specimens No.	Burned Specimens %	Identifiable Elements
Bison	2	13.5	--	--	Phalanx
Jackrabbit size	10	5.9	3	30.0	Tibia, Astragalus, Humerus
Small mammal	307	22.3	166	54.1	--
Medium-large bird	4	1.3	--	--	Humerus, Carpometacarpus
Small-medium mammal	160	29.5	56	35.0	--
Deer-pronghorn size	24	39.9	--	--	Tooth enamel, Metapodial fragment, Alveolus, Rib, Radius fragment
Very small-small mammal	124	4.7	35	28.2	Rib, Metapodial (possible canid)
Ground squirrel	4	0.2	--	--	Mandible, Maxilla
Very small-medium bird	46	1.5	--	--	Eggshell
Very small-medium mammal	7	0.2	--	--	--
Very small mammal	36	1.7	3	8.3	Humerus, Radius
Mussel	1	2.5	--	--	Bivalve shell
Total	735	140.2	263	36.3	

animals contain some percentage of burned elements, with the exception of the avian species. Processing may have included pulverizing the elements prior to stone boiling, which could account for the very fragmentary nature of all the remains.

While several occupational episodes are probably represented within the component, a warm weather residence, possibly spring, is suggested by recovered faunal materials for at least one of the occupations. The recovery of eggshell from Feature 16 may be an indicator of a spring occupation. Since most, if not all, birds in the area nest during the early spring and summer, the eggs would have been available only during a short span of time. Storage of such foods may increase the window of use; however, transportation of such fragile food types would seem to be counterproductive due to loss from breakage. *Lampsilius* bivalves may have been available year-round, but procurement would have been more feasible during warm weather. Winter conditions may restrict access to this food source due to ice formation on sluggish river waters, as well as the dangerously cold conditions associated with the season. Availability or ease of access would probably peak during the summer with lowered water flow in the rivers.

4.5.6 Plant Macrofossils

Samples of matrix from 10 of the features from Component III were floated in an attempt to recover identifiable charred floral remains (Table 4.21). A total of 19.0 liters of feature fill was processed. Thirty-two goosefoot seeds were recovered from the fill of Feature 26; however, none of the seeds were charred, indicating that they are intrusive into the cultural deposits. It is unlikely that uncharred seeds would survive for over 4,000 years in an open camp context. No other features yielded charred or uncharred plant remains.

4.5.7 Spatial Distribution of Cultural Remains

Distribution of Component III features showed two areas of concentration (Figure 4.27). An area around 104-106N 98-101E contained a very dense concentration of features, several with evidence of numerous use episodes. This area appeared to have been reused numerous times, resulting in a palimpsest of occupational episodes upon one surface. A second concentration showed an arc of features from 100-102N 101-108E. Feature 16 appeared to have had at least two reuse episodes. No other feature in this arc showed any evidence of reuse.

Features 16 and 17-18 contained evidence of reuse of the site area, or extended periods of occupation, based on identifiable multiple-use episodes within each feature. The features also represented the most effort in construction and maintenance of any of the Component III features. Additional effort also appeared to have been expended in the construction of Feature 24, a possible post and socket arrangement, approximately 1.4 m west of Feature 17-18. A similar situation was seen approximately 1.5 m west of Feature 16, where Feature 9 was located. No direct evidence exists to link the posthole type features with the multiple-use features, but effort of construction and/or maintenance on all four features suggested a relationship. Possible uses of the post arrangement included drying racks, or windbreak type constructions (see Hughes 1987).

Heat-altered rock was concentrated along a north-south oriented arc around the 106N line (Figure 4.27) as well as in and around the features. The location, shape, and dispersed nature of the arc suggested that the rock represented more that one dumping episode, or that the area was heavily disturbed by human activity or other site formation processes prehistorically. The overall density of flaked artifact distributions falls drastically in the northern area of the arc. The overall bone density appears to increase in frequency along the central and southern area of the arc, with a definite concentration seen immediately to the east of the central portion (Figure 4.27).

Cultural remains are concentrated around the hearth features and may define activity areas. Since the component represented multiple use episodes, many of the distinctive patterns found with single occupational episodes may be obscured. The overall flake density corresponds well with the overall bone density. The highest concentrations of artifacts are seen around Feature 14 in the southeast, and around the feature concentration in the west-central area of the block (Figure 4.28). Minor concentrations are located to the south of Features 8 and 19 and west of Feature 38. Due to the reuse of the area, specific loci of debitage in this general category may simply reflect location of the hearths and the general activities surrounding them.

Distribution of quartzite appears to be concentrated in the south half of the block, with one distinct concentration east of Feature 38 (Figure 4.28). Due to the overall low percentage of quartzite within the assemblage, this concentration may represent a discrete episode of

Table 4.21 Plant Macrofossils Recovered from Feature Fill, Component III, Site 48CR4681 (Locality P-054).

Feature No.	Sample No.	Volume (liters)	No. of Seeds	Taxa
16	51	2.0	0	--
17	33	1.5	2	
18	59	1.5	0	--
19	75	2.0	0	--
21	102	2.0	0	--
21	105	1.5	0	--
23	117	2.0	0	--
26	143	1.5	32	Goosefoot (uncharred)
38	277	1.0	0	--
45	329	2.0	0	--
47	353	2.0	0	--

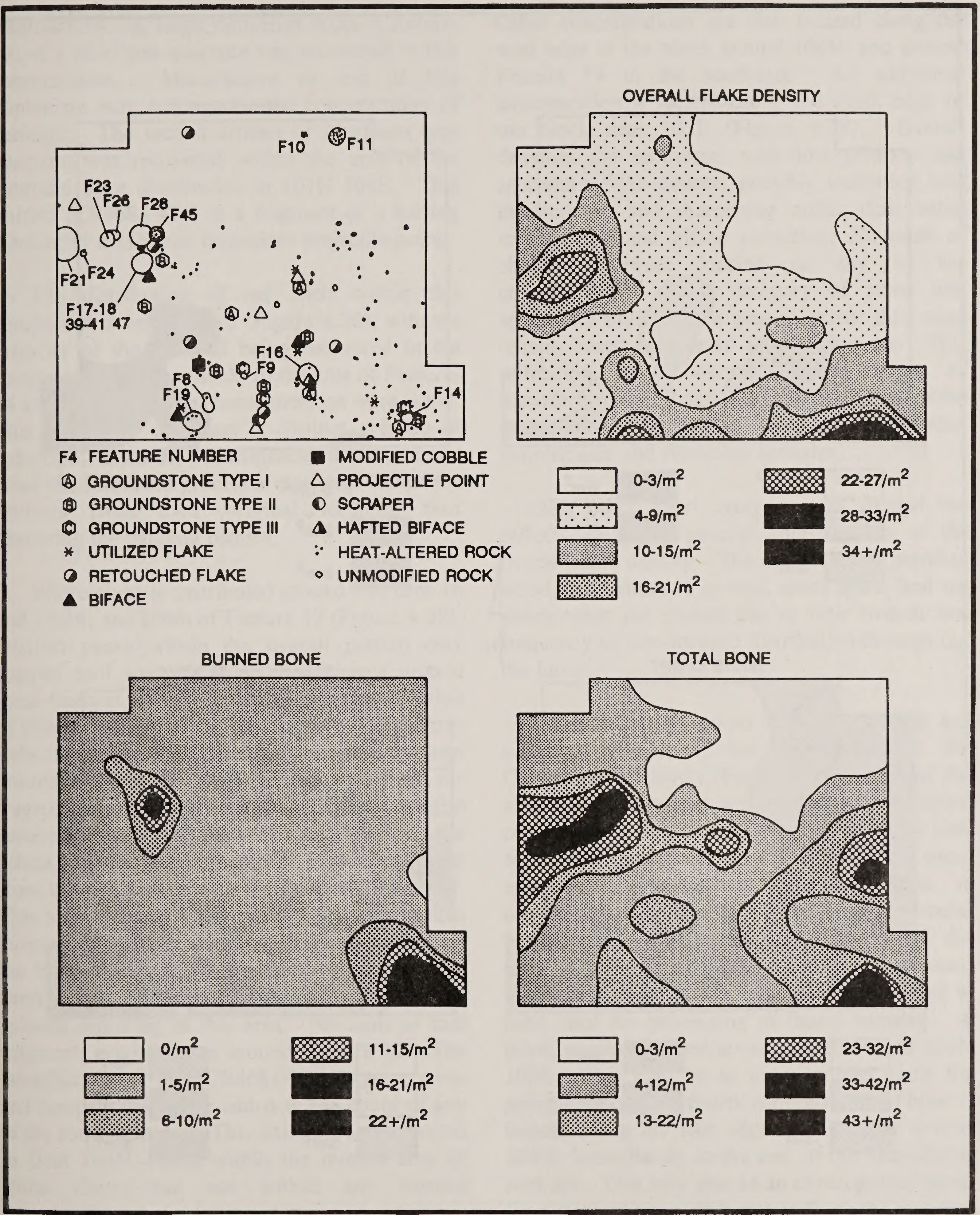


Figure 4.27 Distribution Map for Cultural Features, Heat-altered Rock, and Tools, and Trend Density Maps for Total Debitage, Total Bone, and Burned Bone, Component III, Site 48CR4681 (Locality P-054).

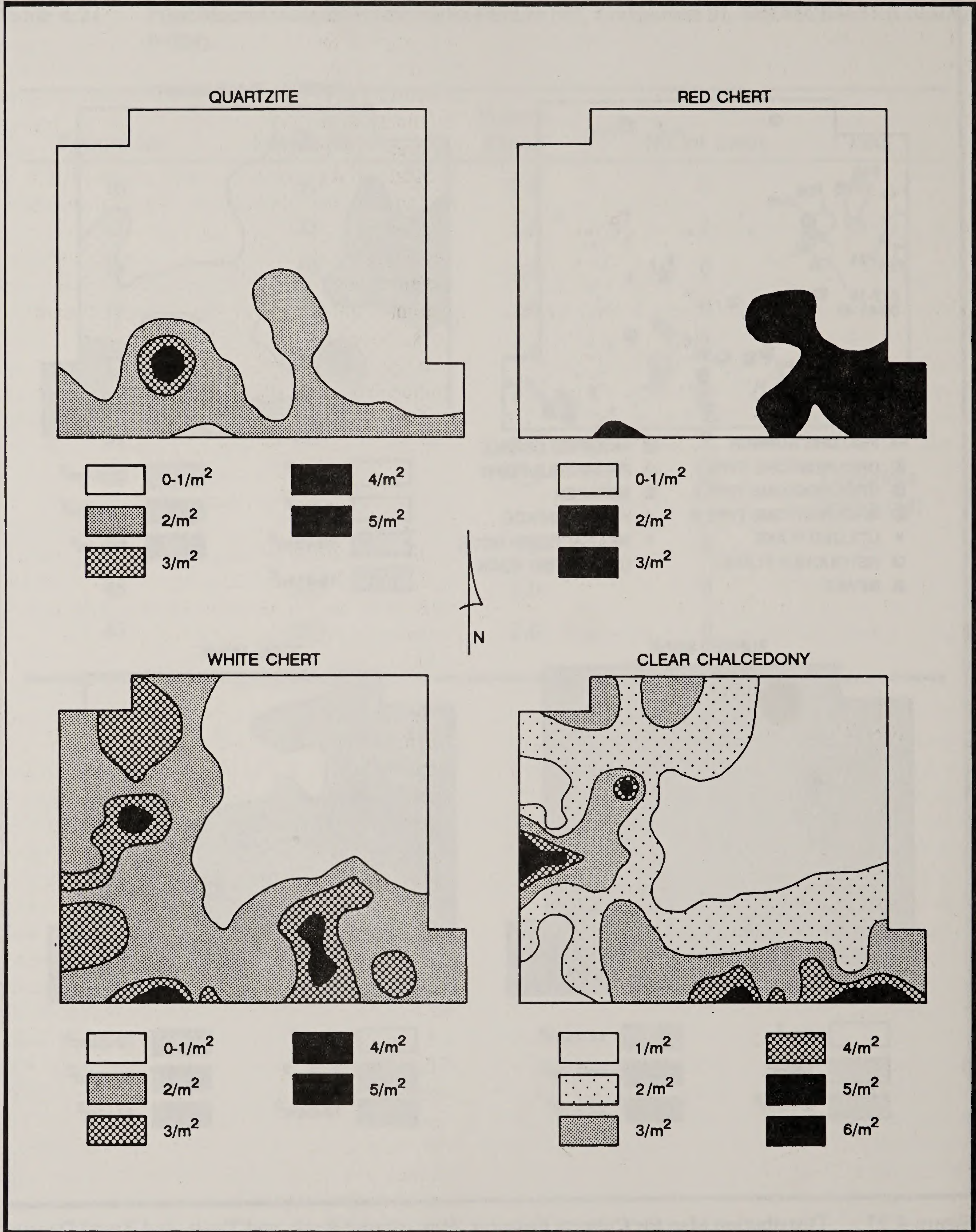


Figure 4.28 Trend Density Maps for Quartzite Debitage, Red Chert Debitage, White Chert Debitage, and Clear Chalcedony, Component III, Site 48CR4681 (Locality P-054).

manufacture. A large retouched flake (CR4681-19) of a Morrison quartzite was recovered in this concentration. Manufacture or use of this implement may account for the concentration of debitage. The second artifact of Morrison type quartzite was recovered within the area of the quartzite flake distribution in 103N 104E. This artifact (CR4681-476) is a fragment of a hafting element of a McKean lanceolate projectile point.

The distribution of red chert within this component is very limited (Figure 4.28), with the majority of the material being recovered in the southeast area of the block, in the area of Features 14 and 16. No distinct concentrations were noted. This may also represent a distinct episode of reduction; however, reoccupation of the site and other site formation processes may have moved the artifacts from their original location, thus obscuring the original pattern.

White chert is distributed around Features 16 and 17-18, and south of Feature 19 (Figure 4.28). Distinct peaks within the overall pattern may suggest tool sharpening or maintenance around these features, or may reflect secondary reduction of bifaces brought to the location after preliminary reduction elsewhere. The slight concentration seen around Feature 16 may be the result of the fragmenting of the heat-spalled hafted knife recovered from that feature. A fragment of a biface (CR4681-433) of white chert was recovered from the concentration in the Feature 17-18 area. This biface fragment appears to have been broken during manufacture, with snap fractures evident on the broken edges. This concentration of white chert debitage may be the result of a reduction episode centering in this area. No tools or tool fragments were located around Feature 19. The manufacture of tool CR4681-266 (plano-convex end scraper) may have added to the count of any of the concentrations. This artifact was recovered in Unit 100N 103E, within the overall area of white chert, but not within any distinct concentration.

Clear chalcedony concentrates around Feature 45 in the west-central area of the block. Other concentrations are also located along the west edge of the block around 104N, and around Feature 14 in the southeast. An additional concentration is located along the south edge of the block near 105E (Figure 4.28). Overall densities are moderate, with low primary and secondary flake counts, possibly indicating tool maintenance and sharpening rather than initial manufacture and biface reduction. No tools of chalcedony were located in any of the concentrations. This category of stone was apparently utilized to a greater extent than most others, based on overall debitage counts. This utilization may obscure distinct areas of manufacture or utilization. The distribution of the chalcedony is likely the product of numerous maintenance and reduction episodes.

The other chert category was plotted but reflects the same general configuration as the overall flake density. The categories of petrified wood, both siltstone groups, moss agate, and tan cherts were not plotted due to their overall low frequency or non-focused distribution through out the block.

Several concentrations of bone (burned and unburned combined) are located within the Component III levels (Figure 4.27). One of the highest concentrations appears around the feature concentration in the west-central area of the site. Numerous superimposed features and reuse episodes of single features occur in this area. A second concentration of bone centers around Feature 14, in the southeast portion of the excavation block. Concentration of bone around Feature 14 suggests that this area was utilized at least once for processing of faunal remains. A third, smaller concentration is noted around 104N 103E. This may be an unrecognized dump for processed bone. A fourth concentration of bone is located along the east edge of the block around 104N, immediately to the east of the heat-altered rock arc. This may also be an unrecognized dump for processed bone, or it may indicate the presence of an additional feature used for bone processing outside the limits of the excavation block. This concentration may also be the dispersed remains of the same dumping episodes that created the heat-altered rock scatter.

Two distinctive concentrations of burned bone are located around features (Figure 4.27). The highest concentration appears around Feature 14. This concentration of burned bone lends further support to the interpretation of Feature 14 as a locus of animal processing. Interestingly, the area around Feature 14 also contained three morphologically distinct fragments of groundstone, representing three individual grinding implements. While no complete grinding tools were recovered from this component, the indication of grinding activity is present in the form of the stones. Whether these implements can be tied directly to use at Feature 14 is conjectural. The occupants may have gathered the grinding stone fragments from elsewhere and utilized them for another purpose, although very little other stone was recovered in the immediate vicinity. It is tempting to suggest that some type of bone processing was occurring at that location using the groundstone (e.g., Frison 1991:339). The second concentration appears to cover the area of Features 25 and 45, and the multiple-use Feature 17-18. Again this appears to support the notion that this area was utilized for faunal processing during at least one of the occupational episodes. A single piece of groundstone was recovered in this area.

4.5.8 Component III Summary

Radiocarbon age estimates of 4,840±90, 4,670±70, and 4,340±80 years B.P. indicate that Component III represented multiple occupations. As with the first two components, utilization of lithic materials seems to be almost exclusively locally available materials from the general site area. Diagnostic artifacts and radiocarbon dates place the series of occupations during the Middle Archaic period (Pine Springs phase), and projectile point styles indicate that groups of the McKean complex occupied the area.

The recovery of hunting type weaponry (projectile points) as well as at least five distinct grinding slabs indicate that the subsistence economy of these occupations was probably very broad based, utilizing both floral and faunal resources. Frison (1991:89) has suggested that the McKean complex utilized "...a carefully calculated scheduling of economic activities to coincide with food resources in a wide range of ecological areas from season to season." A widely varied faunal assembly was recovered from the excavation of Component III, ranging from aquatic resources (bivalve) to avian (both mature individuals and eggs) and from micromammals (mouse size) to bison. No direct evidence of plant utilization (charred seeds, etc.) was recovered during excavation of this component. Indirect evidence of floral utilization may be the presence of at least five distinct grinding slabs. These may be an indication of the importance of floral resources during this time period; however, the use of these implements as bone or small animal processing tools cannot be ruled out.

The material culture of the McKean complex as represented by Component III indicates a general camp situation. Several activities are indicated by the remains. Possible rehafting of projectile points is suggested by the recovery of broken points. Expedient tool production in the form of utilized and retouched flakes occurred, with these tools being manufactured from cores or bifaces present at the time of occupation, but underrepresented in the recovered artifacts. These items may have been totally exhausted (unlikely) during the time of occupation or removed from the camp when the occupants moved to another area.

The presence of small amounts of large animal (deer-pronghorn size, bison) bone suggests that these animals were utilized during this time period, but that the majority of the skeletal elements were not returned to the camp, while those smaller animals procured in or around the camp area (or even in outlying areas) were returned relatively intact. In this situation, the larger animals may be underrepresented in their importance to the occupants, while the smaller animals are overrepresented.

While artifacts diagnostic of the McKean complex were recovered from this component, much of the other material remains and distributions are reminiscent of the earlier cultures who utilized the site location. An overall hunting and gathering adaptation appears to continue, perhaps with a bit wider range of species utilization. This suggests that the indigenous population of the area adopted certain points of the McKean technology but retained large portions of their own identity. Rather than an influx of new populations, this may be the adoption of a new ideological concept by groups already in place in the area.

4.6 COMPONENT IV RESULTS

Radiocarbon age estimates from two features and projectile point types suggest a possible transitional Middle to Late Archaic period affiliation for Component IV. The material remains of the component likely represent a composite of several occupational episodes, and two radiocarbon age estimates from Features 7 and 20 indicate occupation between 3,520$\pm$90 years and 3,750$\pm$80 years B.P. Components of this age are typically considered to be of terminal Middle Archaic period affiliation (Frison 1991) as represented by the McKean complex. However, the projectile point styles recovered from Component IV deposits at Site 48CR4681 are not typical McKean style dart points. At least one Component IV occupation appears to be similar to a little known complex that was represented at the Medicine Lodge Creek Site in the Big Horn Basin of Wyoming (Frison 1991:28, 85, 101). Another occupational episode or series of episodes is probably related to the Late Archaic period Pelican Lake complex, based on other projectile point styles recovered from this component.

Component IV was identified within the entire 90 m^2 excavation block in association with Stratum K. A total of 23 flaked stone tools, one groundstone tool, more than 2,500 pieces of debitage, and more than 700 tooth or bone fragments was recovered from Component IV deposits.

4.6.1 Cultural Features

Six cultural features representing three distinct types were associated with Component IV deposits. Characteristics of the cultural features are detailed in Table 4.22.

4.6.1.1 Unoxidized Basins

Features 22, 25, and 27 were relatively small, shallow, unoxidized basins. These features were roughly oval in plan view with basin-shaped cross sections. No artifacts, debitage, bone, or heat-altered rock was recovered from these features. Feature 20 was morphologically very similar to the others, except in overall size. This feature is approximately four times the size of the next largest unoxidized basin from this component.

A single tertiary flake and four bone fragments were recovered from the fill of Feature 20. The bone fragments are less than 0.5 cm in maximum length. The bone is unburned and appears to be from an animal larger than rodent size. Due to the extremely fragmentary nature of the remains no further information is obtainable.

This class of features appears to have required little preparation. The lack of oxidation may indicate a relatively low temperature of firing, or at least a very short time of use. These features were likely expedient in nature, quickly constructed for some specific use, and then abandoned.

4.6.1.2 Oxidized Basin

Feature 7 was the largest feature in Component IV deposits. This feature appeared to have been more carefully constructed than the unoxidized basins. Feature 7 was more circular in outline, with a well-defined, deep, basin-shaped cross section (Figure 4.29). Fill was very heavily stained, and patchy oxidation was present intermittently around the outline of the feature. This suggests that the heat from the contained fire was rather high, and may also indicate that the fire was maintained for an extended period of time. A

Table 4.22 Characteristics of Cultural Features, Component IV, Site 48CR4681 (Locality P-054).

Feature No.	Excavation Unit	Feature Type	Cross Section	Dimensions (cm)[1] L	W	D	Area (cm^2)	Volume (liters)	Oxidation	Rocks Type	No.	Wt. (kg)	Remarks
7	102-103N 104-105E	Oxidized basin	Hemisphere	76	70	16	4,185	44.6	Present	Granite cobble	1	0.2	Heavily charcoal-stained
20	102-103N 99-100E	Unoxidized basin	Hemisphere	62	54	10	2,642	17.6	Absent	--	--	--	Moderately charcoal-stained
22	106-107N 100E	Unoxidized basin	Hemisphere	26	24	12	491	4.1	Absent	--	--	--	Moderately charcoal-stained
25	107N 106E	Unoxidized basin	Hemisphere	15	14	6	165	0.7	Absent	--	--	--	Moderately charcoal-stained
27	107N 107E	Unoxidized basin	Hemisphere	32	21	7	552	2.6	Absent	--	--	--	Heavily charcoal-stained
33	108N 102E	Unoxidized rock concentration	Mound	26	23	12	471	3.6	Absent	Granite cobble	7	4.5	Unstained

[1] L = length, W = width, D = depth.

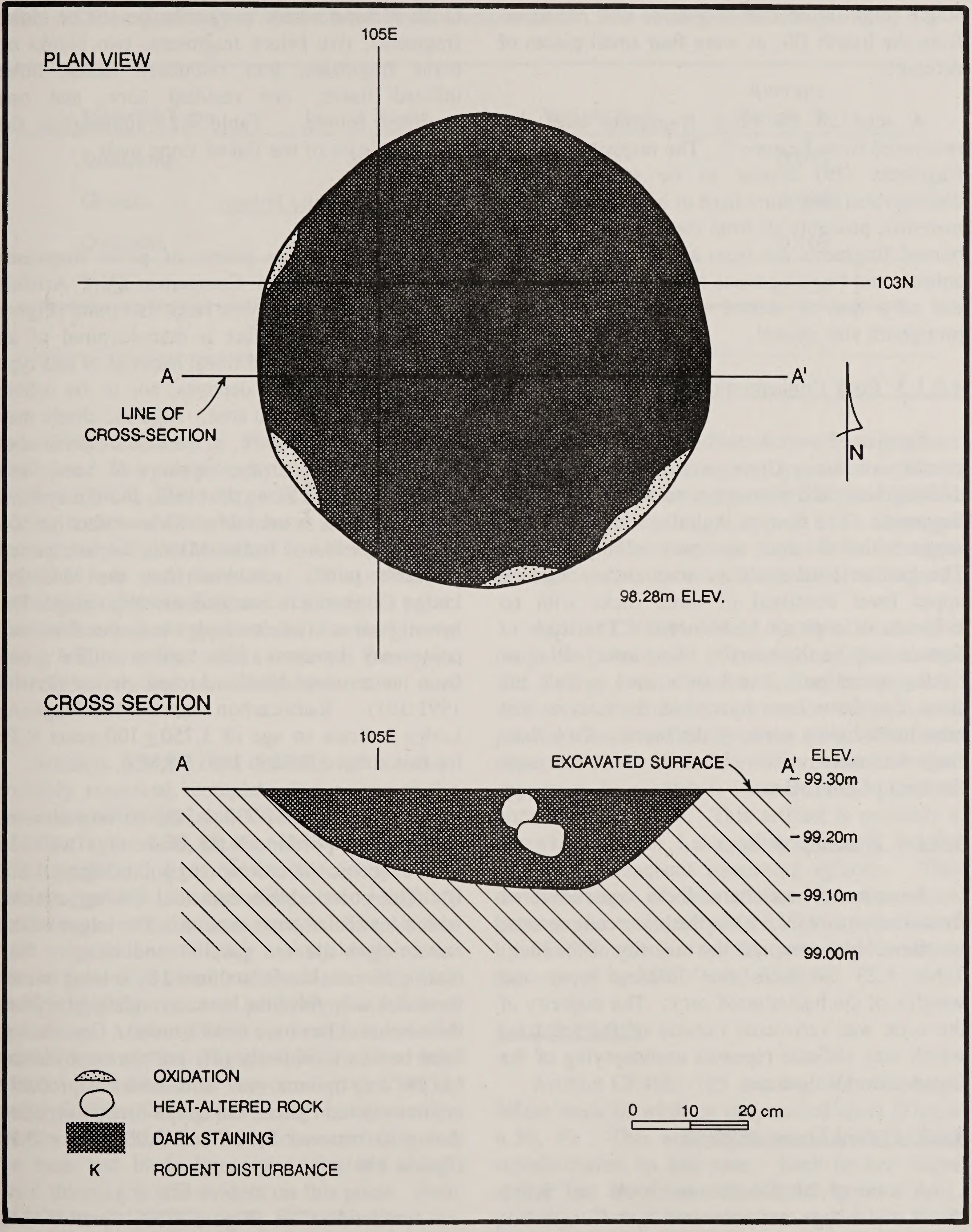


Figure 4.29 Plan View and Cross Section of Feature 7, Component IV, Site 48CR4681 (Locality P-054).

single fragment of burned granite was recovered from the hearth fill, as were four small pieces of debitage.

A total of 84 bone fragments was also recovered from Feature 7. The majority of these fragments (79) appear to be splinters of a disintegrated long bone shaft of a small to medium mammal, probably all from the same bone. Three burned fragments are from a very small to small animal, and two fragments appear to be the distal end of a first or second phalanx from a deer-pronghorn size animal.

4.6.1.3 Rock Concentration

Feature 33 was a stack of seven heat-altered granite cobbles. Upon excavation these rocks disintegrated into numerous small fire-reddened fragments. The form of the pile, with two levels, suggests that the rock was purposefully stacked. The bottom level included four rocks, and the upper level consisted of three rocks with no evidence of a pit or basin noted. This type of feature may be the remains of a stone boiling or baking operation. The hearth used to heat the stone may have been located in the unexcavated area immediately north of the block. Two flake fragments were recovered from the matrix around the base of the rocks.

4.6.1.4 Heat-altered Rock

A number of heat-altered rocks were recovered from Component IV. As in the other components, granite cobbles comprise the majority of the rock. Table 4.23 compares the different types and weights of the heat-altered rock. The majority of the rock was recovered outside of the features, which may indicate repeated use/emptying of the Component IV features.

4.6.2 Flaked Stone Artifacts

A total of 23 flaked stone tools and 2,513 pieces of debitage was recovered from Component IV. The majority of the artifacts are made of locally available material types. The flaked stone tools include seven projectile points or point fragments, five biface fragments, two blanks or blank fragments, four retouched flakes, three utilized flakes, one residual core, and one modified cobble. Table 4.24 summarizes the characteristics of the flaked stone tools.

4.6.2.1 Projectile Points

Seven projectile points or point fragments were recovered form Component IV. Artifact CR4681-442 is a complete large dart point (Figure 4.30, A). This artifact is manufactured of an algalitic chert. No additional material of this type was noted within site deposits, nor in the cobble materials near the site area. Algalitic cherts may be found west of Bairoil, in the Red Desert area of Wyoming. The artifact appears to have been heavily reworked along the blade, and it may have been discarded as unusable. This artifact bears a strong resemblance to late Middle Archaic period projectile points recovered from the Medicine Lodge Creek site in northwestern Wyoming. The investigator at Medicine Lodge indicates that these points may represent a little known cultural group from the terminal Middle Archaic period (Frison 1991:101). Radiocarbon dates from Medicine Lodge indicate an age of 3,750±100 years B.P. for this culture (Frison 1991:28, 85).

Artifact CR4681-739 is the hafting element and a major portion of the blade of a white to clear dendritic chalcedony dart point (Figure 4.30, B). This point exhibits comedial flaking patterns, with a lenticular cross section. The edges of the remaining blade are parallel and sharp. The hafting element has been thinned by driving two or three flakes up from the base, terminating between the notches. The base is not ground. One ear has been broken completely off, and the opposite ear has the very tip removed. This artifact is probably an unreworked Pelican Lake type dart point, often dating to between 3,100 and 2,000 years B.P. (Frison 1991).

Artifact FS#793 (Figure 4.30, C; after field notes) is a complete dart point of white chert. Flaking patterns on this point are parallel-oblique

Table 4.23 Summary of Heat-altered Rock, Component IV, Site 48CR4681 (Locality P-054).

Material Type	No. of Rocks	Weight (kg)	Average Weight (kg)
Sandstone	3	.25	0.083
Granite	223	22.005	0.099
Quartzite	38	6.4	0.168
Total	264	28.655	0.109

and finely executed. The cross section is lenticular. The point is very similar in form to Artifact CR4681-739, with parallel sides, very low side to corner notches, and basal thinning. The notches are wide and terminate in a sharp angle to both the base and the blade. This artifact is probably a complete Pelican Lake complex point. The artifact does not appear to be reworked in any area. This artifact was removed from site collections during an inspection tour and subsequently lost.

Artifacts FS#171 and FS#883 are smaller, probably reworked, complete dart points of the same type as FS#793 and CR4681-739. Artifact FS#171 (Figure 4.30, D; after field notes) is made of a translucent, light brown chalcedony. The flaking pattern is comedial, but irregular, producing a lenticular cross section. The notches were very wide, producing a sharp angle at the intersections of the base and the blade. The base itself is slightly concave, probably the result of reworking. Artifact FS#883 is manufactured of a mottled brown chert (Figure 4.30, E; after field notes). This artifact is very similar to FS#171, but with finer flaking producing a chevron-like pattern on the blade. The notches are wide, and the base and blade intercept angles are sharp. Basal thinning is still evident on this point. Both FS#171 and FS#883 were removed from the collections during site tours and subsequently lost.

Artifact CR4681-349 is a lateral base fragment of white chert. This fragment appears to represent a fragment of the same type of artifact as CR4681-442. Both broken edges appear to be snap-type fractures. The breakage may have occurred during manufacture or as the result of an impact.

Artifact CR4681-699 is the distal blade of a projectile point made of banded tan chalcedony. The flaking pattern on this artifact is very fine, with an inverted chevron pattern on one side, and parallel transverse flaking on the other. The blade edges are finely serrated. The remnant of what appears to be a notch is located on the proximal portion of the blade. This artifact is probably a reworked Pelican Lake point, possibly broken during a subsequent reworking episode. This curation stage of this artifact fits somewhere between the complete point forms as represented by FS#793 and the heavily reworked forms as represented by FS#171 and FS#887.

4.6.2.2 Blanks

Artifact CR4681-185 is a fragment of a large biface made of white to tan mottled chert (Figure 4.30, F). This artifact shows a wind-polished cobble cortex on one side. Both broken edges appear to be from manufacture-type breaks, probably during the reduction sequence. Hard

Table 4.24 Characteristics of Flaked Stone Tools, Component IV, Site 48CR4681 (Locality P-054).

Catalog No.	Excavation Unit	Classification	Condition	Dimensions (mm)[1] L	W	T	Material Type	Remarks
185	101N 102E	Biface	Fragment	47.0	29.7	10.3	Mottled white/ tan chert	Possible manufacture failure
233	105N 100E	Biface	Fragment	19.2	13.4	2.8	Clear to tan chalcedony	Biface tip, possible manufacture failure
349	105N 100E	Projectile point	Fragment	12.7	10.7	4.3	White chert	Ear and base corner notch, probable Pelican Lake
350	105N 100E	Residual core	Complete	45.3	31.8	24.5	Tan banded chert	Exhausted, numerous fracture planes
355	105N 100E	Utilized flake	Fragment	33.0	27.8	10.2	Purple Phosphoria chert	Core rejuvenation spall, utilized on one edge
442	107N 101E	Projectile point	Complete	26.1	22.0	5.0	Algalitic chert	Pelican Lake or displaced Hanna
567	100N 99E	Biface	Fragment	12.7	12.2	3.1	Tan chalcedony	Biface tip, possible manufacture failure
654	100N 98E	Retouched flake	Fragment	18.3	14.2	3.8	Tan chalcedony	Proximal biface reduction flake, retouched on one lateral edge
684	105N 98E	Biface	Fragment	18.5	14.4	6.4	Tan fine-grained quartzite	Biface tip, possible manufacture failure
699	107N 107E	Projectile point	Fragment	30.4	16.6	3.5	Banded tan chalcedony	Parallel oblique flaking pattern, very fine
720	102N 99E	Modified cobble	Complete	77.5	40.5	9.9	Mottled white chert	Heavy retouch on two edges
739	101N 101E	Projectile point	Fragment	39.0	17.8	4.9	White dendritic chalcedony	Side/corner notch, blade and hafting, Pelican Lake
743	106N 101E	Biface	Complete	44.3	33.6	8.6	Purple Phosphoria chert	Preform
960	107N 98E	Biface	Fragment	10.5	6.9	2.9	Tan chert	Biface tip, possible manufacture failure
1219	101N 103E	Retouched flake	Fragment	53.1	21.3	9.2	Black siltstone	Distal blade, one retouched lateral edge
1224	107N 98E	Retouched flake	Fragment	26.3	23.0	6.1	Grey siltstone	Graver tip, retouched on two lateral edges
1225	108N 102E	Biface	Fragment	18.6	12.2	3.5	Brown chalcedony	Biface tip, possible manufacture failure

Table 4.24 (continued)

Catalog No.	Excavation Unit	Classification	Condition	Dimensions (mm)[1] L	W	T	Material Type	Remarks
1237	102N 102E	Utilized flake	Complete	20.9	22.2	4.8	Grey chert	Core reduction flake, utilized on distal edge
1242	104N 99E	Retouched flake	Fragment	22.0	18.0	6.0	White mottled chert	Flake fragment, one retouched edge
1245	105N 99E	Utilized flake	Fragment	34.1	14.5	2.4	Cream chert	Distal, probable biface thinning flake, utilized on lateral and distal edges
FS171	104N 101E	Projectile point	Complete	25.0[2]	16.0[2]	2.5[2]	Brown chalcedony	Side/corner notch, Pelican Lake
FS793	108N 101E	Projectile point	Complete	44.0[2]	17.0[2]	3.0[2]	White chert	Side/corner notch, Pelican Lake
FS883	105N 106E	Projectile point	Complete	23.0[2]	16.0[2]	2.5[2]	Brown chert	Corner notch, Pelican Lake

[1] L = length, W = width, T = thickness.
[2] Estimated sizes based on field drawings.

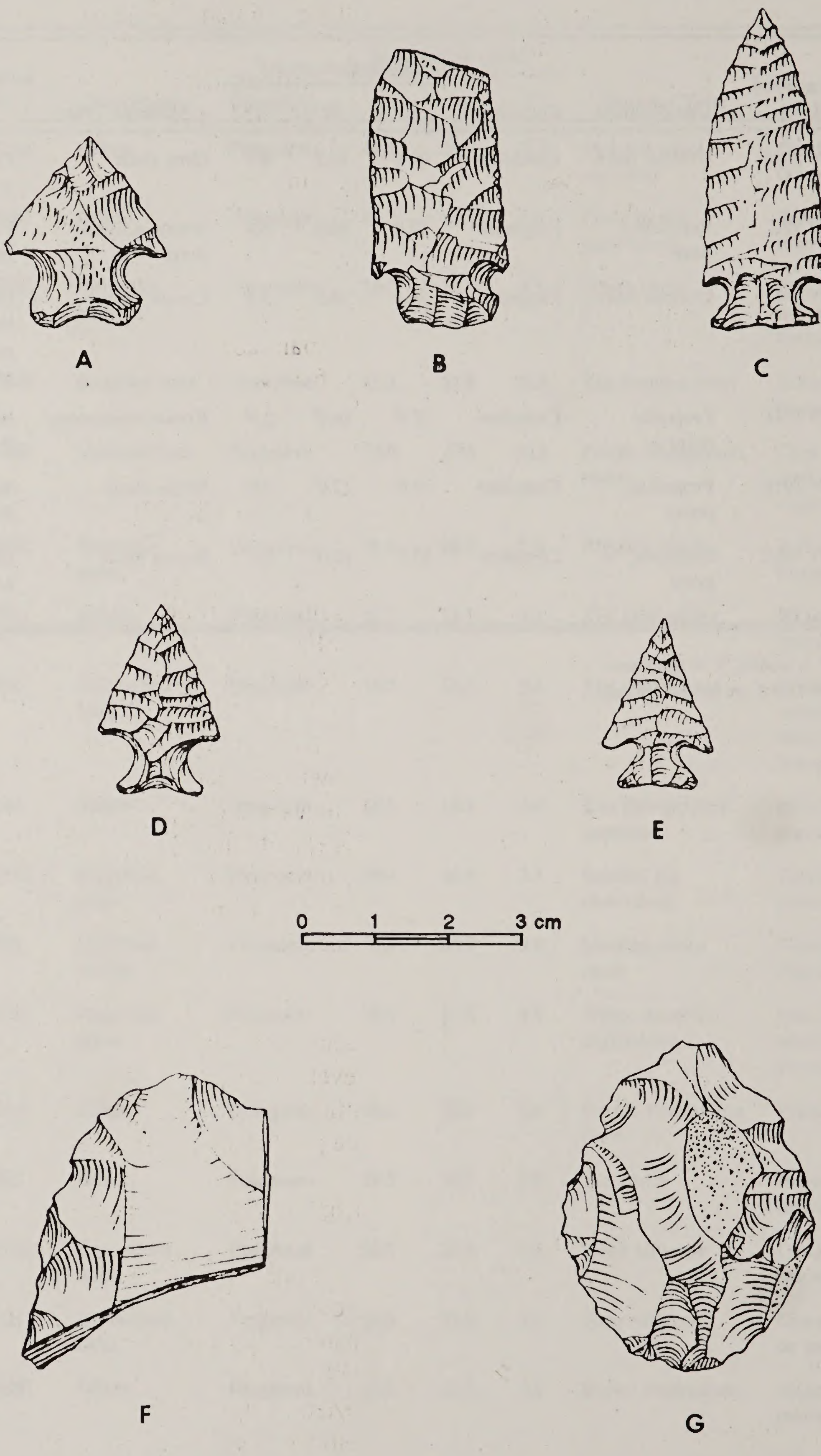


Figure 4.30 Selected Artifacts, Component IV, Site 48CR4681 (Locality P-054). A) CR4681-442; B) CR4681-739; C)FS#793; D) FS#171; E) FS#883; F) CR4681-185; G) CR4681-743.

hammer reduction is indicated by the exaggerated negative scars from the bulb of percussion on both sides of the artifact. Numerous small step-fractures along the worked edge indicate that flake removal was not easily accomplished.

Artifact CR4681-743 is a complete bifacially worked blank of a light purple Phosphoria-type chert (Figure 4.30, G). This biface was apparently manufactured on a flake from a larger cobble. A cobble-type wind-polished cortex was noted on what appears to be the dorsal side. A combination of hard and soft hammer reduction is evident on the biface, with exaggerated negative bulbs of percussion more prevalent on the ventral side, and finer, thinner flake removal evident on the dorsal. The ventral side exhibits numerous small step-fractures and crushed platforms, attesting to the difficulty in working this piece. This may be the reason this artifact was discarded.

4.6.2.3 Biface Fragments

Five biface tip (distal) fragments were recovered from Component IV. Four of these artifacts appear to have been broken during manufacture. The fifth was broken by an impact to one face.

Artifact CR4681-233 is a biface fragment of a clear to tan chalcedony. This artifact was recovered in two pieces and refitted during lab analysis. The breaks are not recent, but appear to be transverse failures, probably caused during pressure flaking. The artifact exhibits pressure flaking on the unbroken margins and appears to represent a tip broken during the final stage in a biface reduction sequence. The lateral edges are sinuous, with no grinding or other platform preparations noted. The cross section is thin and lenticular.

Artifact CR4681-567 is a fragment of a tan chalcedony biface. It exhibits a transverse failure, possibly due to a flaw in the material encountered during pressure flaking. The unbroken margins are pressure flaked, sinuous, and serrated. No platform preparation is evident on this artifact. The fragment appears to be the tip of a final stage biface, thin and lenticular in cross section.

Artifact CR4681-684 is a fragment of a tan, fine-grained quartzite. This specimen exhibits slightly sinuous lateral edges. These lateral margins have also been lightly ground, probably during platform preparation. The cross section of this artifact is thick and lenticular. The specimen appears to be the tip of a pressure flaked, late stage biface. The proximal end exhibits a negative hertzian cone on one face, indicating that the artifact was struck in the center. This impact produced a fracture which resulted in the removal of the tip.

Artifact CR4681-960 is a small fragment of a tan chert biface. This specimen exhibits pressure flaking on two lateral margins, which may have resulted in a transverse failure. The cross section of this small piece is thick and lenticular. This specimen is probably the tip of a late stage biface.

Artifact CR4681-1225 is a fragment of a brown chalcedony biface. Both lateral margins are sinuous and pressure flaked. This pressure flaking appears to have produced a transverse fracture, resulting in the removal of the tip from the biface. No platform preparation was noted on the specimen.

No other fragments of these bifaces were recovered, suggesting that the breakage was not severe enough to warrant discard of the entire biface. These bifaces were probably curated by the producers and left the location of manufacture.

4.6.2.4 Retouched Flakes

Four unifacially retouched flakes were recovered from Component IV. Three different material types are represented. Artifact CR4681-654 is the proximal end of a biface reduction flake of tan to light brown chalcedony. Steep unifacial retouch is evident on one lateral edge and has also removed the striking platform. The modification has produced an edge angle of approximately 65°. Examination under magnification shows numerous very small step-fractures on the working face, as well a slight rounding and polishing of flake scars. This indicates that the tool was utilized in a scraping motion.

Artifact CR4681-1219 is the distal portion of a blade, probably removed from a core of black siltstone. The dorsal side retains a small area of cobble-type cortex. The blade has been retouched along the proximal end, resulting in the removal of the striking platform, and also along one lateral margin. The lateral retouch has produced an angle of approximately 30°, while the retouch at the proximal end resulted in an edge angle of approximately 15°. Examination under magnification shows minute flake scars on the opposite side from the retouch, and a general rounding of the edges. A very slight rounding of the actual flake scars was noted on the lateral margin. Due to sharp edge angles and the bifacial edge attrition, this artifact was likely used as a cutting tool.

Artifact CR4681-1224 is the medial section of a grey siltstone flake. Both lateral edges of this artifact have been retouched on the dorsal side. One edge has been retouched to produce a graver or awl. The working tip of this tool has been snapped. The edge retouch around the graver exhibits a steep edge angle (approximately 75°) and a bright polish. Examination under magnification shows a moderate amount of edge rounding, on the remaining edges of the graver and the area on either side. Very small flake scars are evident on the ventral side, probably resulting from use. The lateral edge opposite the graver has also been retouched, producing an edge angle of approximately 30°. Use wear is also evident on the ventral side of the artifact in this area. A slight rounding of flake scars and a slight polish are evident. Use in this area of the artifact probably reflects a cutting type function.

Artifact CR4681-1242 is a trapezoidal spall from a cobble of mottled white chert. Both faces of this artifact exhibit portions of a wind-polished cortex. One edge has been steeply retouched (approximately 80°); the other three edges appear to be snap fractures. No evidence of a striking platform was noted on any of the edges. Examination under magnification shows a bright polish on the retouched edge, with very little rounding of flake scars. Suggested usage of this tool is as a scraping implement.

4.6.2.5 Utilized Flakes

Artifact CR4681-355 appears to be a portion of a core rejuvenation spall, removed from a cobble of purple to red Phosphoria chert. The artifact still retains a large amount of cortex on the dorsal side. The fragment has been battered on three edges and exhibits numerous small step fractures, oriented in multiple directions on the edges. The artifact has a single edge which appears to have been utilized. Utilization occurred on a spur-like projection and produced a series of small microfractures and a slight polish to one side of the tip. The edge angle is approximately 75°. This artifact may have been used as a graver or as a scraping implement. Other edges may have been expediently utilized, but the battered condition of the specimen does not allow positive identification.

Artifact CR4681-1237 is a medially split flake of dark grey chert. The remaining portion of the striking platform of this artifact is covered by a cobble cortex. The flake appears to have been removed by hard hammer reduction, due to the exaggerated bulb of percussion. Use wear is evident on the distal end of the flake in the form of very small (<0.5 mm) flake scars on the ventral side. Edge angle in this area of the flake is approximately 15°. Use wear or polish is not apparent on the dorsal side.

Artifact CR4681-1245 is fragment of a biface thinning flake of cream-colored chert. Utilization is apparent on the distal edge and one lateral margin. The distal portion has been scalloped, producing a denticulate type edge. No polish or rounding of edges were noted under microscopic examination. Edge angle in this area of the flake is approximately 12°. The lateral margin exhibits use wear on both the dorsal and ventral surface in the form of very small (0.5 mm) flake scars.

These scars appear slightly rounded, probably the result of a cutting-type use. Edge angle in this area is estimated at less than 10°.

4.6.2.6 Residual Core

Artifact CR4681-350 is an exhausted core of tan banded chert. The core still retains small portions of a cobble cortex. The cortex appears to be a dolomitic type of limestone. The cobble appears to have originated as a concretion.

The core exhibits multiple flake scars originating from several directions. Many of these scars terminate in hinge fractures. All of the flake scars are less than 3 cm in length. It appears that no striking platforms remain for removal of additional flakes.

4.6.2.7 Modified Cobble

Artifact CR4681-720 is a thin, tabular cobble of mottled white to tan chert. The surface of this artifact is wind-polished. One edge has been retouched and exhibits heavy utilization. Angle of the working edge is approximately 75°. Examination under magnification shows a moderate polish and a high degree of rounding of the edge and the proximal flake scars. This artifact was probably utilized with a scraping-type motion.

4.6.2.8 Debitage

Component IV contained a total of 2,513 pieces of debitage, the largest amount of any of the components at Site 48CR4681. Table 4.25 summarizes the 11 broad categories of material types identified in this component. The overwhelming majority of debitage reflects the locally available material types. A single tertiary flake of clear quartz crystal was recovered from this component. This material does not appear to be available in the cobble terraces of the area, and may reflect a highly curated item from outside the immediate locale.

Cryptocrystalline cherts and chalcedonies comprise over 83% of the of the total debitage. The other chert category contains the highest percentage within the component, with approximately 43.7%. The clear chalcedony category contains 25.7% of the total debitage. White and tan chert and the quartzite category are about equally represented, at around 4.3% of the total each. Siltstones other than the black siltstone make up 6.5% the black siltstone category contains only 1.6%. Moss agate is also very low, with about 2.6% of the total count. Petrified wood and quartz crystal are very rare in the component, with <0.1% each.

All categories except the petrified wood contain low percentages of primary and secondary flakes and shatter. This may be an indication that initial reduction of bifaces or core production was initiated at the procurement location and the partially finished artifact brought back to this locality to be further reduced.

Since only four pieces of debitage were assigned to the petrified wood category, this percentage (75%) of secondary flakes and shatter may be misleading. Obviously, petrified wood was represented in the component originally, but it may be underrepresented by the recovered debitage.

The white chert category contains 26.2% of the initial reduction type flakes and shatter. This may indicate that cobbles of this type of material were procured relatively close to the site and that the initial reduction was carried out at the site location.

The black siltstone category contains a very high percentage of reduction and shatter; however, the relative percentage of shatter when compared to the reduction flakes probably indicates the difficulty of working with this material type.

The categories of quartzite, red chert, other siltstone, and other chert contain smaller amounts of the debitage types expected in initial reduction. These categories likely represent materials initially

Table 4.25 Cross-Tabulation of Debitage Type by Material Type, Component IV, Site 48CR4681 (Locality P-054).

	Material Type											
Debitage Type	Quartzite	White Chert	Red Chert	Clear Chalcedony	Tan Chert	Black Siltstone	Other Chert	Other Siltstone	Moss Agate	Petrified Wood	Crystal Quartz	Total
Primary Flake												
Number	1	5	7	5	4	0	43	1	1	0	0	67
Row %	1.5	7.5	10.4	7.5	6.0	0	64.2	1.5	1.5	0	0	
Column %	0.9	2.9	6.4	0.8	3.8	0	3.9	0.6	1.5	0	0	2.7
Secondary Flake												
Number	2	28	12	77	12	4	121	24	5	2	0	287
Row %	0.7	9.8	4.2	26.8	4.2	1.4	42.2	8.4	1.7	0.7	0	
Column %	1.9	16.4	11.0	11.9	11.4	9.8	11.0	14.6	7.6	50.0	0	11.4
Tertiary Flake												
Number	71	70	56	332	47	19	530	99	34	1	1	1,260
Row %	5.6	5.6	4.4	26.3	3.7	1.5	42.1	7.9	2.7	<0.1	<0.1	
Column %	65.7	40.9	51.4	51.3	44.8	46.3	48.3	60.4	51.5	25.0	100	50.1
Microflake												
Number	20	46	21	202	39	10	323	26	20	0	0	707
Row %	2.8	6.5	3.0	28.6	5.5	1.4	45.7	3.7	2.8	0	0	
Column %	18.5	26.9	19.3	31.2	37.1	24.4	29.5	15.9	30.3	0	0	28.1
Shatter												
Number	14	22	13	31	3	8	80	14	6	1	0	192
Row%	7.3	11.5	6.8	16.1	1.6	4.2	41.7	7.3	3.1	0.5	0	
Column %	13.0	12.9	11.9	4.8	2.9	19.5	7.3	8.5	9.1	25.0	0	7.6
Total												
Number	108	171	109	647	105	41	1,097	164	66	4	1	2,513
Row %	4.3	6.9	4.3	25.7	4.2	1.6	43.7	6.5	2.6	<0.1	<0.1	

reduced away from the site and returned for further reduction.

The categories of clear chalcedony, tan chert, and moss agate contain even smaller amounts of the reduction type flakes and shatter. This may be a reflection of further reduction away from the site, or the relative ease in working the material, as reflected in the low amounts of shatter.

4.6.3 Groundstone

A single groundstone artifact was recovered from this component. Artifact CR4681-211 is a fragment of a unifacially worked grinding slab. The working face has been pecked and exhibits a well-developed, concave profile. The material is a very fine sandstone, consisting of rounded sand grains with low percentages of orthoclase and plagioclase feldspar. The sandstone appears to have been heat-altered and is a dull reddish brown. The material likely was obtained from sandstone outcrops north of the site area, near Camp Creek Hill.

4.6.4 Ocher

Artifact CR4681-376 is a small slab of ocherous sandstone. Examination under magnification revealed small angular grains of quartz and orthoclase feldspar, loosely cemented together with a red ocherous silt. The percent of silt to grains in the artifact is estimated to be over 40%. The artifact is very friable and produces a bright orange-red streak on contact. The sandstone does not appear to have been extensively heat-altered. No evidence of grinding remains on the eroded faces of this artifact. The overall morphology does not seem to fit any of the other sandstones from near the site location. This artifact may have been transported into the area by the prehistoric inhabitants for use as pigment.

4.6.5 Animal Remains

A total of 718 faunal elements was recovered from Component IV deposits. Table 4.26 summarizes the recovered specimens.

The fragmentary condition of the bone from this component allowed very little identification beyond general body size. A single species (pronghorn) was positively identified with at least one pronghorn represented. Additional animal sizes may be inferred based on cortical thickness of recovered bone specimens. Cortical thickness and size of long bone fragments suggest animals ranging in size from rodent to deer-pronghorn. The bone from this component appears to have been more heavily processed than any other components at this location. The processing of bone appears to have been differential, based on the size of the animal. Over 58% of the bone from animals rodent to coyote size has been burned, while less than 14% of the bone from animals larger than coyote has been burned.

Processing may have included fragmentation of the bone in a preparation process such as stone boiling, designed to recover the maximum amount of caloric yield from the least amount of bone. Such preparation may be expected to yield highly fragmentary remains.

4.6.6 Plant Macrofossils

Matrix samples from all features in Component IV were floated in an effort to recover charred seeds related to the occupations. A total of 9.5 liters of sediment was processed (Table 4.27); however, no identifiable plant remains were recovered.

4.6.7 Spatial Distribution of Cultural Remains

Distribution of Component IV features, tools, and heat-altered rock is shown in Figure 4.31. Tools are provenienced to the nearest definable location (e.g., the center) within the unit of recovery. Organization of artifactual materials may indicate specific loci of activity. Recurrent or extended occupations within the same locale may tend to blur activity areas due to movement of artifacts from their location of deposit. Broad patterns may still be recognized within specific artifact or debitage type distributions and should

Table 4.26 Summary of Animal Remains, Component IV, Site 48CR4681 (Locality P-054).

Animal Size Category	Total Specimens No.	Total Specimens Wt. (g)	Burned Specimens No.	Burned Specimens %	Identifiable Elements
Pronghorn	6	18.1	--	--	1st phalanx, radius, maxilla
Jackrabbit size	13	4.5	7	53.8	Humerus fragments
Small mammal	208	11.1	110	52.8	--
Small-medium mammal	218	35.2	32	14.7	Tooth enamel
Deer-pronghorn size	7	14.5	--	--	Tooth enamel, metapodial
Very small-small mammal	251	11.1	157	62.5	--
Very small mammal	3	0.1	--	--	--
Very small-medium mammal	9	0.5	--	--	--
Very small-large mammal	3	0.1	--	--	--
Total	718	95.2	306	42.6	

Table 4.27 Plant Macrofossils Recovered from Feature Fill, Component IV, Site 48CR4681 (Locality P-054).

Feature No.	Sample No.	Volume (liters)	No. of Seeds	Taxa
7	11	2.0	0	--
20	86	2.0	0	--
22	137	1.0	0	--
27	209	2.0	0	--
27	210	2.0	0	--
33	248	0.5	0	--

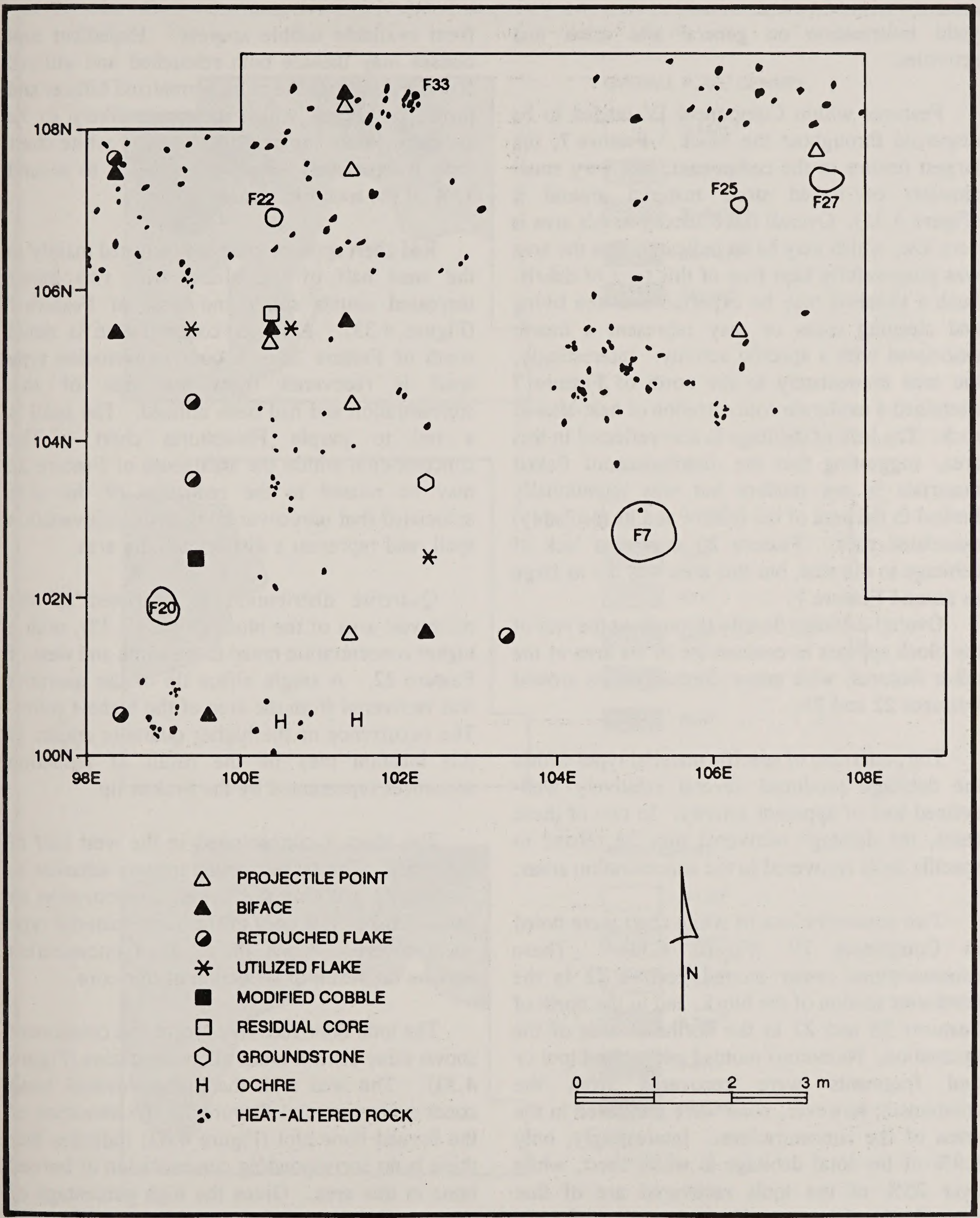


Figure 4.31 Map Showing the Distribution of Cultural Features, Tools, and Heat-altered Rock, and Trend Density Maps Total Debitage, Total Bone, and Burned Bone, Component IV, Site 48CR4681 (Locality P-054).

yield information on general site areas and activities.

Features within Component IV tended to be dispersed throughout the block. Feature 7, the largest feature in the component, had very small amounts of flaked stone material around it (Figure 4.31). Overall flake density in this area is very low, which may be an indication that the area was purposefully kept free of this type of debris. Such a situation may be expected near the living and sleeping areas or may represent a hearth associated with a specific activity. Interestingly, the area immediately to the north of Feature 7 contained a moderate concentration of heat-altered rock. The lack of debitage is also reflected in this area, suggesting that the distribution of flaked materials is not random but was intentionally limited in the area of the feature and its (probably) associated rock. Feature 20 showed a lack of debitage to the east, but this area was not as large as around Feature 7.

Overall debitage density throughout the rest of the block appears to concentrate in the area of the other features, with major concentrations around Features 22 and 25.

The patterning of specific material types within the debitage produced several relatively well-defined loci of apparent activity. In two of these cases, the debitage recovered may be related to specific tools recovered in the concentration areas.

Two concentrations of white chert were noted in Component IV (Figure 4.32). These concentrations center around Feature 22 in the northwest section of the block, and to the north of Features 25 and 27 in the northeast area of the excavation. Numerous mottled white chert tool or tool fragments were recovered from the component; however, none were recovered in the areas of the concentrations. Interestingly, only 6.9% of the total debitage is white chert, while over 25% of the tools recovered are of that general material type. The proportion of early stage reduction flakes and shatter (32%+) to tertiary flakes and microflakes seems high. This may reflect the manufacture of expedient tools from available cobble sources. Expedient tool classes may include both retouched and utilized flakes but exclude the more formalized bifaces and projectile points, which are more likely to be curated. When the expedient type of white chert tools is examined, the percentage falls to around 13% of the total tool count.

Red chert appears to be concentrated mainly in the west half of the block, with two minor increased counts south and west of Feature 7 (Figure 4.33). A larger concentration is noted south of Feature 22. A core rejuvenation type spall is recovered from the area of this concentration and had been utilized. The spall is a red to purple Phosphoria chert. The concentration within the area south of Feature 22 may be related to the reduction of the core associated (but unrecovered) with the rejuvenation spall, and represent a distinct activity area.

Quartzite distribution is restricted to the northwest area of the block (Figure 4.32), with a higher concentration noted to the south and west of Feature 22. A single biface tip of tan quartzite was recovered from the area of the highest count. The occurrence of the higher quartzite counts in this location may be the result of reduction sequences represented by the broken tip.

Tan chert is concentrated in the west half of the block. The largest count appears adjacent to Feature 22. Within the largest concentration an exhausted residual core of the same material type was recovered. Again, the debitage concentration may be the result of reduction of this core.

The total bone recovered from this component shows three distinct areas of concentration (Figure 4.33). The area with the highest overall bone count centers around Feature 7. Examination of the burned bone plot (Figure 4.33) indicates that there is no corresponding concentration of burned bone in this area. Given the high percentage of very small to small animal bone that is burned, the overall bone concentration around Feature 7 probably represents a high percentage of animals larger than coyote size. The second total bone

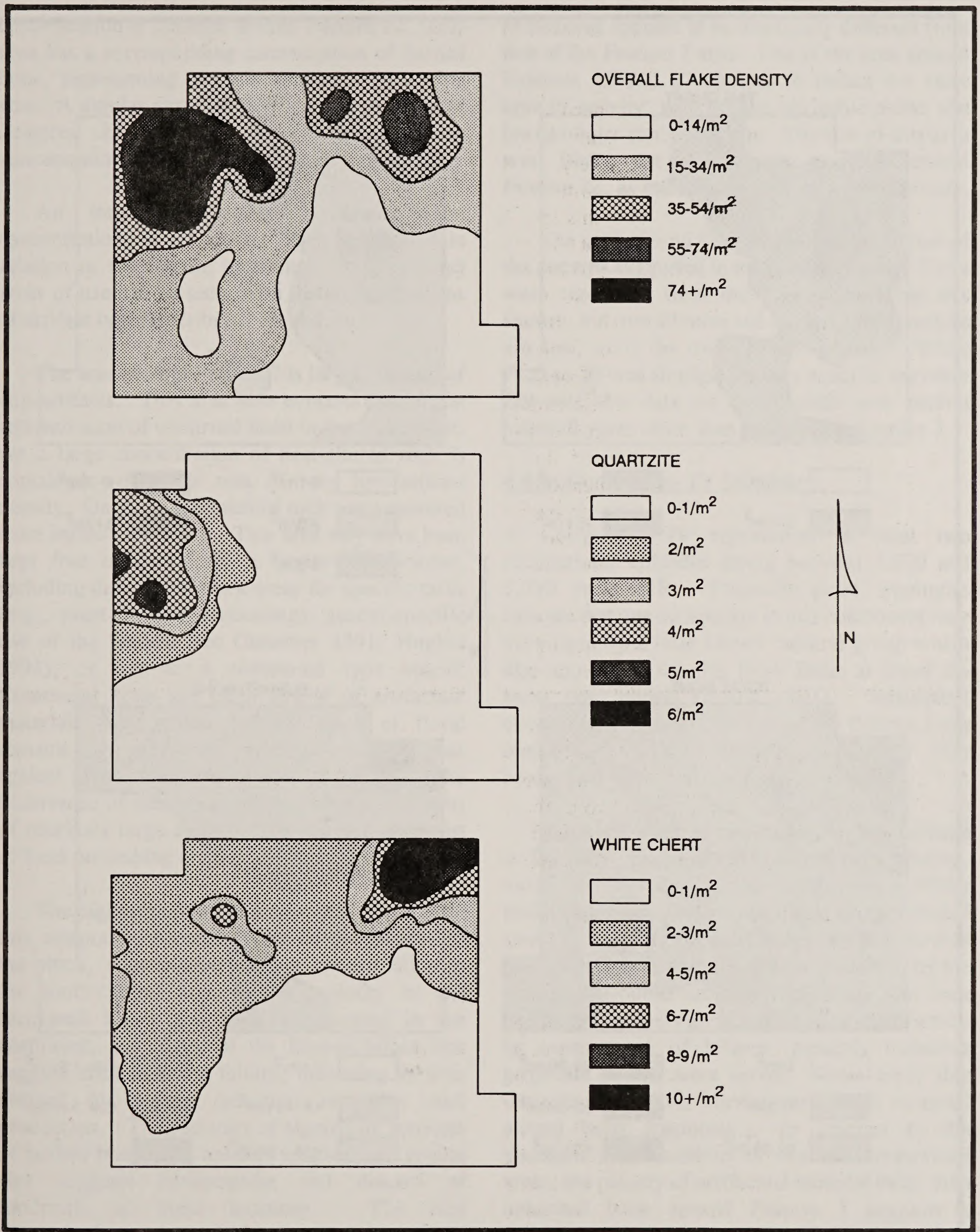


Figure 4.32 Trend Density Maps for White Chert, Red Chert, Quartzite, and Tan Chert, Component IV, Site 48CR4681 (Locality P-054).

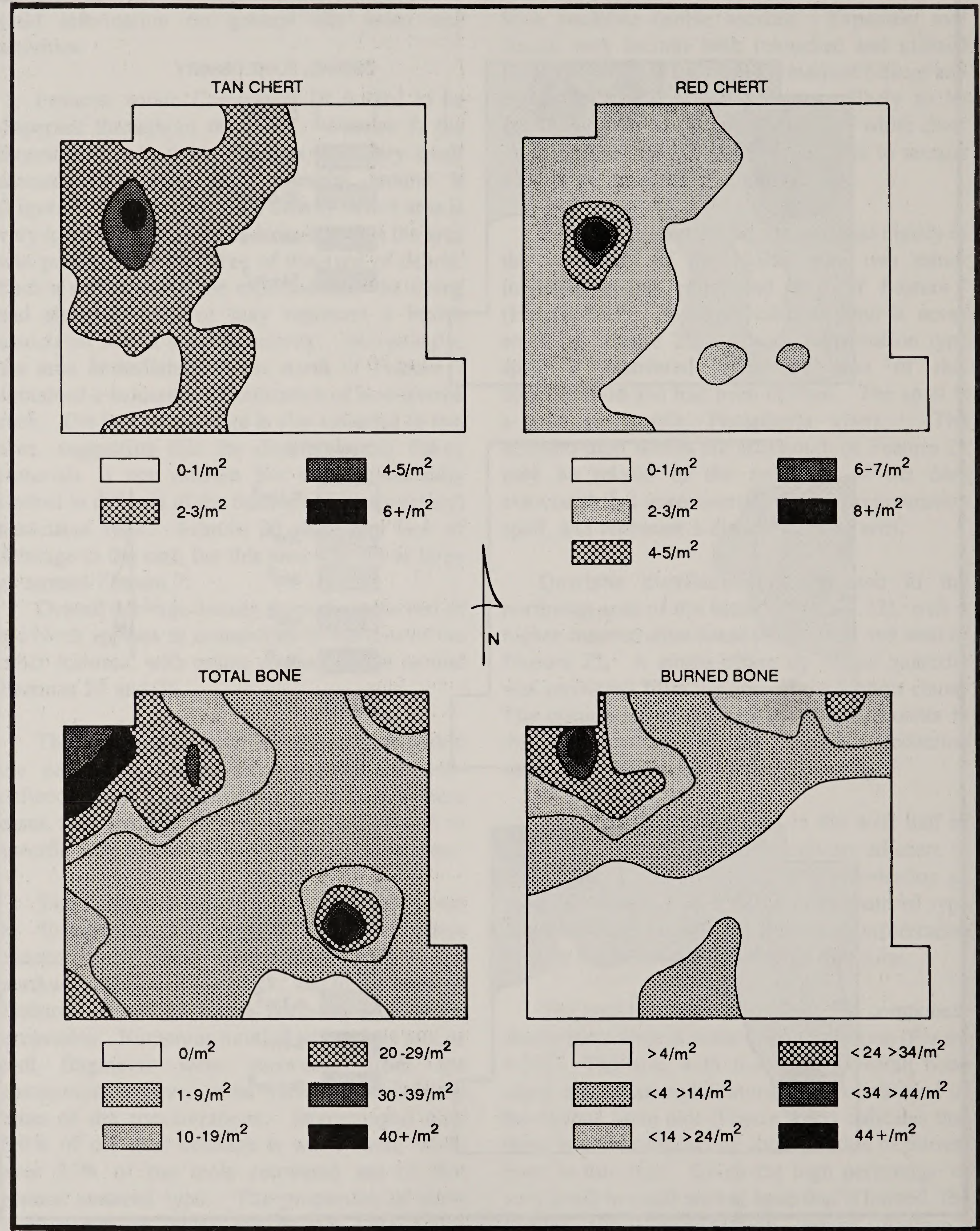


Figure 4.33 Trend Density Maps for Tan Chert, Red Chert, Total Bone, and Burned Bone, Component IV, Site 48CR4681 (Locality P-054).

concentration is centered around Feature 22. This area has a corresponding concentration of burned bone, representing animals smaller than coyote size. A similar situation is evident in the area of Features 25 and 27, where overall bone concentration reflects the location of burned bone.

An interesting pattern is noted when concentrations of all artifact types are viewed in relation to the feature locations. Three distinct areas of use can be seen, with distinctive patterns of artifact types distributed around each.

The area around Feature 7 is largely devoid of any artifacts. This area also contains the largest concentration of unburned bone in the component, yet a large concentration of heat-altered rock is contained within the area of very low artifact density. Only one fragment of rock was recovered from inside the feature. This area may have been kept free of debris for a number of reasons, including differential work areas for specific tasks (e.g., plant or food processing), gender-specific use of the feature (see Guenther 1991, Hughes 1991), or use as a communal type hearth. Communal areas are often devoid of artifactual materials (see Yellen 1977). Lack of floral remains or numerous grinding stones argues against plant processing at this locale, while the occurrence of numerous unburned bone fragments of relatively large animals does suggest some sort of food processing area.

The highest number of total tools recovered in this component occurrs in the northwest area of the block, with another smaller concentration in the south-central area. The majority of the recovered biface fragments are located in the northwest, and many of the broken biface tips suggest manufacturing failure, indicating an area utilized for biface reduction or other tool production. The recovery of significant amounts of burned bone from animals smaller than coyote size suggests consumption and discard of foodstuffs at these locations. The tool concentration and debitage counts around Feature 22 appear to reflect the use of the area as a biface and tool manufacture location. The focus of this area appears to be drastically different from that of the Feature 7 area. Use of the area around Features 25 and 27 appears to reflect the same type of activity, with broken projectile points and burned bone concentrations. The use of this area was likely not as intense as that around Feature 22, as indicated by overall artifact counts.

The area around Feature 20 reflects neither of the patterns suggested in the previous areas. Tools were recovered from the area surrounding this feature, but overall bone and burned bone densities are low, as is the overall flake density. While Feature 20 was stratigraphically equal to the other features, the date on this hearth was several hundred years older than the date on Feature 7.

4.6.8 Component IV Summary

Component IV represented at least two occupational episodes dating between 3,520 and 3,750 years B.P. Projectile point typologies indicate that one occupation in this component may have been by a little known cultural group which also appears in the Big Horn Basin at about the same time period (Frison 1991). Subsequent occupations suggest affinities to the Pelican Lake complex, a Late Archaic adaptation also recognized farther north.

Stone materials as represented by the debitage at Site 48CR4681 reflect available local sources, much like the other earlier components. While initial flaking sequences were apparently initiated away from the site locale, it appears that further reduction continued at the site, as evidenced by the recovery of numerous biface fragments. At least two distinct activity areas that suggest manufacture or maintenance of bifaces, possibly including projectile points, were noted. These areas also contained numerous burned very small to small animal bone fragments. In contrast to the abundant concentrations of the abovementioned areas, the paucity of artifactual material other than unburned bone around Feature 7 suggests a different activity focus, possibly food preparation.

Overall, the patterns within Component IV suggest that less emphasis was placed on grinding of foodstuffs (floral or faunal), with a focus on intense processing of animal remains. A diverse range of animals was exploited, and based on cortical thickness of fragmented bone, these animals ranged from rodent size up to pronghorn. Differentiation is also seen in the treatment of different body sizes in animals, with more burning and crushing seen in the smaller animals than in the larger.

While Component IV may have been a general camp situation, the overall structure of the component seemed to be much more distinct, with definable activity loci, and a basic camp structure which may have included identifiable gender related areas, or communal and family areas. These definable areas were most likely related to the Pelican Lake complex occupation of the area.

4.7 COMPONENT V RESULTS

Based on temporally diagnostic artifacts, Component V appeared to date to as old as 2,000 years B.P., but it may have contained materials of a much younger age. The hafting element and proximal blade of a dart point with low side notches were recovered in the northeastern portion of the site. The point had been extensively reworked but probably belongs to the Besant complex which has been dated elsewhere from about 2,000-1,600 years B.P. (Frison 1991:199). Faunal materials of a much younger age were exposed on the surface outside the block. These include bison horn sheaths and probably date to within the last 100 years. No cultural features were associated with Component V deposits; hence, no radiocarbon age estimates were obtained. Component V cultural remains were recovered from Strata N, O, and P and include a small number of heat-altered rocks, 14 flaked stone tool, 700 pieces of debitage, and 107 bone or tooth fragments.

4.7.1 Heat-altered Rock

While no features were located within the excavation block related to Component V, a small amount of heat-altered rock was recovered. A total of 23 granite rocks that weighed an average of 0.19 kg was recorded, with no other material types represented.

4.7.2 Flaked Stone Artifacts

Three projectile point fragments, three biface fragments, six retouched flakes, one utilized flake, a residual core, and 700 pieces of debitage were recovered from Component V. Table 4.28 summarizes the characteristics of the lithic tool assemblage from this component.

4.7.2.1 Projectile Points

Three projectile point fragments were recovered in Component V excavations. Artifact FS#381 is the hafting element and proximal blade of a very low side- to corner-notched dart point (Figure 4.34, A after field notes). This artifact was manufactured of a cream to white colored chert. The base and ears are lightly ground. The overall morphology of this point fragment suggests a Besant relationship, even though the artifact has been heavily reworked. This projectile point was removed from the site assemblage during an inspection tour and lost before it was returned to the collection. Two other point fragments were also recovered that may also be related to the same complex, although the fragments are less complete.

Artifact CR4681-48 is a lateral edge and partial base of a side-notched dart point (Figure 4.34, B). The remaining notch is placed very close to the base. The notch is lightly ground. The projectile point was apparently manufactured on a flake, as a large part of the bulb of percussion is evident near the fragmentary base. The material is a fine tan chert that grades to chalcedony. A slight white patination is present

Table 4.28 Characteristics of Flaked Stone Tools, Component V, Site 48CR4681 (Locality P-054).

Catalog No.	Excavation Unit	Classification	Condition	Dimensions (mm)[1] L	W	T	Material Type	Remarks
48	103N 106E	Projectile point	Hafting element	15.1	16.9	4.2	Tan chert	Low side notch, lightly ground ear and base, probable Besant/Late Archaic
57	100N 105E	Projectile point	Hafting element	7.7	18.0	3.9	Tan dendritic chert	Low side notched base, well ground ear, probable Besant/Late Archaic
98	103N 101E	Retouched flake	Fragment	13.1	10.4	4.3	Clear chalcedony	Lateral edge of flake, very steep retouch
106	102N 100E	Bifacially retouched flake	Fragment	23.0	22.4	3.1	Tan quarzite	Graver tips on distal end of flake fragment
343	98N 98E	Retouched flake	Complete	23.4	17.8	3.7	Clear chalcedony	Probably biface reduction flake, utilized or retouched on all edges
367	103N 98E	Biface	Fragment	13.3	11.0	3.0	White chert	Biface reduction, use wear on lateral edges
411	103N 98E	Biface	Fragment	7.8	13.4	4.4	Tan banded chert	Lateral edge of biface, badly broken up
524	100N 99E	Retouched flake	Complete	34.3	19.4	7.0	Red/blue mottled phosphoria chert	Core reduction flake, retouched along lateral edge
551	100N 99E	Residual core	Complete	34.6	25.9	19.7	Mottled white chalcedony	Exhausted, flake scars on surface
936	102N 98E	Utilized flake	Complete	38.5	22.7	4.8	Creamy chert	Distal flake fragment, bifacial retouch on lateral and distal edges
1218	104N 104E	Biface	Fragment	11.0	13.1	4.3	White chert	Tip of biface, rough flaking
1241	100N 100E	Retouched flake	Fragment	19.5	15.3	3.1	Red chert	Graver tips on distal end of flake fragment
1248	105N 100E	Bifacially retouched flake	Fragment	22.5	15.8	6.7	Red banded chert	Flake fragment, possibly heat-altered; bifacial retouch
FS381	106N 103E	Projectile point	Fragment[2]	33.0	14.0	4.0	Cream-colored chert	Low side notches, ground edge and base, probable Besant

[1] L = length, W = width, T = thickness.
[2] Dimensions based on field drawing.

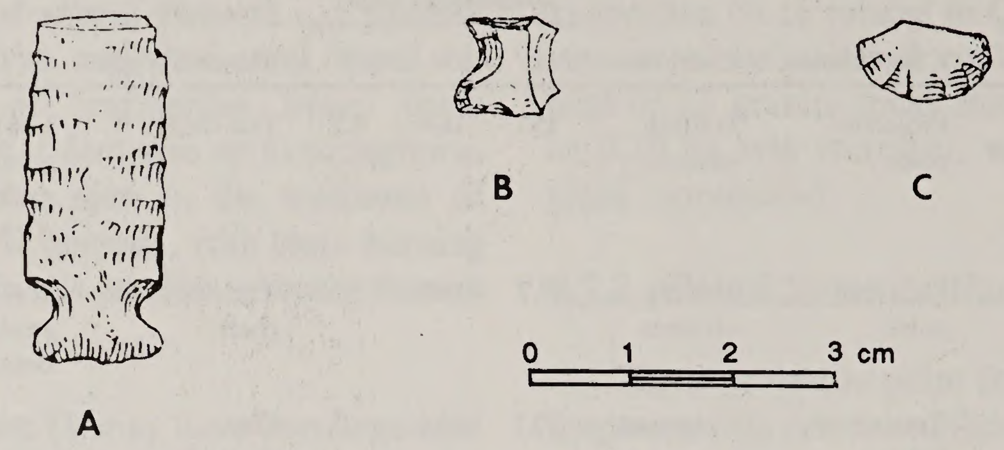


Figure 4.34 Selected Artifacts, Component V, Site 48CR4681 (Locality P-054). A) FS#381; B) CR4681-48; C) CR4681-98.

on the lateral edges of the artifact. The general shape of the fragment suggests Besant, although very little of the hafting element remains.

Artifact CR4681-57 is the basal portion of a low side-notched point made of a tan dendritic chert. The remaining fragment is a lateral hafting notch and ear, both slightly ground. This artifact may be of Besant manufacture; however, no definite determination can be made because of the small portion remaining.

4.7.2.2 Bifaces

Three fragmentary bifaces were recovered from the component. Two distinct material types are represented.

Artifact CR4681-367 is a small fragment of a lateral edge of a white chert biface. A small area of use wear is noted on the lateral edge and appears to have been in place prior to the fragmentation of the artifact. The edge angle of the utilized lateral area is estimated at 15°.

Artifact CR4681-411 is a fragment of a tan banded chert biface. The portion represented appears to be the proximal end and may actually be the base of a projectile point, although none of the hafting element is present. The remaining edge has been ground, possibly in preparation for the next series of flake removal, or as an aid in hafting. The fragment has numerous small flake scars terminating in step-fractures around the perimeter. The broken edge appears to be a snap-type fracture.

Artifact CR4681-1218 is the midsection of a biface manufactured of white chert. Many of the flake scars remaining on the fragment terminate in step-fractures. The cross section of the fragment is lenticular and thick. Both of these attributes may indicate that the fragment was in a median stage of manufacture when broken. Both the proximal and distal breaks appear to be hinge fractures, possibly indicating that the original biface was broken during manufacture.

4.7.2.3 Retouched Flakes

Six retouched flakes were recovered from Component V. Four different material types are represented in the retouched flake category. Two of the six artifacts are bifacially retouched, with the remainder unifacially retouched.

Artifact CR4681-106 is a bifacially retouched flake fragment of a light tan, fine-grained quartzite. The flake remnant is relatively thin (3.1 mm) and has been steeply retouched along a portion of the dorsal margin. This retouch may have removed the striking platform and a large part of the bulb of percussion. A possible remnant of that bulb may be present on the ventral side of the artifact. The ventral margin has been lightly retouched at a low, oblique angle in the same area as the dorsal retouch. Edge angle of the working area of the tool is estimated to be 75°. Examination of the retouched area under magnification revealed a moderate rounding of flake scars along the dorsal margin and working bit, along with numerous very small, use-related step fractures. This may be taken as an indication of use in a scraping-type motion.

Artifact CR4681-1248 is an edge fragment of a thick flake of bright red banded chert. The dorsal and ventral sides of the edge have been retouched, producing an angle of approximately 25°. Under magnification, the dorsal side of the biface area exhibits numerous very small step-fractures, probably use attrition of the working edge. The same type of use attrition was noted on the ventral side, but to a much less degree than the dorsal. Rounding of flake scars and the working bit was noted on the dorsal side but was absent on the ventral. This suggests a use as a scraping implement of some type.

Artifact CR4681-98 is a fragment of clear chalcedony (Figure 4.34, C). The fragment may be a portion of a flake, or simply a piece of shatter. No clear morphological attributes remain to make a determination of origin. The recovered fragment has been unifacially retouched to a steep angle (estimated at 60°), producing a serrated edge. Examination of this edge under magnification revealed a rounding of flake scars and the working bit, suggesting a scraping-type motion. The tool was probably broken after its use, based on lack of rounding on either of the lateral margins.

Artifact CR4681-343 is a nearly complete tertiary flake of clear chalcedony. The striking platform and a small portion of the bulb of percussion have been removed by unifacial retouch along the ventral side. This retouch has produced an edge angle of approximately 75°. Microscopic examination revealed numerous very small, use-related step-fractures and a slight rounding of the flake scars and working bit, indicating use in some form of scraping motion. Both lateral edges contain evidence of edge attrition in the form of very fine flake scars on the dorsal and ventral edges. This may be the result of use of the edges as a tool or may be evidence of a haft attachment.

Artifact CR4681-524 is a complete primary flake of Phosphoria red to purple chert. The cortex is a rough, cream-colored limestone and probably represents a nodule or concretion obtained from locations in the Ferris Mountain area. The interior lateral edge has been retouched to an edge angle of approximately 60°. Microscopic examination failed to detect any use attrition along the retouched edge. This artifact may have been discarded before use or used for an insufficient amount of time to produce any notable wear on the working edge and face.

Artifact CR4681-1241 is the distal end of a tertiary flake of Phosphoria red to purple chert. The distal edge has been retouched to form three graver or awl tips. Examination under magnification revealed a slight polish and rounding of flake scars on the edges and tips of the three fine points. Use attrition is not evident on the opposite sides of the retouch, although working edges are rounded. This suggests a use on some sort of soft material that did not damage the edges of the tool.

4.7.2.4 Utilized Flake

Artifact CR4681-936 is a complete secondary flake of a cream-colored chert. The striking platform is covered in a tan cobble cortex. Use wear is evident along both lateral margins. Numerous small flake scars are evident along the ventral side and form a small, semilunar notch.

The opposite lateral edge is relatively straight but also has multiple very small use attrition flake scars on the ventral side. Both working edges are at an approximate angle of 20°. No use attrition is evident on the dorsal side, indicating a single direction of use, probably in a scraping-type motion.

4.7.2.5 Residual Core

Artifact CR4681-551 is a core of mottled white chalcedony. The artifact exhibits at least nine negative flake scars orienting from several different directions. The core appears to be exhausted, with few (if any) striking platforms remaining. Several attempts to remove additional flakes are evident in the form of crushed and step-fractured areas along the steeper angles of the core.

4.7.2.6 Debitage

A total of 700 pieces of debitage was recovered from Component V. Table 4.29 presents a cross-tabulation of debitage type by material type for the assemblage.

Several flakes appear to represent nonlocal sources, and these include tertiary flakes of quartz crystal and obsidian. No other artifacts of these material types are associated with Component V, which may indicate that they were derived from curated tools. Since these materials do not appear to be locally available, they may represent materials traded into the area, or travel outside the immediate vicinity by the Component V occupants.

Overall, the debitage of Component V is dominated by cryptocrystalline cherts and chalcedonies, with over 83% of the total. Various siltstone categories make up approximately 9.7%, and quartzite contains 6.3%. The clear chalcedony category contains the highest percentage of the individual categories with over 32%, while the composite category of other chert contains less than 28%. The interior flakes (tertiary and microflakes) comprise over 78% of the total. Various individual categories appear to have been treated differently, with the quartzite and other siltstone categories containing less than 15% exterior flakes and shatter. This may indicate that these two material types were reduced external to the site to a higher degree than the other categories. The other categories contain in excess of 20% external flakes and shatter.

4.7.3 Animal Remains

A total of 107 fragments of teeth or bone was recovered from Component V. Table 4.30 outlines the recovered faunal specimens from the component. The animal bone recovered is very fragmented, but over 16% of the recovered bone was identified to species level. The remainder was identified to general body size, based on overall bone morphology including cortical thickness.

At least two individual animals appear to have been present during Component V occupations. A molar fragment of a bison was recovered in the component, along with several long bone fragments of a large deer to bison size animal. The molar is missing the root area and part of the anterior portion but appears to be either a second or third mandibular molar. Numerous fragments of a shattered tibia and a cuneiform were identified as pronghorn. Several fragments of tooth enamel and long bone fragments were recovered that are of the same approximate size as a pronghorn.

Differentiation in treatment can be seen in body size of the recovered elements. Only 6.5% of the total recovered bone is burned, and all burned bone represents coyote to deer-pronghorn size animals.

4.7.4 Spatial Distribution of Cultural Remains

Distribution of Component V tools can be seen in Figure 4.35. The tools are provenienced to the nearest definable point (e.g., the center) within the unit of recovery.

Organization of artifactual materials may indicate a specific area of activity. Recurrent occupations within the same locale may tend to

Table 4.29 Cross-Tabulation of Debitage Type by Material Type, Component V, Site 48CR4681 (Locality P-054).

	Material Type											
Debitage Type	Quartzite	White Chert	Red Chert	Clear Chalcedony	Tan Chert	Black Siltstone	Obsidian	Other Chert	Other Siltstone	Moss Agate	Crystal Quartz	Total
Primary Flake												
Number	0	6	4	4	1	0	0	8	1	0	0	24
Row %	0	25.0	16.6	16.6	4.1	0	0	33.3	4.1	0	0	
Column %	0	10.7	9.3	1.8	1.7	0	0	4.1	1.9	0	0	3.4
Secondary Flake												
Number	1	6	6	29	17	1	0	21	5	2	0	88
Row %	1.1	6.8	6.8	33.0	19.3	1.1	0	23.9	5.7	2.3	0	
Column %	2.3	10.7	14.0	12.9	28.8	7.1	0	10.8	9.3	25.0	0	12.6
Tertiary Flake												
Number	29	32	19	119	17	7	0	99	39	5	1	367
Row %	7.9	8.7	5.2	32.4	4.6	1.9	0	27.0	10.6	1.4	0.3	
Column %	65.9	57.1	44.2	52.9	28.8	50.0	0	50.8	72.2	62.5	100	52.4
Microflake												
Number	10	9	12	61	23	4	1	53	7	1	0	181
Row %	5.5	5.0	6.6	33.7	12.7	2.2	0.6	29.3	3.9	0.6	0	
Column %	22.7	16.1	27.9	27.1	39.0	28.6	100	27.2	13.0	12.5	0	25.9
Shatter												
Number	4	3	2	12	1	2	0	14	2	0	0	40
Row%	10.0	7.5	5.0	30.0	2.5	5.0	0	35.0	5.0	0	0	
Column %	9.1	5.4	4.7	5.3	1.7	14.3	0	7.2	3.7	0	0	5.7
Total												
Number	44	56	43	225	59	14	1	195	54	8	1	700
Row %	6.3	8.0	6.1	32.1	8.4	2.0	0.1	27.9	7.7	1.1	0.1	

Table 4.30 Summary of Animal Remains, Component V, Site 48CR4681 (Locality P-054).

Animal Size Category	Total Specimens No.	Total Specimens Wt. (g)	Burned Specimens No.	Burned Specimens %	Identifiable Elements
Bison	1	0.1	--	--	Molar fragment
Medium mammal	29	1.7	--	--	Tooth enamel
Medium-large mammal	9	2.8	--	--	--
Deer-pronghorn size	33	4.0	--	--	Tooth enamel
Pronghorn	17	5.2	--	--	Tibia fragments, cunieform
Very small mammal	1	0.1	--	--	--
Small-medium mammal	11	0.3	7	63.6	--
Very small-medium mammal	4	0.1	--	--	--
Very small-small mammal	2	0.2	--	--	--
Total	107	14.5	7	6.5	

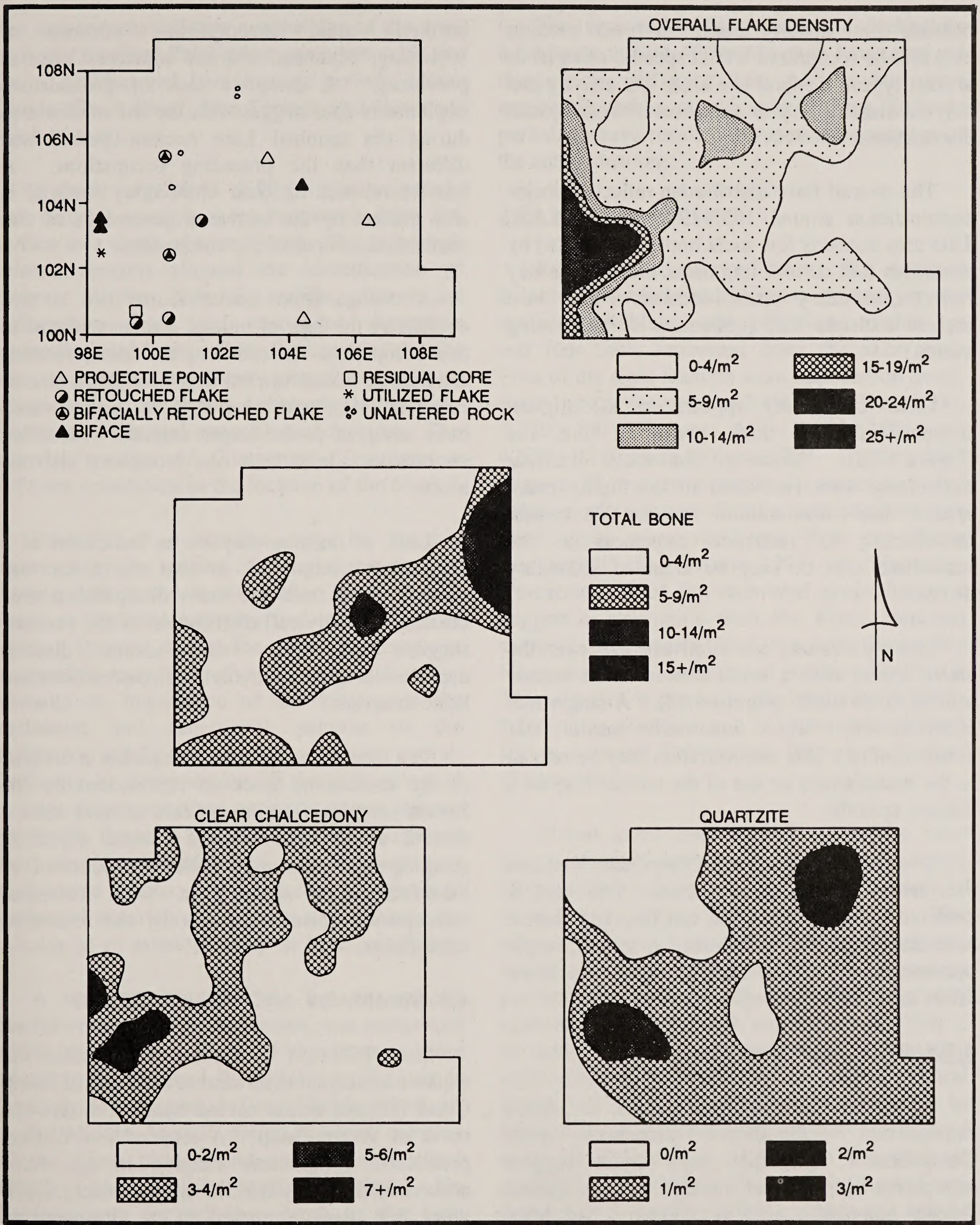


Figure 4.35 Distribution Map for Tools and Unaltered Rock and Trend Density Maps for Total Debitage, Total Bone, Clear Chalcedony Debitage, and Quartzite Debitage, Component V, Site 48CR4681 (Locality P-054).

obscure these activity areas, but broad patterns may still be recognized within specific material or artifact types. General site areas and activity loci may be discerned by examination of these spacial distributions.

The overall flake distribution reflects a major concentration around 103N 99E (Figure 4.35). This area contains few tools but is surrounded by numerous tool or tool fragments. This area may reflect a secondary discard location or may be a loci of multiple tool production or sharpening events.

Clear chalcedony appears in the highest concentrations in three areas of the site (Figure 4.35). None of the tools of clear chalcedony were recovered in the higher count areas. The concentrations may be due to tool manufacture or reduction sequences in the immediate area or may be areas of secondary discard.

Quartzite counts are relatively low over the entire block, with a small concentration located around 103N 100E (Figure 4.35). A single tool (CR4681-106) was recovered inside this concentration. This concentration may be related to the manufacture or use of the tool or may be a discard episode.

Overall bone density in Component V shows two areas of high concentration. One area is centered around 105N 104E and may represent a secondary deposit of food bone. A second, larger concentration is located along the 108E line, from 104N to about 108N and out to 107E.

4.7.5 Component V Summary

While no features from which to obtain radiocarbon dates were associated with Component V, projectile point styles suggest occupation by people of the Late Archaic period Besant complex. This complex has been characterized as an extremely sophisticated bison hunting adaptation (Frison 1991:105). This complex is usually associated with a more northerly area, encompassing portions of Wyoming, Montana, and the adjacent Canadian provinces. A complete lack of groundstone implements does suggest that the use of this area during the terminal Late Archaic period was different than the preceding occupations. A heavier reliance on clear chalcedony material is also evident by the increased percentage of that material recovered in the component.

A change from earlier faunal use is also evident by the lack of burned elements related to this occupation. In addition, the faunal remains are heavily biased toward deer-pronghorn size or larger animals, with over 83% of the recovered bone assigned to the larger animals. Identified remains include at least one pronghorn and one bison.

Lack of features may be an indication of a very short occupation, or that the block was situated away from the main occupational area utilized. The overall distribution of the remains suggests the latter, with several discrete depositional episodes involving discarded bone and lithic materials.

The Late Archaic period occupation in the area of the excavation block as represented by the Besant complex remains appears to have been a discard area. Recovery of several expedient scraping-type tools may indicate production or manufacture of some type, with numerous resharpening episodes evident by the recovered microflakes.

4.8 SUMMARY AND CONCLUSIONS

Site 48CR4681 is situated in a rather flat expanse of aeolian sheet sand to the south of Camp Creek Hill and almost several hundred meters due north of Wertz Camp. A total of five distinct prehistoric components ranging in age from around 7,500 years B.P. to approximately 2,000 years B.P. were preserved in the site deposits. Radiocarbon dates were obtained for four of the components (see Table 4.1), while the fifth was dated by projectile point typological comparisons.

The components indicate occupations of the area from the terminal Paleoindian period through the Early, Middle, and Late Archaic periods (Great Divide, Green River, Pine Springs, and Deadman Wash phases).

A single large block of 90 m^2 was excavated, and cultural remains were recovered from the surface to a depth of over 1.4 m. The recovered cultural remains allowed the identification of several distinct cultural entities, based on radiocarbon dates and associated diagnostic projectile point forms. Overall, the use of the site area appears to represent general camp type situations in Components I through IV based on recovered artifactual materials and features. The material remains of Component V suggest a different orientation in the location of the block.

Intensity of occupation may be roughly measured by the amount of material remains and features left at the location after abandonment. Reuse or repeated emptying and maintenance of existing features during the same or subsequent occupations may also give an indication of the intensity or importance of the locality in the settlement and subsistence patterns of the prehistoric inhabitants of a specific time period. Difficulty in interpretation of the archaeological remains may occur when a specific area is utilized repeatedly for task- specific activities. Repeated short-term specialized activities of different types in the same location may produce a palimpsest of artifactual materials and features which mimic the remains of an extended camp or base occupation.

A total of 36 individual features, mostly hearths or associated rock clusters, was recognized within the block. Eight of the features were related to the terminal Paleoindian period, six to the Early Archaic period (Great Divide phase), 16 to the Middle Archaic period-McKean complex (Green River phase), and six to the terminal Middle Archaic period (Pine Springs phase). No features were located that dated to the Late Archaic period, although the projectile points recovered from Component V suggest this period.

The resources which drew the prehistoric inhabitants to Site 48CR4681 may have changed through the different time periods but were apparently stable enough within these different periods to have resulted in repeated occupation of the same locations.

4.8.1 Component I

Repeated occupations during the terminal Paleoindian period resulted in a surprisingly sparse artifact assemblage, with 144 pieces of debitage and four tools recovered from the excavation. Four of the eight features were radiocarbon dated, returning age estimates of 7,490±90 (Feature 34), 7,230±100 (Feature 44), 7,110±100, and 4,550±90 (Feature 29) years B.P. The date from Feature 29 was stratigraphically anomalous and subsequently rejected. Similar dates and projectile point types were recovered from the Helen Lookingbill site (Frison 1991) in Wyoming. Characteristics of the recovered projectile point suggest a connection with the Pryor Stemmed complex best known from the area of the Big Horn and Pryor Mountains of northern Wyoming. This complex is placed in the Mountain-Foothills Paleoindian tradition and is differentiated from Plains oriented Paleoindian big game hunters (Frison 1991).

Flaked stone tool material appears to have been oriented toward local sources during Component I occupations, with a wide variety of animals apparently utilized by the inhabitants. The material remains from Component I suggest that the area was not utilized solely for big game procurement, with animals ranging from ground squirrel to probable bison size exploited. This is in contrast to the big game hunting adaptation usually attributed to Paleoindian period cultural groups of the Northwestern Plains. Also in contrast to the Plains adaptation is the lack of exotic lithic materials in the tool and debitage assemblage. Artifacts from Component I are derived from locally available cobble and nodule sources.

Overall, the remains of Component I indicate that the occupants were locally oriented, utilizing a broad spectrum of animal resources. The animal resource base may have been supplemented by a wide variety of plant foods, given the probably greater plant diversity under the more mesic conditions indicated by pollen analysis. The adaptation of the occupations related to Component V appears to be more archaic in nature and probably represent the Mountain-Foothills adaptation described by Black (1991).

4.8.2 Component II

Component II occupations appear to be a continuation of the earlier Component I lifeways, with a slightly different adaptation suggested by the cultural remains. A single radiocarbon date of 6,050±100 years B.P. was obtained on Feature 15, one of six cultural features recorded in this component, indicating an Early Archaic period (Great Divide phase) occupation. Again, the lithic tools and debitage reflect locally available materials, and the faunal remains represent essentially the same animals as in Component I. Hearth forms and sizes recorded for the two different components indicate a change in overall morphology, with larger square areas in Component I, but greater volume due to increasing depth in Component II. Component I also contained primarily shallow hemispherical unoxidized basins with a single beveled basin recorded, while Component II contained only one hemispherical feature but contained two other forms, spherical and cylindrical. The largest difference in artifactual material between Components I and II was the recovery of parts of four different grinding slabs from Component II. No diagnostic tools or projectile points were recovered from Component II. The recovery of so many different grinding slabs may indicate an increasing importance of plant resources, which in turn may indicate a change in plant type availability due to the increasingly xeric conditions of the Altithermal period.

Similar dates have been returned from other Early Archaic period sites such as Mummy Cave (Frison 1991:29) near Yellowstone Park in northern Wyoming, the Laddie Creek site (Larson 1990) near Dubois, and Component 3 of the Deadman Wash site in the Rock Springs Uplift of southern Wyoming (Armitage et al. 1982).

4.8.3 Component III

Component III represents a change from the Component II occupations in that the technological adaptations of the McKean complex of the Middle Archaic period (Pine Springs phase) are represented. Diagnostic projectile points of this complex were recovered and are substantiated by radiocarbon dates usually associated with this complex. Three of the 16 features in this component were radiocarbon dated to 4,840±90 (Feature 16), 4,670±70 (Feature 28), and 4,340±80 (Feature 45) years B.P.

Comparison of hearth types between Components II and III indicates that overall shape, square area, and volume are comparable, but that the hearth features from Component III experienced much higher temperatures than those of Component II, as indicated by the oxidation rinds present on the Component III features. This may be taken as an indication of extended occupation resulting in longer periods of exposure to high heat, or repeated use of such features resulting in short-term, high heat incidents.

Interestingly, the only truly distinctive change seen between Components II and III in terms of artifactual material is the recovery of diagnostic point types. The overall orientation appears to still be towards use of local lithic material, with the recovered projectile points manufactured from these available material types. Numerous fragmentary late stage biface tips indicate that some tool production was occurring on site but that the initial reduction sequences probably occurred away from the block location. The recovery of fragments of five distinct grinding slabs indicates a continued dependence upon this type of processing tool. The faunal remains from Component III appear to be more diverse than those of Component II, with both avian and mollusk represented, along with animals ranging from micromammal to bison size species. This may indicate a wider foraging radius or may simply be a product of differential length of occupation or season. Component III contained the only indication of seasonality within the site, based on availability of bird eggs in the spring.

Overall, the remains of Component III appear to represent a classic Middle Archaic period-McKean complex (Pine Springs phase) camp type occupation of a significant duration. The subsistence base appears to have been very diverse.

4.8.4 Component IV

Component IV represents a palimpsest of at least two occupational episodes. Radiocarbon dates obtained on two of the six cultural features related to this component returned ages of 3,750±80 (Feature 20) and 3,520±90 (Feature 7) years B.P., indicating a later Middle Archaic period (Pine Springs phase) occupation; however, no McKean complex diagnostic points were recovered. Rather, two distinctive large, corner-notched point types were associated with the features. The first point type has been associated with the older of the two radiocarbon dates in the Medicine Lodge Creek site of northern Wyoming and apparently represents a little known cultural group which appears toward the end of the Middle Archaic period (Frison 1991:28, 85). The second type is morphologically very similar to a widespread cultural horizon known as the Pelican Lake complex, which usually postdates 3,000 years B.P (Frison 1991). No stratigraphic separation of these two point types was possible within the arbitrary 10 cm levels of excavation. The younger of the two radiocarbon dates may reflect the Pelican Lake complex occupation, although this would indicate a very early manifestation of this complex. The radiocarbon date may actually reflect the age of the wood rather than the age of occupation. Use of long dead wood may account for some of the discrepancy in radiocarbon and typological dates. The radiocarbon ages from Site 48CR4681 suggest the possibility that the Pelican Lake points may be older than generally thought.

Comparisons of feature types between Components III and IV indicate that, overall, Component IV features are much less varied in form, consisting entirely of hemispherical basins, and that, in general, Component IV features are smaller in square area and volume. The flaked stone artifacts related to Component IV reflect local material types. The greatest amount of debitage from excavations was recovered in Component IV; however, overall percentages of material and flake types are very comparable to all other components. An overall lack of groundstone tools from this component indicates that neither complex was involved in this type of processing.

The faunal remains recovered from Component IV are less varied than those of Component III but appear to have been much more heavily processed, resulting in a very low percentage of identifiable animals. The recovered remains do indicate utilization of animals from micromammal size to at least pronghorn size. Component IV appears to have been a general camp situation, with an emphasis on flaked tool maintenance and bone processing evident.

4.8.5 Component V

Component V contained no features but was typologically dated to around 2,000 years B.P., based on diagnostic projectile points. This occupation appears to represent Besant complex occupation that was probably short-term in duration. Examination of faunal materials indicates that a change in animal utilization occurred during this time frame. Pronghorn or larger animals represent over 83% of the total faunal remains from this component, in marked contrast to all the other components within the site. Frison (1991) has characterized the Besant complex as specialized big game hunters, which may account for the paucity of smaller animal remains.

The overall situation of the Component V remains does not suggest an extended camp situation. Lack of features, and debitage oriented more toward expedient tool production and possible maintenance of weaponry, indicate a short-term camp. The area may have been utilized as a short-term, specialized activity site. This component was entirely devoid of groundstone.

Sites attributed to the Besant complex in Wyoming include the Ruby site in northern Wyoming and the Muddy Creek site complex in the Shirley Mountains of south-central Wyoming (Frison 1991:105). A large bison kill/processing/camp attributed to the Besant complex has recently been tested near the southern limits of the Big Horn Mountains. This site has been named the Cedar Gap site (Frison 1991:211).

4.8.6 Occupational History of Site 48CR468/ Locality P-054

Site 48CR4681 represents a relatively rare occurrence in the recorded archaeological history of south-central Wyoming. A distinct stratigraphic sequence spanning approximately 5,500 years has been preserved in good context, with datable features and diagnostic artifacts.

Frison (1991) and Black (1991) as well as earlier investigators indicate that a divergence is seen during the Paleoindian period, with two different adaptations evident. The first, and most widely recognized, is the Plains oriented Paleoindian big game hunters. The second, less well understood, Paleoindian adaptation is linked to the mountains and foothills and appears to be much broader-based in terms of food utilization than the Plains oriented groups. This divergence has been proposed starting as early as the end of Folsom period (Frison 1991:67). The two adaptations appear to have been separate following that time period, around 10,000 years B.P. The first component at Site 48CR4681 appears to represent one of the little-known groups from the Mountain-Foothills tradition.

The Early Archaic period (Great Divide phase) is somewhat unclear at Site 48CR4681, due to a lack of diagnostic artifacts to correlate to the dated features. The material remains do suggest a continuation of the earlier Component I adaptation. Diversity of animal remains again suggests a broad subsistence base.

A change is seen in the Middle Archaic-McKean complex occupations (approximately equal to the Green River phase) of Component III. Diagnostic projectile points represent McKean complex types, and radiocarbon dates indicate that this occupational sequence was not directly attributable to the Mountain-Foothills tradition, although certain aspects of the material culture do resemble the earlier component. Use of locally available flaked stone materials and the number of grinding slabs suggest that the McKean complex may not have replaced the indigenous population of the locale, but that the McKean technology was diffused into the area and adopted by the cultural groups already extant in the area. Faunal remains are very diverse and indicate the exploitation of several habitats.

Toward the end of the Middle Archaic period (Pine Springs phase), another little known group appears to have occupied the area. Similar projectile points and radiocarbon dates were associated with this unknown cultural group in the Medicine Lodge Creek site (Frison 1991). This group may be related to the Mountain-Foothills tradition, but further research and additional distributional information will be required before the nature of this manifestation is understood. Pelican Lake complex dart points also were recovered, from Component IV deposits. The radiocarbon ages for this component are somewhat early for this point type. The point may represent later occupations that could not be separated in the archaeological record.

Toward the end of the Late Archaic period (Deadman Wash phase), another distinct cultural complex appears to have occupied the area. Typological dates indicate that the Besant complex utilized the area of Site 48CR4681, probably around 2,000 years B.P.

Occupation of Site 48CR4681 appears to have been initially by Mountain-Foothills, locally oriented, indigenous groups. These groups occupied the area from probably prior to 7,500 years B.P. to at least 6,050 years B.P. Following these groups, either the McKean complex directly intruded into the area, or the McKean technology spread to the indigenous groups. Following the McKean complex, a little known cultural group occupied the area, and may represent the indigenous Mountain-Foothills tradition. Intrusions, again from the north, are seen by the presence of more northerly groups such as the Pelican Lake complex, and finally followed by the Besant complex.

5.0 PLANT SITE - SITE 48CR4139 (LOCALITY P-069)

This section details the results of block excavations conducted in 1990 by Mariah at the Plant site (Site 48CR4139) (Locality P-069) during the data recovery phase of the Bairoil Archaeological Project. A single prehistoric component of Early/Middle Archaic period (Green River phase) cultural affiliation was encountered within one large excavation block. Numerous cultural features with a lesser density of other classes of cultural remains were recorded during investigations. The following subsections summarize the site setting, natural and cultural stratigraphy, and results of excavations and provide a summary of results.

5.1 SITE SETTING

The Plant site is located in Carbon County, Wyoming, 3.6 km southeast of the town of Bairoil, and 1.0 km east of the Sweetwater County line (Figures 1.1 and 1.2). The site is located in Amoco's Wertz oil field. The site elevation is 2,036 m. Topography of the immediate area is a dunal flat with low ridges and knolls of dunal origin. The foothills of the Green Mountains begin 1.0 km north in the form of Camp Creek Hill. To the east and north the topography is predominantly badlands, characterized by sagebrush flats and dry lake beds. The nearest permanent water source is Lost Soldier Creek 2.0 km to the south. The confluences of Lost Soldier Creek and Abel Creek are within 2.0 km to the southwest. The site is located on the northern portion of a northwest to southeast aligned dunal ridge. The site boundaries are 76 m northwest by southeast and 190 m northeast by southwest, and encompass most of the dune (Greer, Greer, and Zettel 1989b). The higher portion of the site, the ridge top, is to the southwest. To the northeast dunal deposits have created a slope of varying degrees of steepness (Figure 5.1). Local vegetation is restricted to sagebrush, saltbush, prickly pear cactus, and grasses.

The Wyoming Recreation Commission surveyed the project area in 1978 (Larson 1978), and the site was recorded by the BLM in 1984. At that time flakes, heat-altered rock, and a biface were observed on the surface, suggesting that subsurface cultural deposits were likely (Bies et al. 1985). In 1987, Amoco constructed a well pad (Wertz ABC No. 152) on top of the dunal ridge and within the boundaries of the site. The 84 x 94 m pad was to be accessed from the east by a road, and a flow line was to be laid northward from the wellhead. Construction activities were approved by the BLM. After numerous charcoal-stained features were exposed and destroyed, the situation was brought to the attention of the BLM and Amoco. GAC monitored the completion of the well pad and rerouted the access road to the north to avoid further damage to the site. Twelve prehistoric features from the well pad and access road areas were salvaged and recorded by GAC. A fence was constructed to protect the undisturbed portion of the dune nearest the well pad and road (Greer, Greer, and Zettel 1989b).

In October 1989, Mariah conducted subsurface testing within the fenced portion of the site as part of the Bairoil Archaeological Project. A grid of auger holes, spaced at 2 m intervals, was placed across the area. Seven 1 x 1 m test units were placed in locations where auguring provided the best evidence of subsurface deposits. Testing proved the existence of intact cultural deposits in the undisturbed portion of the dune by the recovery of debitage, groundstone, and bone and the exposing of buried hearth features (Reust et al. 1990).

In 1990, Mariah conducted excavations at the Plant site. A 10 x 10 m block was placed within the fenced area where auguring and test units indicated intact buried deposits were located. As excavations progressed, two extensions, amounting to an additional 92 m^2, were added to the north of the original block (Figures 5.2 and 5.3). The

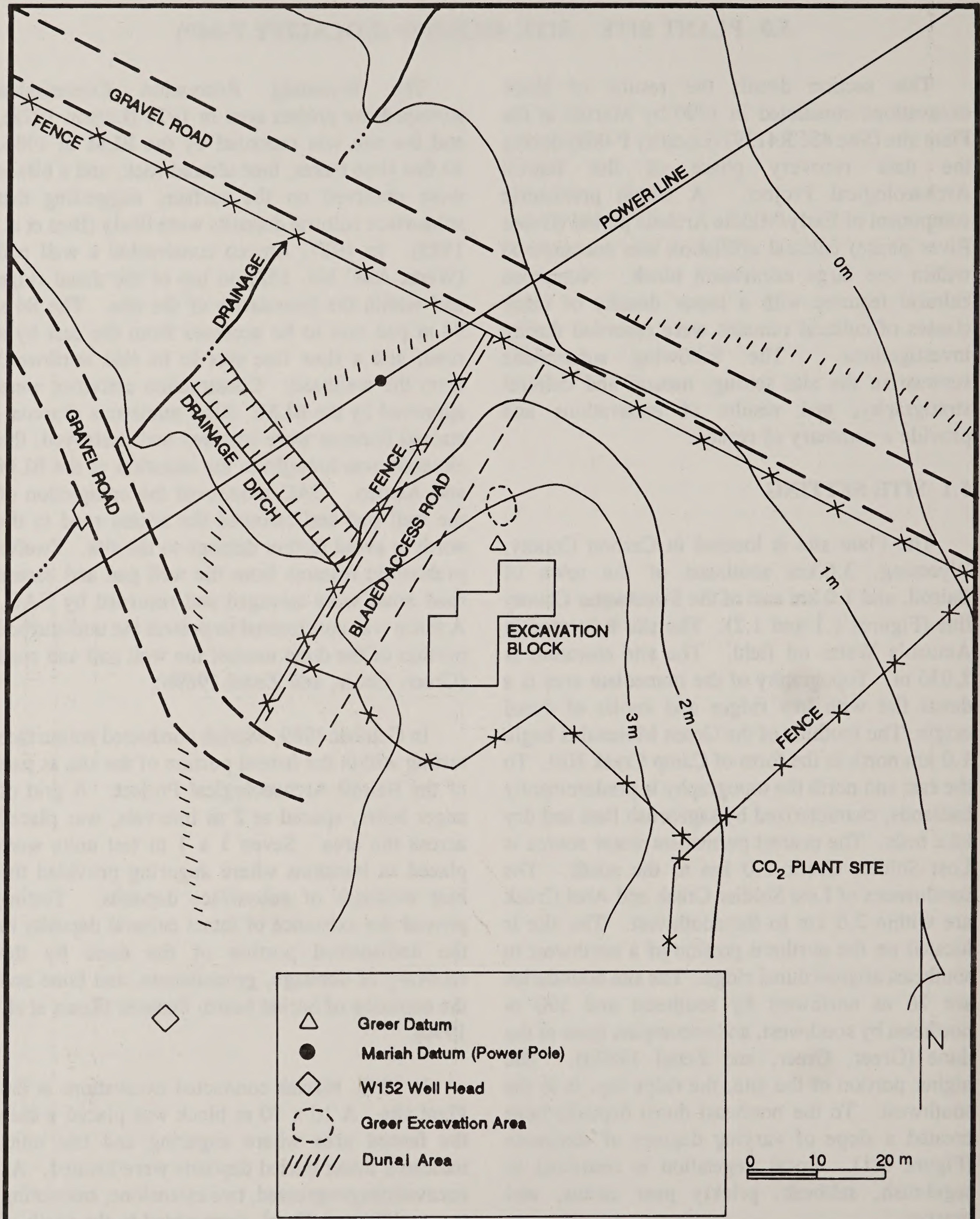


Figure 5.1 Contour Map Showing Location of the Excavation Block, the Plant Site (Locality P-069).

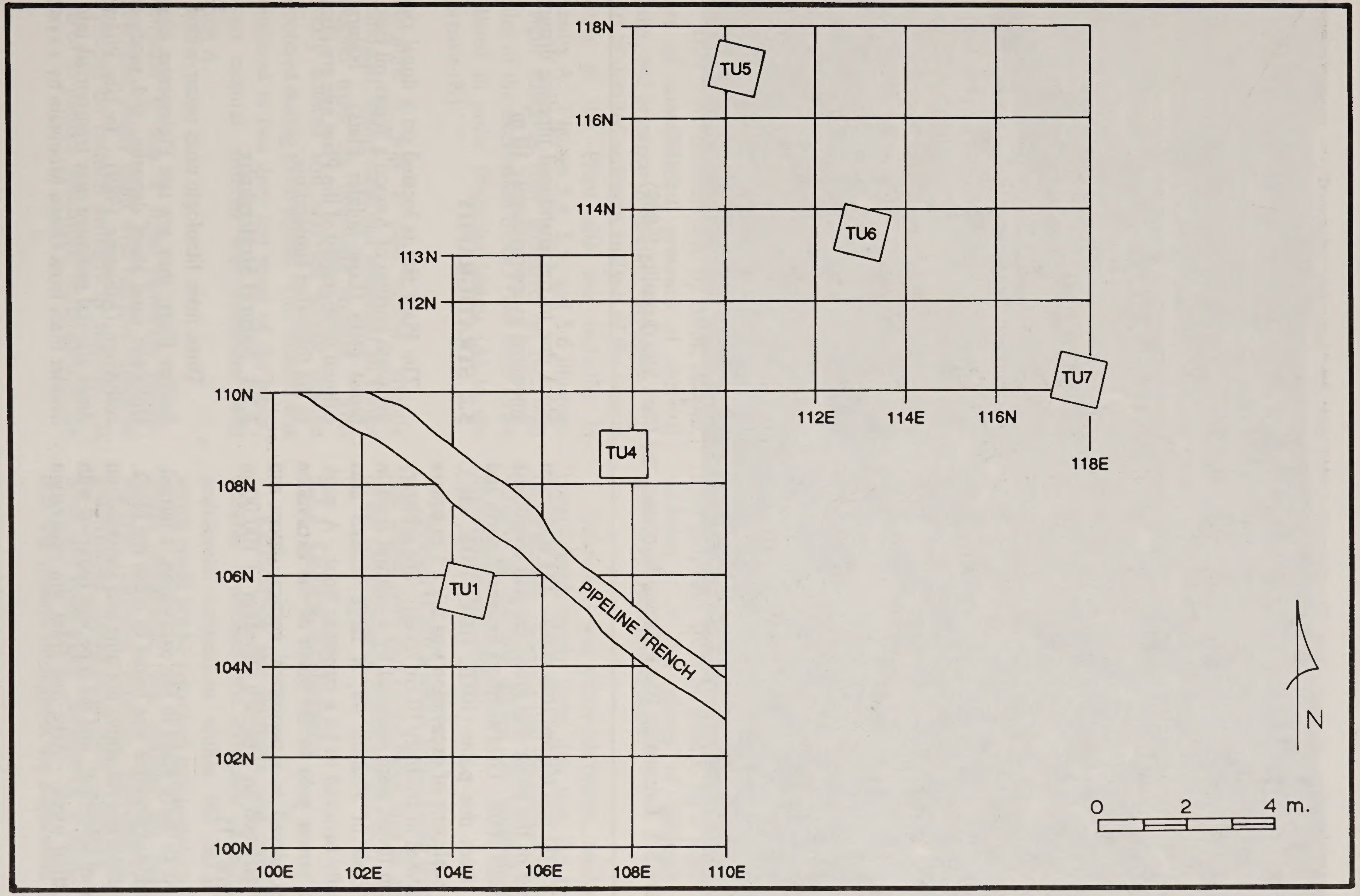


Figure 5.2 Plan Map of Excavation Block, the Plant Site (Locality P-069).

Figure 5.3 Excavation Block Facing Northeast, the Plant Site (Locality P-069).

block grid was aligned true north. The southwest corner of the block was given the grid coordinate of 100N 100E. Grid numbers increased north and east from that point (101E, 102E, 103E, etc.). The basic unit of excavation was a 1 x 1 m square excavated in arbitrary 10 cm levels. The arbitrary 10 cm levels were replaced by a cultural level in the case of Feature 44, a large stained area initially believed to be a structure floor. A mark on a power pole to the north of the excavation block served as a permanent vertical datum and was assigned an arbitrary elevation of 100.00 m (Figure 5.1).

At an early stage in the excavation, a buried, abandoned pipeline was found to cross the block. The disturbed fill above the pipe was shoveled out without screening, and the pipe was removed with a cutting torch. Area lost from the excavation block due to the abandoned pipeline disturbance amounted to approximately 10 m^2.

5.2 STRATIGRAPHY

The Plant site is located on a dunal ridge in the south portion of Amoco's Wertz oil field on a broad plain (Lost Solider Flats). Natural and cultural stratigraphy of the Plant site are discussed in the following subsections.

5.2.1 Natural Stratigraphy

Three main lithologic units occur within Lost Soldier Flats; they are late Pleistocene alluvium, Holocene sand sheet deposits, and sandy-clayey colluvium (Albanese 1989). In late Pleistocene times alluvial sediment was transported into Lost Solider Flats from Green Mountain by a system of braided streams. Towards the end of the Pleistocene, warmer conditions prevailed, resulting in less discharge of water and volume of transported sediments. Aeolian sand deposition began overlaying the alluvial deposits a minimum of 9,000 years ago. Colluvial sediments from Camp Creek Hill then began to cover the preexisting aeolian sands after 4,500 years B.P. Islands of aeolian sand were left unburied but surrounded by colluvium. The Plant site is located on such an area. Stabilization of the landscape began 4,500-2,000 years B.P. when surface soil formed after the aeolian sand sheets were deposited and partially covered by colluvium. The present configuration of the landscape within the Wertz oil field is essentially the same as the one present 4,500 years ago. There has been very little net accumulation of sediments on Lost Soldier Flats within the past 4,500 years (Albanese 1989).

Eight strata, all aeolian in nature, were identified during the block excavations at the Plant site. They were differentiated by color, texture, degree of consolidation, presence of charcoal staining, and presence of calcium carbonate. The results of detailed sediment analysis of the natural deposits at the Plant site are included in Appendix A. Figures 5.4, 5.5, and 5.6 illustrate the eight strata as they appeared on two wall profiles of the excavation block. The eight strata are listed in order from the lowest (A) to the uppermost (H).

Stratum A was a pale yellow, slightly consolidated, loamy sand that presented an abrupt separation from the overlying stratum. This distinctly colored soil was the lowest stratum encountered during excavations. This stratum was encountered in two deep test areas of the block, and no cultural material was associated with Stratum A.

Stratum B was a light yellowish brown, consolidated, sandy loam with calcium carbonate and yielded no cultural artifacts or features. It appeared to predate prehistoric occupation of the site.

Stratum C was a light yellowish brown, consolidated, sandy loam with calcium carbonate, that was distinguishable from Stratum B by a slight color variation. This stratum contained artifacts and cultural features but lacked charcoal staining that could be observed in profile.

Stratum D was a gray, moderately consolidated, sandy loam with traces of calcium carbonate and cultural charcoal staining. Most of the site features and artifacts occurred in this stratum, which represented a period of intense prehistoric occupation. Stratum D was identifiable in all walls of the excavation block due to its stained appearance.

Stratum E was a light yellowish brown, moderately consolidated, sandy loam which overlay the major cultural layer, Stratum D. Debitage was present in this stratum.

Stratum F was a light yellowish brown, moderately consolidated, sandy loam that was distinguishable from Stratum E by a slight color variation. A few pieces of debitage were recovered from this stratum.

Stratum G was yellowish brown, moderately consolidated, sandy loam that was the present dunal surface. Artifacts that were observed on the surface of the site during the original survey occurred on this stratum.

Stratum H was a white, loose, sandy loam that was spread over part of the block area as a result of the reclamation of the Wertz 152 well pad.

5.2.2 Cultural Stratigraphy

Radiocarbon age estimates and overlapping features confirmed the existence of numerous prehistoric occupations within the dunal area which could not be separated stratigraphically. A single component was defined by numerous features, charcoal staining, heat-altered rock, groundstone, flaked stone tools, debitage, animal bone, and bone tools. Stratum D, a stained band that was present throughout the excavation block,

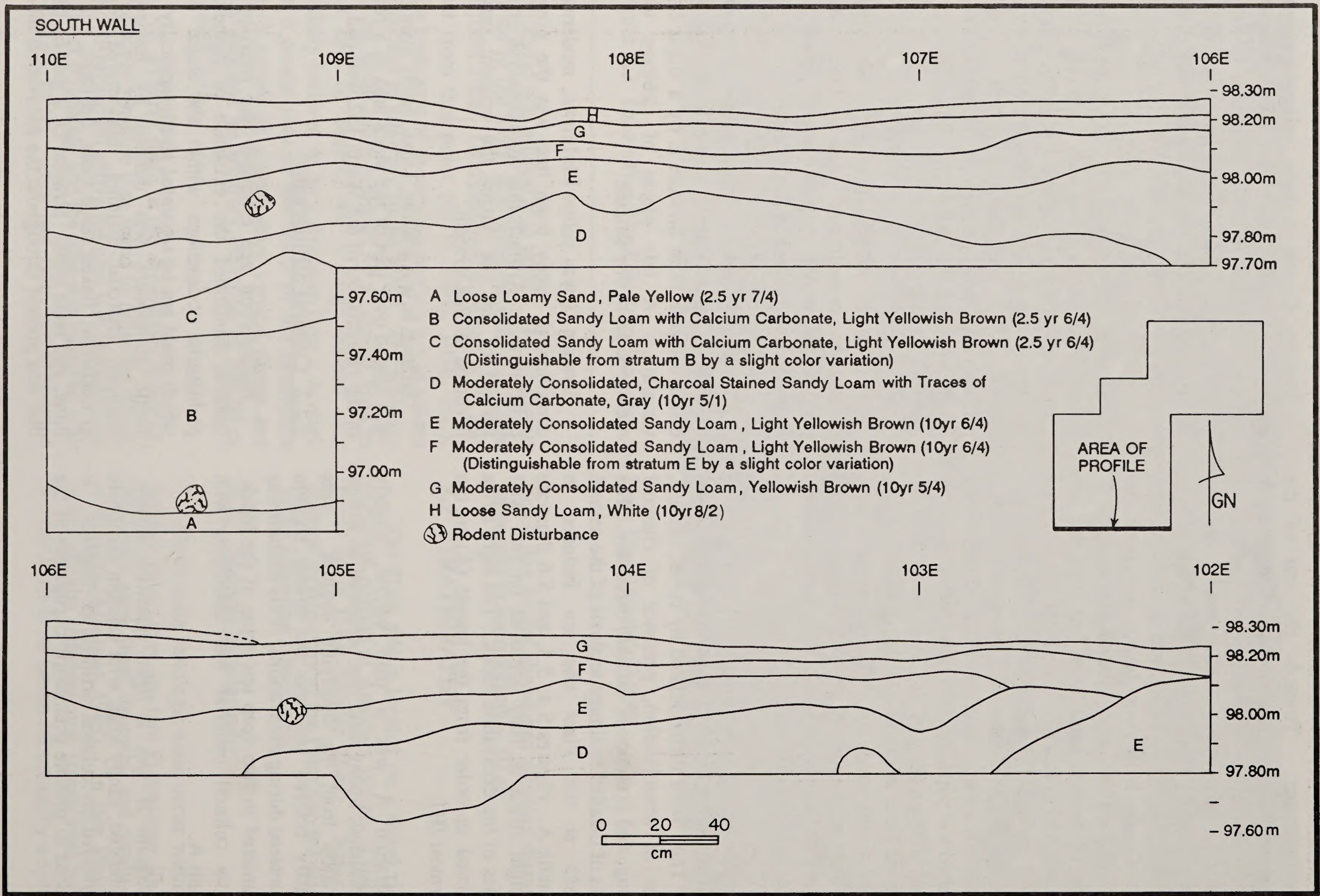
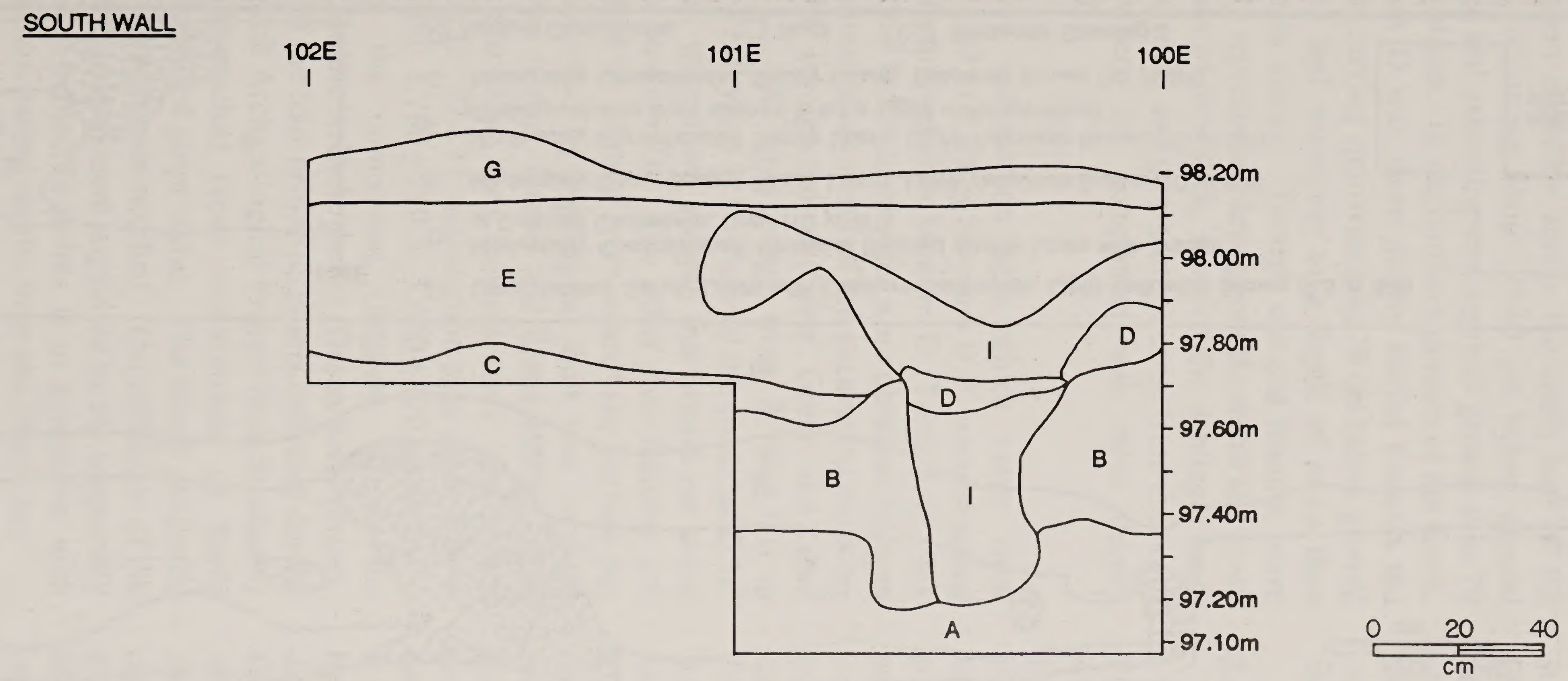


Figure 5.4 Profile of South Wall (100N) of Excavation Block, the Plant Site (Locality P-069).



A Loose Loamy Sand, Pale Yellow (2.5 yr 7/4)
B Consolidated Sandy Loam with Calcium Carbonate, Light Yellowish Brown (2.5 yr 6/4)
C Consolidated Sandy Loam with Calcium Carbonate, Light Yellowish Brown (2.5 yr 6/4) (Distinguishable from stratum B by a slight color variation)
D Moderately Consolidated, Charcoal Stained Sandy Loam with Traces of Calcium Carbonate, Gray (10yr 5/1)
E Moderately Consolidated Sandy Loam, Light Yellowish Brown (10yr 6/4)
F Moderately Consolidated Sandy Loam, Light Yellowish Brown (10yr 6/4) (Distinguishable from stratum E by a slight color variation)
G Moderately Consolidated Sandy Loam, Yellowish Brown (10yr 5/4)
H Loose Sandy Loam, White (10yr 8/2)
Rodent Disturbance

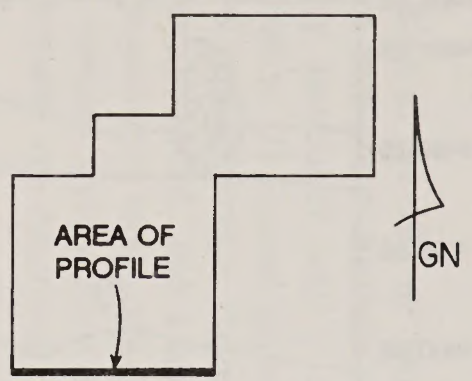


Figure 5.5 Continuation of Profile of South Wall (100N) of Excavation Bock, the Plant Site (Locality P-069).

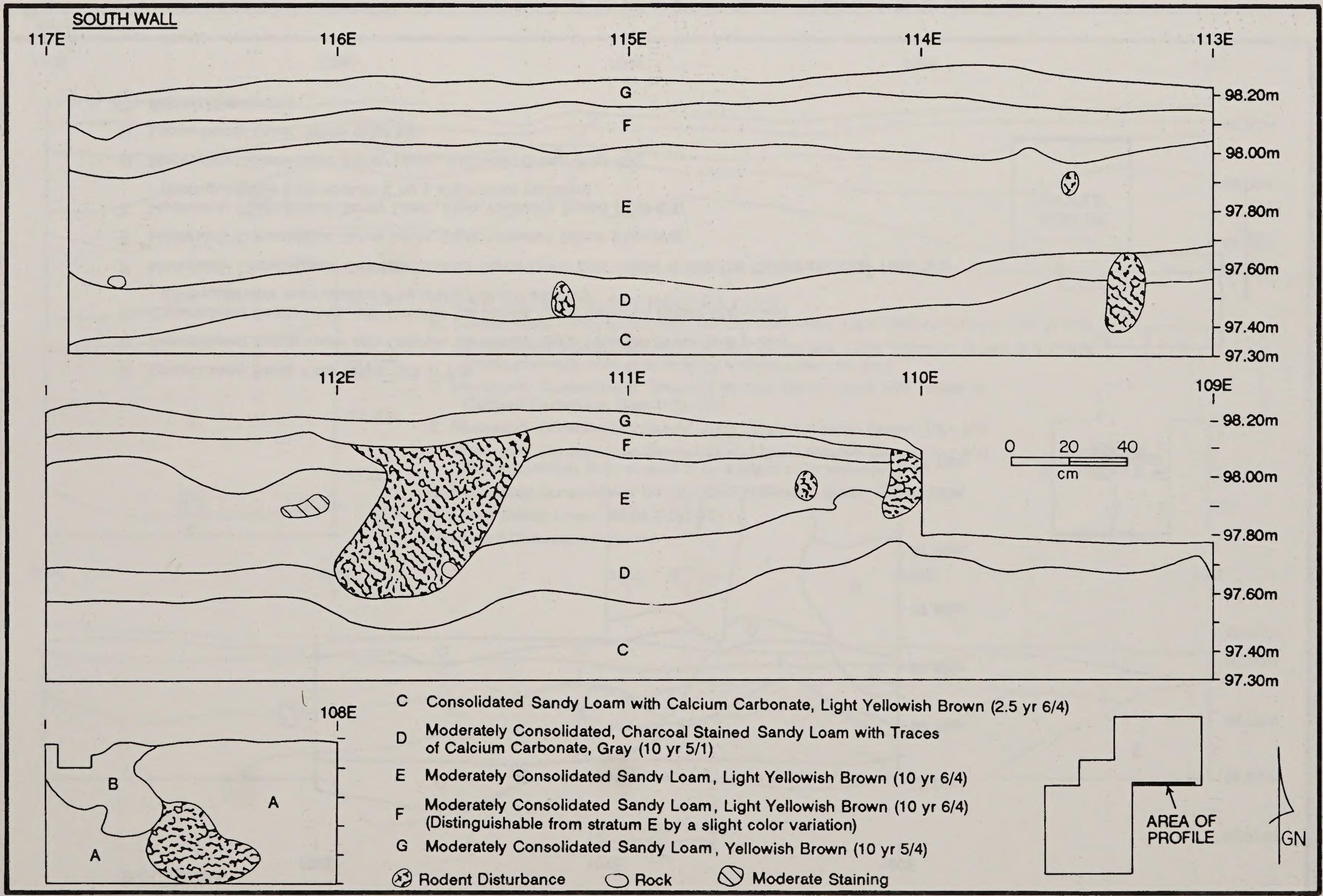


Figure 5.6 Profile of South Wall (110N) of Excavation Block, the Plant Site (Locality P-069).

contained most of the cultural material. There was so much variation in the thickness of Stratum D that only an approximate average of 20 cm can be given, although portions were as thick as 35 cm. The stained stratum was represented at a fairly consistent elevation across the south half of the block, occurring about 20-40 cm below ground surface and extending to a depth of greater than 70 cm in places. In the northern portion of the block, Stratum D was more deeply buried towards the east, occurring approximately 70 cm below ground surface and extending to a depth of more than 90 cm in places. Though cultural features were equally represented throughout the north and south portions of the block, most of the debitage, heat-altered rock, and groundstone came from the north half where the component was more deeply buried.

Five radiocarbon ages which range from 3,830±80 to 5,030±80 years B.P. were obtained from features within Stratum D (Table 5.1). Six additional radiocarbon ages were obtained from an area immediately north of the excavation block by the GAC salvage project (Greer, Greer, and Zettel 1989b). The ages range from 3,780±110 to 5,660±110 years B.P. Four of the six dated GAC features were from a depth that would put them within Stratum D. The other two features are described as coming from nearer the surface but were exposed by blading so their true depth is unknown (Greer, Greer, and Zettel 1989b). It is likely that these two features were also within Stratum D. The 11 radiocarbon ages cover a time span from 3,780±110 to 5,660±110 years B.P., placing the component (Stratum D) in the Early/Middle Archaic period (Green River phase). Three of the four projectile points collected during the Bairoil Archaeological Project from Stratum D are side-notched types characteristic of Early Archaic period point styles. The fourth projectile point is side/corner-notched. The affiliation of the prehistoric component suggested by the temporally diagnostic projectile points is in agreement with radiocarbon dating results from the Plant site.

5.3 RESULTS

Excavation of the 192 m^2 block at the Plant site revealed multiple prehistoric occupations with the majority associated with a charcoal-stained stratum (Stratum D) located approximately 20 to 90 cm below ground surface. Seventy-one cultural features were recorded, and a number of flaked stone and groundstone tools, other tools, debitage, and animal remains were recovered. The various classes of remains are described in the following subsections.

5.3.1 Features and Heat-altered Rock

Test excavations and block excavation at the Plant site recorded 71 features; seven of these were partially excavated in test units and later incorporated into the excavation block, and two (Features 2 and 3) were from test units outside the block (Table 5.2). (Features were numbered sequentially, but due to the technical difficulties of assigning numbers to superimposed features, one number [38] was deleted, leaving 71 actual features.) Of the 71 features, 66 were defined as firepits or ash pits of various sizes and depths. Three of the five remaining features were rock scatters, one was an ash stain, and one was a cache of stone tools. The pits can be generally grouped by morphological type as hemispherical (basin), cylindrical, and fan. Fifty-seven features were basin-shaped, seven features were of cylindrical shape (having vertical sides), and three were fans with very shallow profiles. Pit sizes ranged from 25 x 25 x 22 cm (Feature 32) to 89 x 89 x 32 cm (Feature 56), with an average size being approximately 60 cm in diameter and 25 cm deep. Oxidation was present in 28 of the features. Heat-altered rock was absent in a majority of the pit features. Fourteen of the 66 pits had heat-altered rock within the fill or in association, usually numbering 1-15 pieces. A single exceptional feature (Feature 47) contained a fill of 36 rocks. Though a majority of the features contained moderately to darkly stained fill, only three produced charcoal pieces. Most of the features were arranged in clusters throughout the

Table 5.1 Uncorrected Age Estimates and Calibrated Age Estimates, the Plant Site (Locality P-069).

	Feature				Calibrated Age Estimate (Years B.P.)[1]		
Component	Number	Type	Lab Number (Beta-)	Age Estimate (Years B.P)	Intercept(s)[2]	Range (one sigma)	Sample Type
I	47	Roasting pit	41532	3,830±80	4248	4409-4093	Sediment
I	55	Oxidized basin	41533	4,810±70	5582, 5501, 5498	5643-5466	Sediment
I	18	Oxidized basin	41534	4,920±80	5720, 5713, 5637	5734-5590	Sediment
I	45	Cylindrical pit	41535	4,840±80	5591	5721-5474	Sediment
I	64	Oxidized basin	41536	5,030±80	5851, 5761, 5739	5913-5639	Sediment

[1] Calibration based on Pearson et al. (1986).
[2] If the estimate has more than three intercepts, the largest, middle, and smallest intercepts are included.

Table 5.2 Characteristics of Cultural Features, the Plant Site (Locality P-069).

				Dimensions (cm)[1]						Rocks			
Feature No.	Excavation Unit	Type	Cross Section	L	W	D	Area (cm^2)	Volume (liters)	Oxidation	Type	No.	Weight (kg)	Remarks
1	104N 102E,NE 104N 104E,NW 106N 102E,SE 106N 104E,SW	Unoxidized basin	Hemisphere	76	75	30	4,477	44.8	Absent	--	--	--	Partially Excavated in Test Unit 1
2	Test Unit 2	Unoxidized basin	Hemisphere	52	52	13	1,327	57.5	Absent	--	--	--	Outside excavation grid
3	Test Unit 3	Unoxidized basin	Hemisphere	•	•	20	--	--	Absent	Quartzite Sandstone		0.25 0.75	Outside excavation grid
4	116N 108E,NE	Unoxidized basin	Hemisphere	35	40	18	1,104	6.6	Absent	Granite	1	0.15	Partially excavated in Test Unit 5
5	105N 108E,SW	Unoxidized cylinder	Cylindrical	62	60	37	2,922	108.1	Absent	--	--	--	Partially excavated in Test Unit 4
6	116N 110E,N½	Unoxidized basin	Hemisphere	74	69	12	4,015	16.0	Absent	--	--	--	Partially excavated in Test Unit 5
7	112N 112E,NE 114N 112E,S½	Oxidized cylinder	Cylindrical	68	65	55	3,473	191.0	Present	--	--	--	Partially excavated in Test Unit 6
8	110N 116E,SE	Rock scatter	--	80	85	0	5,346	--	Absent	Granite	42	17.0	Excavated in Test Unit 7; extends beyond the block grid to the south
9	104N 100E,E½ 104N 102E,W½	Unoxidized basin	Hemisphere	66	68	31	3,525	36.4	Absent	--	--	--	Superimposed with Feature 16
10	106N 102E,NW	Unoxidized Cylinder	Cylindrical	77	75	15	4,536	68.0	Absent	Granite	1	0.15	--

Table 5.2 (continued)

Feature No.	Excavation Unit	Type	Cross Section	Dimensions (cm)[1] L	W	D	Area (cm^2)	Volume (liters)	Oxidation	Rocks Type	No.	Weight (kg)	Remarks
11	100N 102E,N½	Unoxidized basin	Hemisphere	83	69	68	4,477	32.8	Absent	--	--	--	--
12	108N 100E,SE 108N 102E,SW	Unoxidized basin	Hemisphere	80	79	20	4,964	33.0	Absent	--	--	--	--
13	102N 104E,NE 104N 104E,SE	Unoxidized basin	Hemisphere	77	69	87	5,281	33.4	Absent	--	--	--	--
14	104N 100E,NE 102N 104E,SE	Oxidized basin	Hemisphere	74	63	16	3,526	18.8	Present	--	--	--	--
15	104N 108E,N½ 106N 100E,E½	Oxidized basin	Hemisphere	80	70	12	4,418	17.6	Present	Granite	5	1.15	--
16	104N 100E,E½	Unoxidized basin	Hemisphere	88	65	26	4,595	39.8	Absent	--	--	--	Superimposed with Feature 9
17	100N 104E,SW	Unoxidized basin	Hemisphere	55	88	35	3,848	44.8	Absent	--	--	--	Superimposed with Features 27 and 30
18	104N 104E,N½	Oxidized basin	Hemisphere	68	62	47	3,318	51.9	Present	--	--	--	4,920 ± 80 years B.P.; partially excavated in Test Unit 1
19	104N 104E,E½	Unoxidized basin	Fan	68	55	6	2,970	5.9	Absent	--	--	--	--
20	102N 102E,SE	Unoxidized basin	Hemisphere	63	81	35	4,072	47.5	Absent	--	--	--	--
21	102N 104E,SE	Unoxidized basin	Hemisphere	40	40	4	1,256	1.6	Absent	--	--	--	--
22	104N 100E,NE 104N 102E,NW 106N 100E,SE 106N 102E,SW	Oxidized basin	Hemisphere	48	63	23	2,419	18.5	Present	--	--	--	--

Table 5.2 (continued)

Feature No.	Excavation Unit	Type	Cross Section	Dimensions (cm)[1] L	W	D	Area (cm^2)	Volume (liters)	Oxidation	Rocks Type	No.	Weight (kg)	Remarks
23	100N 106E,SW	Unoxidized basin	Hemisphere	40*	52	9	1,662	4.9	Absent	Sandstone	1	0.003	--
24	100N 100E,NW	Unoxidized basin	Hemisphere	30	10*	4	314	0.4	Absent	--	--	--	--
25	108N 100E,E½	Unoxidized basin	Hemisphere	48	62	12	2,333	9.3	Absent	--	--	--	--
26	106N 102E,E½ 106N 104E,W½	Oxidized basin	Hemisphere	64	76	28	3,849	35.9	Present	--	--	--	Impacted by pipeline trench; superimposed with Feature 35
27	100N 102E,SE 100N 104E,SW	Oxidized basin	Hemisphere	60	72	22	3,421	25.0	Present	--	--	--	Superimposed with Feature 17
28	108N 108E,E½	Tool cache	Cylindrical	13	12	7	87	0.6	--	--	--	--	Seven piece tool cache
29	108N 108,N½	Oxidized basin	Hemisphere	66	66	36	3,421	41.0	Present	--	--	--	--
30	100N 104E,SW	Oxidized basin	Hemisphere	55	72	20	3,167	21.1	Present	--	--	--	Superimposed with Feature 17
31	106N 108E,NE	Oxidized basin	Hemisphere	30	30	4	707	0.9	Present	--	--	--	--
32	106N 108E,SW	Unoxidized cylinder	Cylindrical	25	25	22	491	10.7	Absent	--	--	--	--
33	106N 104E,NE 106N 106E,NW 108N 106E,SW 108N 104E,SE	Oxidized basin	Hemisphere	105	80	45	6,720	100.8	Present	--	--	--	Superimposed with Feature 44
34	106N 104E,NE	Unoxidized basin	Hemisphere	34	28	12	755	3.0	--	--	--	--	Impacted by pipeline trench
35	106N 102E,E½ 106N 104E,W½	Oxidized basin	Hemisphere	65	65	16	3,318	17.6	Present	--	--	--	Superimposed with Feature 26

Table 5.2 (continued)

Feature No.	Excavation Unit	Type	Cross Section	Dimensions (cm)[1] L	W	D	Area (cm2)	Volume (liter)	Oxidation	Rocks Type	No.	Weight (kg)	Remarks
37	110N 114E,E½	Oxidized basin	Hemisphere	63	64	13	3,167	13.7	Present	--	--	--	--
38	114N 110E,SW	Unoxidized basin	Hemisphere	22	7	7	299	0.2	Absent	--	--	--	--
40	114N 110E,NW	Unoxidized basin	Hemisphere	28	23	7	511	1.1	Absent	--	--	--	--
41	114N 110E,NE 116N 110E,SE	Unoxidized basin	Hemisphere	35	39	16	1,075	5.7	Absent	--	--	--	Superimposed with Feature 45
42	114N 116E	Rock scatter		125	120	14	11,786	--	Absent	Granite Sandstone	78 16	37.5 1.0	--
43	110N 108E,N½ 112N 108E,S½	Unoxidized basin	Hemisphere	68	70	13	3,739	16.2	Absent	--	--	--	--
44	108N 104E 108N 106E 108N 108E,N½ 110N 104E 110N 106E 110N 108E,W½	Amorphous stain	Fan	400	450	36	141,863	1,702.3	Absent	Granite	1	0.5	Superimposed with Features 33, 36, 50, 52, 53, 54, 55, 56, and 57; partially excavated in Test Unit 4 and impacted by a backhoe trench
45	114N 110E,N½ 116N 110E,S½	Oxidized cylinder	Cylindrical	79	68	43	4,243	182.4	Present	--	--	--	Superimposed with Feature 41; 4840 ± 80 years B.P.
46	114N 108E,WSE	Oxidized basin	Hemisphere	78	74	28	4,536	42.3	Present	--	--	--	Superimposed with Features 49, 59, and 69

Table 5.2 (continued)

Feature No.	Excavation Unit	Type	Cross Section	Dimensions (cm)[1] L	W	D	Area (cm^2)	Volume (liters)	Oxidation	Rocks Type	No.	Weight (kg)	Remarks
47	110N 116E,N½ 112N 116E,SE	Oxidized roasting pit	Hemisphere	67	62	18	3,267	19.6	Present	Granite	36	15.500	3,830±80 years B.P.
48	112N 110E,NW	Unoxidized fan	Fan	70	91	4	5,090	6.7	Absent	--	--	--	Superimposed with Feature 61
49	114N 108E,S½	Unoxidized cylin-der	Cylindrical	43	46	28	1,555	43.5	Absent	--	--	--	Superimposed with Feature 69
50	110N 108E,NW	Unoxidized basin	Hemisphere	56	52	15	2,290	11.4	Absent	--	--	--	Superimposed with Feature 44
51	112N 114E,NW 114N 114E,SW	Oxidized basin	Hemisphere	35	50	6	1,418	2.8	Present	Quartzite	3	0.35	--
52	110N 104E,SW	Unoxidized basin	Hemisphere	48	47	10	1,772	5.9	Absent	Quartzite	1	0.005	Superimposed with Feature 44
53	110N 104E	Unoxidized basin	Hemisphere	96	80	35	6,082	70.9	Absent	--	--	--	Superimposed with Feature 44
54	110N 104E,SE	Unoxidized basin	Hemisphere	79	77	45	4,778	71.6	Absent	Granite	1	0.01	Superimposed with Feature 44
55	108N 104E,N½	Oxidized basin	Hemisphere	83	80	39	5,217	67.8	Present	--	--	--	Superimposed with Feature 44; 4,810±70 years B.P.
56	108N 104E,N½	Unoxidized basin	Hemisphere	89	89	32	6,221	66.3	Absent	Granite	2	0.005	Superimposed with Feature 44
57	110N 106E,SE	Unoxidized basin	Hemisphere	53	48	16	2,001	10.6	Absent	Granite	3	0.10	Superimposed with Feature 44
58	114N 110E,E½	Oxidized cylinder	Cylindrical	68	60	34	3,216	36.4	Present	--	--	--	--
59	114N 108E,SW	Oxidized basin	Hemisphere	37	37	26	1,075	27.9	Present	--	--	--	Superimposed with Feature 46

Table 5.2 (continued)

Feature No.	Excavation Unit	Type	Cross Section	Dimensions (cm)[1] L	W	D	Area (cm^2)	Volume (liters)	Oxidation	Rocks Type	No.	Weight (kg)	Remarks
60	112N 110E	Rock scatter		150	120	0	14,314	--	Absent	Granite	30	18.75	--
61	112N 110E,NW	Oxidized basin	Hemisphere	70	68	29	3,739	36.1	Present	--	--	--	Superimposed with Feature 48
62	116N 116E,S½	Unoxidized basin	Hemisphere	36	44	10	1,257	4.1	Absent	--	--	--	--
63	116N 116E	Oxidized basin	Hemisphere	96	71	23	5,476	41.9	Present	Granite	10	0.05	--
64	114N 112E,E½ 114N 114E,W½	Oxidized basin	Hemisphere	57	58	58	2,597	150.6	Present	--	--	--	5030±80 years B.P.
65	116N 116E,NE	Unoxidized basin	Hemisphere	49	42	18	1,626	9.7	Absent	Granite	3	0.08	Superimposed with Feature 67
66	112N 108E,E	Unoxidized basin	Hemisphere	60	65	18	3,068	18.0	Absent	--	--	--	--
67	116N 116E,NE	Oxidized basin	Hemisphere	60	58	64	3,019	33.2	Present	Granite Quartzite	15 1	.325 0.01	Superimposed with Feature 65
68	116N 110E,ESW	Unoxidized basin	Hemisphere	76	86	26	5,153	44.6	Absent	--	--	--	--
69	114N 108E,S½	Oxidized basin	Hemisphere	70	75	12	4,128	16.5	Present	--	--	--	Superimposed with Feature 49
70	110N 112E,NE	Unoxidized basin	Hemisphere	32	38	20	962	6.4	Absent	--	--	--	Superimposed with Feature 71
71	110N 112E	Oxidized basin	Hemisphere	669	68	58	3,685	52.8	Present	--	--	--	Superimposed with Feature 70
72	114N 116E	Oxidized basin	Hemisphere	54	42*	10	1,809	6.0	Present	--	--	--	--

[1] L = Length; W = Width; D = Depth; * = Incomplete Dimensions.

block. Five clusters, ranging in number from two to four features, were superimposed.

5.3.1.1 Unoxidized Basins

Thirty-two basin-shaped features that exhibited no signs of oxidation were excavated at the Plant site. The interior fill of all the basins contained charcoal-stained soil, and all were interpreted as features in which oxidation was not preserved, or was not produced due to insufficient heat or soil conditions. Eight unoxidized basins (25%) produced 16 pieces of debitage, accounting for 2% of the total debitage count. Six unoxidized basins (19%) produced heat-altered rock totaling 0.348 kg, accounting for .003% of the total heat-altered rock weight from the site. Thirteen unoxidized features (41%) produced 147 animal remains or 8% of the total animal remains from the site. Seven samples of stained sediment that totalled 11.7 liters were floated from unoxidized basins with no charred seeds recovered.

Feature 11 (Figure 5.7) is an example of a typical unoxidized basin-shaped feature. Feature 25, an unoxidized basin, was unusual in that it appeared to be an excavated pit in which a fire had never been built (Figure 5.8). The pit fill was laminated layers of charcoal-stained and unstained soil which had been deposited by wind action, the charcoal having blown in from adjacent fire pits. Feature 25 could also have been a storage cist.

5.3.1.2 Oxidized Basins

Twenty-five basin-shaped features that exhibited oxidation along the pit boundaries were excavated at the Plant site. Oxidation color was a dull red-orange to moderate orange hue, appearing most commonly as spots or patches. Twenty-one of the features showed only small traces of oxidation amounting to 10% or less of the surface area. Five features (7, 29, 36, 37, 47) were oxidized to a greater degree, amounting to 25-50% of their surface area. Feature 29 (Figure 5.9) is a typical basin exhibiting extensive medium to intensive oxidation.

Two oxidized basins are unusual in the amount of artifacts associated with them. Feature 15, a basin exhibiting oxidization on less than 10% of its surface (Figure 5.10), produced five granite rocks from within the fill weighing a total of 1.15 kg, as well as debitage, bone identified as sage grouse (CR4139-147), and large animal bone of elk or bison size (CR4139-112).

Radiocarbon ages were obtained from three oxidized basins. Feature 64 was dated at 5,030$\pm$80 years B.P. (Beta-41536), Feature 53 was dated at 4,810$\pm$70 years B.P. (Beta-41533), and Feature 18 produced a date of 4,920$\pm$80 years B.P. (Beta-41534).

Eleven oxidized basins (44%) produced 48 pieces of debitage, accounting for 6.2% of the total debitage count from the site. Six oxidized basins (24%) produced heat-altered rock that weighed 20.2 kg, accounting for 16% of the total heat-altered rock weight from the site. Seventeen oxidized basins (68%) produced 77 bone or tooth fragments, or 4% of the total animal remains from the site. Two groundstone tools came from Features 67 and 64. A side-notched projectile point (CR4139-351) and a piece of ground ocher (CR4139-263) were recovered from Feature 27. Feature 63 was oxidized on more than 50% of its surface (Figure 5.11). Ten granite rocks weighing a total of 0.05 kg were associated with the feature, as well as bone fragments. Eleven samples of stained sediment that totalled 17.5 liters were floated from oxidized basins with no charred seeds recovered.

5.3.1.3 Cylindrical Features

Seven features exhibiting cylindrical (vertical sides) shapes were excavated at the Plant site. Two of the seven features (7 and 58) were distinct cylinders with vertical walls. Feature 7 (Figure 5.12) was the best example of a cylindrical feature excavated at the site. The depth of this feature in proportion to its width created a true vertical-sided construction. The other five features exhibited the cylindrical shape less accurately. It is possible that they were actually basins with

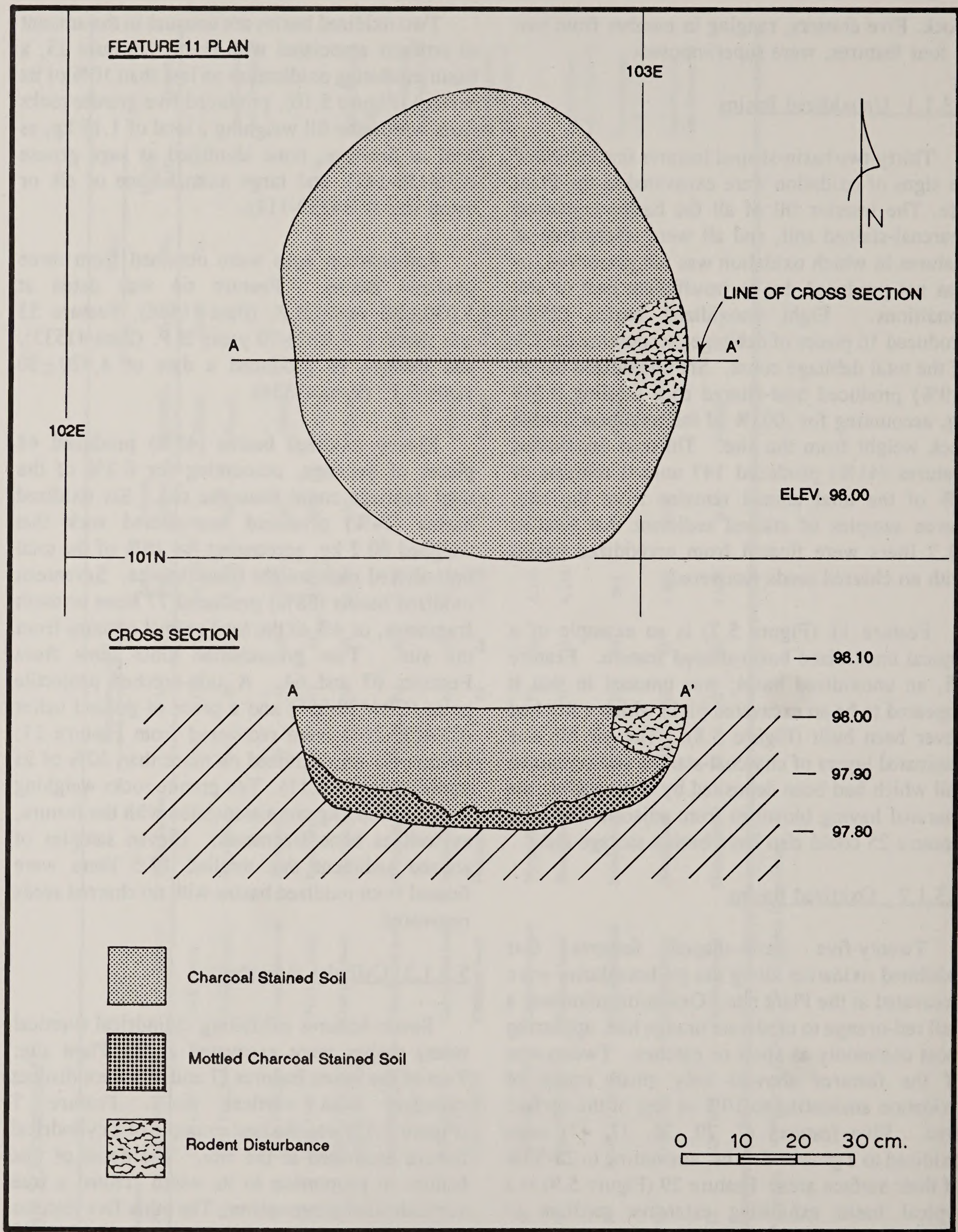


Figure 5.7 Plan View and Cross Section of Feature 11, the Plant Site (Locality P-069).

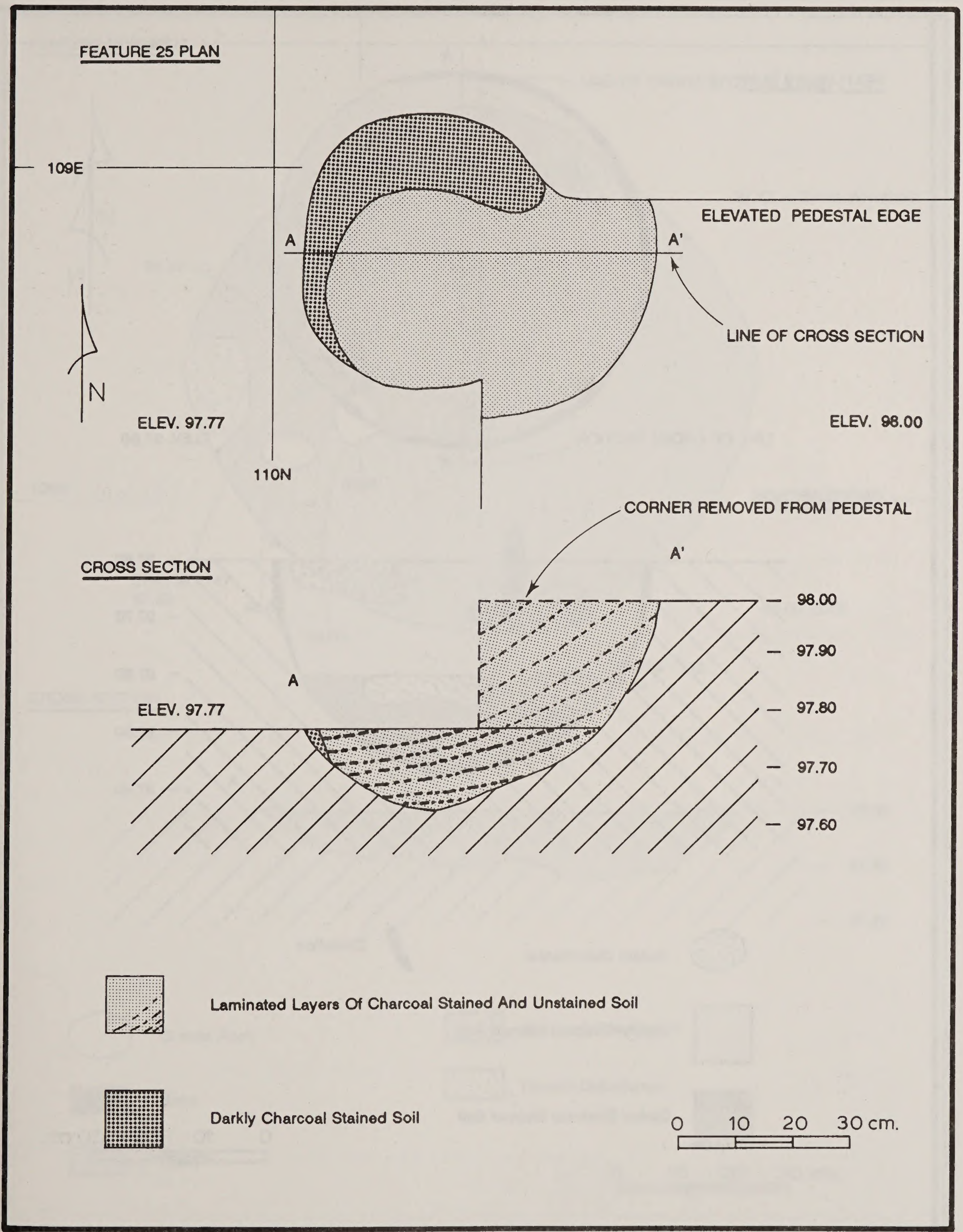


Figure 5.8 Plan View and Cross Section of Feature 25, the Plant Site (Locality P-069).

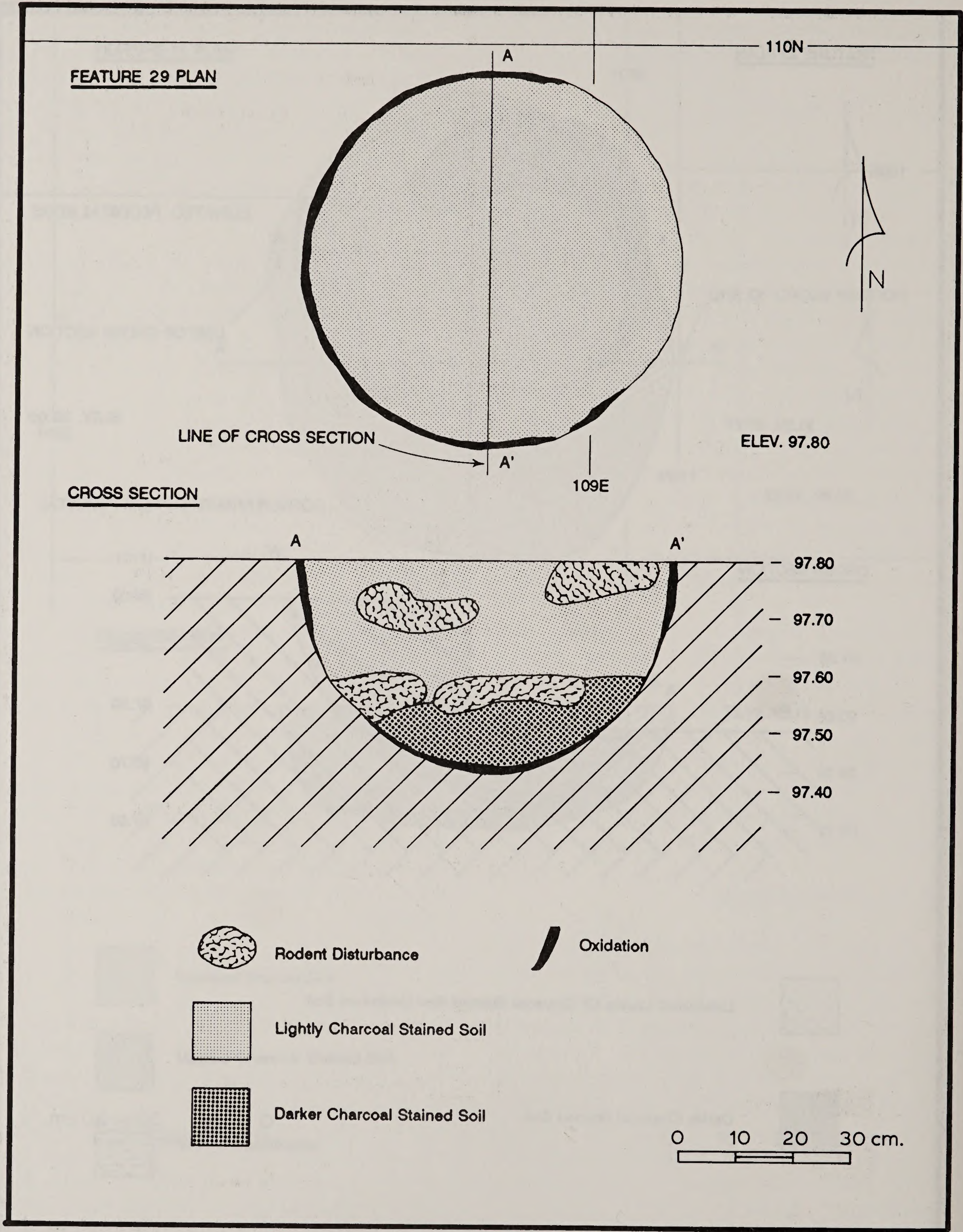


Figure 5.9 Plan View and Cross Section of Feature 29, the Plant Site (Locality P-069).

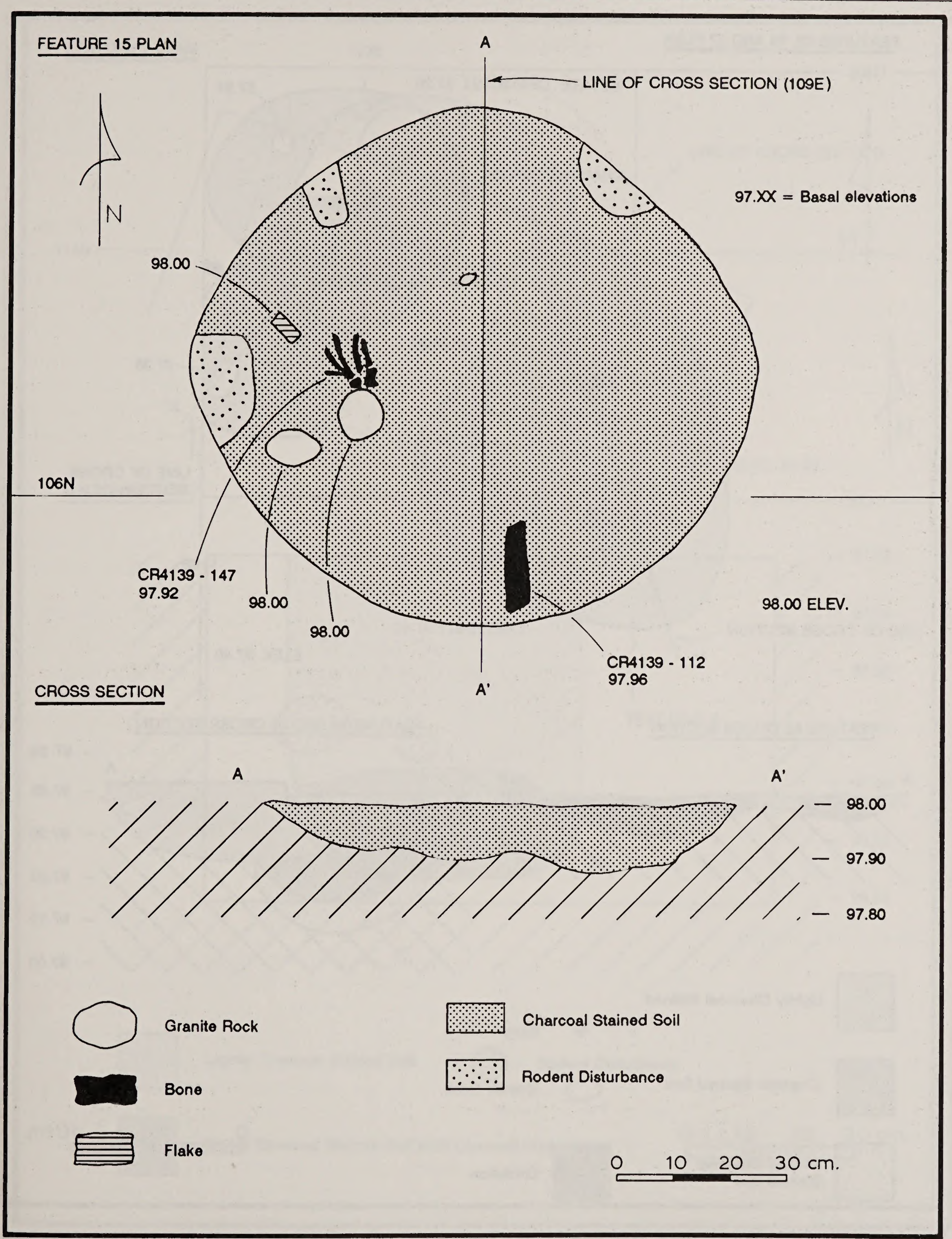


Figure 5.10 Plan View and Cross Section of Feature 15, the Plant Site (Locality P-069).

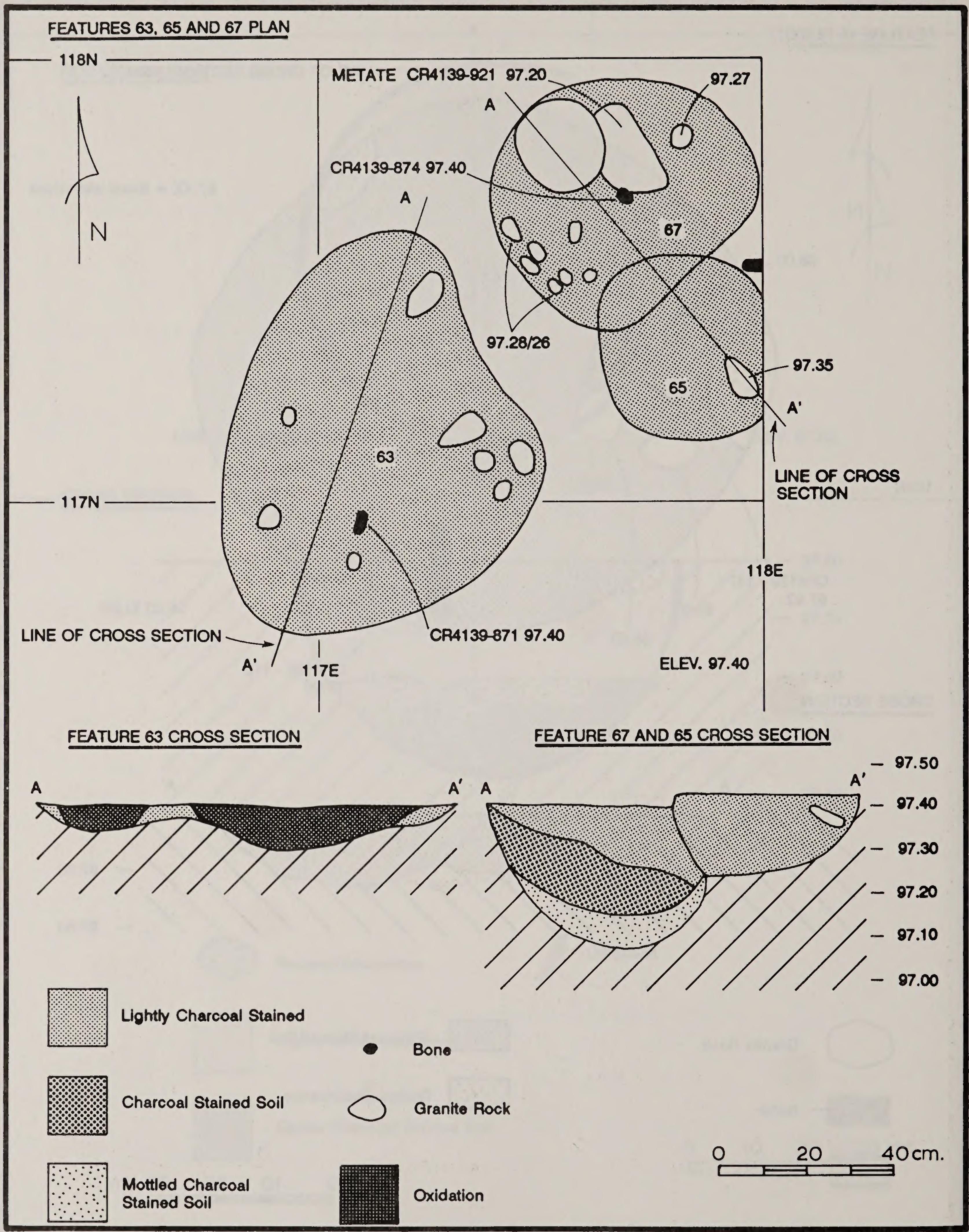


Figure 5.11 Plan View and Cross Section of Features 63, 65, and 67, the Plant Site (Locality P-069).

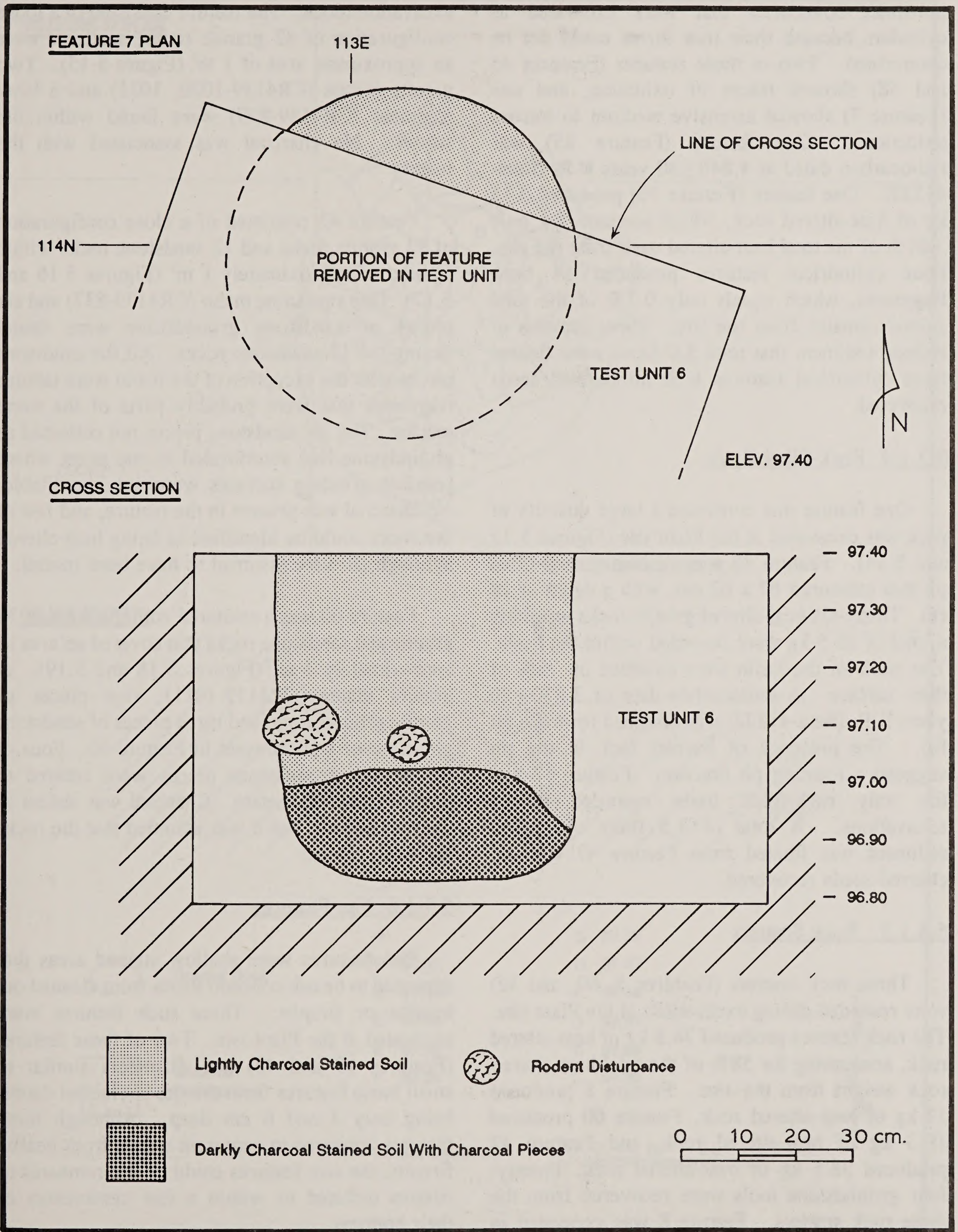


Figure 5.12 Plan View and Cross Section of Feature 7, the Plant Site (Locality P-069).

indistinct boundaries that were excavated as cylinders because their true forms could not be determined. Two of these features (Features 45 and 58) showed traces of oxidation, and one (Feature 7) showed extensive medium to intense oxidation. One feature (Feature 45) was radiocarbon dated at 4,840±80 years B.P. (Beta-41535). One feature (Feature 10) produced 0.15 kg of heat-altered rock, which accounts for only .001% of the total heat-altered rock from the site. Four cylindrical features produced 14 bone fragments, which equals only 0.7% of the total animal remains from the site. Three samples of stained sediment that total 5.0 liters were floated from cylindrical features with no charred seeds recovered.

5.3.1.4 Rock-filled Basin

One feature that contained a large quantity of rock was excavated at the Plant site (Figures 5.13 and 5.14). Feature 47 was an ovate, rock-filled pit that measured 67 x 62 cm, with a depth of 18 cm. Thirty-six heat-altered granite rocks weighing a total of 15.5 kg were recorded within the basin. The walls of the basin were oxidized on 75% of their surface. A radiocarbon date of 3,830±80 years B.P. (Beta-41532) was obtained from the pit fill. The presence of burned rock in the pit suggests a roasting pit function. Feature 47 was the only rock-filled basin recorded during excavations. A total of 3.5 liters of stained sediment was floated from Feature 47 with no charred seeds recovered.

5.3.1.5 Rock Scatters

Three rock scatters (Features 8, 60, and 42) were recorded during excavations at the Plant site. The rock scatters produced 74.8 kg of heat-altered rock, accounting for 58% of the total heat-altered rock weight from the site. Feature 8 produced 17 kg of heat-altered rock, Feature 60 produced 19.3 kg of heat-altered rock, and Feature 42 produced 38.5 kg of heat-altered rock. Twenty-four groundstone tools were recovered from the three rock scatters. Feature 8 was excavated in Test Unit 7, which was later incorporated into the excavation block. The feature consisted of a loose configuration of 42 granite rocks, scattered over an approximate area of 1 m^2 (Figure 5.15). Two granite manos (CR4139-1020, 1021) and a bone fragment (CR4139-879) were found within the scatter. No charcoal was associated with the feature.

Feature 42 consisted of a close configuration of 82 granite rocks and 12 sandstone rocks within an area of approximately 1 m^2 (Figures 5.16 and 5.17). One sandstone mano (CR4139-837) and six pieces of sandstone groundstone were found among the 12 sandstone rocks. All the sandstone pieces with the exception of the mano were tabular fragments that were probably parts of the same metate. The six sandstone pieces not collected as groundstone had deteriorated to the point where possible grinding surfaces were not identifiable. No charcoal was present in the feature, and few of the rocks could be identified as being heat-altered although all were assumed to have been heated.

Feature 60 was a scattered configuration of 30 granite and sandstone rocks that covered an area of approximately 3 m^2 (Figures 5.18 and 5.19). A granite mano (CR4139-1011), five pieces of granite groundstone, and three pieces of sandstone groundstone were present in Feature 60. Four of the granite groundstone pieces were refitted to form a complete metate. Charcoal was absent in the rock scatter, but it was assumed that the rocks had been heated.

5.3.1.6 Fan Features

Fan features were shallow stained areas that appeared to be ash concentrations from cleaned out hearths or firepits. Three such features were excavated at the Plant site. Two of these features (Features 19 and 48) had diameters similar to small basin features from the site but lacked depth, being only 4 and 6 cm deep. Although these features appeared to represent debris from nearby firepits, the two features could be the remnants of firepits deflated to within a few centimeters of their bottoms.

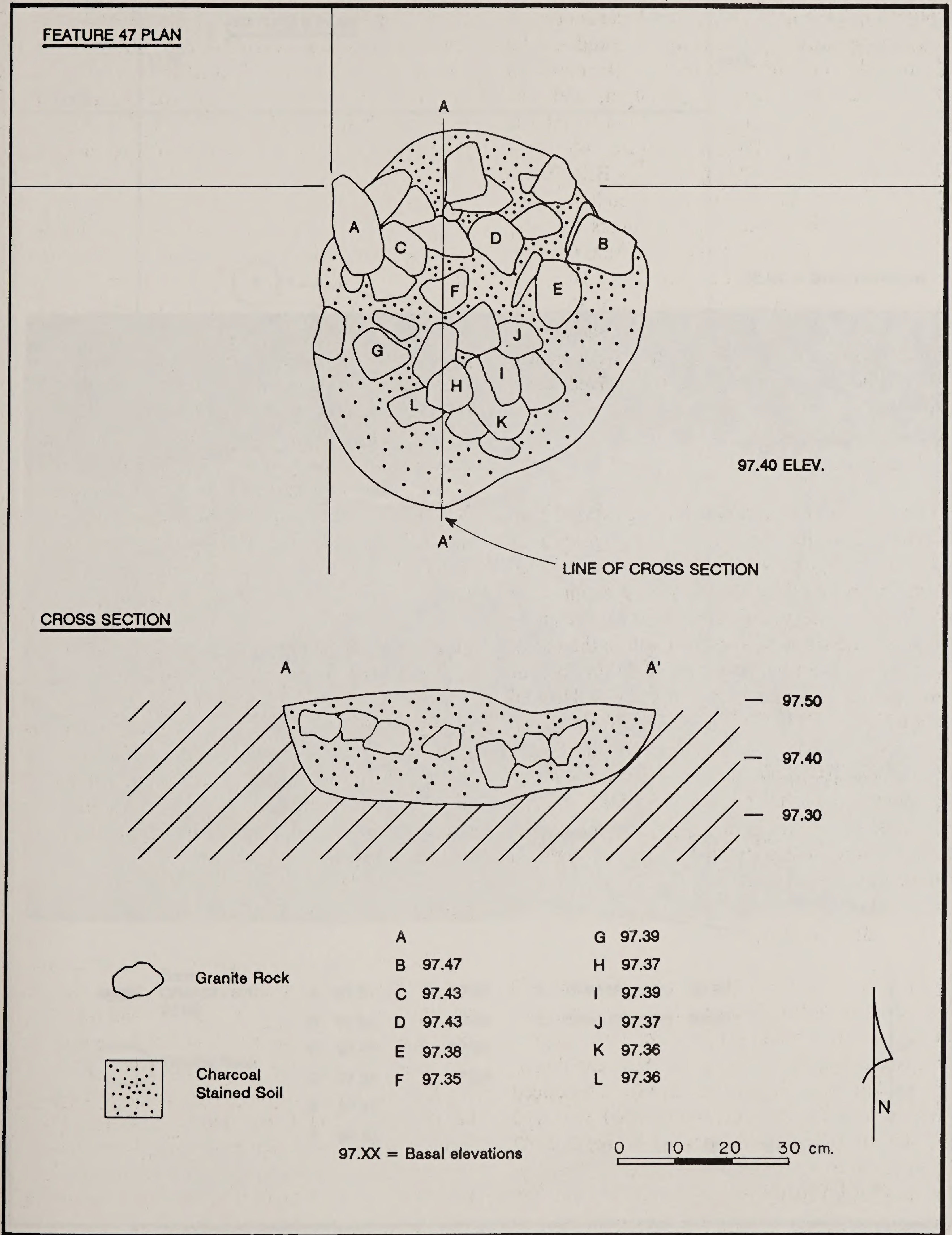


Figure 5.13 Plan View and Cross Section of Feature 47, the Plant Site (Locality P-069).

Figure 5.14 Feature 47 Facing East, the Plant Site (Locality P-069).

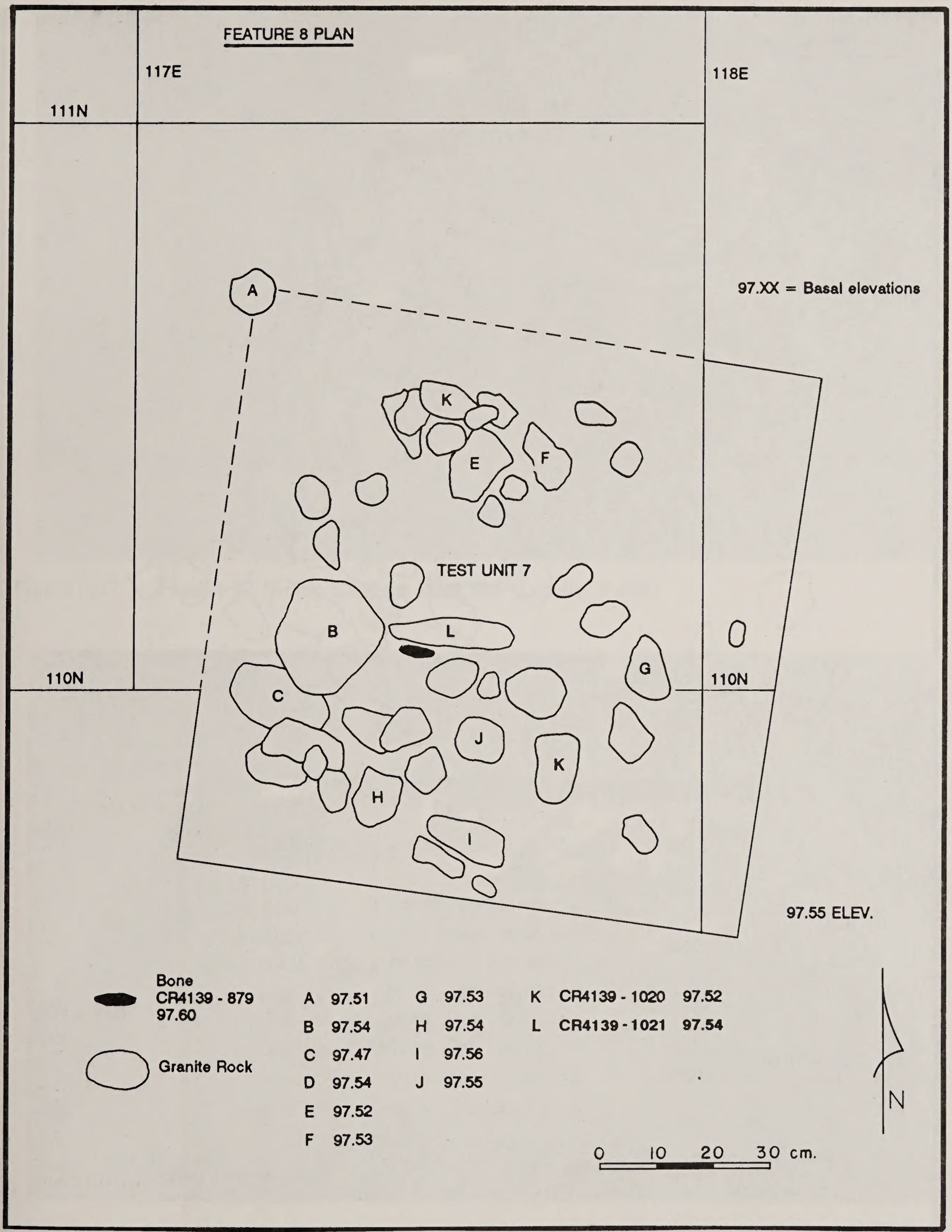


Figure 5.15 Plan View of Feature 8, the Plant Site (Locality P-069).

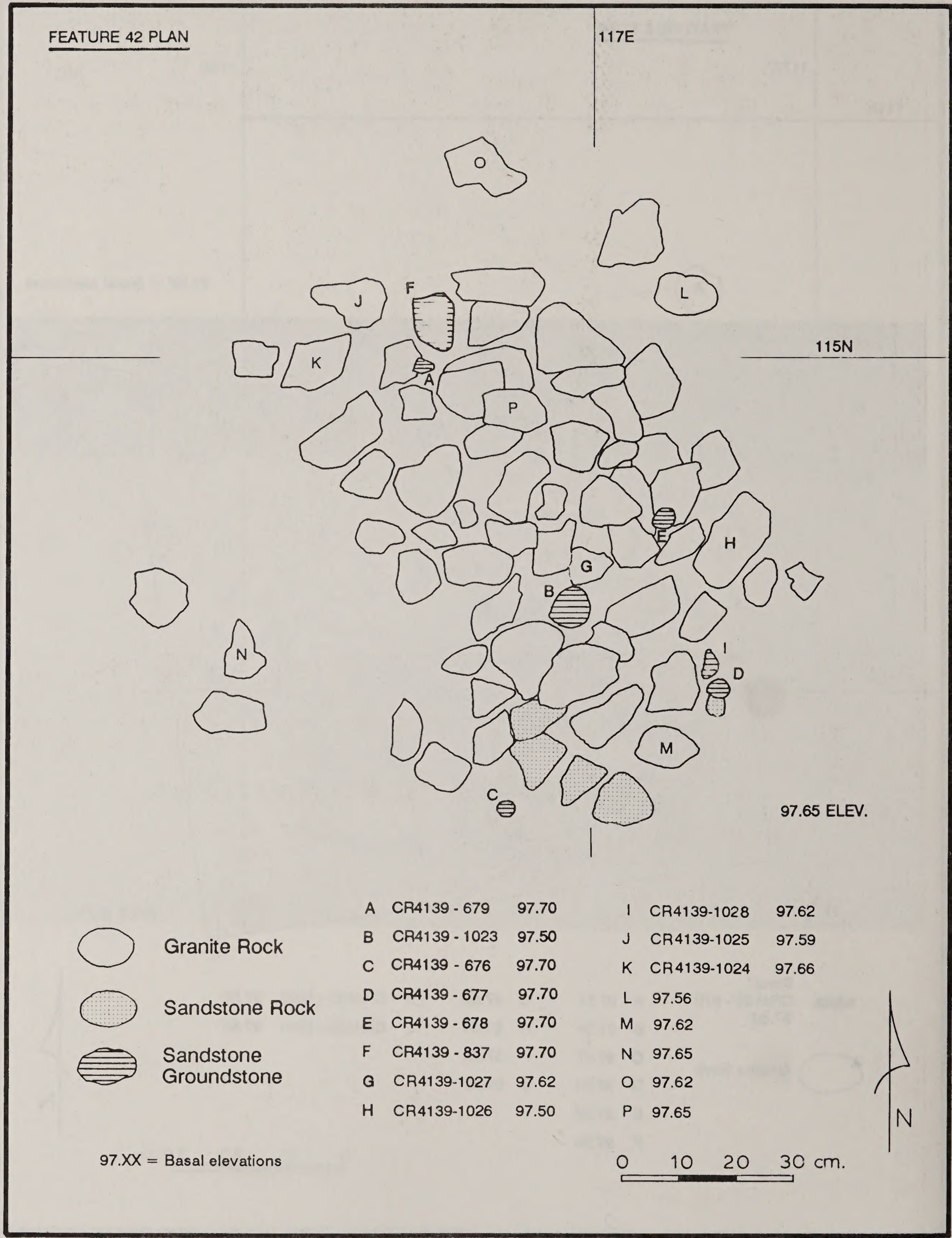


Figure 5.16 Plan View of Feature 42, the Plant Site (Locality P-069).

Figure 5.17 Feature 42 Facing East, the Plant Site (Locality P-069).

Figure 5.18 Feature 60 Facing South, the Plant Site (Locality P-069).

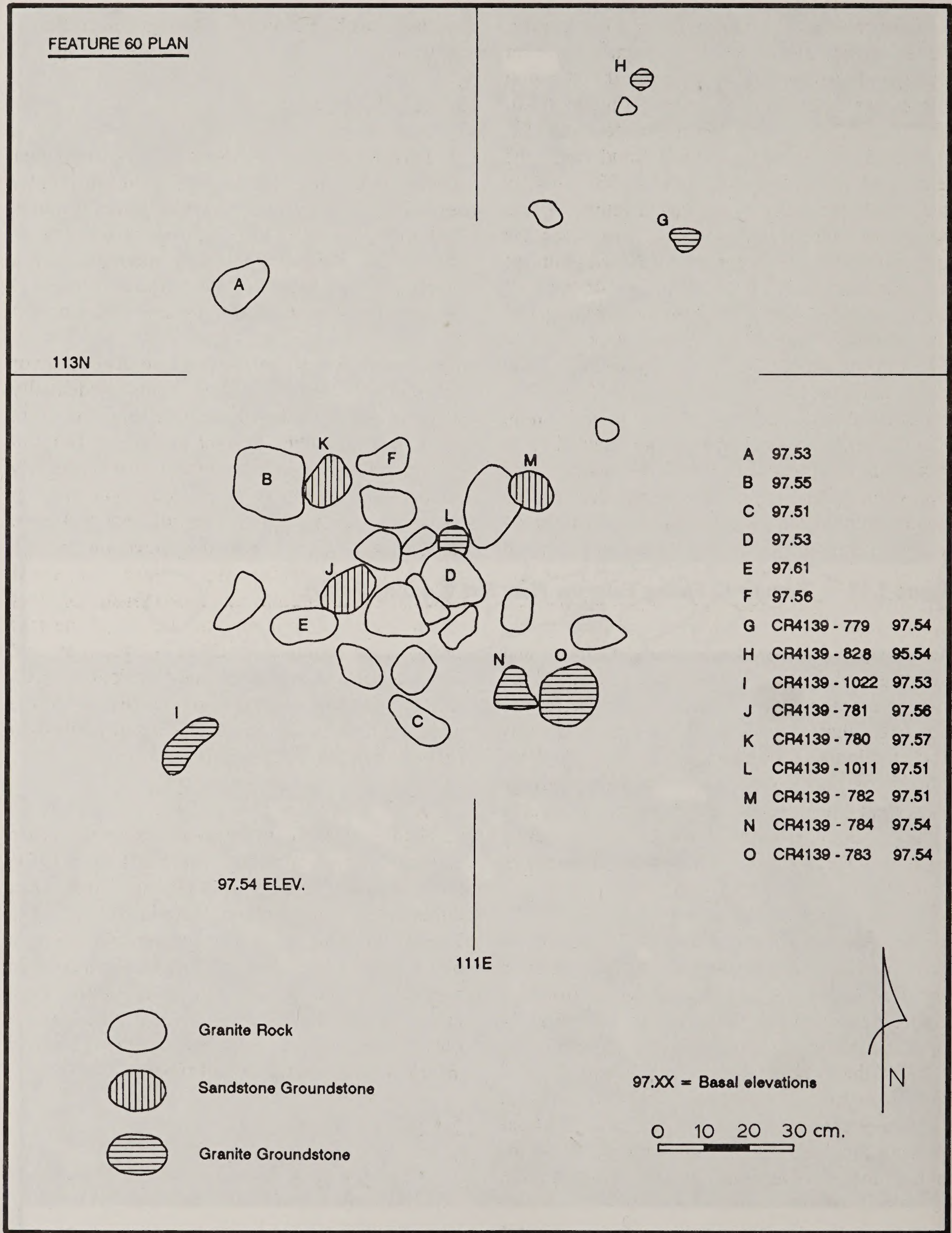


Figure 5.19 Plan View of Feature 60, the Plant Site (Locality P-069).

Feature 44, the third feature in this category, was an ovoid area of charcoal-stained sediment with plan dimensions slightly greater than 4 x 4 m with a maximum depth of 36 cm (Figures 5.20, 5.21, and 5.22). Seven additional features (52, 53, 54, 55, 56, 36, and 57) were found within the Feature 44 area, with one (Feature 33) partially outside. When initially exposed, Feature 44 was thought to represent a structure floor since the separation between stained and unstained sediment formed an abrupt curvilinear boundary on the west and north sides, indicating that the staining had been confined, perhaps by a structure wall. The boundary of the staining was traceable on the south, but the east boundary could not be identified due to gradual fading of the stain. When completely excavated, the stained area presented the appearance of a basin-shaped depression approximately 35-40 cm deep at the center, with a convoluted bottom. Feature 44 probably represented charcoal-stained soil scattered from repeated utilization of one or more of the large firepits. The charcoal had been churned into the unstained sediment by human activity, creating the uneven separation between stained and unstained sediments. The distinct boundary of the staining on the west and north sides of the feature suggested that spreading of the charcoal was restricted in those directions by a barrier, perhaps a brush or hide windbreak. The GAC salvage excavation produced a similar cluster of features within a charcoal-stained area of a size nearly equal to Feature 44, which was interpreted similarly.

A projectile point (CR4139-727) and an elk mandible (CR4139-721) were found in association with Feature 44. All artifacts collected from fan features came from Feature 44. Feature 44 produced 53 pieces of debitage, accounting for 7.0% of the total debitage count for the site; 0.5 kg of heat-altered rock, accounting for .004% of the heat-altered rock from the site; and 188 bone or tooth fragments, accounting for 9.7% of the total animal remains from the site. Four samples of stained sediment that totalled 6.5 liters were floated from Feature 44 (or from features encompassed by Feature 44) with no charred seeds recovered.

5.3.1.7 Tool Cache

Feature 28 was a cache of five modified pebble tools, one biface, and a hammerstone, nestled together within a 12 x 11 cm area (Figures 5.23 and 5.24). The tools were stacked on top of one another, indicating that they were placed in a depression no larger than the diameter of the tool cluster. The hypothesis that the tools were buried in a small hole is strengthened by the vertical positions of two flat pebble tools on the outside of the stacked cluster. They were evidentially supported by the sides of the hole when buried in order to retain their upright positions. The soil immediately surrounding the tool cache was lightly stained, suggesting that the hole was dug in unstained soil and filled with soil that had been charcoal-stained. Since the elevation of the original ground surface is unknown, the actual depth of the hole cannot be ascertained, only that it was greater than 7 cm, the height of the tool cache. One pebble tool (CR4139-340) is stained with red ocher along its bifacial-ly flaked edge, as is the quartzite hammerstone present with the tools. The tools in the cache are described in detail in Section 5.3.2 of this report.

Artifact caches are fairly uncommon in prehistoric sites in the region, although caches dating from the Paleoindian period (Frison 1978) to the Late Prehistoric period have been documented (Laurent and Eckerle 1983). The Feature 28 cache bears a strong resemblance to a tool cache collected from the McKean site in northeast Wyoming (Kornfeld et al. 1990). Both caches date to the Middle Archaic period, contain only seven artifacts, and are characterized by informal multifunctional tool types.

5.3.1.8 Superimposed Features

Nine groups of features recorded at the Plant site were superimposed. Features 67 and 65 overlapped; Features 59, 46, 69, and 49 all overlapped. Features 26 and 35 overlapped, as

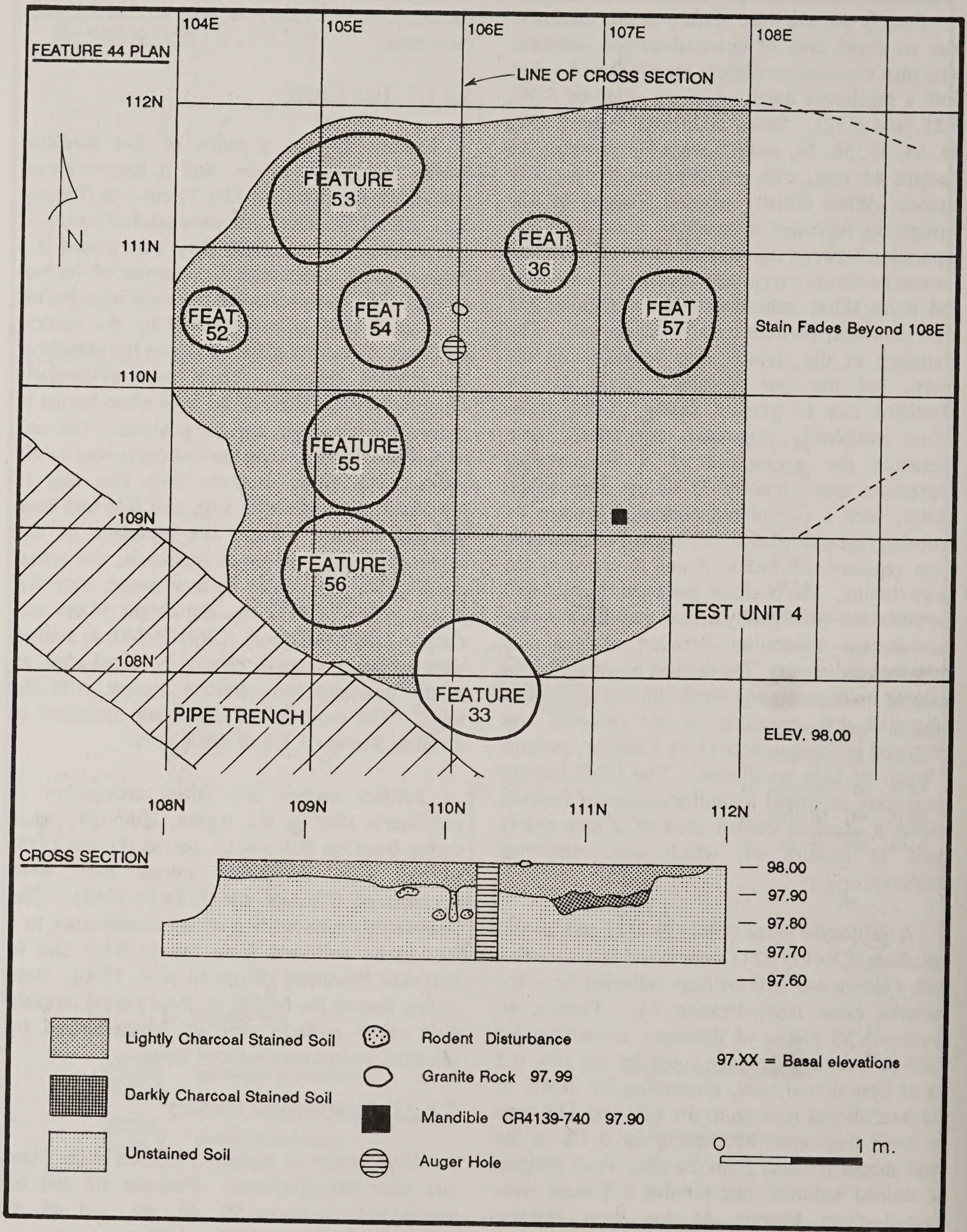


Figure 5.20 Plan View and Cross Section of Feature 44, the Plant Site (Locality P-069).

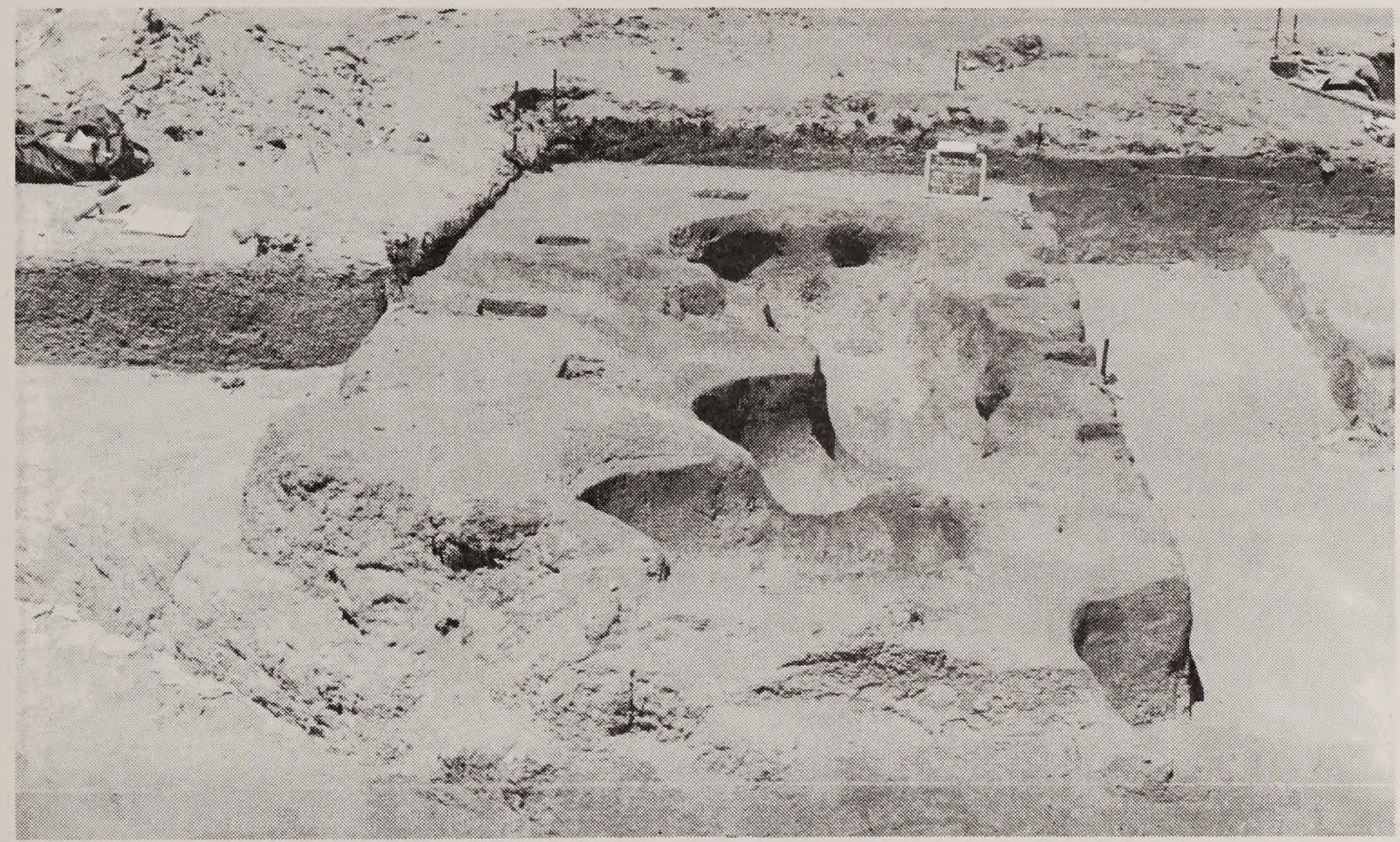


Figure 5.21 Feature 44 Facing North, the Plant Site (Locality P-069).

Figure 5.22 Feature 44 Facing South, the Plant Site (Locality P-069).

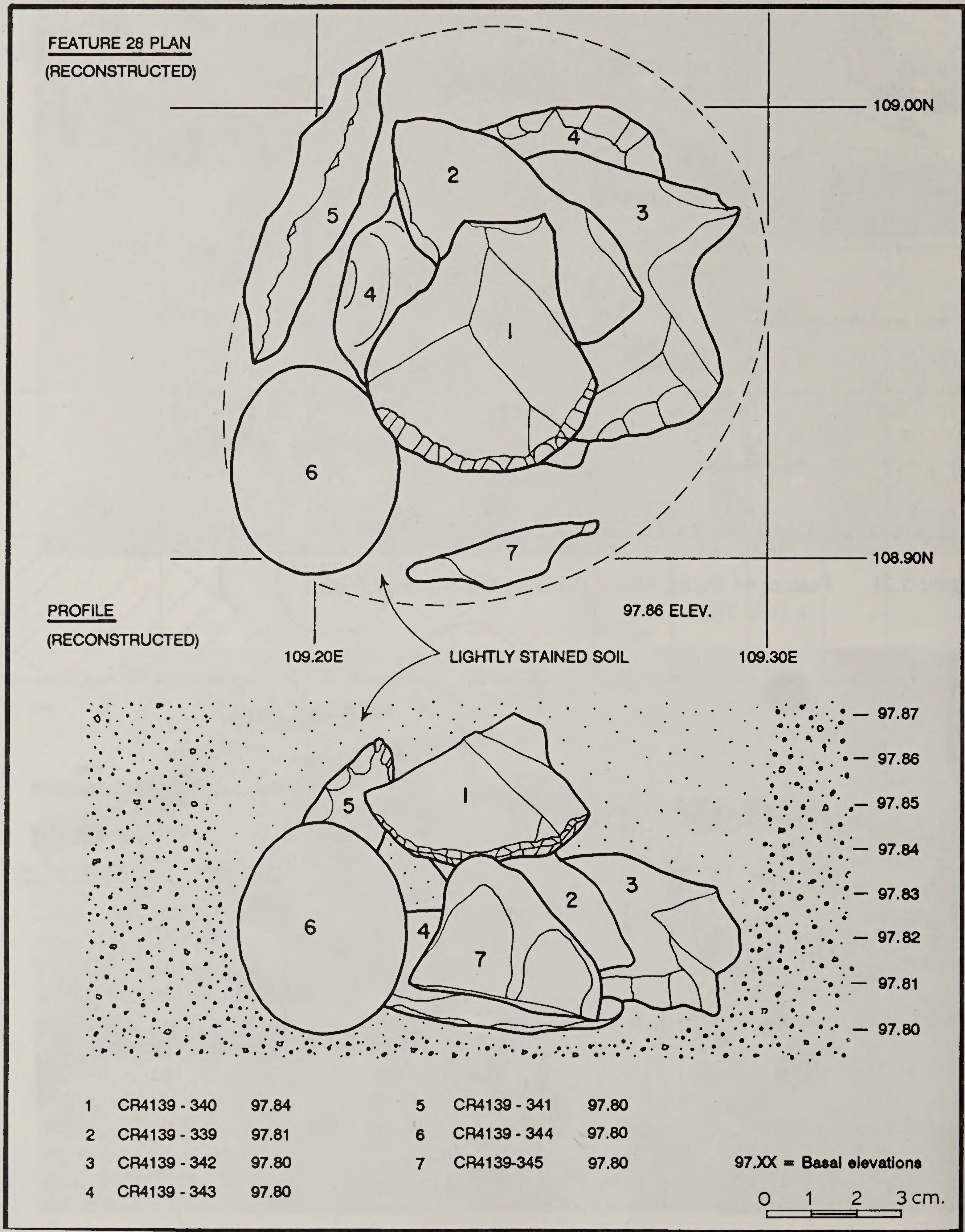


Figure 5.23 Plan View and Cross Section of Feature 28, Tool Cache, the Plant Site (Locality P-069).

Figure 5.24 Feature 28, Tool Cache, the Plant Site (Locality P-069).

did Features 16 and 9. Features 27, 17, and 30, were a cluster of superimposed features and are illustrated in Figure 5.25. Feature 70 was superimposed within Feature 71; Feature 48 was superimposed within Feature 61; Feature 41 was superimposed within Feature 15; and Feature 64 was actually two features, an upper feature with a second feature directly beneath.

5.3.1.9 Heat-altered Rock

Heat-altered rock recovered from the excavation block of at the Plant site total 129.04 kg (466 pieces) in five material type classifications (Table 5.3). Four features (60, 42, 47, and 8) produced 70% of the heat-altered rock from the site (90.3 kg). Thirteen other features produced heat-altered rock in lesser amounts.

The most abundant of the five material types is granite, weighing 98.7 kg (333 pieces) or 71.5% of the total. With the exception of Feature 47, which was filled with blackened granite rocks, determining whether granite at the site had been heat-altered was difficult. Most of this material was in cobble form that exhibited no cracking or crazing. In addition, the natural color of the granite is reddish, making thermal alteration difficult to recognize. After examination of granite rock that formed Features 60, 42, and 8, all the rock was classified as heat-altered because certain select rocks from each feature showed uneven coloration, suggesting that they were heated. The assumption was made that all the rock of these three features had been heated, but not to a degree causing distinctly noticeable characteristics. Granite from other features, and the site in general, was treated accordingly and

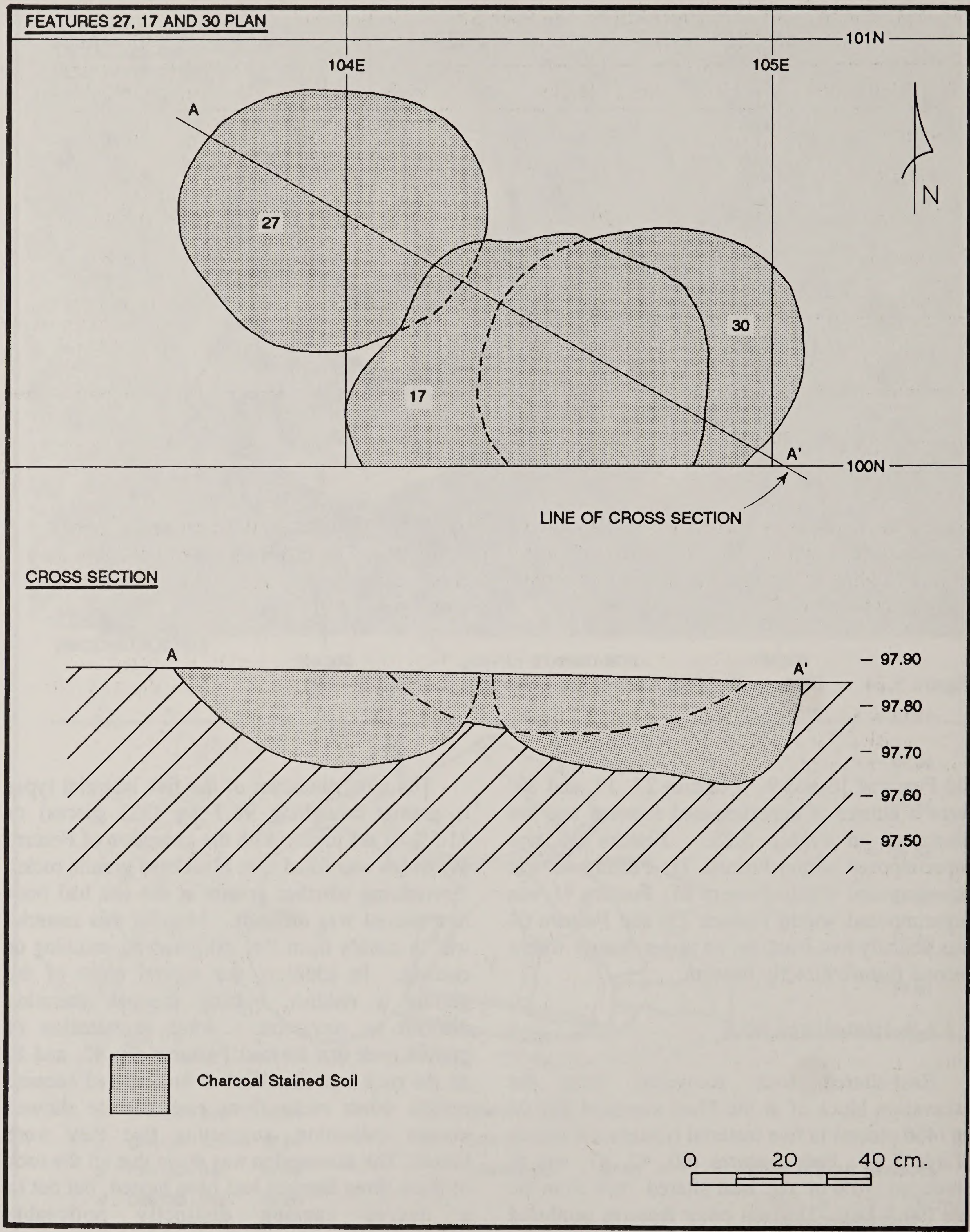


Figure 5.25 Plan View and Cross Section of Features 27, 17, and 30, the Plant Site (Locality P-069).

Table 5.3 Summary of Heat-altered Rock, the Plant Site (Locality P-069).

Material Type	No. of Rocks	Weight (kg)	Average Weight (kg)
Granite	333	98.700	0.296
Quartzite	74	13.220	0.179
Unknown	29	11.280	0.389
Sandstone	28	5.829	0.208
Quartz	2	0.015	0.0075
Total	466	129.044	0.277

recorded as being heat-altered when associated with pieces that showed definite signs of heat alteration. Nine heat-altered granite rocks were also groundstone tools.

Quartzite was the second most numerous material type, weighing 13.2 kg (74 pieces) or 15.9% of the site total. Quartzite proved difficult to distinguish from granite when the pieces were patinated or of small size. Some misclassification between the two material types undoubtedly took place in the field to a limited degree. However, the larger pieces of quartzite were recognized as such and produced a distinct category.

Heat-altered rock of unknown material type accounted for 11.3 kg (29 pieces) representing 6.2% of the total count. The unknown category represents material types that could not be identified, or for which no identification was recorded in the field. A majority of this unrecord ed rock is probably the major material types of granite and quartzite.

Heat-altered sandstone from the excavation block weighed 5.8 kg (28 pieces) representing 6.0% of the total count. Nine of the 28 pieces are groundstone tools. The remaining pieces are probably groundstone also but could not be identified as such due to the deteriorated condition of the stone. The angular shapes of the sandstone pieces, rather than the color, suggest heat fracturing.

Two pieces of material identified as fire-cracked quartz were recorded from the excavation.

5.3.2 Flaked Stone Artifacts

The following sections discuss flaked stone artifacts from the Plant site beginning with finished bifacial tools and following the manufacturing sequence to cores and debitage.

A total of 801 flaked stone artifacts was recovered from the excavation. Twenty-five are tools, including four projectile points, one hafted knife, one preform, one preblank, one blank, nine utilized flakes, six modified cobbles, and two cores (Table 5.4). The remaining 776 artifacts are pieces of debitage.

5.3.2.1 Bifaces

Eight flaked stone artifacts from the excavation block that were thinned and shaped by flake removal from two opposite surfaces are classified as bifaces. Four of the artifacts are projectile

Table 5.4 Characteristics of Flaked Stone Tools, the Plant Site (Locality P-069).

Catalog No.	Excavation Unit	Classification	Condition	Dimensions (mm)[1] L	W	T	Material Type	Remarks
228	116N 108E,NW	Projectile point	Base	9(p)	14(p)	4(p)	Oolitic chert	Base width: 16 mm; stem width: 11 mm; stem length: 6 mm
468	112N 110E,NE	Projectile point	Base	14(p)	17(p)	5(p)	Moss agate	Base width: 14 mm; stem width: 5 mm; stem length: 6 mm
727	108N 104E,NE	Projectile point	Complete	33	18	4	Opaque chert	Base width: 15 mm; stem width: 11 mm; stem length: 5 mm
351	100N 102E,SE	Projectile point	Distal end missing	34(p)	21(p)	6(p)	Quartzite	Base width: 19 mm; stem width: 13 mm; stem length: 18 mm
818	110N 114E,SE	Knife	Complete	30	30	8	Quartzite	Base width: 28 mm; stem width: 24 mm; stem length: 11 mm
622	114N 116E,SW	Preform	Distal end	43(p)	48(p)	9(p)	White chert	--
339	108N 108E,SE	Blank	Complete	68	56	15	Chert	Feature 28, tool cache
938	114N 108E,NE	Preblank	Fragment	20	32	11	Chalcedony	--
385	116N 116E,NW	Utilized flake	Fragment	23	11	5	Opaque chert	--
296	110N 108E,SE	Utilized flake	Complete	12	10	3	Chert	--
932	110N 116E,NW	Utilized flake	Complete	22	16	6	Siltstone	--
549	116N 114E,NW	Utilized flake	Fragment	21	10	6	Opaque chert	--

Table 5.4 (continued)

Catalog No.	Excavation Unit	Classification	Condition	Dimensions (mm)[1] L	W	T	Material Type	Remarks
173	102N 108E,NE	Utilized flake	Complete	20	12	3	Opaque chert	--
942	110N 110E	Utilized flake	Complete	22	25	4	Chert	From the south wall of the unit
467	112N 110E,SE	Utilized flake	Complete	28	19	4	Chert	--
33	106N 104E,SE	Utilized flake	Complete	25	34	18	Chert	Spokeshave
966	114N 110E,SE	Utilized flake	Complete	29	19	6	Siltstone	--
343	108.95N 109.25E	Modified cobble	Complete	81	56	18	Chert	Feature 28, tool cache
341	108.95N 109.25E	Modified cobble	Fragment	71(p)	50(p)	15(p)	Chert	Feature 28, tool cache
345	108.95N 109.25E	Modified cobble	Fragment	41(p)	30(p)	11(p)	Chert	Feature 28, tool cache
340	108.95N 109.25E	Modified cobble	Complete	62	48	19	Quartzite	Feature 28, tool cache; possibly haft-ed
342	108.95N 109.25E	Modified cobble	Complete	62	65	21	Chert	Feature 28, tool cache
44	106N 106E,NW	Modified cobble	Complete	83	49	19	Quartzite	Possible denticulate
27	106N 106E,SW	Core	Complete	48	43	19	Chert	Multidirectional
92	102N 106E,NW	Core	Complete	39	23	19	Chert	Multidirectional

[1] L = length; W = width; T = thickness; (p) = broken specimen, partial dimension.

points, and one is a hafted knife. The remaining three are bifaces of varying degrees of refinement.

5.3.2.1.1 Projectile Points

Artifact CR4139-228 is the base of an oolitic chert, side-notched dart point that has been broken just above the hafting element (Figure 5.26, A). The hinged break, produced by use impact, has removed one notch, but the entire base is still intact. The side notches are wide and square, the base is convex, and the artifact has a bi-convex cross section.

Artifact 48CR4139-468 is the base of a moss agate, side- notched dart point that has been broken above the hafting element (Figure 5.26, B). The hinged appearance of the break indicates that it was produced by use impact. The point appears unusually thick (5 mm) with one flat side and a steeply convex side, suggesting that it might have been made from a pebble that was too small to be properly thinned. The thickness of the artifact resulted in irregular notches. The base is straight to slightly concave.

Artifact 48CR4139-727 is a complete dart point of opaque chert with a triangular blade, slightly expanding stem, and convex base (Figure 5.26, C). One of the narrow, shallow notches is of the corner-notched pattern, the other notch is wider and less recognizably corner-notched.

Artifact 48CR4139-351 is the proximal and medial portion of a quartzite, side-notched dart point. The lateral edges are straight, the notches are wide and deep, and the base is concave (Figure 5.26, D). The point exhibits a transverse snap break across a natural flaw which appears as a coarse-grained inclusion. Discoloration of the entire artifact, but especially the distal end, shows that it was heated, perhaps causing the breakage across the flaw. Two pot-lidded areas are present on the surface of the artifact as well as one undetached pot-lid. The base and both lateral edges have been smoothed by grinding. The extent of this grinding, along both lateral edges beyond portions of the blade covered by hafting ties, could be use wear, suggesting that the projectile point was also used as a tool.

The four projectile points are all side-notched types. Artifact CR4139-727 has one notch that appears-corner notched, which is probably due to a failure to widen the notch toward the distal end. Artifacts CR4139-351 and 468 are of the Northern Side-notched type. Artifacts CR4139-727 and 228 are variants of the Northern Side-notched type, having convex bases. This style is associated with the Early Archaic period in the Great Basin. This type of projectile point was dated at 6,400 years B.P. at the Hawken site near Sundance, Wyoming (Frison 1978). Artifact CR4139-351 matches the Hawken specimens closely and exhibits the same basal grinding. Mummy Cave in northwest Wyoming produced side-notched points dating 7,180 to 5,650 years B.P. from Cultural Layers 18 and 21 that closely match Artifact CR4139-351. Variants of the side-notched style from Cultural Layers 18 and 19, dating 5,650 to 5,840 years B.P., resemble artifacts CR4139-468, 727, and 228 (McCracken et al. 1978). Side-notched points from three Archaic components at the Taliaferro site in southwest Wyoming date from 1,910 to 5,290 years B.P. (Smith and Creasman 1988). They are of the same basic style as those recovered from the Plant site.

5.3.2.1.2 Hafted Knife

Artifact CR4139-818 is a quartzite, side-notched, hafted knife that has been resharpened so extensively that little more than the base remains (Figure 5.26, E). The side notches are broad and shallow, and the base is convex.

5.3.2.1.3 Preform

One preform fragment was recovered from block excavations at the Plant site. Artifact CR4139-622 is the distal end of a white chert preform that was broken transversely during manufacture (Figure 5.26, F). The artifact has been well thinned and was nearing the final stage of reduction when breakage occurred.

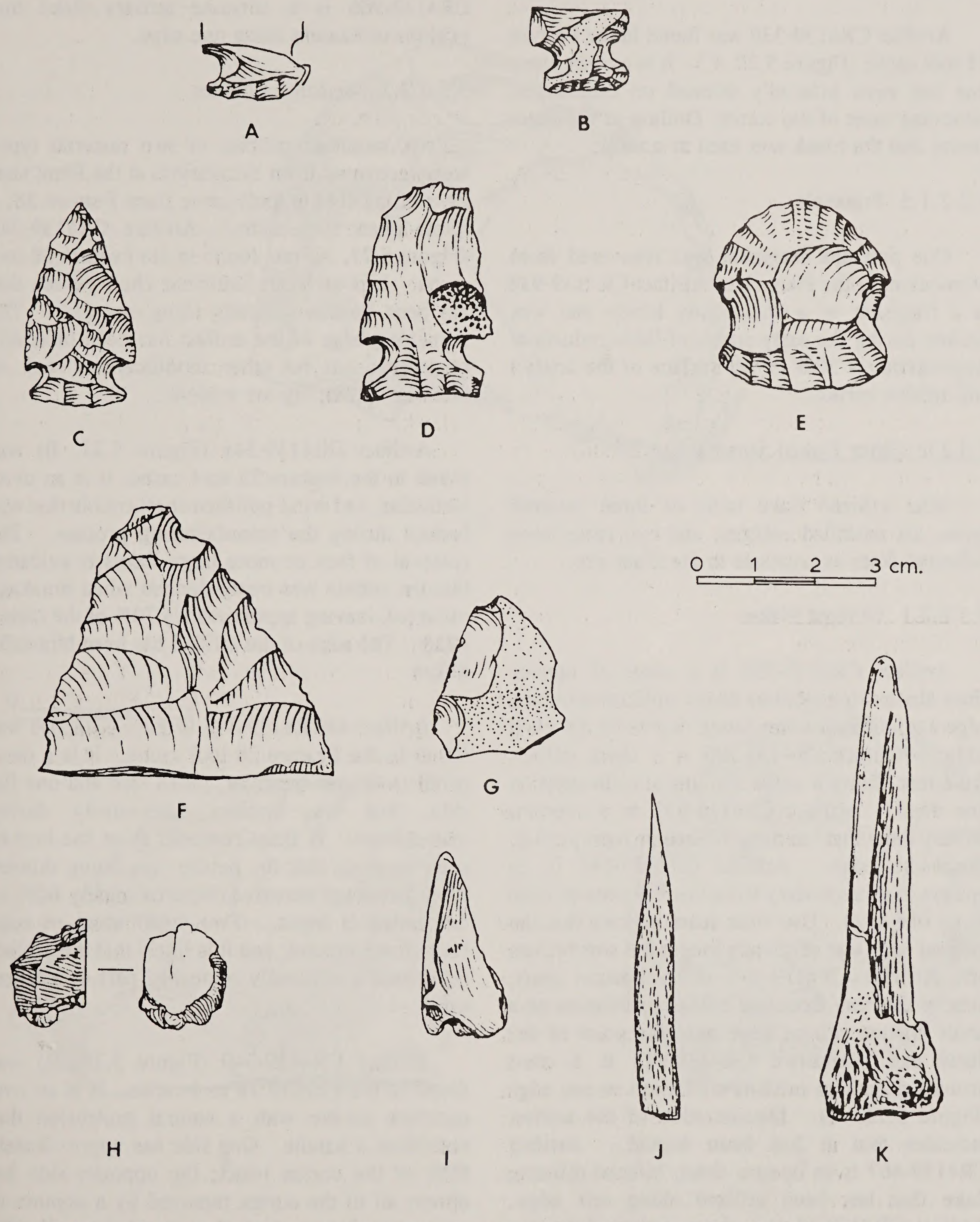


Figure 5.26 Selected Artifacts, the Plant Site (Locality P-069). A) CR4139-228; B) CR4139-468; C) CR4139-727; D) CR4139-351; E) CR4139-818; F) CR4139-622; G) CR4139-942; H) CR4139-263; I) CR4139-630; J) CR4139-1014; K) CR4139-38.

5.3.2.1.4 Blank

Artifact CR4139-339 was found in the Feature 28 tool cache (Figure 5.27, C). It is a chert blank that has been bifacially thinned on both sides, removing most of the cortex. Dulling of the edges shows that the blank was used as a tool.

5.3.2.1.5 Preblank

One preblank fragment was recovered from excavations at the Plant site. Artifact CR4139-938 is a fragment of a chalcedony biface that was broken during the early stages of lithic reduction. Approximately 30% of the surface of the artifact still retains cortex.

5.3.2.2 Other Flaked Stone Tools

Nine utilized flake tools of three material types, six modified cobbles, and two cores were collected from excavations at the Plant site.

5.3.2.2.1 Utilized Flakes

Artifact CR4139-385 is a piece of opaque chert shatter that exhibits heavy utilization on one edge and utilization to a lesser degree on a second edge. Artifact CR4139-296 is a chert tertiary flake that shows a small amount of utilization on one edge. Artifact CR4139-932 is a siltstone tertiary flake that has been utilized on a projecting, chisel-like edge. Artifact CR4139-549 is an opaque chert secondary flake that has been utilized along one edge. Use wear scars indicate that the utilized edge was originally longer but was broken off. Artifact CR4139-173 is an opaque chert, bifacial thinning flake that exhibits utilization on a small portion of one edge near the point of the distal end. Artifact CR4139-942 is a chert primary flake that exhibits utilization on one edge (Figure 5.26, G). Discoloration of the artifact indicates that it has been heated. Artifact CR4139-467 is an opaque chert, bifacial thinning flake that has been utilized along one edge. Artifact CR4139-33 is a chert tertiary flake that has been utilized as a spokeshave. Pressure on the spokeshave notch produced abrupt step-fracturing and crushing on one side of the artifact. Artifact CR4139-966 is a siltstone tertiary flake that exhibits utilization along one edge.

5.3.2.2.2 Modified Cobbles

Six modified cobbles of two material types were recovered from excavations at the Plant site. Five of the cobble tools came from Feature 28, a seven piece tool cache. Artifact CR4139-343 (Figure 5.27, A) was found in the Feature 28 tool cache. It is an oval, lenticular chert pebble that has been broken naturally along one edge. The remaining edge of the artifact has been bifacially retouched, but no other modifications such as thinning or shaping are evident.

Artifact CR4139-341 (Figure 5.27, B) was found in the Feature 28 tool cache. It is an oval, lenticular, and wind-polished chert cobble that was broken during the manufacturing process. The removal of four or more large flakes is evidence that the cobble was being thinned when breakage occurred, leaving approximately 70% of the cortex intact. The edge of the artifact has been bifacially flaked.

Artifact 48CR4139-345 (Figure 5.28, D) was found in the Feature 28 tool cache. It is a chert pebble with one irregular, pitted side and one flat side, that was broken transversely during manufacture. A flake removed from the broken edge suggests that the pebble was being thinned when breakage occurred. Approximately 60% of the cortex is intact. Two small areas of edge retouch are present, and it is likely that the artifact represents a minimally retouched part of a larger tool.

Artifact CR4139-340 (Figure 5.28, E) was found in the Feature 28 tool cache. It is an oval quartzite pebble with a natural protrusion that resembles a handle. One side has approximately 80% of the cortex intact; the opposite side has almost all of the cortex removed by a number of percussion flakes which were struck from all sides for the purpose of thinning. Opposite the "handle" a natural edge has been accentuated by the bifacial

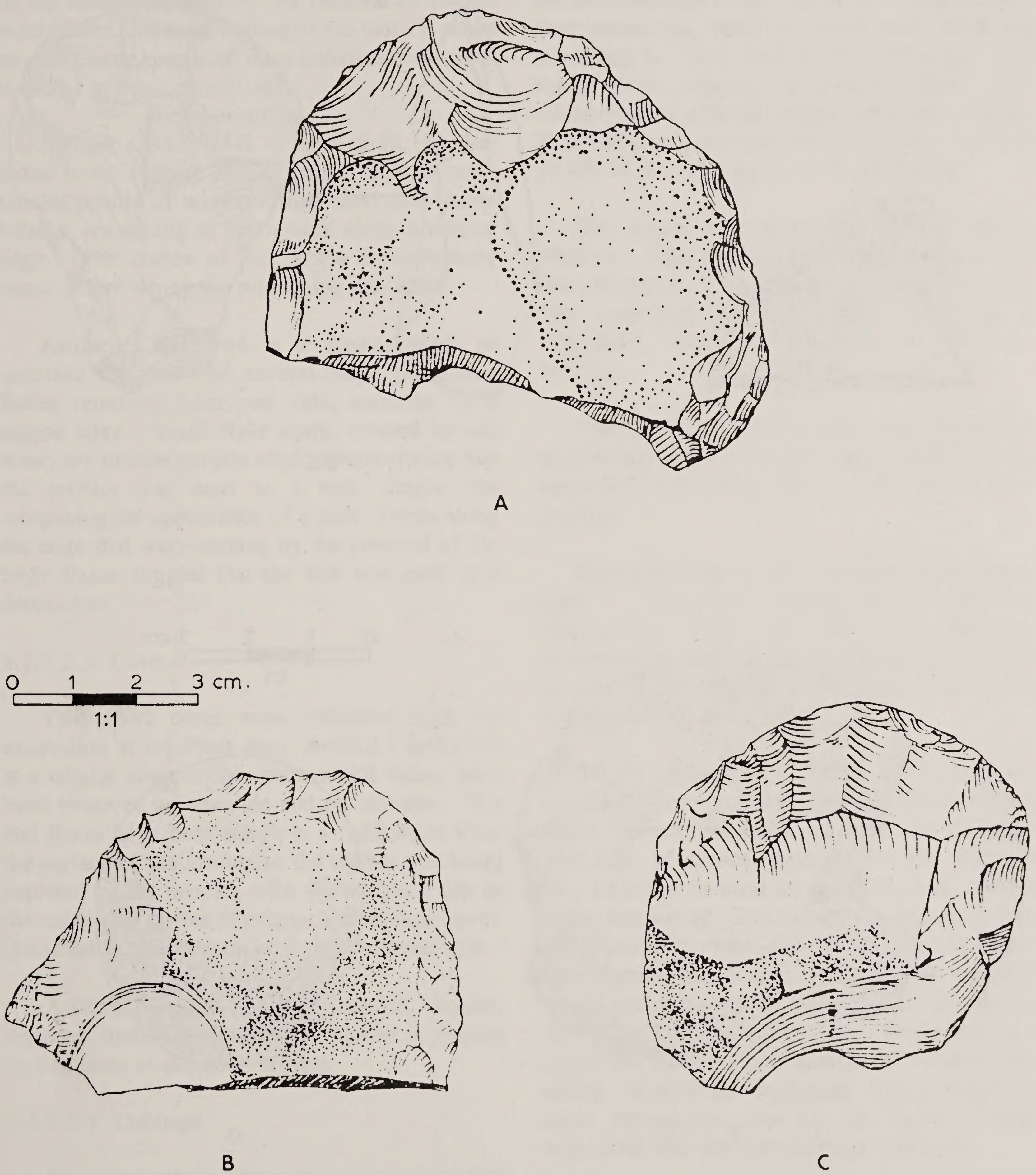


Figure 5.27 Artifacts from the Feature 28, Tool Cache, the Plant Site (Locality P-069). A) CR4139-343; B) CR4139-341; C) CR4139-339.

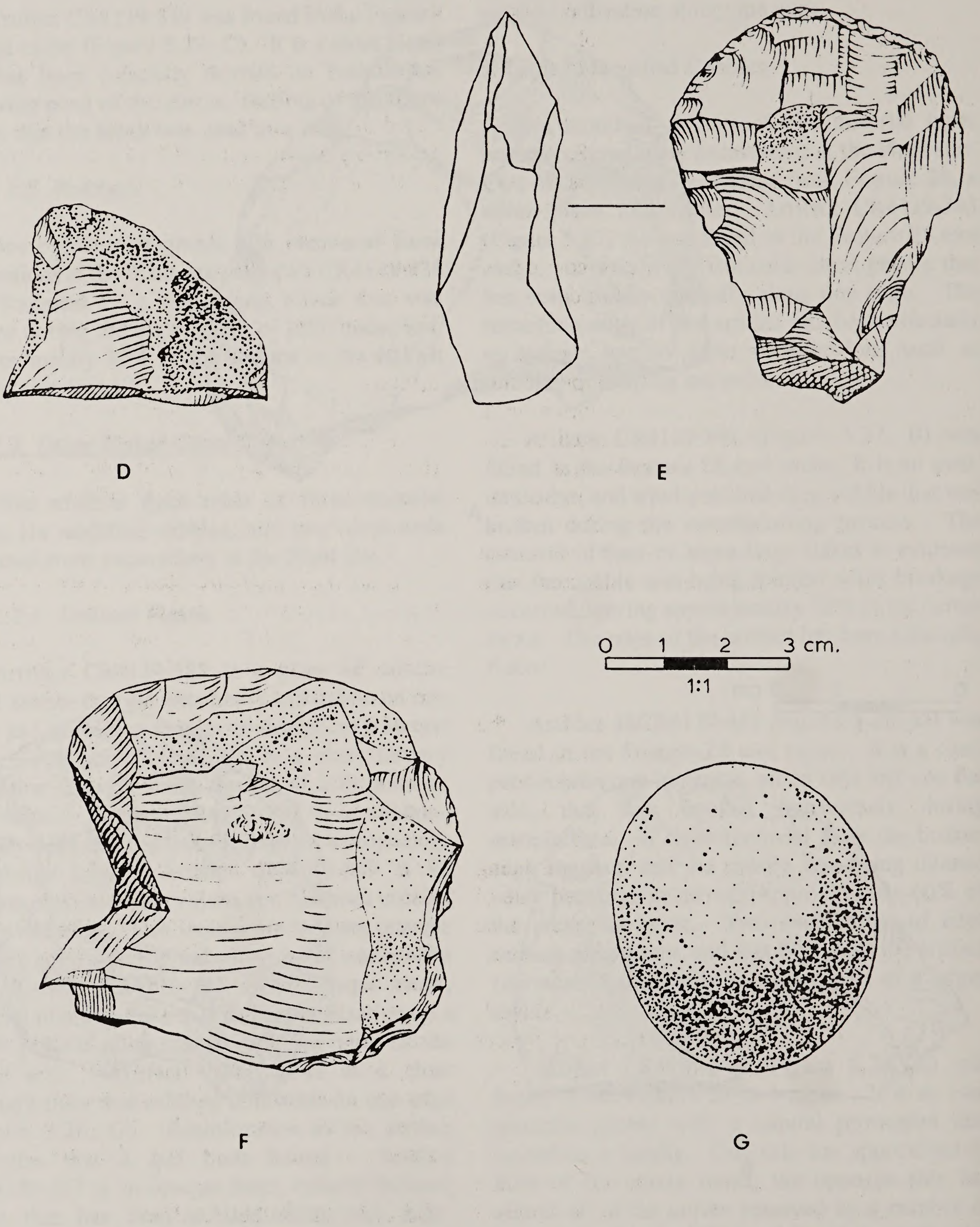


Figure 5.28 Artifacts from the Feature 28, Tool Cache, the Plant Site (Locality P-069). D) CR4139-345; E) CR4139-340; F) CR4139-342; G) CR4139-344.

removal of fine pressure flakes. Distinct traces of red ocher were found on this edge. The presence of the handle, thinned by the removal of flakes, would have facilitated hafting of the tool. It could as easily have been used in an unhafted form since it can be gripped comfortably.

Artifact CR4139-342 (Figure 5.28, F) was found in the Feature 28 tool cache. It is an oval, tabular pebble of wind-polished chert that shows bifacial retouching at two places along a natural edge. The cortex of the pebble is completely intact except where the retouching was done.

Artifact CR4139-44 is a tabular piece of quartzite that has had several large percussion flakes removed from one side, resulting in a jagged edge. Small flake scars, created by use wear, are present on this edge, demonstrating that the artifact was used as a tool, despite the morphological appearance of a core. Points along the edge that were created by the removal of the large flakes suggest that the tool was used as a denticulate.

5.3.2.2.3 Cores

Two chert cores were collected from the excavation at the Plant site. Artifact CR4139-27 is a tabular chert cobble from which flakes have been removed on one side and on one end. The end flakes have been struck at a right angle from the surface of the artifact so the cobble was being depleted by the process. On the unflaked side of the cobble the cortex is intact. The artifact can be classified as the remnant of a unidirectional core.

Artifact CR4139-92 is a conical shaped, depleted, multidirectional core. Cortex is present on one facet of the chert artifact.

5.3.2.2.4 Debitage

Debitage collected from the block excavation of the Plant site totals 775 pieces which represent 12 material types. Table 5.5 provides a cross-tabulation of debitage type by material type for the assemblage.

The predominant material type is chert, numbering 476 pieces, which represents 61.4% of the total debitage count. Chert was separated into four categories, three of which were identified according to color (red, white, and tan). The fourth chert category, designated "other", contained over 20 different colors and material types. This category contained 406 pieces that equalled 52.4% of the debitage from the excavation.

The second most prominent material type is siltstone. This material type was separated into two categories, black siltstone and other siltstone. The combined count of both categories is 120 pieces, representing 15.5% of the total debitage.

The third most prominent material type is clear chalcedony. Ninety pieces of this material were recovered accounting for 11.6% of the total debitage.

Quartzite is the fourth most prominent material type. Sixty-two flakes were collected, representing 8.0% of the total debitage. Remaining material types that account for a small percent of the debitage are granite, moss agate, petrified wood, and quartz.

Of the total debitage, 55.6% is tertiary flakes and 30.8% is microflakes. Primary and secondary flakes account for only 7.2% of the debitage. This ratio of cortical flakes to interior flakes is also reflected in most of the individual material types represented. The large percentage of tertiary flakes and microflakes (86.4%) suggests that lithic manufacture was focused on the later reduction stages including further reduction of bifaces and tool maintenance activities. This interpretation is supported by the small number of bifacial tools enting intermediate reduction stages recovered from excavations, and by the types of tools associated with the tool cache (Feature 28).

5.3.3 Groundstone Artifacts

Thirty-four specimens of groundstone were collected from the excavation block at the Plant

Table 5.5 Cross-tabulation of Debitage Type by Material Type, the Plant Site (Locality P-069).

	Material Type												
Debitage Type	Quartzite	White Chert	Red Chert	Clear Chalcedony	Tan Chert	Black Siltstone	Other Chert	Other Siltstone	Granite	Moss Agate	Petrified Wood	Quartz	Total
Primary Flake													
Number	1	0	0	0	2	2	9	0	0	0	0	0	14
Row %	7.1	0	0	0	14.3	14.3	64.3	0	0	0	0	0	
Column %	1.6	0	0	0	11.8	2.2	2.2	0	0	0	0	0	1.8
Secondary Flake													
Number	4	3	0	6	1	5	23	0	0	0	0	0	42
Row %	9.5	7.1	0	14.3	2.4	11.9	54.8	0	0	0	0	0	
Column %	6.5	6.1	0	6.7	5.9	5.4	5.7	0	0	0	0	0	5.4
Tertiary Flake													
Number	33	29	2	50	3	66	216	22	3	5	1	1	431
Row %	7.7	6.7	0.5	11.6	0.7	15.3	50.1	5.1	0.7	1.1	0.2	0.2	
Column %	53.2	59.2	50.0	55.6	17.6	71.7	53.2	78.6	42.9	31.3	100	33.3	55.6
Microflake													
Number	20	14	2	27	11	18	129	5	0	11	0	2	239
Row %	8.4	5.9	0.8	11.3	4.6	7.5	54.0	2.1	0	4.6	0	0.8	
Column %	32.3	28.6	50.0	30.0	64.7	19.6	31.8	17.9	0	68.7	0	66.7	30.8
Shatter													
Number	2	3	0	7	0	1	29	1	4	0	0	0	47
Row %	4.3	6.4	0	14.9	0	2.1	61.7	2.1	8.5	0	0	0	
Column %	3.2	6.1	0	7.8	0	1.1	7.1	3.6	57.1	0	0	0	6.1
Manuport													
Number	2	0	0	0	0	0	0	0	0	0	0	0	2
Row %	100	0	0	0	0	0	0	0	0	0	0	0	
Column %	3.2	0	0	0	0	0	0	0	0	0	0	0	0.26
Total													
Number	62	49	4	90	17	92	406	28	7	16	1	3	775
Row %	8	6.3	0.5	11.6	2.2	11.9	52.4	3.6	0.9	2.1	0.1	0.4	

site, with a combined weight of 19.98 kg (Table 5.6). Seventeen specimens are granite, representing 50% of the total; 17 specimens are sandstone at 50% of the total. Twenty-seven groundstone specimens are associated with features, with Features 60, 42, and 8 having the greatest number. Twenty-five specimens or 73.5% show heat altering in the form of discoloration or cracking, or were presumed to be heat-altered when found in concentrations of rock where some of the pieces show distinct characteristics of heating.

5.3.3.1 Manos

Eleven manos of two material types were recovered from the block excavation of the Plant site. Ten of the manos came from features, and one was unassociated with features.

A granite mano (CR4139-1011) from Feature 60 is a naturally broken cobble the proper size for single-hand use. A distinct grinding facet covers approximately a third of one convex surface.

Five granite cobbles from Feature 42 were used as manos. Artifacts CR4139-1023, 1024, 1025, 1026, and 1027 are unshaped cobbles with traces of grinding surfaces on one or both sides. They are single-hand types with the exception of CR4139-1025, which was used with both hands. Artifact CR4139-837 (Figure 5.29, A) is a single-hand mano of hard sandstone (actually cemented conglomerate with the major component being quartz sand) with a well-used grinding face. Additional smooth facets on the opposite side appear to be ground also. The mano was shaped by pecking and grinding away portions of the edge to produce a more rounded form.

Feature 8, a scatter of 42 rocks, produced two heat-altered granite manos. Artifact 48CR4139-1020 is an unshaped, single-hand, granite cobble that has been roughly ground on two sides. Artifact CR4139-1021 is a large, unshaped, granite cobble with a natural wedge shape. Two sides are lightly ground, and the edge shows heavy grinding and possibly battering. This mano was used with two hands.

Feature 64 produced an unshaped, single-hand, granite mano (CR4139-1029 [Figure 5.29, B]) that has well-shaped grinding faces on both sides and shows no signs of being heated. Traces of red ocher appear on one of the grinding faces.

An unshaped, unburned, single-hand, granite mano with grinding on one side (CR4139-493) was found unassociated with any feature.

5.3.3.2 Metates

Two complete metates were recovered from two features within the excavation block. Feature 60 is a rock scatter containing 30 sandstone and granite rocks, nine of which are heat-altered groundstone. Four granite groundstone specimens (CR4139-784, 779, 828, and 1022) were reassembled to form a complete metate. It is an ovoid, tabular, granite cobble measuring 17.5 x 13.0 cm. Thickness varies from 4.5 cm on one edge to 1.75 cm on the opposite edge, giving the cobble a wedge-shaped form. Grinding surfaces are present on both sides. The artifact is broken cleanly by straight breaks that produced sharp-edged, blocky pieces, a breakage pattern typically produced by heating.

A complete sandstone metate (CR4139-921) was excavated from Feature 67. It is ground unifacially and has been blackened by exposure to fire.

Fifteen groundstone fragments of two material types were recovered from the excavation block. Eight of the pieces came from features. Two pieces of sandstone from Feature 60 (48CR4139-780 and 782) are ground on one side and broken in a way suggesting that they were heated. Though the pieces cannot be fitted together, their matching thickness indicates that they were probably parts of the same metate. Two other metate fragments were present in Feature 60. One is a tabular piece of sandstone that is dished (concave) on one face (CR4139-781), and the

Table 5.6 Characteristics of Groundstone Tools, the Plant Site (Locality P-069).

Catalog No.	Excavation Unit	Classification	Condition	Dimensions (mm)[1] L	W	T	Weight (kg)	Material Type	Remarks
784	112.30N 111.09E	Metate	Fragment	95	68	52	0.371	Granite	Heavy grinding, one broken edge, reddened; reassembled with Catalog Nos. 779, 828, and 1022 to form a complete metate
779	113.30N 111.47E	Metate	Fragment	72	48	28	0.182	Granite	Bifacially ground; fits Catalog Nos. 784, 828, and 1022
828	113.65N 111.36E	Metate	Fragment	82	66	43	0.542	Granite	Bifacially ground; fits Catalog Nos. 784, 779, and 1022
1022	112.19N 110.35E	Metate	Fragment	140	50	44	0.367	Granite	Bifacially ground, reddened; fits Catalog Nos. 784, 779, and 1022
780	112.76N 110.68E	Metate	Fragment	117	96	28	0.575	Sandstone	Unifacially ground
782	112.74N 110.71E	Metate	Fragment	93	62	32	0.242	Sandstone	Light unifacial grinding, reddened
781	112.52N 110.71E	Metate	Fragment	113	101	54	0.900	Sandstone	Unifacial grinding, dished
783	112.30N 111.21E	Indeterminate	Fragment	140	132	59	1.134	Granite	Lightly bifacially ground
1011	112.62N 110.55E	Mano	Complete	134	86	39	0.584	Granite	Ground and pecked on one face
677	114.42N 117.22E	Metate	Fragment	87	79	11	0.087	Sandstone	Unifacially ground, reddened

Table 5.6 (continued)

Catalog No.	Excavation Unit	Classification	Condition	Dimensions (mm)[1] L	W	T	Weight (kg)	Material Type	Remarks
676	114.21N 116.85E	Metate	Fragment	58	36	5	0.026	Sandstone	Unifacially ground, reddened
1028	114.47N 117.20E	Metate	Fragments (3)	105 116 56	87 62 49	10 9 12	0.105 0.102 0.029	Sandstone	Unifacially ground, reddened, three pieces
679	114.98B 116.71E	Indeterminate	Fragment	117	59	11	0.208	Sandstone	Unifacial grinding, reddened
678	114.72N 117.13E	Indeterminate	Fragment	116	67	12	0.167	Sandstone	Unifacial grinding, reddened
1027	114.65N 117E	Mano	Complete	87	84	82	1.103	Granite	Unifacially ground, reddened, fractured, spalled
1024	115N 116.53E	Mano	Complete	116	84	44	0.671	Granite	Bifacially ground, fractured, reddened
1025	115.10N 116.60E	Mano	Complete	195	115	80	2.300	Granite	Unifacially ground, pecked, reddened, spalled
1026	114.70N 117.25E	Mano	Complete	185	83	57	1.313	Granite	Unifacially ground, reddened, fractured, spalled
1023	114.57N 116.96E	Mano	Complete	96	77	49	0.581	Granite	Grinding on four faces, reddened, pecked
837	115.05N 117.72E	Mano	Complete	84	83	50	0.456	Granite	Ground on all faces, pecked, reddened, battered on one side

Table 5.6 (continued)

Catalog No.	Excavation Unit	Classification	Condition	Dimensions (mm)[1] L	W	T	Weight (kg)	Material Type	Remarks
1020	109.85N 117.75E	Mano	Complete	120	84	63	0.781	Granite	Unifacially ground, reddened
1021	110.09N 117.58E	Mano	Complete	220	77	45	0.951	Granite	Unifacially ground, battered, reddened
1029	114.98N 114.07E	Mano	Complete	195	115	80	2.300	Granite	Bifacially ground, pecked, reddened
921	117.80N 117.70E	Metate	Complete	255	175	39	1.941	Sandstone	Unifacially ground, dished, calcinated
349	100.15N 103.72E	Metate	Fragment	143	132	15	0.441	Sandstone	Unifacially ground, dished, calcinated
355	106N 108E NE	Metate	Fragment	63	30	12	0.038	Sandstone	Unifacially ground, calcinated
257	106N 108E NE	Metate	Fragment	96	48	22	0.084	Sandstone	Unifacially ground, dished, scored
776	112N 112E	Metate	Fragment	45	39	19	0.049	Sandstone	Unifacially ground, dished, calcinated
290	107.70N 109.50E	Metate	Fragment	83	52	15	0.073	Sandstone	Unifacially ground, dished, burned
169	108.22N 109.83E	Metate	Fragment	77	70	30	0.214	Sandstone	Unifacially ground, dished, shaped, burned
492	110.80N 106.27E	Metate	Fragment	86	70	43	0.317	Granite	Unifacially ground, dished, reddened, fractured

Table 5.6 (continued)

Catalog No.	Excavation Unit	Classification	Condition	Dimensions (mm)[1] L	W	T	Weight (kg)	Material Type	Remarks
493	110.65N 104.29E	Mano	Complete	115	82	52	0.748	Granite	Unifacially ground, pecked, hammered

[1] L = length; W = width; T = thickness.

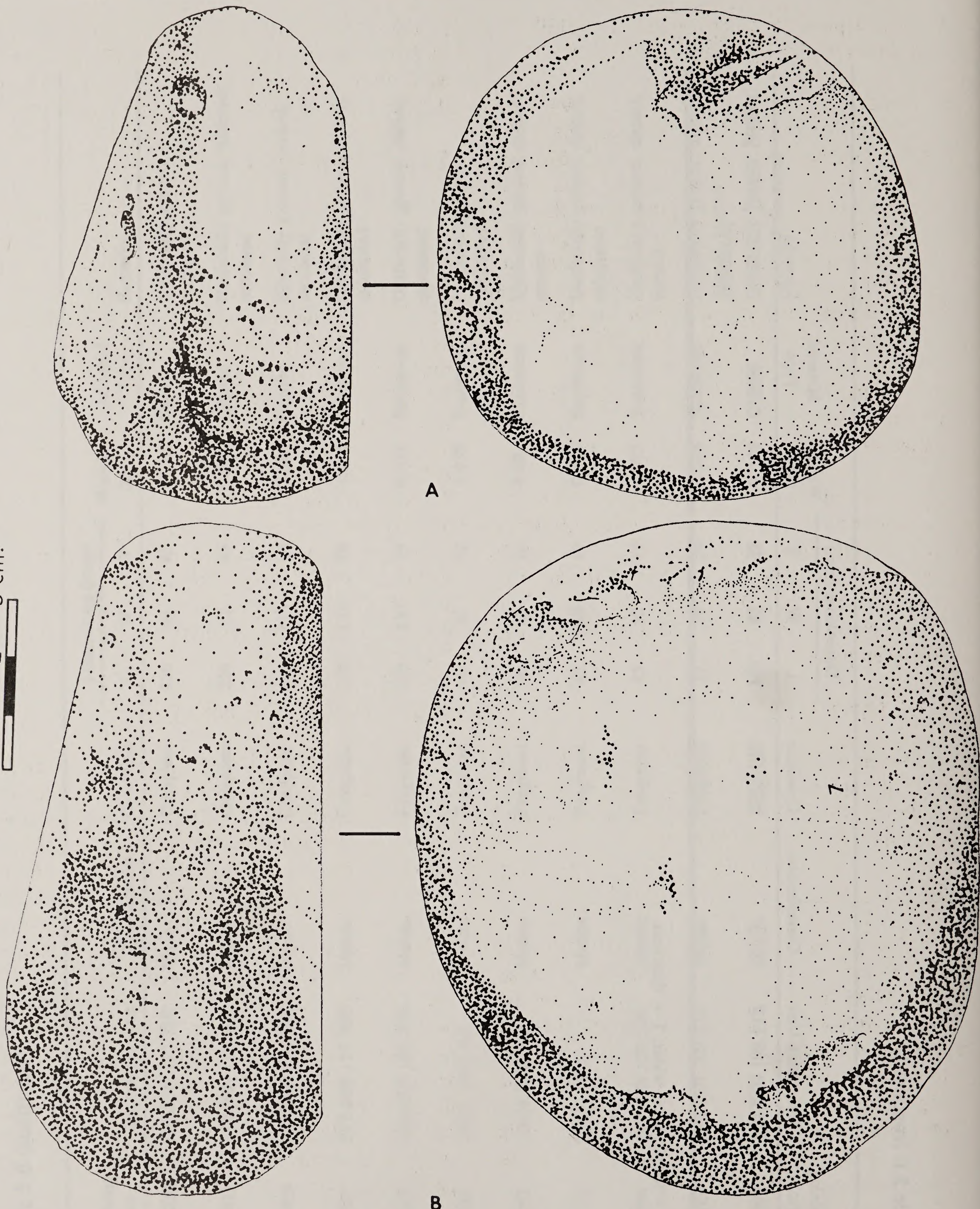


Figure 5.29 Selected Groundstone Artifacts, the Plant Site (Locality P-069). A) CR4139-837, B) CR4139-1029.

other is a piece of broken granite (CR4139-783) that shows minimal grinding on one side.

Feature 42 was a compact cluster of 94 rocks, 13 of which are heat-altered groundstone. Five tabular sandstone pieces (CR4139-677, 676, and 1028 A, B, C) are ground on one side. Two pieces can be refitted, and the uniform thickness of all five pieces indicates that they are probably from the same metate. Two ground sandstone pieces of greater thickness (CR4139-679 and 678) may represent parts of a second broken sandstone metate present in the feature.

A sandstone metate fragment (CR4139-349) was recovered from Feature 27. It is ground unifacially and is not heat altered.

Seven pieces of groundstone from the excavation block were not associated with features. Five of the eight pieces are sandstone metate fragments (CR4139-355, 257, 776, 290, and 169), the two remaining pieces are granite. One of the granite pieces (CR4138-492) is a metate fragment. All seven pieces are unburned.

5.3.4 Other Artifacts

Seven artifacts recovered from the Plant site do not represent groundstone or flaked stone artifacts. They are discussed in the following section by type and function.

5.3.4.1 Unmodified Choppers or Cleavers

Two pieces of granite had been used in their natural state as choppers or cleavers. Artifact CR4139-85 is a tabular piece of unmodified granite. It has been naturally broken transversely, creating a straight, flat edge. The remaining edge is naturally sharp. Smoothing and dulling of this edge demonstrates that the rock was used in a chopping manner with the flat edge gripped in the hand. The tool was probably used in a single-hand fashion.

Artifact CR4139-827 (Figure 5.30) is a naturally wedge-shaped granite cobble that has been used as a chopper or cleaver. The cobble is unaltered except for use wear along the sharp edge. With a weight of one kilogram, it is likely that the tool was wielded with two hands.

5.3.4.2 Hammerstones

Seven granite cobbles used as manos also show evidence of battering as hammerstones. These multipurpose tools were described in the groundstone section. One hammerstone (CR4139-344) is part of the seven piece tool cache identified as Feature 28 (Figure 5.26, G). The artifact is a round quartzite pebble measuring 4.9 x 4.5 x 3.5 cm. A band of battering wear is present around the longest circumference, which has worn the round surface of the pebble flat in one place. A faint red ocher stain can be discerned on part of the battered area. This hammerstone fits the hand in a manner where the index finger passes over the top of the stone and the thumb and second finger support from the sides. This grip and the small size of the stone rule out heavy hammering. It was used for light, precision work such as flintknapping.

5.3.4.3 Problematical Stone Tool

Artifact CR4139-350 is a rectangular piece of shale measuring 12.5 x 1.6 x 1.1 cm, that tapers to form a natural wedge. The four sharp, natural edges appear rounded and polished when examined with a microscope, and two microflakes have been removed from the tapered distal end. Near the broad proximal end of the tool, a natural indentation occurs that bears polishing. This tool best fits the hand when gripped with the thumb in the indentation and the fingers supporting from beneath. The wear observed on the indentation fits exactly the place the thumb would rub if the artifact were held in the manner described. The function of the tool appears to be scraping, rubbing, or shredding. The polishing on the edges suggests that the material being processed was unabrasive, such as plant fiber or hide.

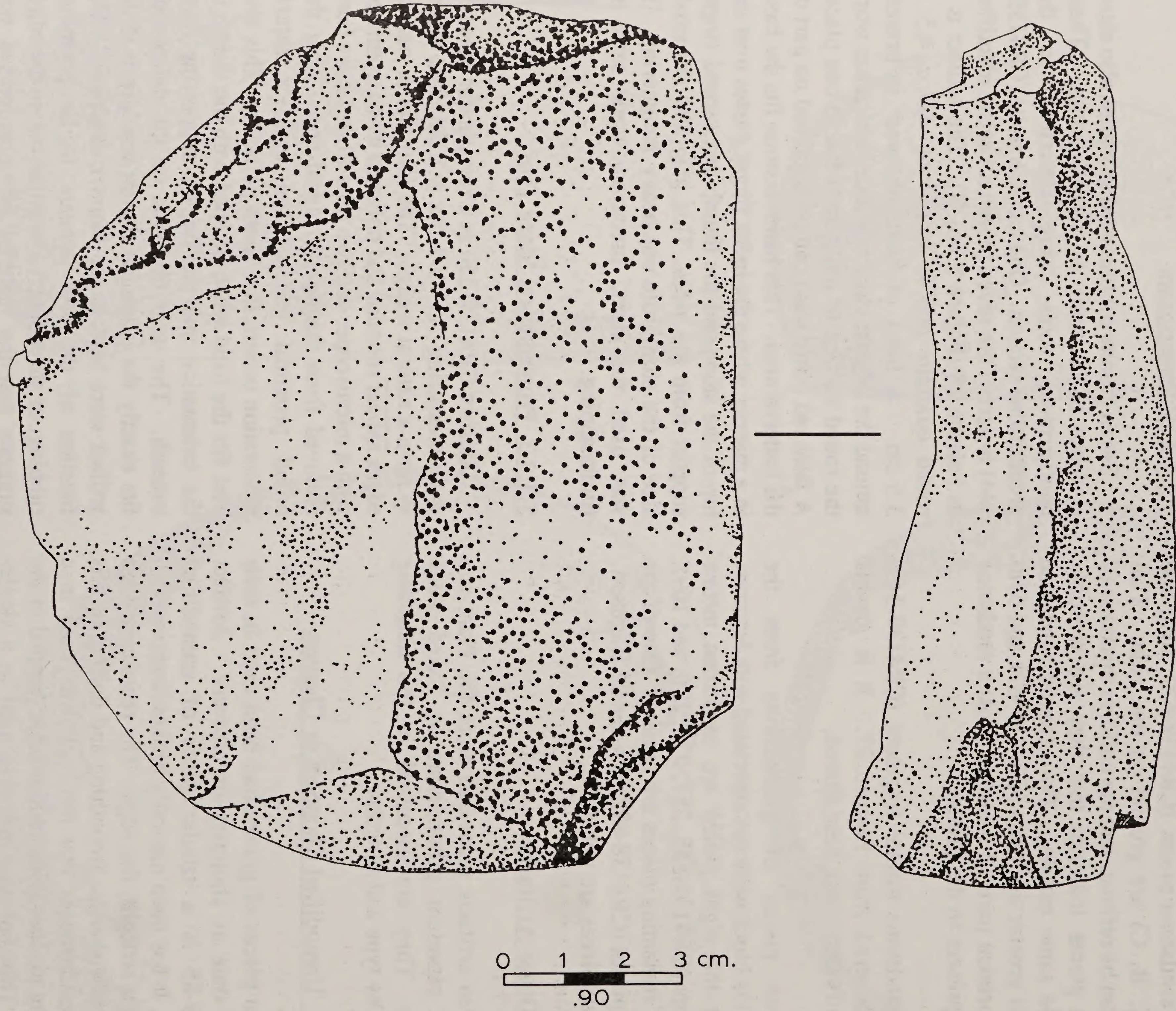


Figure 5.30 Unmodified Stone Tool CR4139-827, the Plant Site (Locality P-069).

5.3.4.4 Bone Awls

Two bone awls came from the excavation block at the Plant site (Figure 5.26, J, K). Artifact CR4138-38 came from the disturbed deposits of the pipeline trench where the trench crossed Excavation Unit 104N 106E. The artifact likely originated from the trench area within the excavation block. The awl is made from the left proximal metacarpal of a deer-pronghorn size animal. The joint forms an expanding, blunt handle; the point may once have been sharp but is now blunt. Polishing and microscopic scratch marks along the awl blade indicate that the tool was used in a drilling manner to make holes as large as 1.5 cm. The blunt tip and polished surface suggest that this awl may have been used to enlarge existing holes in leather rather than to make holes.

Bone awl CR4139-1014 came from 10 cm below Feature 42, a concentration of heat-altered rock. The bone element, measuring 5.3 x 0.8 cm, is from a large animal (deer, pronghorn, or bison). The long, slender, pointed tip and polish extending only a short distance up the shaft suggest that this awl may have been used to make holes in leather (rather than to enlarge holes).

5.3.4.5 Red Ocher

Small ocher nodules occur naturally in the site area. Red ocher (hematite) is the prominent type, but yellow ocher (limonite) is also present. Approximately 40 samples of unmodified ocher were collected from the screens during excavation, with only one culturally modified nodule noted. Artifact CR4139-263 (Figure 5.26, H) is an ocher nodule that has been ground flat on one side. It was found in association with Feature 27 and an Early Archaic period dart point (CR4139-351 [Figure 5.26, D]). Microscopic examination of the ground facet showed linear scratch marks, proving that the nodule was ground in a straight (back and forth) manner rather than a circular one.

5.3.5 Animal Remains

Excavations at the Plant site yielded 1,941 bone, tooth, or shell fragments. Five hundred eighty-five specimens were judged to be recent and noncultural due to their excellent condition, and nearly all these specimens represent rodent size animals. With these intrusive remains subtracted, 1,355 fragments of probable cultural origin are included in the assemblage (Table 5.7). One hundred seventy-three, or 12.8%, were culturally altered by burning, butchering, polishing, or spiral fracturing. Most of the bone that evidences cultural modification is burned. Fifty specimens, or 3.5%, could be identified to species. The remaining 1,309, or 96.5 %, were grouped by animal size ranges: large, medium, small, and/or very small. The large category includes bison and elk; the medium category includes pronghorn, deer, fox, and coyote size animals; small animals would be of rabbit to coyote size; and the very small category includes animals smaller than rabbits. Twenty-three fragments were identified as bird bone or eggshell, one specimen is a bivalve mussel shell, and the rest are mammal remains.

Three bone specimens were identified as those of bison. One bison phalange (CR4139-740) is from an immature animal that was approximately six months of age at death. Nine bones are of bison size but not identifiable as bison; one has a spiral fracture indicative of human activity, possibly indicating marrow extraction.

The left mandible of an elk (48CR4139-740) was found within the area of Feature 44. The mandible is not complete; the ascending ramus is broken off. The remaining portion has been broken open for marrow extraction and exhibits two areas of crushing from impact with a heavy tool. Tooth wear comparison with specimens in the University of Wyoming faunal collection determined the elk to be 7.0-7.5 years of age and that death occurred in the early spring to summer.

One burned pronghorn specimens and 15 pronghorn size fragments were recovered from excavations. Artifact 48CR4139-41, a bone awl, is

Table 5.7 Summary of Animal Remains, the Plant Site (Locality P-069).

Animal Size Category	Total Specimens No.	Total Specimens Wt. (g)	Culturally Modified No.	Culturally Modified %	Identifiable Elements
Bison	3	173	--	--	Right calcaneus, 2nd phalange, ulna radius left
Bison size	9	173.1	1	11.1	Trapezoid-magnum right, unciform right, vertebra, cuneiform right, lunar, metatarsal, scaphoid left and right
Elk	1	298	1	100.00	Left mandible
Pronghorn	1	10.8	1	100.00	Left astragalus
Deer-pronghorn size	15	32.4	1	6.7	Cranial, innominate, cuneiform right, metacarpal left, phalange 3rd, vertebra
Jackrabbit	18	5.5	--	--	Tibia, femur, humerus, ulna, vertebra, maxilla, metapodial, phalange 1st, podial, scapula left
Jackrabbit size	16	35.1	--	--	Mandible left, mandible left and right, metapodial, phalange, tibia, ulna, astragalus left, calcaneus left, cranial, femur, innominate left and right
Ground squirrel	20	4.2	7	35	Patella, phalange 1st, scapula, tibia, ulna, vertebra, cranial, humerus left, mandible left and right, maxilla, metapodial
Pocket gopher	1	0.2	--	--	Mandible
Owl size	1	2.5	--	--	Humerus right
Sage grouse	5	3.3	--	--	Sternum
Medium bird	1	--	--	--	--
Small bird	2	0.1	--	--	--

Table 5.7 (continued)

Animal Size Category	Total Specimens No.	Total Specimens Wt. (g)	Culturally Modified No.	Culturally Modified %	Identifiable Elements
Eggshell	14	--	--	--	--
Bivalve mollusk	1	1.7	--	--	Shell
Large to medium mammal	367	160.6	26	7.0	Cranial, rib
Large mammal	30	7.6	--	--	Rib, tooth
Medium mammal	147	21.9	28	19.0	Phalange, phalange 2nd, podial, rib, ulna, vertebra
Medium to small mammal	511	25.1	76	14.9	Astragalus left, cranial
Medium to very small mammal	128	3	19	14.9	Phalange
Small to very small mammal	16	0.2	--	--	Ulna
Very small mammal	48	24	13	50.0	Innominate right, mandible right, maxilla, scapula, tibia, ulna, vertebra, astragalus, calcaneus, cranial, femur left and right, humerus
Total	1,355	982.3	173	12.8	

made from the left proximal metacarpal of a deer-pronghorn size animal.

Eighteen jackrabbit specimens and 16 jackrabbit size specimens were recovered from the excavation. None of these remains were culturally altered.

Twenty ground squirrel bones and one pocket gopher bone were collected. None showed cultural alteration. Most, if not all, of the very small to medium mammal bone that was in excellent condition (94.4%) may be considered intrusive. Five unaltered bones of a large male sage grouse were found in Feature 15. The excavation produced one large (owl size) bird bone, one medium bird bone, and two small bird bones, as well as 14 pieces of eggshell from small birds. Some of the bones in the very small mammal category could be bird, since it is hard to distinguish between the two types. The 14 pieces of eggshell collected are too fragmentary to identify, other than from a medium bird. They are all white and of matching thickness, probably from the same clutch of eggs or even the same egg. Enough remains of the eggshells to see that they are larger than those of sparrow size (small) birds. None of the bird bone or eggshell shows cultural modification. Eggs could have been gathered from early to late spring.

The hinge portion of a freshwater mussel (bivalve) was collected from the site (CR4139-630 [Figure 5.26, I]). Identified as *Lampsilis*, the specimen is probably *L. raditua siliquoidea*. This type of mussel is found in the North Platte River (Beetle 1991).

5.3.6 Plant Macrofossils

Twenty-three flotation samples collected from features were processed from the excavation block at the Plant site. No charred seeds were recovered (Table 5.8). Numerous flotation samples from cultural features salvaged at the Plant site by GAC also failed to recover charred seeds (Cummings 1988).

5.3.7 Results of Pollen Analysis

Six pollen samples obtained from features, and seven control samples not associated with features were analyzed. The six feature samples yielded insufficient pollen for evaluation due to poor pollen preservation within the ashy feature matrix. Six of the seven control samples produced enough pollen for analysis.

The dominant pollen taxon in the six control samples varied between sagebrush and Cheno-am. Other non-arboreal taxa represented in the samples include low- and high-spine compositae, liguliflorae, greasewood, grass, joint-fir and prickly pear (Appendix B).

Little arboreal pollen was found in the samples, with the exception of Sample 73, taken 20 cm north of Feature 10, which yielded a 23% pinyon-type pine pollen value. It is possible that pine wood was carried in for fuel, accounting for the high pollen count around this particular feature. It is unlikely that green, pollen-producing wood would have been collected for fuel, but dead wood could have accumulated pollen in the vicinity of live trees before being collected. Pine pollinates in the summer, suggesting a summer use of the feature.

Other arboreal pollen represented in the six samples includes spruce, Douglas fir, ponderosa-type pine, undifferentiated pine, juniper, and oak. These tree types are wind-pollinated plants from which pollen can be transported by the wind over long distances. The Green Mountains are a likely source for this pollen (Appendix B).

Pollen analysis suggests that vegetation in the area of the Plant site was not much different in prehistoric times than it is presently, a sagebrush/saltbrush community. A higher Cheno-am pollen count indicates that saltbrush was more plentiful in prehistoric times, occurring closer to the site area or intermixed with the sagebrush. Such differences would most likely relate to local factors of dune development rather than any major change in environmental or climatic conditions (Appendix B).

Table 5.8 Plant Macrofossils Recovered from Feature Fill, the Plant Site (Locality P-069).

Feature No.	Sample No.	Volume (liters)	No. of Charred Seeds	Taxon
27	176	2	0	--
20	112	2	0	--
10	12	1.5	0	--
18	118	1.5	0	--
5	39	2	0	--
29	320	2	0	--
36	219	1	0	--
33	269	2	0	--
54	428	1.5	0	--
49	319	1.5	0	--
71	544	2	0	--
37	205	1.5	0	--
47	365	2	0	--
64	456	1.5	0	--
63	449	1.5	0	--
45	347	1.5	0	--
66	468	1.5	0	--
12	25	1.5	0	--
44	479	1.5	0	--
64	482	1.5	0	--
64	486	1.5	0	--
47	365	1.5	0	--
41	356	2.2	0	--

5.3.8 Spatial Distribution of Remains

The distribution of cultural features and tools from the excavation block of the Plant site is shown in Figure 5.31. Tools which were not point plotted as to exact location are shown in the centers of the 1 m^2 units from which they were recovered. Figures 5.32 and 5.33 provide trend surface maps for heat-altered rock that indicate densities for total heat-altered rock and three material types--granite, quartzite, and sandstone. Figures 5.34, 5.35, 5.36, and 5.37 are trend surface maps that show densities of total debitage, clear chalcedony debitage, white chert debitage, other chert debitage, quartzite debitage, black siltstone debitage, primary and secondary flakes, and tertiary and microflakes. Figures 5.38, 5.39, and 5.40 provide trend surface maps for total animal remains, culturally modified bone, deer-pronghorn and medium size mammal, small mammals including jackrabbit, large mammals, and bird remains.

The feature/tool map shows features of different morphological types distributed somewhat randomly throughout the block area, with one cluster of features, located at 108/112N 104/108E, appearing to represent an activity area encompassed by Feature 44, a discrete area of charcoal staining. The majority of tools from the site are groundstone artifacts associated with features. Features containing such groundstone concentrations were Features 60, 42, and 8. These groundstone concentrations can be attributed to the final use of most groundstone tools as hearthstones which accumulate in heat-altered rock concentrations. Most flaked stone and miscellaneous tools appear in areas unassociated with features and present no patterns that might be interpreted as activity areas.

Density trends for total heat-altered rock show the major amount in the north portion of the block between 110N and 118N. The two high concentrations generalized on the map represent the large quantities of rock present in Features 8, 47, and 42. Two concentrations of granite heat-altered rock appear in the 111N 110E and 110N 118E areas of the block and represent the rock present in Features 60, 8, and 47. A lesser concentration appears at 100/104N 100/102E where no features were present. Quartzite heat-altered rock is restricted to two areas at 110N 108E and 118N 112E and is unassociated with features. The trend density map shows that all sandstone heat-altered rock is found with Features 44, 60, 67, and 42.

Density trends for debitage show the heaviest concentration in the 104/113N 104/110E and 110/118N 114/118E areas of the block. The only features that appeared to be associated with increased debitage counts were the cluster including Features 62, 63, 65, and 67, and Feature 44 with its associated group of features. Three other concentrations of debitage appear on the trend map; two are discrete areas at 104N 104E and 106N 108E, with a third area of high debitage count at 110/112N and 112/118E which extends beyond the block to the south. Clear chalcedony is distributed in the same way as the overall debitage pattern with the same general areas of high concentration. White chert is distributed randomly across the block with high counts occurring near a feature cluster that includes Features 27, 17, and 30, and in the 111N 114E area. Debitage from lithic material classified as other chert is distributed in much the same way as the overall pattern. Quartzite debitage shows a general distribution over the block area with a concentration at a feature concentration that includes Features 59, 46, 49, and 69, at 112/115N 106/109E, and another at 105N 108E. The distribution of black siltstone is of a lesser extent than other material types, but it follows the overall trend patterns with the exception of a discrete concentration in the general area of 116N 112E. Density trends for flake types show a greater spatial distribution for tertiary and microflakes over primary and secondary flakes. The pattern of distribution for all four flake types is generally the same in the areas of highest count.

Density trends for animal remains indicate that remains are distributed across the excavation block with numerous areas of concentration.

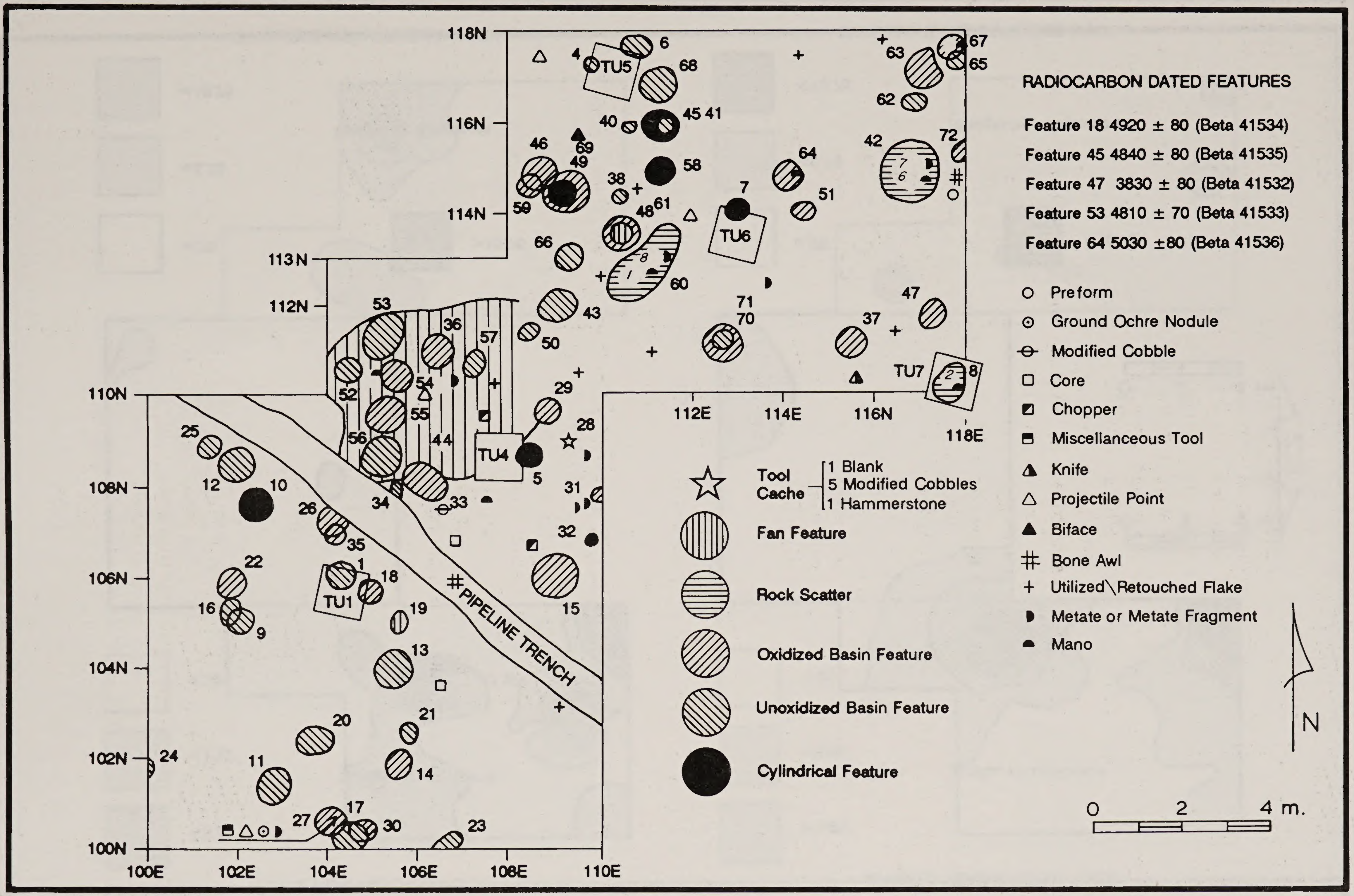


Figure 5.31 Plan Map with Feature Types and Tools Plotted, the Plant Site (Locality P-069).

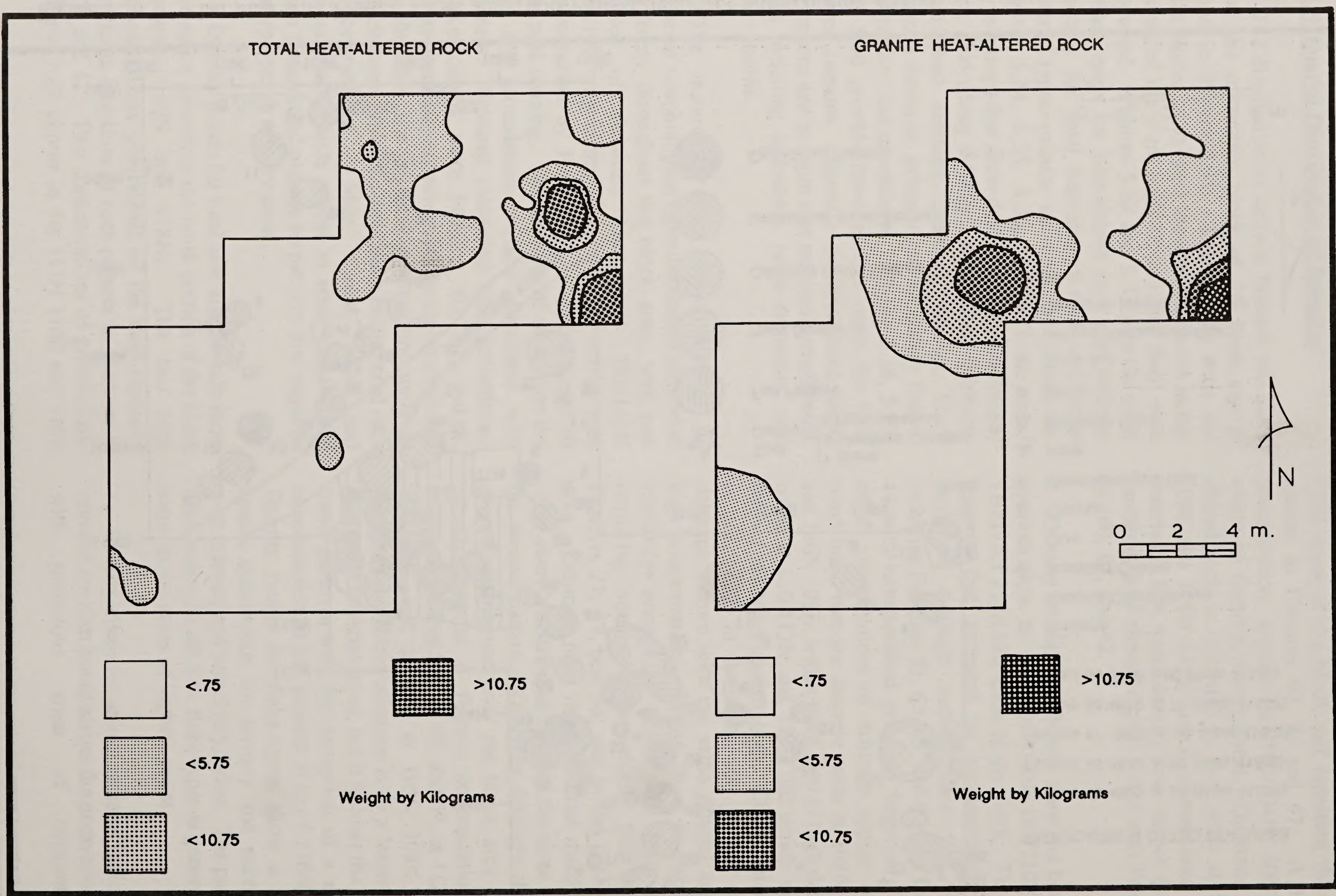


Figure 5.32 Trend Surface Maps for Total Heat-altered Rock and Granite Heat-altered Rock, the Plant Site (Locality P-069).

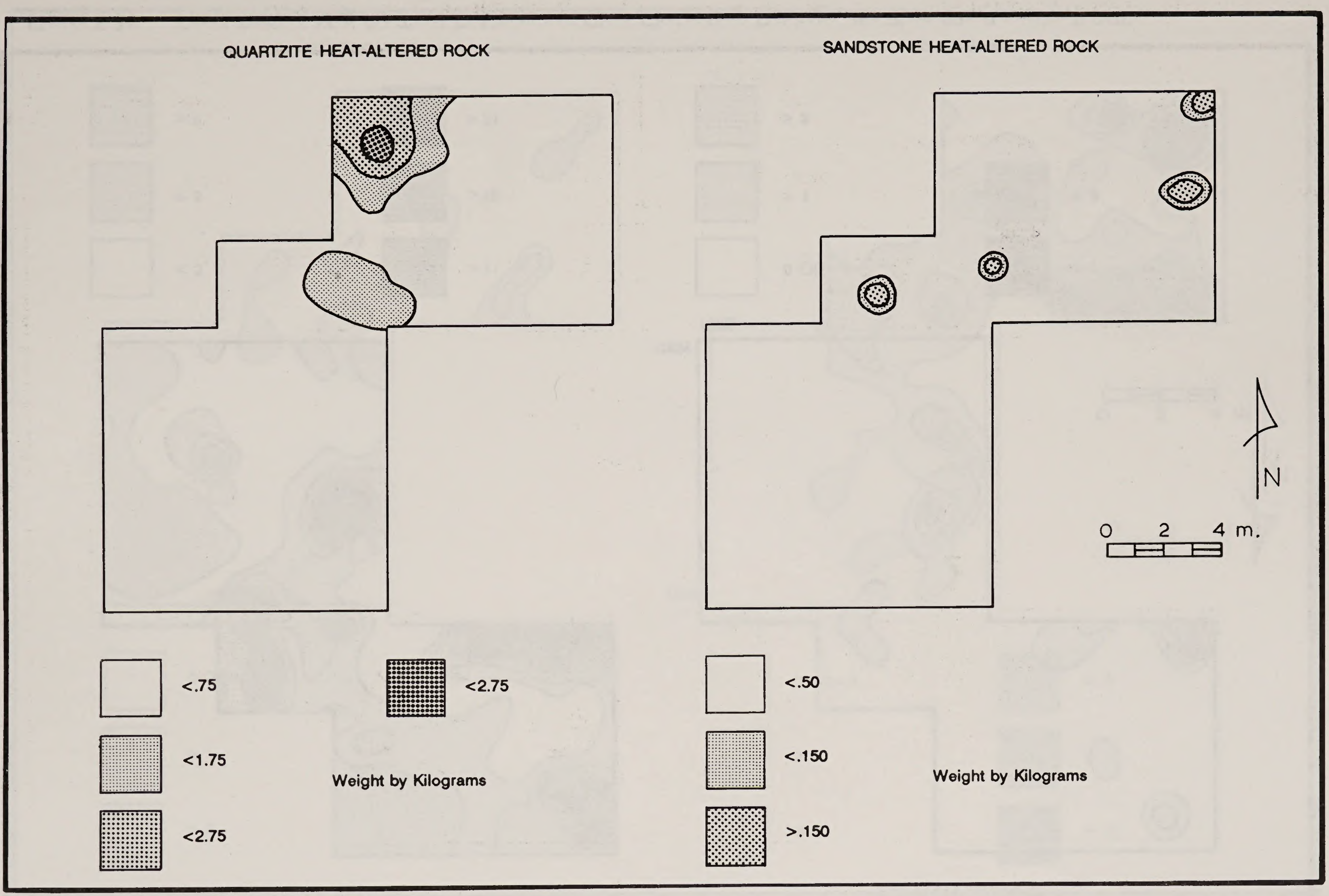


Figure 5.33 Trend Surface Map for Quartzite Heat-altered Rock and Sandstone Heat-altered Rock, the Plant Site (Locality P-069).

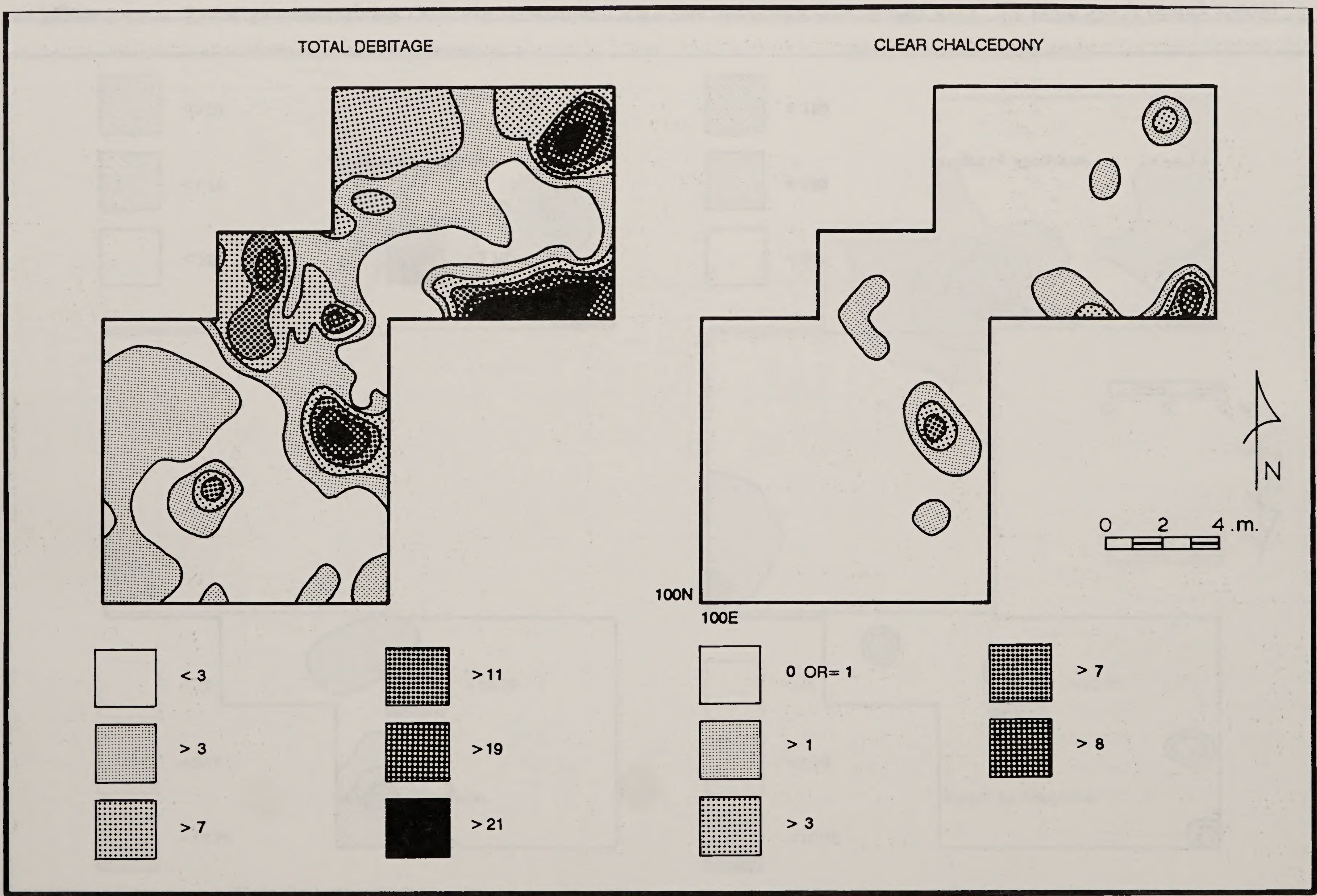


Figure 5.34 Trend Surface Map for Total Debitage and Clear Chalcedony Debitage, the Plant Site (Locality P-069).

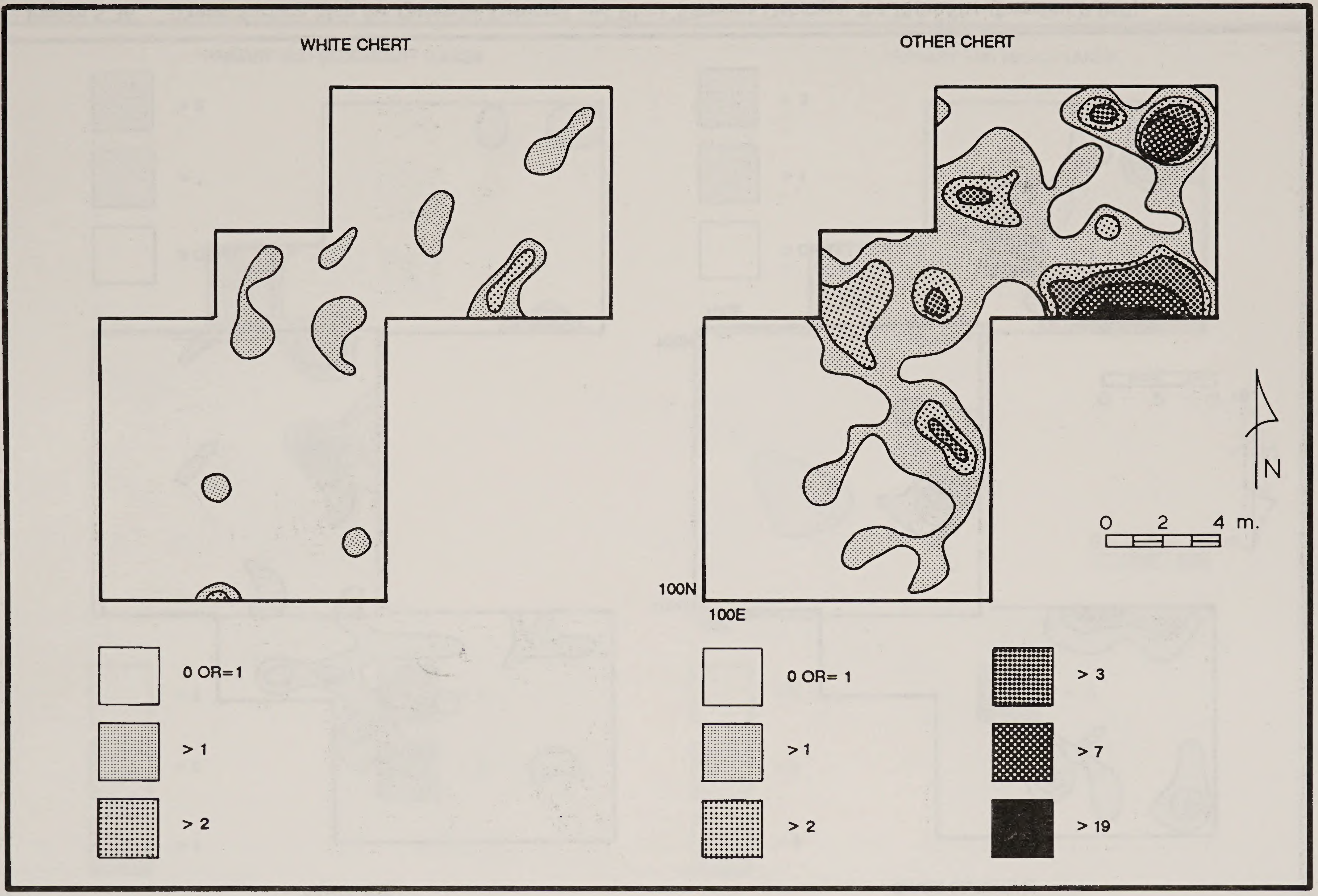


Figure 5.35 Trend Surface Map for White Chert Debitage and Other Chert Debitage, the Plant Site (Locality P-069).

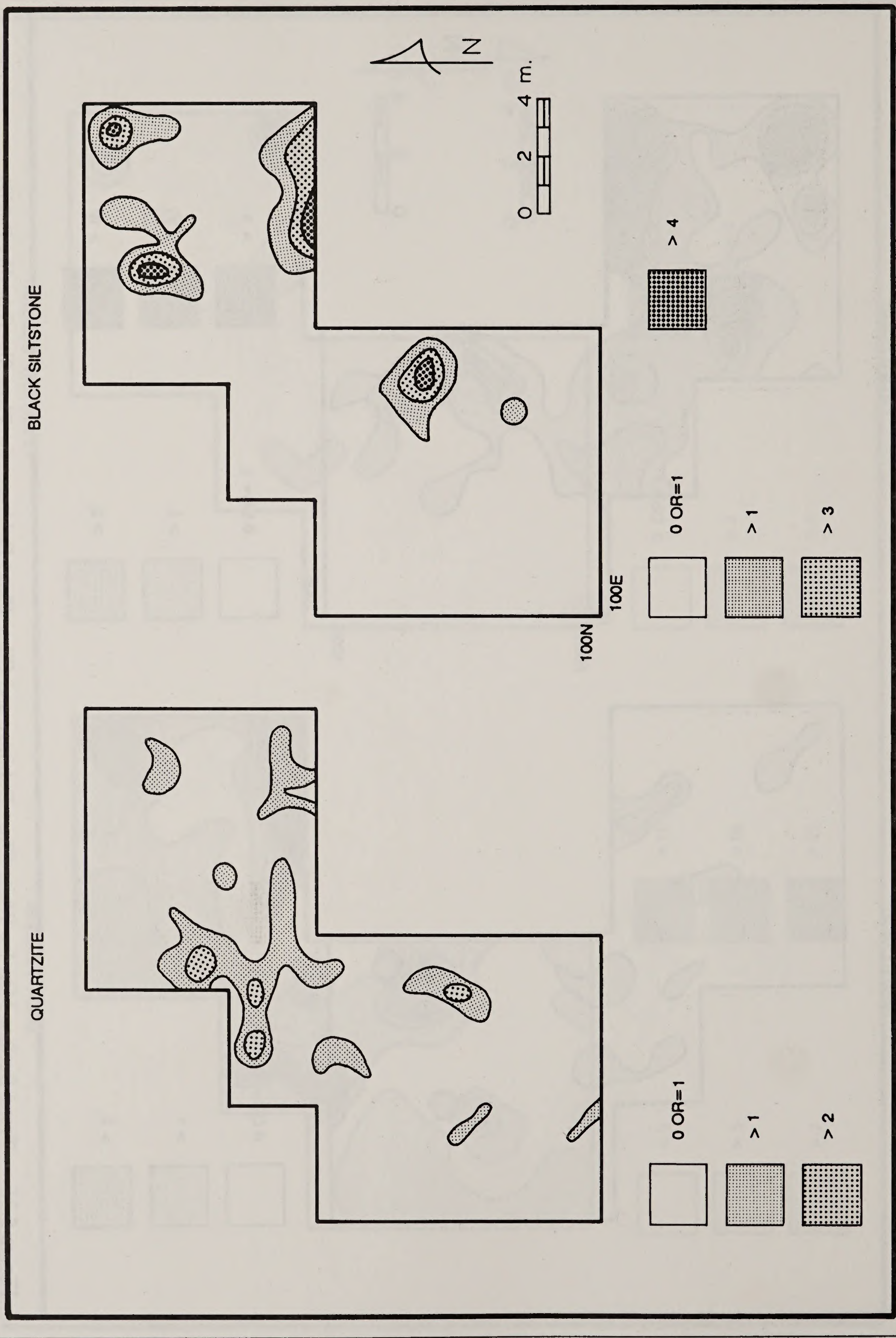


Figure 5.36 Trend Surface Map for Quartzite Debitage and Black Siltstone Debitage, the Plant Site (Locality P-069).

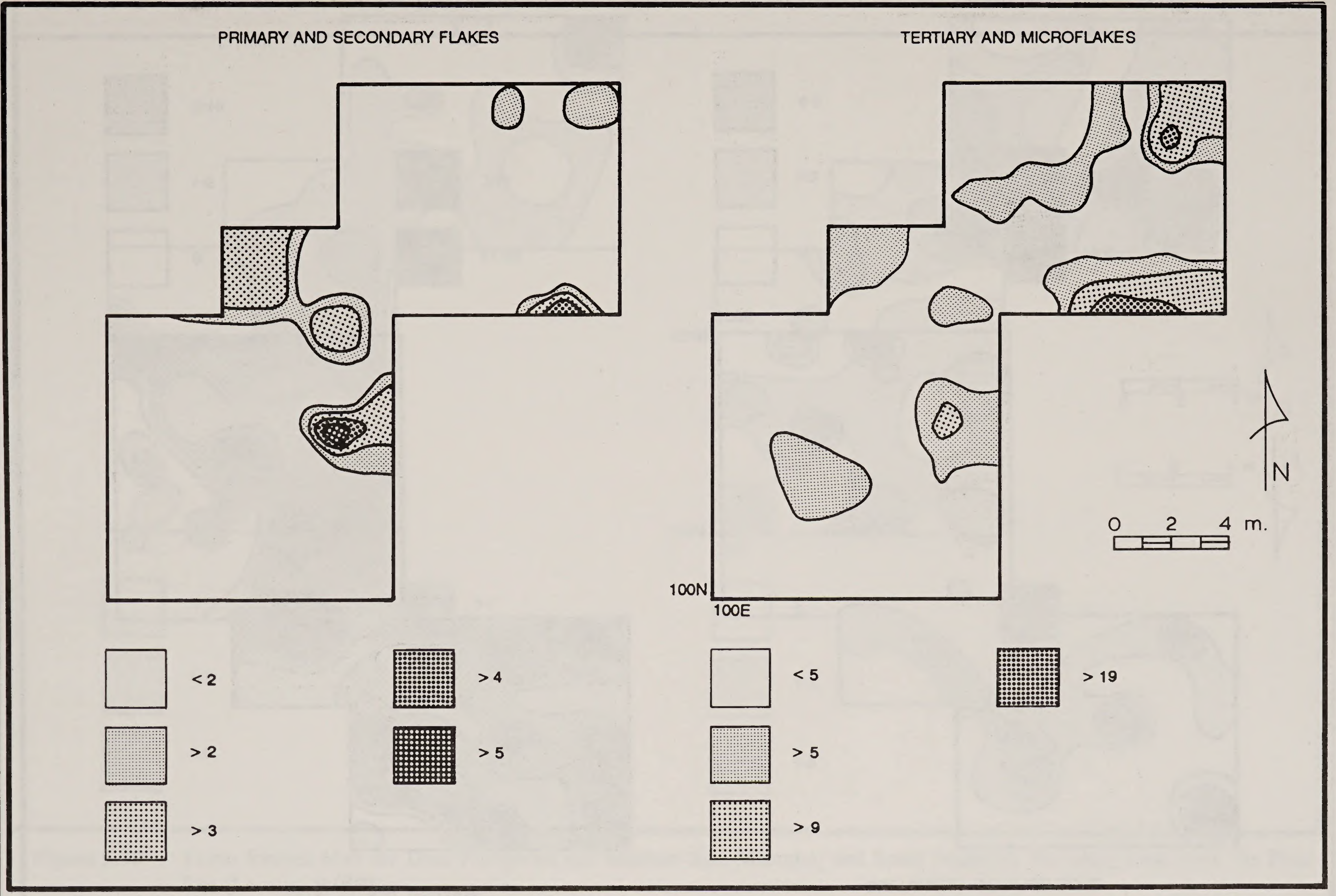


Figure 5.37 Trend Surface Map for Primary and Secondary Flakes, and Tertiary and Microflakes, the Plant Site (Locality P-069).

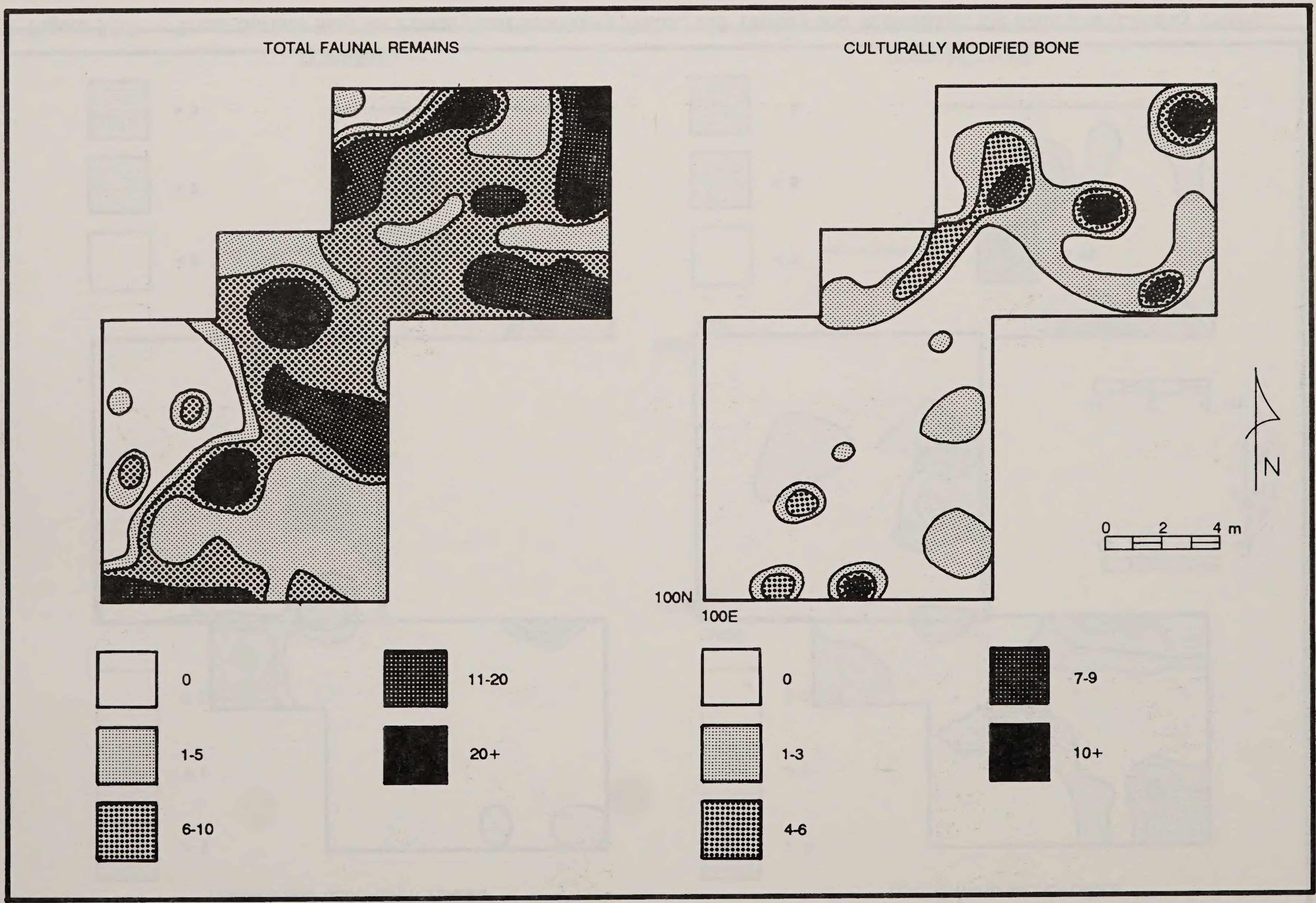


Figure 5.38 Trend Surface Map for Total Faunal Remains and Culturally Modified Bone, the Plant Site (Locality P-069).

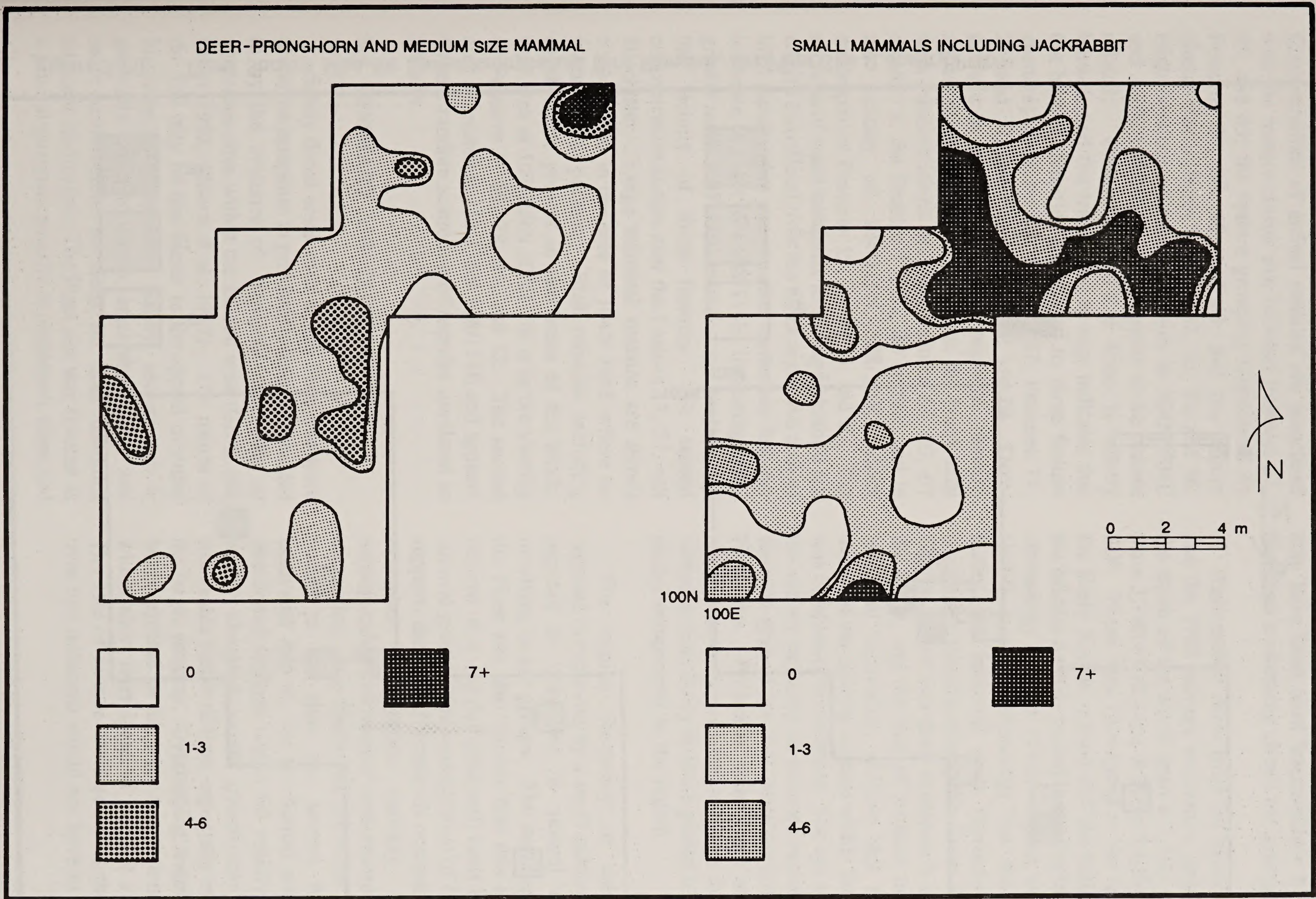


Figure 5.39 Trend Surface Map for Deer-Pronghorn and Medium Size Mammal, and Small Mammals Including Jackrabbit, the Plant Site (Locality P-069).

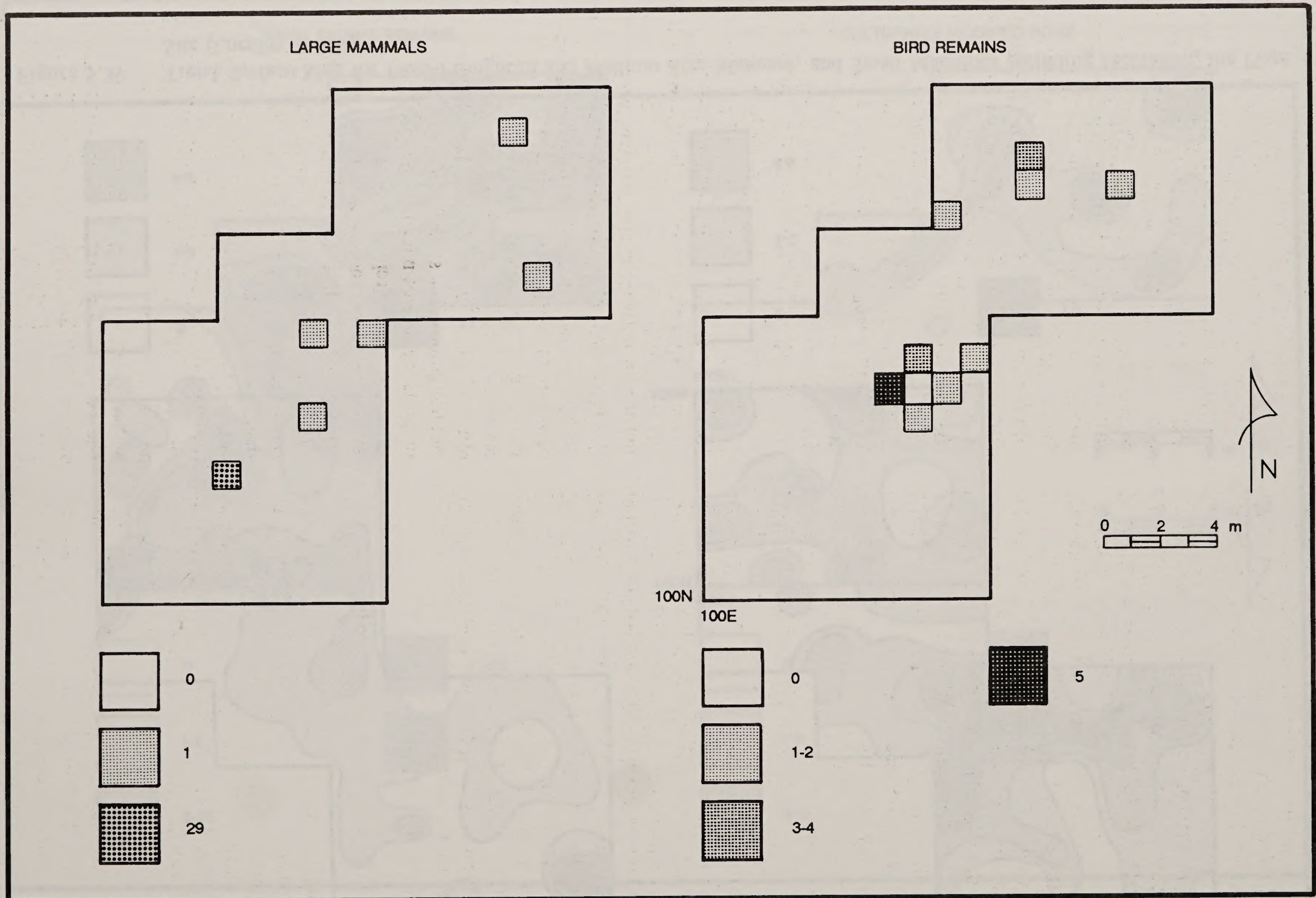


Figure 5.40 Trend Surface Map for Large Animals and Bird Remains, the Plant Site (Locality P-069).

Concentrations of animal remains are associated with the feature cluster that includes Features 67, 65, and 63; the feature grouping represented by Features 59, 46, 49, and 69; and the feature cluster that includes Features 52, 53, 54, and 36. High densities of animal remains at 104N 104E and 100N 100/106E do not appear to be feature related. Culturally modified bone is mostly burned, and the trend surface map indicates that the highest densities are related to three feature clusters: Features 63, 65, and 67; Features 17, 27, and 30; and Features 37, 51, and 64. Deer-pronghorn and medium size mammal remains appear randomly distributed over the block area with concentrations near the Feature 63, 65, 67 cluster; at the Feature 17, 27, 30 cluster; and in the vicinity of 104/111N 108/110E which encompasses Features 15, 31, 32, 5, and 29. The remains of small mammals including jackrabbit are widely distributed over the block area. An area of high density that encompasses numerous features is shown at 110/116N 108/118E, indicating that a greater number of small animals were processed in the vicinity of these features. A second concentration occurs near the Feature 17, 27, and 30 cluster. Large mammal remains are shown concentrated in the area of 104N 104E where no features are present. Bird remains including eggshell are present in two areas of the block. One area at 107/109N 106/110E is in the vicinity of Features 5, 29, 28, 31, and 32. The second area is located at 113/116N 108/114E and appears to be a random scattering of remains unrelated to features.

5.4 SUMMARY AND CONCLUSIONS

Sandy dunal areas such as the Plant site were preferred campsites in prehistoric times, as attested to by the evidence of repeated occupation at numerous sites within the Bairoil area (Greer and Greer 1989, Moore et al. 1987). The nature of the soil may be one factor in the appeal of dunal locations as campsites. Sandy, aeolian soil is generally easier to dig in, erect shelters on, and more comfortable to sleep on than nondunal adjacent landforms. The Plant site was favored as a general-purpose campsite in prehistoric times and may have been used intermittently by the same bands on a returning circuit for generations.

Radiocarbon dates from the excavation block and the 1988 salvage excavation immediately to the north of the block span a 1,880 year period from 3,780±110 years B.P. to 5,660±110 years B.P. These ages correspond to the latter part of the Early Archaic period and the initial stages of the Middle Archaic period in the Northwest Plains chronology (Frison 1978). Based on Metcalf's (1987) cultural chronology for the Wyoming Basin, the temporal span represented by the component includes mostly the Green River phase. The results of two deep exploratory units within the block, and the lack of artifacts in the lowest levels of excavation, indicate that the vertical extent of the cultural stratum within the block area was completely investigated. The age estimates for the site are probably an accurate representation of the time span of the prehistoric occupations at the Plant site. Projectile point types are all side-notched or corner-notched varieties that are most common from Early Archaic period (Green River phase) components in the region.

The regular frequency of dates implies repeated occupations by a small cultural group, as opposed to only one or several occupations involving larger groups. The caching of tools at the Plant site also implies that this locality was utilized on a regular (seasonal) basis by the same cultural group. The superposition of features also supports the idea of numerous occupations. Nine examples of firepits partially or totally encompassing one another were recorded from the excavation. It is likely that the older feature was buried at the time the second feature was excavated into it. In the Bairoil wind corridor abandoned features would fill rapidly, but to be totally obscured would conceivably require a reasonable length of time, especially in the case of the larger features. Overlapping features can then be interpreted as separate occupations occurring within short time spans of perhaps a few years. The rate of feature construction at the Plant site over two millennia would not have to be great to produce the number of features (71) recorded during excavation.

The function of most of the features within the excavation block was probably as general-purpose firepits for heating and cooking. Thirty-four of the 71 features contained culturally modified bone, which was usually burned. These features may have served a roasting or cooking function. The quantity of heat-altered rock on the site indicates that roasting over hot rocks or stone boiling was being practiced. This would account for larger features such as Features 18, 26, 29, and 45, which were deep enough to hold an adequate number of rocks (such as the 13 kg present in feature 60) and enough fuel to heat them. Features 53, 54, 55, 56, and 33, clustered within the charcoal-stained area of Feature 44, were of such proportions as to be excluded from the domestic hearth and stone heating categories. The volume of these pits may imply a special function such as large-scale plant processing.

Artifacts recovered from block excavations indicate that a broad range of subsistence and domestic activities are represented by the single component at the Plant site. These remains appear to represent generalized activities, and suggest that the component functioned as a residential base camp rather than a functionally more specific site type. Although numerous cultural features were recorded, a relatively small flaked stone artifact assemblage (tool, debitage) was associated, which suggests that site occupation was of a short-term nature probably by a small group. Debitage density (4 flakes/m^2) and flaked stone tool density (0.13 tool/m^2) are both fairly low.

The flaked stone tool assemblage is characterized by either finished bifacial tools or expedient tools (utilized flakes, modified cobbles) with very few bifaces representing intermediate lithic manufacturing stages associated. The types of tools and the nature of the debitage assemblage (which consists mostly of tertiary flakes or microflakes with very few cortical flakes) indicates that lithic manufacture was directed mostly towards tool maintenance tasks and further reduction of partially reduced tools. This interpretation is supported by the small number of cores (2) and the nature of the tool cache, which consist of partially reduced, multifunctional tools. The two bone awls indicate craft tasks that probably included leather working. One small nodule of red ocher is heavily smoothed, and several of the flaked stone tools have red pigment staining indicative of ocher processing activities. Numerous groundstone artifacts (34) suggest that plant processing was an important activity at the site, although numerous flotation samples from cultural features produced no charred seeds. Numerous sediment samples processed from cultural features salvaged by GAC at the Plant site also produced no charred macrofossils (Cummings 1988).

The number of animal species represented by the faunal assemblage indicates a diversified animal procurement strategy. Although most animal remains were not identifiable to species, the remains of bison, elk, pronghorn, jackrabbit, ground squirrel, pocket gopher, and sage grouse were recovered from the excavation block. Freshwater mussels, bird bone, and eggshell were also present. All species except the mussel were probably available within a reasonable traveling distance of the site. The nearest present source for mussels is the North Platte River which, at it nearest approach, is 50 km to the east. If the North Platte River represents the source area for the mussels, it is likely that the shell was an ornamental rather than food item.

Indications of season of occupation are provided by animal remains recovered from the excavation block. One bone element from an immature bison and the elk mandible indicate that the animals were procured in the spring or summer. Eggshell from the excavation block may represent the remains of eggs gathered as food during the spring. Although the above interpretations are tentative due to small number of seasonal indicators, at least some Plant site occupations likely occurred in the spring.

6.0 SITE 48CR4686 (LOCALITY P-078)

This section details the results of block excavations conducted in 1990 by Mariah at Site 48CR4686 (Locality P-078) during the data recovery phase of the Bairoil Archaeological Project. A single prehistoric component of Early/Middle Archaic period (Green River phase) affiliation was encountered during block excavations. Nineteen cultural features, including one housepit, were recorded, and a small number of artifacts were recovered during investigations. The following subsections describe the site setting, stratigraphy, and results of excavations and provide an evaluation and summary of investigations.

6.1 SITE SETTING

Site 48CR4686 is a prehistoric campsite that was recorded during an archaeological monitor of the construction of a CO_2 pipeline to the Wertz 153 well location (Greer, Greer, and Zettel 1989c). The locality is located approximately 3.8 km east of the town of Bairoil within the Wertz oil field (Figures 1.1 and 1.2). The site area is situated towards the north side of a broad plain (Lost Soldier Flats) and lies about 0.8 km south of the base of Camp Creek Hill, a high ridge that bounds Lost Soldier Flats on the north (Albanese 1989). The site is approximately 1.8 km northeast of the confluence of Lost Soldier Creek and Abel Creek (Figure 1.2) and occurs at an elevation of 2,042 m. Site 48CR4686 is near the southwest edge of a low, stabilized, dunal rise, and no surficial cultural material occurs in this area.

Modern pipeline ROWs pass along the north and west edges of the locality, and an abandoned buried pipeline crosses northwest to southeast through the area investigated by Mariah (Figure 6.1). Vegetation is fairly sparse in the dunal area, with tall and low sagebrush, rabbitbrush, prickly pear cactus, and low grasses and forbs noted. Disturbed plant communities dominate the modern pipeline ROWs.

The Wertz 153 CO_2 pipeline passes south to north through Site 48CR4686. Monitoring of pipeline construction identified one possible housepit (Feature 1) with an interior firepit 35 cm below ground surface in the east wall of the pipeline trench (Greer, Greer, and Zettel 1989c). In accordance with BLM stipulations then in force, no excavation or sampling of Feature 1 took place, although a feature sketch was completed prior to backfilling. No artifacts were recorded or collected during initial site recording. The trench profile was covered with plastic sheeting, and the feature location was marked with a metal fence post to aid relocation efforts by future investigators.

Investigations conducted by Mariah during the testing phase of the Bairoil Archaeological Project consisted of six 1 x 1 m test units and limited auger testing in the vicinity of the possible housepit (Reust et al. 1990). Test excavations were conducted on the east and west sides of the pipeline trench that passes through Site 48CR4686. These investigations concluded that Feature 1 represented a housepit and that additional cultural features were present to the north and south of Feature 1 on the east side of the trench. The four cultural features encountered during the testing phase were not excavated, and no artifacts were recovered from test excavations. The features occurred 30 to 40 cm below the present ground surface and were evaluated as likely representing a single prehistoric component. Further excavations consisting of a 6 x 10 m block area were recommended for Site 48CR4686 for the second phase of data recovery investigations.

A 6 x 10 m (60 m^2) block, that encompassed several of the test units and the four cultural features recorded during the 1990 testing phase, was excavated on the east side of the pipeline trench (Figure 6.1). The long axis of the block paralleled the trench. A single datum, 100N 100E, located at the southeast corner of the block

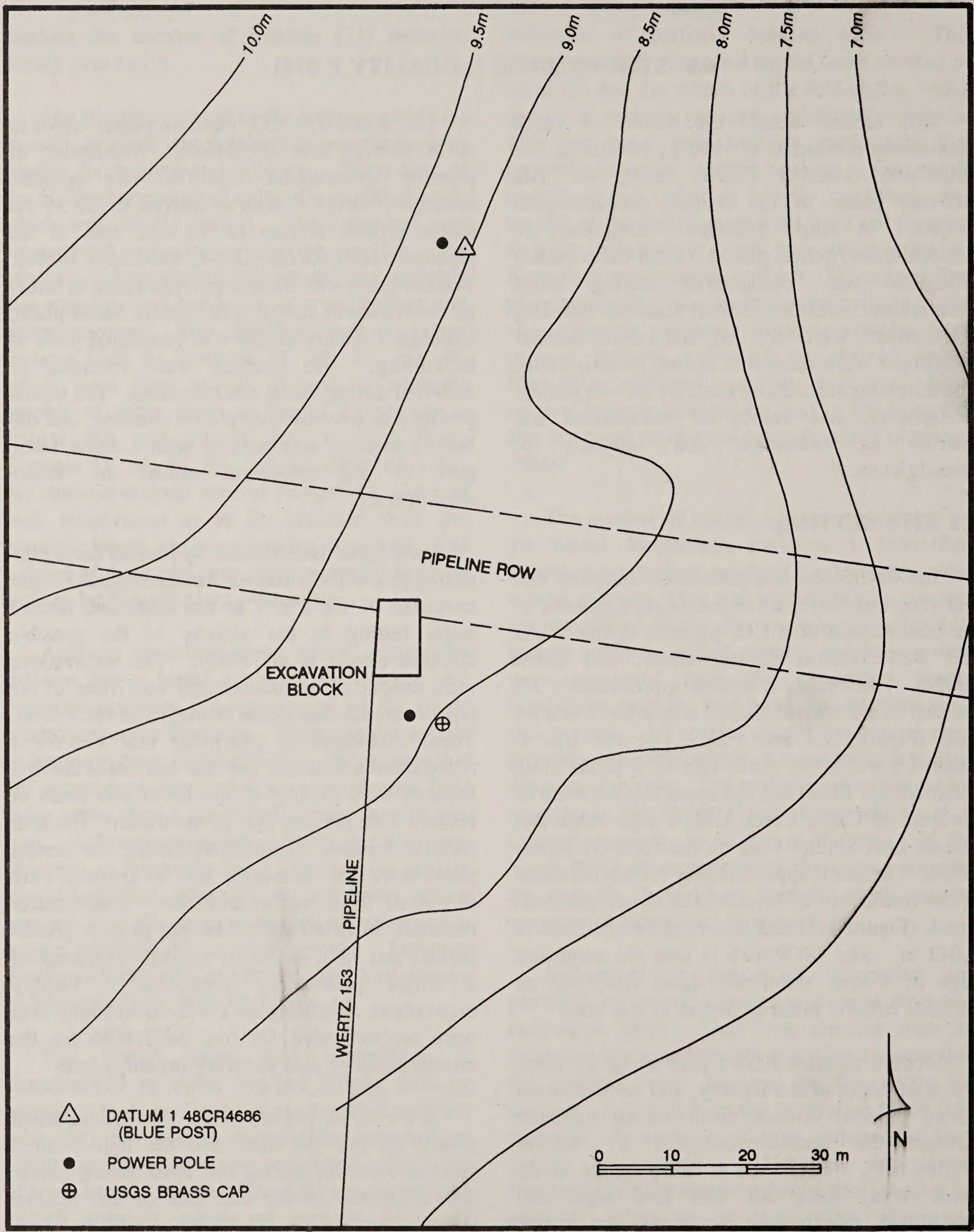


Figure 6.1 Contour Map Showing the Location of the Excavation Block, Site 48CR4686 (Locality P-078).

was used for horizontal reference (Figure 6.2). Vertical measurements were taken from a vertical datum established at an arbitrary 10.0 m elevation on a power pole southeast of the excavation block. Excavation methods followed standard archaeological procedures as outlined in Section 3.0 of this report and in the DRP (Zale 1989). Figures 6.3 and 6.4 provide views of the excavation block that show the general setting of Site 48CR4686.

6.2 STRATIGRAPHY

Site 48CR4686 is located in a low, stabilized, dunal area that is situated on a broad plain. This dunal area extends southwest to northeast for about 600 m across the plain (Albanese 1989:45), with Site 48CR4686 located towards the southwest edge of the dune. Natural sediments consist of aeolian deposits, with one shallowly buried prehistoric cultural layer defined within the natural strata. The following subsections describe the natural and cultural deposits noted during excavations.

6.2.1 Natural Stratigraphy

Natural strata were differentiated during excavations by color, degree of consolidation, texture, and calcium carbonate content. Figure 6.5 illustrates the identified natural strata. Three strata were identified, and these are described from oldest (Stratum A) to youngest (Stratum C) in the following discussion.

Stratum A was a moderately consolidated, pale brown, sandy loam that contained a moderate amount of calcium carbonate mottling. It was encountered only in deeper excavation units and was the lowest stratum noted during excavations. A few small (<2 cm) sandstone or granitic pebbles were noted in Stratum A. This stratum was noncultural.

Stratum B was a moderately consolidated, medium to coarse-grained, brown, sandy loam. This stratum contained the single cultural layer identified within the excavation block. Dispersed charcoal staining occurred within Stratum B, generally in association with cultural features. The boundaries between Stratum B and underlying Stratum A and overlying Stratum C were very distinct. Rodent disturbances were numerous within Stratum B.

Stratum C consisted of a loose to slightly consolidated, light yellowish brown, coarse-grained, loamy sand. It contained a few roots, and the upper few centimeters had been disturbed by pipeline construction equipment. This stratum contained a few small gravels and modern metal fragments, and no prehistoric cultural material was associated.

6.2.2 Cultural Stratigraphy and Age

Investigations at Site 48CR4686 encountered a single component that appears to represent a terminal Early Archaic/early Middle Archaic period (Green River phase) occupation. The component was defined chiefly by cultural features with few artifacts, bone, or heat-altered rock noted within most of the excavation block. Most cultural remains were associated with a small housepit (Feature 1) located in the northwest part of the excavation block. A few areas of dispersed ash staining, generally located near cultural features, were present throughout the block. The component occurred approximately 30 to 40 cm below present ground surface within Stratum B (Figure 6.5). No temporally diagnostic artifacts were recovered from excavations.

The 19 cultural features excavated at Site 48CR4686 contained insufficient wood charcoal for radiocarbon dating, and bulk samples of stained sediment were submitted from three features for radiocarbon dating analyses. These features were shallowly buried, and most showed some indications of rodent disturbances. Samples were submitted from features that appeared to be the least disturbed by rodent activity. Radiocarbon age estimates of 4,930±90, 4,990±80, and 4,330±70 years B.P. were obtained from Features 1.4, 8, and 7, respectively (Table 6.1). Although these estimates suggest that two distinct components spanning a 600 year period are

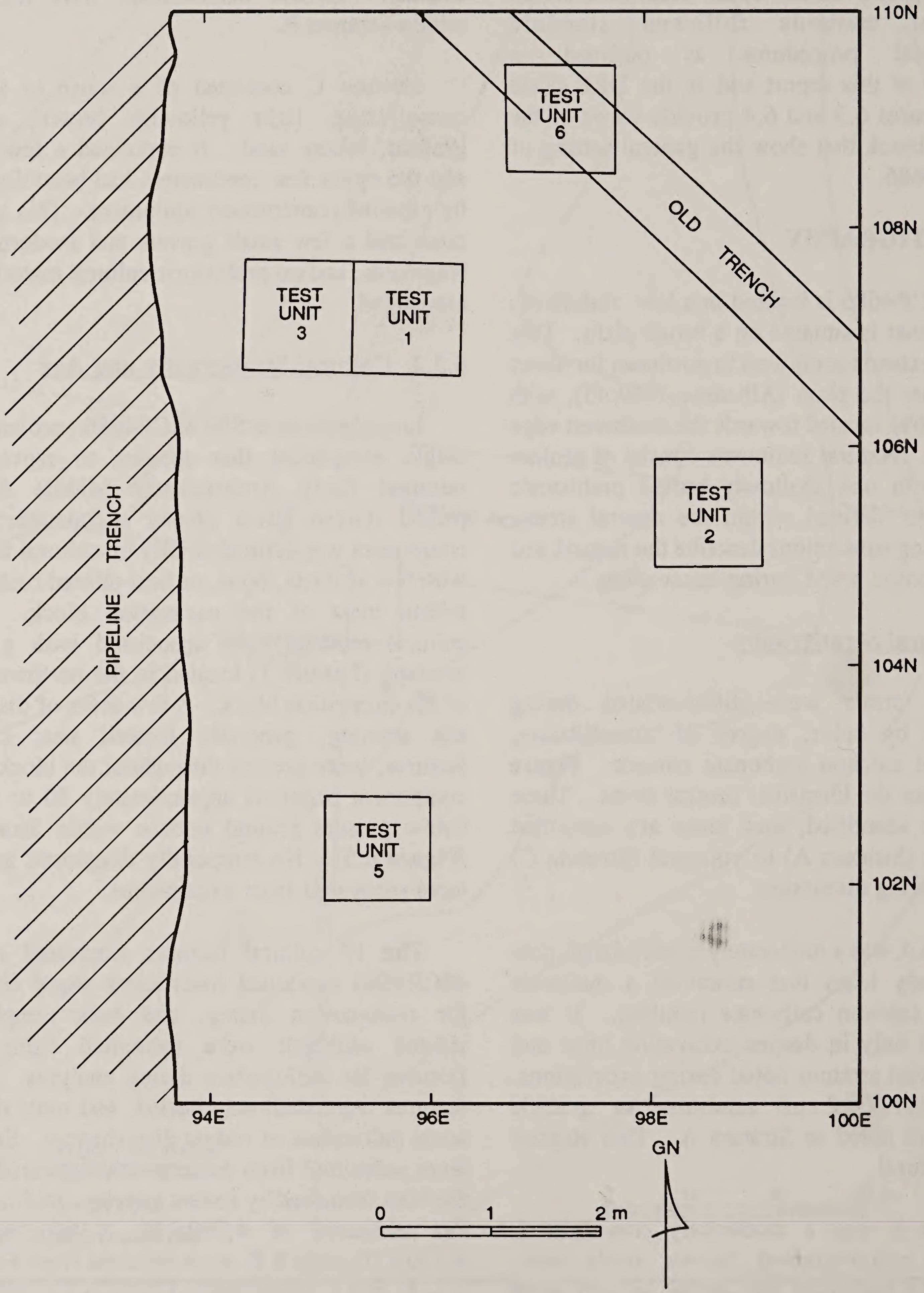


Figure 6.2 Plan Map of Excavation Block, Site 48CR4686 (Locality P-078).

Figure 6.3 Excavation Block Facing Southeast, Site 48CR4686 (Locality P-078).

Figure 6.4 Excavation Block Facing Northeast, Site 48CR4686 (Locality P-078).

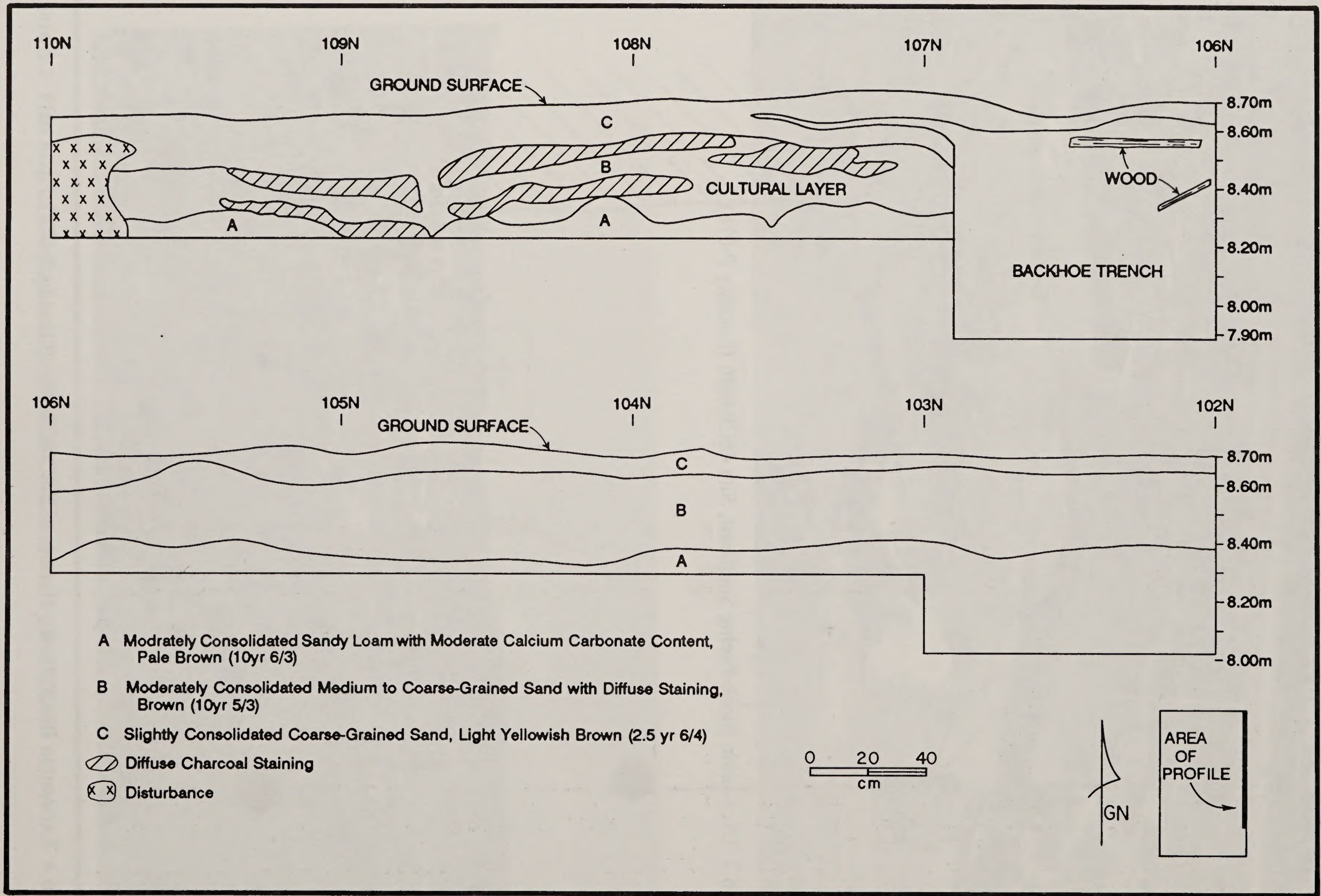


Figure 6.5 Profile of East Wall of the Excavation Block, Site 48CR4686 (Locality P-078).

Table 6.1 Radiocarbon Age Estimates and Calibrated Age Estimates, Site 48CR4686 (Locality P-086).

	Feature		Lab No.	Age Estimate	Calibrated Age Estimate (Years B.P.)[1]		Sample
Component	Number	Type	(Beta-)	(Years B.P.)	Intercept(s)[2]	Range (one sigma)	Type
I	1.4	Unoxidized basin	41540	4,930 ± 90	5,722, 5,707, 5,653	5,846 - 5,590	Sediment
I	8	Unoxidized basin	41541	4,990 ± 80	5,732	5,890 - 5,648	Sediment
I	7	Unoxidized basin	41542	4,330 ± 70	4,870	4,984 - 4,851	Sediment

[1] Calibration based on Pearson et al. (1986).
[2] If the estimate has more than three intercepts, the largest, middle, and smallest intercepts are included.

present, stratigraphic information and the limited density of cultural remains suggest that only one occupation is represented.

Cultural remains within the excavation block were clustered within and adjacent to a housepit, with two general concentrations of small hearth or pit features noted outside the structure. One concentration was located east of the housepit with the second concentration several meters farther to the south. Samples submitted for radiocarbon dating included samples from a housepit subfeature and from each feature cluster. The age estimates (4,990 and 4,930 years B.P.) from Feature 1.4 (a subfeature within the housepit) and Feature 8 (in the more distant feature concentration) are contemporaneous, with the Feature 7 estimate postdating these estimates by approximately 600 years.

Several different explanations for the discrepancy in dating results are possible. During excavation, rodent disturbances were recorded within Feature 7, and it is possible that sediment postdating feature use was collected and included with the sample submitted for dating. Hence, the age estimate obtained from Feature 7 may not be reliable due to contamination. Another possible explanation is suggested by dating results obtained from the Plant site located 160 m southeast of Site 48CR4686, with radiocarbon age estimates ranging from 5,030 to 3,830 years B.P. obtained from the same natural horizon (Appendix A). It is possible that minimal aeolian deposition was occurring between 4,000 and 5,000 years B.P. within Lost Soldier Flats (and at Site 48CR4686) and that Component I actually represents multiple occupations on a relatively stable land surface. As noted previously, the limited density and spatial patterning of the cultural remains indicates that most remains are associated with a small housepit that appears to represent a single occupation. This suggests that the divergence in the radiocarbon dating results reflects an unreliable age estimate, possibly due to sample contamination from Feature 7.

6.3 RESULTS OF EXCAVATIONS

The following subsections summarize and describe the cultural remains recovered from Site 48CR4686. Nineteen cultural features, including one housepit, were recorded, and a limited number of artifacts and animal remains were collected. As noted previously, all cultural remains appear to represent a single Early/Middle Archaic period (Green River phase) component.

6.3.1 Cultural Features and Heat-altered Rock

Nineteen cultural features and a small amount of heat-altered rock were recorded from the block excavation at Site 48CR4686. The features included a housepit recorded but not excavated during initial monitoring (Greer, Greer, and Zettel 1989c), features recorded during site testing (Reust et al. 1990), and a number of newly recorded cultural features. Feature types include a housepit, unoxidized basins (14), and oxidized basins (4). Four of the unoxidized basins were associated with the housepit. Table 6.2 summarizes the features morphological characteristics, and Figures 6.6 and 6.7 show the location of the 19 features within the 60 m^2 excavation area.

6.3.1.1 Housepit

Feature 1 is a small housepit that is circular to ovate in plan view. It was recorded in the east wall of the CO_2 pipeline trench, and the west part of the structure was destroyed by trenching. A radiocarbon age estimate of 4,990±80 years B.P. obtained from a subfeature within Feature 1 indicates that it represents a terminal Early Archaic period (Green River phase) occupation. Excavated dimensions were 250 cm north/south by 140 cm east/west, and the original dimensions of the housepit are estimated at approximately 250 cm in diameter. Feature 1 was investigated in the northwest part of the excavation block, and Figure 6.8 and 6.9 illustrate views of the structure prior to and after excavation.

Feature 1 was delineated in plan view by moderate to dark staining, with only the north

Table 6.2 Characteristics of Cultural Features, Site 48CR4686 (Locality P-078).

Feature No.	Excavation Unit	Feature Type	Cross Section	Dimensions (cm)[1] L	W	D	Area (cm^2)	Volume (liter)	Oxidation	Rocks Type	No.	Wt. (kg)	Remarks
1	104-108N 92-94E	Housepit	Hemisphere	250	120*	33	--	--	Absent	Sandstone Granite	1 3	0.25 0.8	50% destroyed by pipeline trenches
1.1	106W 92E, NE	Unoxidized basin	Hemisphere	55	31*	19	--	--	Absent	--	--	--	Impacted by pipeline trench
1.2	106N 94E, SW	Unoxidized basin	Hemisphere	52	50	10	2,042	6.8	Absent	--	--	--	--
1.3	104N 94E, N½ 106N 94E, S½	Unoxidized basin	Hemisphere	60	57	11	2,887	10.6	Absent	--	--	--	--
1.4	104-106N 94E	Unoxidized basin	Hemisphere	80	54	14	3,526	16.5	Absent	--	--	--	4,930± 90 years B.P.
2	102N 94E, S½	Unoxidized basin	Hemisphere	88	87	23	6,013	46.1	Absent	--	--	--	--
3A	108W 96E, NE	Oxidized basin	Hemisphere	70	60*	38	--	--	Present	--	--	--	Impacted by pipeline trench
3B	108N 96E, S½, NW	Oxidized basin	Hemisphere	66	46*	22	--	--	Present	--	--	--	Impacted by pipeline trench
4	104N 94E, N½	Unoxidized basin	Hemisphere	60	45	10	2,165	7.2	Absent	--	--	--	--
5	108N 94E, E½	Unoxidized basin	Hemisphere	68	67	11	3,579	13.1	Absent	Granite Sandstone	2 1	0.5 0.25	--
6	100N 98E, SE	Unoxidized basin	Hemisphere	76	75	24	4,477	35.8	Absent	--	--	--	--
7	106W 96E, N½	Unoxidized basin	Hemisphere	82	80	20	5,153	34.4	Absent	--	--	--	4,330±70 years B.P.
8	102W 96E, S½, NE, NW	Unoxidized basin	Hemisphere	100	98	24	7,698	61.6	Absent	--	--	--	4,990±80 years B.P.

Table 6.2 (continued)

Feature No.	Excavation Unit	Feature Type	Cross Section	Dimensions (cm)[1] L	W	D	Area (cm^2)	Volume (liter)	Oxidation	Rocks Type	No.	Wt. (kg)	Remarks
9	106N 96E, S½ 104N 96E, N½	Oxidized basin	Hemisphere	90	75	17	5,346	30.3	Present	--	--	--	--
10	100W 94E, W½	Unoxidized basin	Hemisphere	50	42	10	1,662	5.6	Absent	--	--	--	--
11	106W 96E, NW	Unoxidized basin	Hemisphere	40	28	6	908	1.9	Absent	--	--	--	--
12	108W 98E, SE	Oxidized basin	Hemisphere	100	80	43	6,312	91.2	Present	--	--	--	Extensive rodent disturbance
13	106W 94E, NE	Unoxidized basin	Hemisphere	62	54	14	2,642	12.3	Absent	--	--	--	--
14	100N 94E, NW 102N 94E, SW	Unoxidized basin	Hemisphere	80	24*	8	--	--	Absent	--	--	--	--

[1] L = length; W = width; D = depth; * = incomplete dimension.

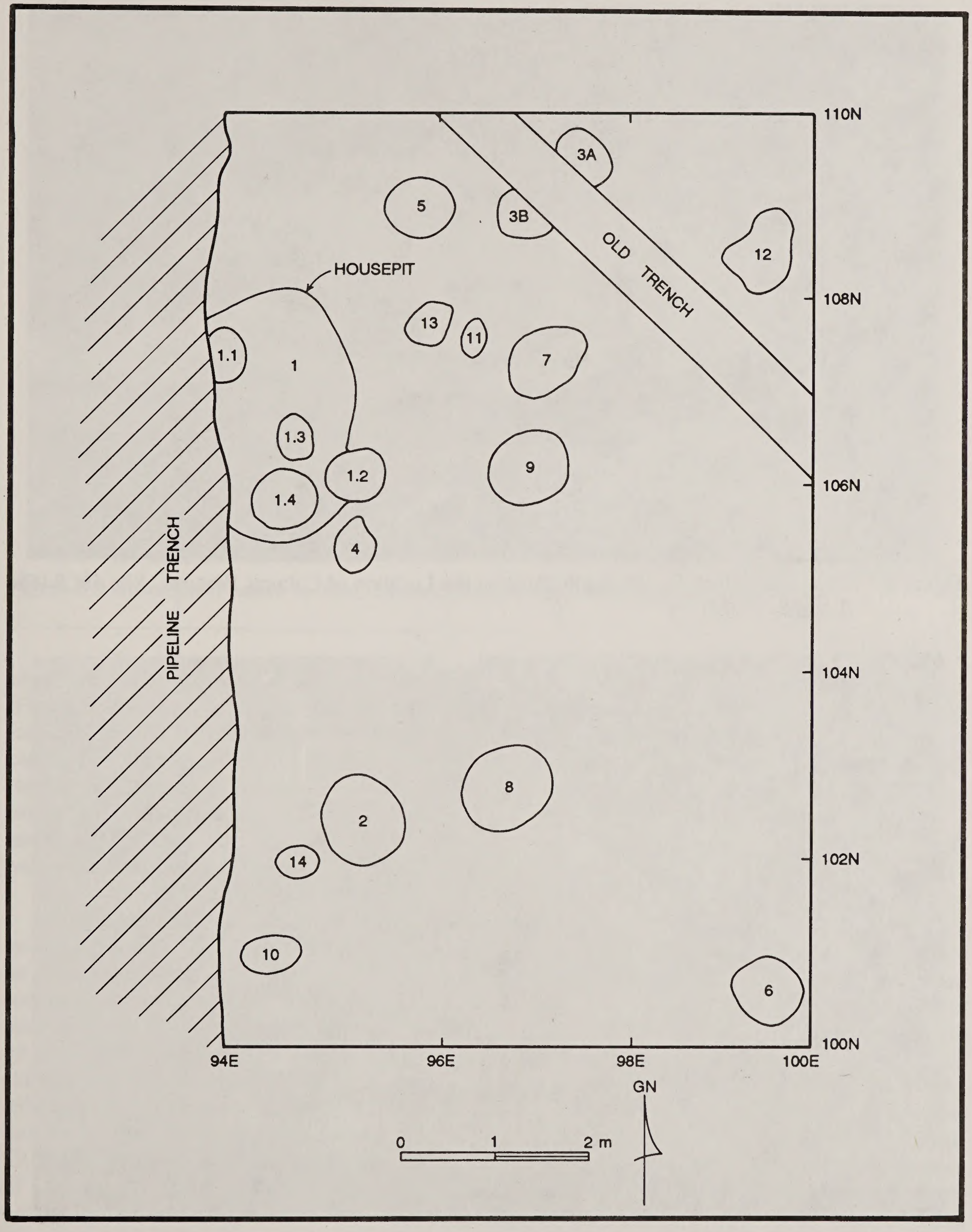


Figure 6.6 Plan Map Showing the Location of Cultural Features, Site 48CR4686 (Locality P-078).

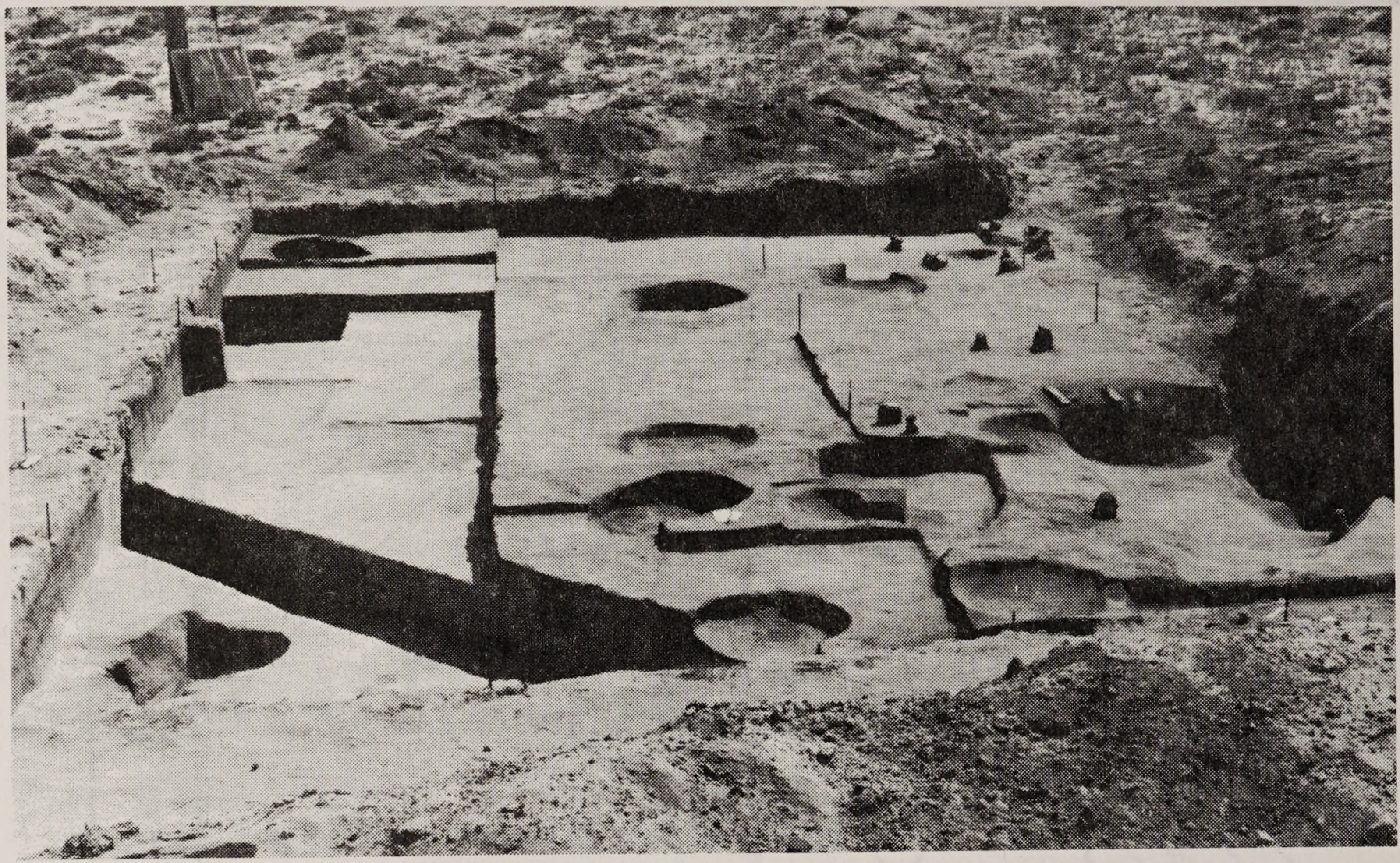


Figure 6.7 Excavation Block Facing South Showing the Location of Cultural Features, Site 48CR4686 (Locality P-078).

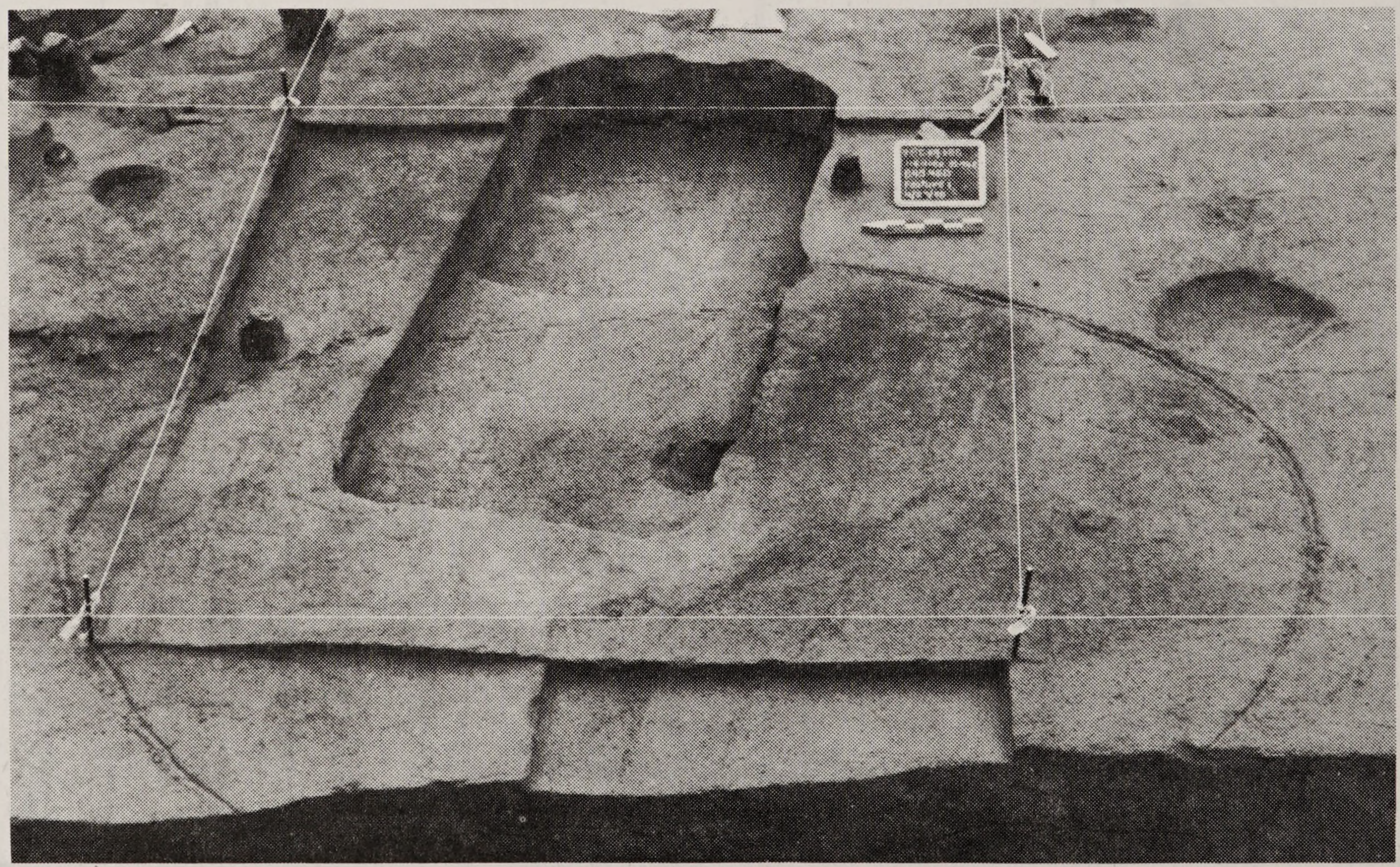


Figure 6.8 Housepit (Feature 1) Before Excavation, Site 48CR4686 (Locality P-078).

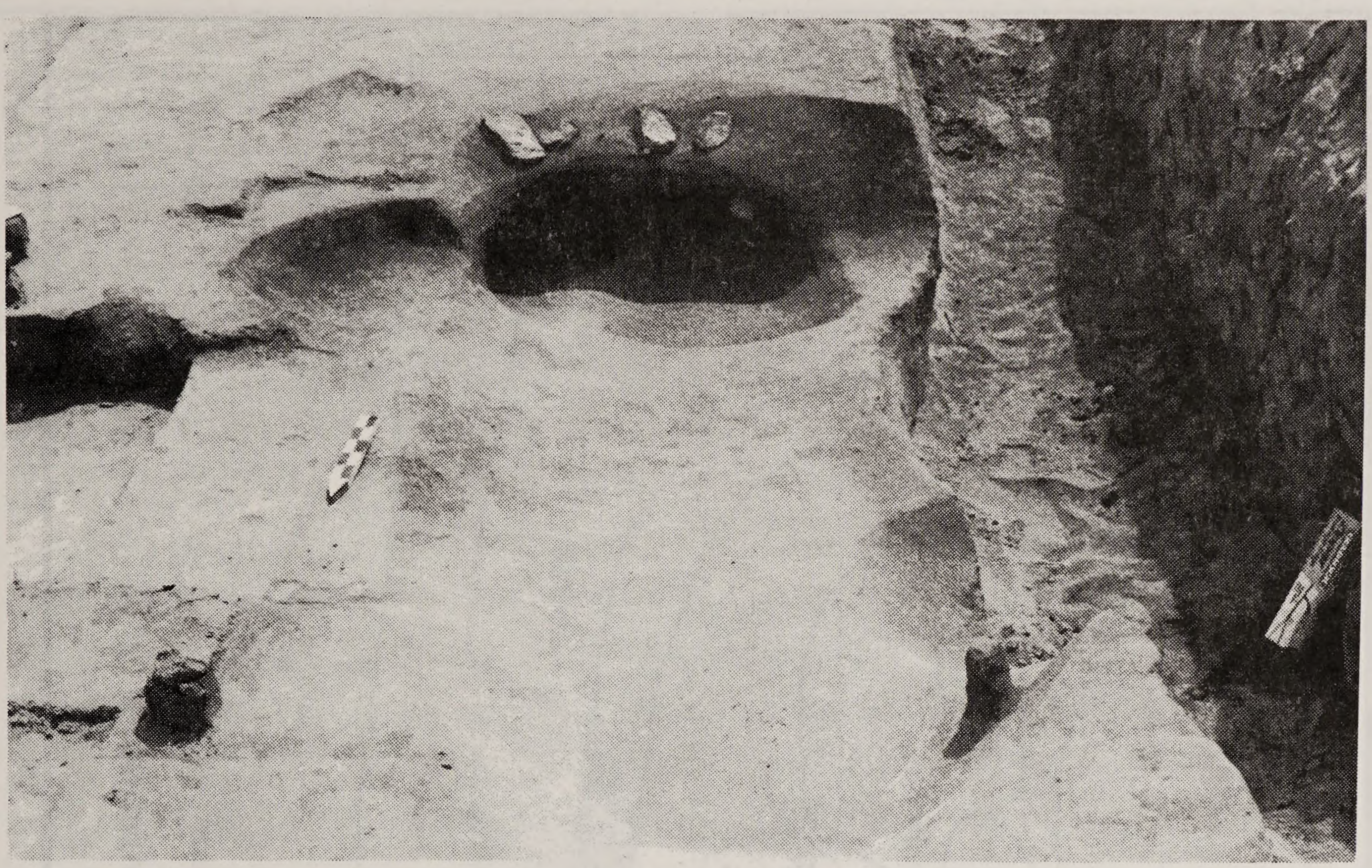


Figure 6.9 Housepit (Feature 1) After Excavation, Site 48CR4686 (Locality P-078).

edge of the housepit not well-defined (Figure 6.10). In cross section the housepit formed a shallow bowl or basin with a maximum depth of 33 cm (Figure 6.11). The upper fill of the feature consisted of lightly stained sand, with darker sediment noted in the lower fill of the housepit. No wood charcoal, soil oxidation, or heat-altered rock were noted within Feature 1.

The housepit floor was flat to undulating with no evidence of extensive preparation. The walls on the north and east sides sloped gently, with the south wall representing a much steeper slope. The south wall was also slightly undercut by a smaller pit feature (Feature 1.4). A limited amount of cultural material was present within Feature 1, although these remains include the vast majority of artifacts or bone recovered from Site 48CR4686. These remains include 38 pieces of debitage (73% of total), 337 tooth or bone fragments (88% of total), a utilized flake, and two small core fragments. Nine flotation samples (20.75 liters) processed from the floor and fill of the housepit yielded no charred seeds. General domestic activities that included animal processing, probably bone grease and juice production, and flaked stone tool maintenance appear to represent the main activities that occurred within Feature 1.

Four small stained basins were recorded as subfeatures (Features 1.1-1.4) within the housepit. These features were small, basin-shaped pits that lacked oxidation, wood charcoal, or heat-altered rock (Figure 6.12). Feature 1.2 occurred on the east edge and partially within the housepit, and Features 1.1, 1.3, and 1.4 occurred on the floor of the structure. Burned and unburned jackrabbit size and smaller mammal remains were recovered from three of the basins, with a number of bone fragments collected from the housepit fill adjacent to the basins. These remains suggest one possible function of the four subfeatures may have been as small firepits utilized during processing of small (jackrabbit size) or very small (rodent size) animals.

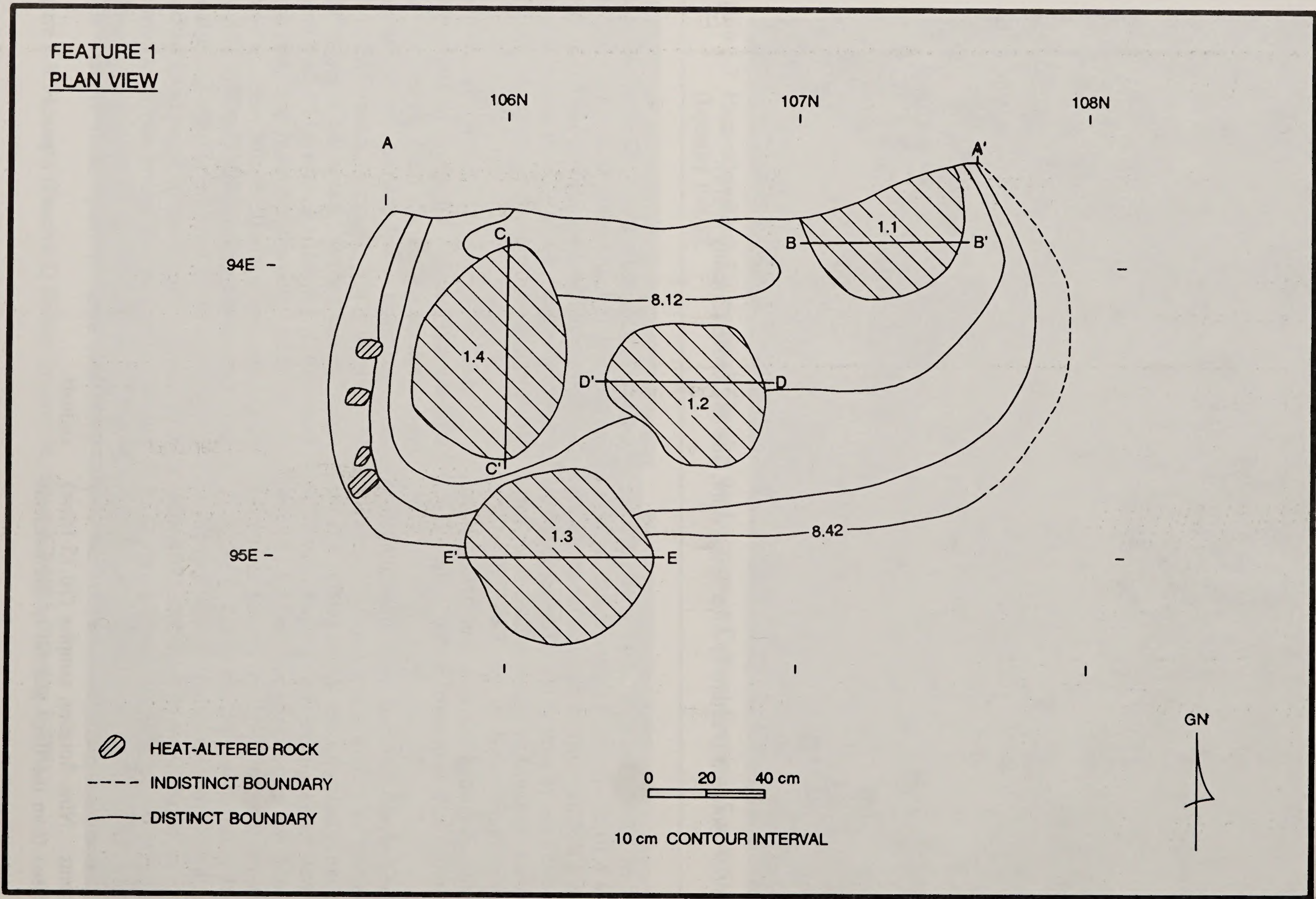


Figure 6.10 Plan View of Feature 1, Site 48CR4686 (Locality P-078).

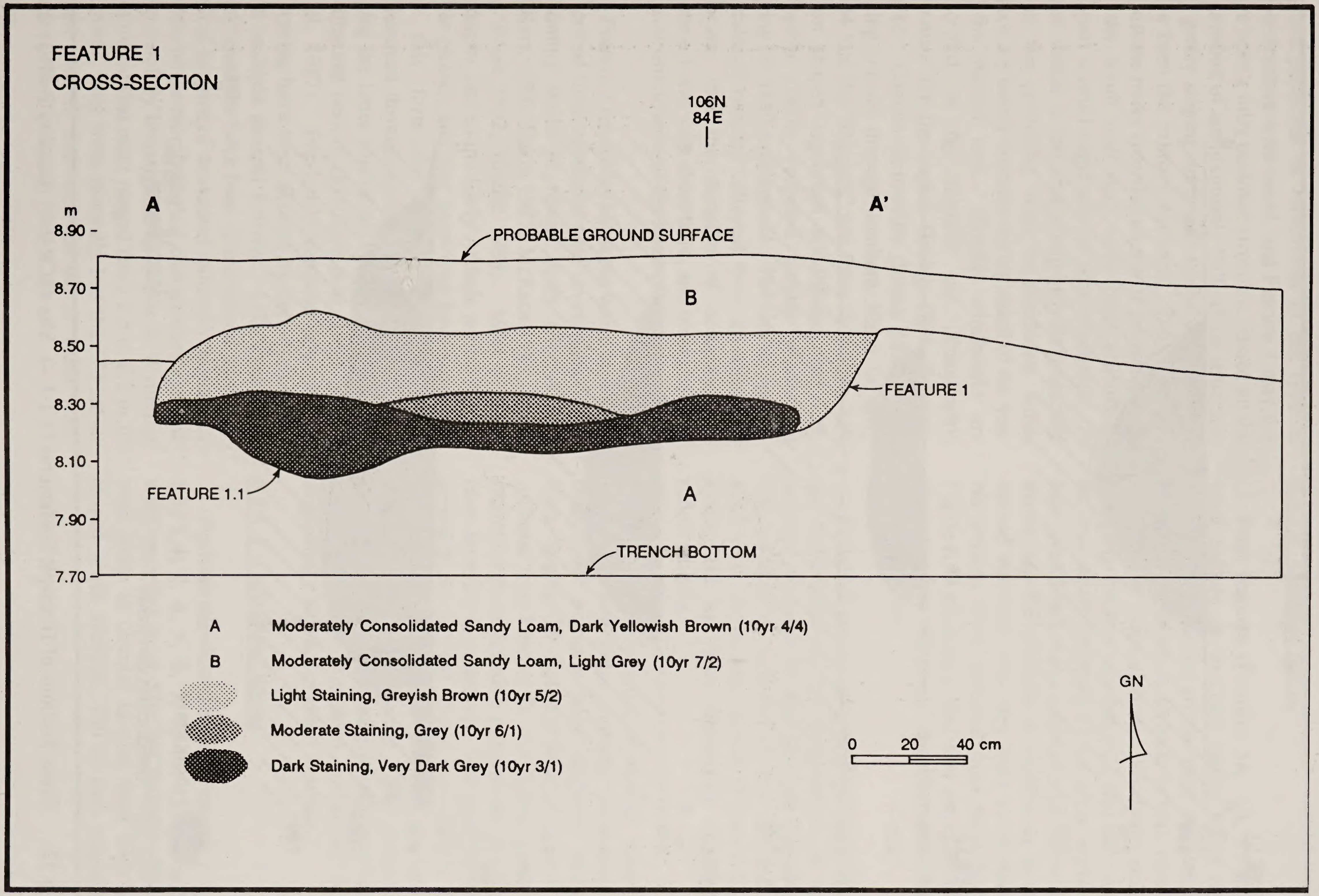


Figure 6.11 Cross Section of Feature 1, Site 48CR4686 (Locality P-078).

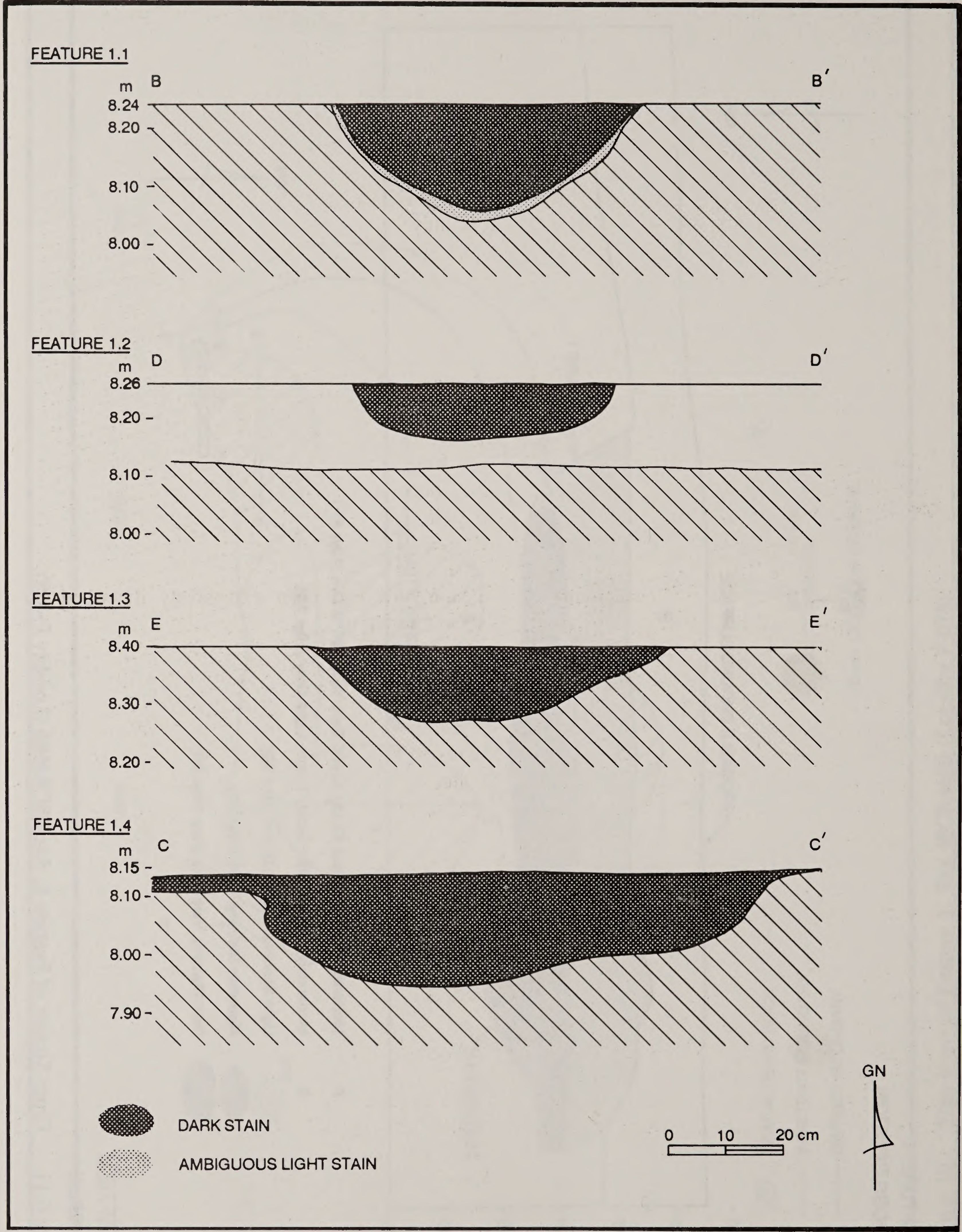


Figure 6.12 Cross Sections of Housepit Subfeatures (1.1-1.4), Site 48CR4686 (Locality P-078).

No postholes or indications of the type of superstructure were noted, and Feature 1 may not have been a fully enclosed structure. Based on the excavation of approximately 50% of the structure, the gently sloping north side of the housepit may have been the primary entrance. The four large sandstone rocks recorded on top of the steep slope of the south wall may have been utilized to support a small sagebrush or skin windbreak. A small shelter in this area would provide protection from the prevailing south to southwest winds which are nearly constant during much of the year in the Bairoil area. Similar windbreaks are described in the historic and ethnographic literature for the region (Irving 1854, Simpson 1876). Captain Bonneville (Irving 1854) noted during travels through southern Idaho in early 1834 that the "Diggers" use three foot high, half moon shaped sagebrush windbreaks, and J.H. Simpson (1876) recorded similar windbreaks during his 1859 explorations. The limited amount of cultural remains collected from investigations indicates that the duration of occupation of Feature 1 was very short-term, and no evidence of reoccupation/reuse of the housepit was noted.

Feature 1 resembles housepits which have been described from numerous sites investigated in the Wyoming Basin in recent years (Harrell and McKern 1986, Eakin 1987, McKern 1987, Smith and Reust 1992, Hoefer 1988). Most of these housepits date to the Early Archaic period (Green River phase), and past overviews have suggested that this form of habitation structure was widespread throughout the western United States during the latter part of the Altithermal and post-Altithermal periods (McGuire et al. 1984, Moore et al. 1987). Previously reported housepits in Wyoming have been defined by depressed floors with multiple internal features. Like Feature 1, most housepits have been characterized by a very limited amount of associated cultural remains. A review of the morphological characteristics shared by previously investigated housepits in Wyoming determined that most ranged from 2.5 to 6.0 m in diameter, they were generally less than 70 cm in depth, and all had multiple pit or basin floor features (Hoefer 1988).

6.3.1.2 Oxidized Basins

Four features (Features 3A, 3B, 9, and 12) were defined as oxidized basins based on the presence of oxidation around their margins. The features were ovate to circular in plan view with basin-shaped cross sections. Oxidation noted on these four features was thin (< 1 cm) and occurred on only small segments of the basin walls. No heat-altered rock was associated with the oxidation basins, and fill consisted of moderately to darkly stained sediment with very little wood charcoal. No artifacts were collected from these features. Figure 6.13 provides a plan view and cross section drawing that illustrate the characteristics of oxidized basins.

Feature 9 was the only oxidized basin that had not been disturbed by construction or rodent activity. Features 3A and 3B were disturbed but discrete features recorded on the east and west sides of an old backhoe trench (Figure 6.2), and Feature 12 had been extensively disturbed by rodent activity.

Very small amounts of animal bone were associated with these features with one very small/small mammal bone fragment recovered from Feature 3B and one jackrabbit size bone collected from Feature 12. No charred seeds were recovered from flotation samples that totalled 10 liters from the four features. The small amount of animal bone and the absence of charred seeds suggest that the pits were not used for intensive animal or seed processing. The presence of oxidation around the pit margins indicates that heat was produced or contained within the basins, suggesting a hearth or firepit function.

6.3.1.3 Unoxidized Basins

Fourteen unoxidized basins (Features 1.1, 1.2, 1.3, 1.4, 2, 4, 5, 6, 7, 8, 10, 11, 13, and 14) were recorded from Site 48CR4686. The pits were ovate to circular in plan view with basin-shaped cross sections. Fill of each consisted of

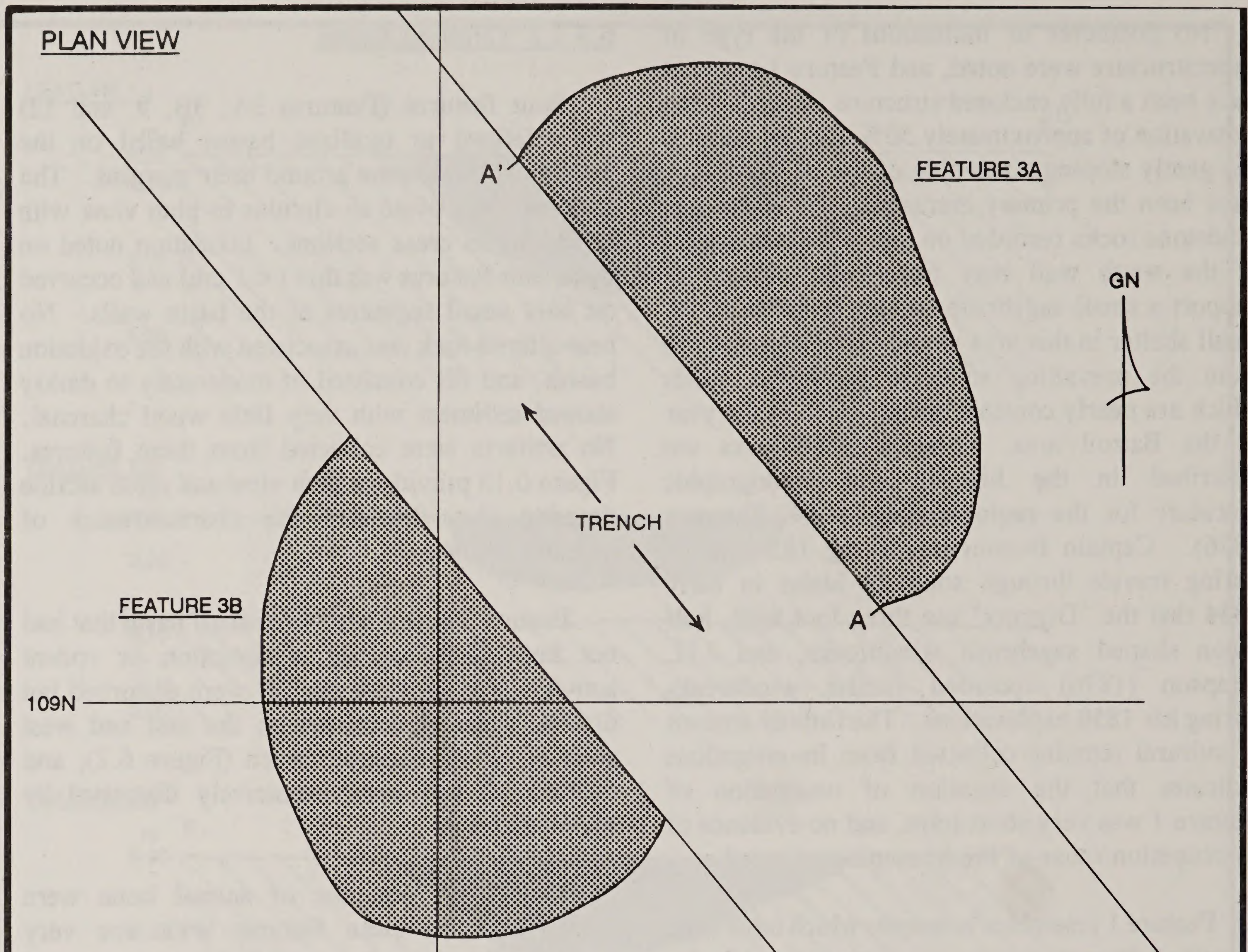


Figure 6.13 Plan Views of Features 3A and 3B and Cross Section of Feature 3A, Site 48CR4686 (Locality P-078).

moderately to darkly stained sediment with very little charcoal. Feature 5 contained three granite or sandstone rocks weighing 0.75 kg and was the only feature of this type with heat-altered rock associated. Figure 6.14 provides a plan view and cross section drawing of Feature 7 which illustrates this feature type. Plan view and cross section drawings of Features 1.1-1.4 are shown in Figures 6.10 and 6.12. Small amounts of very small/small mammal bone were collected from Features 1.1, 1.2, 1.4, and 7. Eleven medium/large mammal bone fragments were found near Feature 5, and the recovery of a pronghorn phalange immediately west of the feature suggests use in animal processing. Debitage (4 flakes) was recovered from Features 1.3, 1.4, and 7. Flotation samples (34.25 liters) were processed from the 14 features, with no charred seeds recovered.

These features were similar morphologically in terms of surface area and volume to the oxidized basins, and the general fill characteristics are also similar. The absence of oxidation may reflect the nature of the sandy sediments at Site 48CR4686 which may not readily oxidize, rather than the absence of fire or heat production within these features. The presence of a small amount of bone in several of the unoxidized basins suggests animal processing activities may have occurred in the vicinity of these features.

6.3.1.4 Heat-altered Rock

Very little heat-altered rock was noted during excavations, with a total of 40 pieces recorded (Table 6.3). The rock was either reddened, blackened, or fractured from exposure to heat.

Rock was associated with only two of the 19 excavated features, with three rocks weighing 0.75 kg recovered from Feature 5. Four rocks were recorded on the upper slope of the south wall of the housepit (Feature 1). Material types of the rock represent local sources including quartzite and granite cobbles and tabular sandstone. The nearest source for these materials is located approximately 0.8 km north of the site along Camp Creek Hill.

In general, the heat-altered rock was not highly fragmented. Quartzite was the dominant material type (58.2% by weight), with lesser amounts of granite (36.7%) and sandstone (5.1%). The quartzite fragments averaged 393.8 g each, granite averaged 220.8 g, and sandstone rocks averaged 91.7 g.

6.3.2 Flaked Stone Artifacts

Four flaked stone tools and 52 pieces of debitage were collected from Site 48CR4686. The tools include two utilized flakes and two small core fragments. Table 6.4 summarizes the morphological characteristics of tools recovered from excavations at Site 48CR4686.

6.3.2.1 Utilized Flakes

Two complete utilized flakes of red opaque chert were collected. The flakes are fairly small (36.5 and 18 mm in length) and thin (7 and 3 mm). One tool (CR4686-8) is a primary flake which exhibits use wear for 19 mm on the ventral surface of one lateral margin (Figure 6.15, A). The second utilized flake (CR4686-69) is a secondary flake that has use wear for 12 mm on the ventral surface (Figure 6.15, B). Use wear on the two flakes is minimal and is evidenced by light edge rounding, and the edge angle on both tools is very acute (approximately 15-20 degrees).

6.3.2.2 Cores

Two small core fragments (CR4686-55 and 100) of chalcedony were recovered from Feature 1. The two fragments do not conjoin but appear to be fragments of one small, multidirectional core. One fragment retains a small amount of highly patinated cortex on one surface suggesting that the artifact was derived from a small lag cobble or pebble. Similar small cobbles occur as lag deposits on Camp Creek Hill which is 0.5 mi (0.8 km) to the north of Site 48CR4686.

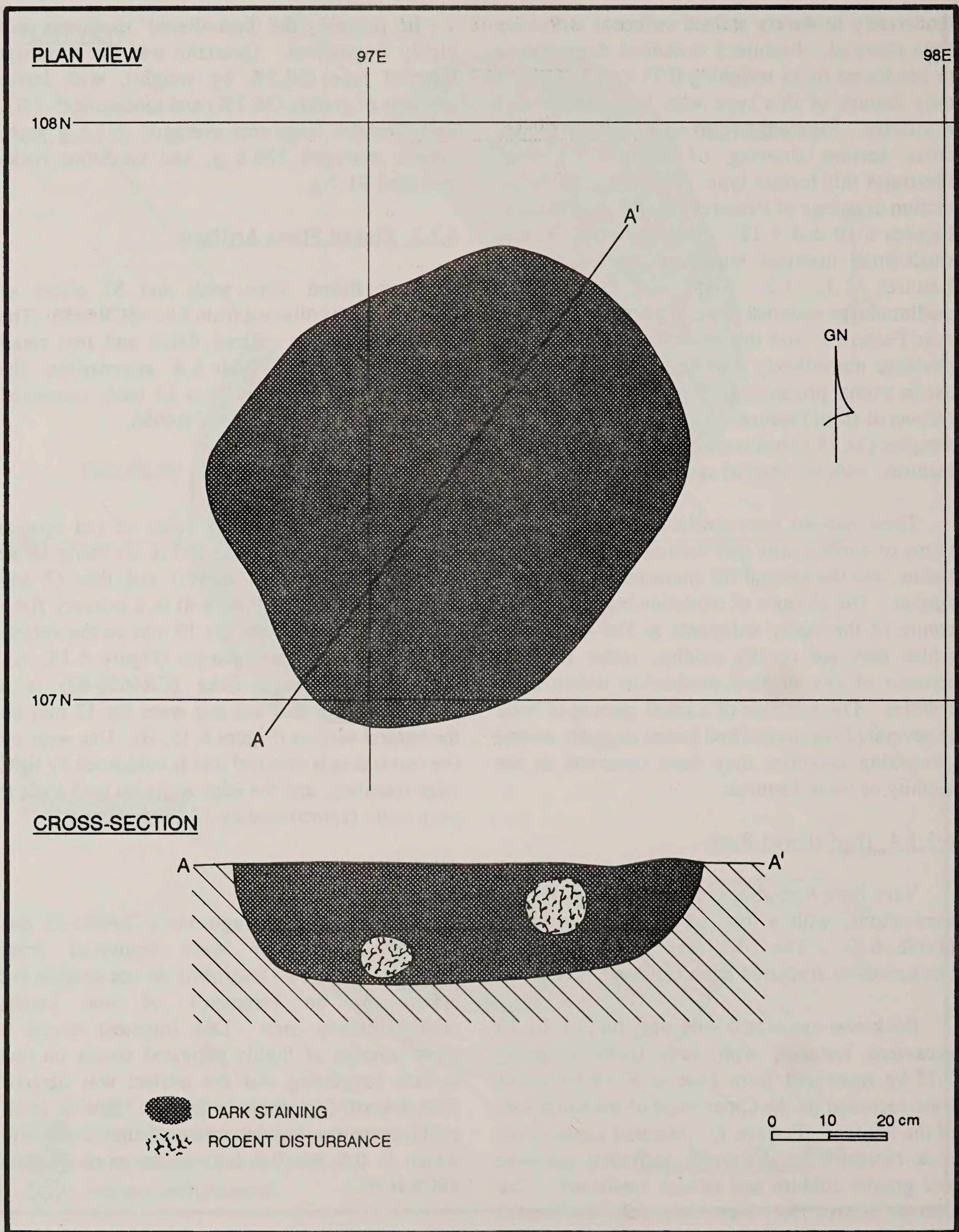


Figure 6.14 Plan View and Cross Section of Feature 7, Site 48CR4686 (Locality P-078).

Table 6.3 Summary of Heat-Altered Rock, Site 48CR4686 (Locality P-078).

Material Type	No. of Rocks	Weight (kg)	Average Weight (kg)
Sandstone	6	0.55	0.09
Granite	18	3.98	0.22
Quartzite	16	6.3	0.39
Total	40	10.83	0.23

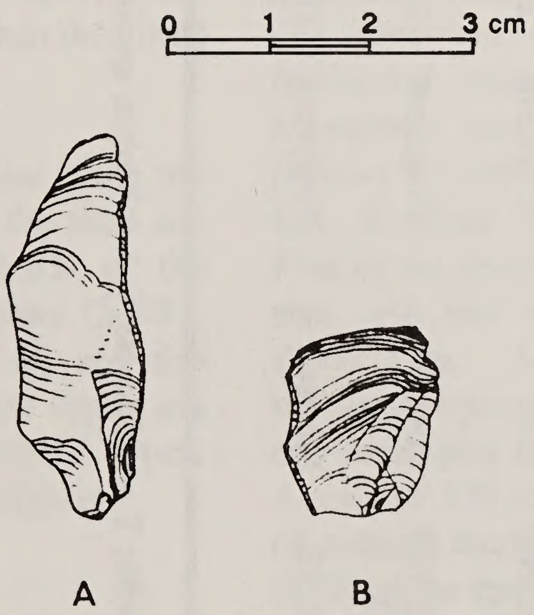


Figure 6.15 Selected Artifacts, Site 48CR4686 (Locality P-078). A) CR4686-8; B) CR4686-69.

Table 6.4 Characteristics of Flaked and Groundstone Tools, Site 48CR4686 (Locality P-078).

Catalog No.	Unit	Classification	Condition	Dimensions (mm)[1] L	W	T	Material Type	Remarks
8	104N 94E, NE	Utilized flake	Complete	36.5	12	7	Red chert	Primary flake, one utilized edge
69	106N 94E, SW (Feature 1)	Utilized flake	Complete	18	15	3	Red chert	Secondary flake, one utilized edge
55	106N 92E, NW (Feature 1)	Core	Fragment	27(p)	24(p)	16(p)	Chalcedony	--
100	104N 94E, NW (Feature 1)	Core	Fragment	24(p)	22(p)	19(p)	Chalcedony	--
36	106N 94E, SE	Metate	Fragment	111(p)	94(p)	16	Sandstone	Unifacial, heavy use wear, oxidized

[1] L = length; W = width; T = thickness; (p) = broken specimen, partial dimension.

6.3.2.3 Debitage

A total of 52 pieces of debitage was collected from the block excavations at Site 48CR4686. Table 6.5 provides the cross-tabulation of debitage type by material type for the assemblage. Tertiary flakes comprise the highest percentage, accounting for 32.7%, with lesser amounts of microflakes (23.1%), shatter (19.2%), secondary flakes (15.4%), and primary flakes (7.7%). The percentage of the various debitage types and the presence of a core suggest most lithic reduction stages took place. However, the limited number of flakes (52) and the low debitage density (0.79/m^2) indicate flaked stone tool manufacture was not a major activity at the site.

Table 6.6 summarizes the size distribution by type for the debitage (including flake fragments) collected from Site 48CR4686. All flakes recovered are less than 3 cm in length.

Most flakes (88.5%) are less than 2 cm in length, with the majority (52.2%) of these less than 1 cm in length. The size range of the debitage suggests that manufacture was oriented towards final shaping and/or rejuvenation (resharpening) of small tools, rather than the initial reduction stages.

Chert is the dominant material type, with red opaque chert accounting for 50% of the total and various other cherts comprising 34.6% of the debitage. Small amounts of chalcedony (3.8%), quartzite (3.8%), and siltstone (7.7%) are also present. Flaked stone tool material types are similar to the dominant debitage material types, although specific percentages differ slightly.

6.3.3 Groundstone

One tabular metate fragment (CR4686-36) was the single groundstone tool collected from excavations, and it was recovered from the surface of Feature 1.2 (Table 6.4). The fragment is heavily smoothed on one face and represents the medial portion of a larger artifact. It is manufactured from fine-grained, brown sandstone and is heat-oxidized.

6.3.4 Animal Remains

A total of 487 bone or tooth fragments was recovered from excavations at Site 48CR4686. One mussel shell (bivalve) fragment was also collected. Based on the degree of preservation and lack of cultural modification, 100 bone or tooth fragments were identified as recent and intrusive to the cultural deposits. Taxa identified as intrusive include ground squirrel, prairie dog, and pocket gopher. These items are not included in Table 6.7, which summarizes the 387 fragments considered to be of cultural origin, or in the following discussion.

The total weight of the 387 fragments is 64.5 g, with most of the assemblage consisting of small bone fragments that were not identifiable to taxon. The vast majority (94.3%) of these fragments represent very small or small mammals. Of the remaining 18 specimens, one phalange is identified as pronghorn, two specimens are deer-pronghorn size, 11 fragments are medium-large mammal, three are small-medium mammal, and one specimen (consisting of 68 pieces) is a freshwater mussel shell fragment. The deer-pronghorn size elements appear to represent portions of one limb. One of the deer-pronghorn size elements is from an immature individual. Five of the small mammal elements are jackrabbit size, and one very small mammal mandible is shrew size. Minimum number of individuals include one pronghorn, one jackrabbit size animal, one shrew size animal, and one freshwater mussel. A total of 135 specimens shows possible evidence of cultural modification (burning), with nearly all (134) of the burned items identified as very small or small mammals.

Although the extremely fragmentary nature of the animal remains limited taxonomic identifications, the different size classes indicate a broad range of species were utilized at the site. The single element identified to species is pronghorn, with a number (5) of jackrabbit size

Table 6.5 Cross-Tabulation of Debitage Type by Material Type, Site 48CR4686 (Locality P-078).

	Material Type							
Debitage Type	Quartzite	Tan Chert	Red Chert	Chalcedony	Siltstone	White Chert	Other Chert	Total
Primary Flake								
Number	0	0	2	0	1	0	1	4
Row %	0	0	50.0	0	25.0	0	25.0	7.7
Column %	0	0	7.7	0	25.0	0	8.3	
Secondary Flake								
Number	0	0	3	1	1	1	2	8
Row %	0	0	37.5	12.5	12.5	12.5	25.0	15.4
Column %	0	0	11.5	50.0	25.0	33.3	16.7	
Tertiary Flake								
Number	1	1	7	1	1	2	4	17
Row %	5.9	5.9	41.2	5.9	5.9	11.8	23.5	32.7
Column %	33.3	50.00	26.9	50.0	25.0	66.7	33.3	
Microflake								
Number	0	1	9	0	0	0	2	12
Row %	0	8.3	75.0	0	0	0	16.7	23.1
Column %	0	50.0	34.6	0	0	0	16.7	
Shatter								
Number	1	0	5	0	1	0	3	10
Row%	10.0	0	50.0	0	10.0	0	30.0	19.2
Column %	33.3	0	19.3	0	25.0	0	25.0	
Tested Material								
Number	1	0	0	0	0	0	0	1
Row%	100.0	0	0	0	0	0	0	1.9
Column%	33.3	0	0	0	0	0	0	
Total								
Number	3	2	26	2	4	3	12	52
Row %	5.8	3.8	50.0	3.8	7.7	5.8	23.1	100.0

Table 6.6 Percentages of Debitage Type by Size Class, Site 48CR4686 (Locality P-078).

Debitage Type	Size Class A (<1 cm)	B (<2 cm)	C (<3 cm)	Total
Primary flake	1.9	3.9	1.9	7.7
Secondary flake	3.9	5.8	5.8	15.5
Tertiary flake	7.7	23.1	1.9	32.7
Micro flake	23.1	--	--	23.1
Shelter	9.6	9.6	--	19.2
Tested material	--	--	1.9	1.9
Total	46.2	42.4	11.5	

Table 6.7 Summary of Animal Remains, Site 48CR4686 (Locality P-078).

Animal Size Category	Total Specimens No.	Wt. (g)	Burned Specimens No.	%	Identifiable Elements
Medium-large mammal	11	5.3	1	9.1	--
Deer-pronghorn size	2	15.2	0	0.0	Metatarsal shaft; metapodial epiphysis
Pronghorn	1	6.2	0	0.0	Phalange
Small-medium mammal	3	3.5	0	0.0	--
Small mammal	5	0.5	2	40.0	Phalange (1)
Jackrabbit size	5	10.0	0	0	Femur shaft (2); radius, ulna, calcaneus
Very small-small mammal	353	18.0	130	36.8	Ulna (2); rib (3); phalange (1); patella (1)
Very small mammal	6	0.5	2	33.3	Shrew size mandible (1); phalange (4)
Mussel shell	1	5.3	0	0.0	--
Total	387	64.5	135	34.9	

elements present, as well as smaller rodent size animals. The limited number of remains suggests that only one or a few individuals of each size class may be represented. The highly fragmented nature of the bone and the number of carbonized fragments suggest an intensive level of processing, and possibly breakage from exposure to fire. The bone was probably processed for grease and juice (Vehik 1977, Binford 1978), and the limited number of fragments suggests that the processing was probably for immediate use rather than for storage.

6.3.5 Plant Macrofossils

Flotation samples from each cultural feature investigated at Site 48CR4686 were processed and examined for plant macrofossils (Table 6.8). Twenty-seven flotation samples consisting of 65.75 liters of stained feature fill were processed. The samples included nine separate samples (20.75 liters) from the floor or fill of the housepit (Feature 1), with one sample processed from each of the 18 smaller basin features. No charred seeds were recovered from the large volume of soil processed, indicating that seeds likely were not processed within the housepit or in exterior features. Virtually no wood charcoal was noted within flotation samples from the oxidized basins, unoxidized basins, or housepit fill.

6.3.6 Pollen Analysis

Fifteen pollen samples were analyzed from Site 48CR4686, and only five of these samples produced sufficient pollen counts for analysis (Appendix B). Twelve samples were analyzed from the housepit including samples from the four subfeatures and eight samples from the housepit floor, with the other three samples processed from a possible activity area at the southwest corner of the block (Figure 6.16). Sufficient grain counts (100) were obtained only from five samples collected from the housepit floor, and one of these samples provides a weak indication of possible usage of Cheno-am species.

6.3.7 Spatial Distribution of Cultural Remains

Figure 6.17 shows the distribution of cultural features, tools, and heat-altered rock within the excavation block. Tools which were not recovered in place are shown in the centers of the units from which they were recovered. Figure 6.18 provides trend surface maps for debitage and animal remains and also shows the location of medium and large mammal bone fragments within the excavation block.

Four small unoxidized basins occur within the housepit (Feature 1), with nine oxidized or unoxidized basins located east of the housepit. No particular pattern is evidenced in the distribution of the nine features, with most occurring within one meter of another feature. Four unoxidized basins are located near the southwest corner of the block, and an isolated unoxidized basin occurs at the southeast corner. Only a few heat-altered rocks were present, with most clustered around the housepit, or near the feature cluster near the southwest corner of the block. The five tools were recovered from within or immediately adjacent to the housepit.

The trend maps for debitage and animal remains show similar distributions, with dense concentrations of both classes of remains occurring within the housepit. Nearly all debitage occurs within or immediately adjacent to the structure, with a very similar pattern shown for the animal remains. Although the animal remains are clustered within the housepit, these remains are nearly entirely very small or small mammals. Medium mammal remains (pronghorn or deer-pronghorn size) occur around Feature 5 (just north of the housepit) and near the feature cluster in the south-west corner of the block. The single mussel shell was also recovered near Feature 5.

The spatial distribution of the various classes of remains suggests that most site activities occurred within the housepit. The overwhelming majority of debitage, animal remains, and tools were recovered within the boundaries of the structure. Cultural remains indicate that activities

Table 6.8 Summary of Flotation Samples, Site 48CR4686 (Locality P-078).

Feature No.	Sample No.	Volume (liters)	No. of Charred Seeds	Taxon
1	55, 56, 107, 110, 115, 118, 121, 124, 148	21.5	0	--
1.1	70	2.5	0	--
1.2	93	2.5	0	--
1.3	74	2.5	0	--
1.4	151	1.75	0	--
2	46	2.5	0	--
3A	47	2.5	0	--
3B	31	2.5	0	--
4	3	2.5	0	--
5	22	2.5	0	--
6	19	2.5	0	--
7	67	2.5	0	--
8	77	2.5	0	--
9	102	2.5	0	--
10	88	2.5	0	--
11	125	2.5	0	--
12	156	2.5	0	--
13	129	2.5	0	--
14	141	2.5	0	--

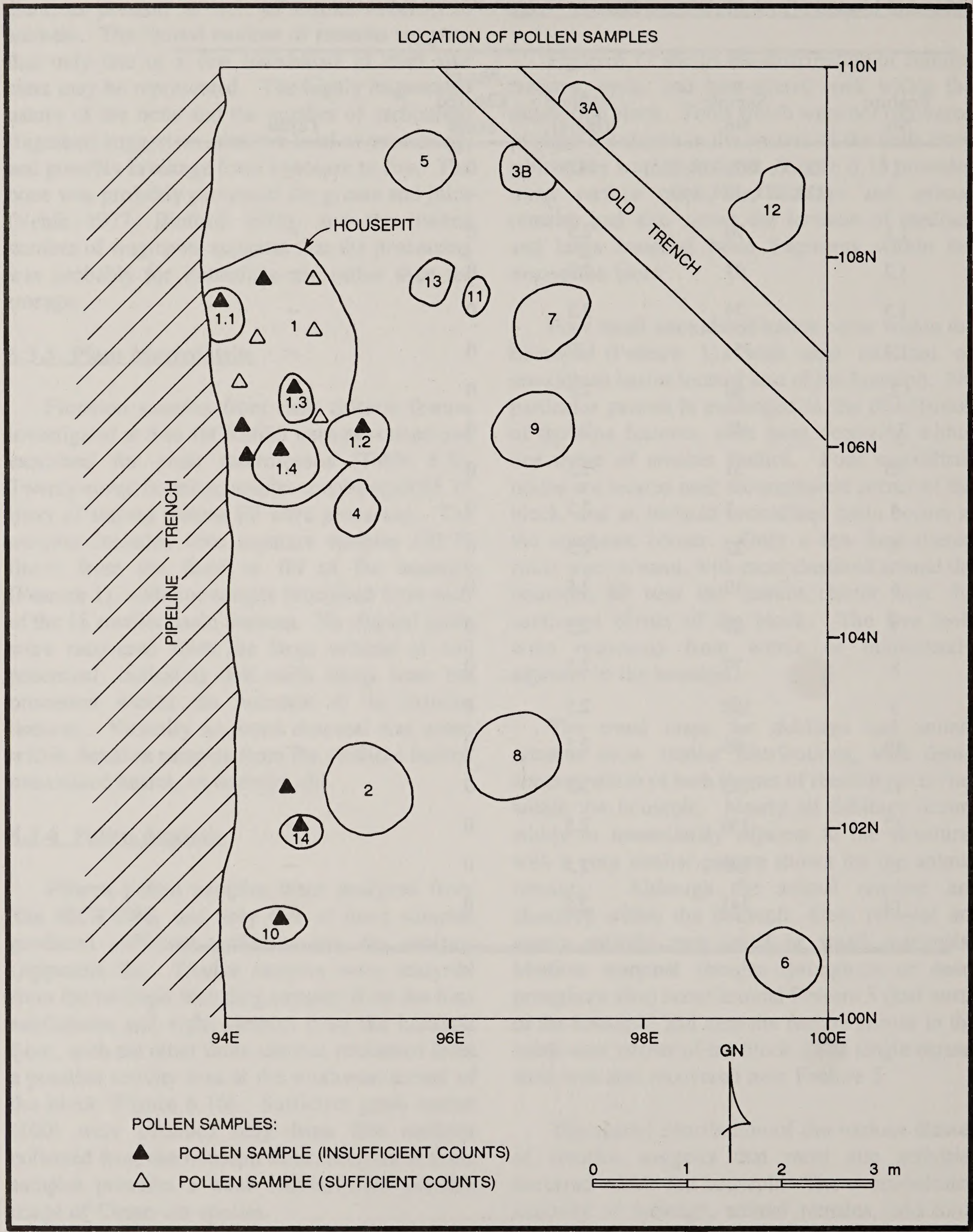


Figure 6.16 Location of Pollen Samples, Site 48CR4686 (Locality P-078).

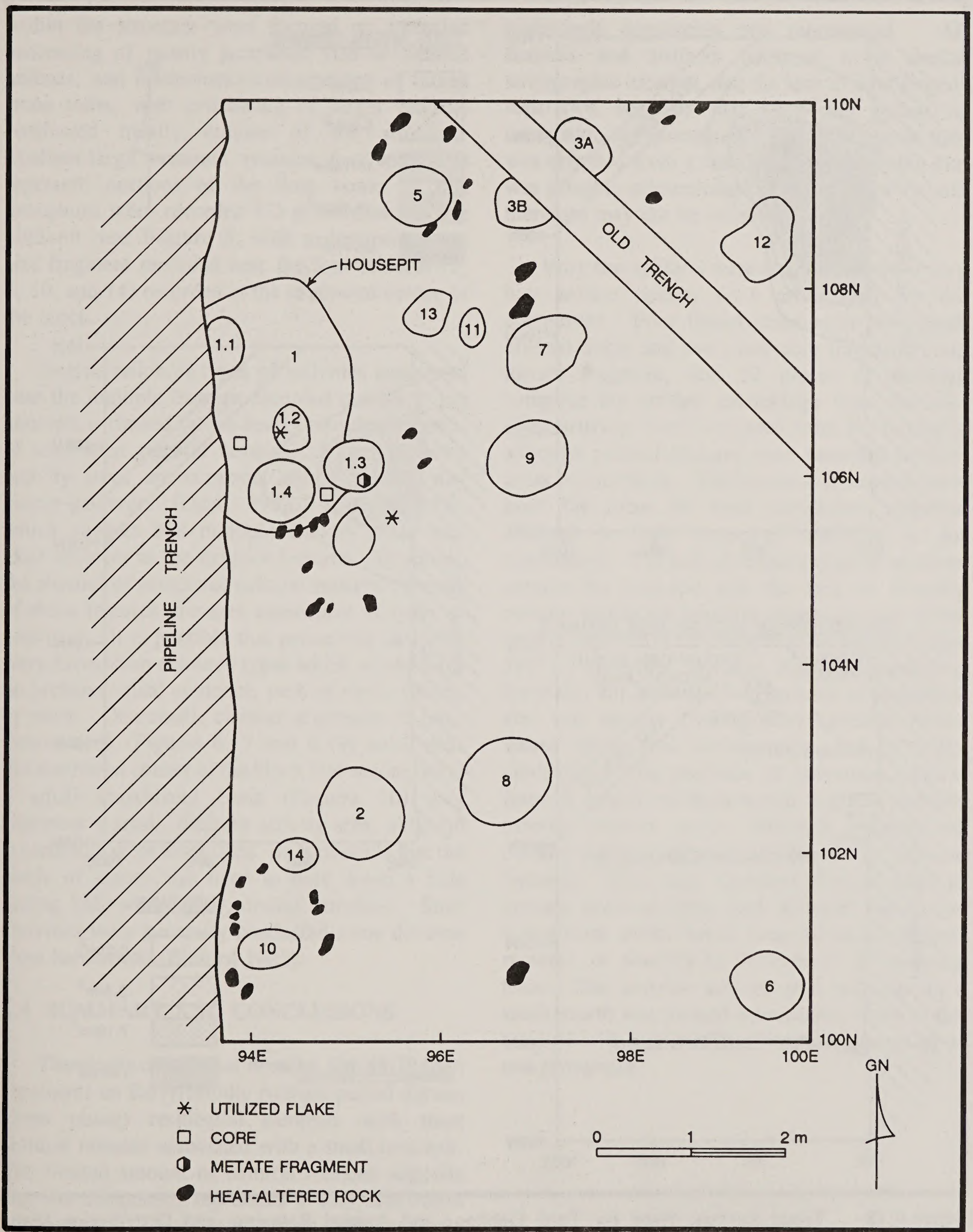


Figure 6.17 Plan Map with Cultural Features, Tools, and Heat-altered Rocks Plotted, Site 48CR4686 (Locality P-078).

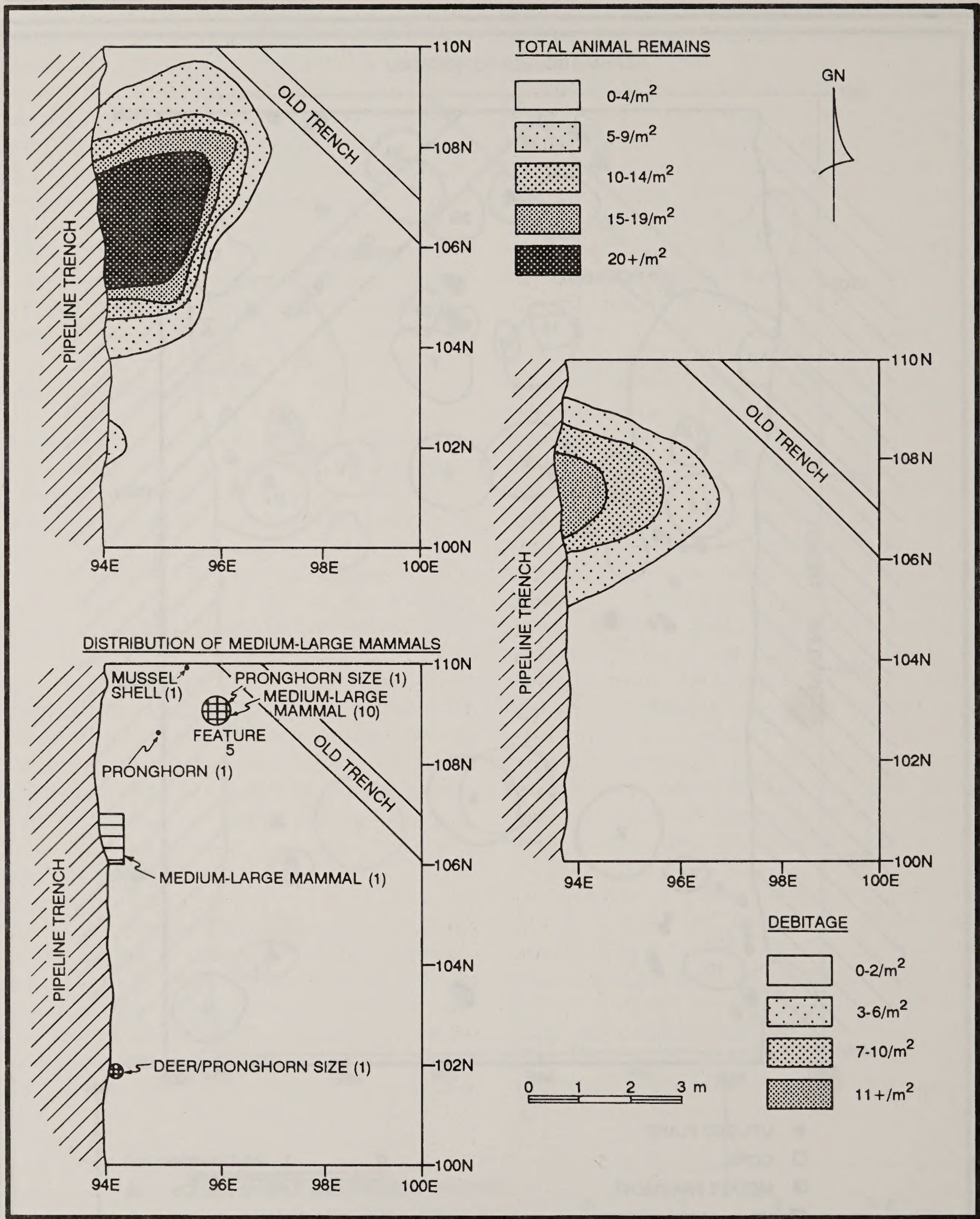


Figure 6.18 Trend Surface Maps for Total Debitage and Animal Remains, and Distribution Map Showing Location of Medium-Large Mammal Bone and Mussel Shell, Site 48CR4686 (Locality P-078).

within the structure were focused on intensive processing of mostly jackrabbit size or smaller animals, and maintenance/resharpening of flaked stone tools, with processing of larger animals conducted mostly outside of the structure. Medium-large mammal remains that appear to represent portions of the limb bones of one pronghorn were recorded 1-2 m northeast of the housepit near Feature 5, with a deer-pronghorn size fragment recorded near the four features (2, 8, 10, and 14) recorded at the southwest corner of the block.

Interpretation of types of activities conducted near the multiple features recorded outside of the housepit is limited by the nearly complete absence of associated cultural remains. Hearth-centered activity areas are common among modern day hunter-gatherers (Odell 1983, Binford 1983), which suggest that multiple activity areas may exist adjacent to the exterior features. However, the absence of associated cultural material for most of these features prevents assessment of types of activities. It is possible that processing activities were focused on resource types which would leave no archaeological evidence, such as roots, tubers, or meat. One small, circular alignment of heat-altered rock (Figures 6.17 and 6.19) noted near the southwest corner of the block that encompasses a small unoxidized basin (Feature 10) may represent a small, discrete activity area, although no artifacts were associated. It is possible that the circle of stones was used to hold down a hide during hide-working or similar activities. Such activities were generally conducted some distance from habitations (Binford 1983).

6.4 SUMMARY AND CONCLUSIONS

The single component noted at Site 48CR4686 represents an Early/Middle Archaic period (Green River phase) residential campsite with most cultural remains associated with a small housepit. The limited amount of cultural remains suggests that the component represents a very short-term occupation. Three radiocarbon age estimates (4,330, 4,930, and 4,990 years B.P.) obtained from cultural features suggest that two periods of prehistoric occupation are represented. All features and artifacts occurred in a similar stratigraphic location, and the lack of stratigraphic separation suggests that only one period of occupation is represented. The most recent date was obtained from a feature sediment sample that was possibly contaminated by rodent activity, and therefore may not be reliable.

Very few artifacts were recovered, with a very low artifact density (< 1 artifact/m^2) for the component. Four flaked stone tools (two small utilized flakes and two small core fragments) one metate fragment, and 52 pieces of debitage comprise the artifact assemblage from the site. Most artifacts were recovered from the housepit, although cultural features were recorded in most areas of the block. The housepit appears to have been the locus of most component activities although a wide range of activities is not represented. The lack of refuse dumps or middens outside the housepit and the lack of cleaning activity within the housepit suggest a very short-term occupation is represented (Brooks and Yellen 1987). Activities included intensive processing (probably for bone juice or grease) of jackrabbit size and smaller (rodent size) animals, minor flaked stone tool maintenance, and probably habitation. The presence of numerous cultural features outside of the housepit suggests multiple exterior activity areas, although virtually no cultural material was associated with any of these features. They may represent features used to process resource types such as roots, tubers, or boned meat which would leave no archaeological remains, or possibly be the remains of warming fires. One exterior activity area centered on a small hearth was located immediately north of the housepit with activities involving the processing of one pronghorn.

Figure 6.19 Rock Alignment Near Southwest Corner of Excavation Block, Site 48CR4686 (Locality P-078).

7.0 STONE CIRCLE SITE - SITE 48SW2613

This section presents the results of data recovery excavations at the Stone Circle site (Site 48SW2613) conducted by Mariah in 1990. One stone circle with a central hearth that was dated at 230 years B.P. was completely excavated within a 10 x 10 m excavation block. The following subsections describe the site setting, stratigraphy, and excavation results and provide a summary of results.

7.1 SITE SETTING

The Stone Circle site located in the Wertz oil field in the extreme northeast corner of Sweetwater County, Wyoming, 1.2 km northeast of the town of Bairoil (Figures 1.1 and 1.2). This site is separate from Site 48SW2369, the Bairoil Tipi Ring site, which is located 0.2 km to the northeast. The Bairoil Tipi Ring site consists of 182 stone circles and occupies the top of a southern extension of Camp Creek Hill at an elevation of 2,144 m. The Stone Circle site is located on part of the same formation on a saddle between the crest of Camp Creek Hill and a lower spur. An elevation difference of approximately 37 m exists between the two sites, the Stone Circle site being the lower at approximately 2,107 m (Figure 7.1).

In April 1980, Archaeological Services of Laramie (AS) conducted investigations at the Bairoil Tipi Ring site for Amoco (Jess and Berrigan 1982). The purpose was to assess possible adverse impacts from a proposed well pad in the immediate area. The site was mapped and surface collected, and subsurface testing was conducted. Four stone circles that had been damaged by construction activities and vehicle traffic were excavated. In conjunction with this project, the stone circles on the Stone Circle site were mapped and recorded. The Stone Circle site has 14 stone circles that represent two configurations, possibly representing two separate occupations. Stone Circles 1, 2, 5, 7, and 8 comprise one grouping, with Stone Circles 4, 11, 12, 13, and 14 comprising the second. Stone Circles 3, 6, 9, and 10 are outlying features (Figures 7.2, 7.3, and 7.4).

In the fall of 1989, Mariah conducted archaeological testing at the Stone Circle site (Reust et al. 1990). Ten 1 x 1 m test units were excavated at the site to sample stone circle interiors and exteriors, and the areas between stone circles. Stone Circles 5 and 14 were given priority because central hearths were suspected. Two test units were placed within Stone Circle 14, and three test units were dug outside. Stone Circle 5 proved to be very deflated and was not tested. Instead, two units were excavated in adjacent Stone Circle 7. The five test units in or around Stone Circle 14 yielded cultural material in the form of animal tooth fragments and heat-altered rock. The other five test units contained no cultural material. Based on testing results, a 5 x 10 m excavation block to partially encompass Stone Circle 14 was recommended for the data recovery phase of the Bairoil Archaeological Project.

A 5 x 10 m block to investigate the east half of Stone Circle 14 was initially excavated at the Stone Circle site. Based on results from this excavation, an additional 50 m^2 were added to the west side of the block to investigate the remainder of Stone Circle 14. The block was oriented so that Stone Circle 14 could be completely excavated and so that areas adjacent to the stone circle could be investigated. Grid orientation was true north, which matched the alignment of the five test units within the block. Horizontal grid designations were established from a 100N 100E point at the southeast corner of the block (Figure 7.5). Vertical grid elevations were established from the top of a pipe that was located along a fence line southeast of the block. It was assigned an elevation of 100.0 m. During excavations an attempt was made to find and follow the cultural level marked by the structure floor. All rocks uncovered during excavation were mapped with

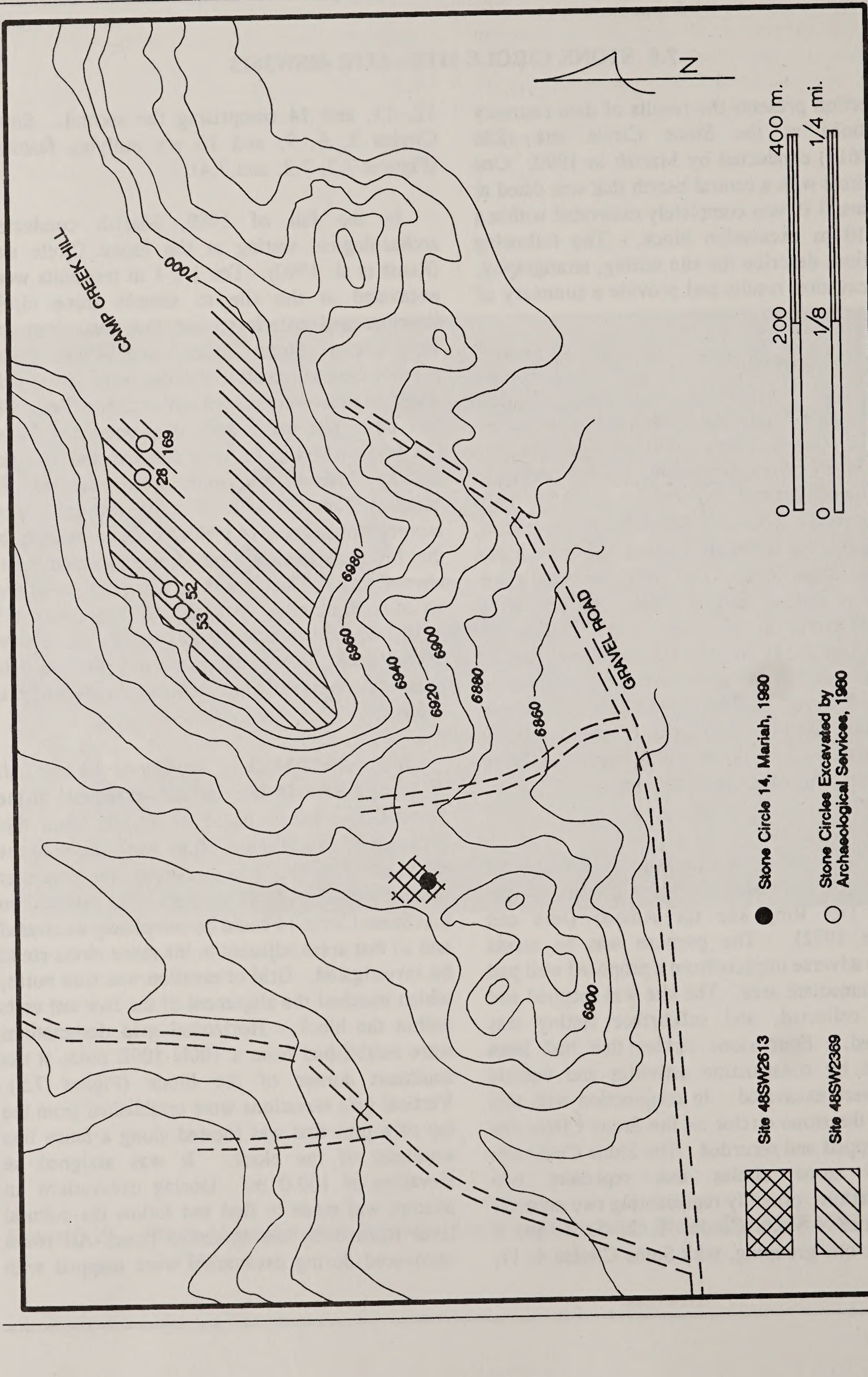


Figure 7.1 Contour Map Showing the Locations of the Stone Circle (Site 48SW2613) and the Bairoil Tipi Ring Site (Site 48SW2369).

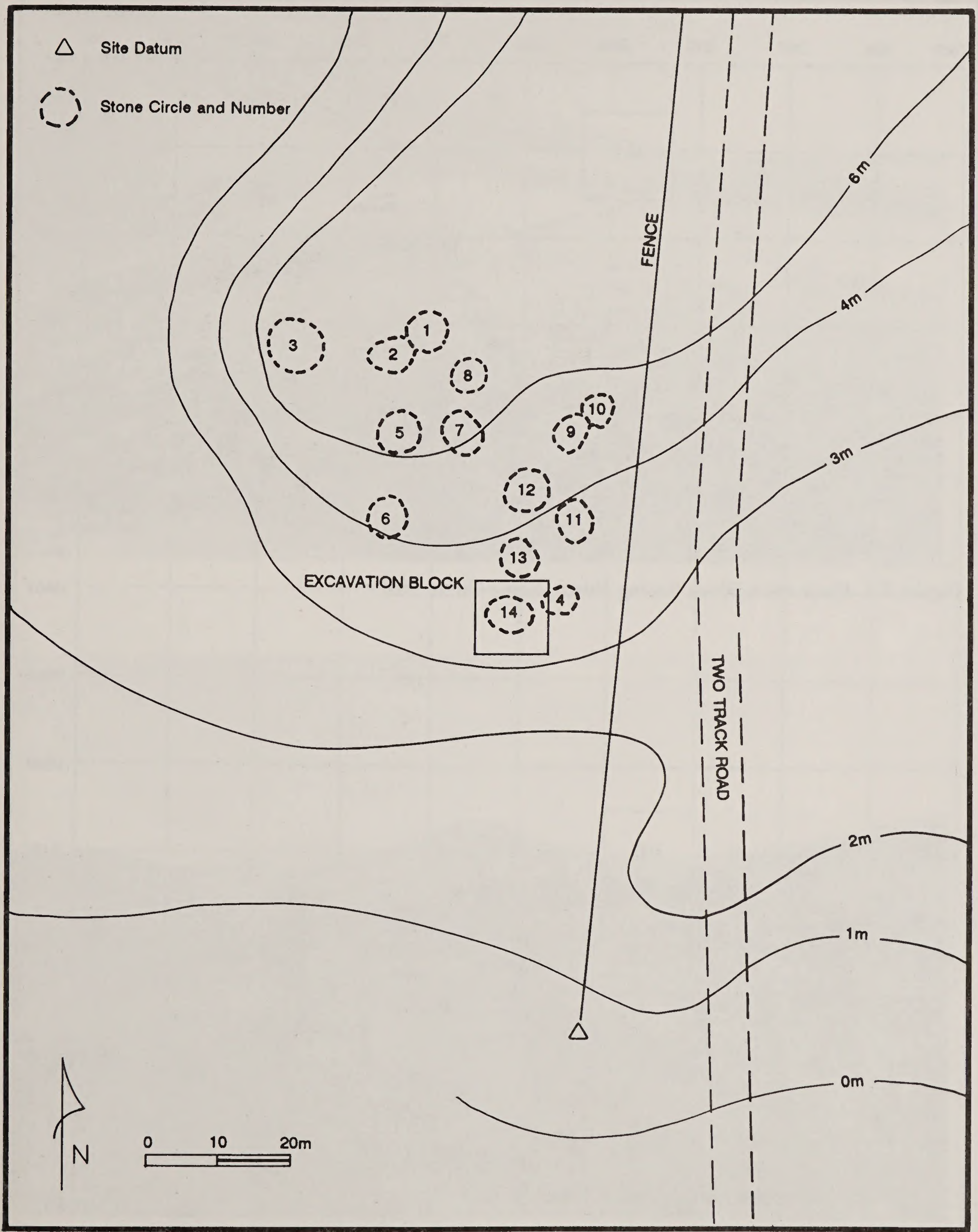


Figure 7.2 Contour Map of the Stone Circle Site.

Figure 7.3 Excavation Block Facing North, Stone Circle Site.

Figure 7.4 Excavation Block Facing East, Stone Circle Site.

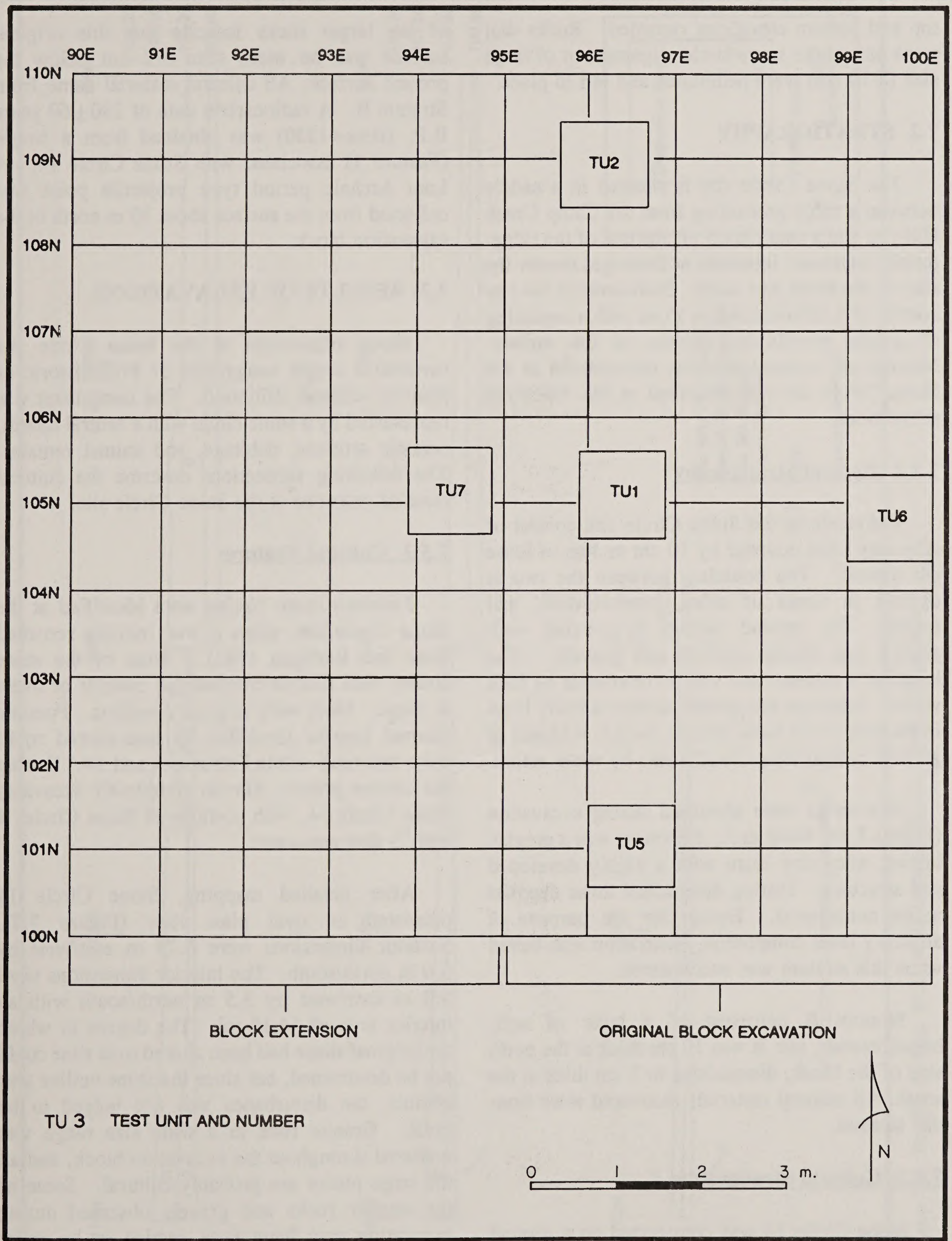


Figure 7.5 Plan Map of Excavation Block, Stone Circle Site.

top and bottom elevations recorded. Rocks that were part of the stone circle alignment or of large size (8-10 cm) were pedestaled and left in place.

7.2 STRATIGRAPHY

The Stone Circle site is situated in a saddle between a ridge protruding from the Camp Creek Hill rim and a small knoll off the end of the ridge. Small, unnamed, intermittent drainages border the site on the north and south. Sediments at the site consist of a colluvial clayey loam with a scattering of granite gravels and cobbles on the surface. Natural and cultural deposits encountered at the Stone Circle site are described in the following subsections.

7.2.1 Natural Stratigraphy

Sediments at the Stone Circle site consist of silty clay loam covered by 10 cm or less of loose silt topsoil. The boundary between the two is distinct in terms of color, consolidation, and texture. The ground surface is covered with granite and diorite cobbles and gravels. The location is exposed and subject to erosion by high winds. Although the ground surface is fairly level in the area of the stone circles, there is evidence of gradual redepositing of sediments by water action.

Two strata were identified during excavation (Figure 7.6). Stratum A, the lower, was a greyish brown, silty clay loam with a highly developed ped structure. Testing determined these deposits to be noncultural. Except for the purpose of arbitrary level completion, excavation was halted when this stratum was encountered.

Stratum B consisted of a layer of soft, homogeneous, silt. It was 10 cm thick at the north side of the block, diminishing to 5 cm thick at the south. All cultural materials recovered were from this stratum.

7.2.2 Cultural Stratigraphy

Stone Circle 14 was constructed on a ground surface represented by Stratum B. Base elevations of the larger rocks indicate that this original surface was no more than 5-8 cm below the present surface. All cultural material came from Stratum B. A radiocarbon date of 230±60 years B.P. (Beta-41530) was obtained from a firepit (Feature 1) associated with Stone Circle 14. A Late Archaic period type projectile point was collected from the surface about 30 m north of the excavation block.

7.3 RESULTS OF EXCAVATIONS

Block excavations at the Stone Circle site revealed a single component of Protohistoric or Historic cultural affiliation. The component was represented by a stone circle with a central hearth, ceramic artifacts, debitage, and animal remains. The following subsections describe the cultural remains recorded at the Stone Circle site.

7.3.1 Cultural Features

Fourteen stone circles were identified at the Stone Circle site when it was initially recorded (Jess and Berrigan 1981). Most of the stone circles were double-coursed and circular or ovate in shape. Most were in good condition. Possible internal hearths identified by heat-altered rocks were recorded within Features 5 and 14. During the current project, Mariah completely excavated Stone Circle 14, with portions of Stone Circles 4 and 13 also excavated.

After detailed mapping, Stone Circle 14 presented an oval plan view (Figure 7.7). Exterior dimensions were 6.75 m east/west by 5.0 m north/south. The interior dimensions were 5.0 m east/west by 3.5 m north/south with an interior area of 14.18 m^2. The degree to which the original shape had been altered over time could not be determined, but since the stone outline was distinct, the disturbance was not judged to be great. Granite rock in a wide size range was scattered throughout the excavation block, and all the large pieces are probably cultural. Some of the smaller rocks and gravels observed during excavation may have been carried in by water action. Approximately 200 pieces of rock can be

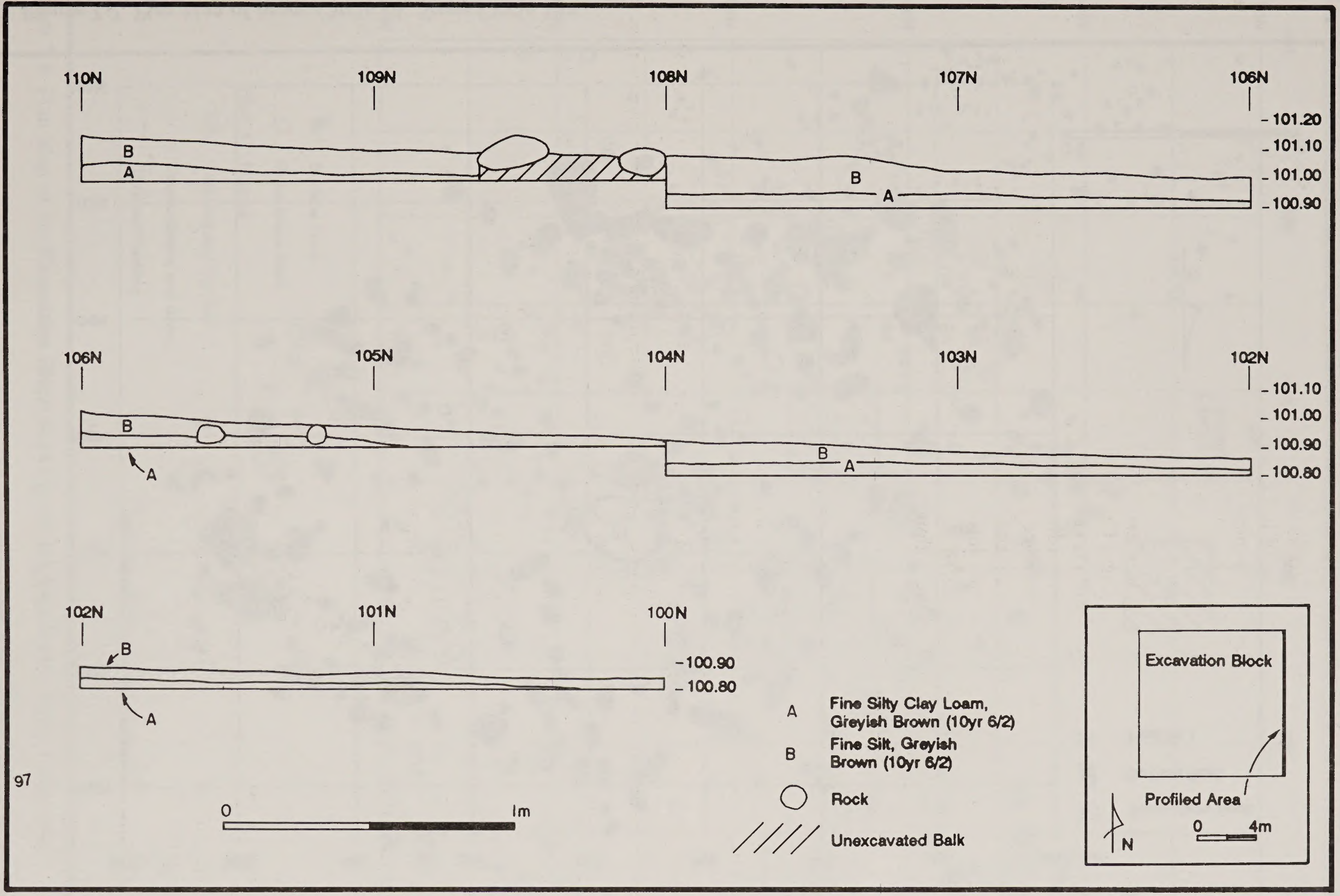


Figure 7.6 Profile of East Wall of Excavation Block, Stone Circle Site.

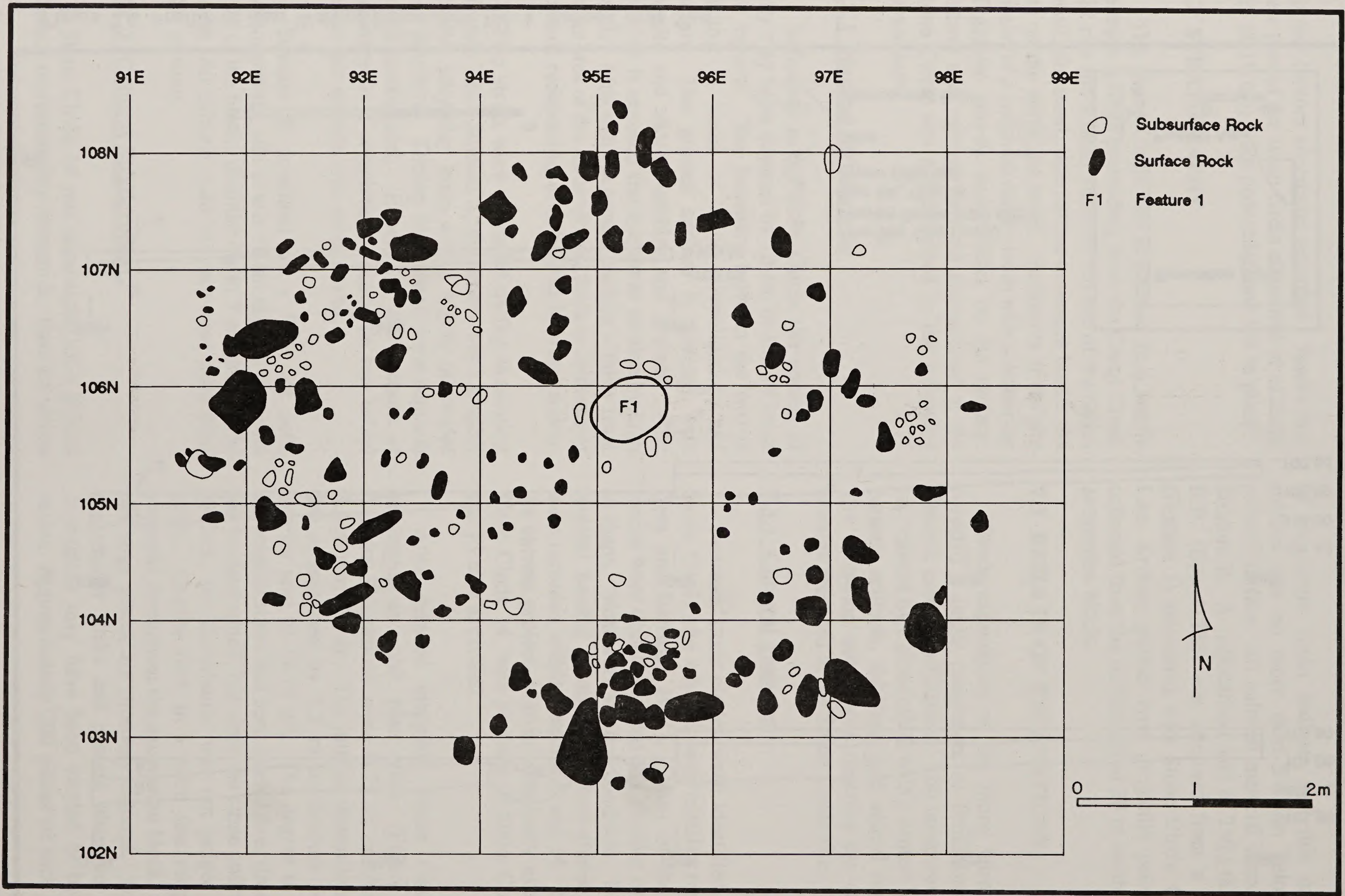


Figure 7.7 Plan Map of Stone Circle 14, Stone Circle Site.

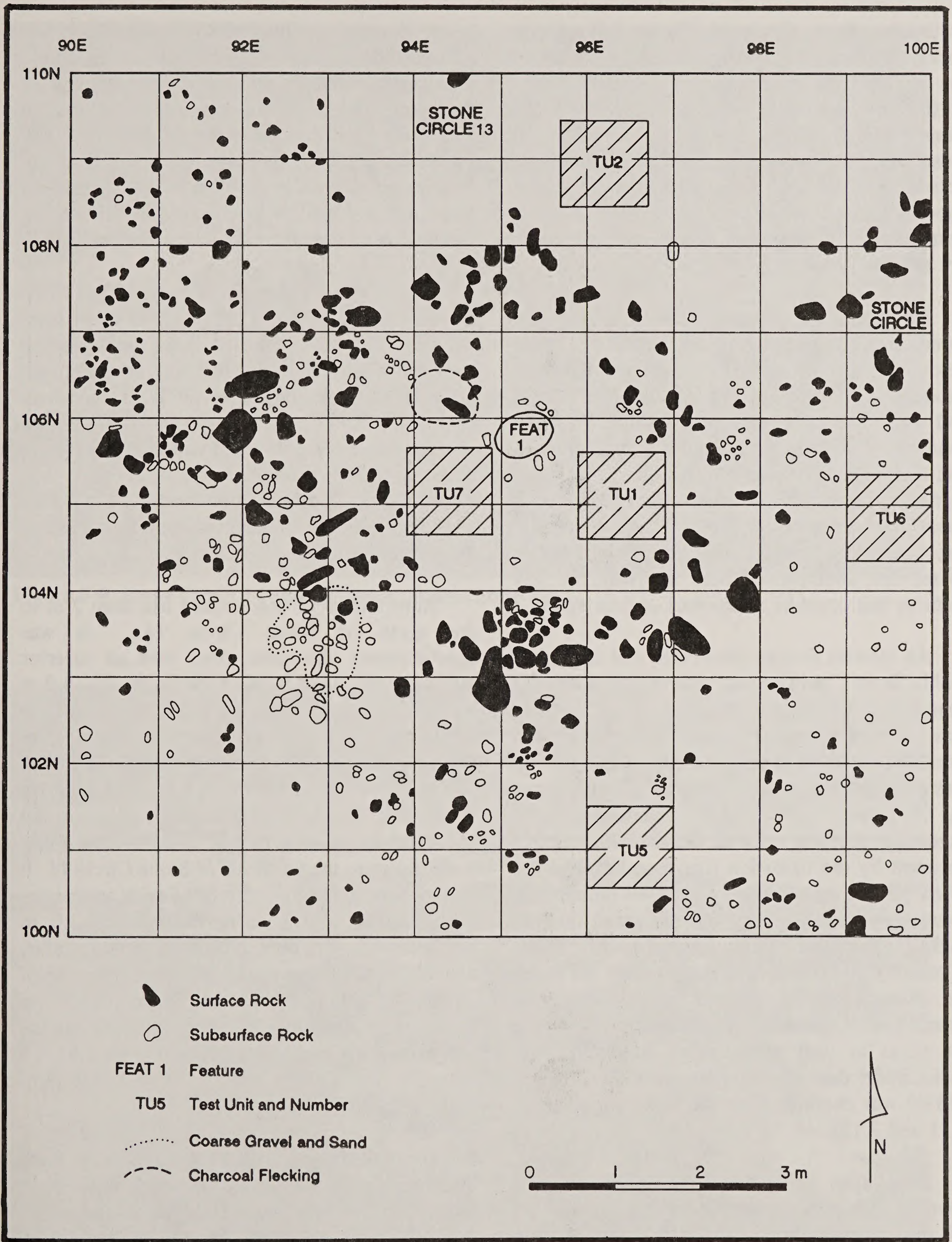


Figure 7.8 Plan Map of the Excavation Block Showing All Mapped Rocks, Stone Circle Site.

assigned to Stone Circle 14 (Figure 7.8). Large rocks could be easily recognized as belonging to the stone circle construction (Figures 7.9 and 7.10). Smaller rocks were identified with the stone circle by being within the stone circle or in close proximity to the larger rocks. It should be noted that if the 1980 AS map is accurate, and it appears to be, then some of the largest rocks in Stone Circle 14 have been moved, and two rocks are apparently missing.

Excavation revealed the ground surface the stone circle was originally constructed on to be below the present surface by 5-8 cm. The area inside Stone Circle 14 was excavated by trowel and whisk broom to determine whether an intact living floor existed. Special attention was given to soil texture and compaction. An effort was made to find the structure entrance, anticipating that it would be more compact than the surrounding soil due to heavier traffic. This approach failed to reveal the anticipated floor, doorway, or any features that could be interpreted as post molds.

An internal feature discovered and excavated within Stone Circle 14 was interpreted as being a central hearth. The hearth, designated Feature 1, was a well-preserved, rock-filled basin that exhibited two distinct use episodes. The lower pit was a steep-sided, oval basin with the bottom lined by 18 granite rocks. A 1 cm thick lens of sagebrush charcoal covered these rocks. It was apparent by the oxidation ring found around the lower pit and the quantity of charcoal present that a considerable amount of fuel was burned over the rocks, probably for the purpose of heating them. A roasting pit function was suggested by the lower pit characteristics. Several medium to large animal bone fragments were collected from among the rocks as well as pieces of fired clay. A radiocarbon date of 230$\pm$60 years B.P. (Beta-41530) was obtained from the lower pit (Figures 7.11 and 7.12).

Soon after being used the lower pit was covered with soil, accounting for the preservation of the charcoal, and a second feature was excavated into the fill to within a centimeter of the lower feature. This upper construction was represented by a close cluster of randomly positioned granite rocks and a small amount of charcoal. The upper pit appeared to be smaller and more dish than basin-shaped (Figure 7.13). An area of charcoal flecking slightly less than 1 m in diameter and centered 0.5 m to the northeast of Feature 1 appeared to be the remains of ash and charcoal from the emptying of the firepit.

Rocks near the feature were presumed to be associated, although not all appeared to be heat-altered. The 18 rocks that lined the lower pit were positively heat-altered, and an additional three rocks from the upper pit were reddened. Eighteen rocks showing no heat-altered characteristics were recorded within or adjacent to Feature 1. No other heat-altered rock was recorded from the excavation block. Flotation of a 4.0 liter sample of stained sediment from Feature 1 produced no charred seeds.

Stone Circle 13 was located less than 2 m to the north of Stone Circle 14. It was approximately the same size, with an exterior measurement of 4.8 m north/south by 4.9 m east/west, and an interior measurement of 3.6 m north/south by 3.6 m east/west. It was double-coursed, was circular, and had a doorway (Jess and Berrigan 1981). One rock belonging to Stone Circle 13 was within the north edge of the excavation block (Figure 7.8). Stone Circle 4 was located 1 m to the northeast of Stone Circle 14. It was smaller than Stone Circle 14 with an interior measurement of 1.8 m north/south by 2.0 m east/west. It was double-coursed, was circular, and had a doorway (Jess and Berrigan 1981). Approximately one-third of Stone Circle 4, accounting for possibly 30 rocks, extended into the east side of the excavation block (Figure 7.8).

7.3.2 Flaked Stone Artifacts

Few flaked stone artifacts were collected from the Stone Circle site. Six pieces of debitage were recovered from the excavation block, with one projectile point collected from the surface during testing (Reust et al. 1990).

Figure 7.9 Stone Circle 14 Facing South, Stone Circle Site.

Figure 7.10 Stone Circle 14 Facing East, Stone Circle Site.

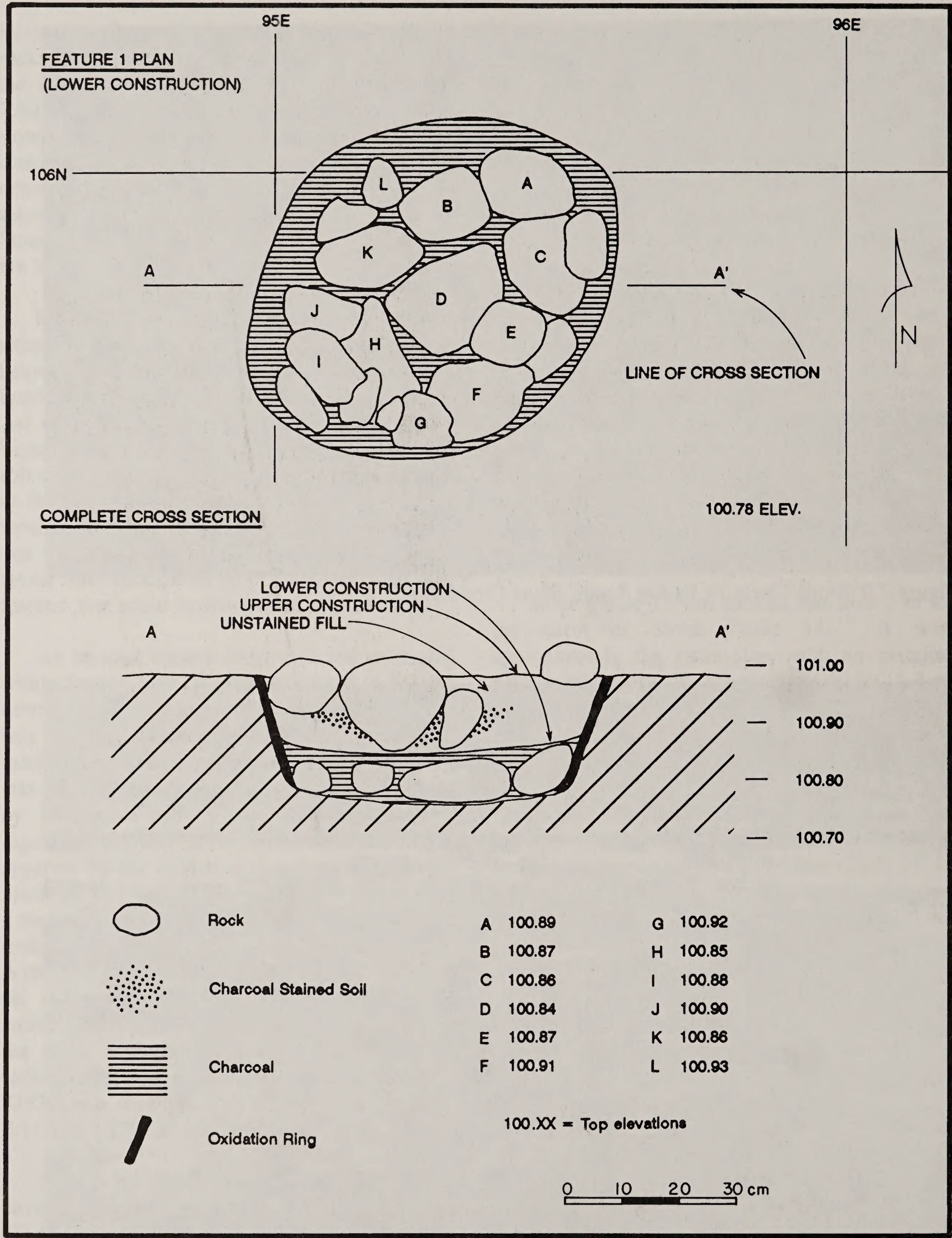


Figure 7.11 Plan View and Cross Section of Lower Portion of Feature 1, Stone Circle Site.

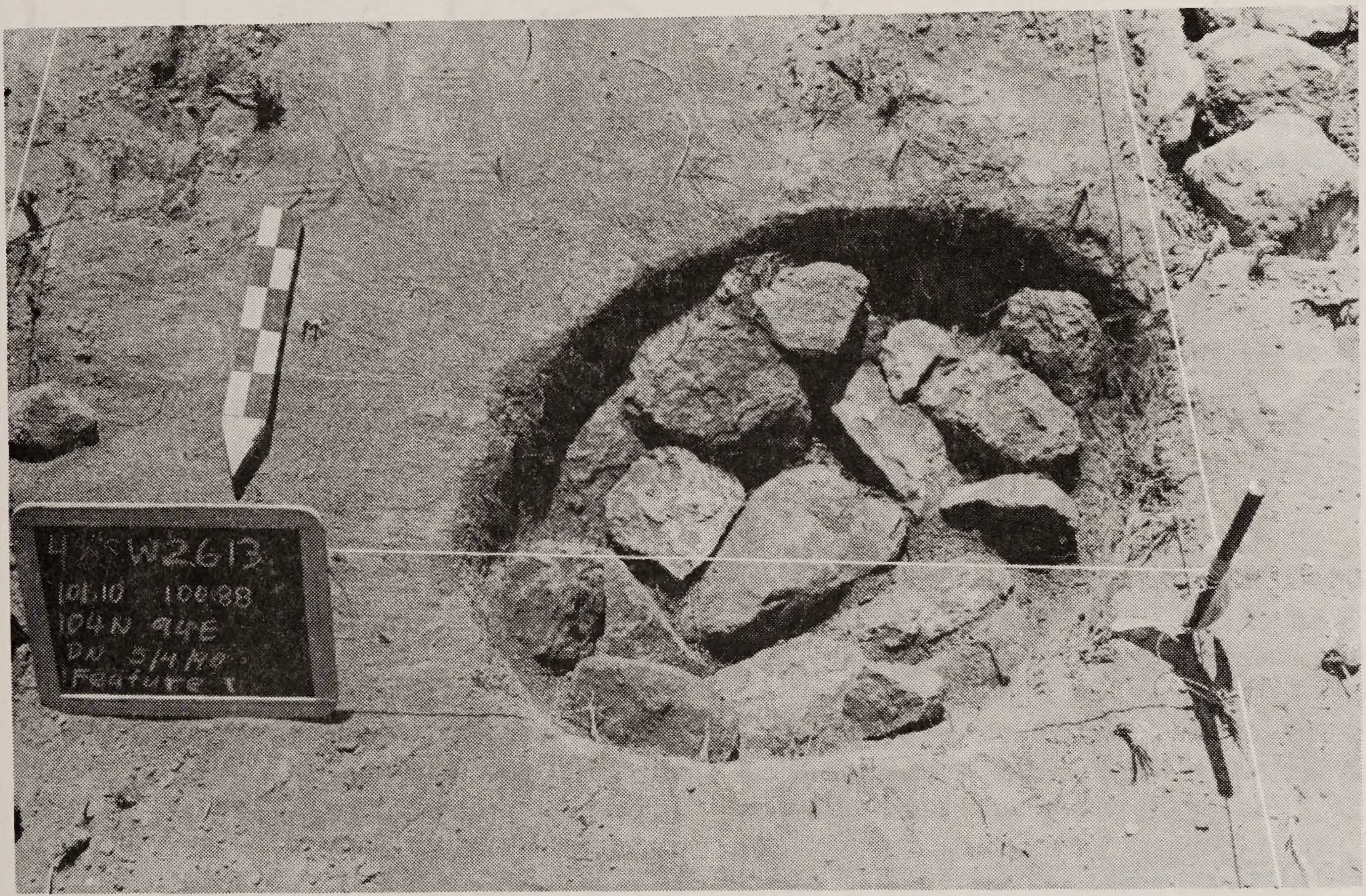


Figure 7.12 Lower Portion of Feature 1, Stone Circle Site.

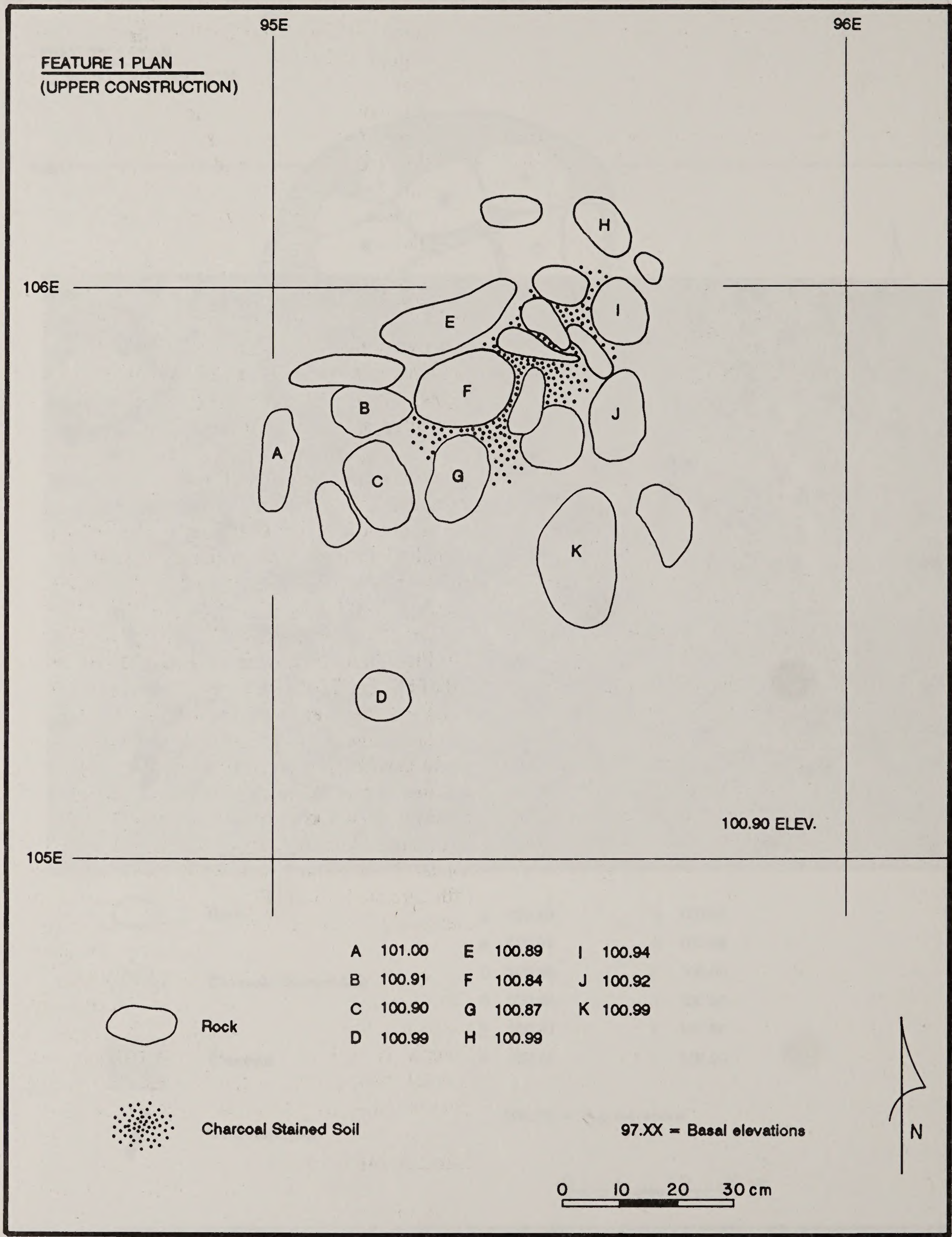


Figure 7.13 Plan View of Upper Portion of Feature 1, Stone Circle Site.

7.3.2.1 Projectile Point

During testing a projectile point (SW2613-64) was collected from the surface of the Stone Circle site (Figure 7.14). It was found 30 m north of Stone Circle 14 on the edge of Stone Circle 8. It measures 23 mm wide x 30 mm long x 4 mm thick and represents a type usually associated with Late Archaic period components in the region (Frison 1978). This suggests that it has no association with the site occupation represented by Stone Circle 14. The point was described in the Bairoil Archaeological Project Testing report as follows (Reust et al. 1990):

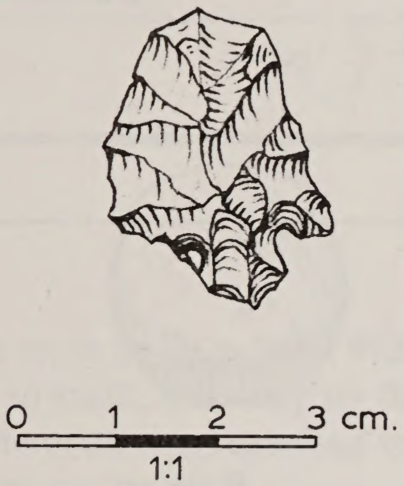


Figure 7.14 Projectile Point (SW2613-64) Collected from Surface, Stone Circle Site.

> The corner-notched point fragment exhibits an impact fracture at the tip, and the base is broken diagonally across the stem through one shoulder. The other shoulder and the other corner of the stem are also broken. This specimen originally apparently had deep, narrow side notches forming sharp tips at its intersection with the blade and base margins. The blade was apparently triangular, and the base may have been slightly concave. This specimen resembles the Pelican Lake type of the Northwestern Plains. It exhibits some evidence along the distal edge suggestive of reuse as some sort of hafted tool after breakage. It is made of yellowish brown dendritic chert. It was heated (burned) after discard, producing a thin red oxidation rind across the entire surface of the artifact. It is also potlidded on one face, but it was not fractured by the heating.

7.3.2.2 Debitage

Debitage collected from the block excavation amounts to six flakes, representing three material types. Four of the flakes recovered are microflakes; two are of opaque chert, one of fine-grained quartzite, and one of brown, semitranslucent chert. All four microflakes are complete. Two flakes are primary flakes, both being of brown, semitranslucent chert. One is complete; the other is a proximal portion.

7.3.3 Ceramics

Five ceramic artifacts were found in the lower fill of Feature 1 (Figure 7.15). Two (Figure 7.15, A,B) are irregular in shape and bear the imprints of plant stems or twigs on their surfaces. These could have been accidently put into the fire with the fuel, or represent pieces of wattle and daub material. Two other pieces (Figure 7.15, C,D) also show impressions of organic matter but appear kneaded and somewhat smoothed. The fifth ceramic artifact (Figure 7.15, E) is a sphere, measuring 2.4 cm in diameter, which was created by purposefully rolling the clay into a ball shape. The sphere is grey (10yr 5/1). All five objects are fired but not to the degree usually considered necessary for ceramic status. No tempering material is visible in any of these artifacts. No cultural associations or function can be inferred from morphology or context of these artifacts.

7.3.4 Animal Remains

A total of 292 tooth or bone fragments was found within the excavation block at the Stone Circle site (Table 7.1). Of these, 276 are tooth

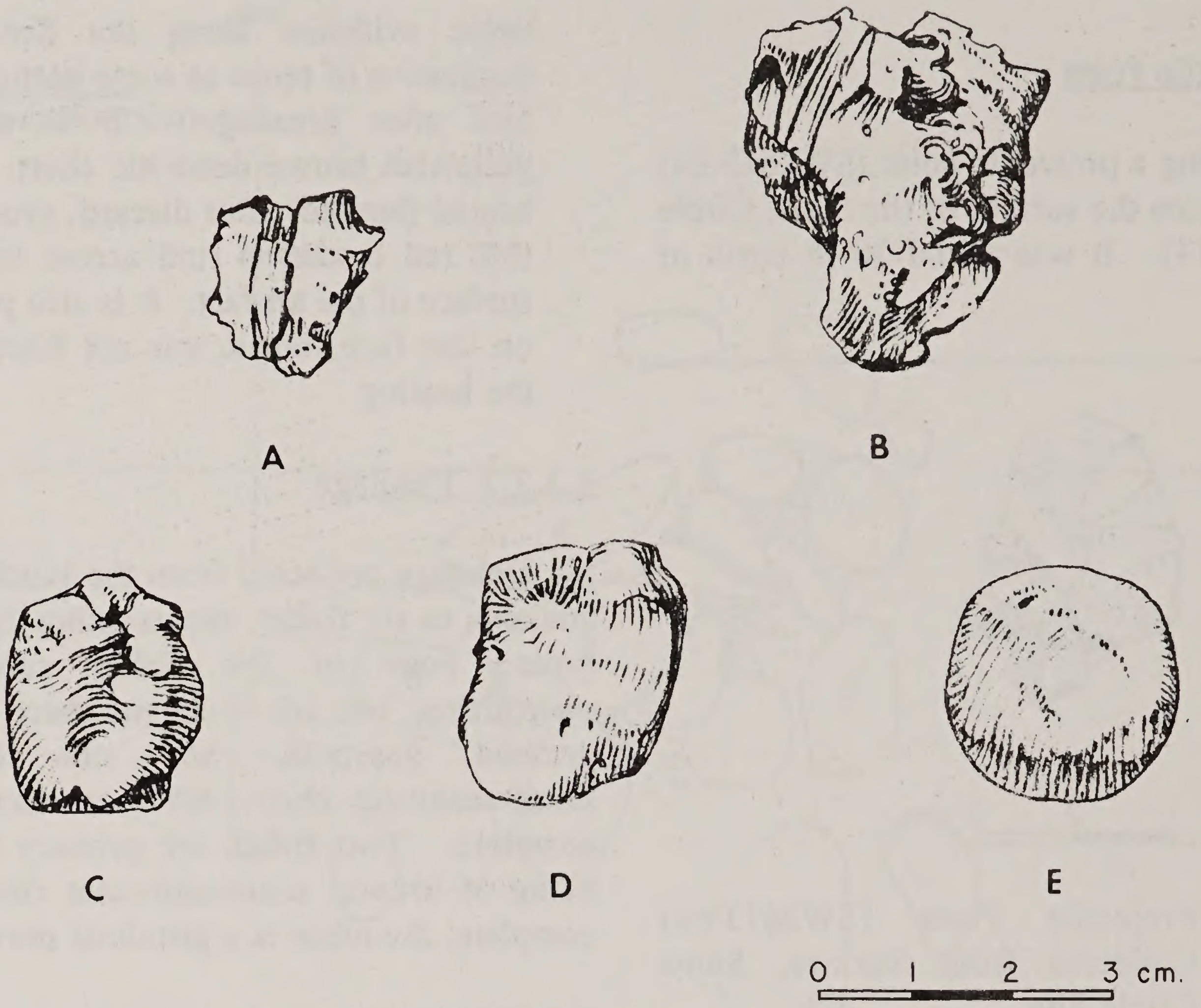


Figure 7.15 Ceramic Artifacts Recovered from Feature 1, Stone Circle Site. A) SW2613-76A; B) SW2613-76B; C) SW2613-76C; D) SW2613-76D; E) SW2613-18.

fragments of medium to large artiodactyla, probably deer or pronghorn. Of the remaining 16 bone fragments, 13 were associated with Feature 1. They are identifiable as medium to large mammal remains with two specimens, both cranial fragments, being burned. Five pieces of medium to large mammal bone and one glenoid fragment, probably belonging to a cottontail rabbit, were found elsewhere in the block. Two of the medium to large mammal fragments were burned.

The 13 bone fragments associated with Feature 1 came from the lower fill of the basin. The presence of bone on the cobble-lined pit bottom strengthens the hypothesis of a roasting pit function for the feature. The fragments are too small to be identified as anything but medium to large mammal.

7.3.5 Plant Macrofossils

Two soil samples totalling 4.0 liters collected from the central hearth (Feature 1) of Stone Circle 14 were floated to extract plant material and seeds. One uncharred chenopodium seed was recovered. Due to the lack of burning, the seed was determined to be noncultural.

7.3.6 Spatial Distribution of Cultural Remains

Spatial distribution patterns of debitage and faunal remains within the excavation block at the Stone Circle site are discussed in this section.

Distribution of debitage within the excavation block of the Stone Circle site is presented in Figure 7.16. Debitage occurred in two areas outside the stone circle, corresponding to 102N 99E, and 108/109N 98E. A third area occurred

Table 7.1 Summary of Animal Remains, Stone Circle Site.

Animal Size Category	Total Specimens No.	Total Specimens Wt. (g)	Burned Specimens No.	Burned Specimens %	Identifiable Elements
Medium to large mammal	291	44.8	2	0.7	Cranial fragment (2), tooth fragments (276)
Small mammal	1	0.2	--	--	Glenoid fragment
Total	292	45.0	2	0.7	

within the stone circle at 104N 96E. The debitage sample is so small, with only six flakes recovered, that no interpretations regarding spatial patterning of activities can be made.

Distribution of animal remains within the excavation block of the Stone Circle site is shown in Figure 7.17. Distribution patterns indicate that almost all the remains are localized in the east half of the block with the greatest concentration in the 103/108N 97/98E areas. Animal remains are shown within the east half of the stone circle interior with the highest concentration for the block occurring at 104N 97E. The concentration appearing at 105N 95E represents the bone fragments found in the lower part of Feature 1, which is interpreted as being the central hearth of a structure represented by Stone Circle 14. This association suggests that food was being prepared within the shelter, implying a winter occupation. The distribution of the remaining animal remains provides no differentiation between activities conducted in the stone circle's interior or exterior, although the location of all debitage and most animal remains in the east half of the block may indicate that most activity and/or dumping of remains occurred in this area.

7.4 SUMMARY AND CONCLUSIONS

The Stone Circle site may be an extension of the Bairoil Tipi Ring site, the former being a smaller locality of the larger stone circle site. When summarizing the results of the excavation of Stone Circle 14, the data from the current project are pertinent to both localities, as are the results of the 1980 excavations at the Bairoil Tipi Ring site.

The Bairoil Tipi Ring site, consisting of 182 stone circles, is described as commanding a broad view from the top of Camp Creek Hill, at an elevation of 2,144 m. The hill is a pediment formation with steep sides dropping 43 m from top to bottom. This formation is located near the base of the Green Mountains on the northeast edge of the Red Desert/Great Divide Basin. The basin area to the south and southeast of the site is characterized by a broad, flat, sandy plain cut by numerous drainage channels. The terrain to the north and northwest is dominated by the pine-covered slopes and peaks of the Green Mountains. Therefore, the site is situated within a transitional area in close proximity to the resources offered by two major ecological zones (Jess and Berrigan 1982).

In the 1980 AS survey, Stone Circle 14 at the Stone Circle site was recorded as being double-coursed, being oval, having a central hearth, and having no discernible doorway (Jess and Berrigan, 1981). These characteristics are common to stone circles on both sites. When the average exterior and interior dimensions of Stone Circle 14 (Mariah's measurements) are compared against the

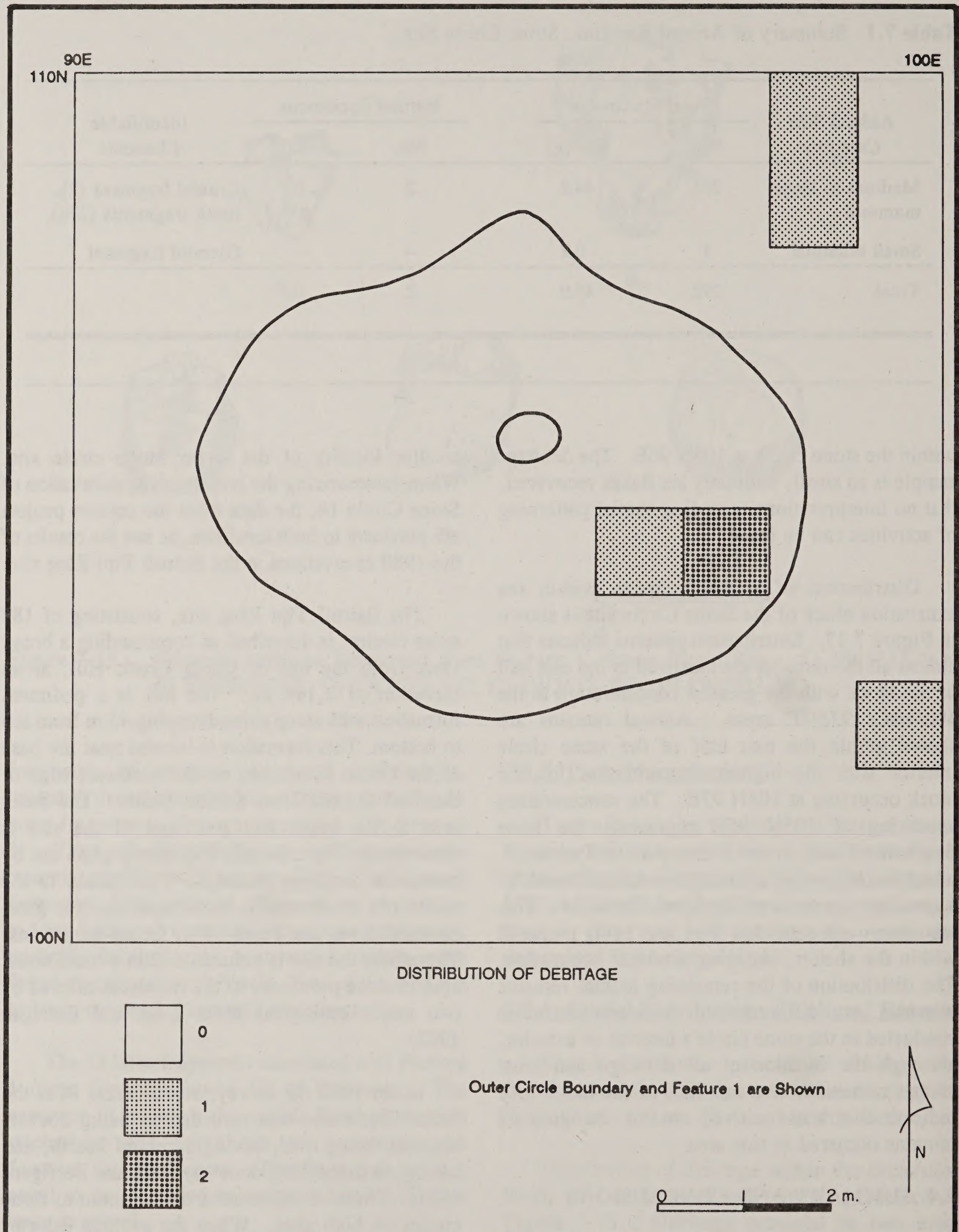


Figure 7.16 Distribution Map of Debitage, Stone Circle Site.

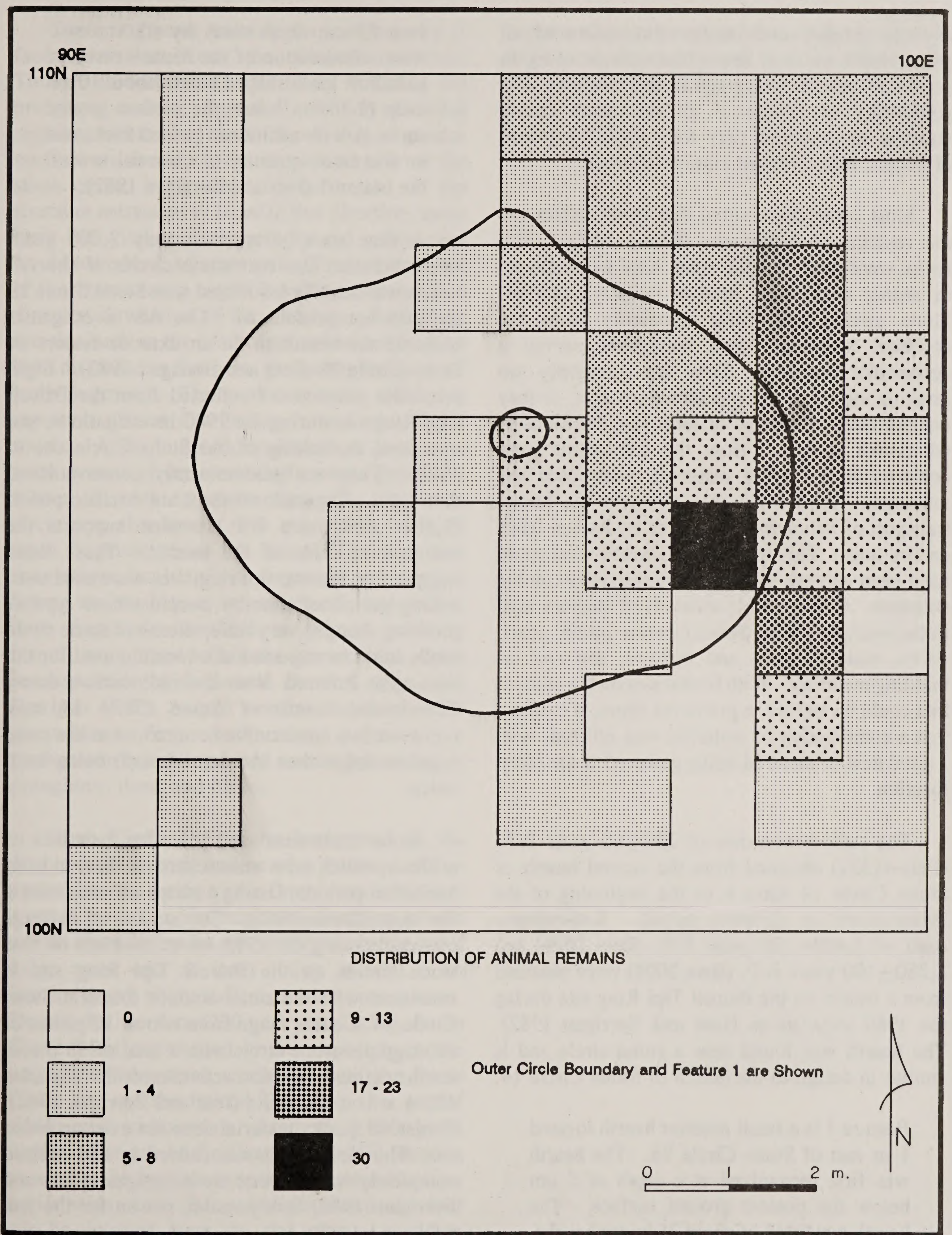


Figure 7.17 Distribution Map of Animal Remains, Stone Circle Site.

average exterior and interior dimensions of all stone circles on both sites, Stone Circle 14 again proves to be nearly average in this respect. The conformity of design of all the stone circles strongly suggests that they were made by groups of people who followed similar lifeways.

Most researchers agree that stone circles are the remains of habitations (Kehoe 1960). The rocks were used to hold down hide lodge covers or anchor some other kind of building material. Stone circles that differ noticeably from the common habitation style may have served a ceremonial function. They are commonly too large or too small to represent structures, or they contain unusual internal features like partitions or wheel-like spokes. How the habitations were constructed and what materials were used are unknown. Before the acquisition of the horse, transport of belongings was done by human labor and by dogs. This would have limited what could have been carried, putting a size restriction on the structure. Ethnographic accounts of shelters used in the western United States mention brush, grass, woven mats of grass and willows, and sod, as building materials. With limitations on the amount that could be moved in pre-horse times, it is likely that a combination of materials was utilized, with a good deal of material being gathered at the camp location.

The radiocarbon date of 230±60 years B.P. (Beta-41531) obtained from the central hearth of Stone Circle 14 dates it to the beginning of the Protohistoric or Historic period. Radiocarbon dates of 2,410±120 years B.P. (Beta 2006) and 2,250±100 years B.P. (Beta-2008) were obtained from a hearth on the Bairoil Tipi Ring site during the 1980 excavations (Jess and Berrigan 1982). The hearth was found near a stone circle and is similar in design to the hearth of Stone Circle 14.

> Feature 1 is a small exterior hearth located 1 m east of Stone Circle 28. The hearth was first recognized at a depth of 5 cm below the present ground surface. The hearth consisted of about 25 burned rocks, grey staining, and charcoal flacks in an area 55 cm north-south by 65 cm east-west. Excavation of the feature revealed a shallow basin shaped hearth about 10 cm deep (5-15 cm below the present ground surface) with additional burned rocks and an increased quantity of charcoal toward the bottom" (Jess and Berrigan 1982).

A time span of approximately 2,000 years exists between the two stone circles if the AS hearth was actually associated with Stone Circle 28 and did not predate it. The AS investigators believed the hearth to be an exterior feature of Stone Circle 28 (Jess and Berrigan 1982). Eight projectile points were collected from the Bairoil Tipi Ring site during the 1980 investigations, and one from the testing of the Stone Circle site in 1989. They are predominantly corner-notched dart types, diagnostic of the Late Archaic period (2,500-1,500 years B.P.), which supports the radiocarbon dates of the hearth. These dates suggest that the two tipi ring sites were used over a long period of time by people whose type of dwelling changed very little. Reuse of stone circle rocks could be expected at a location used for the time span inferred from the radiocarbon dates. The reused hearth of Stone Circle 14 may represent two consecutive occupations at the same location rather then the same hearth being built twice.

Stone circle sites are known for their lack of artifacts, which most researchers attribute to brief habitation periods, lasting perhaps no more than a few days (Davis 1983). The amount of debitage collected during the 1980 AS excavations of four stone circles on the Bairoil Tipi Ring site is consistent with the small amount found at Stone Circle 14. Counts range from two to 10 pieces of debitage per stone circle with a total of 53 pieces for the entire excavation activities, which included 121 1 x 1 m test units (Jess and Berrigan 1982). Toolstone quality material does not exist on either site. The idea that it was carried in and utilized completely was put forth by investigators Jess and Berrigan (1982) as a possible reason for the low debitage quantity.

Tooth fragments make up the vast majority of faunal remains from the excavation block. Though unidentifiable, it is likely that they are pronghorn or deer. Spatial distribution of animal remains within the block shows that a greater number are found on the downwind side of the stone circle, being east and northeast. If the structure entranceway faced in that direction, away from the wind, a likely activity and refuse area would have been adjacent to it. Trash thrown out of the entranceway would have accumulated in a direction downwind of the structure. Butchering remains such as the head of an animal might have been discarded in that area, producing hundreds of tooth fragments. The tooth fragments could also represent natural distribution from a noncultural source. A single deteriorated skull or jaw to the north or east of the stone circle would produce a scatter of tooth fragments long after the stone circle was abandoned. No mention is made of tooth fragments from the Bairoil Tipi Ring site excavations, but long bone fragments appearing to belong to "small deer or pronghorn", and thicker bone fragments identified as "almost certainly bison", were found within two stone circles, some in association with hearth charcoal (Jess and Berrigan 1982). Animal remains and the lack of groundstone from both sites point to a predominantly hunting-based economy focusing on pronghorn, deer, and bison.

Stone Circle 14 can be interpreted as the double-coursed rock outline of a structure with a central hearth, dating to the Protohistoric/Historic contact period. The supposed function of the double course of rocks was to hold down the outer lodge cover and an inner lining as well. An interior hearth might indicate a winter occupation. Despite its late date (230$\pm$60 years B.P.), Stone Circle 14 is constructed in the same way as the majority of the stone circles on both the Stone Circle site and the Bairoil Tipi Ring site, one of which was radiocarbon dated to 2,000 years earlier. The use of the Camp Creek Hill location as a campsite appears to span a considerable time period without any change in habitation design that can be detected from the size, shape, or other structural characteristics of the stone circles. This suggests that the people who used the location up to historic times followed a stable lifeway that changed little over many generations.

8.0 ABEL CREEK SITE - SITE 48SW998 (LOCALITY P-132)

This section summarizes the results of block excavations completed in 1990 by Mariah at the Abel Creek site (Site 48SW998). Three prehistoric components of Late Archaic period (Deadman Wash phase) and Late Prehistoric period (Uinta and Firehole phases) cultural affiliation were identified in two small excavation blocks. The following subsections summarize the site setting, stratigraphy, and excavation results and provide a summary of results.

8.1 SITE SETTING

The Abel Creek site is a large site complex that extends southeast from Bairoil for more than 2 km along both sides of Abel Creek to near its confluence with Lost Soldier Creek (Figure 1.2). The site is located near the west end of a broad basin which is part of the Lost Soldier-Separation Flat physiographic zone (Gaylord 1982) referred to as Lost Soldier Flats (Albanese 1989) in the project area. The Abel Creek site encompasses portions of the modern floodplain, as well as older terraces on each side of Abel Creek. This broad site area exhibits minimal vertical relief and occurs between 2,073 m and 2,060 m in elevation. Surface cultural remains include a very diffuse scatter of artifacts and burned rock, with a few buried cultural features exposed in cutbanks formed by the deep entrenchment of the Abel Creek stream channel. Past construction projects, which are summarized below, have also encountered a number of subsurface cultural features.

Several modern pipeline ROWs pass across Abel Creek and transect the Abel Creek site, including the Bairoil CO_2 Spur Pipeline (Moore et al. 1987) and the LSU Main CO_2 Injection Line (Greer, Greer, and Frizell 1989). State Highway 73 passes along the north edge of the Abel Creek site and has disturbed small areas of the site. The upper terraces adjacent to Abel Creek are dominated by a big sagebrush plant community with sagebrush, rabbitbrush, spiny hopsage, other low shrubs, western wheatgrass, needle-and-thread grass, and other low grasses and forbs. This plant community is transitional to a sagebrush steppe that dominates higher ridges in the region (Dueholm and Latady 1989). Scattered stands of wild rye and scattered greasewood occur adjacent to the modern channel of Abel Creek. Disturbed plant communities with thistle, halogeton, and kochia occur in areas of highway and pipeline disturbances.

The site was initially recorded by the OWSA as a single hearth eroding from the Abel Creek cutbank (Larson 1978). The area recorded by the OWSA was subsumed within a large site complex (Site 48SW998) identified during the 1984 reinventory of the Wertz oil field which established the current boundaries of the Abel Creek site (Bies et al. 1985). Subsequent investigations at the site have included subsurface testing, surface reconnaissance, and construction monitoring by OAI in conjunction with the construction of the Bairoil CO_2 Spur Pipeline (Moore et al. 1987). The area investigated by OAI is greater than 1 km downstream (east) from the area investigated by Mariah, and 18 cultural features (hearths) were recorded by OAI. Six radiocarbon age estimates ranging from 950 ± 70 to $2,680 \pm 70$ years B.P. were obtained from these features. Subsurface testing was conducted in 1988 by the OWSA in a portion of the site along the Lamont-Bairoil Highway within several hundred meters of the portion of the site reported here (Latady et al. 1989). The OWSA investigations obtained radiocarbon dates of $3,290 \pm 95$, $3,440 \pm 90$, and $5,950 \pm 120$ years B.P. from hearths exposed in the north cutbank of Abel Creek.

The portion of the site investigated by Mariah--Locality P-132--was recorded during construction monitoring of the LSU Main CO_2 Injection Line (Greer, Greer, and Frizzel 1989).

Construction monitoring and limited salvage excavations recorded 10 cultural features including a possible house floor, an ash stain/midden, and eight small pit or hearth features. No radiocarbon dates were obtained, although the recovery of a corner-notched dart point suggests a Late Archaic period cultural affiliation for Locality P-132.

Locality P-132 is located at the west end of the Abel Creek site along the north bank of Abel Creek just to the south of State Highway 73. This area is approximately 1.0 km south of Camp Creek Hill, a large ridge system that borders Lost Soldier Flats on the north. A portion of the site lying directly across the stream adjacent to the south cutbank of Abel Creek was also investigated by Mariah (Figure 8.1). This area lies on a sand-covered upper stream terrace abutting the foot of Bald Knob, another prominent ridge. During the initial phase of investigations completed by Mariah for the Bairoil Archaeological Project, a number of auger tests and a total of ten 1 x 1 m test units were excavated on the north and south sides of Abel Creek (Reust et al. 1990). Test units and auger tests failed to relocate the possible house floor and associated cultural features recorded during monitoring of the LSU Main CO_2 Injection Line (Greer, Greer and Frizzel 1989), although single buried cultural levels were noted on each side of Abel Creek. Based on testing results, it was recommended that 4 x 5 m excavation blocks, with possibility for further expansion, be utilized for the second phase of the Bairoil Archaeological Project.

This report details the results of block excavations completed at the Abel Creek site in 1990. Initially, the single buried cultural levels noted by test excavations on the north and south sides of Abel Creek were investigated within 4 x 5 m blocks. The north block was situated on the west edge of a disturbed ROW, and the south block was excavated in undisturbed deposits along the creek cutbank. Based on the results of initial block excavations, and after meeting with state and federal regulators in the field in July 1990, an additional 4 x 6 m area (24 m^2) was excavated along the south bank of Abel Creek. Partial excavation units adjacent to the cutbank equalled approximately 6 m^2. A total contiguous area of about 50 m^2 was excavated on the south side of Abel Creek.

Figure 8.2 provides plan drawings of the two excavation blocks that illustrate the horizontal grid designation system used at the site. All excavation units were referenced from a 100N 100E point established at the northwest corner of the north block. Vertical measurements for each block were referenced from the top of a brass tagged, blue, wooden post on the north side of Abel Creek previously established as a site datum (Greer, Greer, and Frizzel 1989). The top of the post was assigned an arbitrary elevation of 100.0 m. Figures 8.3 and 8.4 provide views that show the setting of the two excavation blocks.

8.2 STRATIGRAPHY

Excavations at the Abel Creek site were conducted on the north and south sides of the Abel Creek channel, with both excavation blocks situated on the T2 terrace. Detailed discussion of the geomorphic setting of the north and south excavation blocks is provided in Appendix A. The sediments on the north side of the stream are alluvial in origin, with aeolian deposits noted on the south side. Prehistoric components were noted in both excavation blocks, with a radiocarbon age obtained from a cultural feature in each block. The following subsections describe the natural and cultural deposits encountered during investigations at Locality P-132.

8.2.1 Natural Stratigraphy

Natural strata were differentiated during excavations by color, compactness, texture, and calcium carbonate content. Results of detailed sediment analysis from both excavation blocks are included in Appendix A. The strata from each block are described from oldest (Stratum A) to youngest (Stratum D or E) in the following subsections.

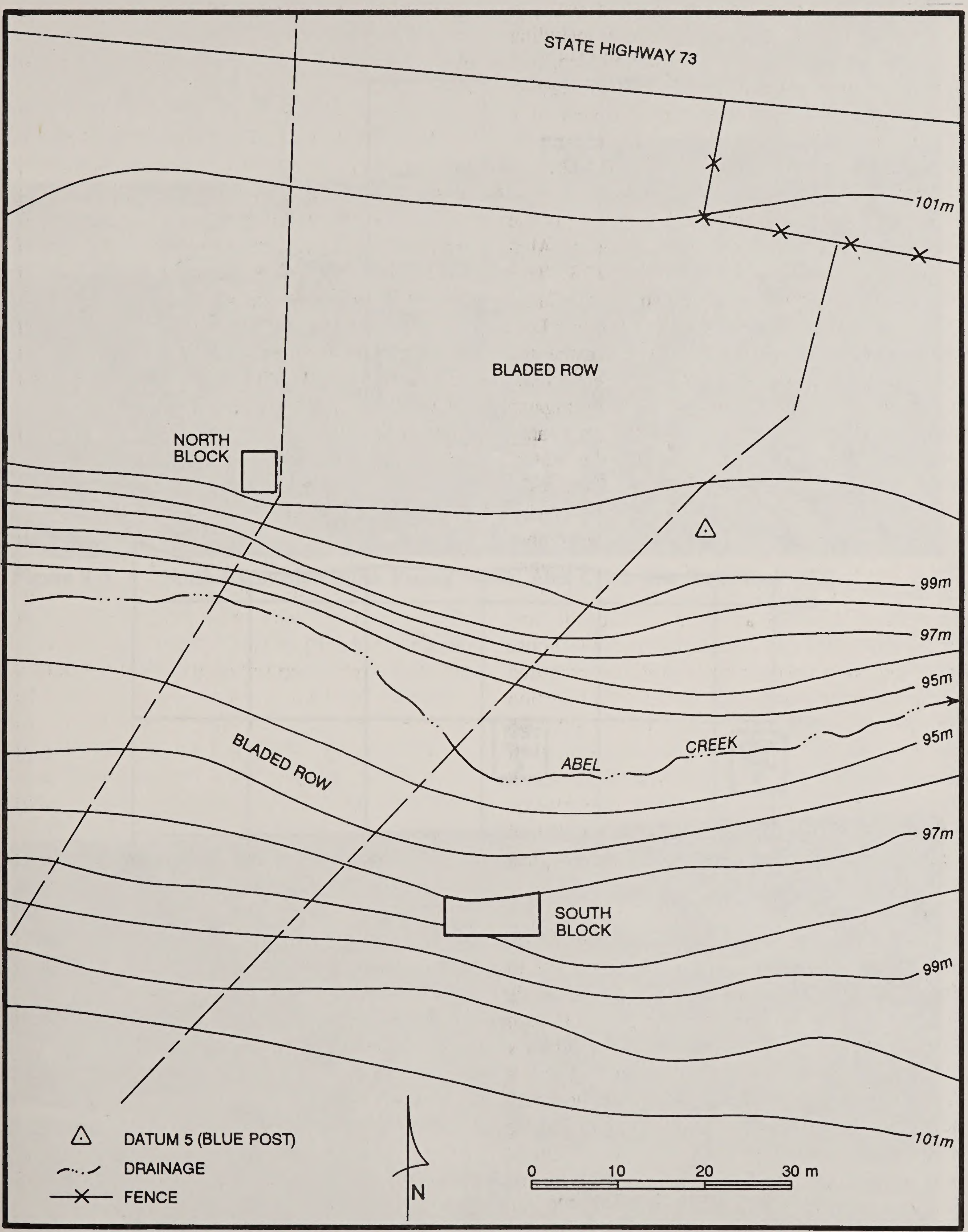


Figure 8.1 Map of Abel Creek Site (Locality P-132), Showing Location of Excavation Blocks.

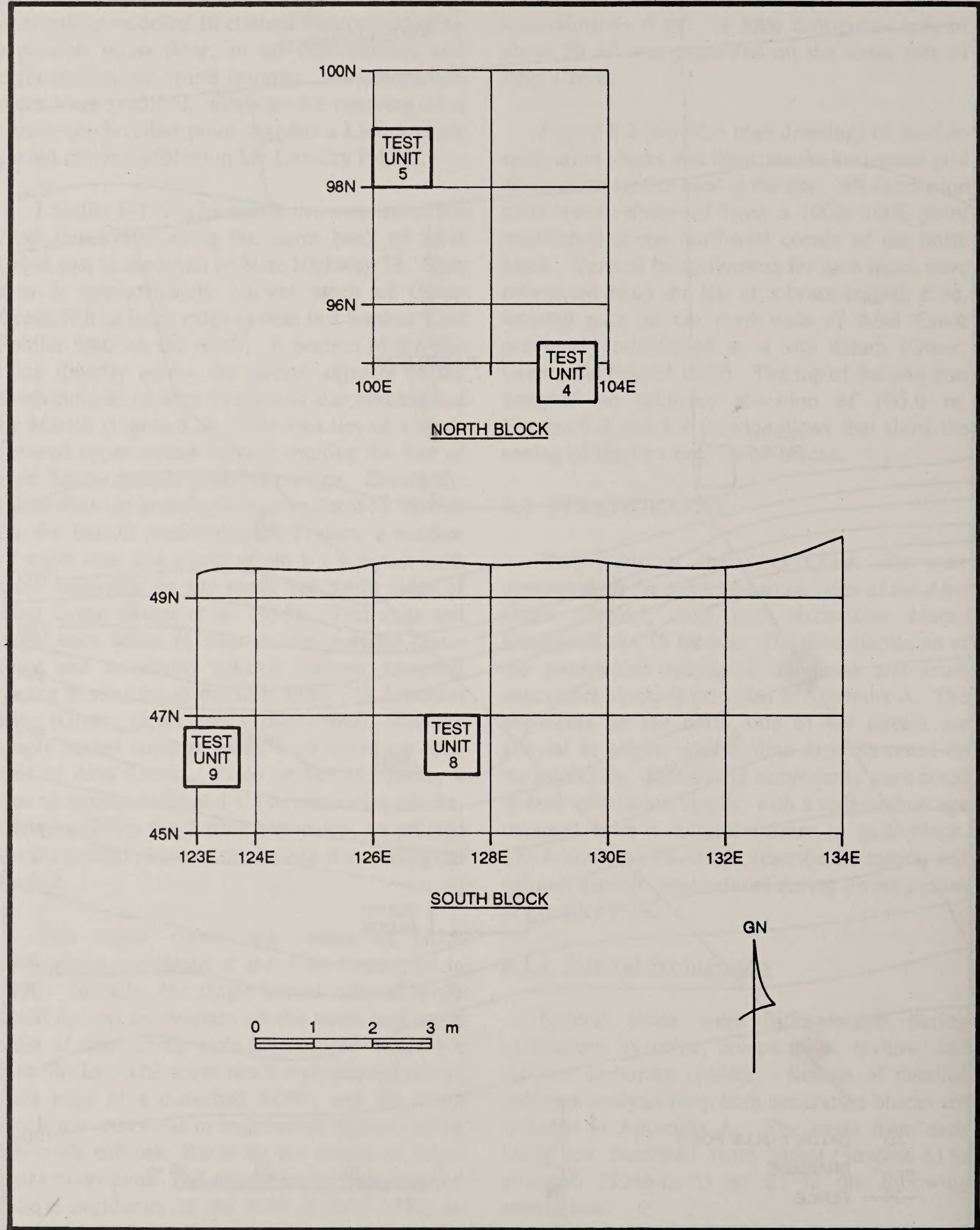


Figure 8.2 Plan Maps, North and South Excavation Blocks, Abel Creek Site (Locality P-132).

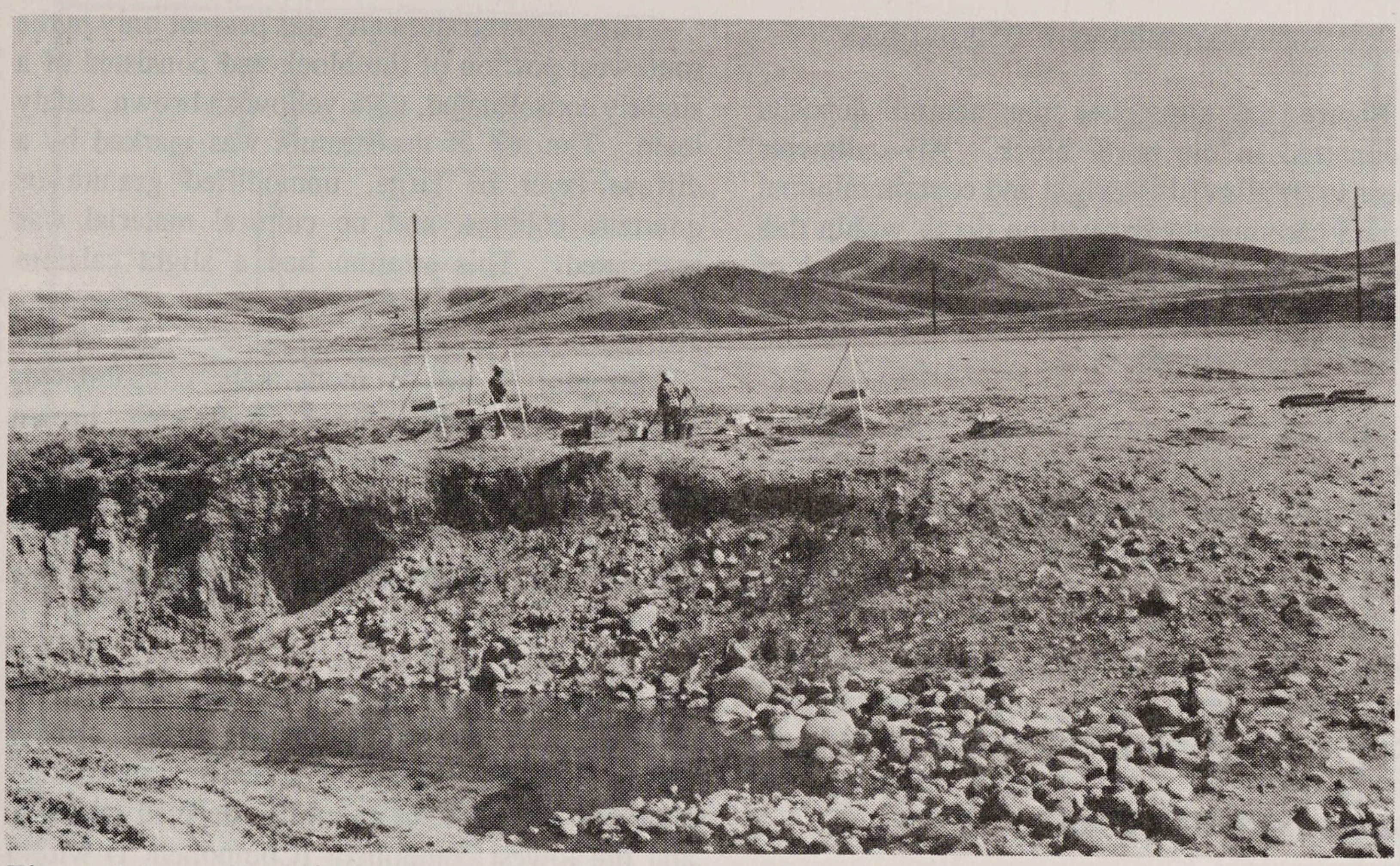


Figure 8.3 North Excavation Block Facing North, Abel Creek Site (Locality P-132).

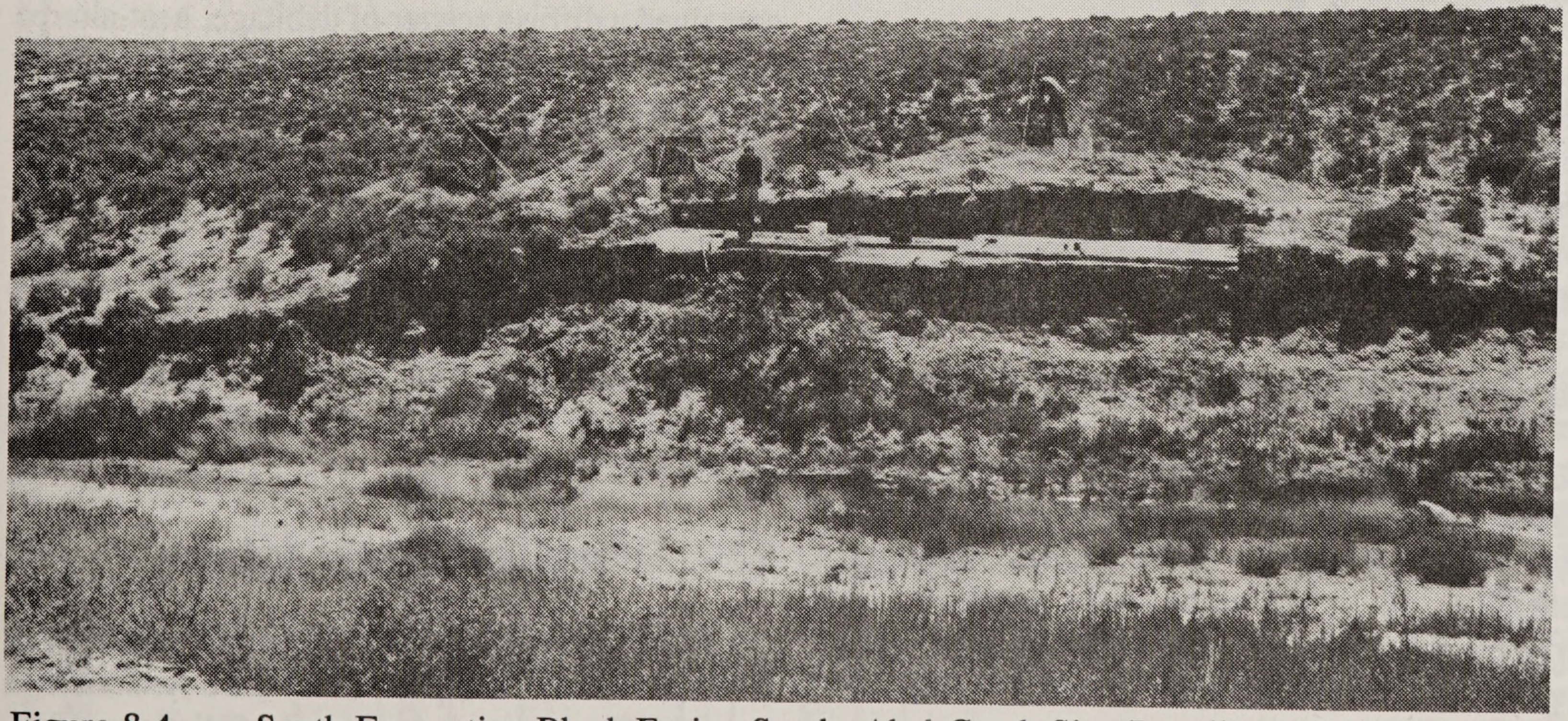


Figure 8.4 South Excavation Block Facing South, Abel Creek Site (Locality P-132).

8.2.1.1 Natural Stratigraphy - North Block

Figure 8.5 illustrates the natural deposits encountered in the north block. All sediments appear to be alluvial in origin and contain minimal calcium carbonate. Excavation depth within this block was fairly shallow, with maximum depth of excavation 50 to 60 cm below present ground surface.

Stratum A, the lowest stratum, was a yellow, moderately consolidated, sandy loam. Rodent disturbances were fairly extensive, and this stratum contained no cultural materials.

Stratum B occurred only in the northwest quadrant of the block and consisted of a very consolidated, white, sandy clay. Several thin, poorly sorted gravel lenses occurred within the natural deposits. No cultural material was associated with Stratum B.

Stratum C was a very consolidated, light yellowish brown, sandy clay with fairly indistinct (wavy) upper and lower boundaries. This stratum contained the single cultural component (Component II) noted within the north block, although minimal soil discoloration (staining) was present in the wall profiles. A radiocarbon age estimate of 1,260±80 years B.P. (Beta-41544) was obtained from Stratum C.

Stratum D was the uppermost stratum recorded. It consisted of a very consolidated, sandy loam that had been disturbed by past vehicular traffic associated with pipeline construction. No cultural components were identified within Stratum D.

8.2.1.2 Natural Stratigraphy - South Block

Natural stratigraphy recorded on the south side of Abel Creek is illustrated in Figures 8.6 and 8.7. Most sediments appear to be aeolian in origin. Generally, all strata slope from southwest to northeast following the orientation of the terrace slope on which the excavation block was situated.

The lowest stratum (A) was present only in the southwest portion of the block and consisted of a slightly consolidated, dark yellowish brown, sandy loam. The top of the stratum was marked by a diffuse layer of large, unmodified granite or quartzite cobbles, and no cultural material was associated. This stratum had a slight calcium carbonate content.

Stratum B was a moderately consolidated, medium to coarse-grained, yellowish brown sand/sandy loam. A moderate number of rodent disturbances were present, and no cultural layers were associated. The boundary between Strata A and B was indistinct in a few areas of the excavation block.

Stratum C was a dark brown, moderately consolidated, medium to coarse-grained sandy loam. The slightly darker color of this stratum appeared to represent culturally derived staining, and the lowest component (Component I) within the south block was associated with Stratum C. A radiocarbon age estimate of 1,790±60 years B.P. (Beta-41543) was obtained from Component I. Root and rodent disturbances were fairly extensive within Stratum C.

Stratum D was a brown, moderately consolidated sand that had a moderate number of root and rodent disturbances. This stratum contained a diffuse scatter of debitage, heat-altered rock, and animal bone, although a distinct cultural layer (Component III) could be defined in only the northeast part of the block adjacent to the Abel Creek cutbank.

The uppermost stratum (E) was a slightly consolidated thin layer of brown, loamy sand that contained abundant root and rodent disturbances. No cultural material was associated with Stratum E.

8.2.2 Cultural Stratigraphy and Age

Excavations at the Abel Creek site encountered three prehistoric components of Late Archaic and Late Prehistoric period cultural affiliation. Two

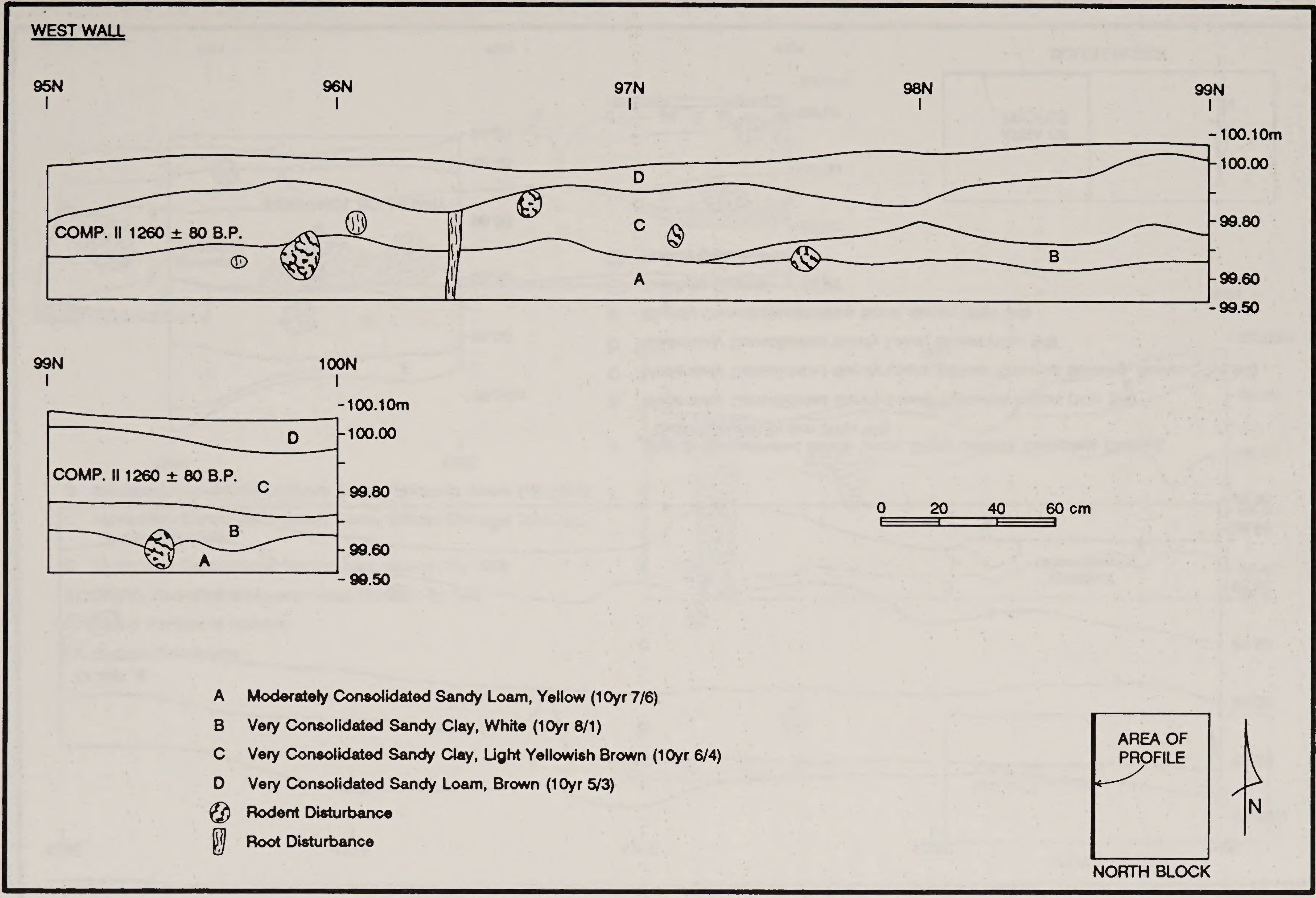


Figure 8.5 Profile of West Wall, North Block, Abel Creek Site (Locality P-132).

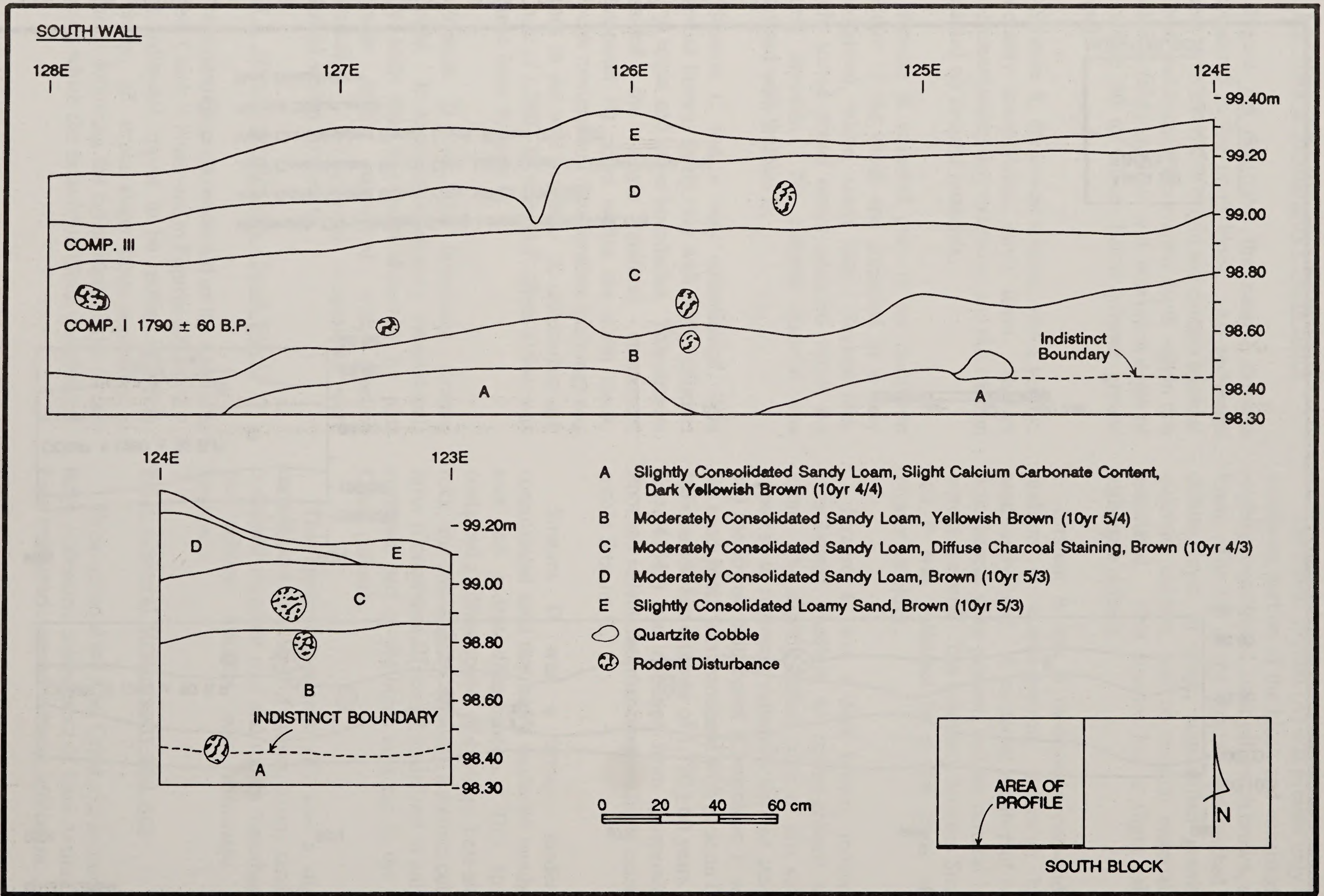


Figure 8.6 Profile of South Wall (Segment), South Block, Abel Creek Site (Locality P-132).

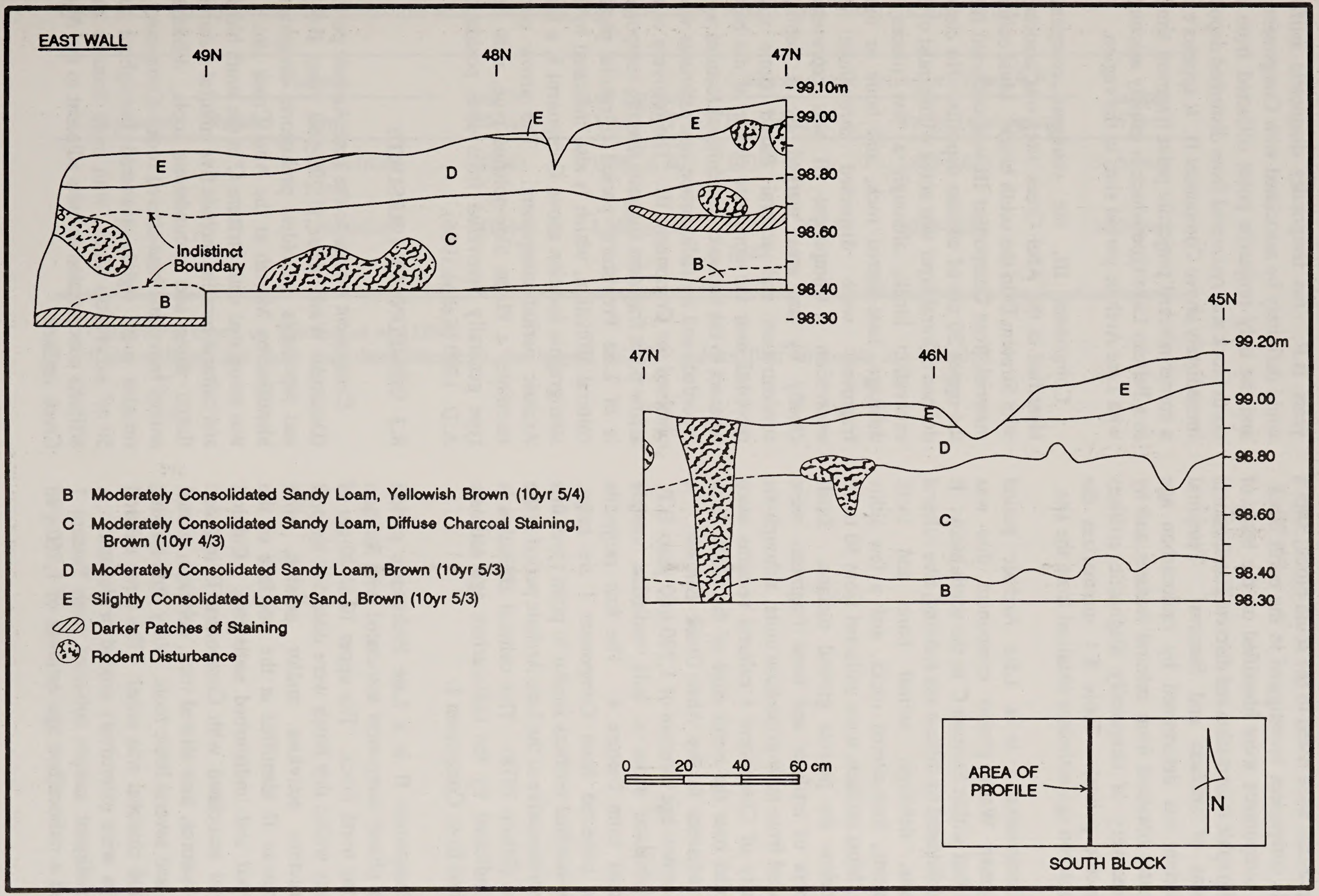


Figure 8.7 Profile of East Wall (Within Center), South Block, Abel Creek Site (Locality P-132).

components were noted in the south block, with a single component investigated in the north block. The components were identified on the basis of stratigraphic information and discrete distributional patterns of artifacts and features. Temporal affiliation was determined by radiocarbon age estimates obtained from cultural features and by the recovery of temporally diagnostic artifacts (projectile points). Table 8.1 summarizes the radiocarbon age estimates obtained from the site.

Component I is a Late Archaic period (Deadman Wash phase) component that was identified within Stratum C in the south block. It was delineated by diffuse ash staining, five cultural features, debitage, animal bone and tooth fragments, heat-altered rocks, and a few lithic tools. Most artifacts were collected from 50 to 80 cm below the present ground surface. Small numbers of artifacts and bone fragments were collected from most excavation units, although the majority of Component I cultural remains were recorded near the north edge of the block from units adjacent to the Abel Creek cutbank. A radiocarbon age estimate of 1,790±60 years B.P. was obtained from a bulk sediment sample collected from Feature 4. The four projectile points collected from Component I are large, corner-notched artifacts similar to point types that are representative of the Late Archaic period in the region (Frison 1978). This cultural affiliation is also indicated by the radiocarbon age estimate obtained from Component I.

Component II is a Late Prehistoric period (Uinta phase) component associated with Stratum C in the north block. The upper 10 to 20 cm of deposits within this block were disturbed by past construction activities and/or erosion, with Component II identified at the interface of the disturbed and undisturbed sediments. Cultural material associated with Component II included three features, heat-altered rock, debitage, animal bone, and several lithic tools. Very little staining or wood charcoal was noted. The three cultural features were extensively eroded or deflated. A bulk sediment sample collected from Feature 1 yielded a radiocarbon age estimate of 1,260±80 years B.P. No temporally diagnostic artifacts could definitely be associated with Component II, and the only projectile point collected from the north block was recovered from disturbed deposits immediately above Component II. It appears to be a corner-notched projectile point fragment similar to a Pelican Lake type which is usually associated with Late Archaic period sites in the region.

Component III, the youngest component identified at the Abel Creek site, was associated with Stratum D in the south block. Most cultural material from Component III was collected from the upper 30 cm of aeolian deposits. No clearly defined cultural layer was noted within most of the excavation block, although a few pieces of debitage, heat-altered rock, and bone or tooth fragments were dispersed throughout the excavation. Component III was represented chiefly by an area marked by a debitage concentration and several flaked stone tools recorded near the northeast corner of the block adjacent to the cutbank. No cultural features were recorded, and no radiocarbon age estimates were obtained for Component III. The recovery of an arrow point fragment suggests that the component is of Late Prehistoric period (Firehole phase) cultural affiliation, which is also indicated by its stratigraphic location above Component I, a Late Archaic period component. The arrow point resembles a Plains Side-notched type, with this type generally recovered from sites postdating A.D. 1300 (Kehoe 1966).

8.3 COMPONENT I RESULTS

Component I dates to the Late Archaic period (Deadman Wash phase [1,790±60 years B.P.]) and represents the oldest prehistoric component identified by Mariah at the Abel Creek site. It was associated with Stratum C in the south block, and cultural remains include five cultural features, flaked stone and groundstone tools, debitage, animal bone, and heat-altered rock. Component I remains were lightly scattered throughout the 50 m^2 excavation block, with most features and artifacts concentrated in units adjacent to the Abel Creek cutbank.

Table 8.1 Radiocarbon Age Estimates and Calibrated Age Estimates, Abel Creek Site (Locality P-132).

Component	Feature		Lab No. (Beta-)	Age Estimate (Years B.P.)	Calibrated Age Estimate (Years B.P.)[1]		Sample Type
	Number	Type			Intercept(s)[2]	Range (one sigma)	
I	4	Rock-filled basin	41543	1,790 ± 60	1,719	1,819-1,616	Sediment
II	1	Unoxidized basin	41544	1,260 ± 80	1,255, 1,206, 1,181	1,286-1,081	Sediment

[1] Calibration based on Pearson et al. (1986).
[2] If the estimate has more than three intercepts, the largest, middle, and smallest intercepts are included.

8.3.1 Cultural Features and Heat-altered Rock

Five cultural features and 131 pieces of heat-altered rock were recorded from Component I deposits. Most of the features had been fairly extensively disturbed by cutbank erosion or rodent and root intrusions. The features included a rock-filled basin, a discrete rock cluster, and the remnants of three very disturbed possible basin features. The three disturbed features include a concentration of bone fragments and staining (possibly a small basin), a discrete unoxidized basin, and a concentration of staining and heat-altered rock possibly representing a disturbed hearth. Table 8.2 summarizes the morphological characteristics of the five features.

8.3.1.1 Rock-filled Basin

Feature 4, a rock-filled basin, was impacted by cutbank erosion with approximately 50% of the feature destroyed prior to excavation. The feature was ovate to circular in plan view and had a basin-shaped cross section (Figure 8.8). Feature fill consisted of darkly stained sediment and 21 granite cobbles. No wood charcoal was noted, and no oxidation was present. The cobbles were mostly intact, although they were blackened or reddened from exposure to fire. The rocks weighed a total of 28.5 kg, and most were located in the upper part of the basin. One piece of debitage was collected from the feature. A radiocarbon age estimate of 1,790$\pm$60 years B.P. was obtained from a sediment sample collected from Feature 4. A 2.0 liter flotation sample of feature fill produced no charred seeds.

8.3.1.2 Unoxidized Basin

Feature 6 was an unoxidized basin exposed in the Abel Creek cutbank. It had been severely impacted by cutbank erosion and by roots and rodent activity. Plan dimensions were 49 x 22 cm with a maximum depth of 13 cm (Figure 8.9). It was defined by moderate to dark staining that occurred within a broader area of light staining. No oxidation of the pit edges or basin was recorded. Fill consisted of dark gray sand with small charcoal flecks, one heat-altered granite rock, and seven burned medium mammal bone fragments. Twenty scattered sandstone or granite rocks that weighed a total of 2.9 kg were recorded immediately to the south of Feature 6. Flotation of a 2.0 liter sediment sample from the feature produced no charred seeds.

8.3.1.3 Bone/Ash Concentration

Feature 5 was defined by a discrete area of dark ash staining associated with a concentration of bone fragments. It occurred within a broader area of light ash staining and was very disturbed by rodent activity and large sagebrush roots. The north part of the feature was destroyed by cutbank erosion, and excavated dimensions of the concentration were 48 x 42 cm with no appreciable depth (Figure 8.10). Feature 5 was cross-sectioned, with no evidence of a prepared basin noted. No heat-altered rock was recorded, and 67 medium or large mammal bone fragments were collected from Feature 5. This feature may represent a very disturbed stained basin, but more likely represents a bone dump, possibly from bone juice or grease extraction activities. Flotation of a 2.0 liter sample of stained sediment produced no charred seeds.

8.3.1.4 Rock Cluster

Feature 7 consisted of a cluster of 12 heat-altered granite rocks located within a 33 x 27 cm area (Figure 8.11). The rocks were discolored from exposure to fire and weighed a total of 5.5 kg. The concentration was a maximum of two layers thick, with no ash staining or wood charcoal associated. No evidence of a prepared basin was recorded, and no artifacts or animal bone fragments were associated.

8.3.1.5 Rock/ash Concentration

Feature 8 was defined by a single level of seven large granite rocks that weighed 1.4 kg and charcoal staining within a 40 x 30 cm area with no appreciable depth (Figure 8.11). No oxidation, bone fragments, or artifacts were associated.

Table 8.2 Characteristics of Cultural Features, Component I, Abel Creek Site (Locality P-132).

				Dimensions (cm)[1]						Rocks			
Feature No.	Excavation Unit	Type	Cross Section	L	W	D	Area (cm^2)	Volume (liter)	Oxidation	Type	No.	Weight (kg)	Remarks
4	49N 124E,SE	Rock-filled basin	Hemisphere	74	36*	23	--	--	Absent	Granite	21	28.5	50% destroyed by cutbank erosion; 1,790 ± 60 years B.P.; one flake associated
5	49N 126E,SE	Unoxidized basin (possible)	Indeterminate	48	42*	6	--	--	Absent	--	--	--	Impacted by cutbank erosion; 67 bone fragments associated
6	45N 130E,SW	Unoxidized basin	Hemisphere	49	22*	13	--	--	Absent	Granite	1	0.1	50% destroyed by cutbank erosion; seven burned bone fragments associated
7	45N 130E,SE	Rock cluster	--	33	27	--	706.8	--	Absent	Granite	12	5.5	--
8	49N 132E,SW	Rock/ash concentration	Indeterminate	40	30	--	962.0	--	Absent	Granite	7	1.4	--

[1] L = Length; W = Width, D = Depth; * = Incomplete dimension.

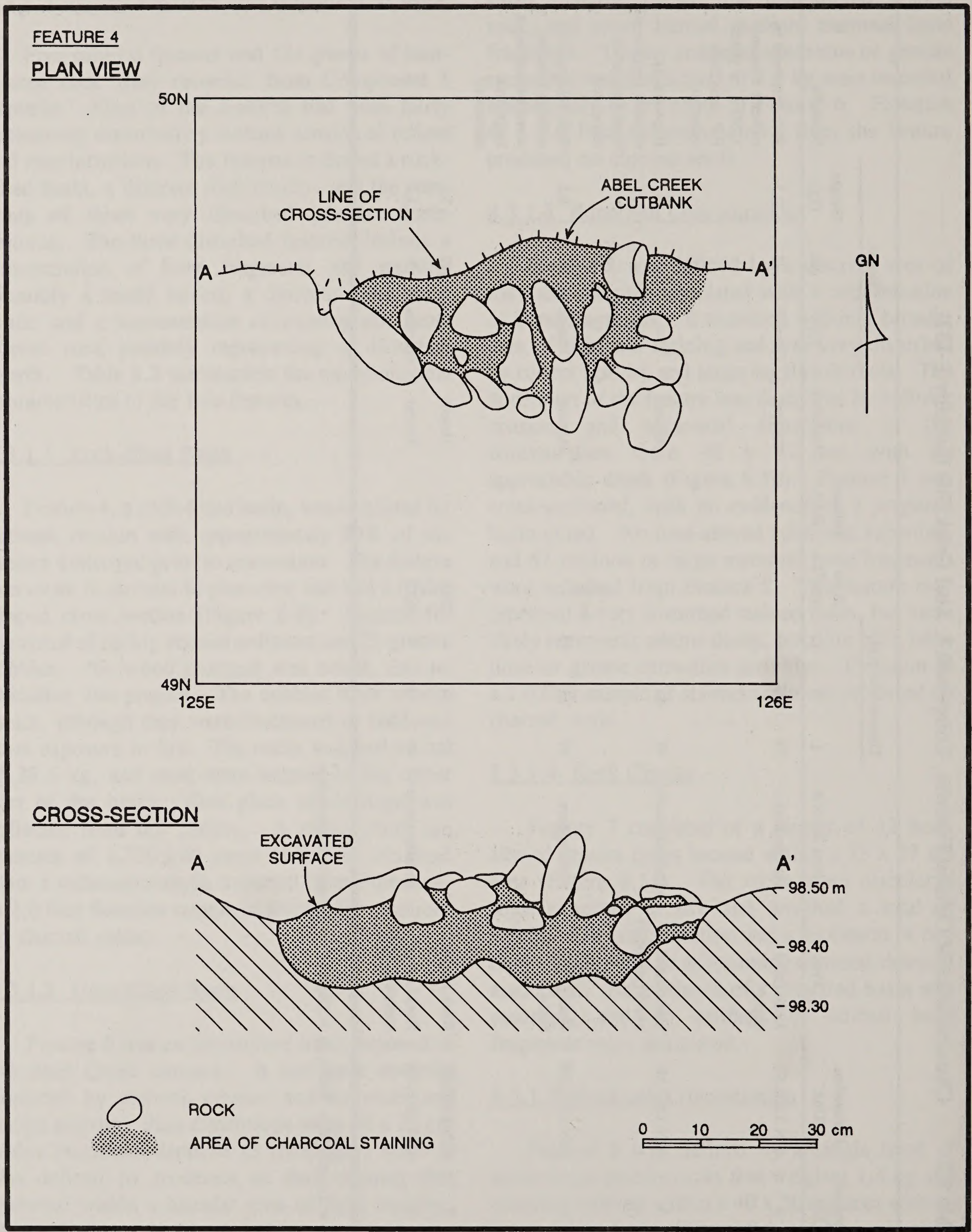


Figure 8.8 Plan View and Cross Section, Feature 4, Component I, Abel Creek Site (Locality P-132).

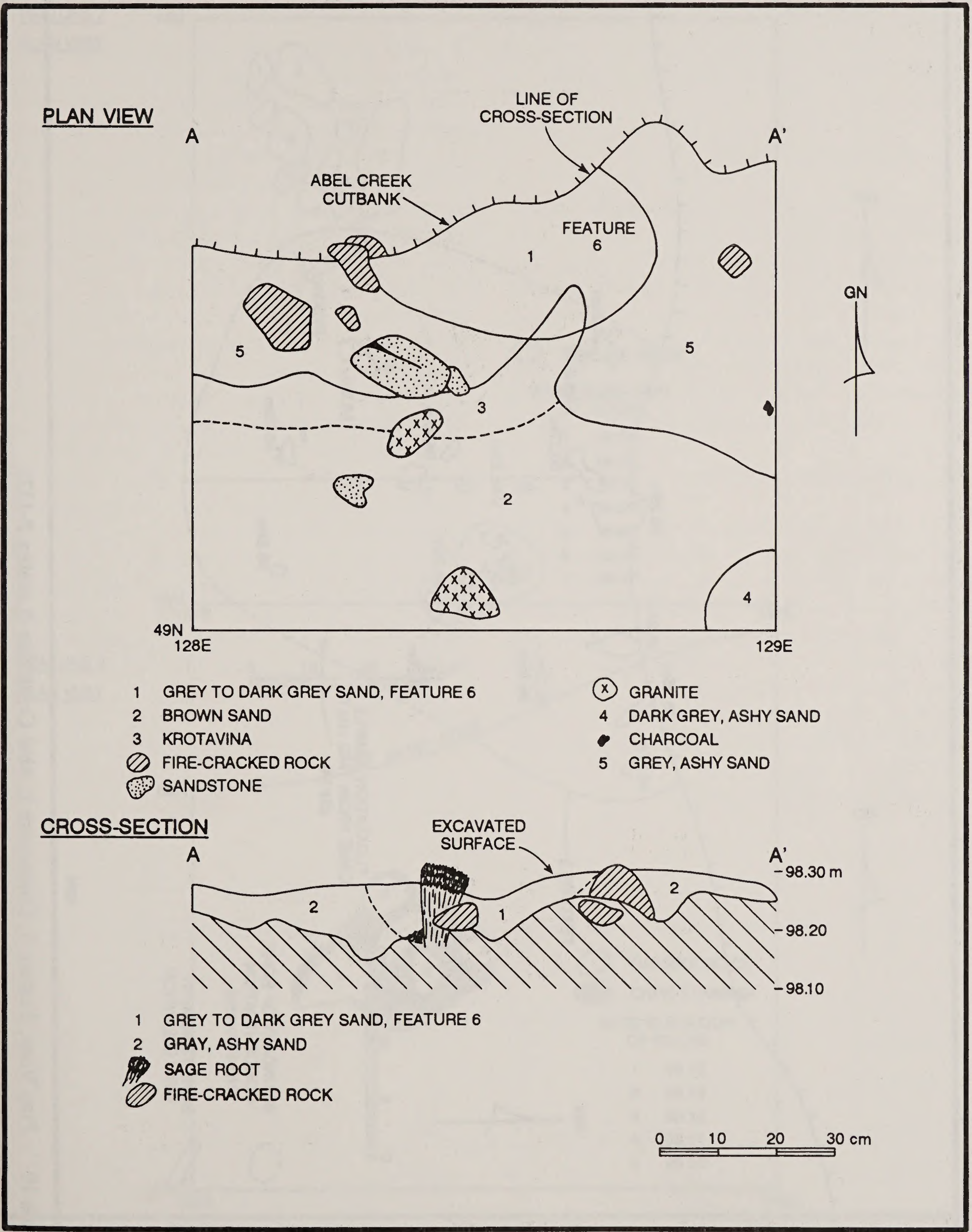


Figure 8.9 Plan View and Cross Section, Feature 6, Component I, Abel Creek Site (Locality P-132).

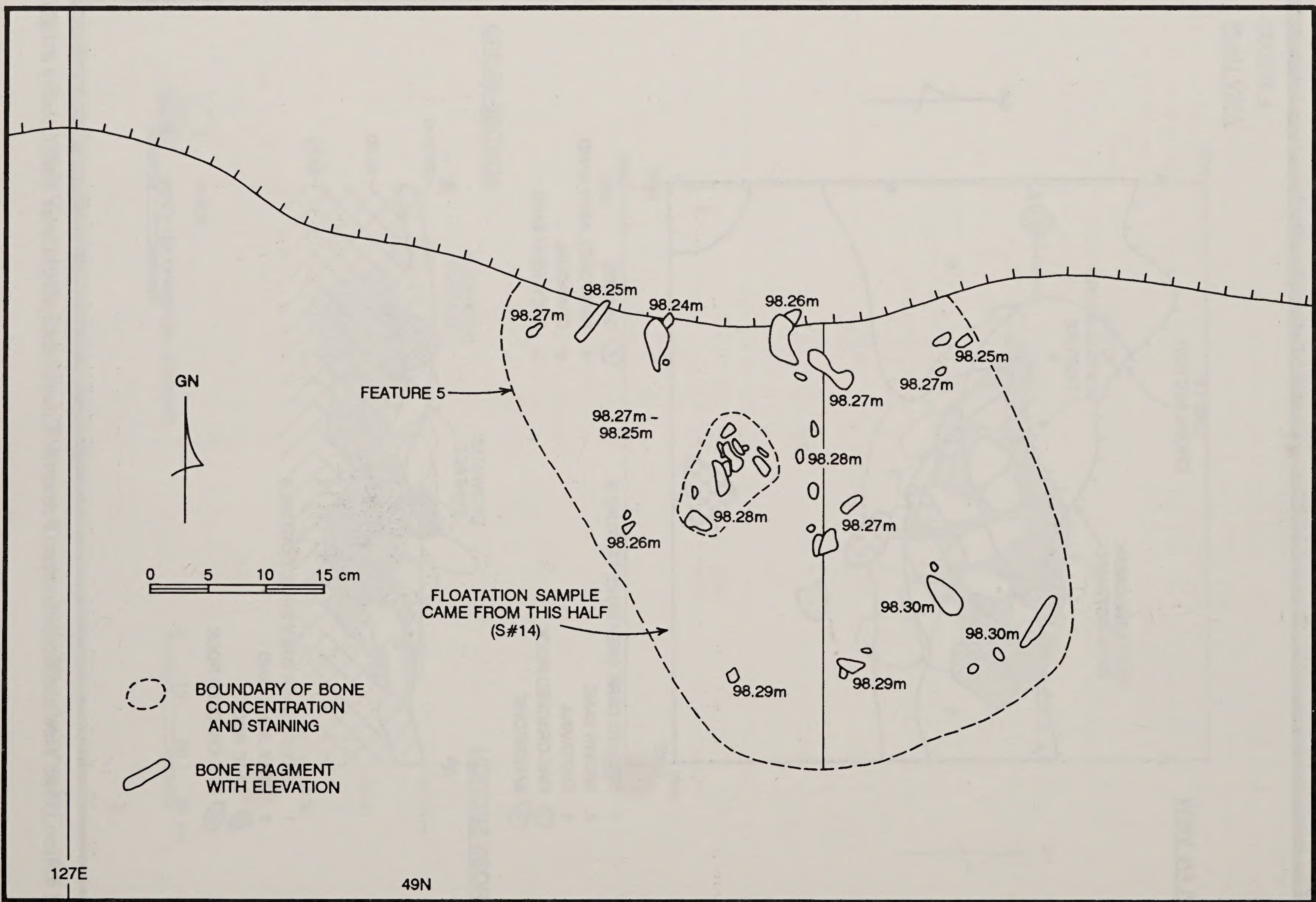


Figure 8.10 Plan View, Feature 5, Component I, Abel Creek Site (Locality P-132).

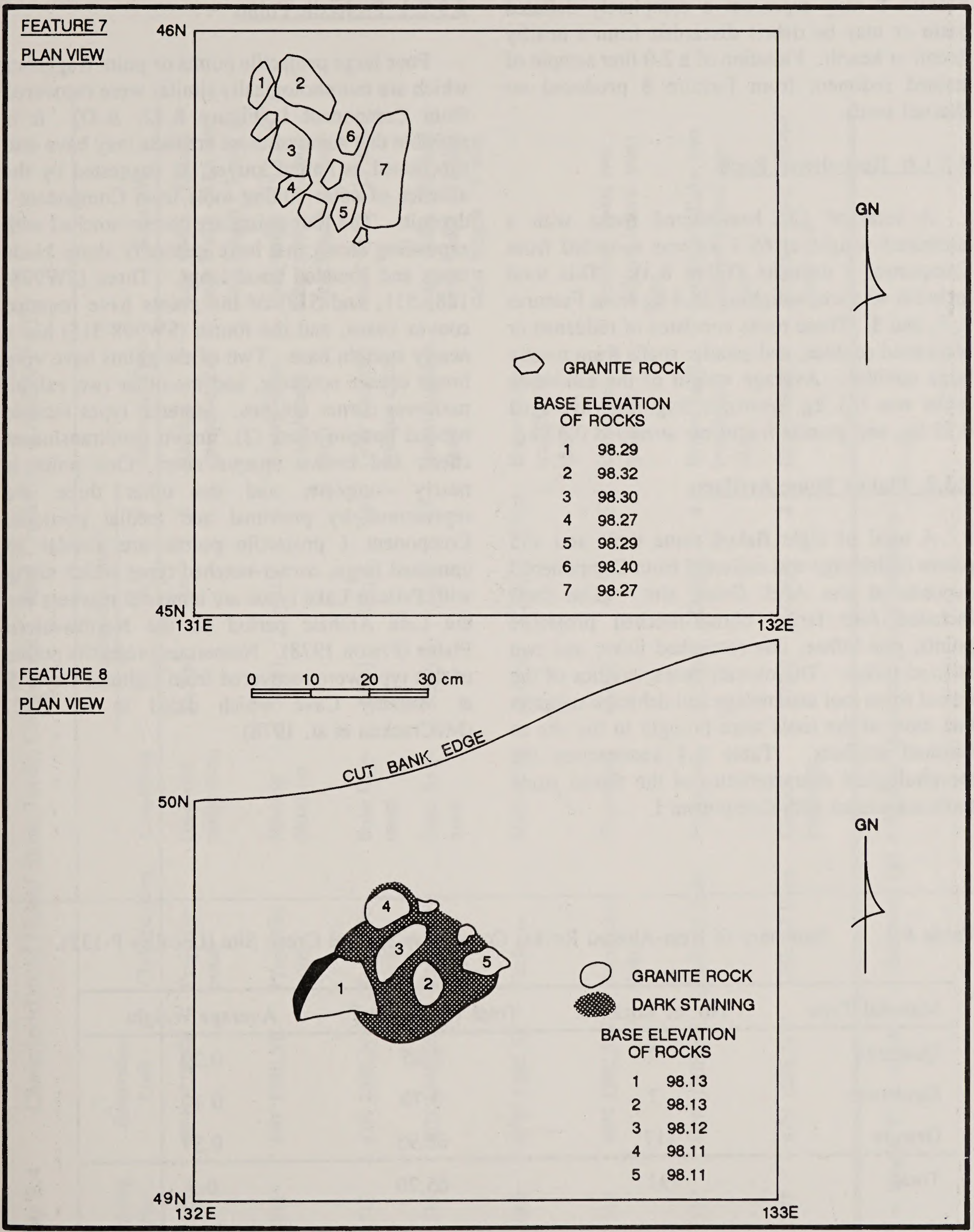


Figure 8.11 Plan Views, Features 7 and 8, Component I, Abel Creek Site (Locality P-132).

Feature 8 may represent a completely deflated basin or may be debris discarded from a nearby firepit or hearth. Flotation of a 2.0 liter sample of stained sediment from Feature 8 produced no charred seeds.

8.3.1.6 Heat-altered Rock

A total of 131 heat-altered rocks with a combined weight of 65.7 kg was recorded from Component I deposits (Table 8.3). This total includes 40 rocks weighing 35.4 kg from Features 4, 7, and 8. These rocks consisted of reddened or blackened cobbles, and smaller spalls from mostly large cobbles. Average weight of the sandstone rocks was 0.1 kg, quartzite fragments averaged 0.29 kg, and granite fragments averaged 0.57 kg.

8.3.2 Flaked Stone Artifacts

A total of eight flaked stone tools and 455 pieces of debitage was collected from Component I deposits at the Abel Creek site. The tools included four large, corner-notched projectile points, one biface, one retouched flake, and two utilized flakes. The overall characteristics of the flaked stone tool assemblage and debitage suggests that most of the tools were brought to the site as finished artifacts. Table 8.4 summarizes the morphological characteristics of the flaked stone tools associated with Component I.

8.3.2.1 Projectile Points

Four large projectile points or point fragments which are morphologically similar were recovered from Component I (Figure 8.12, A-D) It is possible that some of these artifacts may have also functioned as hafted knives, as suggested by the absence of other cutting tools from Component I deposits. The four points are corner-notched with expanding stems that have generally sharp blade tangs and rounded basal tangs. Three (SW998-128, 511, and 512) of the points have rounded convex bases, and the fourth (SW998-515) has a nearly straight base. Two of the points have very broad corner notching, and the other two exhibit narrower corner notches. Material types include banded opaque chert (2), brown semitranslucent chert, and brown opaque chert. One point is nearly complete, and the other three are represented by proximal and medial portions. Component I projectile points are similar to unnamed large, corner-notched types which along with Pelican Lake types are temporal markers for the Late Archaic period on the Northwestern Plains (Frison 1978). Numerous projectile points of this type were recovered from Cultural Layer 5 at Mummy Cave which dated to 87 B.C. (McCracken et al. 1978).

Table 8.3 Summary of Heat-Altered Rocks, Component I, Abel Creek Site (Locality P-132).

Material Type	No. of Rocks	Total Weight (kg)	Average Weight
Quartzite	7	2.05	0.29
Sandstone	7	0.70	0.10
Granite	117	62.95	0.57
Total	131	65.70	0.5

Table 8.4 Characteristics of Flaked Stone Tools, Component I, Abel Creek Site (Locality P-132).

Catalog No.	Excavation Unit	Classification	Condition	Dimensions (mm)[1] L	W	T	Material Type	Remarks
128	48N 122E,SE	Projectile point	Base and midsection	33.5(p)	24	6	Banded opaque chert	Base width - 18 mm stem width - 11.5 mm stem length - 3 mm
511	49N 128E,SE	Projectile point	Missing distal tip	31(p)	21	6	Brown semi-translucent chert	Base width - 16.5 mm stem width - 12 mm stem length - 4 mm
512	47N 130E,NW	Projectile point	Base fragment	24(p)	20(p)	5(p)	Gray banded opaque chert	Stem width - 13 mm
515	47N 130E,SW	Projectile point	Base fragment	18(p)	24.5	4.5	Brown opaque chert	Base width - 16 mm stem width - 12 mm stem length - 4 mm
280	47W 126E,SE	Preform	Midsection	13.5(p)	22.5(p)	3(p)	Brown semi-translucent chert	--
514	49N 130E,SW	Retouched flake	Fragment	32(p)	44.5	6	Dark gray quartzite	Tertiary flake; two utilized lateral margins
517	49W 130E,SE	Utilized flake	Fragment	11.5(p)	23.5(p)	4	Brown semi-translucent chert	Secondary flake; two utilized lateral margins
377	47N 128E,NW	Utilized flake	Distal fragment	17(p)	16.5(p)	3	Chalcedony	Primary flake; utilized distal end

[1] L = length; W = width; T = thickness; (p) = broken specimen, partial dimension.

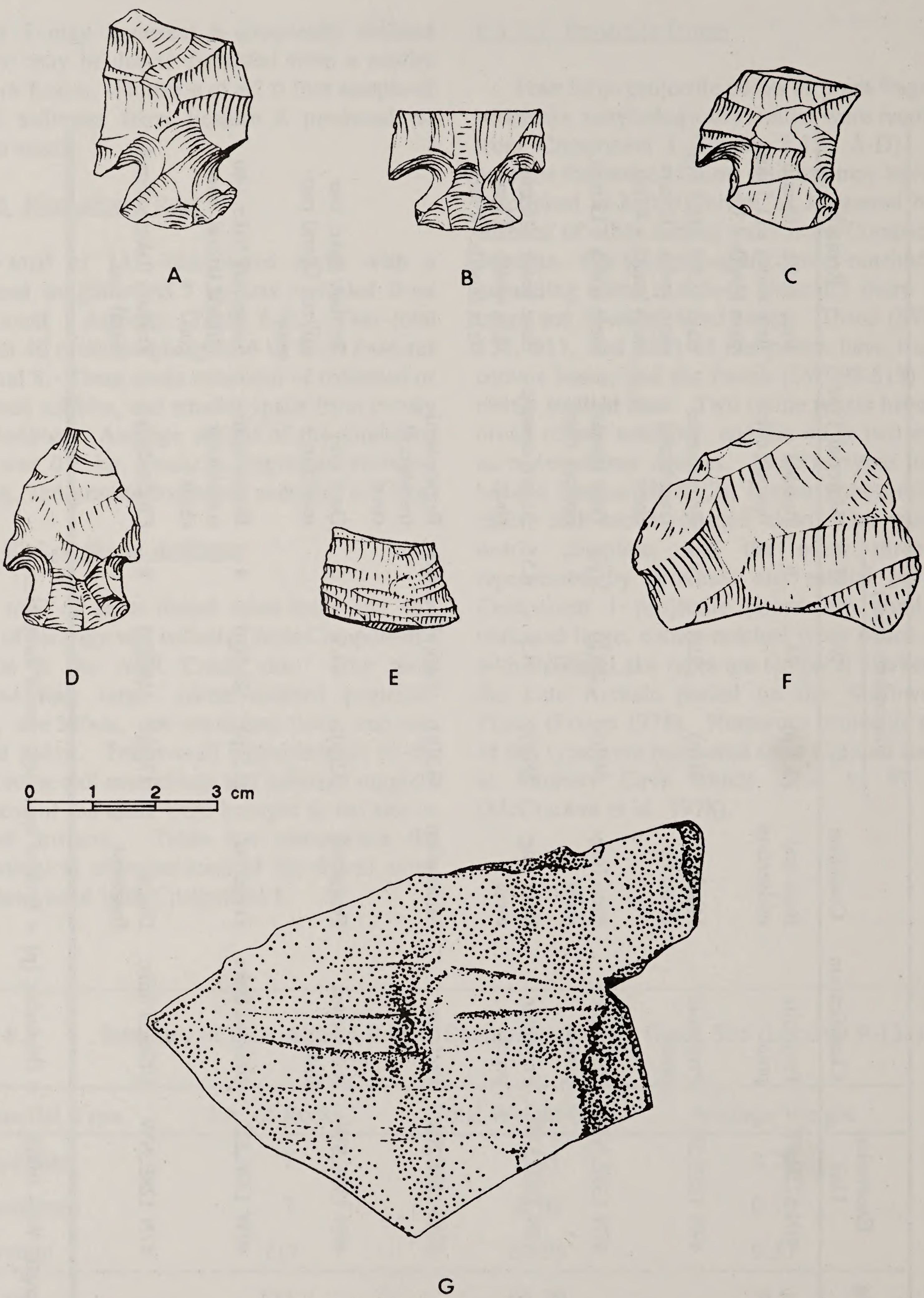


Figure 8.12 Selected Artifacts, Component I, Abel Creek Site (Locality P-132). A) SW998-128; B) SW998-515; C) SW998-512; D) SW998-511; E) SW998-280; F) SW998-514; G) SW998-406.

8.3.2.2 Preform

One thin (3 mm) preform fragment of semitranslucent chert was collected from Component I deposits. The artifact (SW998-280) is the medial portion of a large, flaked stone tool, possibly a large projectile point (Figure 8.12, E). No use wear is evident on the lateral margins of the preform.

8.3.2.3 Retouched Flake

One retouched flake fragment (SW998-514) of dark gray quartzite with small black inclusions was collected (Figure 8.12, F). The material type closely resembles Black Buttes Quartzite which occurs near Point of Rocks in southwest Wyoming. The flake is the proximal segment of a large tertiary flake, and both lateral margins are convex and have evidence of retouch and/or use wear as indicated by edge rounding or blunting and occasional step fractures. Edge angles of the two lateral margins are variable and range from about 25° to 60°.

8.3.2.4 Utilized Flakes

Utilized flakes associated with Component I include one small secondary flake fragment of brown, semitranslucent chert and one small primary flake fragment of chalcedony. The chert tool (SW998-517) has use wear along one concave and one convex lateral margins, and the chalcedony artifact (SW998-377) shows use wear on a convex distal margin. Both utilized flakes are small and use wear, as indicated by small (1 mm) flake scars and light edge rounding, is minimal on each. The small size of the flakes and the limited use wear suggest that the flakes were used for performing delicate tasks.

8.3.2.5 Debitage

A total of 455 pieces of debitage was recovered from Component I cultural deposits. Table 8.5 provides a cross-tabulation of debitage type by material type for the debitage. Most of the assemblage is small tertiary flakes (30.3%) or microflakes (63.7%) or flake fragments, with a very low percentage (3.3%) of cortical flakes (primary or secondary) or shatter (2.6%). The low number of primary or secondary flakes and shatter indicates that initial raw material reduction was not a Component I activity, and the size range of the debitage, with greater than 60% microflakes, further suggests that lithic manufacture was oriented towards maintenence of tools which were brought to the site. This interpretation of minimal flaked stone tool manufacturing activities is supported by the types of flaked stone tools recovered from Component I deposits, which included no cores or early production stage bifaces (blanks, preblanks).

Chert is the dominant material type and accounts for more than 69% of the total debitage. Most chert flakes were very small and were not assignable to specific types, with the chert debitage types including various mottled, opaque, and semitranslucent types. Quartzite equalled 17.1% of the total, with lesser amounts of chalcedony (10.3%) and siltstone (1%). Flaked stone tool types are the same as the dominant material types (Table 8.4) although specific percentages differ slightly.

8.3.3 Groundstone

The four groundstone fragments recovered from Component I deposits are small interior portions of one or more larger sandstone metates (Table 8.6). Use wear is indicated by smoothing and possible pecking on one or both faces, one fragment show bifacial utilization, and three are unifacial fragments. The fragments appear to be oxidized from exposure to fire, suggesting that the last usage of these fragments may have been as hearthstones rather than as grinding implements.

8.3.4 Other Artifacts

Other artifacts associated with Component I include a sandstone abrader and a possible anvil stone. The artifacts are described below.

Table 8.5 Cross-Tabulation of Debitage Type by Material Type, Component I, Abel Creek Site (Locality P-132).

	Material Type								
Debitage Type	Quartzite	White Chert	Red Chert	Clear Chalcedony	Tan Chert	Black Siltstone	Other Chert	Other Siltstone	Total
Primary Flake									
Number	0	0	0	1	0	0	0	0	1
Row %	0	0	0	100	0	0	0	0	
Column %	0	0	0	2.1	0	0	0	0	0.2
Secondary Flake									
Number	0	0	0	2	0	0	12	0	14
Row %	0	0	0	14.3	0	0	85.7	0	
Column %	0	0	0	4.3	0	0	4.1	0	3.1
Tertiary Flake									
Number	38	0	14	9	2	0	72	3	138
Row %	27.5	0	10.1	6.5	1.4	0	52.2	2.2	
Column %	48.7	0	50.0	19.1	66.7	0	24.6	100.0	30.3
Microflake									
Number	35	2	14	34	0	1	204	0	290
Row %	12.1	0.7	4.8	11.7	0	0.3	70.3	0	
Column %	44.9	100.0	50.0	72.3	0	100.0	69.6	0	63.7
Shatter									
Number	5	0	0	1	1	0	5	0	12
Row %	41.7	0	0	8.3	8.3	0	41.7	0	
Column %	6.4	0	0	2.1	33.3	0	1.7	0	2.6
Total									
Number	78	2	28	47	3	1	293	3	455
Row %	17.1	0.4	6.2	10.3	0.7	0.2	64.4	0.7	

Table 8.6 Characteristics of Groundstone Tools, Component I, Abel Creek Site (Locality P-132).

Catalog No.	Excavation Unit	Classification	Condition	Dimensions (mm)[1] L	W	T	Weight (kg)	Material Type	Remarks
353	47N 128E,SE	Metate	Medial fragment	270	105	27	0.79	Sandstone	Heavy unifacial use wear
371	47N 128E,NE	Metate	Medial fragment	85	62	27	1.20	Sandstone	Moderate to heavy bifacial use wear
383	49N 128E,NE	Metate	Two fragments	181 146	96 82	26 24	0.55	Sandstone	Moderate unifacial use wear
439	49N 130E,SE	Metate	Medial fragment	108	95	22	0.36	Sandstone	Moderate unifacial use wear
406	45N 128E,NW	Abrader	Complete	89	51	23	0.10	Sandstone	Three grooves; 44 cm, 31 cm, 28 cm

[1] L = length, W = width, T = thickness.

One small sandstone abrader (SW998-406) was recovered (Table 8.6). The artifact has three narrow, 1-2 mm deep grooves as well as several shallower striations (Figure 8.12, G). It likely was used for tool resharpening or manufacturing activities.

The possible anvil consists of a very large, tabular granite rock. No definite evidence of cultural modification was noted, and the artifact was not collected. Dimensions are 29 x 25 x 11 cm, and the artifact weighs 13.8 kg. It was recorded immediately south of a number of small bone fragments and may have been utilized during animal processing activities.

8.3.5 Animal Remains

A total of 1,750 bone fragments and 236 tooth fragments weighing 684.6 g was recovered from Component I deposits (Table 8.7). The vast majority of the faunal assemblage is extremely fragmented. No elements are identifiable to species, and all fragments were assigned to general animal size categories. The vast majority (82.6%) were classified as medium-large mammal. Additionally, 5.8% were identified as medium mammal, 1.0% were large mammal, 0.8% were small-medium mammal size, 7.2% were classified as bison size, and 2.6% were identified as pronghorn size. Bison size elements include 141 tooth fragments, a vertebra fragment, and an innominate fragment. Pronghorn size remains include 48 tooth fragments, a phalange, a sesamoid, and an astragalus. A small number of the bone fragments evidence cultural modification with 158 (8.0%) burned or calcined fragments, and one large mammal bone fragment evidences a spiral fracture.

Although none of the fragments were identified to species, the size range of the fragments indicates the utilization of both bison size (large mammal) and deer-pronghorn size (medium mammal) animals with at least one individual of each size range represented. Virtually no evidence of utilization of animals smaller than pronghorn was noted. Bison size fragments include portions of the cranial (tooth fragments) and axial skeleton (vertebra, innominate), with no limb elements identified. Pronghorn size elements include cranial (tooth) and lower limb elements (phalange, sesamoid, astragalus). The identified elements suggest that at least portions of the cranial and axial skeleton of bison size animals were processed, while pronghorn size elements indicate utilization of the head and limbs. The presence of cranial (tooth) and elements representing other major parts of the skeleton of both deer-pronghorn size and bison size animals suggests that initial processing (butchering) probably occurred at or near the site, rather than at some distant kill site. The high number of small unburned bone fragments, the small average size (<0.5 cm) of the fragments, and the lack of complete or identifiable elements representing long bones are consistent with the remains of bone juice/bone grease extraction activities (Binford 1978, Vehik 1977). No evidence of season of occupation could be derived from the animal remains, possibly due to the very fragmented nature of the assemblage.

8.3.6 Plant Macrofossils

Table 8.8 summarizes the results obtained from flotation of sediment samples processed from Component I cultural features. Samples that totalled 8.0 liters were floated from four features, with no charred plant macrofossils recovered.

8.3.7 Spatial Distribution of Cultural Remains

The distribution of cultural features, tools, and heat-altered rock associated with Component I is shown in Figure 8.13. Tools which were not found in place are mapped in the center of the units from which they were recovered. Figure 8.14 provides trend surface maps showing the distribution of total debitage, chert debitage, and quartzite debitage. Figure 8.15 includes trend maps that illustrate the distribution of animal remains.

The feature/tool map indicates that four of the five cultural features (4, 5, 6, and 8) were situated

Table 8.7 Summary of Animal Remains, Component I, Abel Creek Site (Locality P-132).

Animal Size Category	Total Specimens No.	Total Specimens Wt. (g)	Burned Specimens No.	Burned Specimens %	Identifiable Elements
Bison size	143	214.1	--	--	Tooth fragments (141); Vertebra-axis; Innominate R.
Large mammal	20	46.5	--	--	Rib (1)
Medium-large mammal	1,640	402.1	102	6.2	Tooth fragments (34); Vertebra (1)
Deer-pronghorn size	51	7.2	19	37.3	Tooth fragments (48); phalange (1); astragalus L. (1); sesamoid (1)
Medium mammal	116	13.9	30	25.9	Tooth fragments (13)
Small-medium mammal	16	0.8	7	43.8	Phalange - 3rd
Total	1,986	684.6	158	7.0	

Table 8.8 Plant Macrofossils Recovered from Feature Fill, Component I, Abel Creek Site (Locality P-132).

Feature No.	Sample No.	Volume (liters)	No. of Charred Seeds	Taxon
4	7	2.0	0	--
5	14	2.0	0	--
6	20	2.0	0	--
8	27	2.0	0	--

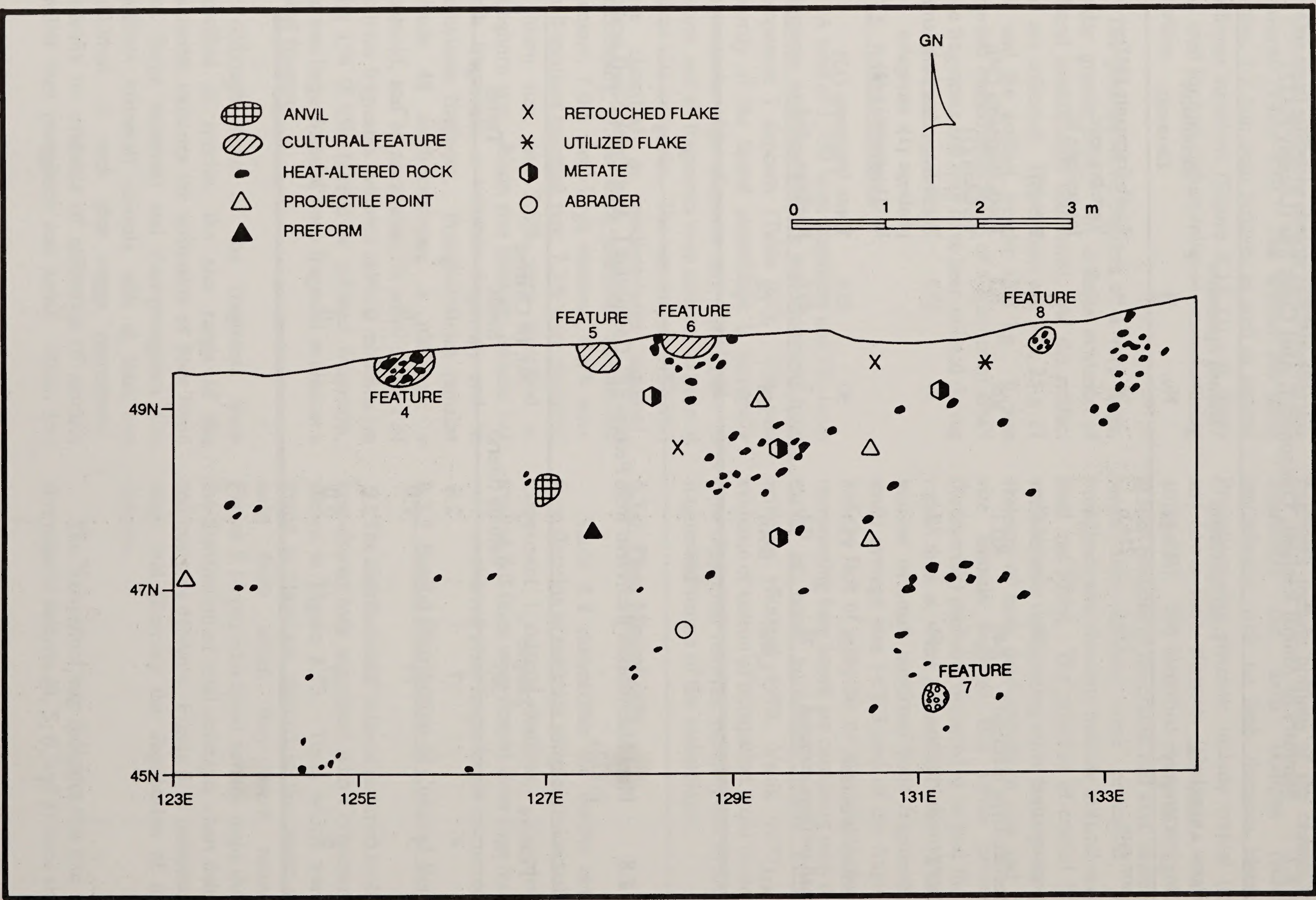


Figure 8.13 Plan Map of Features, Tools, and Heat-altered Rock Plotted, Component I, Abel Creek Site (Locality P-132).

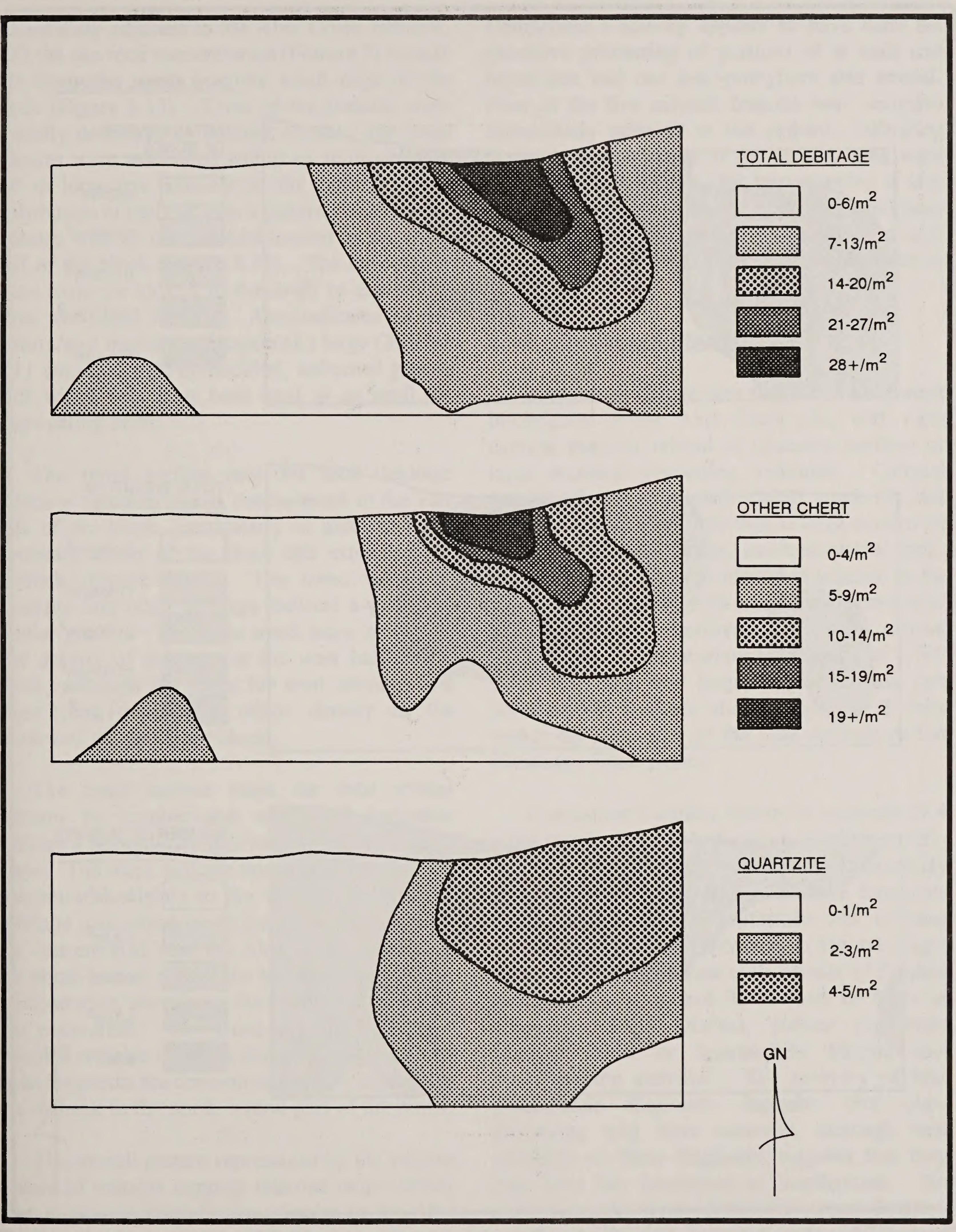


Figure 8.14 Trend Surface Maps for Total Debitage, Chert Debitage, and Quartzite Debitage, Component I, Abel Creek Site (Locality P-132).

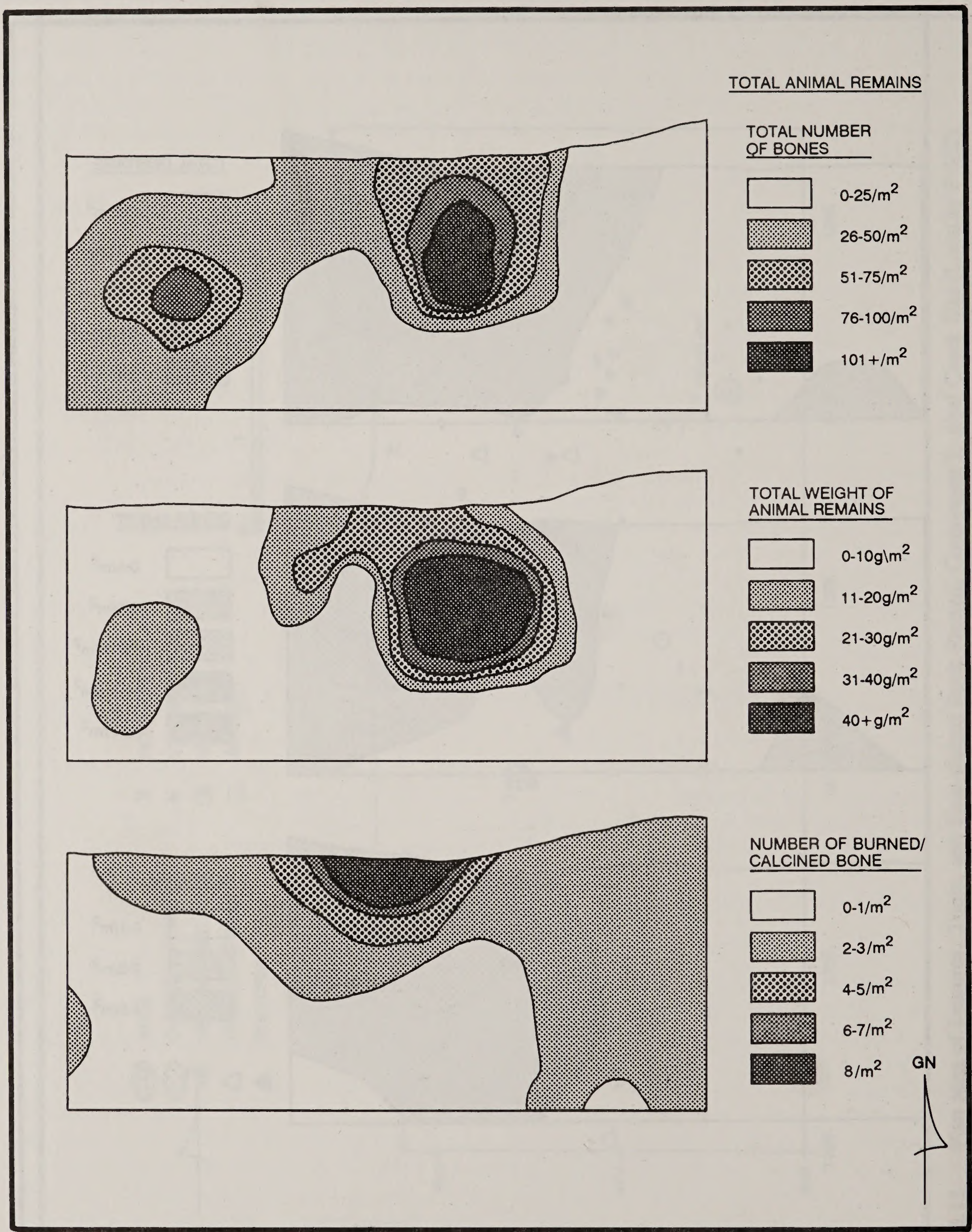


Figure 8.15 Trend Surface Maps for Number of Animal Remains, Weight of Animal Remains, and Number of Burned/Calcined Bones, Component I, Abel Creek Site (Locality P-132).

immediately adjacent to the Abel Creek cutbank, with the one rock concentration (Feature 7) located 3.0 m to the south near the south edge of the block (Figure 8.13). Three of the features were partially destroyed by cutbank erosion, and these features were associated within an approximately 3.0 m long area adjacent to the cutbank. The distribution of tools reflects a pattern similar to the features with all but one tool located in the north half of the block (Figure 8.13). The majority of these tools are located to the south or east of the three associated features. Also indicated on the feature/tool map is the location of a large (29 x 25 x 11 cm, 13.8 kg), unmodified, unburned granite rock which may have been used as an anvil for fragmenting bone.

The trend surface map for total debitage indicates that debitage is concentrated in the east part of the block, particularly in units near the northeast corner of the block that extend to the cutbank (Figure 8.14). The trend maps for quartzite and other debitage indicate a generally similar pattern. The three trend maps indicate a low density of debitage in the west half of the block, although the maps for total debitage and other chert indicate a minor density in the southwest corner of the block.

The trend surface maps for total animal remains by number and weight of fragments indicate a generally similar pattern as the debitage maps. The maps indicate that animal remains are concentrated slightly to the west of the areas of debitage concentration. Bone and tooth fragments are concentrated near the Abel Creek cutbank in the north-central part of the block, with a smaller concentration noted near the southwest corner of the excavation. The trend map of burned or calcined remains indicates that culturally modified bone fragments are concentrated mostly adjacent to the cutbank in the north-central part of the block.

The overall pattern represented by the various classes of remains suggests that one large activity area is present immediately adjacent to the Abel Creek cutbank. As indicated by the large quantity of small unburned bone fragments, the major Component I activity appears to have been the extensive processing of portions of at least one bison size and one deer-pronghorn size animal. Four of the five cultural features were recorded immediately adjacent to the cutbank, indicating that unknown portions of the activity area were destroyed by erosion. This interpretation is also suggested by the distribution of debitage and bone fragments, with the densest concentrations of each class of remains located immediately adjacent to the stream bank.

8.3.8 Component I Summary

Component I represents the oldest component investigated at the Abel Creek site, with most cultural material related to intensive medium or large mammal processing activities. Cultural remains recovered include flaked stone (8) and groundstone (4) tools, debitage, a large number of bone and tooth fragments, and heat-altered rock. A large activity area was identified adjacent to the Abel Creek cutbank, with an unknown portion of the component destroyed by past stream downcutting. A radiocarbon age estimate of 1,790 years B.P. and four large, corner-notched dart points/knives indicate that Component I falls within the latter part of the Late Archaic period (Deadman Wash phase).

Component I artifact density is moderate (9.4 artifacts/m^2) with a flaked stone tool/debitage ratio of only 1:57. Debitage consist of predominately tertiary flakes or microflakes or flake fragments indicating that lithic manufacture was oriented towards rejuvenation/ maintenence of tools brought to the site. Flaked stone tools consist of finished bifacial tools or utilized flakes (with no cores or production stage bifaces), further suggesting minimal initial or intermediate bifacial tool manufacturing activities. The recovery of four groundstone fragments suggests that plant processing may have occurred, although heat oxidation of these fragments suggests that they may have last functioned as hearthstones. No charred seeds were recovered from flotation samples, suggesting that seed processing was not a component activity.

A large sample of bone and tooth fragments (1,986) identified as bison size and deer-pronghorn size animals was recovered, with at least one individual of each size range represented. The types of elements present suggest that initial processing may have occurred at or near the site, although the vast majority of the assemblage consists of small, unburned bone or tooth fragments. The overall characteristics of the faunal assemblage indicate intensive processing activities that probably included marrow extraction and bone juice/grease processing. No evidence of season of occupation was obtained from excavations.

8.4 COMPONENT II RESULTS

Component II was associated with Stratum C in the north block and represented a Late Prehistoric period (Uinta phase) component dated at 1,260±80 years B.P. Three poorly preserved cultural features, flaked stone tools and debitage, animal bone, and heat-altered rock were recorded. No groundstone tools were associated. The upper 10 to 20 cm of deposits were moderately to heavily disturbed by past construction activities or erosion, with Component II identified at the interface of the disturbed and undisturbed sediments. Small amounts of cultural material were distributed throughout the 4 x 5 m block, with most artifacts concentrated in the southern part of the block near two cultural features.

8.4.1 Cultural Features and Heat-altered Rock

Three cultural features and 38 pieces of heat-altered rock were associated with Component II deposits. The features were poorly preserved and included one small stained basin, a possible rock-filled basin, and a possible eroded hearth marked by staining, oxidation, and heat-altered rock. Table 8.9 summarizes the morphological characteristics of the three features.

8.4.1.1 Unoxidized Basin

Feature 1 was a small unoxidized basin (30 x 24 x 5 cm) that was ovate in plan with a shallow, basin-shaped cross section (Figure 8.16). Fill consisted of darkly stained sediment with no wood charcoal associated. No oxidation of feature boundaries was present, and five small heat-altered rocks (0.03 kg) were noted in the upper part of the feature. A total of 38 bone fragments including six large mammal and 32 medium or large mammal size fragments were collected from Feature 1. Three of these fragments were burned or calcined. A radiocarbon age estimate of 1,260±80 years B.P. was obtained from a sample of stained sediment from Feature 1.

8.4.1.2 Possible Rock-filled Basin

Feature 2 appeared to represent a disturbed rock-filled basin. Heat-altered rocks were noted in the upper 20 cm of disturbed deposits near the center of a 2 x 2 m excavation unit (96N 100E), with a small area (15 x 10 x 3 cm) of moderate staining with eight heat-altered granite rocks noted at the base of the disturbance (Figure 8.17). No basin feature could be defined, although the concentration of rocks in disturbed and underlying undisturbed areas and the presence of staining suggested that a rock-filled pit was originally present near the center of the excavation unit. No artifacts were collected from Feature 2, although artifacts were concentrated in units adjacent to the feature. A total of 19 bone fragments including one medium-large mammal, five medium mammal, 12 small-medium mammal, and one very small-small mammal was associated. No oxidation or wood charcoal was noted.

8.4.1.3 Possible Deflated Hearth

Feature 3 was defined by a moderately stained and oxidized area with six heat-altered granite rocks associated (Figure 8.17). Plan dimensions of Feature 3 were 65 x 40 cm with a maximum depth of 3 cm, and the oxidation and staining encompassed a 34 x 28 cm area.

No artifacts, wood charcoal, or bone were associated with the staining. The association of the heat-altered rock with the discrete area of staining and oxidation may indicate that the feature represents a poorly preserved hearth or firepit. A

Table 8.9 Characteristics of Cultural Features, Component II, Abel Creek Site (Locality P-132).

				Dimensions (cm)[1]						Rocks			
Feature No.	Excavation Unit	Type	Cross Section	L	W	D	Area (cm^2)	Volume (liter)	Oxidation	Type	No.	Weight (kg)	Remarks
1	96N 102E,SW	Unoxidized basin	Hemisphere	30	24	5	572.5	0.95	Absent	Granite	3	0.03	1,260 ± 80 years B.P., 38 bone fragments associated
2	96N 100E,C	Rock-filled basin (possible)	Indeterminate	30	30	5	706.9	--	Absent	Granite	8	3.7	Very disturbed
3	98N 100E,SE	Oxidized basin (possible)	Indeterminate	65	40	3	2,164.7	--	Present	Granite	6	2.5	Very disturbed

[1] L = Length, W = Width, D = Depth.

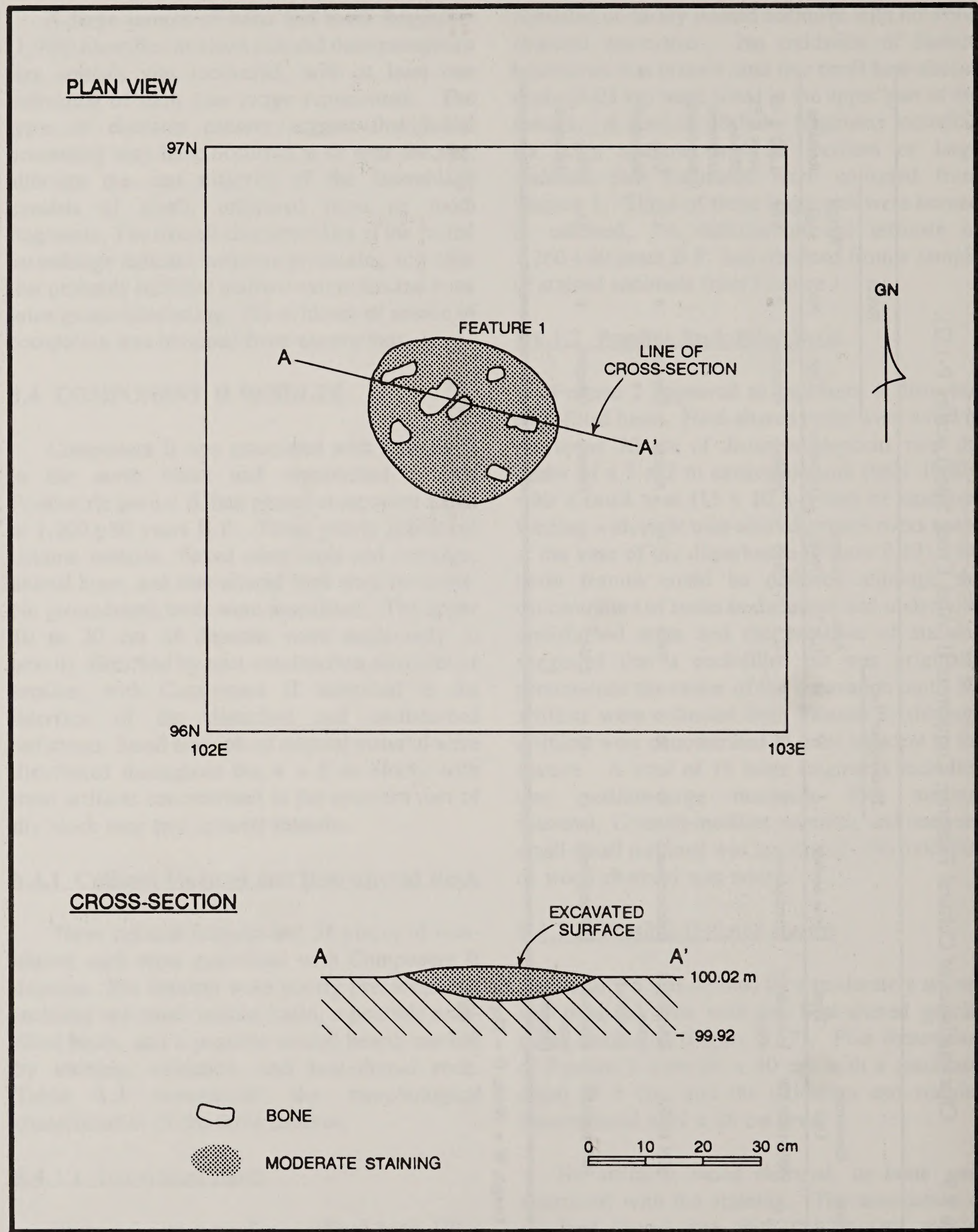


Figure 8.16 Plan View and Cross Section of Feature 1, Component II, Abel Creek Site (Locality P-132).

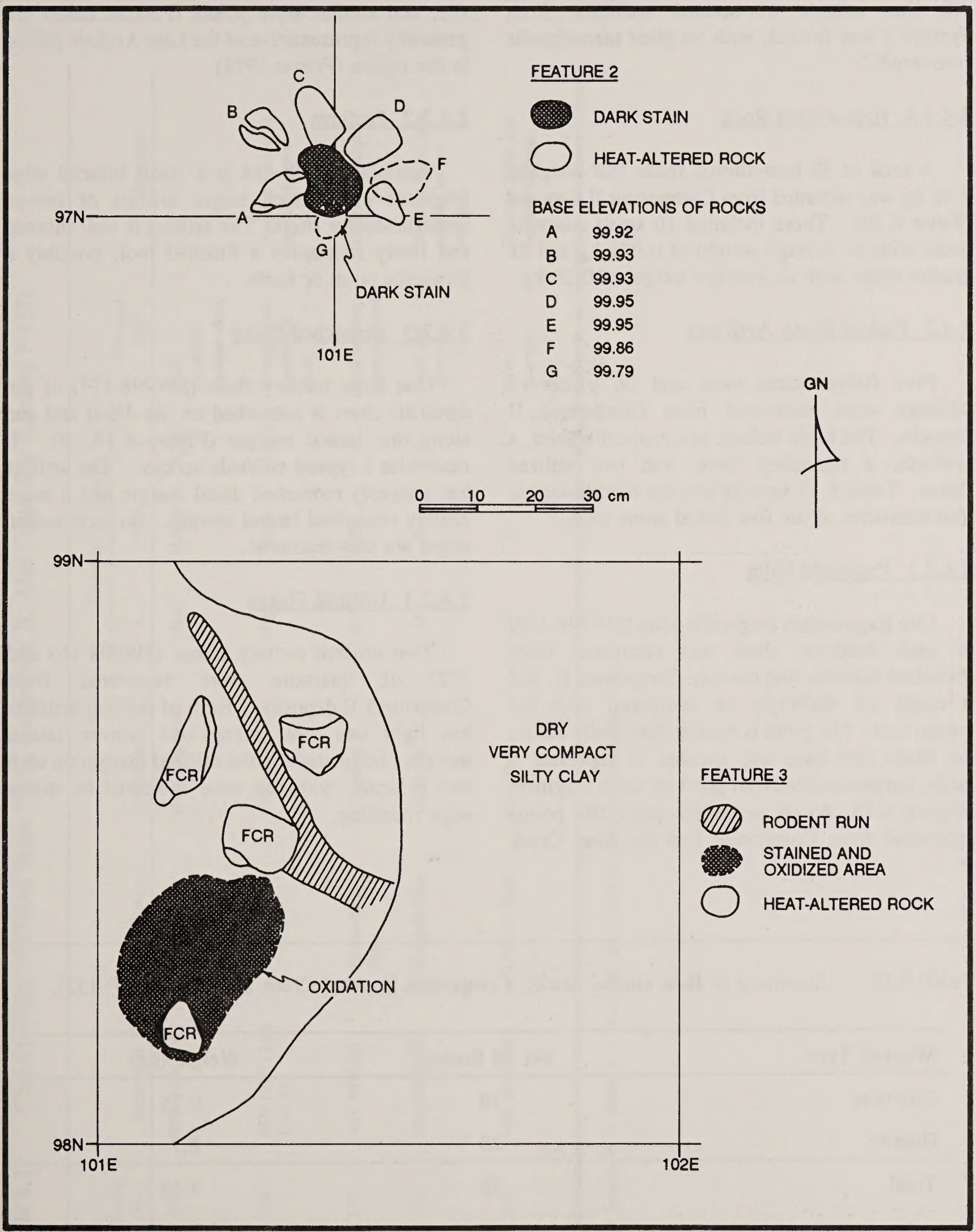


Figure 8.17 Plan Views of Features 2 and 3, Component II, Abel Creek Site (Locality P-132).

3.0 liter sample of stained sediment from Feature 3 was floated, with no plant macrofossils recovered.

8.4.1.4 Heat-altered Rock

A total of 38 heat-altered rocks that weighed 9.45 kg was recorded from Component II deposits (Table 8.10). These included 10 small quartzite rocks with an average weight of 0.075 kg and 28 granite rocks with an average weight of 0.25 kg.

8.4.2 Flaked Stone Artifacts

Five flaked stone tools and 36 pieces of debitage were recovered from Component II deposits. The tools include one projectile point, a preform, a retouched flake, and two utilized flakes. Table 8.11 summarizes the morphological characteristics of the five flaked stone tools.

8.4.2.1 Projectile Point

One fragmentary projectile point (SW998-150) of pink dendritic chert was recovered from disturbed deposits that overlay Component II, and it could not definitely be associated with the component. The point is broken diagonally across the blade and base and appears to represent a large, corner-notched dart point or knife fragment (Figure 8.18, A). It resembles projectile points recovered from Component I of the Abel Creek site, and similar style points (Pelican Lake) are generally representative of the Late Archaic period in the region (Frison 1978).

8.4.2.2 Preform

Artifact SW998-114 is a small bifacial edge fragment of a much larger artifact of brown semitranslucent chert. The artifact is well-thinned and likely represents a finished tool, possibly a projectile point or knife.

8.4.2.3 Retouched Flake

One large tertiary flake (SW998-177) of tan dendritic chert is retouched on the distal end and along one lateral margin (Figure 8.18, B). It resembles a typical end/side scraper. The artifact has a steeply retouched distal margin and a more acutely retouched lateral margin. Both retouched edges are step-fractured.

8.4.2.4 Utilized Flakes

Two utilized tertiary flakes (SW998-169 and 172) of quartzite were recovered from Component II deposits. Each of the two artifacts has light use wear along one convex lateral margin. Edge angle of the utilized margin on each tool is acute, with use wear indicated by minor edge rounding.

Table 8.10 Summary of Heat-altered Rocks, Component II, Abel Creek Site (Locality P-132).

Material Type	No. of Rocks	Weight (kg)
Quartzite	10	0.75
Granite	28	8.7
Total	38	9.45

Table 8.11 Characteristics of Flaked Stone Tools, Component II, Abel Creek Site (Locality P-132).

Catalog No.	Excavation Unit	Classification	Condition	Dimensions (mm)[1] L	W	T	Material Type	Remarks
150	98W 100E,NW	Projectile point	Base fragment	18(p)	14.5(p)	3.5(p)	Pink dendritic opaque chert	–
114	94N 102E (Test Unit 4)	Preform	Edge fragment	15(p)	16(p)	3.5(p)	Brown semi-translucent chert	Possible projectile point fragment
177	96N 100E,SE	Retouched flake	Complete	38.5	25	6	Red and tan opaque chert	End/side scraper
172	96N 100E,NE	Utilized flake	Complete	44	22	7	Dark red quartzite	Tertiary flake; one utilized lateral margin
169	98N 100E,NW	Utilized flake	Complete	21	26	4	Grey quartzite	Teritary flake; one utilized margin

[1] L = length, W = width, T = thickness; (p) = broken specimen, partial dimension.

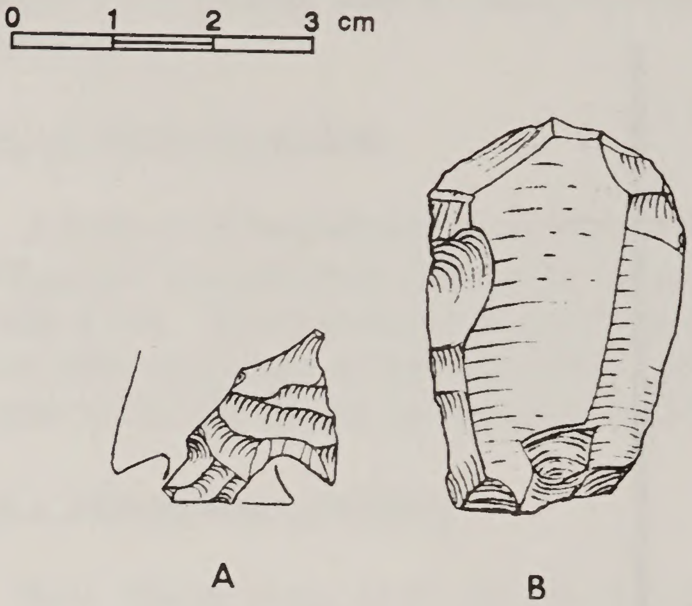


Figure 8.18 Selected Artifacts, Component II, Abel Creek Site (Locality P-132). A) SW998-150; B) SW998-177.

8.4.2.5 Debitage

A total of 36 pieces of debitage was recovered from Component II deposits. Table 8.12 provides a cross-tabulation of debitage type by material type. The majority (66.7%) of the debitage is tertiary flakes, microflakes, or flake fragments, 27.8% is secondary flakes, and 5.6% is tested cobbles. No primary flakes were included within the debitage assemblage. The small amount of debitage recovered limits interpretation of flaked stone manufacturing activities, although the large percent of tertiary flakes and microflakes suggests that most activities were oriented towards final manufacturing stages. The limited density ($1.8/m^2$) of debitage within the excavation block also suggests that lithic manufacturing activity was very limited in scope.

Chert is the dominant material type, with various opaque, mottled, and semitranslucent cherts comprising greater than 58% of the debitage. The remainder of the debitage consists of red or gray quartzite. The material types and percentages of the debitage are the same as the flaked stone tool material types from Component II.

8.4.3 Animal Remains

Seventy-five bone and three tooth fragments weighing 51.8 g were collected from Component II deposits (Table 8.13). None of the elements are identifiable to species. Size range of the animal remains include 61.5% medium-large mammal, 7.7% large mammal, 7.7% medium mammal, 16.7% small-medium mammal, 1.3% very small-small mammal, and 1.3% very small mammal, and three (3.8%) tooth fragments are deer-pronghorn size. Nine (11.5%) bone fragments are burned or calcined including two medium mammal and seven medium-large mammal fragments.

The vast majority (80.8%) of the animal remains were identified as medium or large mammal size, and all culturally modified (burned or calcined) bone represents these size categories. The large mammal bone was not assignable to a more specific size category, although in light of the distribution of large mammal species prehistorically in south-central Wyoming, bison or elk are probably represented. Considering the limited number of fragments representing each size category, probably only portions of one individual (MNI) of each size class is represented. Only two elements represent very small or small mammals, and both are complete elements with no evidence of cultural modification. These two elements are probably intrusive into Component II cultural deposits.

8.4.4 Spatial Distribution of Cultural Remains

The distribution of cultural features and tools associated with Component II is shown in Figure 8.19. Tools which were not found in place are mapped in the centers of the units from which they were recovered. Figure 8.20 provides trend surface maps showing the distribution of total debitage, quartzite debitage, chert debitage, and animal remains.

Table 8.12 Cross-Tabulation of Debitage Types by Material Type, Component II, Abel Creek Site (Locality P-132).

	Material Type		
Debitage Type	Quartzite	Chert	Total
Secondary Flake			
Number	4	6	10
Row %	40.0	60.0	
Column %	26.7	28.6	27.8
Tertiary Flake			
Number	11	7	18
Row %	61.1	38.9	
Column %	73.3	33.3	50.0
Microflake			
Number	0	6	6
Row %	0	100.0	
Column %	0	28.6	16.7
Tested Cobble			
Number	0	2	2
Row %	0	100.0	
Column %	0	9.5	5.6
Total			
Number	15	21	36
Row %	41.7	58.3	

Table 8.13 Summary of Animal Remains, Component II, Abel Creek Site, (Locality P-132).

Animal Size Category	Total Specimens No.	Total Specimens Wt.	Burned Specimens No.	Burned Specimens %	Identifiable Elements
Large mammal	6	12.5	--	--	Vertebra (1)
Medium-large mammal	48	36.5	7	14.6	--
Deer/pronghorn Size	3	0.2	--	--	Tooth fragments (3)
Medium mammal	6	1.3	2	22.2	Vertebra (1)
Small-medium mammal	13	1.1	--	--	--
Very small mammal	1	0.1	--	--	Tibia (1)
Very small-small mammal	1	0.1	--	--	Phalange (1)
Total	78	51.8	9	11.5	

Two tools are located in the northwest corner of the block, two are located between Features 1 and 2, and one is located near the southeast corner of the excavation. Debitage is concentrated mostly in the west central portion of the block, and individual density maps for quartzite and chert indicate the same general pattern. Animal remains are concentrated slightly to the east of the greatest debitage density, with most bone associated with Feature 1.

The overall pattern indicated by the debitage and animal remains distribution maps suggests a discrete activity area centered around Feature 1 and 2. This pattern is suggested by the concentration of remains around the features and by the very small amount of remains located in units away from the features. Similar hearth-centered activity areas are commonly noted among modern day hunter-gatherers (Odell 1980, Binford 1983). Activities were apparently focussed on processing of one or more medium size mammal (deer or pronghorn) and one or more large mammal, possibly bison or elk, with minor flaked stone tool maintenence or manufacturing also occurring.

8.4.5 Component II Summary

Component II represents the single cultural component identified in the north block at the Abel Creek site. Three disturbed cultural features, a small number of flaked stone artifacts, heat-altered rock, and animal bone and tooth fragments were associated. The component, which was noted 15 to 30 cm below surface, was partially deflated and possibly disturbed by vehicle traffic associated with past pipeline construction across Abel Creek. A radiocarbon age estimate of 1260 years B.P. indicates Component II represents a Late Prehistoric period (Uinta phase) component.

The limited density and types of cultural remains recovered from Component II suggests it represents a short-term campsite primarily associated with animal processing activities. The distribution of remains reflects a hearth-centered activity area situated around two of the three associated cultural features. No groundstone tools

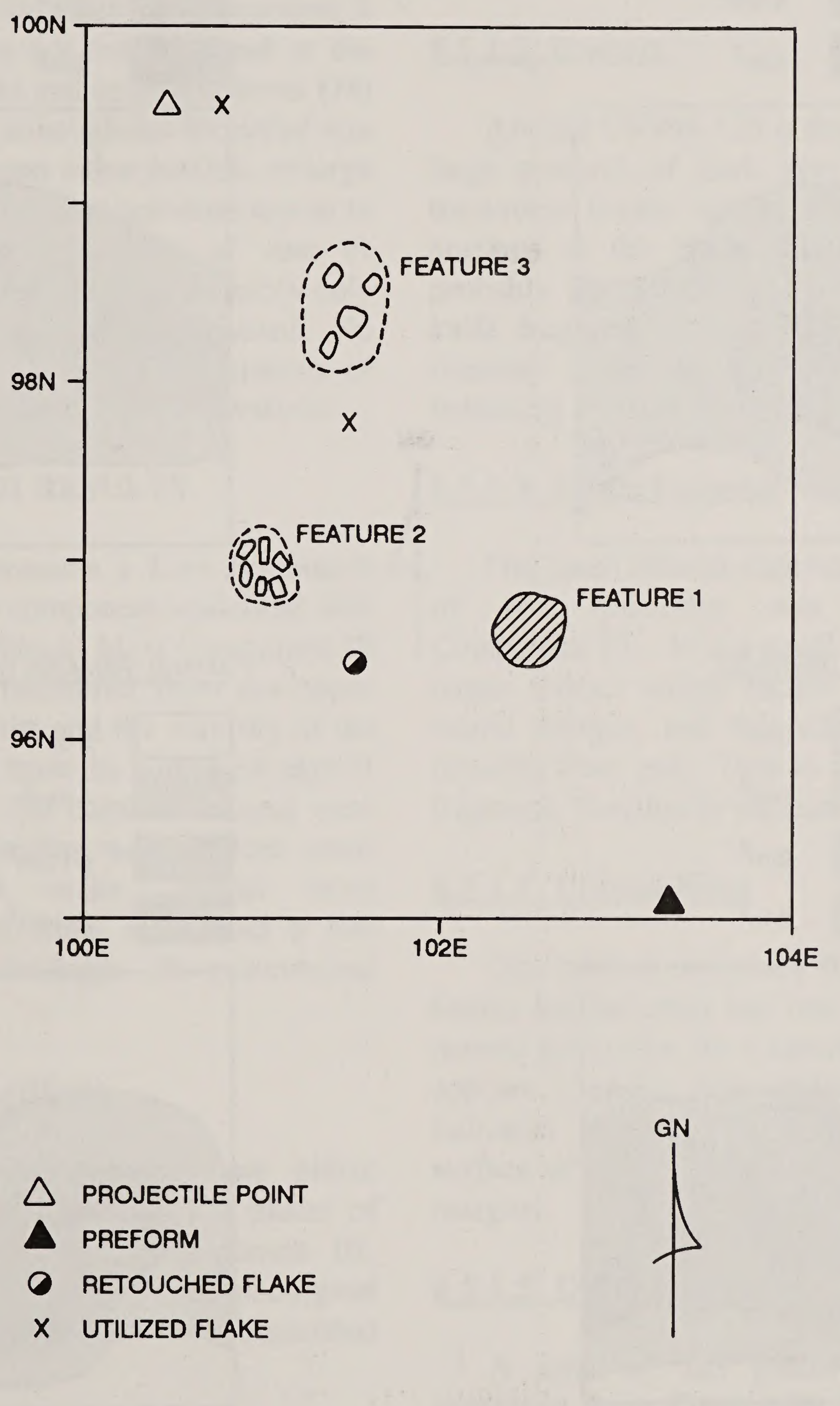


Figure 8.19 Plan Map of Component II with Features and Tools Plotted, Abel Creek Site (Locality P-132).

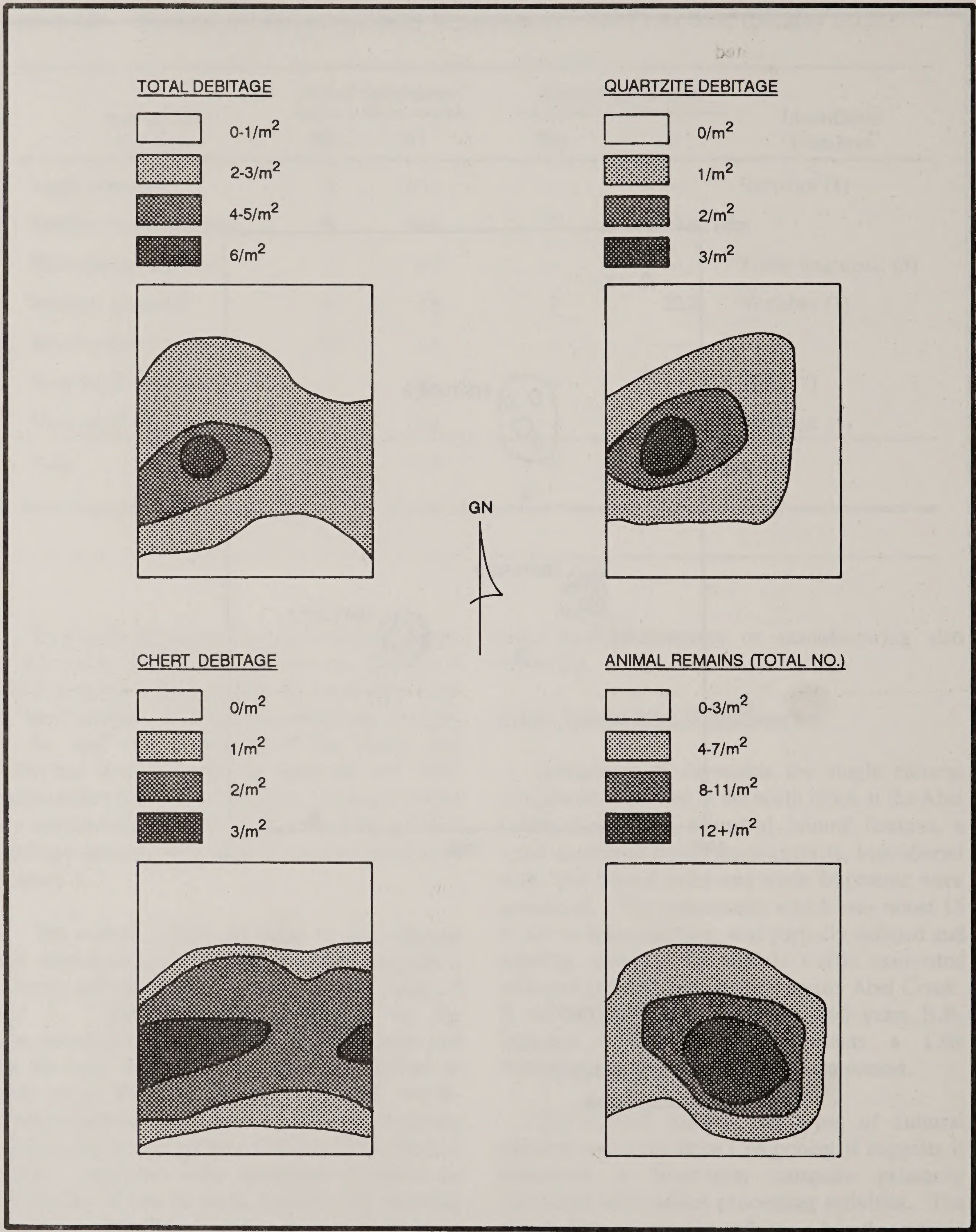


Figure 8.20 Trend Surface Maps for Total Debitage, Quartzite Debitage, Chert Debitage, and Animal Remains, Component II, Abel Creek Site (Locality P-132).

were recovered, and flaked stone tools included a projectile point, a preform, and three utilized or retouched flakes. A limited number of flakes (35) was recovered, with a density of only 1.8 flakes/m^2 for the entire block. The high tool to debitage ratio (1:7) and the small amount of debitage suggests very minimal tool manufacturing activities and probably indicates the Component II flaked stone tools were not manufactured at the site. The sample of bone and tooth fragments (78) was very fragmentary, although the identified size range of animals represents either medium or large mammals. Overall, component activities appear to have been focused on processing of deer or pronghorn and larger animals, with probably only one individual of each size range represented. No information regarding season of occupation of Component II was recovered from excavations.

8.5 COMPONENT III RESULTS

Component III represents a Late Prehistoric period (Firehole phase) component associated with Stratum D in the south block. Most Component III cultural material was recovered from the upper 30 cm of aeolian deposits and the majority of the remains were collected from the northwest edge of the excavation block. No cultural features were associated. Cultural remains included four small quartzite heat-altered rocks, animal bone fragments, four flaked stone tools, and a few pieces of flaked stone debitage. No groundstone tools were associated.

8.5.1 Flaked Stone Artifacts

One projectile point fragment, two biface fragments, one utilized flake, and 185 pieces of debitage were collected from Component III. Table 8.14 summarizes the morphological characteristics of the flaked stone tools associated with Component III.

8.5.1.1 Projectile Point

One small projectile fragment (SW998-513) of chalcedony was recovered from excavations (Figure 8.21). It is the base of a side-notched arrowpoint that has a concave base. The artifact has a transverse snap break across the stem, and it appears the side notches were relatively deep and placed fairly high on the blade. The point is similar to a Plains Side-notched variant that generally occur after A.D. 1300 on the Northwestern Plains (Kehoe 1966).

8.5.1.2 Preform

Artifact SW998-126 is the medial portion of a large preform of dark grey quartzite. It has transverse breaks across the medial and distal portions of the blade. It is well-thinned and probably represents a projectile point or bifacial knife fragment. Both lateral blade margins are rounded from use with some step fracturing indicating it likely functioned as a knife.

8.5.1.3 Biface Fragment

One small bifacial edge fragment (SW998-523) of red quartzite was associated with Component III. It is a small fragment of a much larger artifact which retains one partially intact lateral margin, and this edge is retouched and rounded from use. Due to the small size of the fragment, function is unclear.

8.5.1.4 Utilized Flake

One utilized secondary flake (SW998-426) of brown banded chert has one utilized margin. A natural projection on a terminal end of the flake appears to have been utilized as a graver as indicated by small flake scars on the ventral surface of the projection and on adjacent lateral margins.

8.5.1.5 Debitage

A total of 185 pieces of debitage were recovered from Component III deposits. Table 8.15 provides a cross-tabulation of debitage type by material type for the debitage. The vast majority of flakes are microflakes (80.5%) with lesser amounts of tertiary flakes (16.2%), secondary flakes (2.2%), and shatter (1.1%). The

Table 8.14 Characteristics of Flaked Stone Tools, Component III, Abel Creek Site (Locality P-132).

Catalog No.	Excavation Unit	Classification	Condition	Dimensions L	Dimensions W	Dimensions T	Material Type	Remarks
513	49N 132E SE	Projectile Point	Base fragment	6(P)	10(P)	2	Chalcedony	Base width - 10mm
126	47N 126E NE	Preform	Medical portion	28(P)	32(P)	7(P)	Grey quartzite	Possible bifacial knife
523	49N 132E SW	Biface fragment	Edge fragment	15(P)	7(P)	2(P)	Red quartzite	Small fragment
426	49N 132E SE	Utilized flake	Complete	48.5	22	11	Brown banded chert	One utilized natural projection (gravel)

large number of microflakes indicates flaked stone manufacturing activities were oriented towards tool maintenence rather than tool manufacturing activities.

Various mottled, opaque, and semitranslucent cherts (48.1%) and quartzite (46.5%) comprise most of the debitage, with lesser amounts of clear chalcedony, moss agate, black siltstone, and obsidian also recovered. The four flaked stone tools recovered from Component III deposits were manufactured from the two dominant material types.

8.5.2 Animal Remains

Two hundred and thirty-nine bone fragments and one tooth fragment weighing a total of 150.3 g were recovered from Component III deposits (Table 8.16). None of the specimens were identifiable to species. Six (2.5%) cranial fragments are bison size, one (0.4%) tooth enamel fragment is pronghorn size, and two (0.8%) bone fragments are jackrabbit size. The remainder of the assemblage was classified by more general size ranges, with two (0.8%) large mammal, 192 (80.0%) medium-large mammal, eight (3.3%) medium mammal, 22 (9.2%) small-medium mammal, and seven (2.9%) are very small-small mammal. The only elements that exhibit cultural modification are 23 (9.6%) fragments that are burned or calcined, including nine medium-large mammal, one medium mammal, six small-medium mammal, and seven very small-small mammal fragments.

The size range of the recovered animal remains suggests Component III activities included utilization of a number of different species, including bison size, deer-pronghorn size, and jackrabbit size. The lack of associated cultural remains, particularly cultural features, limits interpretations of types of processing activities. It is possible that at least some of the remains were associated with cultural activities that took place some distance from the block, with the animal remains discarded and dumped within the area of the excavation block. Another possibility is that the remains are associated with a large processing area that was destroyed by cutbank erosion, with the recovered remains representing the southern edge of this area. This interpretation is supported by the location of the flaked stone tools associated with Component III, which were recovered near the cutbank edge.

8.5.3 Spatial Distribution of Cultural Remains

The distribution of tools recovered from Component III is shown in Figure 8.22. Tools which were not found in place are mapped in the centers of the units from which they were recovered. Figure 8.22 also provides trend surface maps which show the distribution of debitage and animal remains within the excavation block.

The tool distribution maps indicates three of the four flaked stone tools from Component III are concentrated in the northeast corner of the block adjacent to the cutbank. The trend map for total debitage indicates that debitage is also very concentrated in the same area. The trend map for total number of animal remains indicates a dense concentration occurs at the southwest corner of the block, with a second slightly less dense concentration near the northeast corner of the

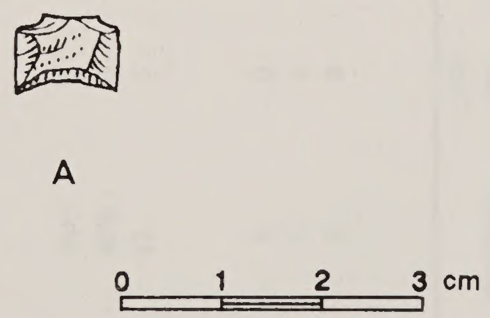


Figure 8.21 Projectile Point (SW998-513), Component III, Abel Creek Site (Locality P-132).

Table 8.15 Cross-Tabulation fo Debitage Type by Material Type, Component III.

Debitage Type	Quartzite	Red Chert	Clear Chalcedony	Tan Chert	Black Siltstone	Obsidian	Other Chert	Moss Agate	Total
Secondary Flake									
Number	0	0	0	0	0	0	3	1	4
Row %	0	0	0	0	0	0	75.0	25.0	100.0
Column %	0	0	0	0	0	0	3.5	100.0	2.2
Tertiary Flake									
Number	12	0	0	0	0	0	18	0	30
Row %	40.0	0	0	0	0	0	60.0	0	20.9
Column %	14.0	0	0	0	0	0	20.9	0	16.2
Microflake									
Number	74	1	3	2	1	5	63	0	149
Row %	49.7	0.6	2.0	1.3	0.6	3.4	42.3	0	73.3
Column %	86.0	100.0	100.0	100.0	100.0	100.0	73.3	0	80.5
Shatter									
Number	0	0	0	0	0	0	2	0	2
Row%	0	0	0	0	0	0	100.0	0	2.3
Column %	0	0	0	0	0	0	2.3	0	1.1
Total									
Number	86	1	3	2	1	5	86	1	185
Row %	46.5	0.5	1.6	1.1	0.5	2.7	46.5	0.5	

Table 8.16 Summary of Animal Remains, Component III, Abel Creek Site (Locality P-132)

	Total Specimens		Burned Specimens		
Animal Size Category	No.	Wt. (g)	No.	%	Identifiable Elements
Bison size	6	83.5	--	--	Cranial (temporal) fragments (6)
Large mammal	2	16.4	--	--	Rib (1)
Medium-large mammal	192	48.4	9	4.7	Femur (tuberosity)
Deer-pronghorn size	1	0.1	--	--	Tooth
Medium mammal	8	0.4	1	12.5	--
Jackrabbit size	2	0.6	--	--	Innominate R.; femur R.
Small-medium mammal	22	0.8	6	27.3	--
Very small-small mammal	7	0.1	7	100.0	--
Total	240	150.3	23	9.6	

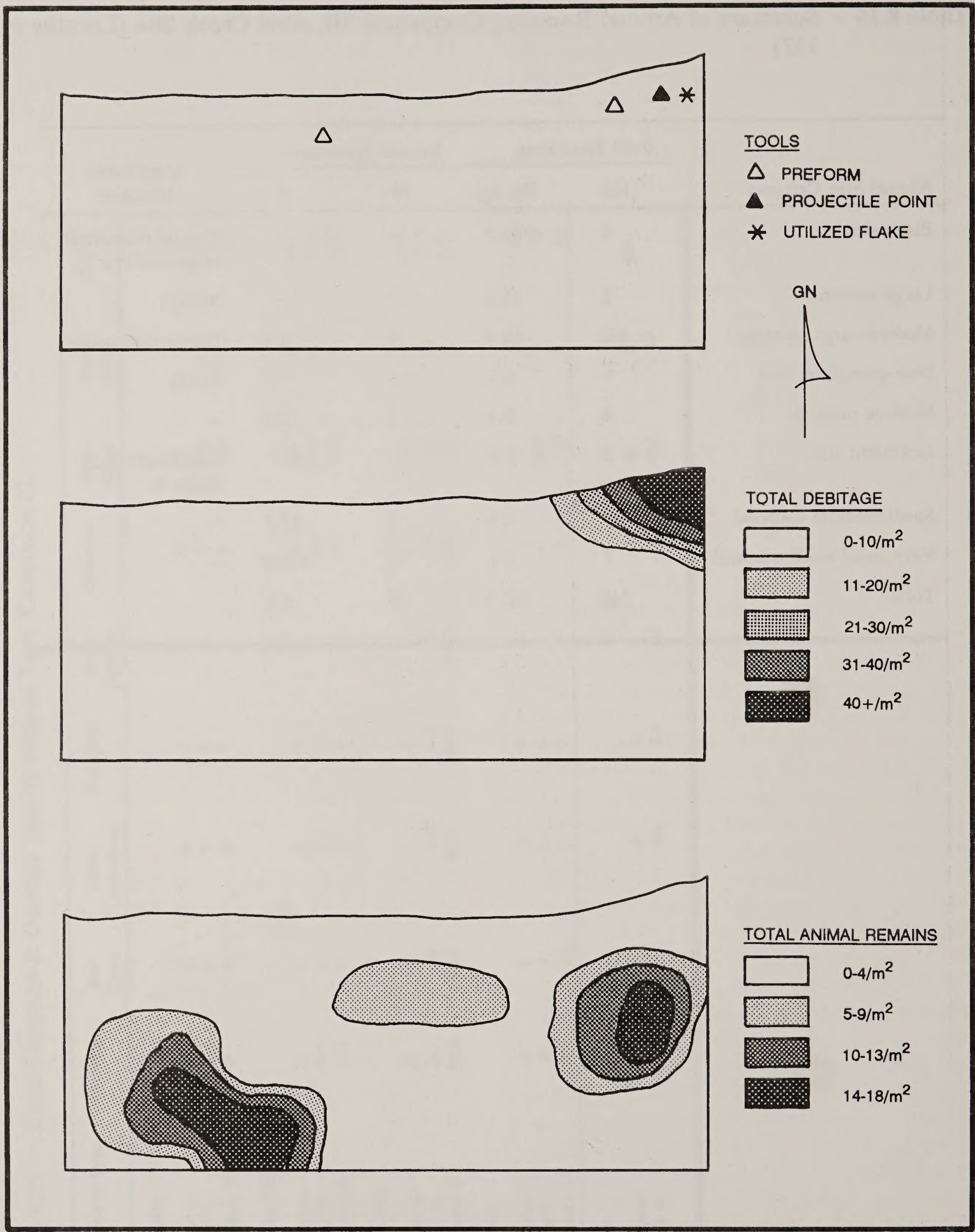


Figure 8.22 Plan Map with Tools and Trend Surface Maps for Debitage and Animal Remains, Component III, Abel Creek Site (Locality P-132).

block in the area of tool and debitage concentration.

The pattern indicated by the various classes of remains suggests two distinct activity areas may be present. One area is delineated by the flaked stone tools, debitage, and animal remains concentrated adjacent to the Abel Creek cutbank near the northeast corner of the block. A second possible area, as indicated by a high density of animal bone, may be located near the southwest corner of the excavation. Virtually no other cultural material was recovered from this area, although it is possible the bone concentration marks the north end of an activity area situated in unexcavated areas to the south. Identification of either area as a discrete activity area is very tentative due to the lack of cultural features.

8.5.4 Component III Summary

Component III represents the youngest component identified during excavations at the Abel Creek site. A major portion of the component, which was identified mostly near the northeast corner of the south block, appears to have been destroyed prior to excavation by cutbank erosion. No radiocarbon age estimates were obtained, although the stratigraphic position of the component above a Late Archaic period cultural layer (Component I) and the association of a small side-notched arrowpoint fragment suggests a Late Prehistoric period (Firehole phase) affiliation that postdates A.D. 1300. Interpretations of component activities are limited by the absence of cultural features, although most cultural remains appear to represent animal processing activities.

Debitage density was light (3.7 flakes/m2), and most flakes are tertiary or microflakes indicating an emphasis on tool maintenence rather than initial tool manufacturing activities. This interpretation is supported by the flaked stone tool assemblage which includes a projectile point, two biface fragments which appear to be finished tools, and a utilized flake. The vast majority of the animal remains represent medium or large mammals, with deer-pronghorn size and bison size elements identified. Several jackrabbit size elements were also recovered. No evidence of season of occupation represented by Component III was obtained during excavations.

8.6 SUMMARY AND CONCLUSIONS

Three prehistoric components were identified within block excavations completed on the north and south sides of Abel Creek. Two radiocarbon age estimates (1790 and 1260 years B.P.) and temporally diagnostic artifacts indicate one Late Archaic period (Deadman Wash phase) and two Late Prehistoric period (Uinta phase, Firehole phase) occupations are represented. Component I and III were noted in the south block within aeolian deposits, with Component II noted within shallow alluvial deposits on the north side of Abel Creek. The three components had incurred varying amounts of disturbance prior to excavations, with Component I and III partially destroyed by Abel Creek cutbank erosion, and Component II had been impacted by vehicle traffic associated with pipeline construction.

The three components had been disturbed prior to excavations, and the main prehistoric activity identified with each component appears to have been the processing of medium or large mammals. Component I contained the largest assemblage of cultural remains including numerous small bone fragments representing deer-pronghorn size and bison size animals. The spatial patterning of Component I remains indicates the presence of one large activity area that represents intensive processing activities (bone juice/grease production) from at least one deer-pronghorn and one bison size animal. The other main activity was the rejuvenation/resharpening of flaked stone tools that were apparently used during animal processing activities. The temporally diagnostic artifacts include four large corner-notched projectile points typical of the Late Archaic period (Deadman Wash phase), with this cultural affiliation also indicated by one radiocarbon age estimate (1790 years B.P.) obtained from Component I.

The least amount of cultural remains collected from the three components was obtained from Component II. The distribution of cultural material indicates one hearth-centered activity area with most artifacts collected within several meters of this area. Activities were focused on processing of one or more pronghorn size animals, and several unidentifiable bone fragments provide weak evidence to suggest larger and smaller animal may also have been processed. Minimal lithic manufacturing activities were noted, and no temporally diagnostic artifacts (projectile points) could definitely be associated with this Late Prehistoric period (Uinta phase) occupation which was radiocarbon dated at 1260 years B.P.

Component III deposits were extensively disturbed, with most cultural remains representing the southern edge of an activity area that was extensively impacted by cutbank erosion. Interpretations of component function are limited by the absence of cultural features, although cultural remains indicate activities included processing of bison size, deer-pronghorn size, and jackrabbit size animals. As with the other two components, flaked stone tool manufacturing was directed towards maintenence/resharpening of tools brought to the site. No radiocarbon age estimates were obtained, and the single temporally diagnostic artifact appears to be a variant of a Plains Side-notched arrowpoint suggesting Component III dates within the past 600 to 700 years (Kehoe 1966).

Past investigations during construction of the LSU Main Injection Line through the Abel Creek site are pertinent to the results of the current project. Construction monitoring recorded 10 cultural features including a possible house floor and a midden on the north side of Abel Creek approximately 5-50 m east and northeast of the north excavation block (Greer, Greer, and Frizell 1989). The partial house floor was partially excavated with flaked stone tools and a large amount of debitage an animal bone associated. The house floor was estimated to date to the Late Archaic period based on an associated projectile point (Pelican Lake), and activities were apparently focused on bison processing. Although none of the three components investigated by Mariah can be directly associated with these features, the results of both projects indicates an intense period of cultural activity during the Late Archaic and Late Prehistoric periods on terraces immediately adjacent to Abel Creek. Most site activities appear to have been related to animal processing (deer/pronghorn and bison), and numerous similar prehistoric occupations probably exist along the extensive length of the Abel Creek site.

9.0 BALD KNOB SITE - SITE 48SW5982

This section presents the results of archaeological investigations conducted by Mariah in 1990 at the Bald Knob site (Site 48SW5982). Site investigations included the completion of one large excavation block, identifying two prehistoric cultural components which dated to the Early Archaic period (Great Divide phase) and Early/Middle Archaic period (Green River phase). The following subsections summarize the site setting, stratigraphy, and excavation results and provide a summary of investigations.

9.1 SITE SETTING

The Bald Knob site is located southeast of the town of Bairoil on the south end of a prominent ridge or knoll, Bald Knob, that is situated on a divide between the Lost Soldier and Abel Creek drainages (Figures 1.1 and 1.2). The site is about 1.2 km west of the confluence of the two streams and occupies an area of about 30 acres on the southwest, southeast, and south slopes of Bald Knob. This setting affords a commanding view of Lost Soldier Flats, a very broad basin, to the south and east of Bald Knob (Figure 9.1). The site occurs at an elevation between 2,078 to 2,103 m, with elevation decreasing to 2,056 m near the confluence of the two drainages on Lost Soldier Flats. Cretaceous age Cody shale is exposed on the surface along much of Bald Knob, with recent deposition (Holocene) located primarily along the east slope of the ridge.

Aeolian deposits, that increase in depth from the west to the east slopes, have accumulated on the southeast slope of Bald Knob within the area investigated by Mariah. Vegetation on the site includes a variety of desert shrubs including big and low sagebrush, rabbitbrush, and greasewood with short native grasses and forbs also present. Vegetation is densest in areas of aeolian deposition, with disturbed plant communities noted within the bladed pipeline ROW.

The Bald Knob site was initially recorded in 1984 by the BLM during a resurvey of the Wertz oil field (Bies et al. 1985). It was rerecorded and tested by OAI prior to construction of the Bairoil CO_2 Spur Pipeline (Moore et al. 1987). During the Class III survey, OAI recorded numerous surface concentrations and scatters of burned rock along the windward or west side of Bald Knob. No significant buried cultural deposits were encountered during test excavations conducted by OAI that consisted of 319 m of backhoe trenches. Construction monitoring by OAI investigators that followed test excavations recorded 11 cultural features within the bladed ROW, with an additional 21 buried features recorded in the pipeline trench walls. Most of the features were noted on the leeward (east) slope of Bald Knob within fairly shallow aeolian deposits.

Three of these features were identified by OAI investigators as possible housepits, with the remaining features classified as hearths. During monitoring, the features were recorded and profiled, and radiocarbon samples were collected although no excavation of the features took place. Radiocarbon age estimates of $5{,}000 \pm 80$, $4{,}270 \pm 70$, and $3{,}450 \pm 70$ years B.P. were obtained by OAI from the three housepits. One of the housepits was subsequently excavated by Western Wyoming College (WWC) and yielded a radiocarbon age estimate of $4{,}940 \pm 40$ years B.P. (Hoefer 1988). Archaeological survey and testing by the BLM for the Bairoil Fire Training Center near the southwest edge of the Bald Knob site identified a possible housepit, with a radiocarbon age estimate of $5{,}490 \pm 80$ years B.P. obtained from a cultural feature (Bronsdon 1987).

During the initial phase of the Bairoil Archaeological Project completed by Mariah in 1989, seven 1 x 1 m test units were excavated to determine the area within the Bald Knob site in which block excavations would be most productive (Reust et al. 1990). As stipulated in the DRP (Zale 1989), test investigations were conducted on

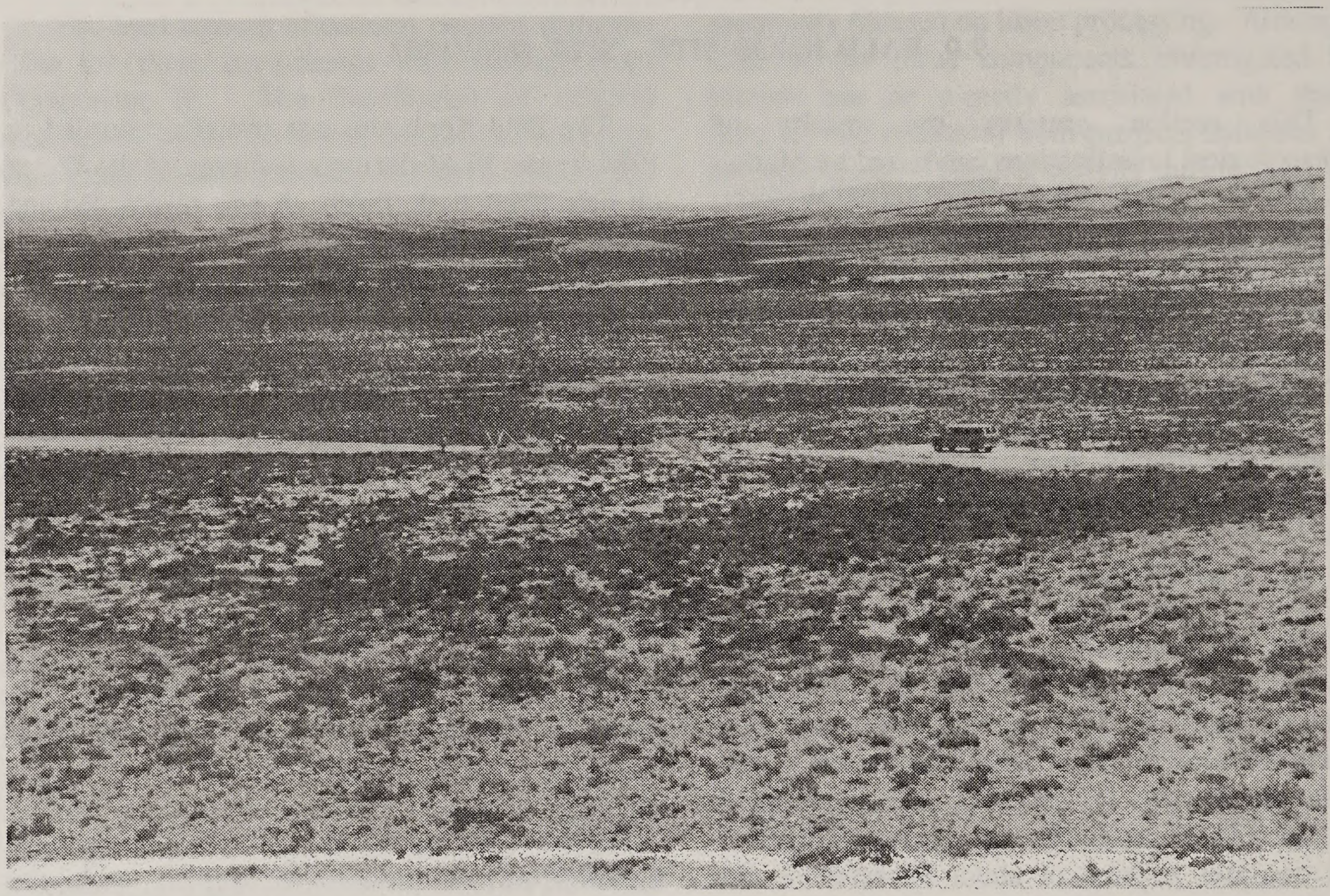


Figure 9.1 Excavation Block Setting Facing Southeast, Bald Knob Site.

the southeast slope of Bald Knob in a location where OAI recorded feature concentrations and housepits during construction monitoring. The pipeline trench was reopened, and two of the housepits recorded by OAI were relocated. Test excavations and trench inspections indicated that significant cultural deposits, including housepits, occurred on the north and south sides of the pipeline trench. Block excavations that included 132 m^2 were recommended for both sides of the pipeline trench at the Bald Knob site.

Block excavations in 1990 were completed in two stages with a total of 185 m^2 excavated at the Bald Knob site (Figure 9.2). Initially, a 132 m^2 block that extended on the north and south sides of the pipeline trench was excavated. Figures 9.3 and 9.4 show views during excavation of the north and south sides of the excavation block. Based on the preliminary results of block excavations, Mariah recommended at a meeting of state and federal regulatory officials at Bairoil in July 1990, that an additional 55 m^2 be excavated at the site.

Standard excavation procedures were utilized during investigations, with horizontal grid designations referenced from a 100N 100E datum located near the southwest corner of the excavation block (Figure 9.5). Vertical measurements were referenced from a single datum represented by the top of a brass-tagged, wooden post previously established by OAI as Datum 2 during monitoring of pipeline construction (Moore et al. 1987). The top of this post was assigned an arbitrary elevation of 100.0 m. This datum is located on the south side of the pipeline ROW on the west bank of a small, ephemeral drainage to the southwest of the excavation block (Figure 9.2).

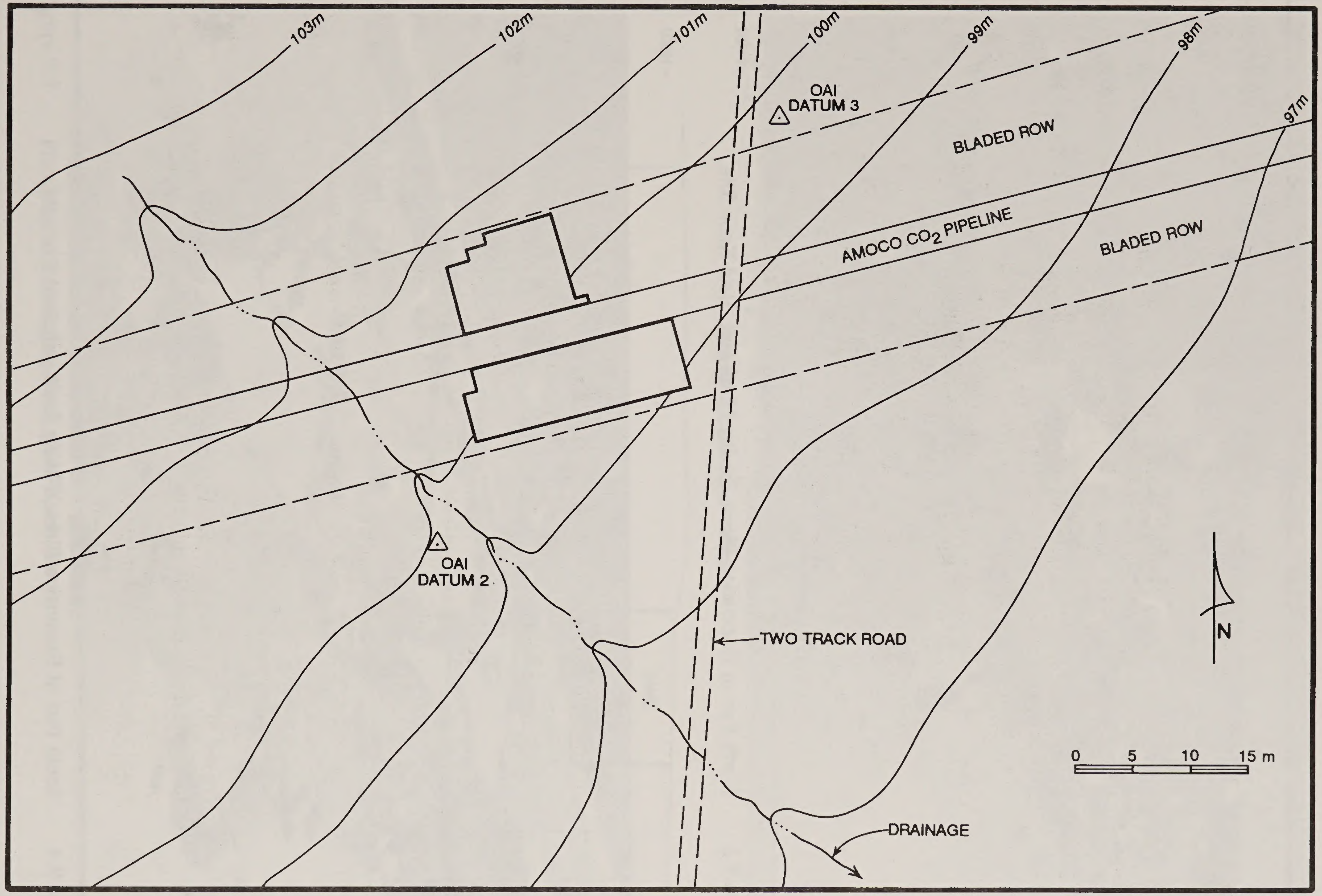


Figure 9.2 Contour Map Showing Location of Excavation Block, Bald Knob Site.

Figure 9.3 North Part of Excavation Block, Facing Northwest, Bald Knob Site.

Figure 9.4 South Part of Excavation Block, Facing Southeast, Bald Knob Site.

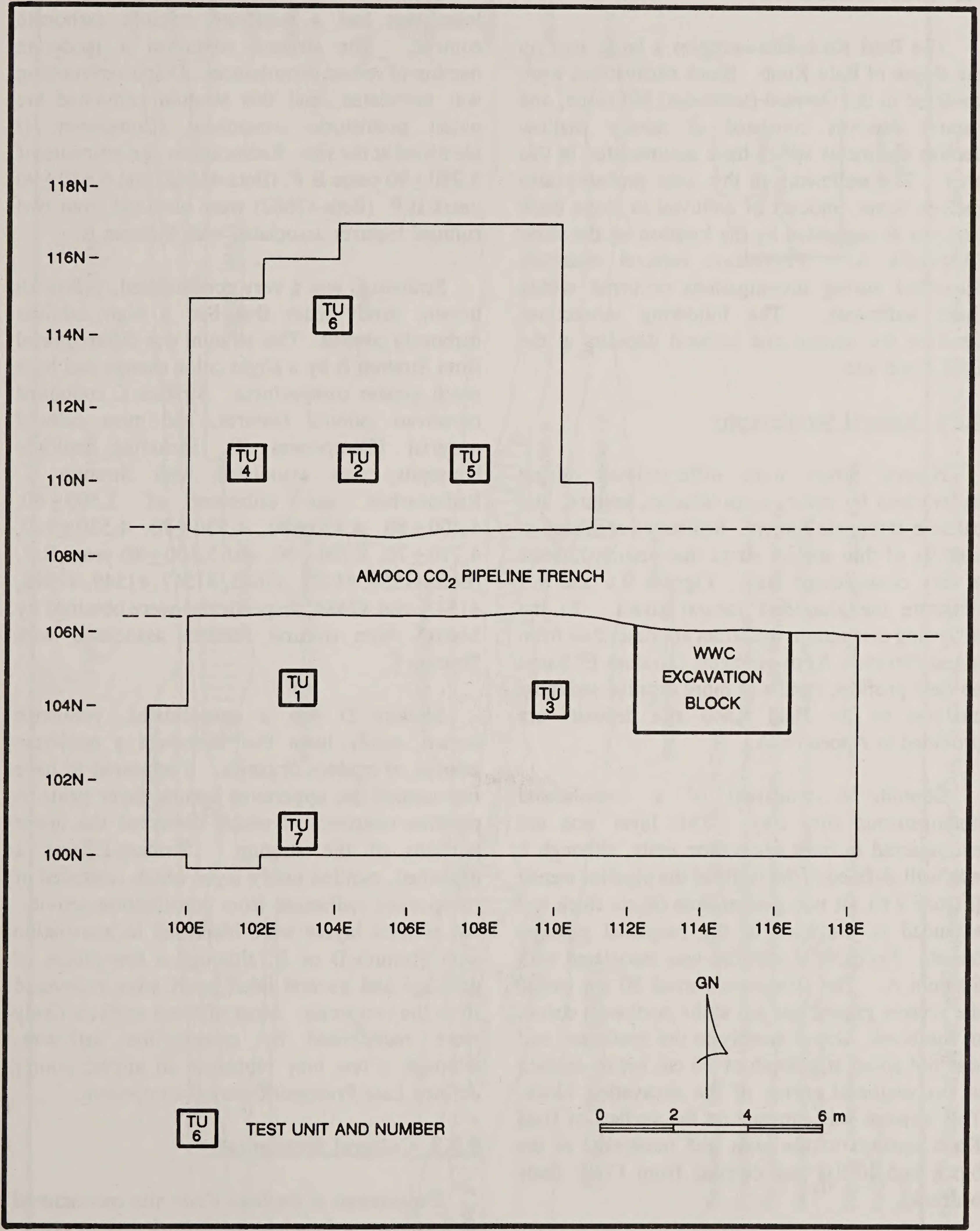


Figure 9.5 Plan Map of Excavation Block, Bald Knob Site.

9.2 STRATIGRAPHY

The Bald Knob site occupies a large area on the slopes of Bald Knob. Block excavations were confined to the leeward (southeast) hill slope, and natural deposits consisted of mostly shallow aeolian sediments which have accumulated in this area. The sediments in this area probably also include lesser amounts of colluvial or slope wash deposits as suggested by the location on the slope (Appendix A). Prehistoric cultural materials identified during investigations occurred within these sediments. The following subsections describe the natural and cultural deposits at the Bald Knob site.

9.2.1 Natural Stratigraphy

Natural strata were differentiated during excavations by color, consolidation, texture, and calcium carbonate content. Sediments consisted of a series of thin aeolian strata that occurred above a very consolidated clay. Figures 9.6 and 9.7 illustrate the identified natural strata. In the following discussion, the strata are described from oldest (Stratum A) to youngest (Stratum E) based on field profiles; results of more detailed sediment analyses of the Bald Knob site deposits are provided in Appendix A.

Stratum A consisted of a consolidated homogeneous silty clay. This layer was not encountered in most excavation units, although it was well-defined in the walls of the pipeline trench (Figure 9.6). It was greater than 60 cm thick and extended to the base of the reopened pipeline trench. No cultural material was associated with Stratum A. The stratum occurred 30 cm below the present ground surface at the northwest corner of the block, sloped steeply to the southeast, and was not noted at a depth of 80 cm below surface at the southeast corner of the excavation block. This stratum was exposed on the surface of Bald Knob upslope to the west and northwest of the block and likely was derived from Cody shale bedrock.

Stratum B was a consolidated, brown, sandy loam that had a moderate calcium carbonate content. The stratum contained a moderate number of rodent disturbances. Dispersed staining was associated, and this stratum contained the oldest prehistoric component (Component I) identified at the site. Radiocarbon age estimates of 5,980±90 years B.P. (Beta-41548) and 6,610±90 years B.P. (Beta-42682) were obtained from two cultural features associated with Stratum B.

Stratum C was a very consolidated, yellowish brown, sandy loam that had a high calcium carbonate content. This stratum was differentiated from Stratum B by a slight color change and by a much greater compactness. Stratum C contained numerous cultural features, and most cultural material (Component II), including multiple housepits, was associated with Stratum C. Radiocarbon age estimates of 3,500±60, 4,400±80, 4,430±80, 4,530±70, 4,530±110, 4,710±70, 4,760±90, and 5,100±80 years B.P. (Beta-41550, 41551, 42683, 41547, 41549, 41546, 41545, and 42484, respectively) were obtained by Mariah from cultural features associated with Stratum C.

Stratum D was a consolidated, yellowish brown, sandy loam that contained a moderate amount of modern organics. It appeared to have represented the uppermost natural layer prior to pipeline construction which disturbed the upper portions of the stratum. Stratum E was a disturbed, mottled sandy layer which consisted of redeposited sediments from construction activity. No cultural layers were identified in association with Stratum D or E, although a few pieces of debitage and several lithic tools were recovered from the two strata. Most of these artifacts likely were redeposited by construction activities, although a few may represent an upper, poorly defined Late Prehistoric period component.

9.2.2 Cultural Stratigraphy

Excavations at the Bald Knob site encountered at least two subsurface prehistoric components. The components were identified by the horizontal

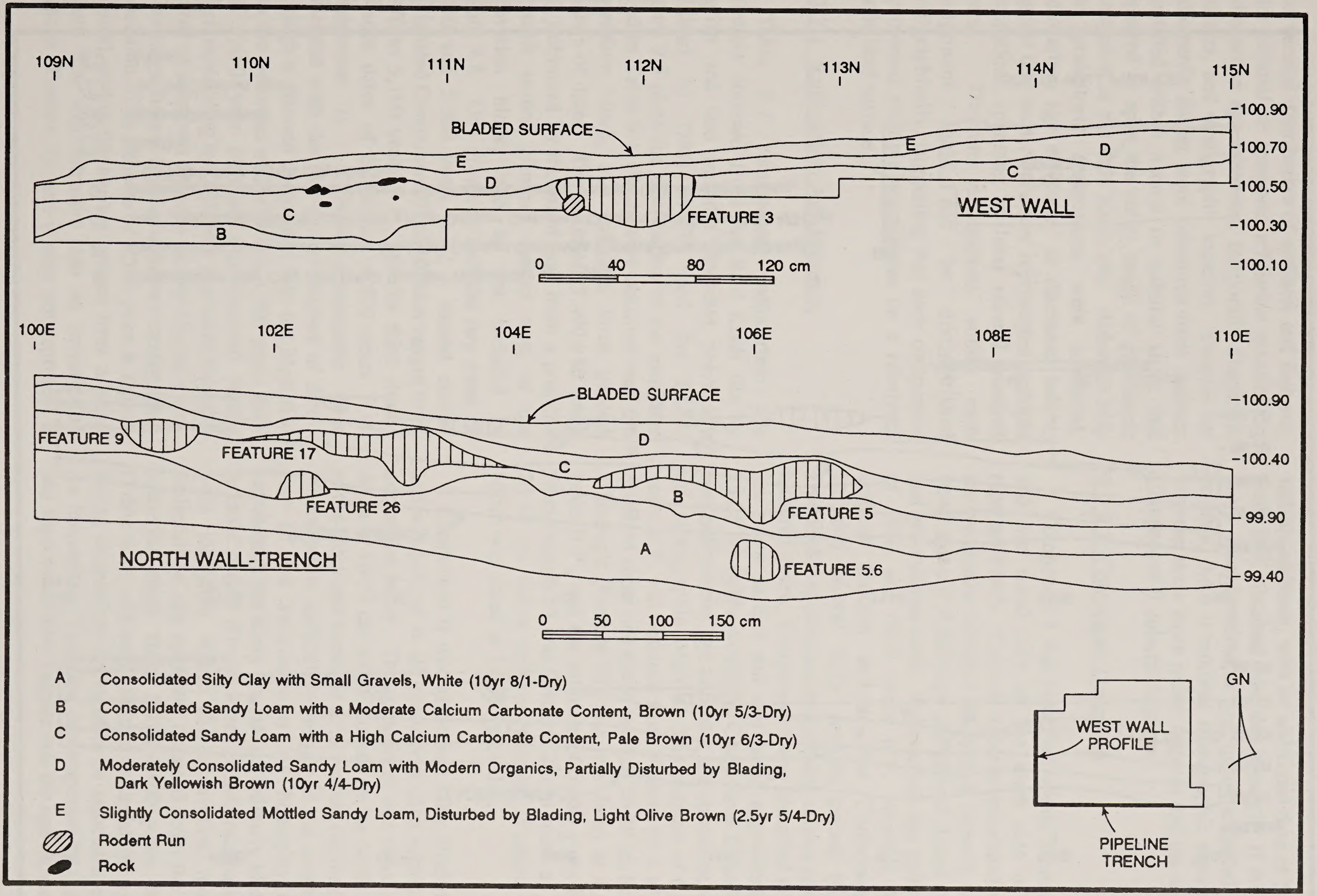


Figure 9.6 Profiles of West Wall(Upper) of Excavation Block and North Wall (Lower) of Pipeline Trench, Bald Knob Site.

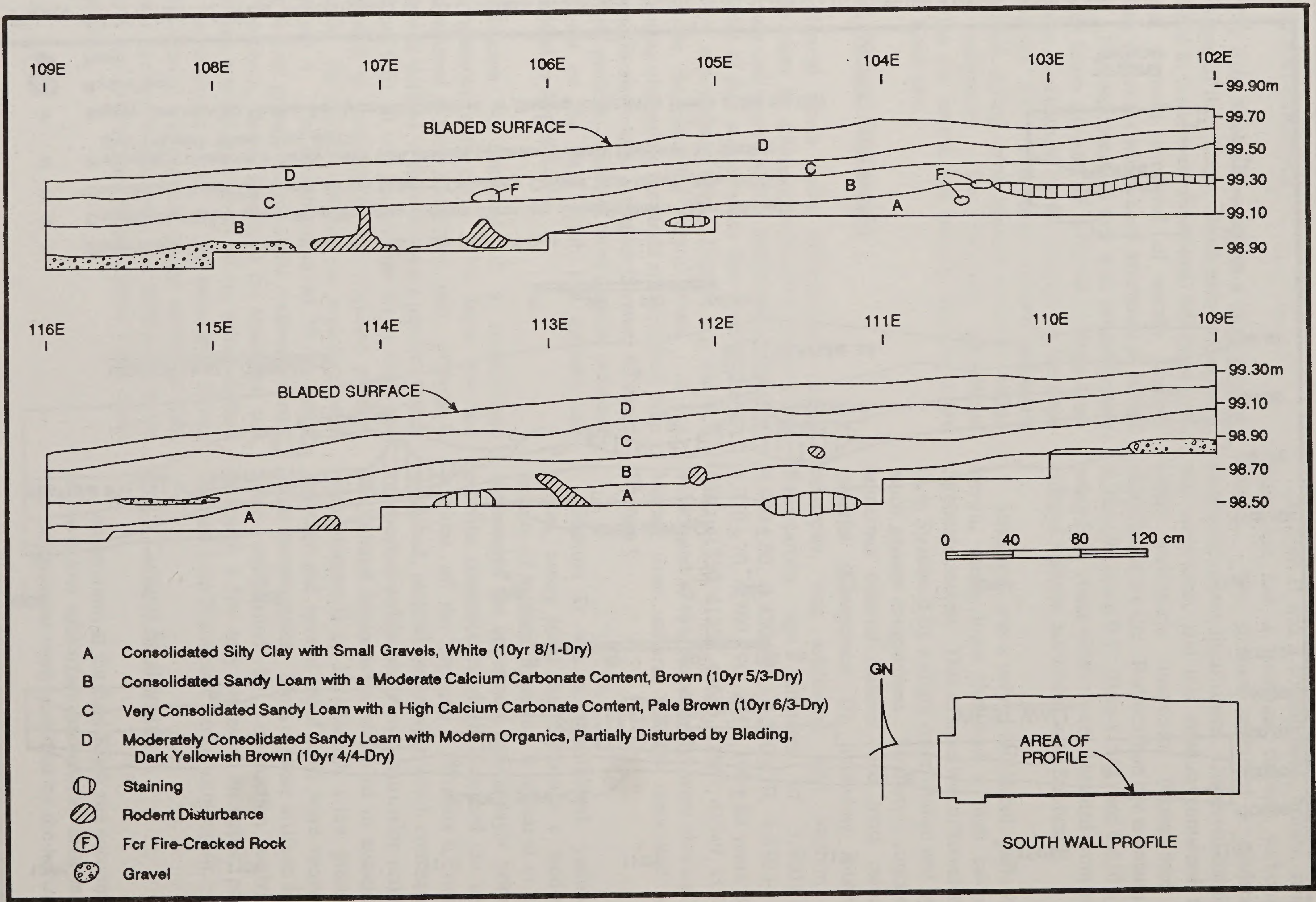


Figure 9.7 Profiles of South Wall of Excavation Block, Bald Knob Site.

and vertical distribution of artifacts and features, with cultural or temporal affiliation assessed by radiocarbon age estimates, temporally diagnostic artifacts, and stratigraphic location. Samples for radiometric dating were submitted from features identified within natural or cultural strata that appeared to span the entire range of prehistoric occupation at the Bald Knob site. Although only two prehistoric components were identified, radiocarbon age estimates, as discussed below, suggest that each component represented multiple occupations spanning at least several hundred years. Discrete occupations within each component could not be distinguished stratigraphically, suggesting that each component represented multiple occupations on a relatively stable land surface.

9.2.2.1 Radiocarbon Age Estimates

Table 9.1 summarizes radiocarbon age estimates obtained from the Bald Knob site by Mariah and also includes estimates previously obtained by OAI, WWC, and the BLM. Figure 9.8 plots the distribution of the estimates listed in Table 9.1 which were obtained near the excavation block, and indicates three general clusters of dates. The estimate (5,490±80 years B.P.) obtained by the BLM was from a possible housepit several hundred meters west of the excavation block, and is not included in Figure 9.8. One grouping includes two dates of 3,450 and 3,500 years B.P.; a second cluster (designated Component II) of 10 dates ranges from 4,270 to 5,100 years B.P.; and the third cluster includes dates of 5,980 and 6,610 years B.P. (Component I). Cultural components were associated with the two earlier clusters of dates, although a discrete component was not identified with the estimates of 3,450 and 3,500 years B.P. The 3,450 year estimate was obtained during trench monitoring by OAI from a possible housepit located an unknown distance west of Mariah's area of investigation and from an unknown stratigraphic association. The estimate of 3,500 years B.P. was obtained during the current project from a basin feature that was intrusive into an investigated housepit (Feature 5), and it may not represent a reliable estimate, with an additional date of 5,100 years B.P. obtained from this housepit. If the two more recent estimates are uncontaminated and reliable, there is minimal stratigraphic separation between these more recent features and the earlier Component II cultural features.

9.2.2.2 Component Definition

Component I was identified within Stratum B and was noted only on the south side of the pipeline trench. Cultural material associated with the component included six cultural features and a small amount of debitage and several flaked stone and groundstone tools. Radiocarbon age estimates of 5980 and 6610 years B.P. obtained from cultural features indicate that Component I included several Early Archaic period (Great Divide phase) occupations spanning at least several hundred years. Component I was identified 60-80 cm below surface and was noted approximately 15-25 cm below overlying Component II, and the two radiocarbon age estimates are consistent with this stratigraphic location. The estimate of 6,610 years B.P. was obtained from Feature 53.1 which occurred about one meter east and 20-30 cm below a housepit (Feature 35) that was dated at 4,400 years B.P., and the estimate of 5,980 years B.P. from Feature 45 was obtained 2-3 m south of and 20-30 cm below another housepit (Feature 20) which was dated at 4,530 years B.P.

Component II was associated with Stratum C and was present in all excavation units within the excavation block. The component was noted at a depth of 10-20 cm below surface on the north end of the block and occurred at increasing depths (30-50 cm below surface) downslope in the southeast part of the excavation. Six housepits that represented late Early Archaic period/early Middle Archaic period (Green River phase) occupations were identified within the excavation block. Radiocarbon age estimates obtained from the six housepits range from 5,100-4,400 years B.P. (Table 9.1), and most cultural material recorded during excavations appeared to be associated with the housepits. Tests for contemporaneity (Long and Rippeteau 1974) suggest that the age estimates

Table 9.1 Radiocarbon Age Estimates and Calibrated Age Estimates, Bald Knob Site.

Component	Feature		Lab No. (Beta)	Age Estimate (Years B.P.)	Calibrated Age Estimate (Years B.P.)[1]		Sample Type
	Number	Type			Intercept(s)[2]	Range (one sigma)	
II	8.1	Bell-shaped hearth	41545	4,760 ± 90	5564, 5528, 5476	5595-5327	Sediment
II	15.5	Oxidized cylinder	41546	4,710 ± 70	5456, 5350, 5335	5572-5321	Sediment
II	17.1	Oxidized cylinder	41547	4,530 ± 70	5283, 5138, 5097	5310-5047	Sediment
I	45	Unoxidized basin	41548	5,980 ± 90	6848, 6821, 6814	6947-6732	Sediment
II	20.1	Oxidized cylinder	41549	4,530 ± 110	5283, 5138, 5097	5139-4989	Sediment
II	5.2	Oxidized cylinder	41550	3,500 ± 60	3826, 3773, 3736	3858-3695	Sediment
II	35.1	Unoxidized basin	41551	4,400 ± 80	4983	5245-4868	Sediment
I	53.1	Unoxidized basin	42682	6,610 ± 90	7450	7568-7426	Sediment
II	58	Oxidized cylinder	42683	4,430 ± 80	5040, 5014, 4992	5271-4873	Sediment
II	5.6	Bell-shaped hearth	42684	5,100 ± 80	5906, 5787, 5775	5943-5737	Sediment
--	BLM Feature 2	--	22185	5,490 ± 80	6299	6404-6197	--

Table 9.1 (continued)

Component	Feature		Lab No. (Beta)	Age Estimate (Years B.P.)	Calibrated Age Estimate (Years B.P.)[1]		Sample Type
	Number	Type			Intercept(s)[2]	Range (one sigma)	
--	OAI Feature T23	Housepit	17220	5,000 ± 80	2734	5896-5650	-
--	OAI Feature T26	Housepit	17221	4,270 ± 70	4858	4872-4659	-
--	OAI Feature T32	Housepit	17222	3,450 ± 70	3698	3832-3634	-
--	WWC Feature A.1	Hearth	23305	4,940 ± 40	5724, 5700, 5655	5731-5645	Wood charcoal

1 Calibration based on Pearson et al. (1986).
2 If the estimate has more than three intercepts, the largest, middle, and smallest intercepts are included.

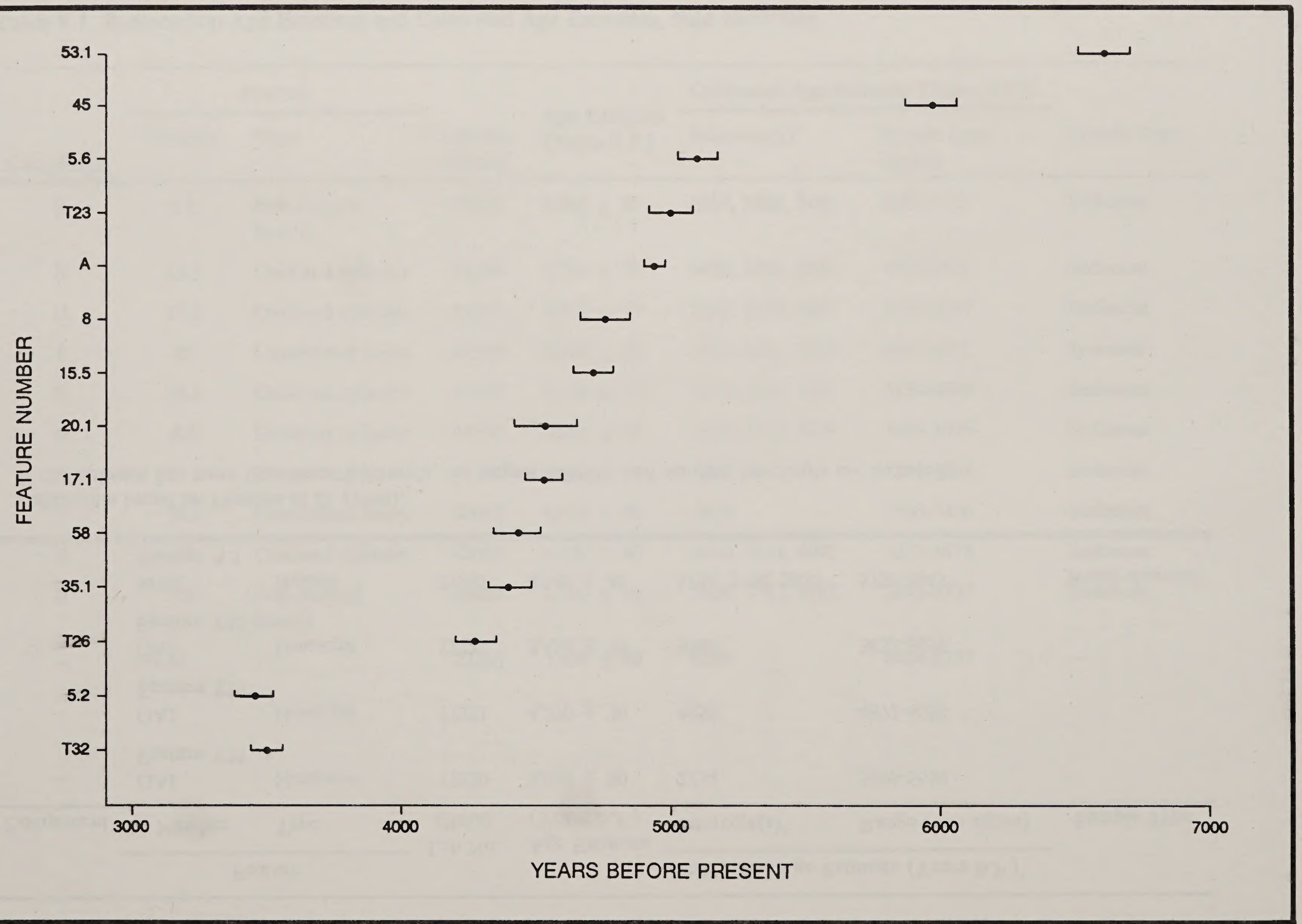


Figure 9.8 Plot of Uncorrected Radiocarbon Age Estimates Including One Sigma Value, Bald Knob Site.

obtained from the six housepits represent at least three different periods of occupation. Radiocarbon age estimates (4,400±80, 4,530±70, and 4,530±110 years B.P.) reflect one grouping of three housepits (Features 35, 17, and 20); a fourth housepit (Feature 15) had an age estimate of 4,710±70 years B.P.; and two housepits (Features A and 5) dated 4,940±40 and 5,100±80 years B.P. (Figure 9.8). Two more recent radiocarbon age estimates obtained from two housepits (Feature 5 and Feature T26 [OAI]) may not accurately date the housepits. Radiocarbon age estimates associated with the housepits are discussed in the individual feature descriptions in Section 9.4.1. Additional radiocarbon age estimates obtained from Component II outside the housepits and within the excavation block include a 4,760 year B.P. estimate from a hearth (Feature 8) near the northwest edge of the block; a 4,430 year B.P. estimate from a deep hearth at the southeast corner of the excavation; and an estimate of 3,500 years B.P. from a hearth (Feature 5.2) which was identified on the surface of a housepit (Feature 5) and which was probably intrusive into the housepit. Numerous cultural features (77), flaked and groundstone tools, debitage, heat-altered rock, and a small amount of animal bone were associated with Component II deposits.

The entire surface of the excavation block at the Bald Knob site was previously bladed concurrent with the excavation of the CO_2 pipeline trench. A few artifacts including six flaked stone tools and one groundstone tool were collected from the upper 0-15 cm of disturbed deposits. These artifacts may represent material disturbed from buried cultural deposits by the backhoe or may indicate an upper surficial or shallowly buried component that was disturbed by blading. The recovery by WWC in 1987 of an arrow point from disturbed deposits (Hoefer 1988), and the recovery of an arrowpoint fragment during the current project may indicate that a shallowly buried or surficial Late Prehistoric component existed prior to pipeline construction. Cultural remains collected from disturbed deposit were not assigned a component designation, although they are discussed in Section 9.5.

9.3 COMPONENT I RESULTS

Component I represented an Early Archaic period (Great Divide phase) component with radiocarbon age estimates of 6,600 and 5,980 years B.P. obtained from two cultural features. The two estimates indicate that the component encompassed occupations that span 600-700 years. Component I was associated with Stratum B and was present only on the south side of the pipeline trench. It was identified by a diffuse scatter of flaked stone and six cultural features, with most features moderately to extensively deflated. Artifacts associated with Component I include two flaked stone tools, one groundstone tool, 11 heat-altered rocks, and a small amount of debitage.

9.3.1 Cultural Features and Heat-altered Rock

Six small cultural features and 11 heat-altered rocks were recorded from Component I deposits. The features included two oxidized basins and four unoxidized basins. Table 9.2 summarizes the morphological characteristics of the Component I cultural features.

9.3.1.1 Oxidized Basins

Features 53.1 and 53.2 were two associated oxidized basins that were partially excavated near the southwest corner of the block. These features occurred immediately to the east and 20-30 cm deeper than a Component II housepit (Feature 35). The features extended below excavation units that contained Feature 35 and therefore were not completely investigated. Figure 9.9 shows plan view and cross section drawings of the two features. These features were oval to circular in plan view with basin-shaped cross sections. Feature fill consisted of darkly stained sediment with very little wood charcoal, and no heat-altered rock was associated. A few small, discontinuous areas of oxidation were noted on the features' walls. Feature 53.2 was excavated into Feature 53.1, indicating that it was slightly younger in age. A 6,610±90 years B.P. radiocarbon age estimate was obtained from a sediment sample collected from Feature 53.1. No artifacts were

Table 9.2 Characteristics of Cultural Features, Component I, Bald Knob Site.

Feature No.	Excavation Unit	Feature Type	Cross Section	Dimensions (cm)[1] L	W	D	Area (cm^2)	Volume (liter)	Oxidation	Rocks Type	No.	Wt.(kg)	Remarks
36	102-104N 102E, SW, NW	Unoxidized basin	Hemisphere	50	40	6	1,590	3.2	Absent	Sandstone	10	0.13	--
45	104N 108E,SW 104N 106E,SE	Unoxidized basin	Hemisphere	55	48	17	2,083	11.8	Absent	--	--	--	5,980±90 years B.P.
50	100N 112E,SE	Unoxidized basin	Hemisphere	50	38	10	1,521	5.1	Absent	--	--	--	--
53.1	100N 100-102E	Oxidized basin	Hemisphere	70	49*	20	--	--	Present	--	--	--	6,610±90 years B.P.; partially excavated
53.2	100N 100-102E	Oxidized basin	Hemisphere	45	32*	15	--	--	Present	--	--	--	Partially excavated, intrusive into Feature 53.1
55	100N 110E,SE	Unoxidized basin	Hemisphere	40	14*	8	--	--	Absent	--	--	--	Partially excavated

[1] L = Length, W = Width, D = Depth; * = incomplete dimension.

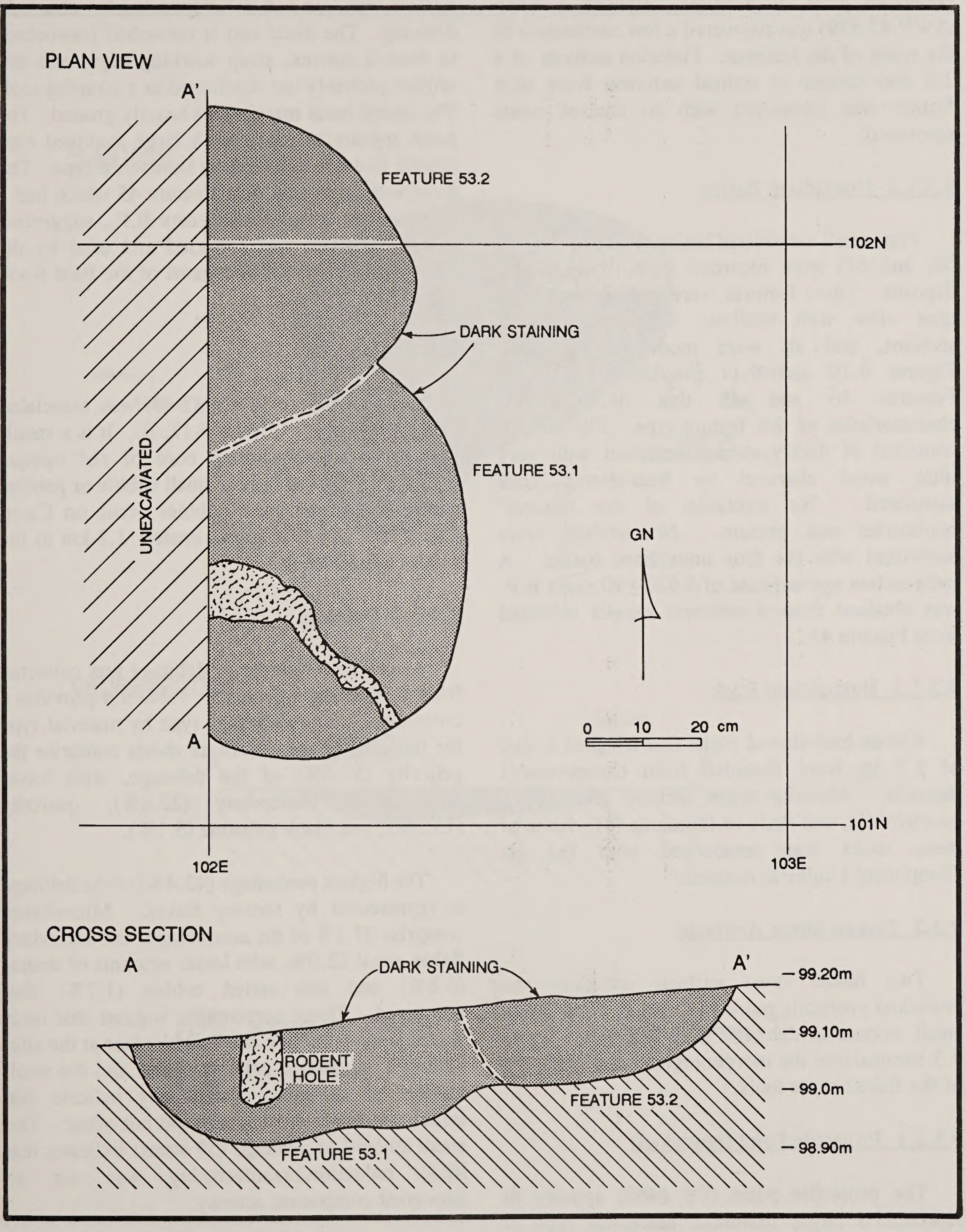


Figure 9.9 Plan Views and Cross Sections, Features 53.1 and 53.2, Component I, Bald Knob Site.

recovered from the features, although a mano (SW5982-579) was recovered a few centimeters to the south of the features. Flotation analysis of a 2.0 liter sample of stained sediment from each feature was completed with no charred seeds recovered.

9.3.1.2 Unoxidized Basins

Four small unoxidized basins (Features 36, 45, 50, and 55) were recorded from Component I deposits. These features were oval to circular in plan view with shallow, basin-shaped cross sections, and all were moderately deflated. Figures 9.10 and 9.11 provide drawings of Features 36 and 45 that illustrate the characteristics of this feature type. Fill of each consisted of darkly stained sediment with very little wood charcoal or heat-altered rock associated. No oxidation of the features' boundaries was present. No artifacts were associated with the four unoxidized basins. A radiocarbon age estimate of 5,980±90 years B.P. was obtained from a sediment sample collected from Feature 45.

9.3.1.3 Heat-altered Rock

Eleven heat-altered rocks that weighed a total of 5.7 kg were recorded from Component I deposits. Material types include granite (6), quartzite (1), and shale or limestone (4). None of these rocks were associated with the six Component I cultural features.

9.3.2 Flaked Stone Artifacts

Two flaked stone artifacts including one reworked projectile point and a small core, and a small amount of debitage were collected. Table 9.3 summarizes the morphological characteristics of the flaked stone tools.

9.3.2.1 Projectile Point (reworked)

The projectile point (FS #460) appears to represent a large, stemmed, lanceolate type of fine-grained quartzite (Figure 9.12, A). The artifact was lost and the figure is after the field drawing. The distal end is retouched (reworked) to form a convex, steep working edge, and this artifact probably last functioned as a scraping tool. The lateral basal margins are heavily ground. The point appears to represent a large stemmed type similar to a late Paleoindian Scottsbluff type. The point was recovered near Feature 45 which had a radiocarbon age of 5,980 years B.P., suggesting that this artifact was collected and used by the Early Archaic period occupants of the Bald Knob site.

9.3.2.2 Core

One small core (SW5982-45) was associated with Component I (Figure 9.12, B). It is a small, complete, multidirectional core of red opaque chert. It is derived from a small cobble or pebble, and similar small chert cobbles occur on Camp Creek Hill which is approximately 1.2 km to the north of Bald Knob.

9.3.2.3 Debitage

A total of 59 pieces of debitage was collected from Component I deposits. Table 9.4 provides a cross-tabulation of debitage type by material type for the assemblage. Various cherts comprise the majority (57.6%) of the debitage, with lesser amounts of chalcedony (22.0%), quartzite (15.3%), and black siltstone (5.1%).

The highest percentage (42.4%) of the debitage is represented by tertiary flakes. Microflakes comprise 27.1% of the assemblage, and secondary flakes equal 22.0%, with lesser amounts of shatter (6.8%) and one tested cobble (1.7%) also recovered. These percentages suggest that most flaked stone reduction stages took place at the site, although the lack of primary flakes and the small number of secondary flakes may indicate that initial raw material reduction did not occur. The small amount of debitage (59 items) indicates that lithic reduction/manufacturing was not an important component activity.

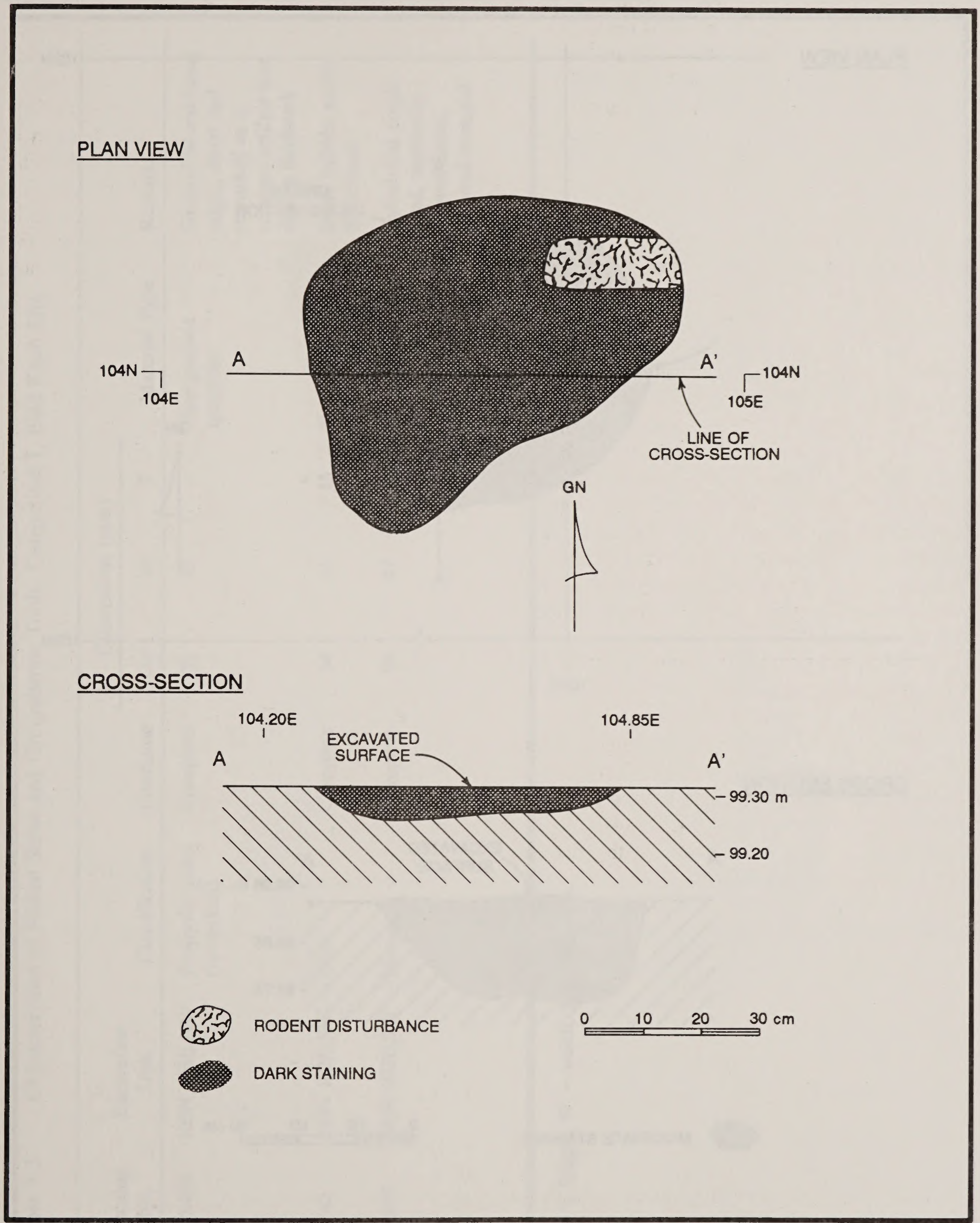


Figure 9.10 Plan View and Cross Section of Feature 36, Component I, Bald Knob Site.

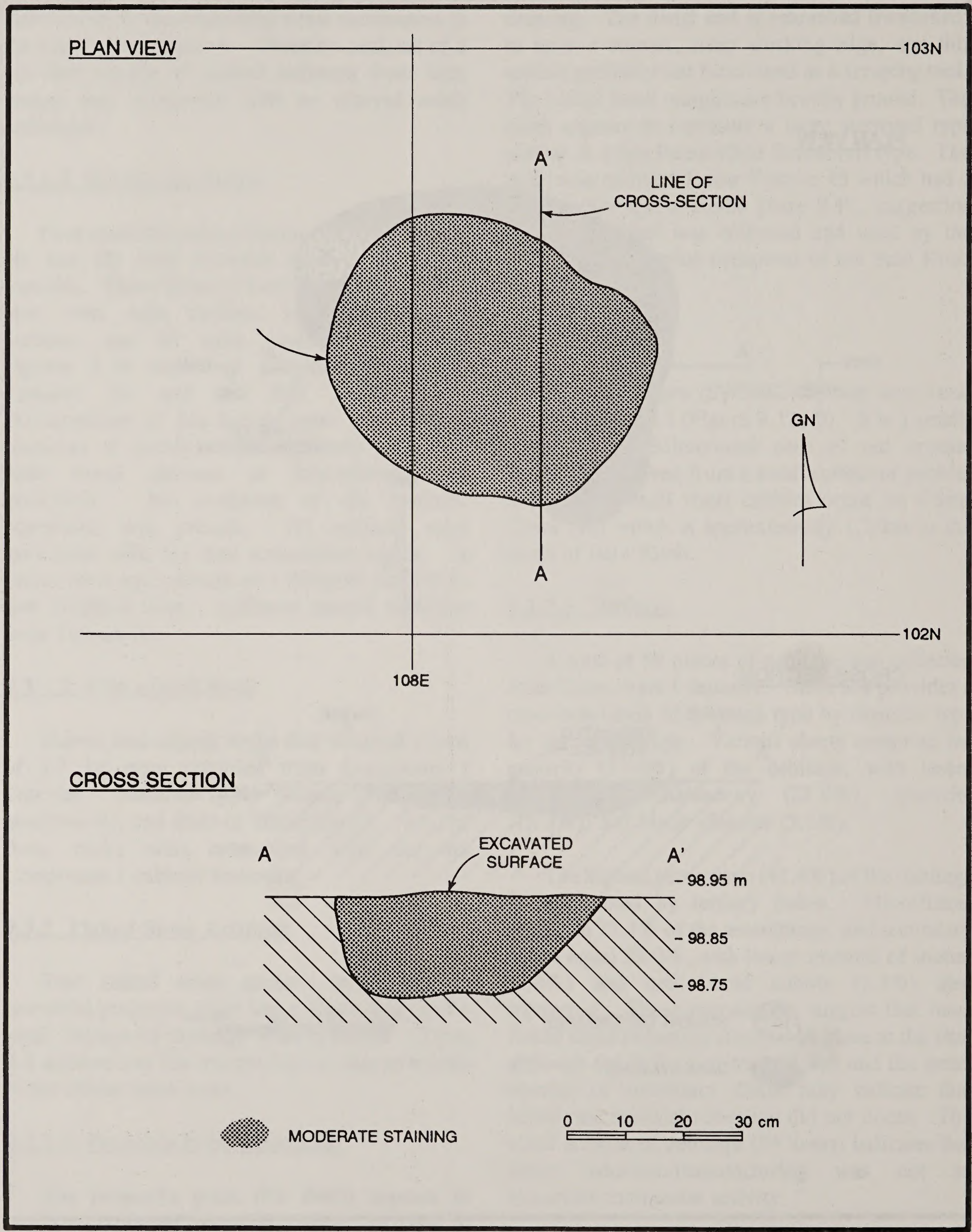


Figure 9.11 Plan View and Cross Section of Feature 45, Component I, Bald Knob Site.

Table 9.3 Characteristics of Flaked Stone and Groundstone Tools, Component I, Bald Knob Site.

Catalog No.	Excavation Unit	Classification	Condition	Dimensions (mm)[1]			Material Type	Remarks
				L	W	T		
FS460	100N 108E,NW	Projectile point (reworked)	Complete	51	25	--	Fine-grained quartzite	Ground lateral-basal edges, distal end reworked as a scraper; artifact lost during fieldwork
45	100N 102E,SW	Core	Complete	34	21	15	Red opaque chert	Small cobble, multi-directional
579	100N 102E,SW	Mano	Complete	98	67	57	Granite	Cylindrical, single hand, numerous ground facets, battered terminal ends

[1] L = length, W = width, T = thickness.

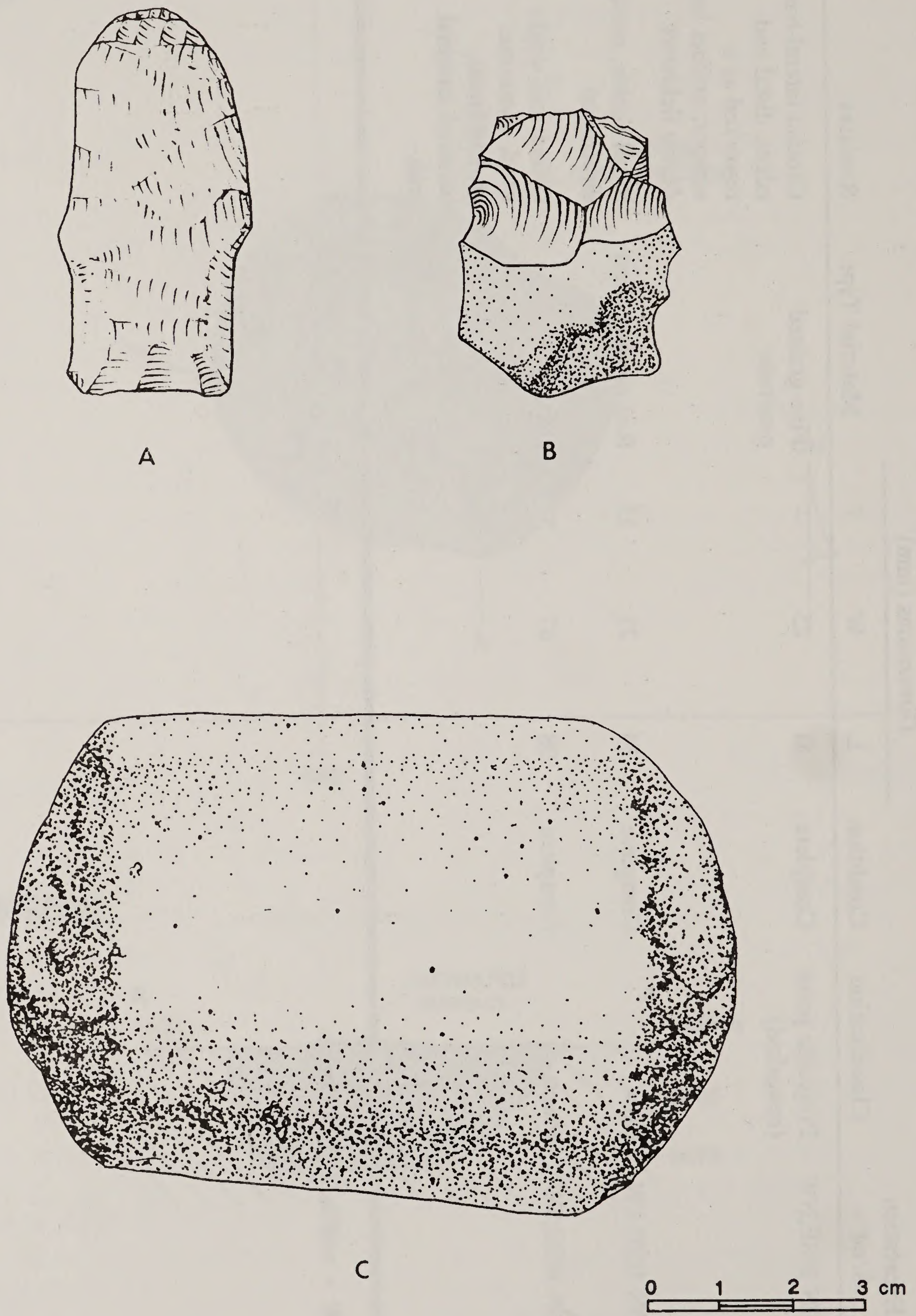


Figure 9.12 Selected Artifacts, Component I, Bald Knob Site. A) FS#460; B) SW5982-45; C) SW5982-579.

Table 9.4 Cross-Tabulation of Debitage Types by Material Type, Component I, Bald Knob Site.

Debitage Type	Material Type					
	Quartzite	White Chert	Clear Chalcedony	Black Siltstone	Other Chert	Total
Secondary Flake						
Number	0	0	1	0	12	13
Row %	0	0	7.7	0	92.3	
Column %	0	0	7.7	0	38.7	22.0
Tertiary Flake						
Number	4	2	3	2	14	25
Row %	16.0	8.0	12.0	8.0	56.0	
Column %	44.4	66.7	23.1	66.7	45.2	42.4
Microflake						
Number	4	1	7	1	3	16
Row %	25.0	6.2	43.8	6.2	18.8	
Column %	44.4	33.3	53.8	33.3	9.7	27.1
Shatter						
Number	0	0	2	0	2	4
Row %	0	0	50.0	0	50.0	
Column %	0	0	15.4	0	6.4	6.8
Tested Cobble						
Number	1	0	0	0	0	1
Row %	100.0	0	0	0	0	
Column %	11.1	0	0	0	0	1.7
Total						
Number	9	3	13	3	31	59
Row %	15.3	5.1	22.0	5.1	52.5	

9.3.3 Groundstone

One complete mano (SW5982-579) of granite was the only groundstone tool recovered from Component I (Table 9.3, Figure 9.9, C). It is a single hand mano that is cylindrical in shape, and it is heavily smoothed on all facets or margins. Both terminal ends evidence heavy crushing or battering from use.

9.3.4 Spatial Distribution of Cultural Remains

The distribution of cultural features and tools associated with Component I is shown is Figure 9.13. Tools which were not found in place are mapped in the centers of the unit from which they were recovered. Figure 9.13 also provides a trend density map showing the distribution of Component I debitage.

The feature/tool map indicates that all cultural features were recorded south of the pipeline trench, with most of the features located towards the southern edge of the block. A core and mano were recorded near Features 53.1 and 53.2, with a reworked projectile point collected south of Feature 45. The greatest density of debitage occurs immediately south of Features 53.1 and 53.2.

Interpretations of the distribution of the different classes of remains are limited by the paucity of remains. As indicated by the two tools and small concentration of debitage, an activity area may be present near Features 53.1 and 53.2, with no other particular patterns suggested by the artifact distributions. This possible activity area was only partially investigated, and it appears to extend to the west and south into areas uninvestigated during this project.

9.3.5 Component I Summary

Component I dates to the Early Archaic period (Great Divide phase), and radiocarbon age estimates of 6,600 and 5,980 years B.P. obtained from two cultural features indicate that multiple occupations are included. The single temporally diagnostic artifact is a reworked Paleoindian projectile point that was collected next to Feature 45, which was dated at 5,980 years B.P., indicating that a Paleoindian occupation is not represented by this artifact. The component was defined within the southern part of the block by a very sparse scatter of flaked stone artifacts with six small cultural features noted.

Debitage density was very low (< 1 flake/m^2), indicating that the occupations represented by Component I were of limited duration and/or intensity. The cultural deposits were moderately deflated with six cultural features including two oxidized basins and four small unoxidized basins recorded. The tool assemblage is limited, with one reworked projectile point (scraper), a small core, and a well-shaped mano included. The spatial distribution of Component I cultural remains suggests that one activity area may be present near the southwest corner of the block. This possible activity area extends outside of the excavation block and was only partially investigated.

The recovery of only a limited number of cultural remains suggests that Component I represented very short-term occupations. No subsistence remains (bone, charred seeds) were recovered, and very little evidence of types of activities and no evidence of season of occupation were recovered.

9.4 COMPONENT II RESULTS

Numerous radiocarbon age estimates obtained by Mariah indicate that multiple prehistoric occupations that represent terminal Early Archaic period/early Middle Archaic period (Green River phase) occupations were represented by Component II. Seven of the eight dates obtained by Mariah range from 4,400±80 to 5,100±80 years B.P., with one more recent estimate of 3,500±60 obtained. All temporally diagnostic artifacts (projectile points) represent Early Archaic period types, and it is possible that the most recent date (3,500 years B.P.) is not a reliable estimate, perhaps due to sample contamination. Most

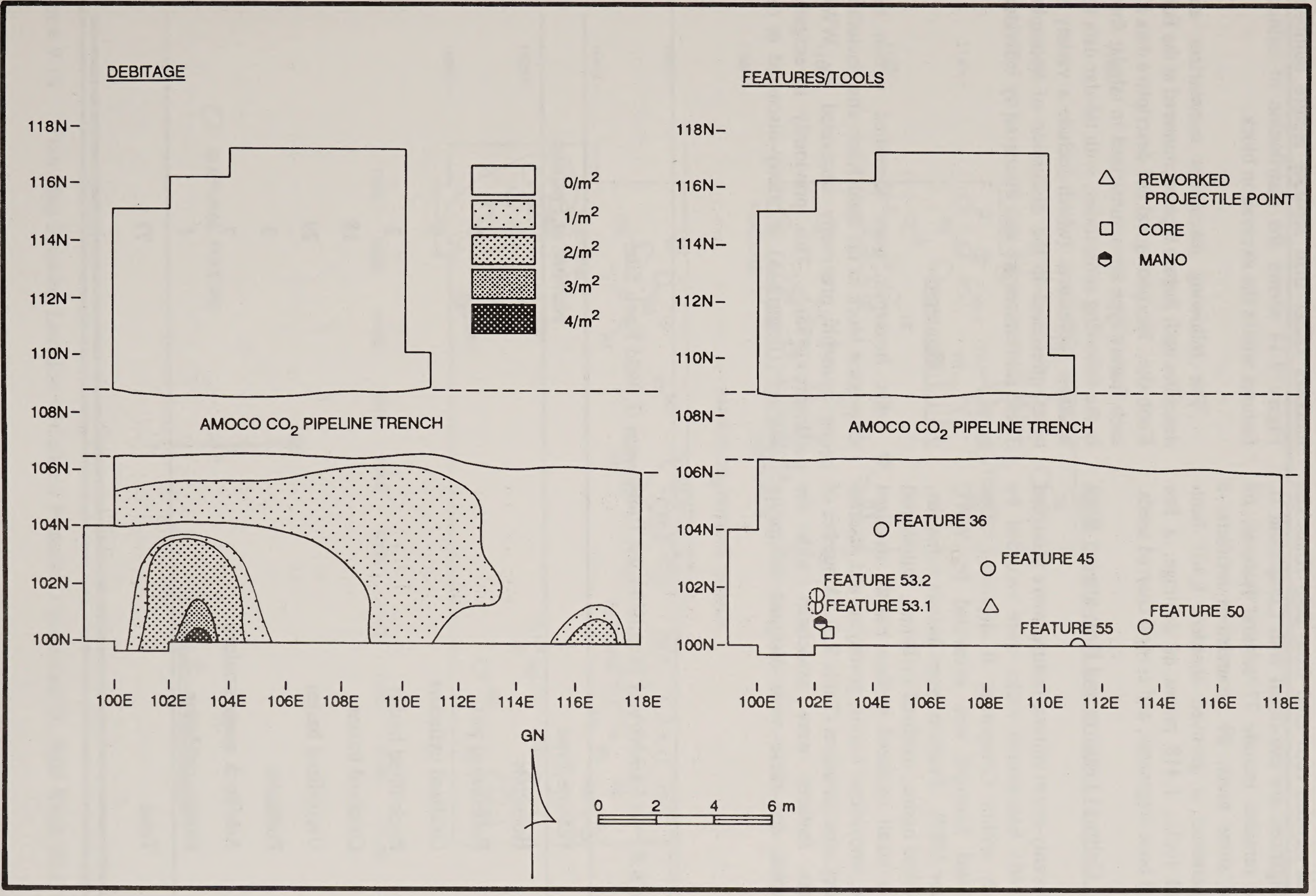


Figure 9.13 Plan Map with Features and Tools Plotted and Trend Density map for Total Debitage, Component I, Bald Knob Site.

cultural remains recovered from Bald Knob site investigations are associated with Component II. These remains include 77 cultural features; 63 flaked stone tools; 29 groundstone artifacts; a hammerstone; a grooved abrader; 1,401 heat-altered rocks; 1,418 pieces of debitage; a few animal bone fragments; and several charred seeds.

9.4.1 Cultural Features and Heat-altered Rock

Seventy-seven cultural features were identified and 1401 heat-altered rocks were recorded by Mariah within Component II deposits. One additional housepit was excavated by WWC (Hoefer 1988). Features types include housepits, rock-filled basins, oxidized cylinders, bell-shaped pits, a small oxidized surface hearth, oxidized basins, unoxidized basins, postholes, and discrete ash/rock concentrations (Table 9.5). A number of discrete features were associated with the housepits, and these were assigned subfeature numbers rather than separate feature numbers. Figure 9.14 shows the distribution of cultural features within the excavation block.

The following discussion summarizes and describes each feature type encountered at the Bald Knob site. Morphological and descriptive data for each feature type are summarized in tabular form in the following subsections, with tabular data for housepit subfeatures (which include a variety of types) presented in the discussion of housepits. These subfeatures are also discussed by individual types.

9.4.1.1 Housepits

Six housepits were identified within the excavation block at the Bald Knob site, including one housepit previously excavated by WWC (Hoefer 1988). This previously investigated housepit (Feature A) is briefly discussed at the

Table 9.5 Summary of Feature Types, Component II, Bald Knob Site.

Feature Type	Number of Features
Housepits	5
Bell-shaped pits	5
Oxidized cylinders	7
Rock-filled basins	2
Oxidized basins	18
Unoxidized basins	29
Postholes	3
Ash/Rock concentrations	7
Surface oxidation	1
Total	77

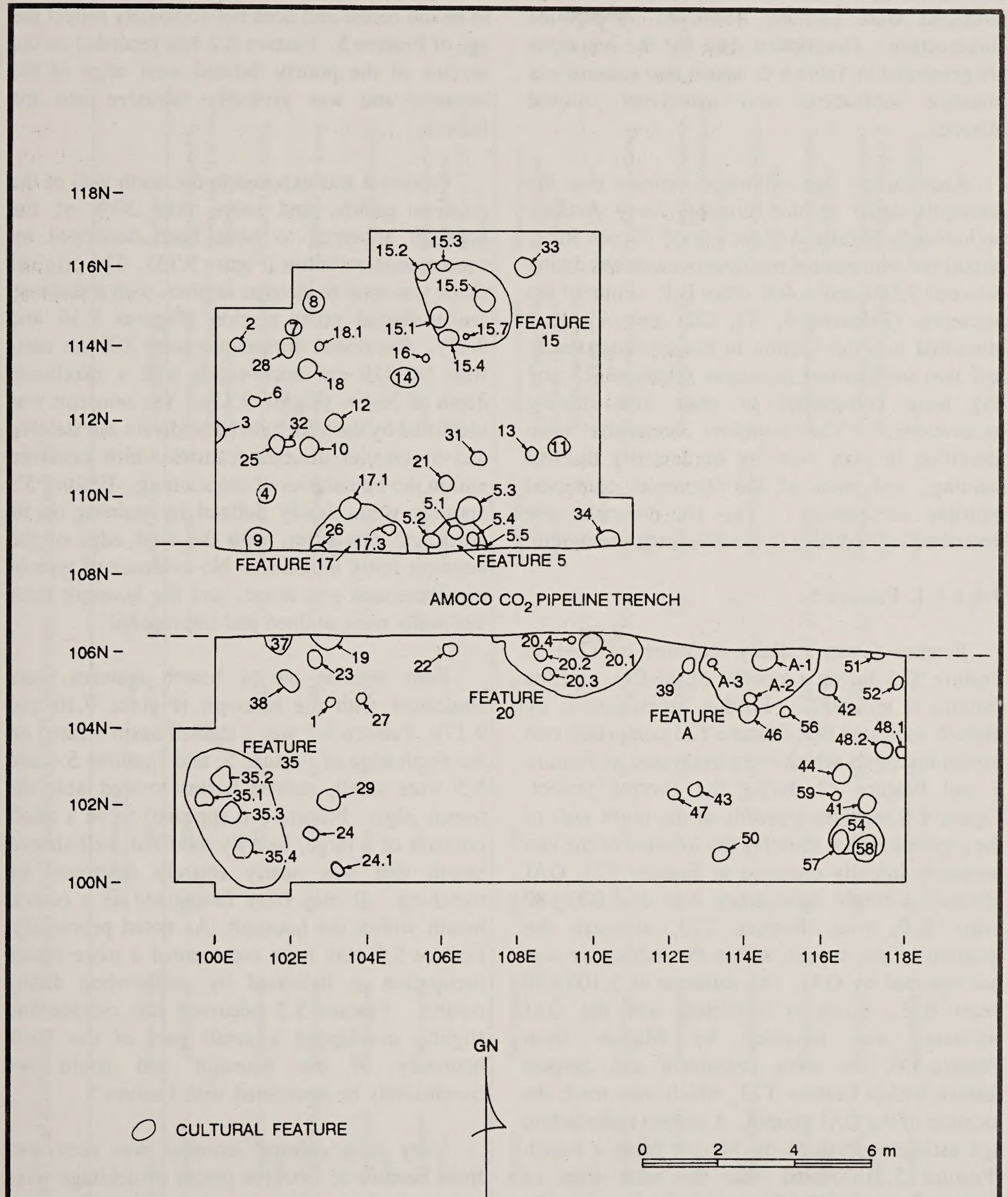


Figure 9.14 Plan Map Showing Location of Cultural Features, Component II, Bald Knob Site.

conclusion of this subsection. Four of the six housepits were partially destroyed by pipeline construction. Descriptive data for the housepits are presented in Table 9.6, which also summarizes housepit subfeatures and associated cultural material.

Radiocarbon age estimates indicate that the housepits dated to the terminal Early Archaic period/early Middle Archaic period (Green River phase) and represented multiple occupations dating between 5,100 and 4,400 years B.P. Four of the housepits (Features 5, 17, 20, and A) were identified in cross section in the pipeline trench, and two undisturbed housepits (Features 15 and 35) were recognized in plan view during excavations. The complete housepits were identified in plan view by horizontally discrete staining, and each of the housepits contained multiple subfeatures. The six housepits are described individually in the following discussion.

9.4.1.1.1 Feature 5

Feature 5 was initially recorded by OAI as Feature T23 during a monitor of the CO_2 pipeline (Moore et al. 1987). Further investigations by Mariah indicated that Feature T23 comprised two partial housepits which were excavated as Feature 5 and Feature 17 during the current project. Figure 9.6 includes a profile of the north wall of the pipeline trench showing the location of the two housepits initially recorded as Feature T23. OAI obtained a single radiocarbon date of 5,000±80 years B.P. from Feature T23, although the location of the sample within the subfeature was not reported by OAI. An estimate of 5,100±80 years B.P., which is consistent with the OAI estimate, was obtained by Mariah from Feature 5.6, the most prominent and deepest feature within Feature T23, which may mark the location of the OAI sample. A second radiocarbon age estimate obtained by Mariah from a hearth (Feature 5.2) located near the west edge of Feature 5 was 3,500±60 years B.P. Based on the concurrence of the two estimates obtained by Mariah and OAI and by relatively similar estimates obtained from other Bald Knob housepits, the estimate from Feature 5.2 appears to be too recent and does not accurately reflect the age of Feature 5. Feature 5.2 was recorded on the surface of the poorly defined west edge of the housepit and was probably intrusive into the feature.

Feature 5 was exposed in the north wall of the pipeline trench, and more than 50% of the housepit appeared to have been destroyed by construction activities (Figure 9.15). The original shape was oval to circular in plan, with a shallow, saucer-shaped cross section (Figures 9.16 and 9.17). Excavated dimensions were 200 cm east-west by 110 cm north-south with a maximum depth of 36 cm (Figure 9.18). The housepit was identified by discrete light to moderate ash staining and by smaller discrete features which occurred within the boundaries of the staining. Feature 5's margins were clearly defined by staining on its north and east sides, with the west edge of the housepit fairly indistinct. No evidence of type of superstructure was noted, and the housepit floor and walls were unlined and unprepared.

Four smaller pit or hearth features were associated with the housepit (Figures 9.16 and 9.17). Feature 5.1 was a stained basin located on the north edge of Feature 5, and Features 5.4 and 5.5 were small, stained basins located near the trench edge. Feature 5.6 appeared to be a small remnant of a large, heavily oxidized, bell-shaped hearth that was nearly entirely destroyed by trenching. It may have functioned as a central hearth within the housepit. As noted previously, Feature 5.2 may have represented a more recent occupation as indicated by radiocarbon dating results. Feature 5.3 occurred just outside and slightly overlapped a small part of the north boundary of the housepit and could not conclusively be associated with Feature 5.

Very little cultural material was recovered from Feature 5. Twelve pieces of debitage were collected from the housepit fill, with two additional flakes recovered from Feature 5.6. Approximately 30 small heat-altered rock fragments (0.5 kg total) of sandstone and granite

Table 9.6 Characteristics of Housepits and Subfeatures, Component II, Bald Knob Site.

Feature No.	Type	Cross Section	Dimensions (cm)[1] L	W	D	Area (cm^2)	Volume (liters)	Oxidation	Cultural Remains	Remarks
5	Housepit	Hemisphere	170*	100*	36	--	--	Absent	14 flakes; four sub-features; 30 heat-altered rocks, 0.5 kg	Heavily impacted by trench; east ½ of OAI Feature T23
5.1	Unoxidized basin	Hemisphere	52	52	13	2,124	9.2	Absent	Four heat-altered rocks, 1.5 kg	Housepit sub-feature
5.4	Oxidized basin	Hemisphere	35	35	10	962	3.2	Present, upper edge	None	Housepit sub-feature
5.5	Unoxidized basin	Hemisphere	26	23	14	471	2.2	Absent	None	Housepit sub-feature
5.6	Bell-shaped hearth	Bell-shaped	--	40*	43	--	--	Present, all edges	None	Heavily impacted by trench; housepit subfeature; 5,100± 80 years B.P.
15	Housepit	Indeterminate	300	300	--	70,686	--	Small area--center of housepit	47 flakes, 1 projectile point, one utilized flake, two cores, two small-medium mammal bones, six subfeatures	Extensive rodent disturbance and deflation
15.1	Oxidized cylinder	Cylindrical	79	75	57	4,657	265.4	Present, all edges	19 flakes, one core	Housepit sub-feature
15.2	Unoxidized basin	Hemisphere	44	40	12	1,385	5.5	Absent	One heat-altered rock	Housepit sub-feature; very disturbed; one core associated
15.3	Oxidized basin	Indeterminate	--	66	18	--	--	Present, upper edge	None	Housepit sub-feature; very disturbed
15.4	Unoxidized basin	Hemisphere	80	75	7	4,717	11.0	Absent	One core, one flake	Housepit subfeature; very disturbed
15.5	Bell-shaped hearth	Bell-shaped	75	75	49	4,418	143	Present, all edges	Eight flakes, two small-medium mammal bones	Housepit subfeature; 4,710±70 years B.P.
15.7	Posthole	Hemisphere	14	14	6	154	0.3	None	None	Housepit subfeature

Table 9.6 (continued)

Feature No.	Type	Cross Section	Dimensions (cm)[1] L	W	D	Area (cm^2)	Volume (liters)	Oxidation	Cultural Remains	Remarks
17	Housepit	Hemisphere	280	100	25	--	--	Absent	Five flakes, one core, two retouched flakes, one utilized flake, three subfeatures	Heavily impacted by trench; W½ of OAI Feature T23
17.1	Oxidized basin	Cylindrical	74	70	37	4,072	50.2	Present, all edges	One flake	Housepit subfeature, 4,530±70 years B.P.
17.3	Unoxidized basin	Hemisphere	38	25	20	779	5.2	Absent	None	Housepit subfeature
26	Bell-shaped pit (possible)	Indeterminate	--	40	15	--	--	Present, all edges	None	Probable housepit sub-feature; heavily impacted by trench
20	Housepit	Hemisphere	230*	175*	44	--	--	Present, two discrete areas on housepit floor	165 flakes, one hammerstone, eight heat-altered rocks, 19 bone or tooth frag-ments, four subfeatures	Heavily impacted by trench; W½ of OAI Feature T26
20.1	Oxidized cylinder	Cylindrical w/ lip	75	73	50	4,902	91.3	Present, all sides	46 flakes, one hammerstone, three bone fragments	Subfeature (central hearth) within housepit; impacted by trench; 4,530±110 years B.P.
20.2	Unoxidized basin	Hemisphere	40	39	18	1,225	7.4	Absent	One heat-altered rock	Housepit subfeature
20.3	Unoxidized basin	Hemisphere	34	25	16	684	3.7	Absent	None	Housepit subfeature
20.4	Posthole	Hemisphere	14	14	6	154	0.3	Absent	None	Housepit subfeature; adjacent to central hearth
35	Housepit	Hemisphere	330	250	54	21,025	378.4	Present, center of housepit (Feature 35.3)	Seven flakes, one retouched flake, one utilized flake, one mano, four sub-features	--
35.1	Unoxidized basin	Hemisphere	52	39	17	1,626	9.2	Absent	None	Housepit subfeature; 4,400±80 years B.P.

Table 9.6 (continued)

Feature No.	Type	Cross Section	Dimensions (cm)[1] L	W	D	Area (cm^2)	Volume (liters)	Oxidation	Cultural Remains	Remarks
35.2	Unoxidized basin	Hemisphere	68	51	16	2,781	14.8	Absent	None	Housepit subfeature
35.3	Surface oxidation	Indeterminate	84	74	13	4,901	--	Present, two layers	None	Housepit subfeature; probable central hearth
35.4	Oxidized basin	Hemisphere	65	52	20	2,688	17.9	Present, upper edge	None	Housepit subfeature
A (from Hoefer 1988)	Housepit	Hemisphere	310	137	24	--	--	Present, wells	35 pieces debitage, one utilized flake, one bone, two grooved abrader fragments, three sub-features	Heavily impacted by trench; E½ of OAI Feature T26
A.1	Oxidized cylinder	Cylindrical	80	69	53	--	--	Present, wells	Six pieces debitage, one utilized flake, one bone	Housepit subfeature; central hearth; 4,940±40 years B.P.
A.2	Unoxidized basin	Hemisphere	31	22	13	--	--	Absent	None	Housepit subfeature
A.3	Unoxidized basin	Hemisphere	18	16	8	--	--	Absent	None	Housepit subfeature

[1] L = length, W = width, D = depth; * = incomplete dimensions.

Figure 9.15 North Wall of Pipeline Trench Showing Cross Section of Feature 5 Facing North, Component II, Bald Knob Site.

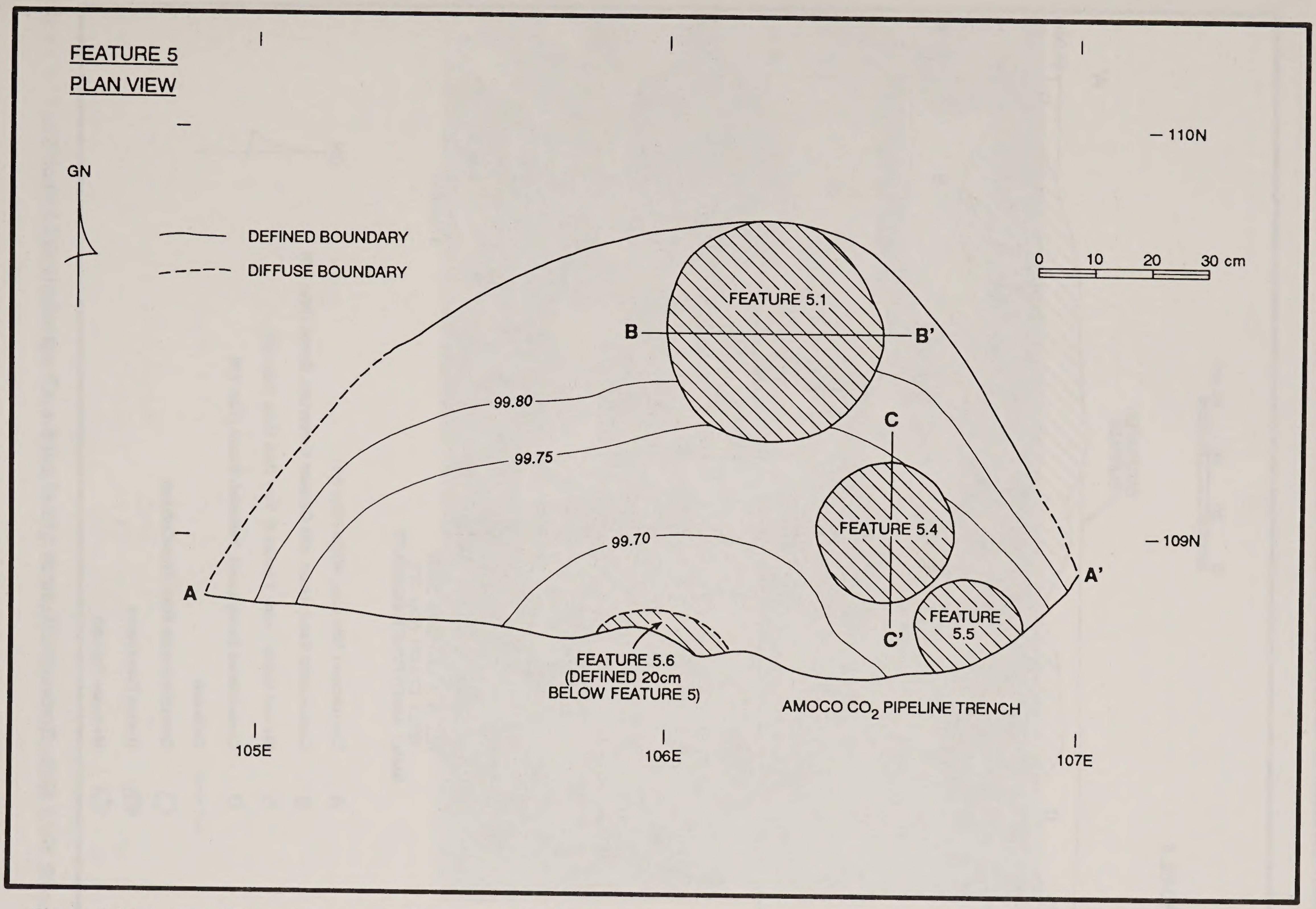


Figure 9.16 Plan View of Feature 5, Component II, Bald Knob Site.

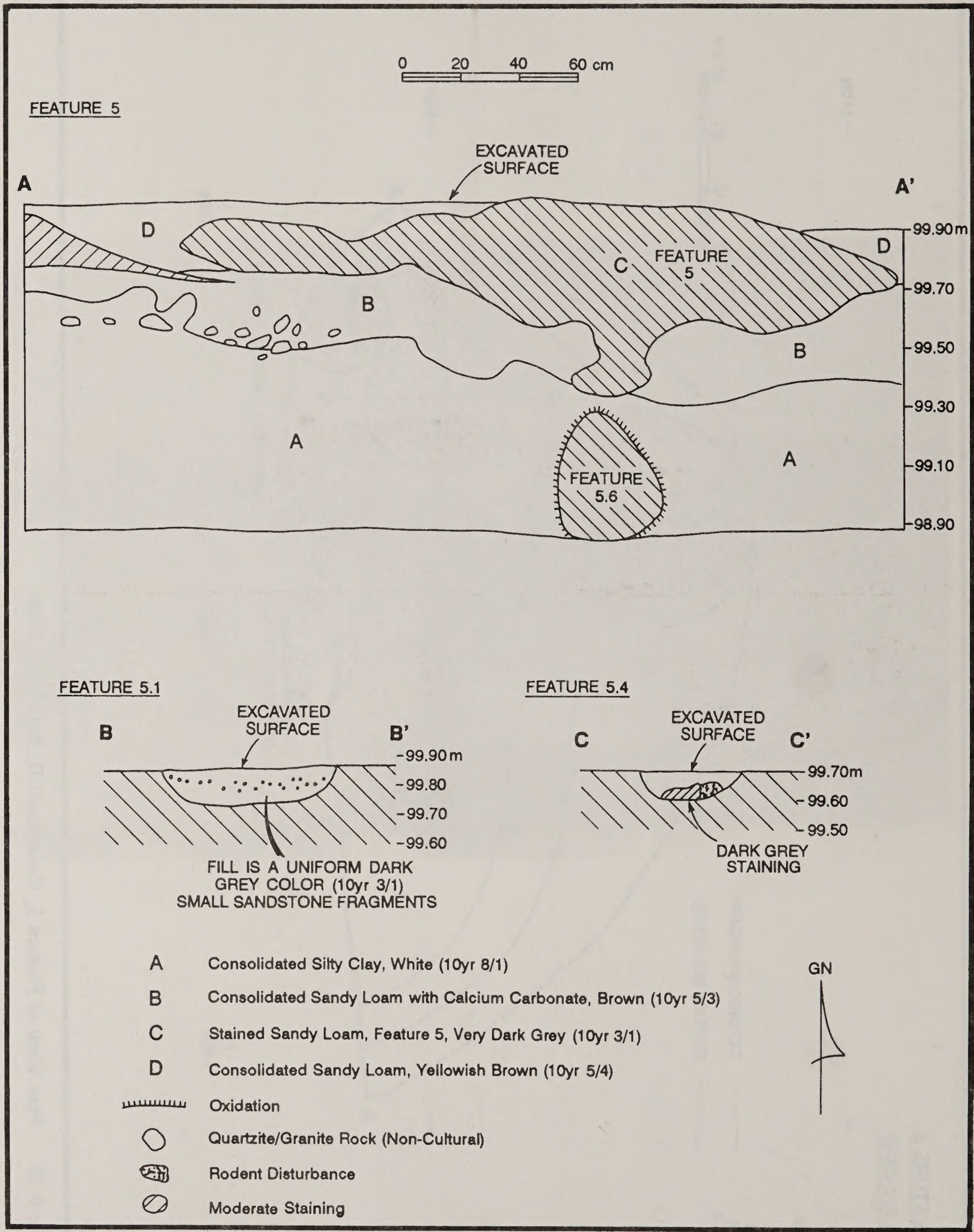


Figure 9.17 Cross Sections of Features 5, 5.1, and 5.4, Component II, Bald Knob Site.

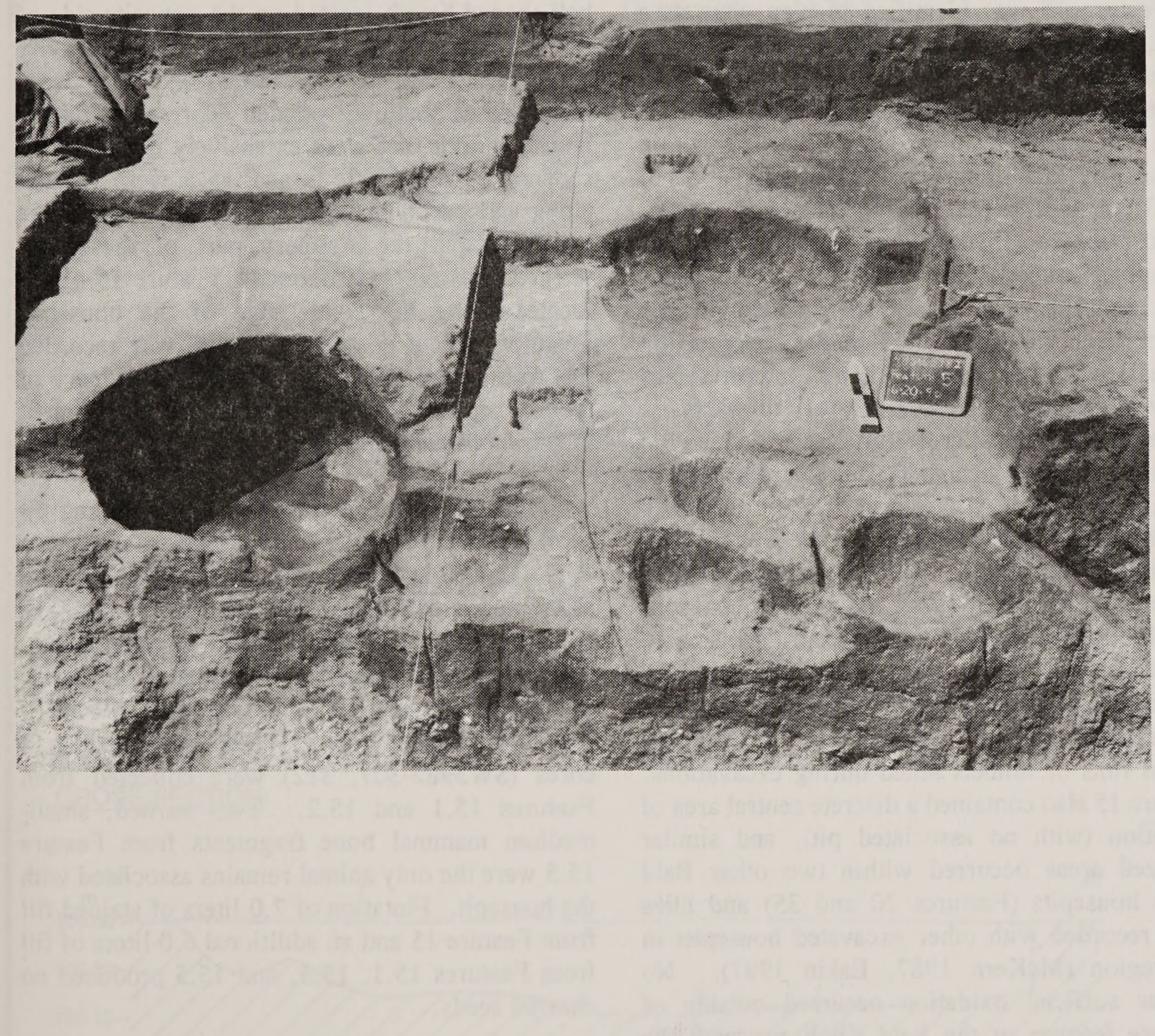


Figure 9.18 View of Feature 5 After Excavation Facing North, Component II, Bald Knob Site.

were recorded within the feature, although additional amounts of rock were noted within the subfeatures (Table 9.6). No tools or bone were recovered from the fill of Feature 5. Flotation of 6.0 liters of sediment from subfeatures within Feature 5 recovered no charred seeds.

9.4.1.1.2 Feature 15

Feature 15 was identified in plan view as a large, discrete, nearly circular area of staining (Figures 9.19 and 9.20). It occurred within 10 to 20 cm of the present ground surface. Six smaller basin or hearth features were recorded within Feature 15. Plan dimensions of the stain were 300 x 280 cm, with depth ranging from 5 to 20 cm. In cross section (Figure 9.19), Feature 15 lacked a basin or saucer-shaped form that is typical of most housepits previously investigated in the region (Hoefer 1988). Although the cross section of Feature 15 was atypical, it was interpreted as likely representing a structure, probably a housepit. The smaller features recorded within Feature 15 were located on the margins of the stain, and post-occupation erosion likely obliterated portions of the exterior walls. The remaining discretely stained area probably represented a portion of the floor of the housepit. Possible indications of the housepit walls were evident only on the northern edge of Feature 15 (Figure 9.19). Numerous rodent disturbances traversed Feature 15, with at least 13 discrete rodent runs or tunnels noted during excavations. Feature 15 also contained a discrete central area of oxidation (with no associated pit), and similar oxidized areas occurred within two other Bald Knob housepits (Features 20 and 35) and have been recorded with other excavated housepits in the region (McKern 1987, Eakin 1987). No similar surficial oxidation occurred outside of discrete features at the Bald Knob site with the exception of the three housepits. The single radiocarbon age estimate (4,710±70 years B.P.) obtained from the Feature 15 is consistent with age estimates obtained from housepits investigated at the Bald Knob site, and from other dated housepits within the region (Smith and Reust 1992).

Two deep oxidized hearths (Features 15.1 and 15.5); three shallow, disturbed basins (Features 15.2, 15.3, and 15.4); one possible posthole (Feature 15.7); and one central oxidized area were recorded within the housepit (Figures 9.19 and 9.21). The six features were located around the margins of Feature 15. Feature 15.1 was a deep, cylindrical hearth located on the west edge of the housepit, and Feature 15.5 was a deep, slightly bell-shaped hearth located on the opposite side of the structure. Both features were heavily oxidized. Features 15.2, 15.3, and 15.4 were identified as shallow, rounded depressions on the housepit floor that were extensively disturbed by rodents. Features 15.2 and 15.3 were located along and partially defined the north wall of the housepit, and the southern part of these two features was not well-defined. Feature 15.4 was located along the south edge of the housepit; Feature 15.7, a possible posthole, was recorded just to the west of Feature 15.4. No evidence of type of superstructure was noted, and the floor of the structure was unlined and unprepared.

Forty-seven pieces of debitage, including 19 flakes from Feature 15.1, one flake from Feature 15.4, and eight flakes from Feature 15.5, were associated with Feature 15. Most of the debitage consisted of small tertiary flakes or microflakes. Flaked stone tools recovered from the housepit fill include one projectile point fragment (SW5982-137) and a utilized flake (SW5982-313), and small cores (SW5982-307, 312) were collected from Features 15.1 and 15.2. Two burned, small-medium mammal bone fragments from Feature 15.5 were the only animal remains associated with the housepit. Flotation of 7.0 liters of stained fill from Feature 15 and an additional 6.0 liters of fill from Features 15.1, 15.3, and 15.5 produced no charred seeds.

9.4.1.1.3 Feature 17

Feature 17 represented the west portion of Feature T23 as recorded by OAI during trench monitoring (Moore et al. 1987). Approximately 50% of the housepit was destroyed by trenching, and excavated dimensions were 280 cm east-west

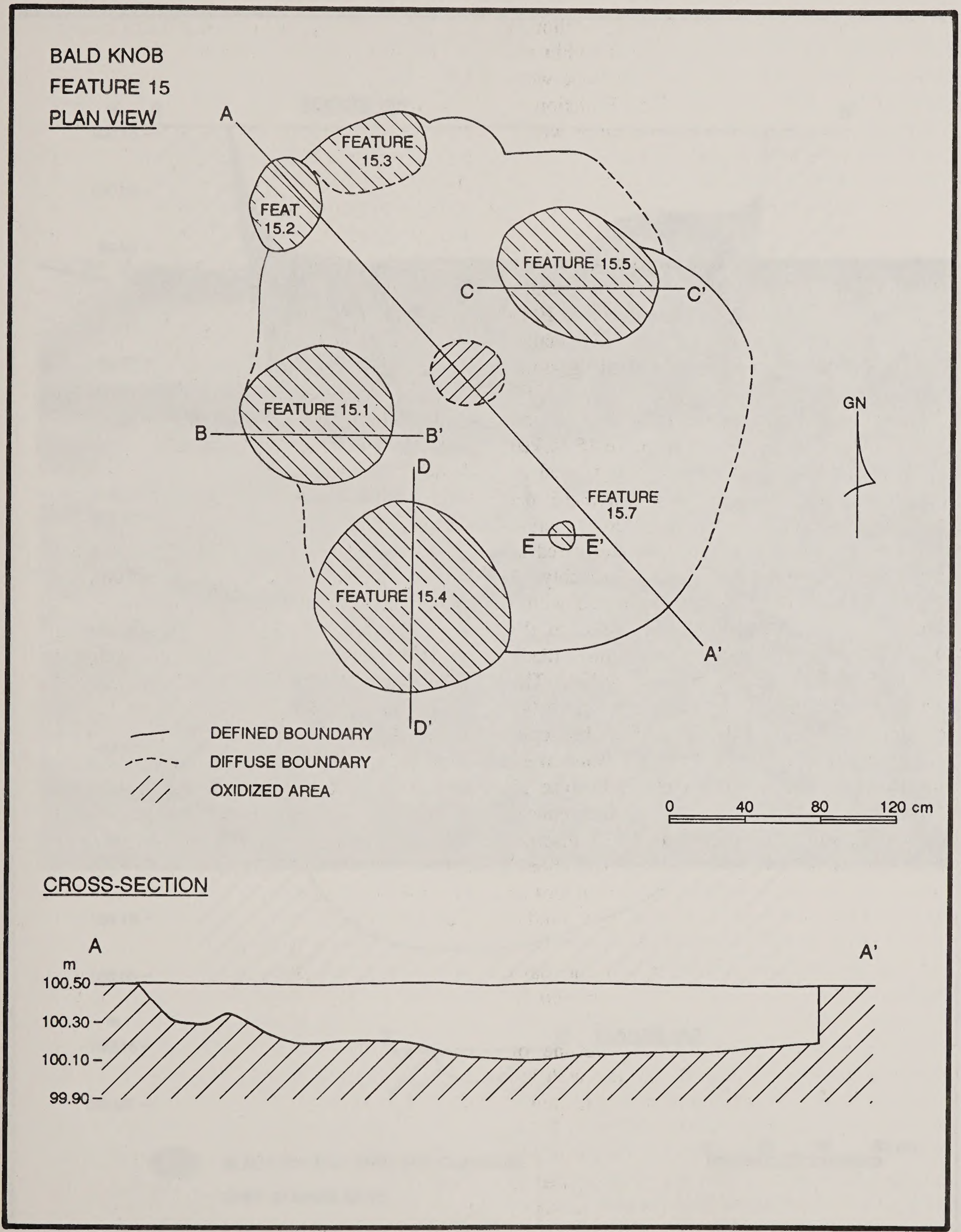


Figure 9.19 Plan View and Cross Section of Feature 15, Component II, Bald Knob Site.

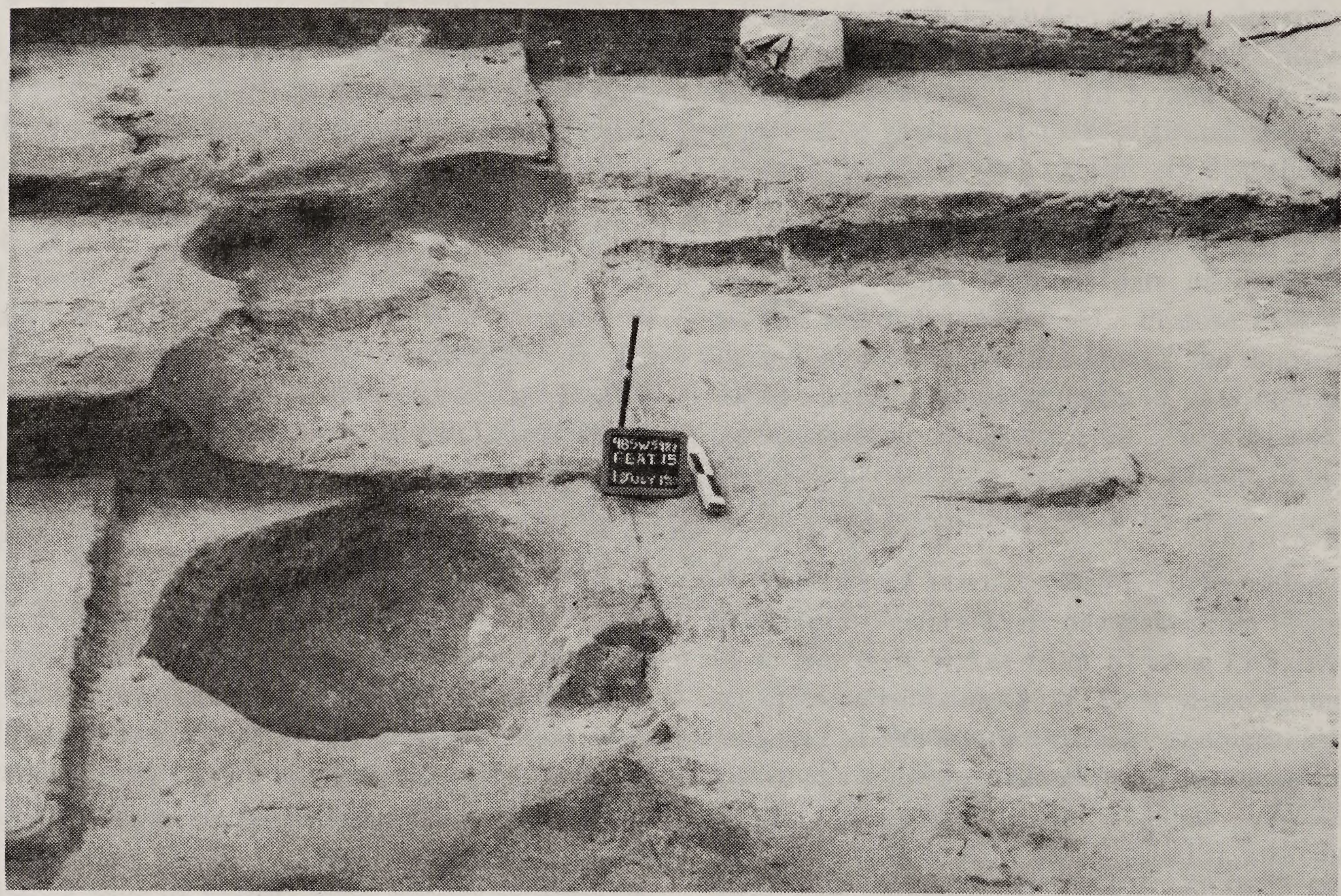


Figure 9.20 Feature 15 Facing North, Component II, Bald Knob Site.

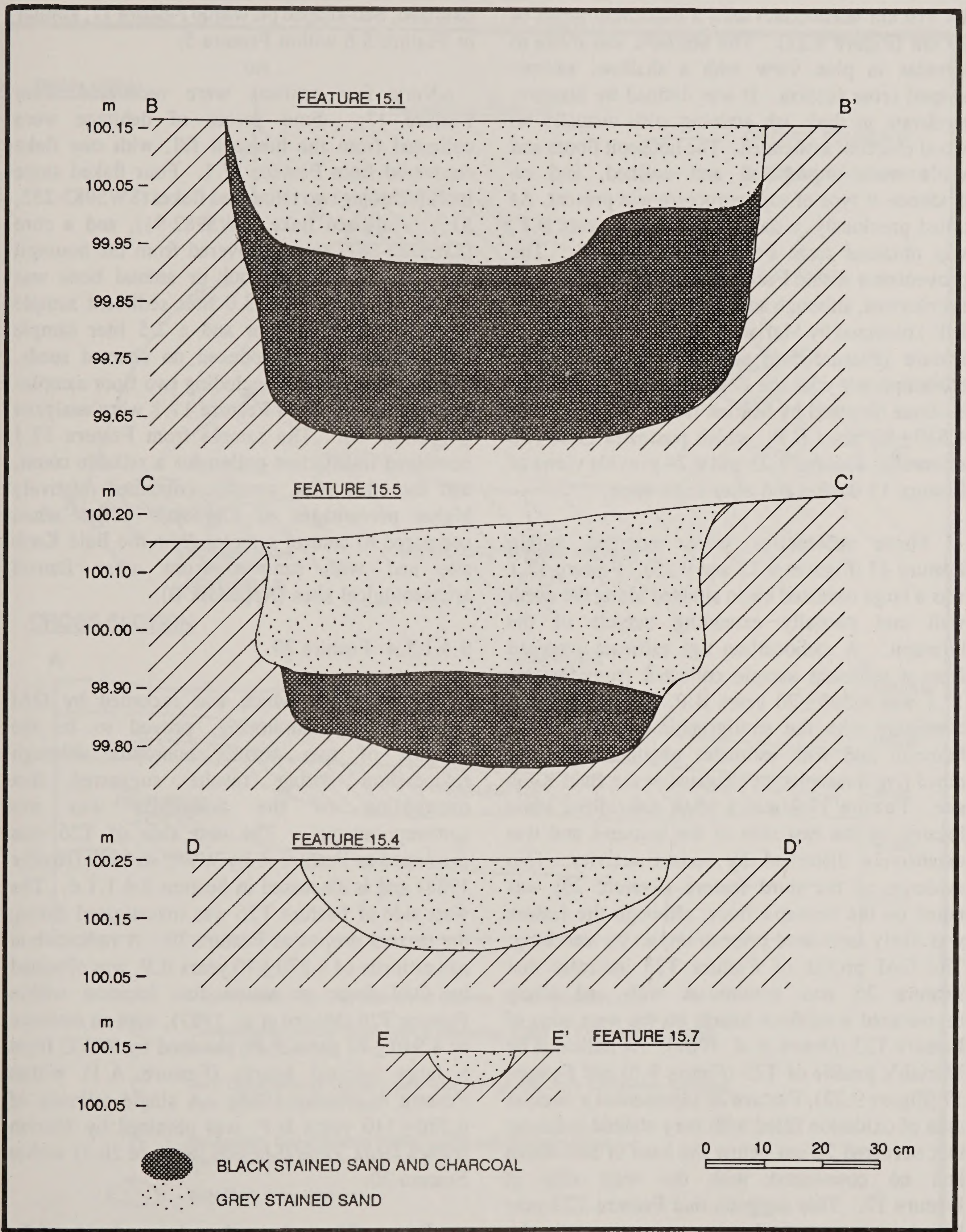


Figure 9.21 Cross Sections of Features 15.1, 15.4, 15.5, and 15.7, Component II, Bald Knob Site.

by 110 cm north-south with a maximum depth of 25 cm (Figure 9.22). The housepit was ovate to circular in plan view with a shallow, saucer-shaped cross section. It was defined by discrete, moderate to dark ash staining with virtually no wood charcoal associated. The housepit floors and walls were unprepared and unlined, and no evidence of type of superstructure was present. As noted previously, a date of 5,000±80 years B.P. was obtained from Feature T23 by OAI. The provenience within Feature T23 of the OAI sample is unknown, although an estimate (5,100±80 years B.P.) obtained by Mariah from the most prominent feature (Feature 5.6) within Feature T23 was contemporary with the OAI estimate. The single estimate obtained by Mariah from Feature 17 was 4,530±80 years B.P., which postdates these two estimates. Figures 9.23 and 9.24 provide views of Feature 17 during and after excavation.

Three subfeatures were recorded within Feature 17 (Figures 9.22 and 9.25). Feature 17.1 was a large oxidized basin situated along the north wall and partially extending outside of the housepit. A radiocarbon age estimate returned from a sediment sample collected from Feature 17.1 was 4,530±70 years B.P. The estimate is consistent with the stratigraphic location of the housepit and with estimates obtained from the other five housepits investigated at the Bald Knob site. Feature 17.3 was a small unoxidized basin located on the east side of the housepit and was extensively disturbed by rodent activity. No evidence of the third feature (Feature 26) was noted on the housepit floor, although the feature was likely associated prior to impact by trenching. The OAI profile of Feature T23 indicates that Feature 26 was continuous with and likely represented a subfloor hearth on the west edge of Feature T23 (Moore et al. 1987). As indicated by Mariah's profile of T23 (Figure 9.6) and Feature 17 (Figure 9.22), Feature 26 represented a circular area of oxidation filled with very stained sediment that occurred 20 cm below the base of and which had no connection with the west side of Feature 17. This suggests that Feature T23 may have been impacted subsequent to the recording by OAI. Feature 26 probably represented a large, oxidized, bell-shaped pit within Feature 17, similar to Feature 5.6 within Feature 5.

Very few artifacts were recovered from Feature 17. Four pieces of debitage were collected from the housepit fill, with one flake recovered from Feature 17.1. Four flaked stone tools including two retouched flakes (SW5982-252, 515), a utilized flake (SW5982-91), and a core (SW5982-287) were recovered from the housepit fill. No heat-altered rock or animal bone was noted. Flotation of a 3.0 liter sediment sample from the housepit floor and a 2.5 liter sample from Feature 17.1 produced no charred seeds. Three pollen samples including two floor samples and one sample from Feature 17.1 were analyzed (Appendix B). The sample from Feature 17.1 contained insufficient pollen for a reliable count, and the other two samples contained relatively higher percentages of Cheno-am pollen when compared to control samples from the Bald Knob site and with samples from other Bairoil archaeological sites (Appendix B).

9.4.1.1.4 Feature 20

Feature T26, which was recorded by OAI during trench monitoring, proved to be the remains of two distinct housepits although radiocarbon dating results suggested that occupation of the housepits was not contemporaneous. The east side of T26 was excavated as Feature A by WWC in 1987 (Hoefer 1988) and is discussed in Section 9.4.1.1.6. The west side of Feature T26 was investigated during the current project as Feature 20. A radiocarbon age estimate of 4,270±70 years B.P. was obtained by OAI from an unspecified location within Feature T26 (Moore et al. 1987), with an estimate of 4,940±40 years B.P. obtained by WWC from a large internal hearth (Feature A.1) within Feature A (Hoefer 1988). A single estimate of 4,530±110 years B.P. was obtained by Mariah from a large, central hearth (Feature 20.1) within Feature 20.

Feature 20 was located on the south side of the Amoco CO_2 pipeline trench, with an estimated

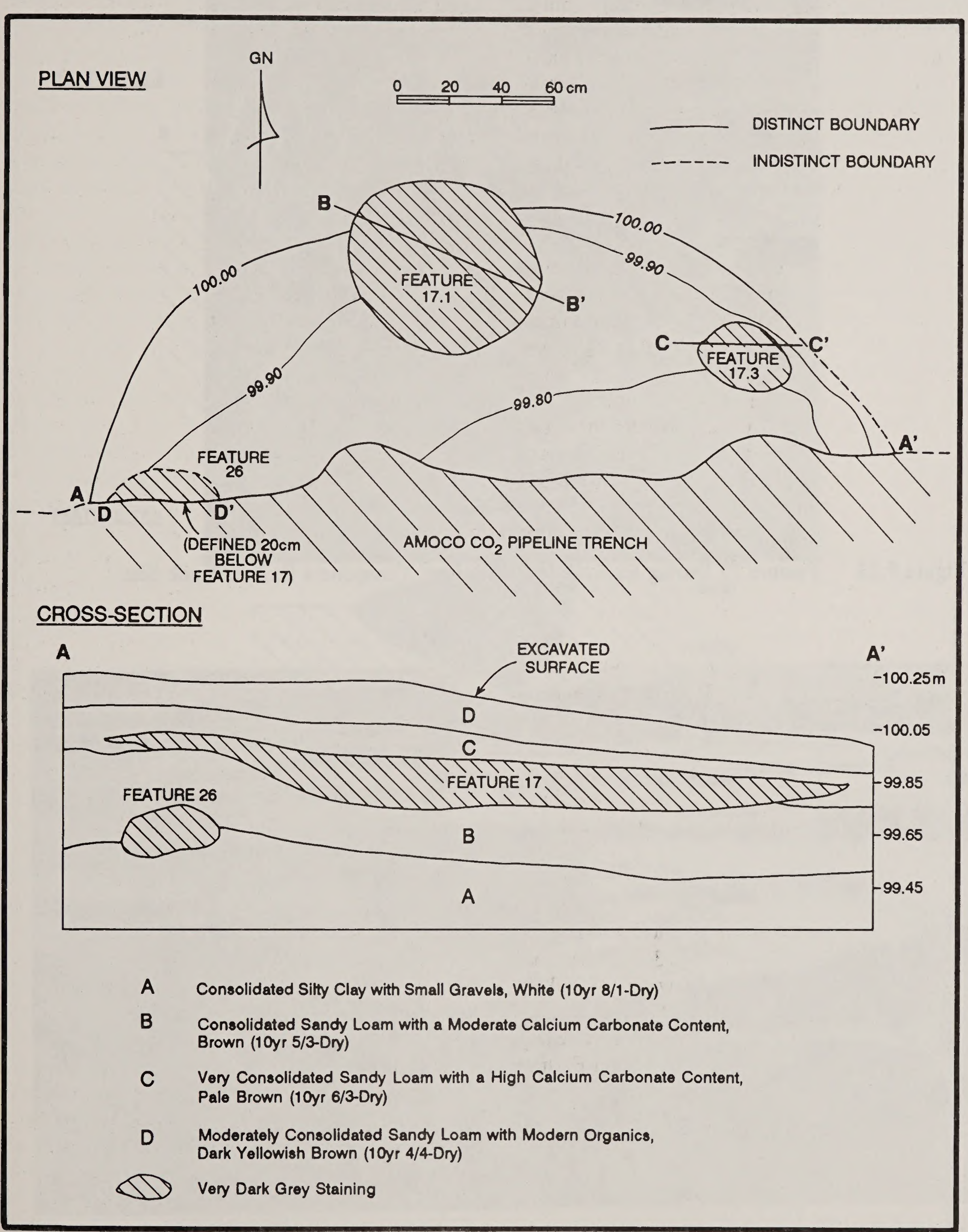


Figure 9.22 Plan View and Cross Section of Feature 17, Component II, Bald Knob Site.

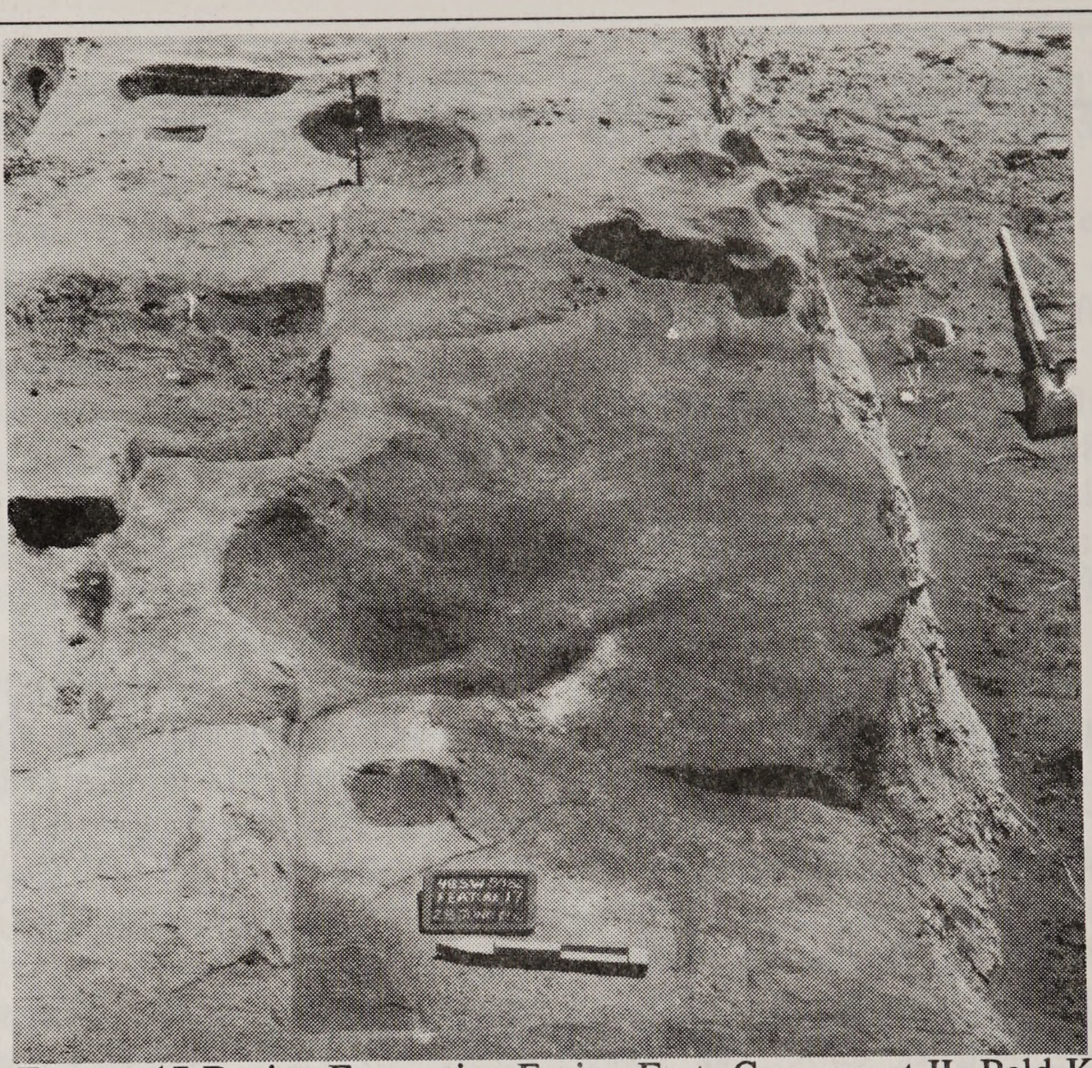


Figure 9.23 Feature 17 During Excavation Facing East, Component II, Bald Knob Site.

Figure 9.24 Feature 17 After Excavation Facing North, Component II, Bald Knob Site.

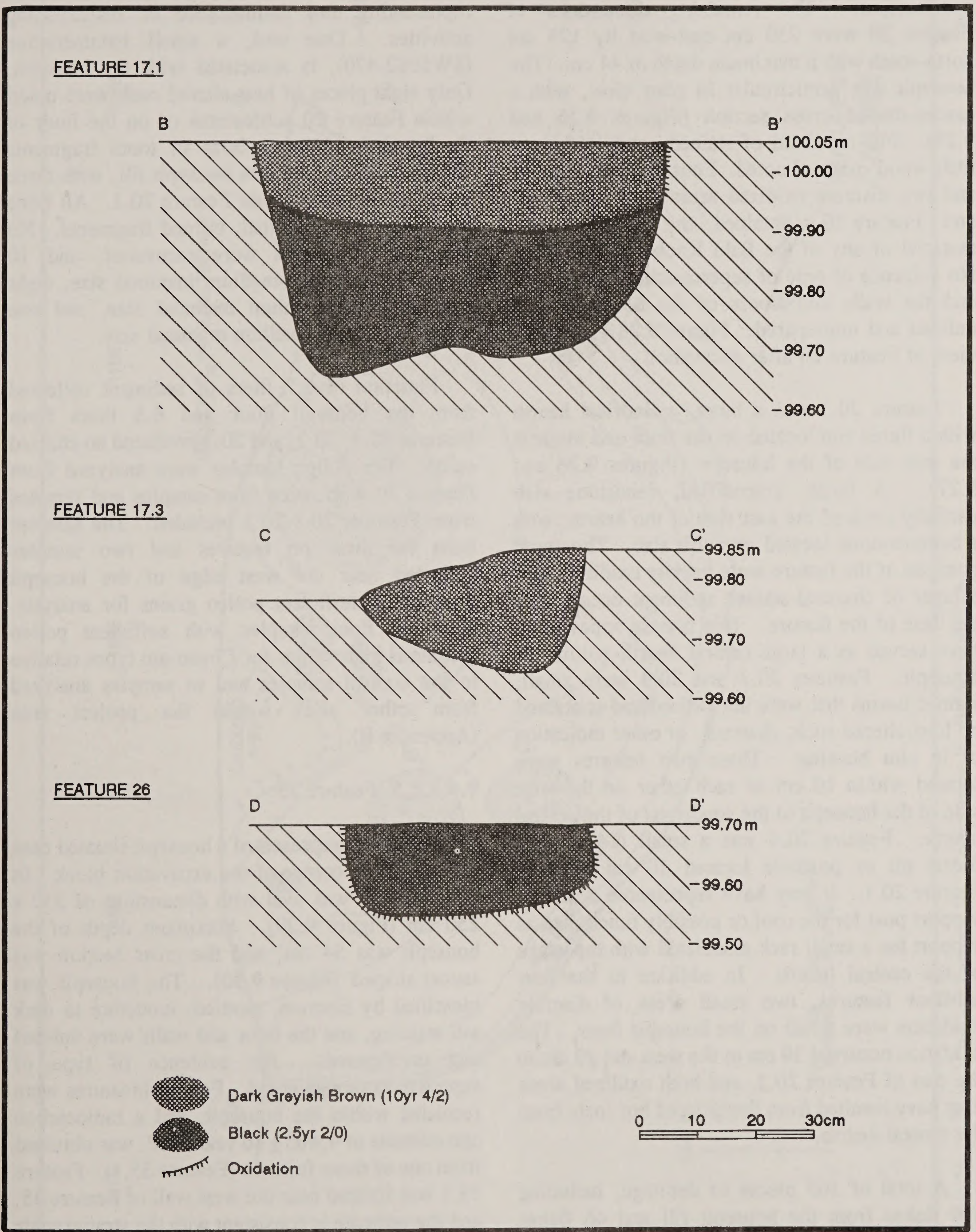


Figure 9.25 Cross Sections of Features 17.1, 17.3, and 26, Component II, Bald Knob Site.

50% of the housepit destroyed during pipeline construction. The remaining dimensions of Feature 20 were 230 cm east-west by 175 cm north-south with a maximum depth of 44 cm. The housepit was semicircular in plan view, with a saucer-shaped cross section (Figures 9.26 and 9.27). Fill consisted of stained sand, with very little wood charcoal noted. Four subfloor features and two discrete oxidized areas were identified, and Feature 20 contained the most cultural material of any of the Bald Knob site housepits. No evidence of type of superstructure was noted, and the walls and floors of the housepit were unlined and unprepared. Figure 9.28 provides a view of Feature 20 after excavation.

Feature 20.1 was a large, cylindrical hearth with a flared rim located on the floor and towards the east side of the housepit (Figures 9.26 and 9.27). A large, unmodified, sandstone slab partially covered the east side of the hearth, with a hammerstone located near this slab. The upper portions of the feature were heavily oxidized, and a layer of charcoal-stained sediment occurred in the base of the feature. This feature appeared to have served as a large central hearth within the housepit. Features 20.2 and 20.3 were small, stained basins that were unoxidized and contained no heat-altered rock, charcoal, or other indication of in situ burning. These two features were located within 10 cm of each other on the west side of the housepit to the southwest of the central hearth. Feature 20.4 was a small (14 x 14 x 6 cm) pit or posthole located 10 cm west of Feature 20.1. It may have represented a central support post for the roof or possibly functioned as support for a small rack associated with the usage of the central hearth. In addition to the four subfloor features, two small areas of discrete oxidation were noted on the housepit floor. The oxidation occurred 30 cm to the west and 10 cm to the east of Feature 20.1, and both oxidized areas may have resulted from dumping of hot coals from the central hearth.

A total of 165 pieces of debitage, including 119 flakes from the housepit fill and 46 flakes from Feature 20.1, were recovered from Feature 20. Most flakes are small tertiary flakes representing tool maintenance or resharpening activities. One tool, a small hammerstone (SW5982-470), is associated with the housepit. Only eight pieces of heat-altered rock were noted within Feature 20 subfeatures or on the floor of the housepit. Sixteen bone or tooth fragments were recovered from the housepit fill, with three fragments collected from Feature 20.1. All bone fragments (17) are small, burned fragments. No identifiable elements were recovered, and 10 fragments are small-medium mammal size, eight are very small-medium mammal size, and one tooth fragment is medium mammal size.

Flotation of 6.7 liters of sediment collected from the housepit floor and 6.5 liters from Features 20.1, 20.2, and 20.3 produced no charred seeds. Ten pollen samples were analyzed from Feature 20 with seven floor samples and samples from Features 20.1-20.3 included. The samples from the three pit features and two samples collected near the west edge of the housepit contained insufficient pollen grains for analysis. The five floor samples with sufficient pollen contained high values for Cheno-am types relative to the control samples and to samples analyzed from other sites within the project area (Appendix B).

9.4.1.1.5 Feature 35

Feature 35 represented a housepit situated near the southwest corner of the excavation block. In plan view, it was oval with dimensions of 330 x 250 cm (Figure 9.29). Maximum depth of the housepit was 54 cm, and the cross section was saucer-shaped (Figure 9.30). The housepit was identified by discrete, mottled, moderate to dark ash staining, and the floor and walls were unlined and unprepared. No evidence of type of superstructure was noted. Four subfeatures were recorded within the housepit, and a radiocarbon age estimate of 4,400 $\pm$ 80 years B.P. was obtained from one of these features (Feature 35.1). Feature 35.1 was located near the west wall of Feature 35, and the estimate is consistent with the stratigraphic location of the housepit and with dating results

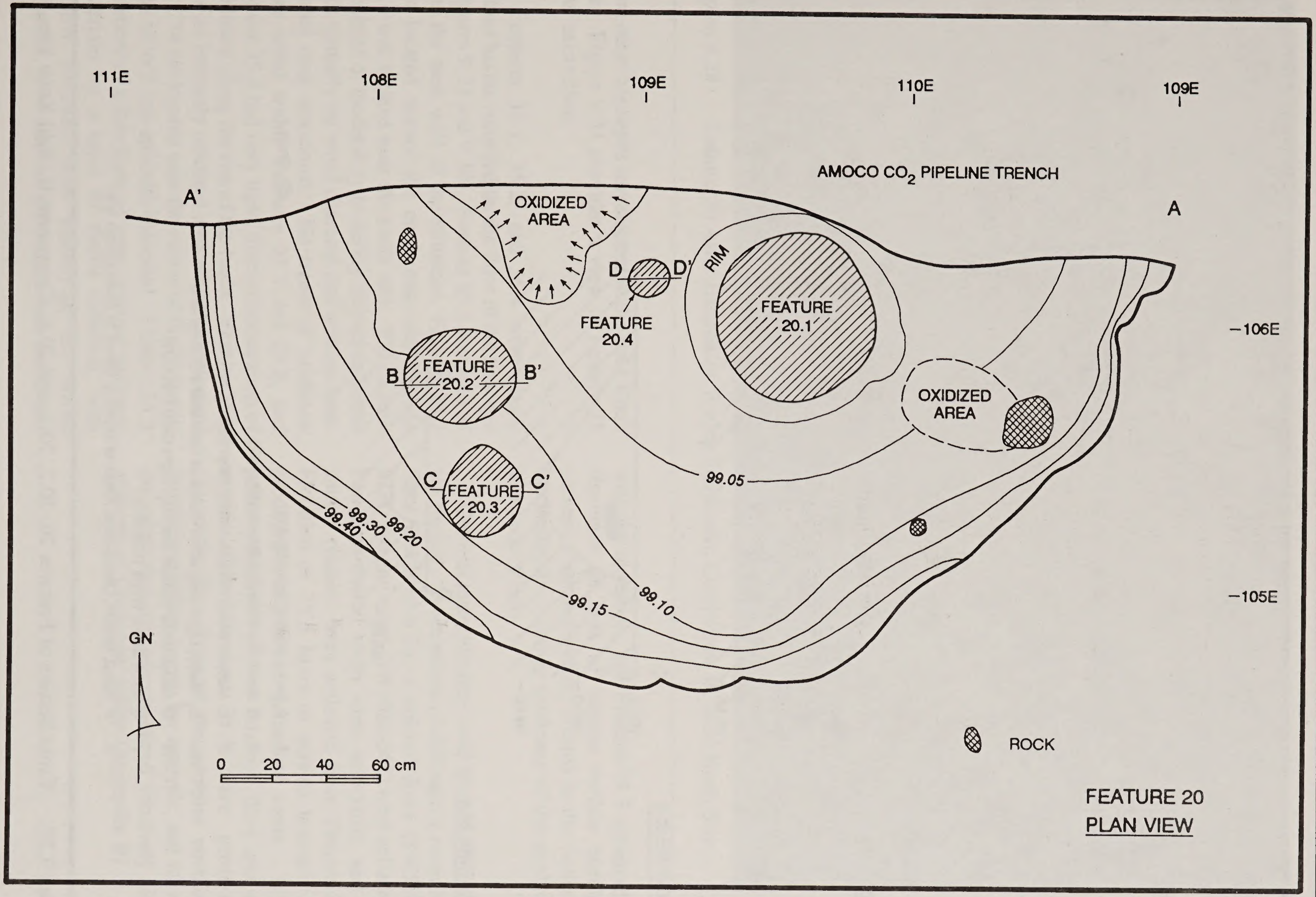


Figure 9.26 Plan View of Feature 20, Component II, Bald Knob Site.

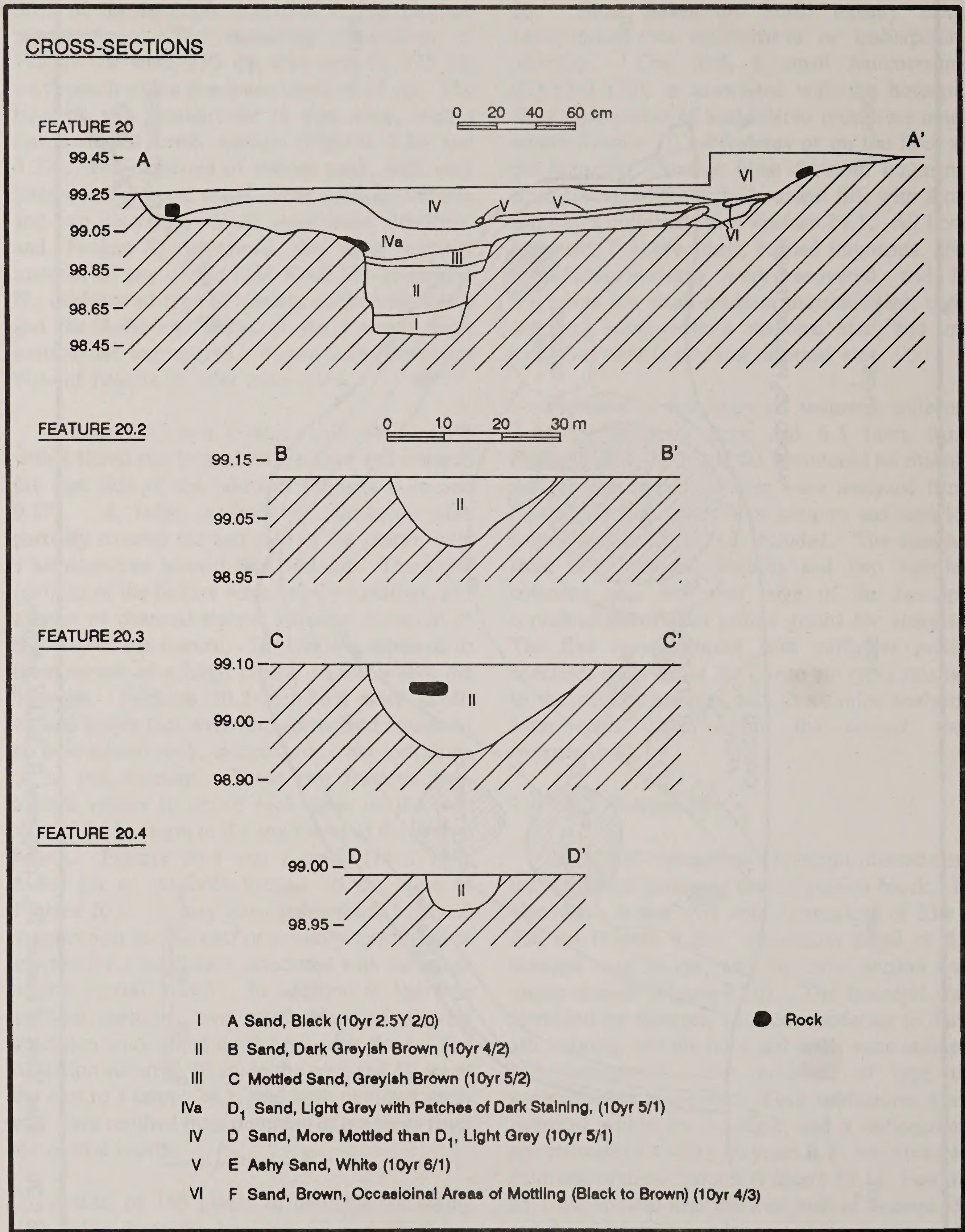


Figure 9.27 Cross Section of Features 20, 20.2, 20.3, and 20.4, Component II, Bald Knob Site.

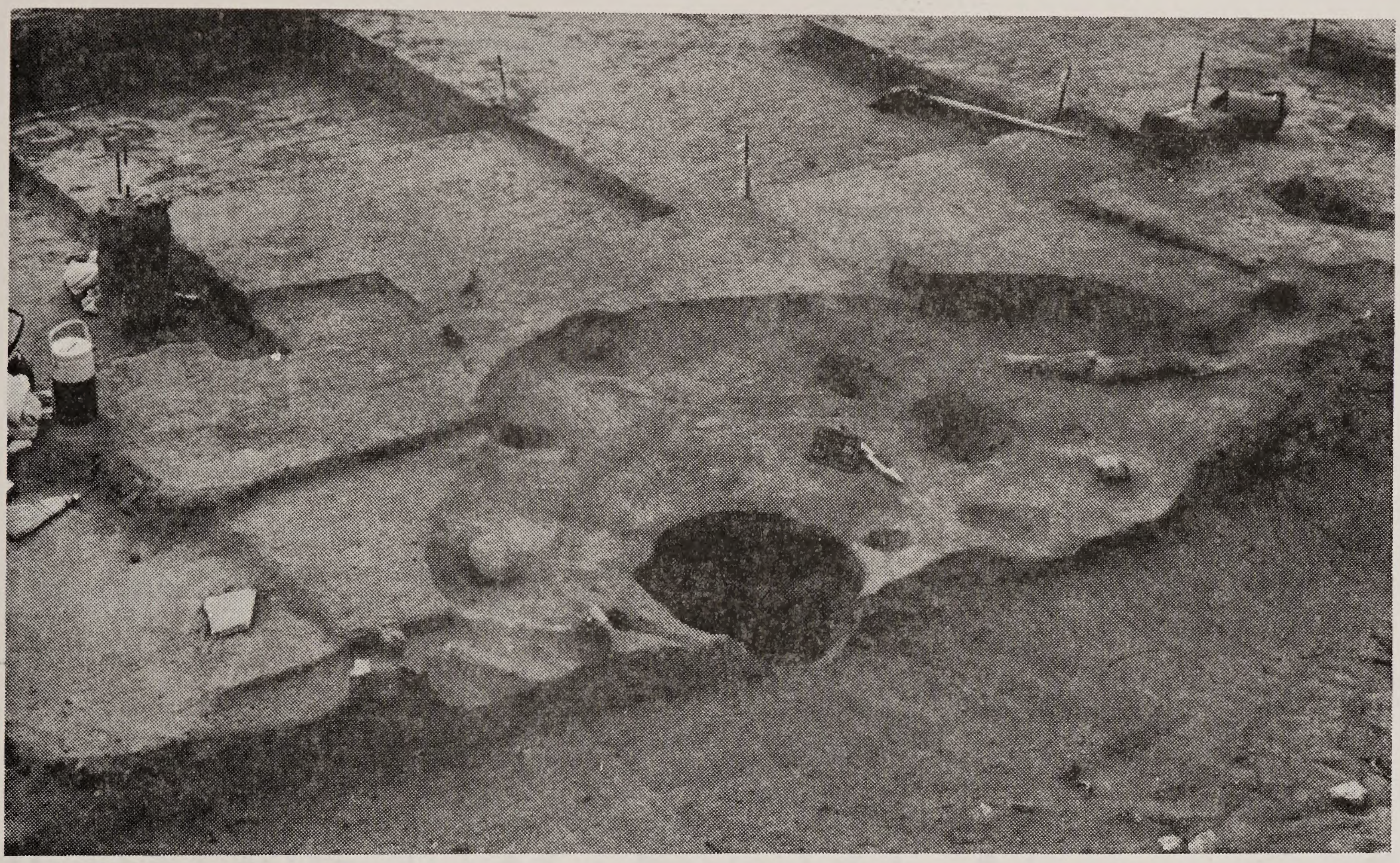


Figure 9.28 Feature 20 After Excavation Facing Southwest, Component II, Bald Knob Site.

from other housepits investigated at the Bald Knob site. Figure 9.31 provides a view of Feature 35 after excavation.

Features 35.1, 35.2, and 35.4 were small, stained basins recorded on the floor of the housepit (Figures 9.29 and 9.30). Feature 35.1 was located near the west wall of the structure, Feature 35.2 was located toward the north end, and Feature 35.4 was located near the south end. Fill of each consisted of moderately to darkly stained sediment with virtually no wood charcoal and with no heat-altered rock associated. No traces of oxidation were noted within Features 35.1 and 35.2, and Feature 35.4 had very light, discontinuous areas of oxidation along the rim of the basin. Feature 35.3 was an intensely oxidized area with dimensions of 84 x 74 cm located near the center of the housepit, with several use episodes indicated. Feature 35.3 consisted of a thin layer of very oxidized sediment underlain by a layer of sterile sediment, with another oxidized layer underlying the sterile sediment. No discrete pit feature was associated with the oxidation, and Feature 35.3 appeared to represent an area of intense surface burning, perhaps a surface hearth, located in the center of the housepit. Average thickness of the oxidation was about 8 cm.

Cultural materials recovered from the housepit are limited. Seven pieces of debitage, a retouched flake (SW5982-672), a utilized flake (SW5982-633), and one mano (SW5982-562) were collected. Few heat-altered rocks were associated, and no animal remains were collected from Feature 35. Flotation of 23.5 liters of stained housepit fill produced two charred goosefoot seeds. Eight pollen samples from the housepit floor and one sample from Feature 35.1 were processed (Appendix B). Four of the samples contained insufficient pollen counts for analysis, and four of the other five samples contained relatively large amounts of Cheno-am pollen (Appendix B).

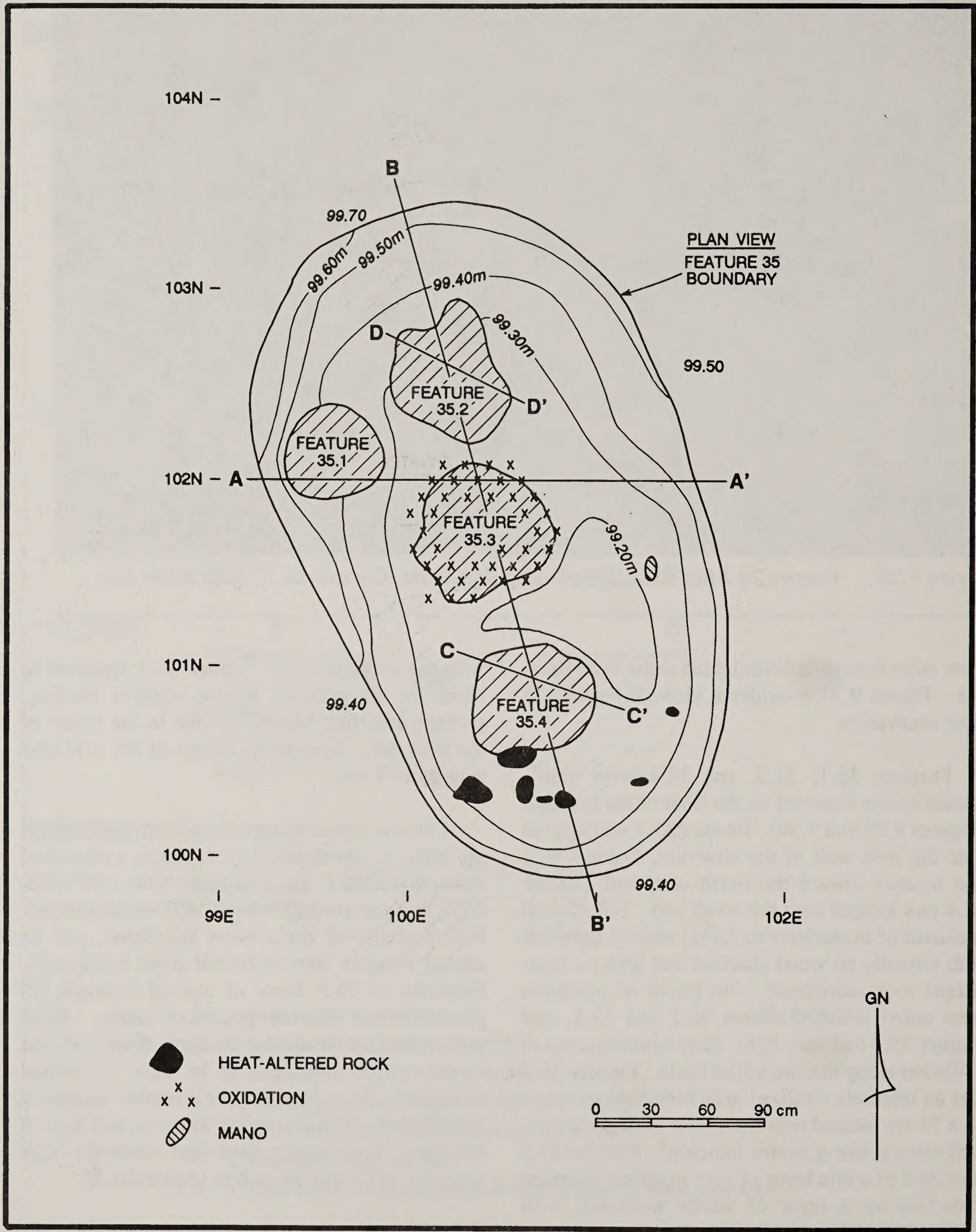


Figure 9.29 Plan View of Feature 35, Component II, Bald Knob Site.

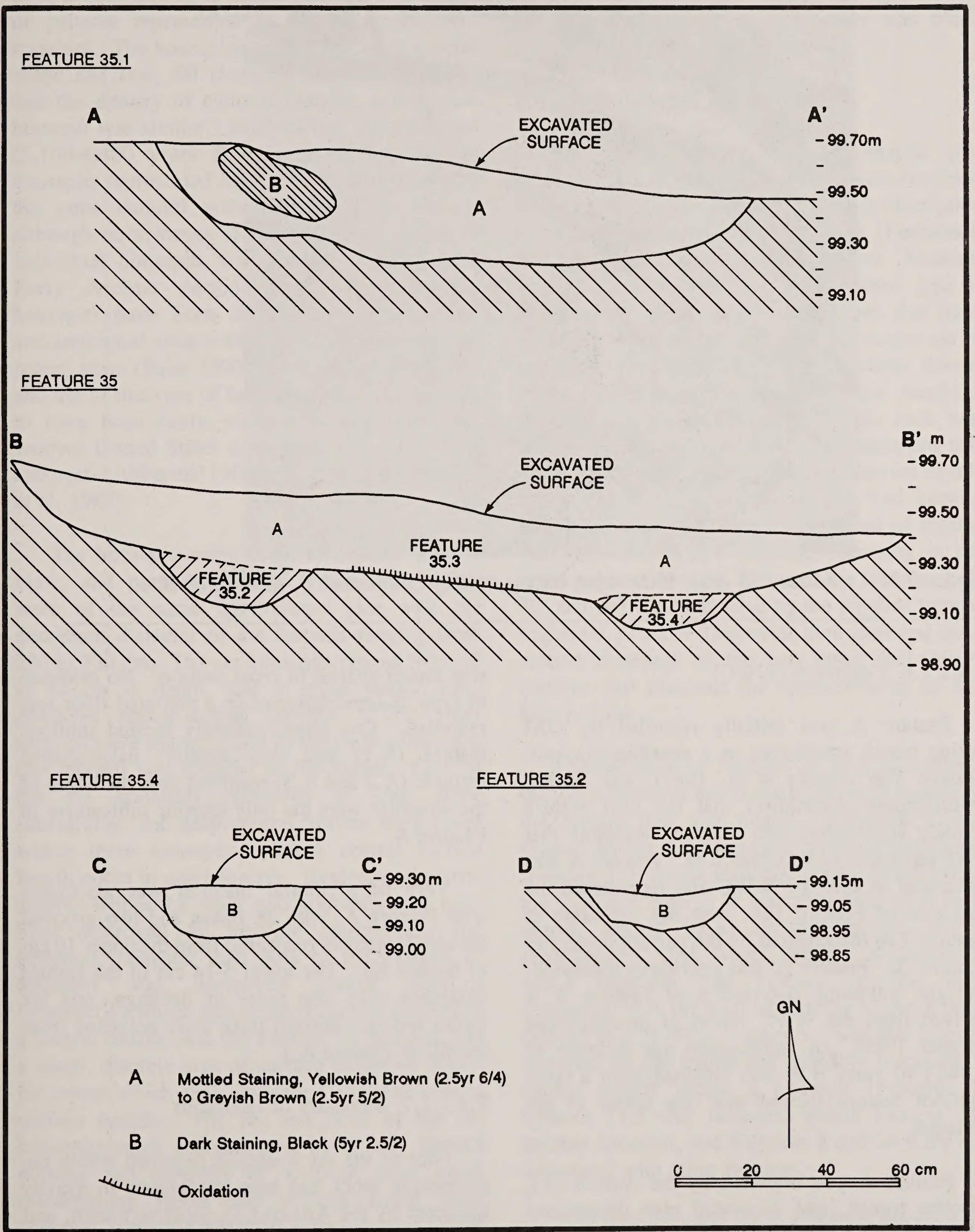


Figure 9.30 Cross Sections of Features 35, 35.2, and 35.4, Component II, Bald Knob Site.

Figure 9.31 Feature 35 After Excavation Facing North, Component II, Bald Knob Site.

9.4.1.1.6 Feature A (WWC)

Feature A was initially recorded by OAI during trench monitoring as a possible housepit, Feature T26 (Moore et al. 1987), and further investigations determined that the OAI feature actually represented two discrete housepits that were separated by less than 2 m. Feature A was excavated in 1987 by WWC and represented the east side of Feature T26, with the west side of Feature T26 investigated by the current project as Feature 20. Feature 20 was previously discussed, and the following description of Feature A is derived from the WWC report of investigations (Hoefer 1988). A radiocarbon age estimate of 4,940$\pm$40 years B.P. was obtained from a large subfloor feature located near the center of the housepit.

Feature A was impacted by the Amoco CO_2 pipeline trench, and excavated plan dimensions measured 310 x 137 cm with a maximum depth of 24 cm. The housepit was ovate in plan view and was saucer-shaped in cross section. No evidence of type of superstructure or a prepared floor was recorded. One large, centrally located subfloor feature (A.1) and two smaller, basin-shaped features (A.2 and A.3) recorded near the edges of the structure were the only interior subfeatures in Feature A.

Very little cultural material was associated with Feature A, with 28 flakes and two grooved abrader fragments recovered from the upper 10 cm of feature fill. The lower 5-14 cm of the feature contained only one piece of debitage, and six flakes and one utilized flake were collected from the fill of Feature A.1.

9.4.1.1.7 Summary of Housepits

Four of the six housepits recorded within the excavation block had been moderately to heavily impacted by the Amoco CO_2 pipeline trench, and one of the two complete housepits was very deflated. Although these impacts limited comparisons among housepits, certain similarities or patterns represented by the housepits were apparent. The housepits were of the same general shape and size, fill characteristics were similar, and the density of cultural remains within each housepit was similar. Radiocarbon age estimates (5,100-4,400 years B.P.) suggest that the six housepits represented multiple site occupations by the same cultural group (Green River phase), although no evidence of reuse or reoccupation of individual housepits was noted. Similar style Early Archaic period (Green River phase) housepits have been documented at numerous archaeological sites within the Wyoming Basin in recent years (Reiss 1990, Smith and Reust 1992), and use of this type of habitation structure appears to have been fairly widespread throughout the western United States during the late Altithermal and post-Altithermal (McGuire et al. 1984, Moore et al. 1987).

The housepits were ovate to circular in plan view, and plan dimensions (when determined) were of the same approximate size with the maximum diameter of the features ranging from 280 to 330 cm. The six housepits ranged from 10 to 54 cm in depth, and in cross section most exhibited saucer-shaped profiles. The cross sections were characterized by gently sloping walls that merged into rounded or flat floors. Each of the six housepits contained at least three subfeatures, and deep central hearths were noted within three housepits, with a central surface hearth noted in one housepit. Evidence of central hearths within the other two housepits may have been destroyed by pipeline construction and deflation. Greater than 50% of the Feature 17 housepit was destroyed during pipeline construction which may account for the absence of a central hearth, and the Feature 15 housepit had a small, discrete area of surface oxidation within its center which may indicate a deflated central surface hearth. The fill and floor of the six housepits were characterized by a very limited number and diversity of artifacts, with small resharpening flakes and utilized flakes most common. Possible postholes were recorded within two housepits, with no evidence of prepared walls or floors observed in the six housepits. No indication of type of superstructure was noted during excavation of the housepits.

9.4.1.2 Bell-shaped Pits

Four and possibly five bell-shaped pits (Features 5.6, 8, 15.5, 26, and 34) were recorded during excavations. Table 9.7 provides descriptive information for the bell-shaped pits (Features 8 and 34) previously not listed as housepit subfeatures (Table 9.6). This feature type is characterized by deep pits (>50 cm) that have relatively small surface openings and excurvate or expanding walls and flat or rounded floors. Virtually no heat-altered rocks were recorded within these features, and very little rock was noted in adjacent excavation units, suggesting that rocks were not associated with the function of this feature type. All bell-shaped pits had heavily oxidized walls. Fill of each consisted of stained sediment, with darker staining occurring in the lower parts of the pits. Three of the features (5.6, 26, and 34) were impacted by the pipeline trench. Figures 9.32 and 9.33 provide plan view and cross section drawings of the two intact bell-shaped features that illustrate the characteristics of this feature type.

Identification of Feature 26 as a bell-shaped feature is tentative based upon the small portion of the feature that was intact. Although it was located within the horizontal limits of a housepit (Feature 17), it was identified about 20 cm below the housepit floor. It was classified as a bell-shaped feature based on the feature profile recorded by OAI when initially encountered, which indicates that Feature 26 was then continuous with the west edge of the housepit floor (Moore et al. 1987). Feature 5.6 was also heavily impacted by the trench and probably represents a central hearth within a housepit (Feature 5). Feature 15.5 was recorded within Feature 15, another housepit, and Features 8 and 34 were not associated with other features.

Few artifacts were recovered from the features with two flakes collected from Feature 5.6, eight

Table 9.7 Characteristics of Bell-shaped Pits, Oxidized Cylinders, and Rock-filled Basins, Component II, Bald Knob Site.

		Dimensions (cm)[1]						Rocks			
Feature No.	Excavation Unit	L	W	D	Area (cm^2)	Volume (liters)	Oxidation	Type	No.	Weight (kg)	Remarks
8	113-115N 102E, E½	80	72	64	4,537	279.0	Present, walls	Quartzite	3	0.04	4,760±90 years B.P.
34	107-109N 110E, W½	82	60*	59	--	--	Present, walls	Sandstone	20	0.35	Disturbed by pipeline trench; five debitage and one burned bone
14	113N 104E, C	63	60	35	2,971	103.1	Present, upper walls	--	--	--	Four pieces of debitage
29	100-102N 102E, NW, SW	74	70	47	4,072	191.4	Present, upper walls	Granite	3	2.5	Seven pieces of debitage
33	115N 107E, C	83	78	48	5,089	233.5	Present, walls	Quartzite	10	0.1	--
48.2	102N 116E, NW	51	43	25	1,735	43.4	Present, upper walls	Sandstone	8	2.23	--
58	100N 116E, C	73	72	46	4,128	189.9	Present, upper walls	--	--	--	4,430±80 years B.P.; 13 pieces of debitage and two burned bone fragments
43	102N 112E, SW	44	36	30	1,257	37.7	Absent	Limestone Sandstone Granite	17 1 27	5.0 0.5 23.0	Associated with Feature 47
47	102N 110-112E, SE, SW	39	36	12	1,105	4.5	Absent	Limestone Sandstone	5 2	3.75 3.5	--

[1] L = length, W = width, D = depth; * = incomplete dimensions.

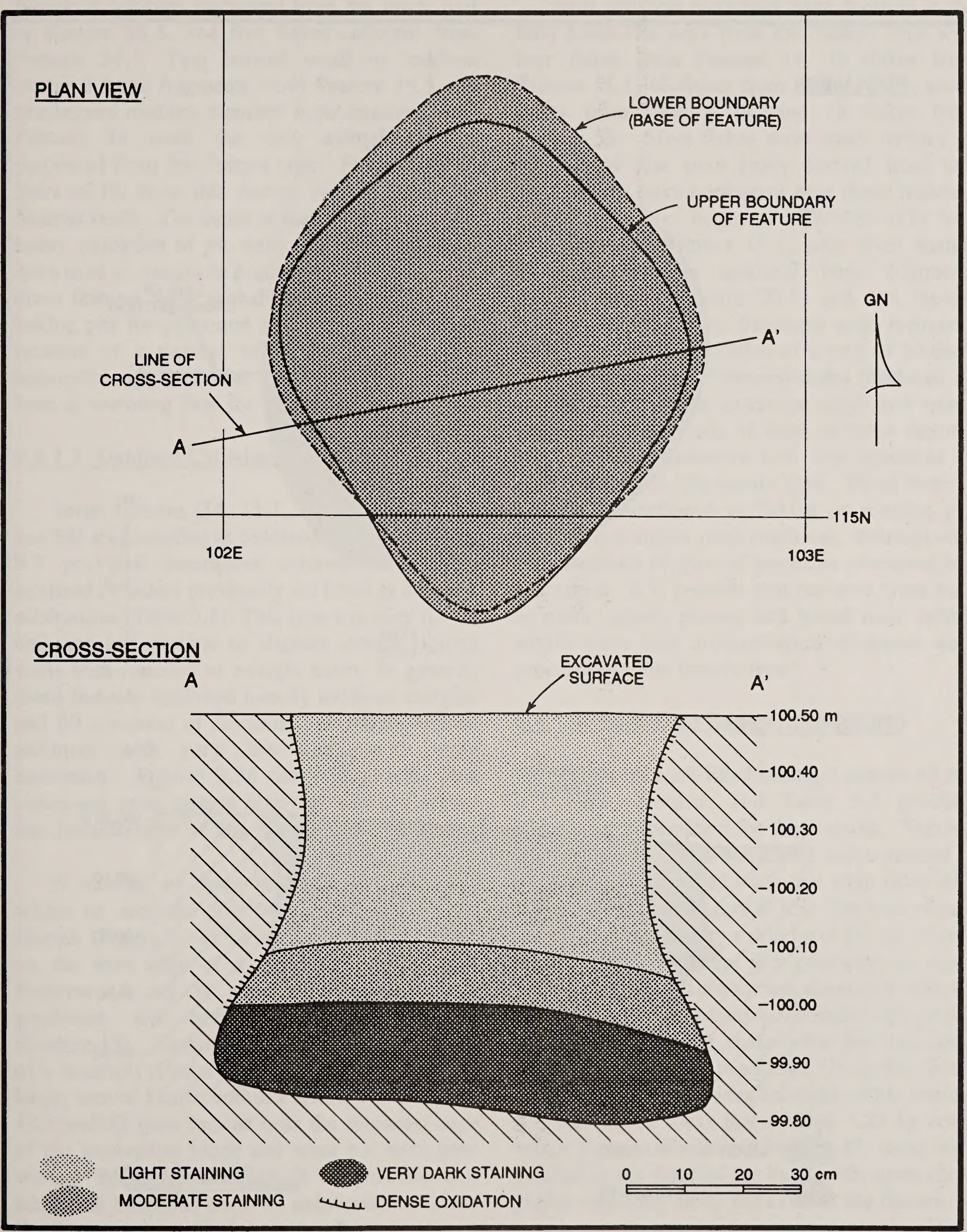


Figure 9.32 Plan View and Cross Section of Feature 8, Component II, Bald Knob Site.

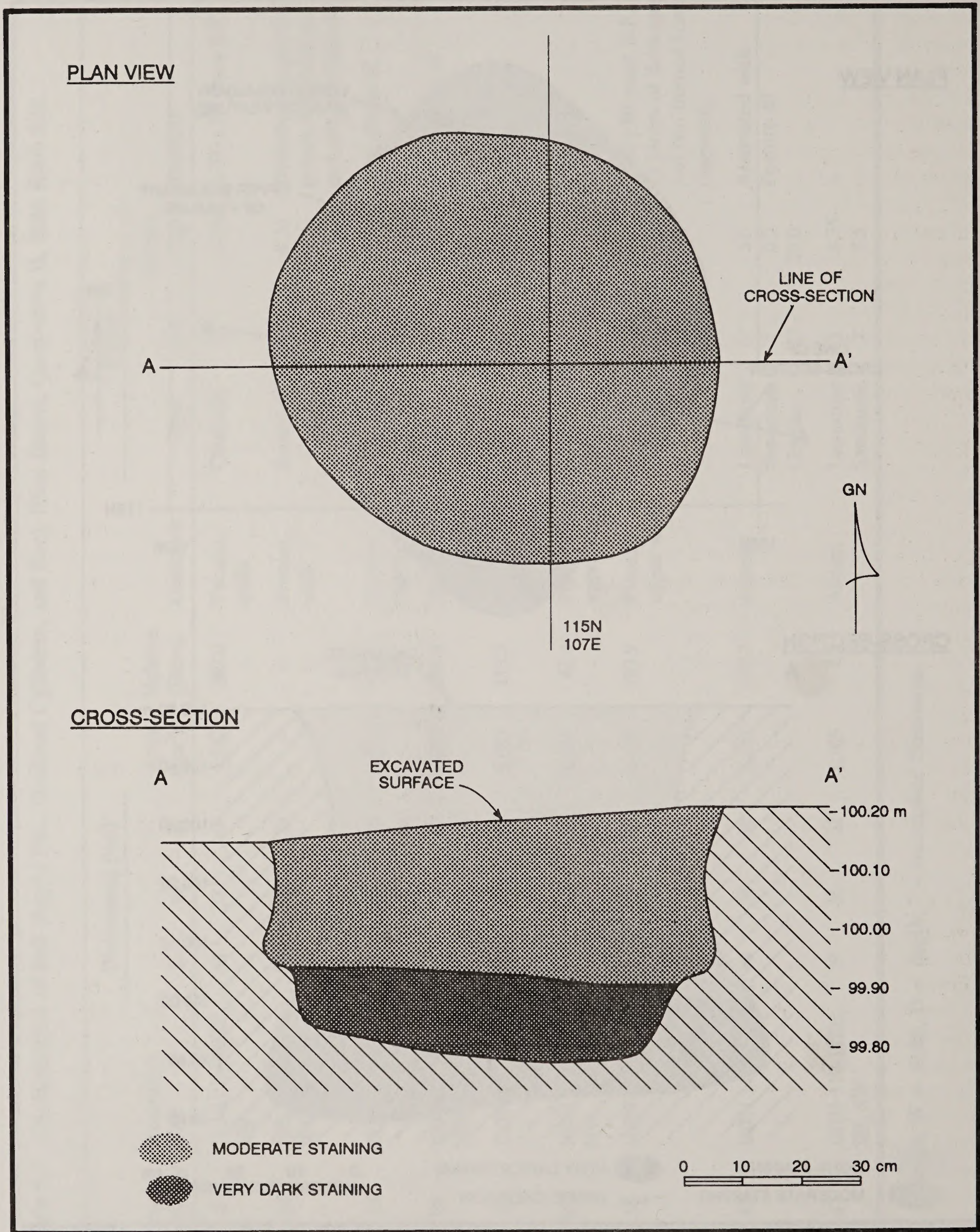


Figure 9.33 Plan View and Cross Section of Feature 15.5, Component II, Bald Knob Site.

pieces of debitage recovered from the lower part of Feature 15.5, and five flakes collected from Feature 34. Two burned small or medium mammal bone fragments from Feature 15.5 and one burned medium mammal bone fragment from Feature 34 were the only animal remains recovered from this feature type. Flotation of 10 liters of fill from this feature type produced no charred seeds. The depth of these features and the heavy oxidation of pit walls suggested that they were used to contain or produce extensive heat and these features were probably used as roasting or baking pits for plant and animal resources. The location of a number of these features within housepits suggested that another use may have been as warming fires for the structure.

9.4.1.3 Oxidized Cylinders

Seven features (14, 15.1, 20.1, 29, 33, 48.2, and 58) are classified as oxidized cylinders. Table 9.7 provides descriptive information for the oxidized cylinders previously not listed as housepit subfeatures (Table 9.6). This type was deep (> 25 cm) and had vertical to slightly inward sloping walls with rounded to straight bases. In general, these features exhibited heavily oxidized margins and fill consisted of moderately to darkly stained sediment with very few heat-altered rocks associated. Figures 9.34 and 9.35 provide plan views and cross section drawings which illustrate the characteristics of this feature type.

A number of these features were recorded within or near the five housepits excavated by Mariah (Figure 9.14). Feature 15.1 was located on the west edge of a probable housepit, and Features 14 and 34 were located within 1 m southwest and northeast of this housepit (Feature 15). Feature 29 was located 1.5 m east of a housepit (Feature 35). Feature 20.1 was a large, central hearth within Feature 20. Features 48.1 and 58 were located near the southeast edge of the excavation block and were not associated with a housepit, although it is possible that additional housepits occur in uninvestigated areas to the east and south of these two features.

Most artifacts recovered from features at the Bald Knob site were from this feature type with four flakes from Feature 14, 19 flakes from Feature 15.1, 46 flakes from Feature 20.1, seven flakes from Feature 29, and 13 flakes from Feature 58. Most flakes were small tertiary or microflakes that were likely derived from tool maintenance tasks performed near these features. One chert core fragment (SW5982-312) was collected from Feature 15.1, with three burned small or medium mammal bone fragments associated with Feature 20.1, and two burned medium mammal bone fragments were recovered from Feature 58. Flotation of a total of 20 liters of fill from seven of these features produced no charred seeds. The extensive depth and heavy oxidation of the walls of most of these features suggested that extensive heat was produced or contained within this feature type. These features may have functioned as baking or roasting pits from animal and/or plant resources, although very little evidence of types of resources processed was recovered. It is possible that resource types such as roots, tubers, greens, and boned meat (which would leave little archaeological evidence) were processed in this feature type.

9.4.1.4 Rock-filled Basins

Two small rock-filled basins (Features 43 and 47) were recorded, and Table 9.7 provides descriptive information for the features. The two features were closely associated and consisted of small pits with straight walls that were filled with heat-altered rocks (Figure 9.36). The base of each feature was marked by a thin layer (2 cm) of very darkly stained sediment that contained no wood charcoal, and no oxidation was associated with the two features. The basins were filled with granite or shale rocks, most rocks were heat-reddened, and a few rocks were blackened. Forty-five rocks that weighed 28.5 kg were recorded within Feature 43, with seven rocks that totalled 7.25 kg noted within Feature 47. Within Feature 47, rocks were stacked in the floor of the basin with some rocks placed vertically along the sides of the feature.

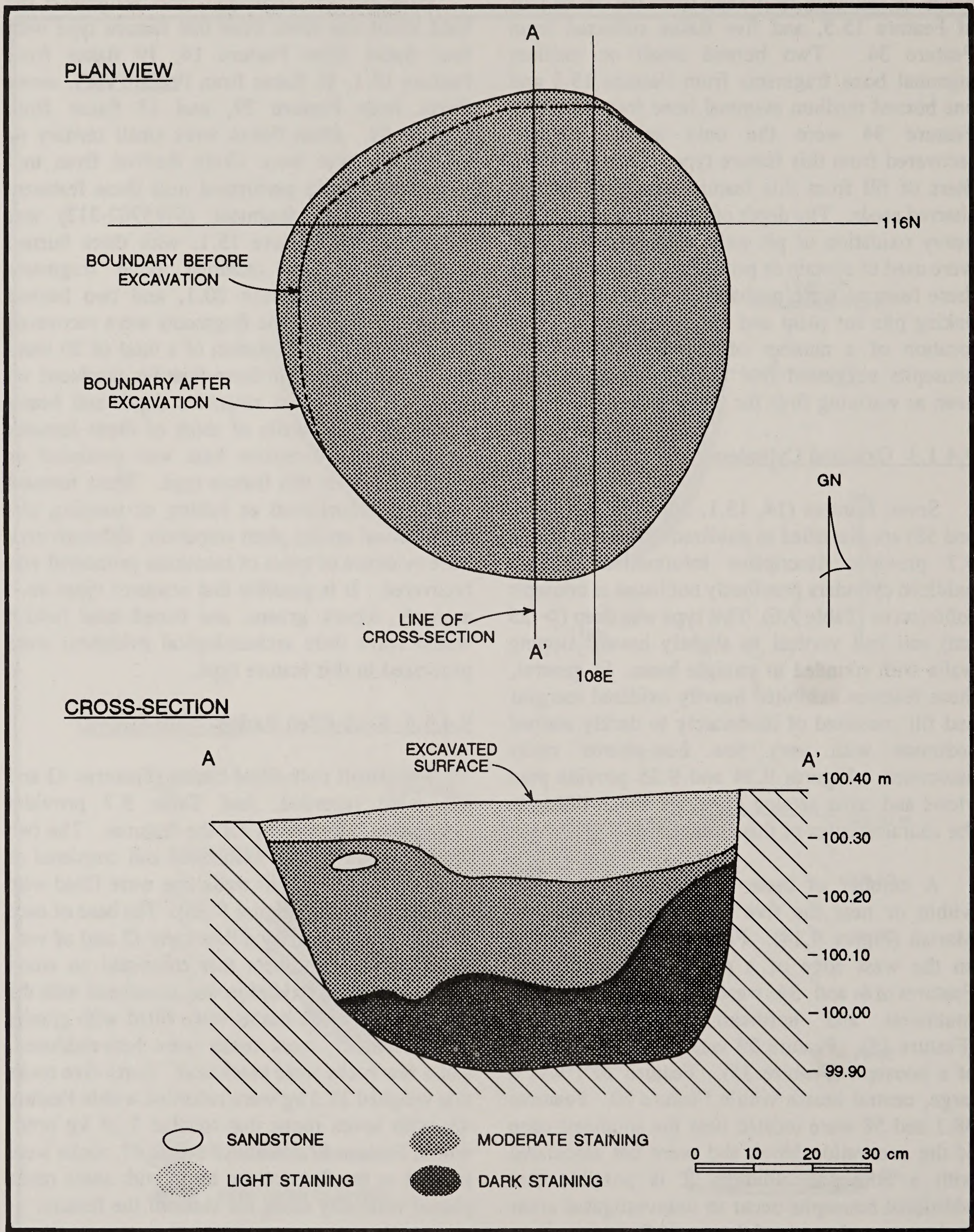


Figure 9.34 Plan View and Cross Section of Feature 33, Component II, Bald Knob Site.

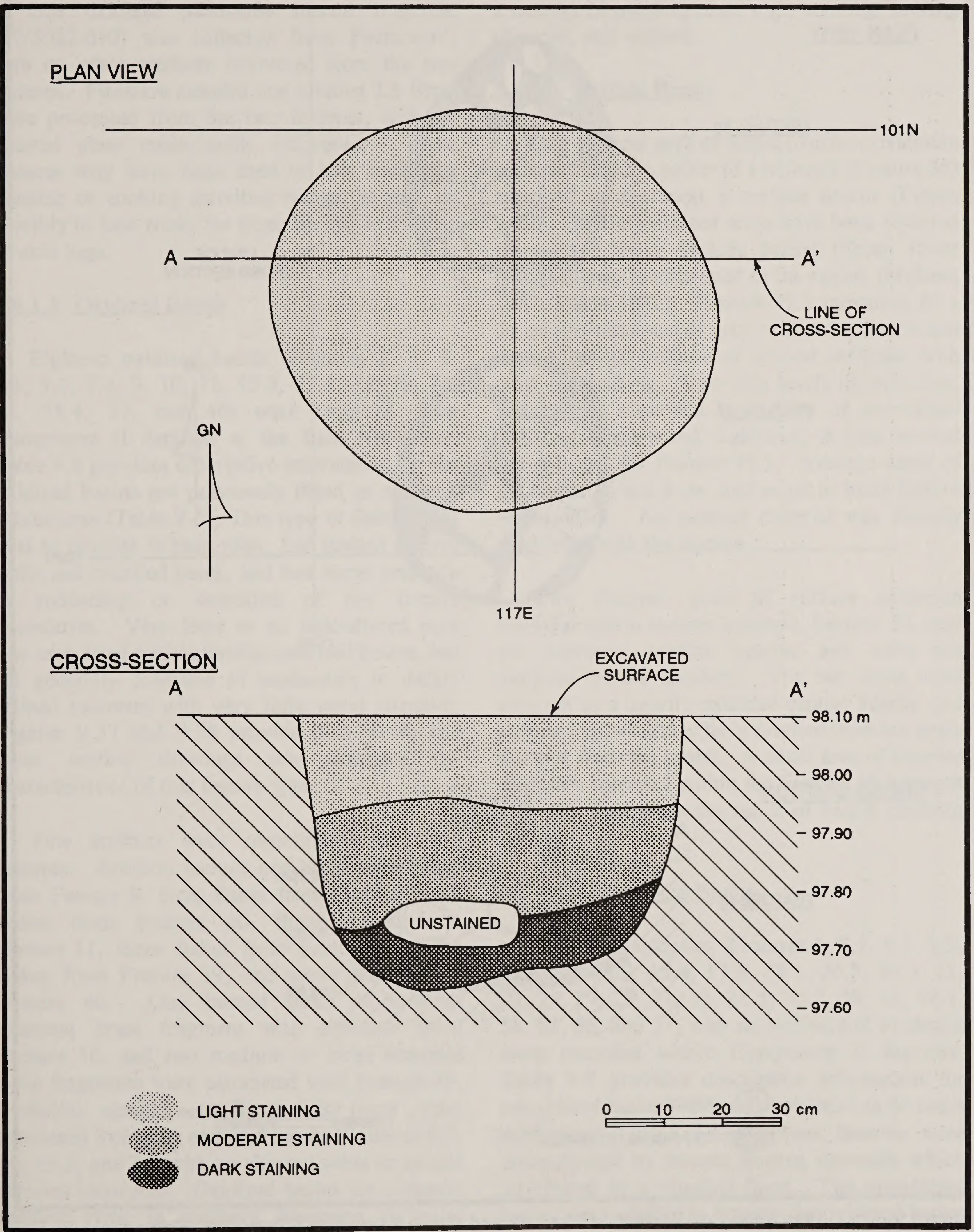


Figure 9.35 Plan View and Cross Section of Feature 58, Component II, Bald Knob Site.

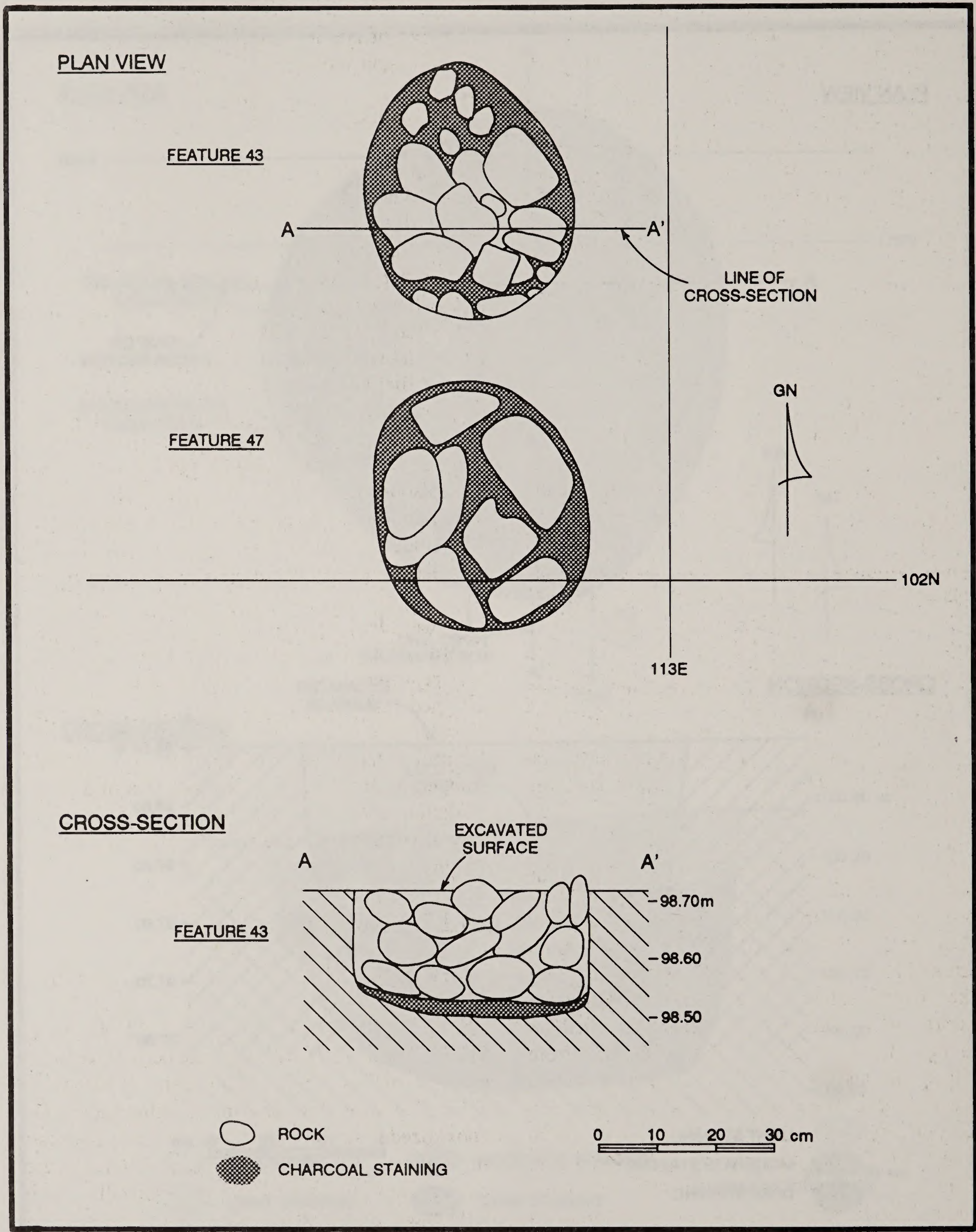


Figure 9.36 Plan Views of Features 43 and 47 and Cross Section of Feature 43, Component II, Bald Knob Site.

One oxidized sandstone metate fragment (SW5982-610) was collected from Feature 47, with no other artifacts recovered from the two features. Flotation samples that totalled 3.5 liters were processed from the two features, with no charred plant macrofossils recovered. These features may have been used to heat rocks for roasting or cooking activities within the pits, or possibly to heat rocks for stone boiling in baskets or skin bags.

9.4.1.5 Oxidized Basins

Eighteen oxidized basins (Features 2, 3, 4, 5.1, 5.2, 5.4, 9, 10, 11, 15.3, 17.1, 18, 19, 22, 24, 35.4, 37, and 46) were recorded from Component II deposits at the Bald Knob site. Table 9.8 provides descriptive information for the oxidized basins not previously listed as housepit subfeatures (Table 9.6) This type of feature was oval to circular in plan view, had inward sloping walls and rounded bases, and had some evidence of reddening or oxidation of the feature boundaries. Very little or no heat-altered rock was associated with individual oxidized basins, and fill generally consisted of moderately to darkly stained sediment with very little wood charcoal. Figures 9.37 and 9.38 provide plan views and cross section drawings that illustrate the characteristics of this feature type.

Few artifacts were recovered from these features. Artifacts include one piece of debitage from Feature 3, three flakes from Feature 9, 17 flakes from Feature 10, three flakes from Feature 11, three flakes from Feature 18, four flakes from Feature 19, and seven flakes from Feature 46. One burned small or medium mammal bone fragment was collected from Feature 10, and two medium or large mammal bone fragments were associated with Feature 19. Flotation samples totalling 7.5 liters were processed from four oxidized basins (Features 5.2, 10, 15.3, and 24) with no charred seeds or animal remains recovered. Oxidized basins are common features types in southern Wyoming (Wheeler et al. 1986, Harrell 1989), and this type likely functioned as multipurpose firepits or hearths with a number of possible uses, e.g., cooking, heating of rocks, and warmth.

9.4.1.6 Surface Hearth

One discrete area of intense surface oxidation recorded near the center of a housepit (Feature 35) appeared to represent a surface hearth (Figure 9.29). Similar oxidized areas have been reported from other Early Archaic period (Green River phase) housepits excavated in the region (McKern 1987, Eakin 1987). Feature 35.3 measured 84 x 74 cm and consisted of very oxidized sediment and a very limited volume of stained sediment with charcoal flecking. Two thin levels of oxidation, which were separated by a layer of unoxidized sediment, were noted, indicating at least several use episodes for Feature 35.3. Average depth of the oxidation was 8 cm, and no pit or basin feature was evident. No cultural material was directly associated with the feature.

Two discrete areas of surface oxidation recorded within another housepit, Feature 20, may not represent surface hearths and were not assigned feature numbers. The two areas were adjacent to a heavily oxidized central hearth, and surface oxidation may have resulted from hot coals dumped from the hearth. A small area of discrete oxidation recorded within the Feature 15 housepit may also have been the result of hearth cleaning activity.

9.4.1.7 Unoxidized Basins

Twenty-nine basins (Features 1, 5.1, 5.3, 5.5, 6, 7, 12, 15.2, 15.4, 17.3, 18.1, 20.2, 20.3, 21, 23, 25, 27, 28, 31, 32, 35.1, 35.2, 38, 42, 48.1, 51, 52, 56, and 57) with no evidence of oxidation were recorded within Component II deposits. Table 9.9 provides descriptive information for unoxidized basins previously not listed as housepit subfeatures (Table 9.6). These features were characterized by inward sloping sidewalls which terminated in a rounded floor. The unoxidized basins were similar in form to the oxidized basins but lacked oxidation and were generally shallower than the oxidized basins. Fill consisted of

Table 9.8 Characteristics of Oxidized Basins, Component II, Bald Knob Site.

		Dimensions (cm)[1]						Rocks			
Feature No.	Excavation Unit	L	W	D	Area (cm^2)	Volume (liters)	Oxidation	Type	No.	Weight (kg)	Remarks
2	104N 102E, SW	45	39	14	1,388	6.5	Present, upper walls	Sandstone	15	0.75	Rock located on surface of feature
3	113N 100E, SW, NW	70	40*	25.5	--	--	Present, upper edge	Sandstone	1	0.18	Partially excavated; one piece of debitage associated
4	109N 100E, NE	66	63	20	3,268	21.8	Present, upper edges	--	--	--	--
5.2	109N 105E, SW, NW	64	62	24	3,117	24.9	Present, upper walls	Sandstone Granite	6 7	1.0 2.0	Intrusive into Feature 5 (housepit); 3,500±60 years B.P.
9	109N 102E, S½	78	60*	21	--	--	Present upper edges	Sandstone	3	0.11	Disturbed by trench
10	111N 102E, S½	56	54	33	2,375	26.1	Present, all edges	Sandstone	1	0.28	17 pieces of debitage and one bone fragment associated
11	111N 108E, SW, SE	54	52	20	2,206	14.7	Present, base	Sandstone Granite Chert	7 6 1	0.8 1.1 0.14	Three pieces of debitage associated; associated with Feature 13
18	113N 102E, SW	62	60	20	2,923	21.4	Present, upper edges	Quartzite	1	0.02	--

Table 9.8 (continued)

Feature No.	Excavation Unit	Dimensions (cm)[1] L	W	D	Area (cm^2)	Volume (liters)	Oxidation	Rocks Type	No.	Weight (kg)	Remarks
19	106N 102E, SE, SW	62	20*	40	--	--	Present, all edges	--	--	--	Four pieces of debitage and two bone fragments associated; disturbed by trench
22	105N 105E, C	63	54	20	2,688	17.9	Present, all edges	Quartzite Sandstone	1 2	0.75 0.75	--
24	100N 102E, NW	69	40*	38	--	--	Present, upper edges	Granite	14	4.25	Associated with Feature 24.1
37	104-106N 100E, SW, NW	72	50*	32	--	--	Present, all edges	--	--	--	Disturbed by trench
46	104N 112-114E, SE, SW	66	56	47	2,922	45.8	Present, all edges	Sandstone	13	1.6	Seven pieces of debitage associated

[1] L = length, W = width, D = depth; * = incomplete dimensions.

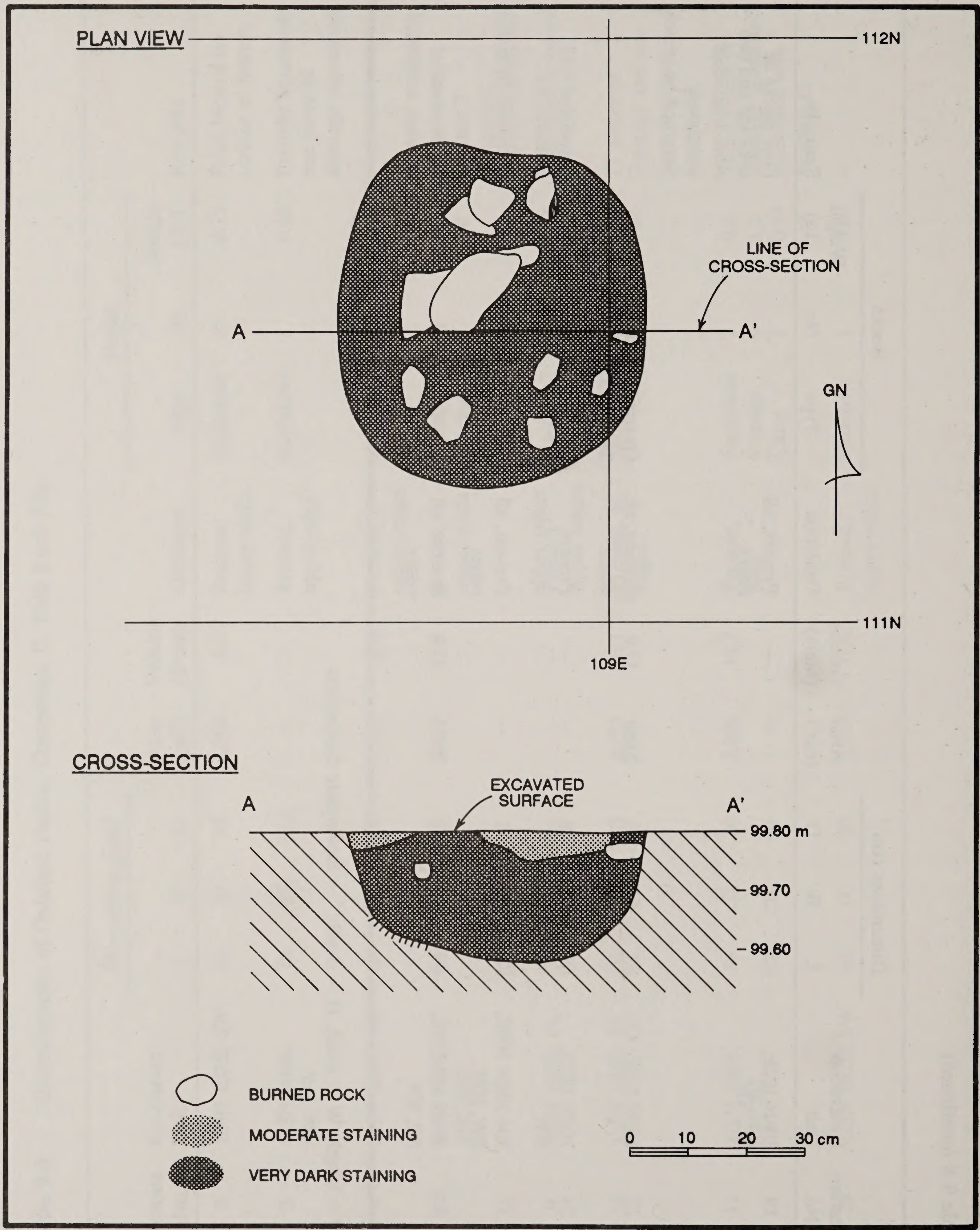


Figure 9.37 Plan View and Cross Section of Feature 11, Component II, Bald Knob Site.

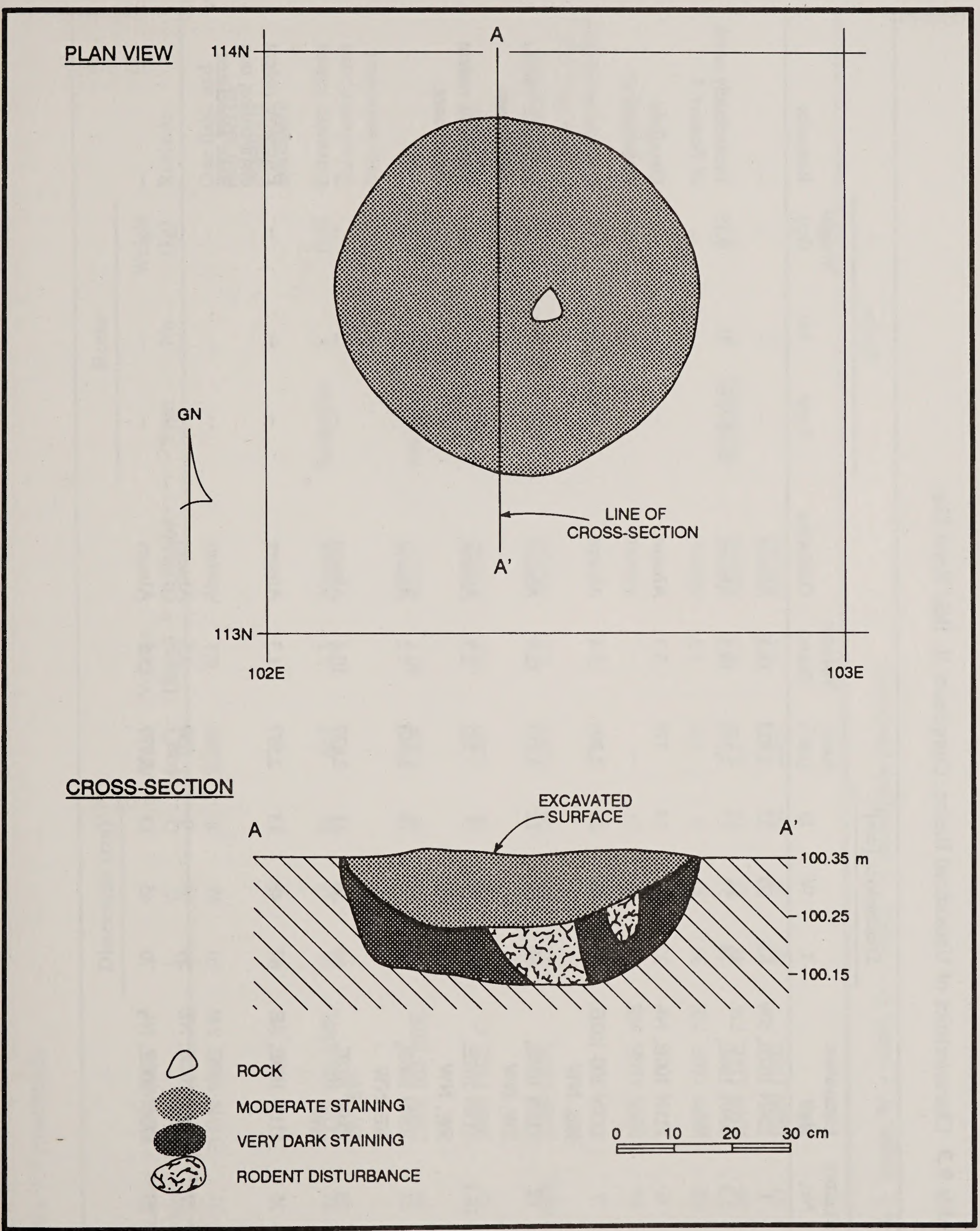


Figure 9.38 Plan View and Cross Section of Feature 18, Component II, Bald Knob Site.

Table 9.9 Characteristics of Unoxidized Basins, Component II, Bald Knob Site.

Feature No.	Excavation Unit	Dimensions (cm)[1] L	W	D	Area (cm^2)	Volume (liters)	Oxidation	Rocks Type	No.	Weight (kg)	Remarks
1	104N 102E, SW	62	60	15	2,922	14.5	Absent	--	--	--	--
5.3	109N 106E, W½	74	57	17	3,370	19.1	Absent	Sandstone	31	0.15	Immediately north of Feature 5
6	111N 100E, N½	32	31	14	779	3.7	Absent	--	--	--	One flake associated
7	113N 100-102E, NE, NW	55	51	21	2,206	15.4	Absent	--	--	--	--
12	113N 102E, SW, NW	68	60	12	3,217	12.9	Absent	--	--	--	Extensive rodent disturbance
18.1	113N 102E, SW, NW	27	26	9	552	1.7	Absent	--	--	--	Extensive rodent disturbance
21	109N 106E, NE, NW	52	50	14	2,043	9.2	Absent	--	--	--	--
23	104N 102E, NW	64	56	11	2,827	10.4	Absent	--	--	--	--
25	111N 100E, SE	67	48	13	2,597	11.3	Absent	--	--	--	Extensive rodent disturbance; one flake associated
27	104N 102E, NE	34	31	9	830	2.5	Absent	--	--	--	--
28	113N 100E, N½	70	65	13	3,579	15.5	Absent	--	--	--	--

Table 9.9 (continued)

		Dimensions (cm)[1]						Rocks			
Feature No.	Excavation Unit	L	W	D	Area (cm^2)	Volume (liters)	Oxidation	Type	No.	Weight (kg)	Remarks
31	111N 106E, SW	60	48	8	2,290	6.1	Absent	--	--	--	One flake and four metate fragments associated
32	111N 100-102E, SW, SW	35	31	22	855	6.3	Absent	Sandstone	3	0.15	Extensive rodent disturbance; one flake associated
38	104N 100-102E, NE	75	50	30	3,068	30.7	Absent	Sandstone	10	0.2	--
42	104N 115E, C	54	52	18	2,206	13.2	Absent	Sandstone	8	2.0	One flake associated
48.1	102N 116E, NW	42	35	16	1,164	6.2	Absent	Sandstone	1	0.27	Associated with Feature 48.1; one preform associated
51	104N 116E, NE	27	17*	14	--	--	Absent	--	--	--	Disturbed by trench
52	102N 116E, NE	33	30	5	779	1.3	Absent	--	--	--	--
56	104N 114E, SW	41	35	13	1,134	4.7	Absent	Sandstone	2	0.1	--
57	100N 116E, W½	68	52	10	2,827	9.4	Absent	--	--	--	--

[1] L = length, W = width, D = depth; * = incomplete dimensions.

moderately to darkly stained sediment with minimal wood charcoal. Very few heat-altered rocks were associated with these basins. A number of the unoxidized basins were deflated or disturbed by rodent activity. Figures 9.39 and 9.40 provide plan view and cross section drawings that illustrate the characteristics of this feature type.

Artifacts were recovered from the fill of eight unoxidized basins. Debitage includes one flake from Feature 6, one flake from Feature 15.4, one flake from Feature 25, one flake from Feature 31, one flake from Feature 32, and one flake from Feature 42. One complete chert core (SW5982-307) was recovered from Feature 15.2, four oxidized metate fragments (SW5982-359) were collected from Feature 31, and a chert preform medial fragment (SW5982-688) was associated with Feature 48.1. Flotation samples totalling 9.5 liters were processed from Features 5.1, 5.3, 7, 26, and 35.1 with no charred seeds recovered.

9.4.1.8 Postholes

Three possible postholes (Features 15.7, 16, and 20.4) were recorded during excavations. These features consisted of small, circular or ovate stains with basin-shaped cross sections. The three features were very shallow and ranged from 4 to 6 cm in depth. Two of the possible postholes (Features 15.7 and 20.4) were located within housepits, and Feature 16 was located about 1 m south of a housepit (Feature 15). Plan view and cross section drawings of postholes are included in the description (Section 9.4.1.1) of two housepits, Features 15 and 20.

9.4.1.9 Ash/Rock Concentrations

Seven rock or ash concentrations (Features 13, 24.1, 39, 41, 44, 54, and 59) were recorded within the excavation block at the Bald Knob site. Table 9.10 provides descriptive information for these features. These seven features consisted of mostly amorphous surface scatters of heat-altered rocks and/or stained sediment with no evidence of a prepared basin. Most of these features were located near large hearths and likely represented debris discarded from the hearths. Features 41, 44, and 54 were associated concentrations of heat-altered rock or staining, and all were located close to Feature 58, a large hearth. Feature 13 was a rock cluster and amorphous staining located adjacent to Feature 11, an oxidized basin, and Feature 24.1 was an amorphous rock scatter located near Feature 24, a large oxidized basin. Feature 39 was a small, amorphous ash scatter located adjacent to a housepit (Feature A) excavated in 1987 by WWC (Hoefer 1988). One piece of debitage from Feature 54 is the only artifact associated with this feature type. Flotation of a 2.0 liter sample of stained sediment from Feature 54 produced no charred seeds.

9.4.1.10 Heat-altered Rock

A total of 1,401 heat-altered rocks, including rocks from cultural features, was recorded from Component II (Table 9.11). Total weight of these rocks was 298.25 kg with an average weight of 0.21 kg. Sandstone rocks occurred in the greatest frequency (60.2%), although this type had the lowest average weight (0.09 kg). Most of the sandstone rock recorded consisted of small, oxidized, tabular pieces. Heat-discolored granite cobbles were often recovered intact, and this material type had the highest average weight (0.56 kg). The majority of the quartzite rocks consisted of angular fragments of cobbles that averaged 0.26 kg in weight. Other types--which included shale, limestone, chert, and plagioclase--averaged 0.24 kg, and this category was least common.

9.4.2 Flaked Stone Artifacts

A total of 63 flaked stone tools and 1,418 pieces of debitage was collected from Component II deposits. The flaked stone tools include four projectile points or point fragments, five preform fragments, five blank fragments, three preblank fragments, 11 retouched flakes, 26 utilized flakes, and nine cores. Morphological characteristics of the flaked stone tools are summarized in Table 9.12.

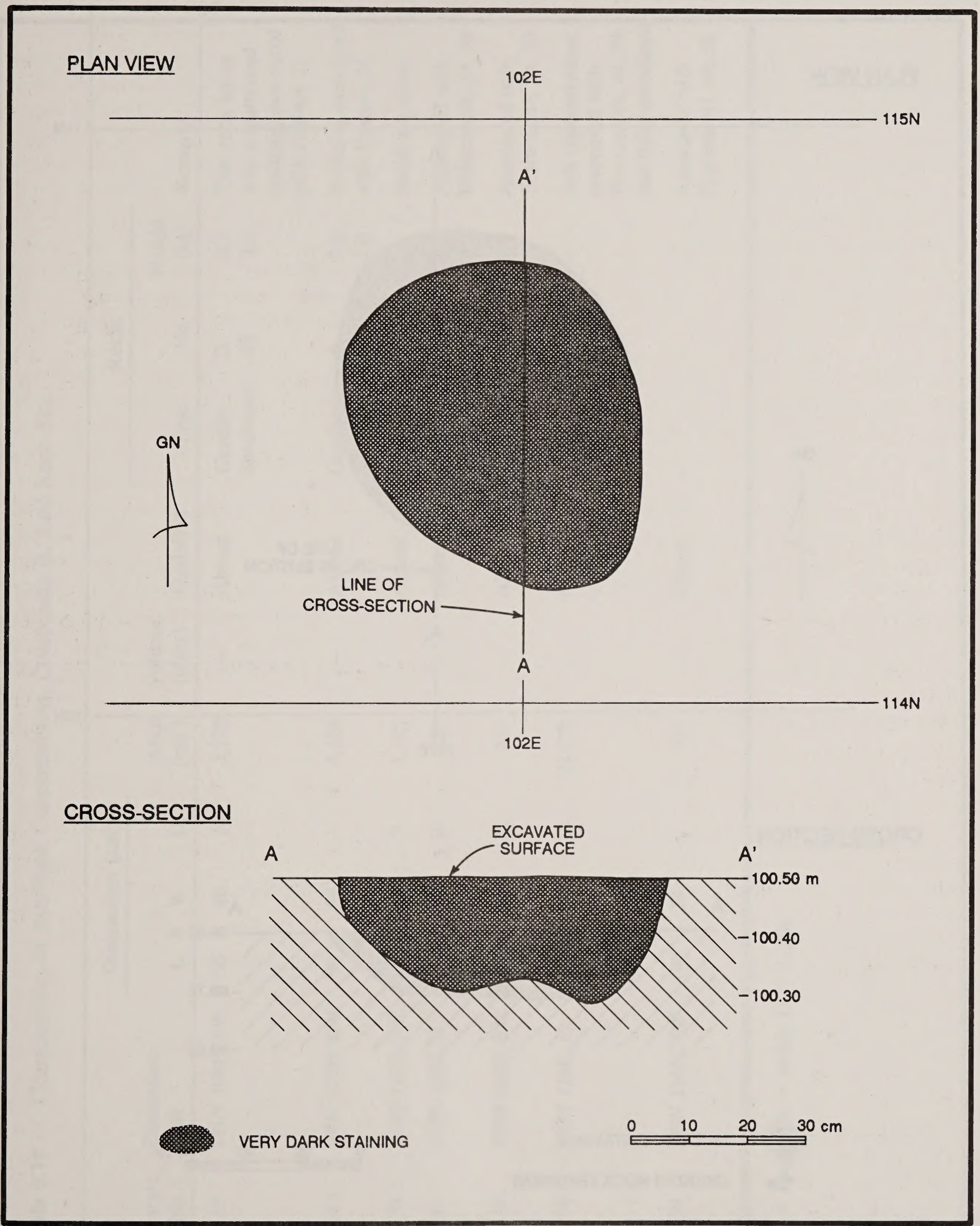


Figure 9.39 Plan View and Cross Section of Feature 7, Component II, Bald Knob Site.

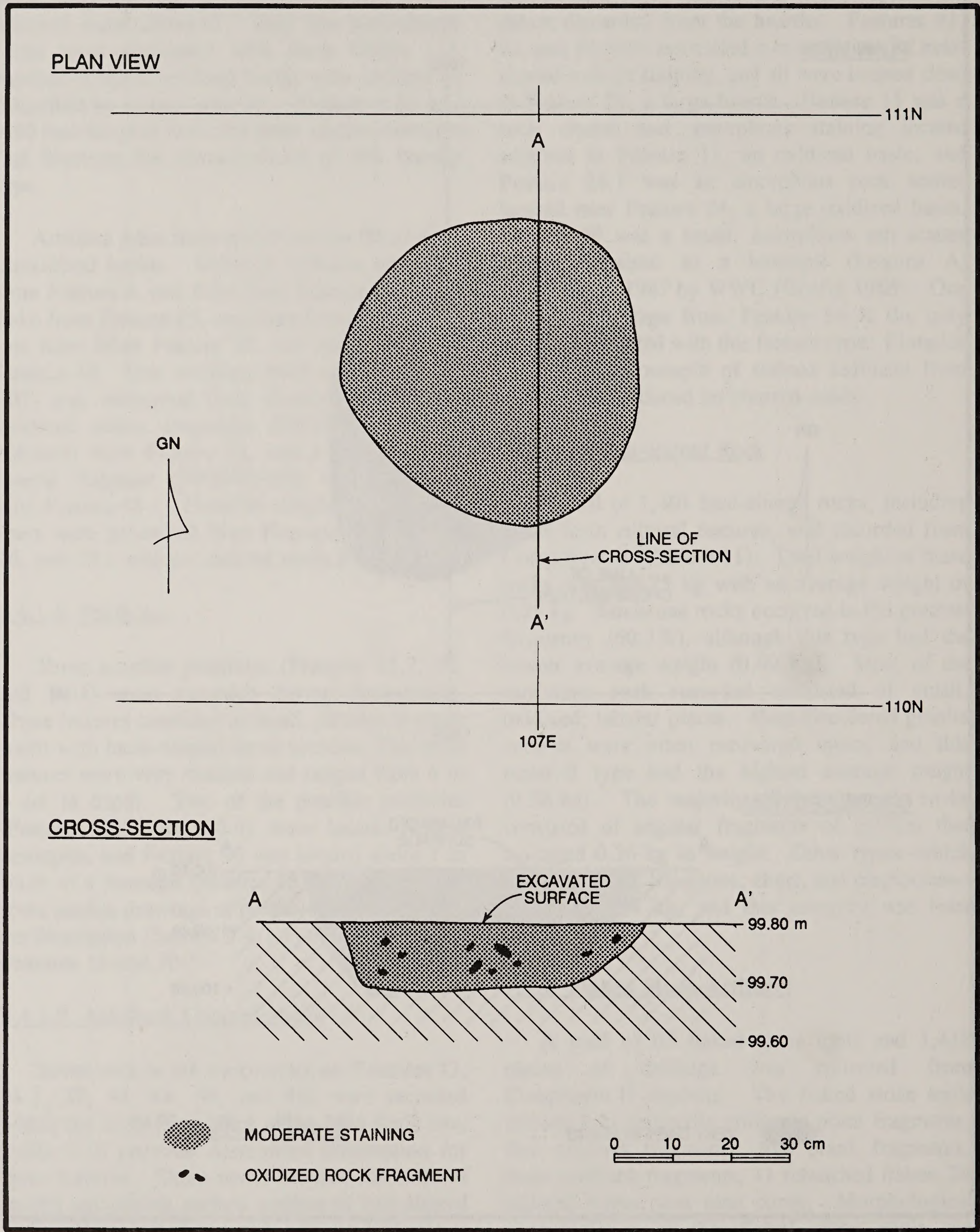


Figure 9.40 Plan View and Cross Section of Feature 21, Component II, Bald Knob Site.

Table 9.10 Characteristics of Ash/Rock Concentrations, Component II, Bald Knob Site.

Feature No.	Excavation Unit	Dimensions (cm)[1] L	W	D	Area (cm^2)	Volume (liters)	Oxidation	Rocks Type	No.	Weight (kg)	Remarks
13	111N 108E, SW	55	40	6	1,772	--	Absent	Granite Sandstone	2 27	0.3 3.5	Two rock layers with unpatterned staining; associated with Feature 11
24.1	100N 102E, SW	90	55	--	4,128	--	Absent	Granite Sandstone	6 13	2.5 1.0	Probably associated with Feature 24
39	104N 112E, NE	40	35	9	1,105	--	Absent	--	--	--	Small ash stain
41	113N 116E, C	35	30	10	829	--	Absent	Sandstone Granite	14 1	1.8 1.5	Associated with Features 41, 54, 59
44	102N 116E, SW	35	35	12	962	--	Absent	Sandstone	9	4.0	Associated with Features 41, 54, 59
54	100N 116E, C	125	125	10	12,272	--	Present, scattered	--	--	--	Ash concentration; associated with Features 41, 44, 59; one flake associated
59	102N 116E, SW	30	30	--	707	--	Absent	--	--	--	Associated with Features 41, 44, 54

[1] L = length, W = width, D = depth.

9.4.2.1 Projectile Points

Four side-notched projectile points or point fragments are associated with Component II deposits. Although the four points resemble Early Archaic period side-notched types, which is consistent with their association with Component II, the points represent a heterogeneous sample and may represent four distinct types. The four projectile points or point fragments occur within the range of variability represented in terminal Early Archaic period Cultural Layers 12-14 at the Mummy Cave site (McCracken et al. 1978).

One complete point (FS #452) appears to be a small dart point (Figure 9.41, A). The artifact was lost and the figure is after the field drawing. It has very shallow side notches and a straight base. It was collected adjacent to a housepit (Feature 35) and is similar in morphology to small side-notched dart points associated with an Early Archaic period (Green River phase) housepit excavated at the Sinclair site about 75 km south of the Bald Knob site (Reust 1989).

A second, nearly complete dart point (FS #443) has a transverse break across the distal end (Figure 9.41, B). The artifact was lost and the figure is after the field drawing. It has a concave base with rounded base tangs and very shallow side notches. It was collected near two housepits (Features A and 20). Numerous similar indented base side-notched points were associated with Cultural Layer 12 at Mummy Cave which dated about 5,300 years B.P. (McCracken et al. 1978). The point resembles the Oxbow type which is typical of terminal Early Archaic period components in the Northern Plains (Greiser et al. 1983). Several similar style projectile points are also illustrated from the Middle Archaic period component at the Dead Indian Creek site in northwest Wyoming (Frison and Walker 1984).

One fragmentary projectile point (SW5982-137) collected from the fill of a housepit (Feature 15) includes the base and part of the stem of a large, side-notched, chalcedony artifact (Figure 9.41, C). It is broken transversely at notch level. The notches are very broad and occur very low on the blade. The stem is slightly expanding and the base is nearly straight. The point resembles Elko Side-notched types that are typical of Early Archaic period sites in areas west of Bairoil, and which typically span a broad temporal range (Newberry and Harrison 1986, Smith and Creasman 1988).

Table 9.11 Summary of Heat-Altered Rocks, Component II, Bald Knob Site.

Material Type	No. of Rocks	Total Weight (kg)	Average Weight (kg)
Quartzite	119	30.9	0.26
Sandstone	844	74.7	0.09
Granite	276	154.6	0.56
Other	162	38.1	0.24
Total	1401	298.3	0.21

Table 9.12 Characteristics of Flaked Stone Tools, Component II, Bald Knob Site.

Catalog No.	Excavation Unit	Classification	Condition	Dimensions (mm)[1] L	W	T	Material Type	Remarks
87	113N 102E, SE	Projectile point	Base fragment	15(p)	11(p)	3(p)	Grey, semi-translucent chert	Stem length: 3.5 mm
137	115N 106E, SW, Feature 15	Projectile point	Base fragment	14(p)	18(p)	4(p)	Chalcedony	Base width: 16 mm; stem width: 12 mm; stem length: 7 mm
FS443	102N 114E, NE	Projectile point	Proximal, medial fragment	28(p)	16	--	--	Artifact lost during fieldwork
FS452	100N 98E, SE	Projectile point	Complete	21.5	14	--	--	Artifact lost during fieldwork
96	109N 106E, SE	Preform	Distal fragment	20(p)	9(p)	3(p)	Brown, opaque chert	Drill fragment
337	100N 106E, SE	Preform	Edge fragment	18(p)	17(p)	3.5(p)	Reddish brown, mottled chert	Small fragment
428	104N 100E, SE	Preform	Medial fragment	21(p)	17(p)	4.5(p)	Grey, opaque chert	--
482	102N 110E, SE	Preform	Terminal fragment	15.5(p)	18(p)	4(p)	Chalcedony	Small fragment
688	102N 116E, Feature 48.1	Preform	Medial fragment	12(p)	14(p)	3(p)	Grey, semi-translucent chert	Small fragment; serrated blade fragment
53	109N 100E, NW	Blank	Proximal fragment	18(p)	39(p)	9(p)	Chalcedony	Small fragment
151	102N 100E, SE	Blank	Terminal fragment	12(p)	16(p)	6(p)	Chalcedony	Small fragment
302	104W 106E, NW	Blank	Medial, distal fragment	31(p)	20(p)	5	Red, opaque chert	Three refitted fragments

Table 9.12 (continued)

Catalog No.	Excavation Unit	Classification	Condition	Dimensions (mm)[1] L	W	T	Material Type	Remarks
348	100N 110E, NE	Blank	Terminal fragment	15(p)	19(p)	4	Siltstone	Partially reduced tabular pebble
627	100N 114E, SW	Blank	Edge fragment	14(p)	13(p)	6(p)	Reddish-brown, opaque chert	Small fragment
148	104N 110E, SE	Preblank	Terminal fragment	21(p)	22.5(p)	10	Reddish-brown, opaque chert	--
237	104N 102E, NE	Preblank	Terminal fragment	36(p)	33(p)	11	Chalcedony	--
715	113N 116E, NW	Preblank	Terminal fragment	17(p)	23(p)	7(p)	Red, opaque chert	Small fragment
2	102N 108E, NE	Retouched flake	Complete	34	22	5	Tan, opaque chert	Tertiary flake; retouched distal and one lateral margin
82	109N 104E, SW	Retouched flake	Terminal fragment	27(p)	16(p)	6	Grey, semi-translucent chert	Tertiary flake; continuous retouch on ventral face
123	111W 106E, NE	Retouched flake	Complete	34	20	10.5	Red, opaque chert	Secondary flake; two retouched concavities (notches)
193	113N 102E, NE	Retouched flake	Edge fragment	32(p)	10(p)	6.5	Tan, opaque chert	Secondary flake; bifacially retouched
252	109N 102E, SE, Feature 17	Retouched flake	Complete	39	15	7	Red, opaque chert	Primary flake; one retouched lateral edge, one utilized lateral margin

Table 9.12 (continued)

Catalog No.	Excavation Unit	Classification	Condition	Dimensions (mm)[1] L	W	T	Material Type	Remarks
354	102N 110E, NE	Retouched flake	Complete	38	16.5	6	Grey, opaque chert	Secondary flake; retouched lateral margins
486	102N 112E, NW	Retouched flake	Complete	33	23.5	13	Red, opaque chert	Secondary flake; retouched distal edge
515	109N 104E, SW, Feature 17	Retouched flake	Complete	39	29	11.5	Grey, opaque chert	Tertiary flake; two retouched/utilized lateral margins; possible graver
614	102N 116E, SE	Retouched flake	Complete	29	28	5	Grey, opaque chert	Tertiary flake; continuous retouch, distal and lateral margins
672	102N 98E, SE, Feature 35	Retouched flake	Complete	40	34	10	Purple, opaque chert	Tertiary flake; retouched lateral margin
FS442	102N 114E, NE	Retouched flake	Complete	37	36	--	Grey, opaque chert	Retouched distal and lateral margins; artifact lost during fieldwork
62	109N 104E, NE	Retouched flake	Complete	31	25	6.5	Grey, dendritic chert	Tertiary flake; one utilized lateral edge
63	104N 110E, SE	Utilized flake	Complete	45	31	13	Brown, fine-grained quartzite	Tertiary flake; one utilized lateral margin

Table 9.12 (continued)

Catalog No.	Excavation Unit	Classification	Condition	Dimensions (mm)[1] L	W	T	Material Type	Remarks
91	107N 104E, NW, Feature 17	Utilized flake	Complete	31	24	7	Chalcedony	Secondary flake; one utilized margin (graver)
116	111N 100E, NE	Utilized flake	Complete	26	25	6.5	Grey quartzite	Tertiary flake; utilized lateral margin
313	113N 106E, NE, Feature 15	Utilized flake	Proximal fragment	35(p)	37.5(p)	11.5	Brown, fine-grained quartzite	Tertiary flake, one utilized lateral margin
388	104N 110E, SE	Utilized flake	Terminal fragment	21(p)	19	3.5	Siltstone	Tertiary flake; one utilized lateral margin
429	104N 100E, SW	Utilized flake	Medial fragment	15.5(p)	17.5(p)	4	White, opaque chert	Tertiary flake; one utilized lateral margin
441	100N 108E, SW	Utilized flake	Edge fragment	20.5(p)	13(p)	5(p)	White, opaque chert	Tertiary flake; utilized lateral margin
544	100N 112E, NW	Utilized flake	Terminal fragment	15(p)	10(p)	10(p)	White, opaque chert	Small tertiary flake fragment; one utilized margin
583	100N 112E, SW	Utilized flake	Complete	34	22.5	4	Brown, semi-translucent chert	Tertiary flake, utilized lateral margin
613	102N 116E, SW	Utilized flake	Complete	52	39	9	Grey, semi-translucent	Secondary flake; utilized lateral margin
633	102N 100E, SE, Feature 35	Utilized flake	Complete	38.5	17	9	Grey, opaque chert	Tertiary flake; utilized lateral margin

Table 9.12 (continued)

Catalog No.	Excavation Unit	Classification	Condition	Dimensions (mm)[1] L	W	T	Material Type	Remarks
676	100N 116E, NE	Utilized flake	Complete	53.5	32.5	11.5	Brown quartzite	Tertiary flake; one utilized lateral margin
711	102N 114E, NW	Utilized flake	Terminal fragment	12(p)	14(p)	2	Brown, semi-translucent chert	Tertiary flake; utilized lateral margin
712	111N 104E, NE	Utilized flake	Terminal fragment	13(p)	20(p)	7	Brown, fine-grained quartzite	Tertiary flake; utilized lateral margin
713	100N 112E, NW	Utilized flake	Complete	25	21	3	Brown, opaque chert	Tertiary flake; utilized distal edge
716	102N 110E, NW	Utilized flake	Complete	30	19	40	Red, opaque chert	Tertiary flake; utilized lateral margin
717	104N 104E, NE	Utilized flake	Complete	22	21	6.5	Purple, opaque chert	Tertiary flake; utilized lateral margin
718	102N 102E, NE	Utilized flake	Distal fragment	17(p)	19(p)	5	Siltstone	Tertiary flake; one utilized lateral margin, graver
719	109N 108E, SE	Utilized flake	Complete	24.5	16	6	Purple, opaque chert	Tertiary flake; two utilized lateral margins
720	111N 108E, NE	Utilized flake	Complete	33	15	5	Grey, opaque chert	Secondary flake; utilized lateral margin
721	113N 104E, NE	Utilized flake	Complete	21.5	16	5	Red, opaque chert	Secondary flake; one utilized lateral edge
722	102N 104E, NE	Utilized flake	Terminal fragment	19.5(p)	23(p)	3	Siltstone	Tertiary flake; one utilized lateral margin

Table 9.12 (continued)

Catalog No.	Excavation Unit	Classification	Condition	Dimensions (mm)[1] L	W	T	Material Type	Remarks
723	109N 110E, SW	Utilized flake	Proximal fragment	16(p)	12(p)	3	Chalcedony	Secondary flake; one utilized lateral margin
724	102N 112E, NE	Utilized flake	Complete	25	15	3	Grey, opaque chert	Tertiary flake; two utilized lateral margins
725	113N 104E, NW	Utilized flake	Complete	34	22	5	Red, opaque chert	Secondary flake; utilized lateral margin, possible graver
157	115N 104E, SW	Core	Complete	34	21	15	Red, opaque chert	Bidirectional
217	104N 104E, NW	Core	Complete	40	36	21.5	Grey, opaque chert	Multidirectional
280	104N 106E, NE	Core	Complete	33	23	18	Moss agate	Multidirectional
284	102N 106E, NE	Core	Fragment	41	16(p)	18	Grey, opaque chert	--
287	109N 102E, SE, Feature 17	Core	Complete	42	36	25	Red, opaque chert	--
300	104N 106E, NW	Core	Complete	38	34	15	Red, opaque chert	Multidirectional
307	115N 104E, Feature 15.2	Core	Complete	34	29	18	Red, opaque chert	Bidirectional
312	113N 106E, Feature 15.1	Core	Edge fragment	30(p)	26(p)	14(p)	Red, opaque chert	Small fragment
314	102N 108E, NE	Core	Edge fragment	26.5(p)	24(p)	21	Red, opaque chert	Small fragment

[1] L = length, W = width, T = thickness; (p) = broken specimen, partial dimension.

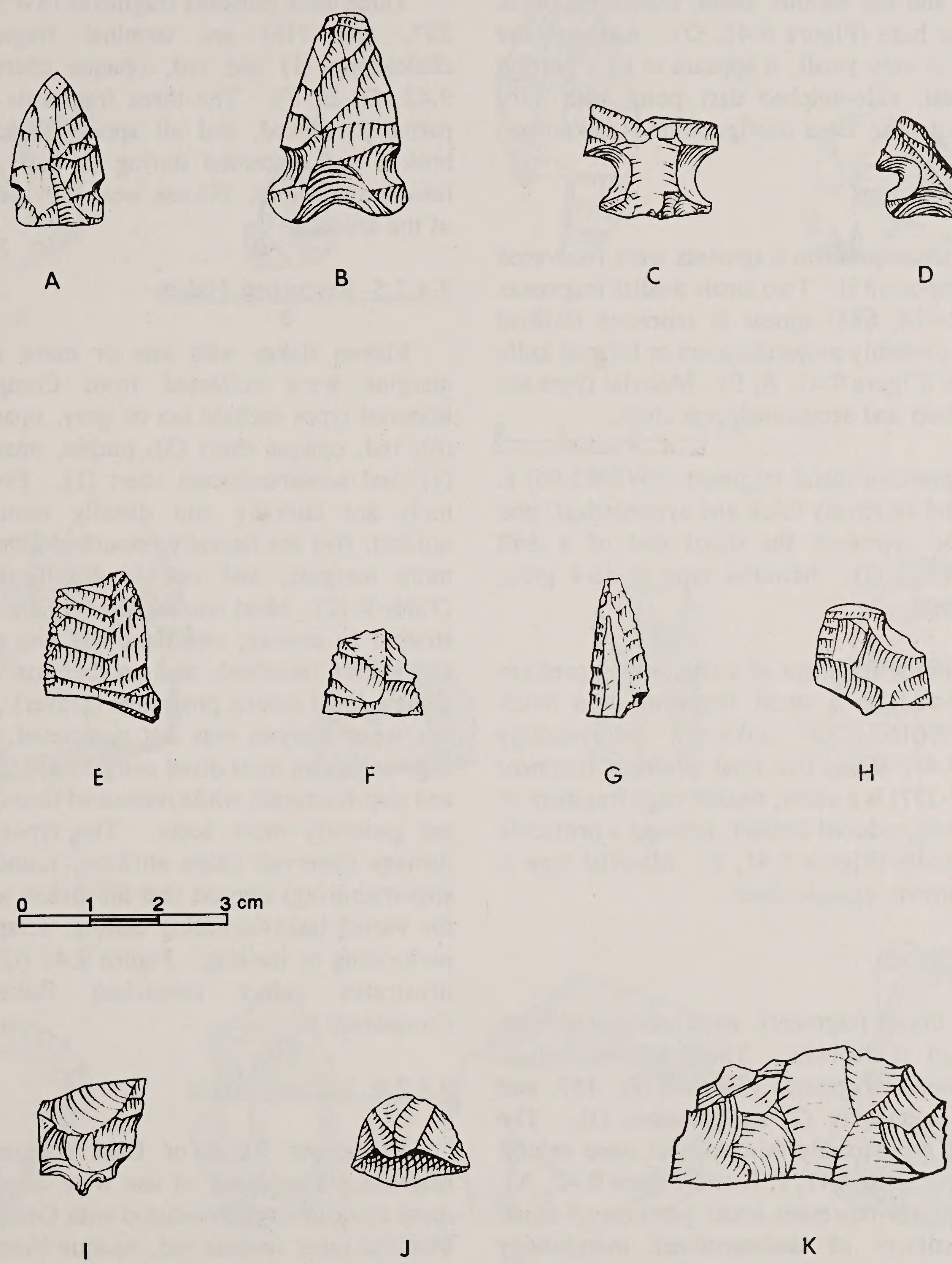


Figure 9.41 Selected Artifacts, Component II, Bald Knob Site. A) FS#452; B) FS#443; C) SW5982-137; D) SW5982-87; E) SW5982-428; F) SW5982-688; G) SW5982-96; H) SW5982-482; I) SW5982-337; J) SW5982-53; K) SW5982-151.

One small base fragment (SW5982-87) of semitranslucent chert is broken diagonally across the stem and has another small, transverse break across the base (Figure 9.41, D). Although the fragment is very small, it appears to be a portion of a small, side-notched dart point with very narrow notches. Base configuration is unknown.

9.4.2.2 Preforms

Five small preform fragments were recovered from Component II. Two small medial fragments (SW5982-428, 688) appear to represent finished artifacts, probably projectile point or bifacial knife fragments (Figure 9.41, E, F). Material types are opaque chert and semitranslucent chert.

One preform distal fragment (SW5982-96) is narrow and relatively thick and symmetrical, and appears to represent the distal end of a drill (Figure 9.41, G). Material type is dark grey, opaque chert.

A terminal fragment of a chalcedony preform (SW5982-482) is a small fragment of a much larger artifact of unknown morphology (Figure 9.41, H). The final preform fragment (SW5982-337) is a small, medial edge fragment of a completely reduced artifact, perhaps a projectile point or knife (Figure 9.41, I). Material type is reddish-brown, opaque chert.

9.4.2.3 Blanks

Five blank fragments were associated with Component II deposits. These bifaces include three terminal fragments (SW5982-53, 151, and 348) of chalcedony (2) and siltstone (1). The fragments are partially thinned, and none exhibit use wear (Figure 9.41, J, K and Figure 9.42, A). The fragments represent small portions of much larger artifacts of undetermined morphology and/or function. The remaining two blank fragments include a small edge fragment (SW5982-627) of reddish-brown, opaque chert, and the medial and distal portions (SW5982-302) of a partially thinned blank of dark red, opaque chert (Figure 9.42, B and C).

9.4.2.4 Preblanks

Three thick preblank fragments (SW5982-148, 237, and 715) are terminal fragments of chalcedony (1) and red, opaque chert (Figure 9.42, D, E, F). The three fragments are only partially reduced, and all appear to have been broken and discarded during an early stage of lithic manufacture. No use wear is evident on any of the artifacts.

9.4.2.5 Retouched Flakes

Eleven flakes with one or more retouched margins were collected from Component II. Material types include tan or grey, opaque chert (6); red, opaque chert (3); purple, opaque chert (1); and semitranslucent chert (1). Five of the tools are laterally and distally retouched or utilized, five are laterally retouched along one or more margins, and one is distally retouched (Table 9.12). Most retouched edges are generally straight to convex; one flake has two retouched concavities (notches), and another has use wear along a small natural projection (graver). Detailed use wear analysis was not completed, although edge angles on most distal margins are fairly steep and step-fractured, while retouched lateral margins are generally more acute. The types of edge damage observed (edge attrition, rounding, and step-fracturing) suggest that the flakes were used for varied tasks including cutting, scraping, and perforating or incising. Figure 9.42 (G, H, I, J) illustrates select retouched flakes from Component II.

9.4.2.6 Utilized Flakes

Twenty-six flakes or flake fragments with macroscopic evidence of use wear along one or more margins were associated with Component II. Material types include red, opaque chert (5); tan or grey, opaque chert (6); white, opaque chert (3); chalcedony (2); siltstone (2); brown, fine-grained quartzite (3); grey quartzite (1); brown quartzite (1); and semitranslucent chert (3). Four flakes are utilized along both lateral margins, 20 flakes are utilized on one distal or one lateral margin, and

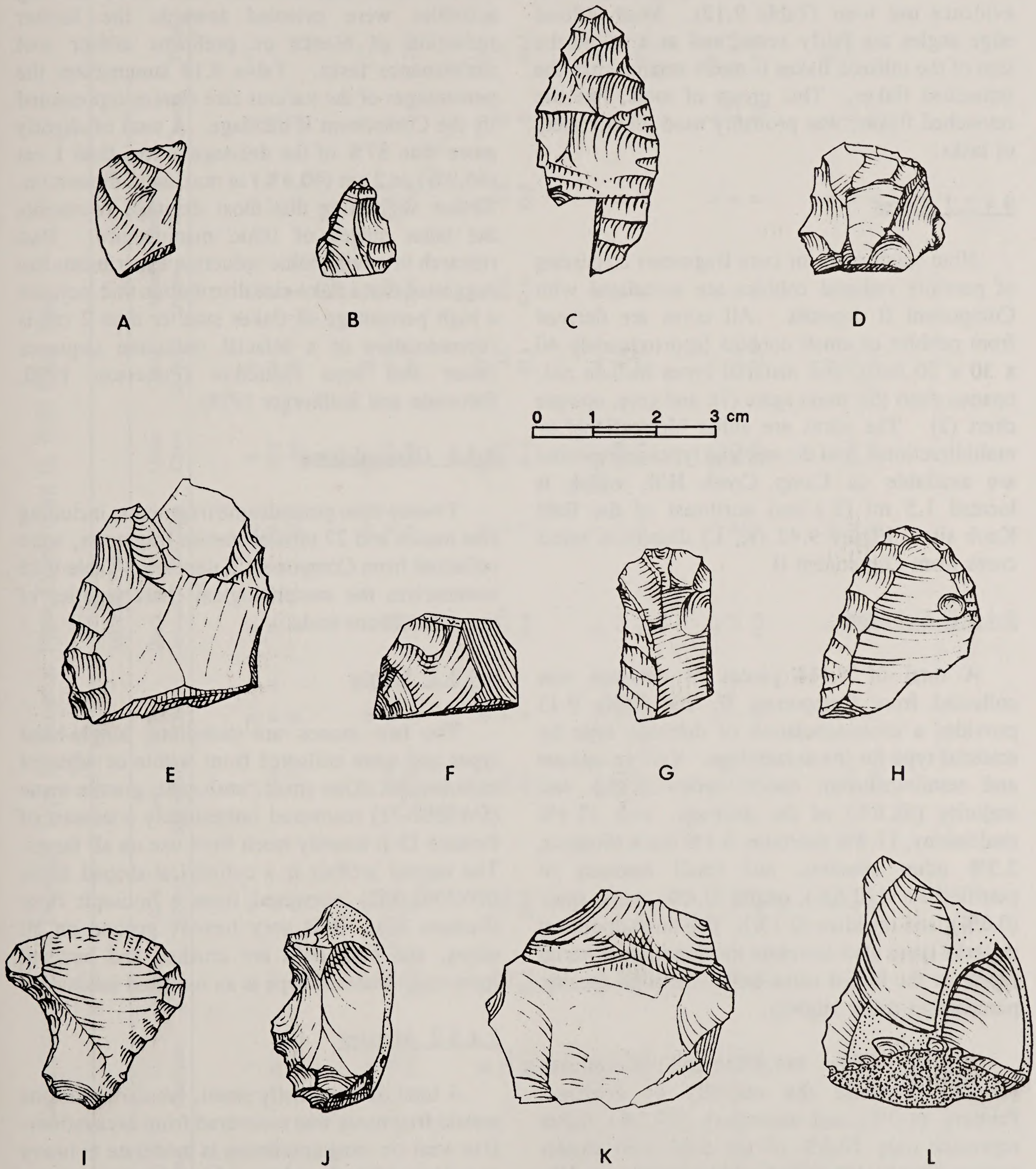


Figure 9.42 Selected Artifacts, Component II, Bald Knob Site. A) SW5982-348; B) SW5982-627; C) SW5982-302; D) SW5982-148; E) SW5982-237; F) SW5982-715; G) SW5982-82; H) SW5982-2; I) SW5982-614; K) SW5982-123; L) SW5982-287.

two flakes have small natural projections that evidence use wear (Table 9.12). Most utilized edge angles are fairly acute, and as a whole the size of the utilized flakes is much smaller than the retouched flakes. This group of tools, like the retouched flakes, was probably used for a variety of tasks.

9.4.2.7 Cores

Nine small cores or core fragments consisting of partially reduced cobbles are associated with Component II deposits. All cores are derived from pebbles or small cobbles (approximately 40 x 30 x 30 mm), and material types include red, opaque chert (6); moss agate (1); and grey, opaque chert (2). The cores are either bidirectional or multidirectional, and the material types represented are available on Camp Creek Hill, which is located 1.5 mi (2.4 km) northeast of the Bald Knob site. Figure 9.42 (K, L) illustrates select cores from Component II.

9.4.2.8 Debitage

A total of 1,418 pieces of debitage was collected from Component II, and Table 9.13 provides a cross-tabulation of debitage type by material type for the assemblage. Various opaque and semitranslucent cherts comprise the vast majority (68.8%) of the debitage, with 12.4% chalcedony, 11.8% quartzite, 3.1% black siltstone, 2.5% other siltstone, and small amounts of petrified wood (0.6%), quartz (0.4%), moss agate (0.3%), and obsidian (0.1%). The three dominant material types also represent the dominant material types for the flaked stone tools, although specific percentages differ slightly.

Tertiary flakes (44.4%) and microflakes (23.1%) comprise the majority of debitage. Primary (1.0%) and secondary (19.2%) flakes represent only 20.2% of the total with shatter representing 11.1%, tested cobbles/pebbless 1.1%, and unmodified manuports 0.1%. The low number of primary flakes suggests that initial raw material reduction was not an important component activity. The dominance of noncortical flakes may indicate that flaked stone manufacturing activities were oriented towards the further reduction of blanks or preforms and/or tool maintenance tasks. Table 9.14 summarizes the percentages of the various size classes represented by the Component II debitage. A total of slightly more than 87% of the debitage is less than 1 cm (46.9%) or 2 cm (40.4%) in maximum dimension, further suggesting that most debitage represents the latter stages of lithic manufacture. Past research involving lithic reduction experiments has suggested that a flake-size distribution that includes a high percentage of flakes smaller than 2 cm is representative of a bifacial reduction sequence rather that core reduction (Patterson 1990, Patterson and Sollberger 1978).

9.4.3 Groundstone

Twenty-nine groundstone fragments, including two manos and 27 tabular metate fragments, were collected from Component II deposits. Table 9.15 summarizes the morphological characteristics of the groundstone tools.

9.4.3.1 Manos

The two manos are complete, single-hand types and were collected from within or adjacent to housepits. One small, unshaped, granite mano (SW5992-71) recovered immediately southeast of Feature 15 is heavily worn from use on all facets. The second artifact is a cylindrical-shaped mano (SW5982-562) recovered from a housepit floor (Feature 35). It is very heavily ground on all edges, and both ends are crushed and battered from use. Material type is an oxidized sandstone.

9.4.3.2 Metates

A total of 27, mostly small, tabular sandstone metate fragments was recovered from excavations. Use wear on most specimens is moderate to heavy as indicated by smoothing and pecking on one or more facets, and original morphology (shaped or unshaped) of most specimens could not be determined from the small fragments recovered. The ground facets on most specimens are flat to

Table 9.13 Cross-Tabulation of Debitage Type by Material Type, Component II, Bold Knob Site.

	Material Type												
Debitage Type	Quartzite	White Chert	Red Chert	Clear Chalcedony	Tan Chert	Black Siltstone	Obsidian	Other Chert	Other Siltstone	Moss Agate	Petrified Wood	Quartz	Total
Primary Flake													
Number	3	1	0	3	0	0	0	6	0	0	1	0	14
Row %	21.4	7.1	0	21.4	0	0	0	42.9	0	0	7.1	0	0
Column %	1.8	2.1	0	1.7	0	0	0	0.6	0	0	11.1	0	1.0
Secondary Flake													
Number	26	9	0	27	0	6	0	183	15	1	5	0	272
Row %	9.6	3.3	0	9.9	0	2.2	0	67.3	5.5	0.4	1.8	0	0
Column %	15.6	19.1	0	15.3	0	13.6	0	19.8	42.9	20.0	55.6	0	19.2
Tertiary Flake													
Number	73	25	1	70	0	16	0	425	13	4	3	0	630
Row %	11.6	4.0	0.2	11.1	0	2.5	0	67.5	2.1	0.6	0.5	0	0
Column %	43.7	53.2	33.3	39.8	0	36.4	0	46.0	37.1	80.0	33.3	0	44.4
Microflake													
Number	40	8	0	66	1	15	1	193	4	0	0	0	328
Row %	12.2	2.4	0	20.1	0.3	4.6	0.3	58.8	1.2	0	0	0	0
Column %	24.0	17.0	0	37.5	100.0	34.1	100.0	20.9	11.4	0	0	0	23.1
Shatter													
Number	20	4	2	9	0	6	0	110	1	0	0	5	157
Row%	12.7	2.5	1.3	5.7	0	3.8	0	70.1	0.6	0	0	3.2	8.3
Column%	12.0	8.5	66.7	5.1	0	13.6	0	11.9	2.9	0	0	8.3	11.1
Tested Cobble													
Number	4	0	0	1	0	1	0	6	2	0	0	1	15
Row%	26.7	0	0	6.7	0	6.7	0	40.0	13.3	0	0	6.7	16.7
Column %	2.4	0	0	0.6	0	2.3	0	0.6	5.7	0	0	16.7	1.1

Table 9.13 (continued)

	Material Type												
Debitage Type	Quartzite	White Chert	Red Chert	Clear Chalcedony	Tan Chert	Black Siltstone	Obsidian	Other Chert	Other Siltstone	Moss Agate	Petrified Wood	Quartz	Total
Manuport													
Number	1	0	0	0	0	0	0	1	0	0	0	0	2
Row%	50.0	0	0	0	0	0	0	50.0	0	0	0	0	0
Column %	0.6	0	0	0	0	0	0	0.1	0	0	0	0	0.1
Total													
Number	167	47	3	176	1	44	1	924	35	5	9	6	1,418
Row %	11.8	3.3	0.2	12.4	0.1	3.1	0.1	65.2	2.5	0.4	0.6	0.4	

Table 9.14 Percentages of Debitage Type by Size Class, Component II, Bald Knob Site.

Debitage Type	<1 cm	<2 cm	<3 cm	<4 cm	>4 cm	Total %
Primary flake	0.2	0.7	0.1	--	--	1.0
Secondary flake	1.7	10.6	4.6	1.6	0.3	18.8
Tertiary flake	14.2	25.1	4.0	0.4	--	43.7
Microflake	23.5	--	--	--	--	23.5
Shatter	7.3	3.9	0.2	0.2	--	11.6
Tested material	--	0.1	0.1	0.1	0.2	0.5
Manuport	--	--	0.1	0.1	0.4	0.6
Total	46.9	40.4	9.1	2.4	0.9	

slightly concave. Most specimens likely represent unshaped tabular metates, although one small fragment (SW5982-1) of a basin metate was recovered. Twelve artifacts consist of small tabular fragments associated with an activity area at the southeast corner of the block, with six fragments recovered near Feature 31 on the north side of the trench. The uniform thickness of the fragments from these areas suggests that only one or two metates are represented from each concentration.

9.4.4 Other Tools

Other tools collected from the Bald Knob site include a small abrader and a hammerstone. Characteristics of the two artifacts are summarized in the following discussion.

9.4.4.1 Abrader

One complete, small, grooved, sandstone abrader (SW5892-679) was collected (Figure 9.43, A). It has one well-developed groove (20 x 16 x 4 mm deep) on one face. Two similar artifacts were recovered by WWC during the excavation of Feature A at the Bald Knob site (Hoefer 1988).

9.4.4.2 Hammerstone

One small grey quartzite (SW5982-470) cobble evidences crushing on both terminal ends (Figure 9.43, B). It has three negative flakes scars on one end, and this flaking probably resulted incidentally during hammerstone use. The hammerstone is complete, and dimensions are 60 x 48 x 44 mm. The hammerstone was collected from near Feature 20.1, a central hearth within a housepit.

9.4.5 Animal Remains

Fifty-seven bone or tooth fragments, three mussel shell fragments, and two possible eggshell fragments were recovered from Component II deposits. Table 9.16 summarizes the animal size classes represented.

Total weight of the 62 fragments is only 18.3 g, and none of the fragments were identified to species. Twenty-two (35.5%) fragments are medium or large mammal, one (1.6%) is small to large mammal, 14 (22.6%) are medium mammal, 10 (16.1%) are small or medium mammal, 10 (16.1%) are very small to medium mammal, two (3.2%) eggshell fragments may represent a small bird, and three (4.8%) fragments of mussel shell

Table 9.15 Characteristics of Groundstone Tools, Component II, Bald Knob Site.

Feature No.	Excavation Unit	Classification	Condition	Dimensions (mm)[1] L	W	T	Weight (kg)	Material Type	Remarks
1	109N 106E, NE (Test Unit 5)	Metate	Medial fragment	81	68	20	0.177	Sandstone	Oxidized; heavily worn basin metate fragment
71	113N 106E, SE	Mano	Complete	63	47	43	0.187	Granite	Heavy use wear; numerous ground facets; single-hand
125	109N 108E, NW	Metate	Small fragment	63	37	18	0.055	Sandstone	Heavy unifacial use wear
358	111N 106E, SE, Feature 31	Metate	Lateral fragments (2)	94 81	77 51	20 21	0.153 0.139	Sandstone	Moderate to heavy bifacial use wear
359	111N 106E, NE	Metate	Medial fragments (4)	127 63 44 40	92 58 32 30	25 23 15 17	0.21 (total)	Sandstone	Oxidized; light to moderate unifacial use wear
372	100N 110E, NE	Metate	Medial fragment	72	32	19	0.025	Sandstone	Oxidized; heavy unifacial use wear
497	100N 106E, NE	Metate	Small indeterminate fragment	49	31	16	0.035	Sandstone	Heavy unifacial use wear
539	100N 116E, NW	Metate	Medial fragment	46	44	14	0.045	Sandstone	Oxidized; heavy unifacial use wear

Table 9.15 (continued)

Feature No.	Excavation Unit	Classification	Condition	Dimensions (mm)[1] L	W	T	Weight (kg)	Material Type	Remarks
562	100N 100E, SE, Feature 35	Mano	Complete	105	59	57	0.55	Granite	Oxidized; single-hand, cylindrical shape; very heavy use wear; numerous ground facets; battered terminal ends
577	100B 116E, NE	Metate	Medial fragment	86	57	8.5	0.03	Sandstone	Oxidized; heavy unifacial use wear
588	100N 112E,	Metate	Medial fragment	142	112	27	0.40	Sandstone	Moderate unifacial use wear
610	102N 112E, SW, Feature 43	Metate	Edge fragment	92	85	27	0.38	Sandstone	Oxidized; moderate unifacial use wear
623	102B 116E, NW	Metate	Medial fragments (3)	52 61 63	32 40 51	10 11 11	0.12 (total)	Sandstone	Oxidized; moderate to heavy unifacial use wear
624	102N 116E, SW	Metate	Medial fragments (5)	38 45 21 21 19	31 27 16 20 19	9 5 9 5 5	0.19 (total)	Sandstone	Oxidized; moderate to heavy bifacial use wear
628	100N 114E, NE	Metate	Indeterminate fragment	40	28	8	0.016	Sandstone	Oxidized; moderate unifacial use wear
651	104N 110E, NE	Metate	Medial fragment	221	149	31	0.48	Sandstone	Light unifacial use wear

Table 9.15 (continued)

Feature No.	Excavation Unit	Classification	Condition	Dimensions (mm)[1] L	W	T	Weight (kg)	Material Type	Remarks
664	102N 114E, SE	Metate	Medial fragment	74 65	44 65	12 12	0.095 (total)	Sandstone	Heavy unifacial use wear
671	102N 116E, NE	Metate	Medial fragment	69	43	9	0.035	Sandstone	Oxidized; heavy unifacial use wear
679	100N 116E, NE	Grooved abrader	Complete	26	22	16	0.01	Sandstone	One groove (20 x 8 x 4 mm)

[1] L = length, W = width, T = thickness.

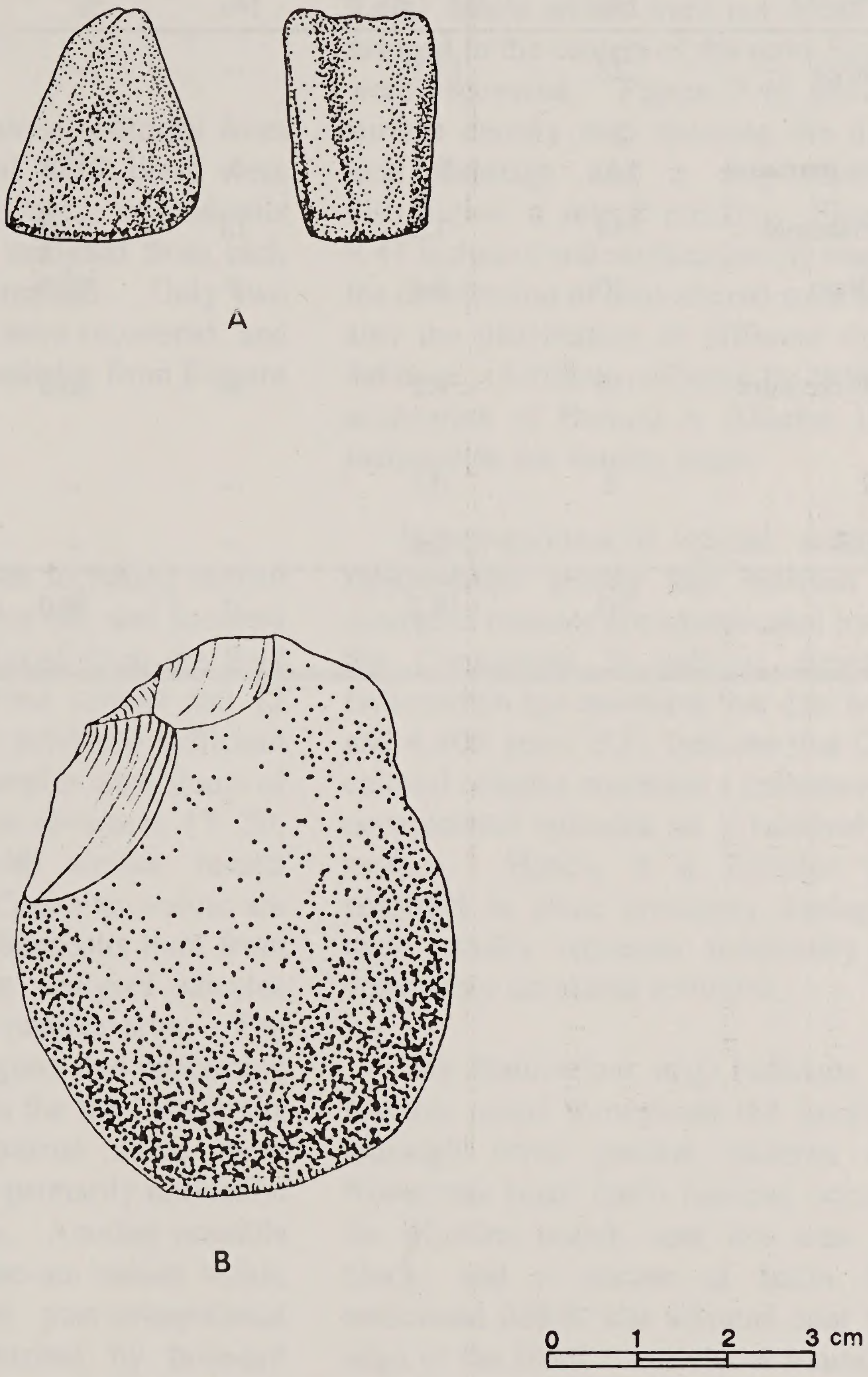


Figure 9.43 Selected Artifacts, Component II, Bald Knob Site. A) SW5982-679; B) SW5982-470.

Table 9.16 Summary of Animal Remains, Component II, Bald Knob Site.

Animal Size Category	Total Specimens		Burned Specimens		Identifiable Elements
	No.	Wt. (g)	No.	%	
Medium-large mammal	22	13.3	--	--	Tooth fragments (2)
Small-large mammal	1	0.1	1	100.0	--
Medium mammal	14	1.2	13	92.9	Tooth fragment (1)
Small-medium mammal	10	0.6	9	90.0	Tooth fragment (1)
Very small-medium mammal	10	0.2	8	80.0	--
Small bird	2	0.1	--	--	Eggshell
Mussel shell	3	2.8	--	--	--
Total	62	18.3	31	50.0	

are included. Most specimens are very small fragments, and 31 (50%) of the fragments are burned. Thirty-one (50%) of the fragments were recovered from cultural features.

9.4.6 Plant Macrofossils

Forty-nine samples of stained sediment from cultural features that totalled 88.7 liters were processed (floated) for plant macrofossils (Table 9.17). Samples were analyzed from each basin type and from each housepit. Only two charred seeds (chenopodium) were recovered, and both were collected from fill samples from Feature 35, a housepit.

9.4.7 Pollen Analysis

Twenty-nine pollen samples including control samples (3), feature fill samples (8), and housepit floor samples (18) were analyzed from the Bald Knob site (Appendix B). Two control and 12 samples from housepit floors produced sufficient pollen counts for analysis. Samples from floors of the three most intact housepits (Features 17, 20, and 35) were analyzed with similar results obtained from each feature. Cheno-am values are generally higher from these housepits than from the control samples, or from analyzed samples from other sites within the project area. The results of pollen analysis suggests that processing of Cheno-ams occurred within the Bald Knob site housepits, although few charred seeds were recovered. This may indicate primarily utilization of greens or other plant parts. Another possible explanation for the high Cheno-am values within the housepits may relate to post-occupational processes. The areas disturbed by housepit construction would foster growth of plant communities, including Chenopodaceous species, which are adapted to disturbed areas. It is likely that samples from housepit floors would contain not only culturally introduced pollen but also pollen introduced by natural processes subsequent to housepit occupation.

9.4.8 Spatial Distribution of Cultural Remains

The distribution of cultural features and tools associated with Component II is shown in Figure 9.44. Tools which were not found in place are mapped in the centers of the units from which they were recovered. Figure 9.45 provides a trend surface density map showing the distribution of total debitage and a map that shows the distribution of animal remains. Figures 9.46 and 9.47 include trend surface density maps illustrating the distribution of heat-altered rock by weight and also the distribution of different size classes of debitage. Artifacts collected by WWC during the excavation of Feature A (Hoefer 1988) are not included in the density maps.

Interpretations of spatial and/or functional relationships among and between the various classes of remains are complicated by the nature of the Component II cultural deposits. Eight radiocarbon age estimates that date between 5,100 and 4,400 years B.P. indicate that Component II cultural remains represent a palimpsest of multiple occupational episodes on a relatively stable land surface. Hence, it is possible that remains recorded in close proximity during excavations may actually represent temporally distinct and completely unrelated activities.

The feature/tool map indicates that cultural features occur throughout the excavation block, although some general patterns are evident. Numerous small basin features occured north of the pipeline trench near the west edge of the block, and a cluster of basin features and associated debris was situated near the southeast edge of the block. Individual housepits occurred near the north edge and at the southwest corner of the block, with two groupings of two housepits (Features 5 and 17, Features A and 20) located in the center of the block on the north and south sides of the pipeline trench. Radiocarbon dating results suggest that the housepits within each cluster probably did not represent contemporaneous occupations. Each of the six housepits had a number of internal subfeatures, and generally few cultural features were recorded

Table 9.17 Plant Macrofossils Recovered from Feature Fill, Component II, Bald Knob Site.

Feature No.	Sample No.	Volume (liters)	No. of Charred Seeds	Taxon
5.1	86	2	0	--
5.2	100	2	0	--
5.3	118	2	0	--
5.6	148	2	0	--
7	47	1.5	0	--
8	127	2	0	--
8	131	2	0	--
10	76	1.5	0	--
14	133	2	0	--
15	167	1	0	--
15	233	2	0	--
15	237	2	0	--
15	275	2	0	--
15.1	533	2	0	--
15.3	254	2	0	--
15.5	279	2	0	--
17	196	1.5	0	--
17	230	1.5	0	--
17.1	183	1	0	--
17.1	198	1.5	0	--
20	303	2	0	--
20	333	2.2	0	--
20	347	1	0	--
20	371	1.5	0	--
20.1	314	2	0	--
20.1	362	1.5	0	--

Table 9.17 (continued)

Feature No.	Sample No.	Volume (liters)	No. of Charred Seeds	Taxon
20.2	399	1	0	--
20.3	403	2	0	--
24	221	2	0	--
26	255	1	0	--
29	286	2	0	--
29	394	2	0	--
33	319	2	0	--
35	374	2	0	--
35	389	2	0	--
35	392	1.5	0	--
35	397	2	0	--
35	407	2	0	--
35	423	2	1	goosefoot
35	424	2	1	goosefoot
35	440	2	0	--
35	441	2	0	--
35	469	2	0	--
35	514	2	0	--
35.1	488	2	0	--
43	429	1.5	0	--
47	457	2	0	--
54	528	2	0	--
58	548	2	0	--

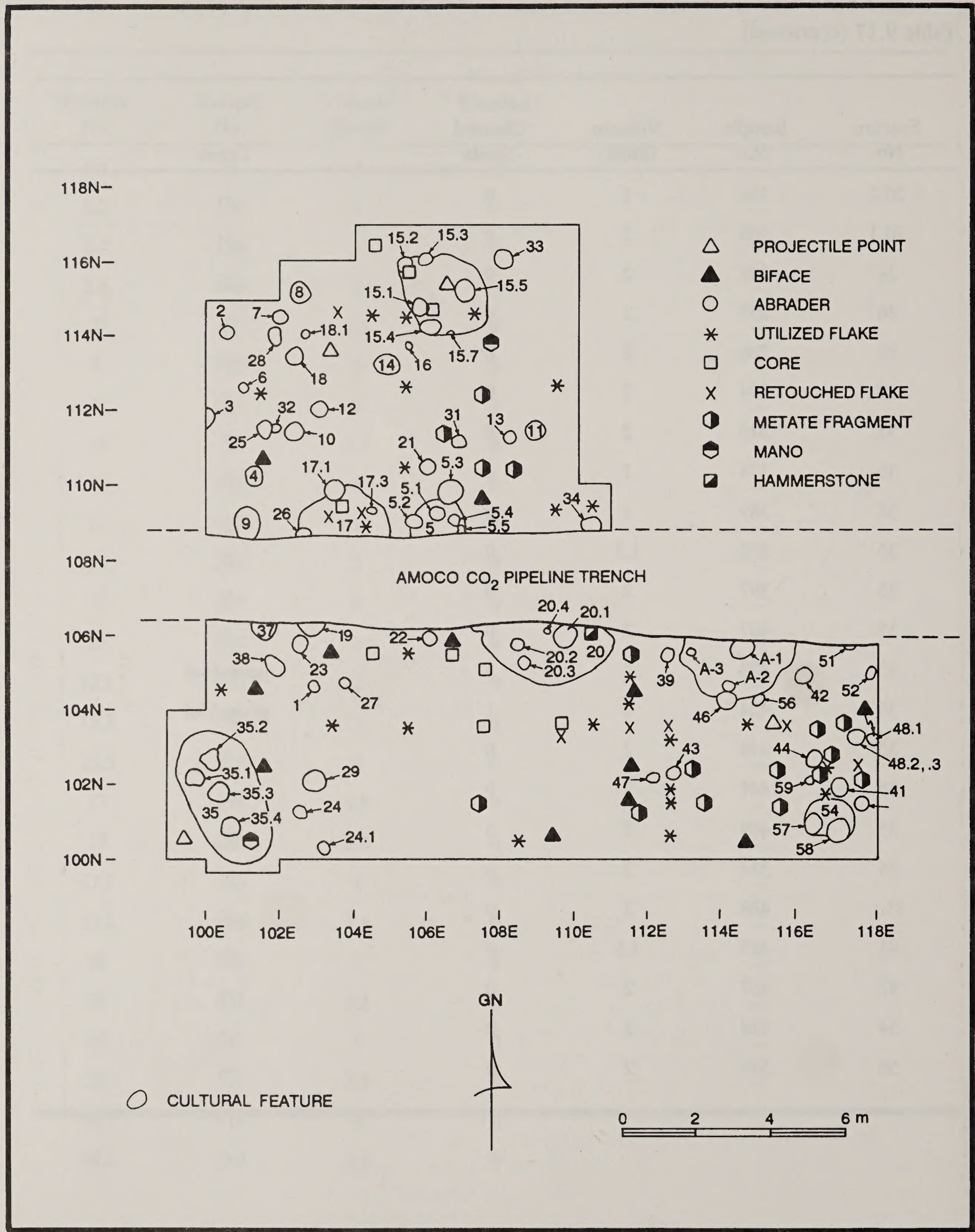


Figure 9.44 Plan Map with Features and Tools Plotted, Component II, Bald Knob Site.

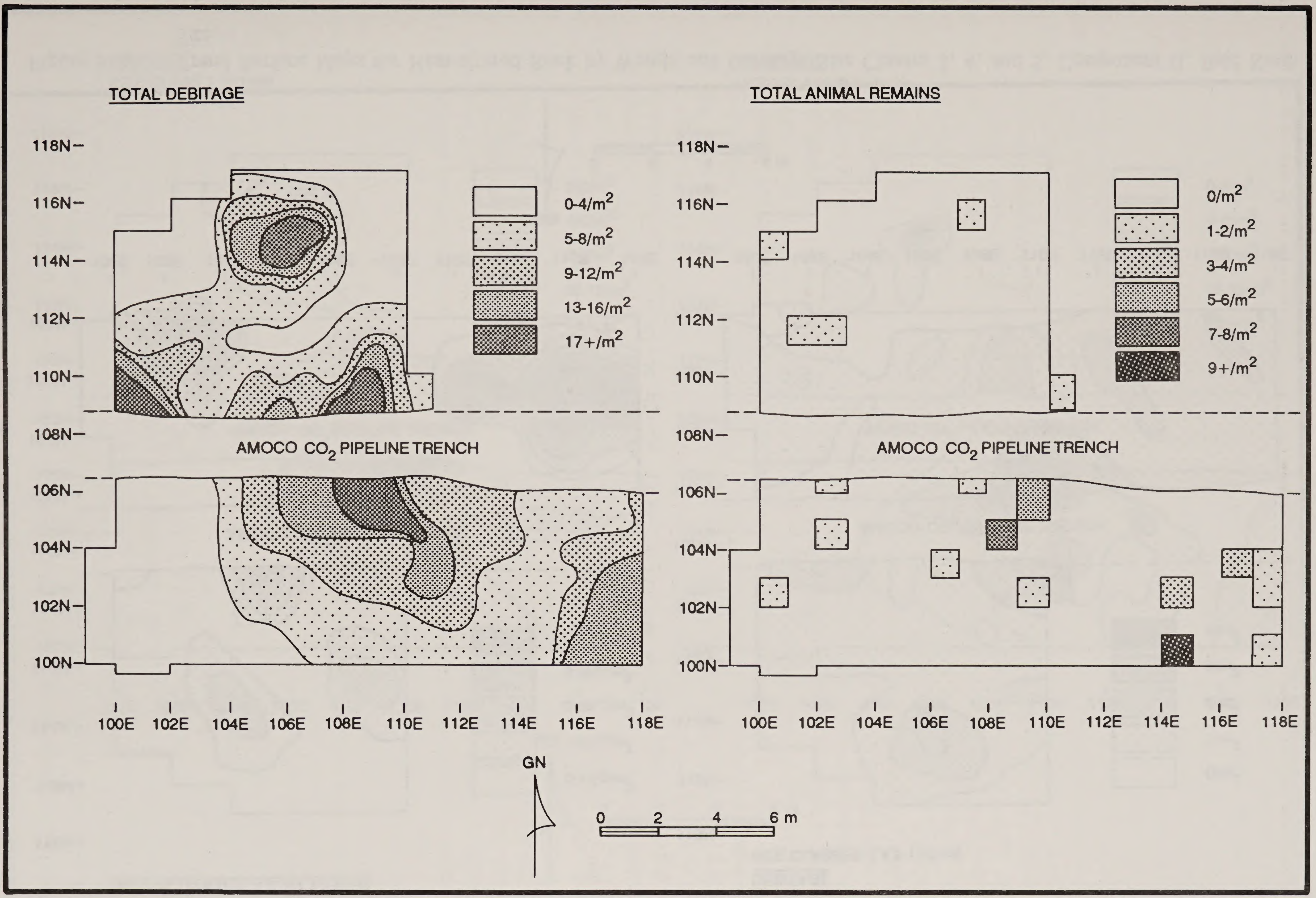


Figure 9.45 Trend Surface Map for Total Debitage and Distribution Map for Animal Remains, Component II, Bald Knob Site.

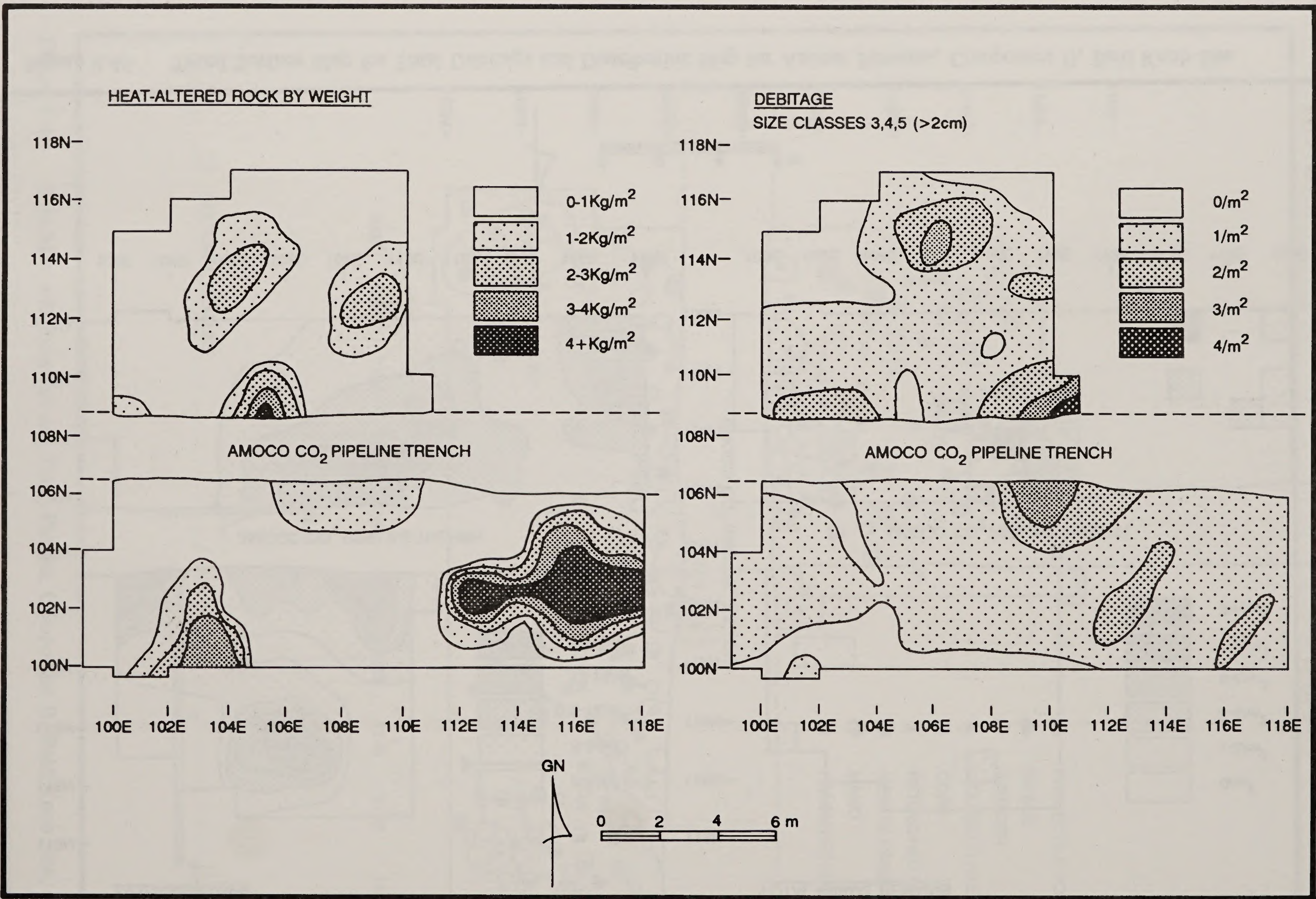


Figure 9.46 Trend Surface Maps for Heat-altered Rock by Weight and Debitage Size Classes 3, 4, and 5, Component II, Bald Knob Site.

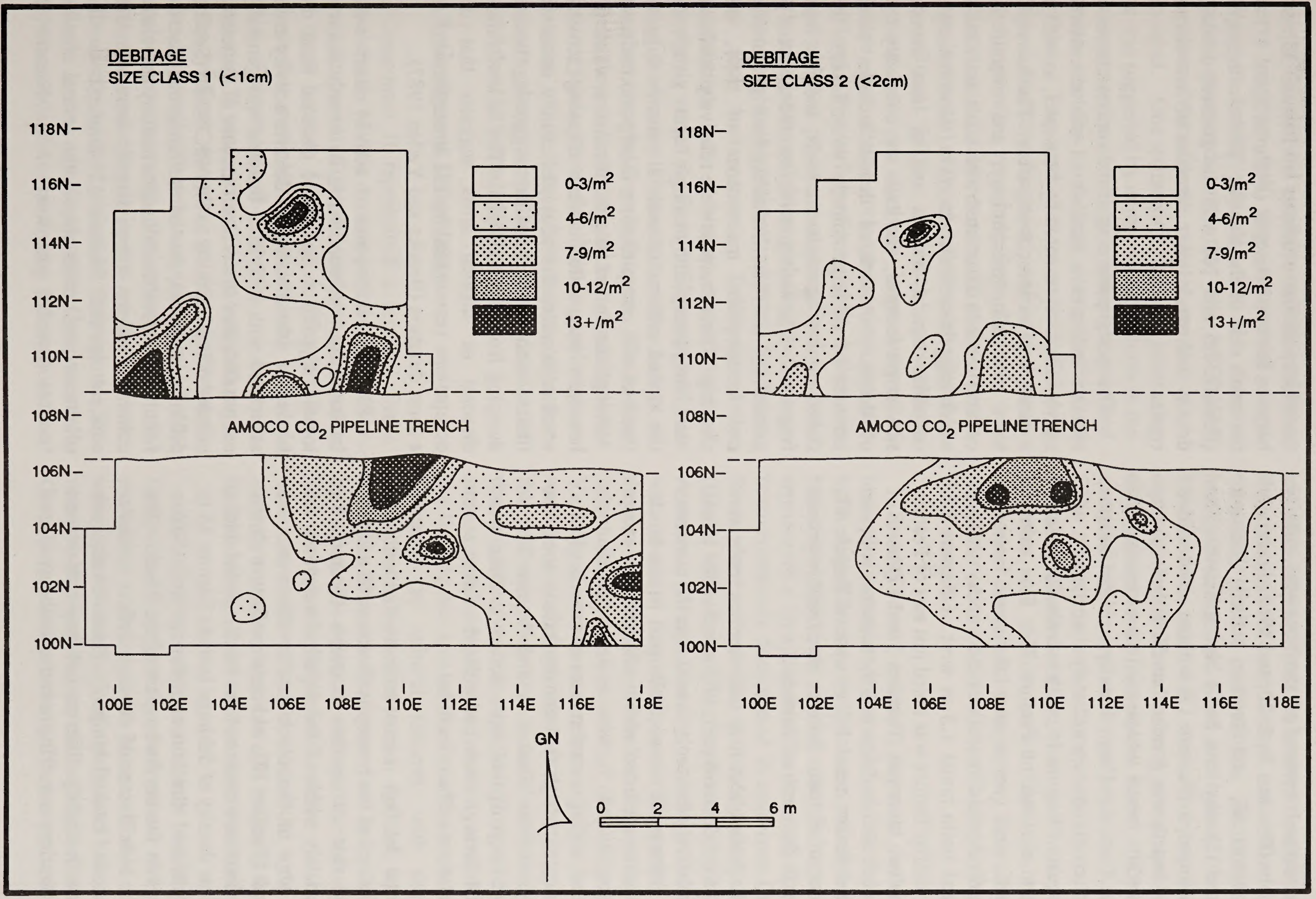


Figure 9.47 Trend Surface Maps for Debitage Size Classes 1 and 2, Component II, Bald Knob Site.

within several meters of the housepits. Four housepits (Features A, 5, 20, and 35) had centrally located hearths, and another deflated housepit (Feature 15) may have had a central hearth. The single housepit (Feature 17) without an identified central hearth was greater than 50% destroyed by the pipeline trench which may have removed the central feature. Deep, heavily oxidized hearths were recorded immediately northeast and southwest of Feature 15, with two similar features noted to the east of Feature 35. Few cultural features were noted near the two housepits (Features A and 20) south of the trench, with one oxidized basin noted 1.5 m west of Feature 20, and a similar feature was noted just east of Feature A. The two housepits (Features 5 and 17) north of the trench also had few nearby features, with two oxidized basins noted 1-2 m west of Feature 17, and four small basin features noted within several meters to the north of Feature 5.

The feature/tool map indicates that tools were recovered from most parts of the excavation block, with relatively few tools located near the numerous basin features in the northeast part of the block. Tools were recorded within all housepits except Features A and 5, with at least several tools recorded within several meters of most housepits. Two areas of high tool density extend southeast for 4-5 m from Feature A and Feature 20. A diverse range of tool types occurs in these areas with bifaces, retouched/utilized flakes, and groundstone artifacts included.

Total debitage is most concentrated within or near several of the housepits (Features 15 and 20), to the east of another housepit (Feature 5), immediately north of the pipeline trench on the west edge of the block just to the west of a housepit (Feature 17), and near the feature cluster at the southeast corner of the block. Areas with a very low density of debitage include Feature 35 (a housepit) and the concentration of small basin features in the northwest part of the block. The various size classes of debitage reflect a similar pattern as total debitage. Heat-altered rock indicates a slightly different pattern, with densest concentrations occurring near the southeast edge of the block, to the southeast of Feature 35, and between the two housepits (Features 5 and 17) on the north side of the trench. The two housepits (Features 15 and 20) with the greatest debitage density had much lower densities of heat-altered rocks.

The spatial patterning of the various classes of remains indicates a number of shelter-centered activity areas represented by housepits, as well as a number of exterior work areas. The housepits were of similar morphology, and overall the cultural remains associated with each are similar which suggests a similar function. Most housepits contained central hearths and at least several smaller pit features, and each was relatively free of debris. Associated debris includes small amounts of debitage (mostly microflakes), few flaked stone or groundstone tools, and few bone fragments. The housepits represented the locus of generalized activities including food preparation and consumption, maintenance of tools, and sleeping. These features were relatively small and were likely occupied by a single family group, and the limited amount of cultural remains suggests that each was occupied for a short period of time. Although the limited amount of remains within the housepits may reflect refuse cleaning activity, areas adjacent to the housepits usually contained limited amount of remains, suggesting limited dumping from the housepits. The lack of refuse disposal or midden areas suggests that the occupations represented by the housepits were of a short duration (Brooks and Yellen 1987).

Possible hearth-centered activity areas were indicated by numerous basin or hearth features located adjacent to and some distance from the housepits. Identification of discrete activity areas associated with individual features was generally not possible due to the small amount of associated cultural debris. Similar to Site 48CR4686 (Section 6.0 of this report), few of the numerous discrete features outside of the housepits had any associated cultural remains. Large hearths were recorded adjacent to the Feature 15 housepit on the southwest and northeast, with several similar features recorded just west of the Feature 35 housepit. The size and extensive oxidation of these features suggest that they represented large roasting or baking pits, but like the exterior features associated with the Site 48CR4686 component, virtually no cultural remains were associated. One extramural work or processing area was suggested by numerous pit features in the northwest portion of the block, although associated remains are few and limit interpretations of activities. Two retouched or utilized flakes, a biface, a few bone fragments, and several pieces of debitage were recovered from this area. A similar cluster of features occurred at the opposite corner (southeast) of the excavation with retouched and utilized flakes, a biface, groundstone fragments, and a relatively large amount of debitage, heat-altered rock, and animal remains associated. The variety of remains from this area suggests that it represents a generalized domestic work area with activities including subsistence resource processing (animal and plant) and flaked stone tool maintenance. Relatively dense concentrations of debitage were recorded immediately east of the Feature 5 housepit and just west of the Feature 17 housepit, with a variety of flake sizes recorded from both areas. The variety of flake sizes indicates that the two concentrations represent primary tool manufacturing/maintenance task areas rather than refuse dumps, as refuse areas are characterized by a preponderance of large flakes (O'Connell 1987).

9.4.9 Component II Summary

Component II represented a terminal Early Archaic/early Middle Archaic period (Green River phase) component. Eight radiocarbon age estimates that range between 5,100 and 4,400 years B.P. indicate that multiple occupations were included within Component II deposits. Although Component II occurred within the temporal range of the McKean complex on the Northwestern Plains, no projectile points representative of this complex were recovered. Projectile points include small, side-notched varieties that are characteristic of the Early Archaic period in the region. Six housepits were associated with Component II deposits, and the distribution of radiocarbon estimates obtained from the housepits suggests that they may have represented at least three temporally distinct occupations. The distinctive housepits at the Bald Knob site indicate that the Bairoil area (and this site) were repeatedly occupied by the same cultural group, probably during the course of a seasonal round. With the exception of impacts associated with the Amoco CO_2 pipeline trench, Component II cultural deposits appeared to possess good integrity. However, the shallow burial (10-40 cm below surface) of the cultural remains may have affected the preservation of animal bone and possibly of floral remains.

Seventy-seven cultural features including housepits, numerous bell-shaped, cylindrical, and basin-shaped hearths, and pits were recorded. The housepits were of similar morphology and represented a type of habitation structure that has been extensively documented in numerous Green River phase components in the Wyoming Basin (Hoefer 1988, Reiss 1991, Smith and Reust 1992). A number of large, heavily oxidized pit features were recorded from Component II deposits, and the size and extensive oxidation of these features may indicate use as roasting or baking pits. Virtually no subsistence remains (plant, animal) were recovered from these features, suggesting that processing may have included resource types that would leave little archaeological evidence, such as root, tuber, or meat. Activity areas within the investigated area of the Bald Knob site were delineated by cultural features, with shelter-centered or household areas defined by the housepits, and with exterior or yard areas defined by artifact concentrations and/or cultural features. The absence of well-defined midden or refuse areas may indicate that site occupations were of a short-term nature, which is also indicated by the limited density of the various classes of artifacts.

Flaked stone and groundstone tools from Component II suggest that both animal and plant processing activities took place. Flaked stone tools included four projectile points, 15 bifaces, 37 retouched/utilized flakes, and nine small cores. Groundstone tools include 27 metate and two mano fragments, with one small grooved abrader and a hammerstone also collected. Component II had a high ratio of features to flaked stone tools (nearly 1.2:1) and a fairly low density of debitage ($7.7/m^2$) across the excavation block. The flaked stone tool assemblage is dominated by retouched/utilized flakes and small cores (71%), and most projectile points and bifaces represent fragments of heavily used and discarded tools. The cores represent cobbles smaller than most of the bifacial tools and may have been used for the production of expedient (retouched/utilized flake) tools. Overall, the flaked stone tool assemblage and the low debitage density indicate nonintensive lithic manufacturing activities at the Bald Knob site, and suggests a high degree of curation of tools. The percentage of noncortical flakes and microflakes indicates that most manufacturing was oriented towards reduction of blanks, final tool shaping and/or tool maintenance, and the limited reduction of small local cobbles. Very little evidence of a complete bifacial reduction sequence is indicated, and most bifaces were probably brought to the site as complete or partially reduced tools.

Extensive flotation of feature fill recovered only two charred seeds, and pollen samples from the floors of the least disturbed housepits provided weak evidence of processing of Chenopodaceous species within the structures. The few associated bone fragments are highly fragmented and provide little indication of types of animals present, although several fragments suggest utilization of medium mammals (coyote size to deer-pronghorn size). The small number of animal remains from Component II deposits may be the result of preservation factors, possibly related to the shallow depth below surface of the cultural deposits. Additional remains include several eggshell fragments and three freshwater mussel shell fragments. The eggshell may indicate occupation in the spring or early summer, and the mussel shell fragments suggest occupation in the warmer months (spring-fall) of the year when mussels are available for collection. The eggshell and mussel shell fragments are not associated with the housepits, and no direct evidence of season of occupation was collected from the five housepits excavated by Mariah. Relatively high counts of Cheno-am pollen within several of the housepits provide weak evidence that at least some of these features represent spring or early summer occupations. Similarly, the recovery of two charred seeds from one housepit provides some indication of occupation during the late summer or fall at the time of seed maturation.

9.5 CULTURAL REMAINS FROM DISTURBED DEPOSITS

The surface within the entire block excavation was bladed during previous pipeline construction. In most excavation units the upper 5-15 cm of deposits were partially disturbed, and a few artifacts were collected from these deposits. Cultural remains recovered include six flaked stone tools, one groundstone tool, 108 pieces of debitage, four heat-altered rocks, and one bone element. This bone was identified as an innominate fragment of a deer-pronghorn or sheep size animal. These remains may represent artifacts displaced from buried components by backhoe trenching, or may indicate an upper shallowly buried component which was disturbed by blading.

Flaked stone tools from disturbed deposits are described in Table 9.18. The tools include two projectile point fragments, two preform fragments, a blank, and a preblank. One mano fragment was also recovered. The two projectile points include the distal portion of a probable arrow point with serrated blade margins, and an edge fragment of a side- or corner-notched dart point. Previous investigations (Hoefer 1988) at the Bald Knob site collected an arrow point from disturbed deposits suggesting that a Late Prehistoric component may have been disturbed by pipeline construction. Generally, the preforms, blanks, and preblanks represent small portions of much larger tools of unknown morphology.

A total of 108 pieces of debitage was collected from disturbed deposits, and Table 9.19 provides a cross-tabulation of debitage type by material type for these artifacts. Chert (77.9%) is the dominant

Table 9.18 Characteristics of Flaked Stone and Groundstone Tools, Disturbed Deposits, Bald Knob Site.

Feature No.	Excavation Unit	Classification	Condition	Dimensions (mm)[1] L	W	T	Material Type	Remarks
3	113N 102E, NE	Projectile point	Distal fragment	20.5(P)	12	3	Grey, semi-translucent chert	Possible arrow point fragment; serrated blade edges
434	104N 104E	Projectile point	Base edge fragment	17(P)	11(P)	3(P)	Grey, semi-translucent chert	Small fragments
48	109N 104E, NE	Preform	Medial fragment	7(P)	17(P)	4(P)	Grey, opaque chert	Small fragment
368	102W 100E, NW	Preform	Distal fragment	17(P)	14(P)	4(P)	Reddish-brown, mottled chert	Small fragment
333	100N 110E, SE	Blank	Medial fragment	29.5(P)	35	12	Chalcedony	Minimally reduced
389	102N 100E, NE	Preblank	Complete	36	33	13	Brown, opaque chert	--
60	109N 100E, NW	Mano	Terminal fragment	46(P)	110(P)	46(P)	Granite	Small fragment; bifacial

[1] L = length, W = width, T = thickness; (P) = broken specimen, partial dimension.

Table 9.19 Cross-Tabulation of Debitage Type by Material Type, Disturbed Deposits, Bald Knob Site.

	Material Type							
Debitage Type	Quartzite	White Chert	Red Chert	Clear Chalcedony	Black Siltstone	Other Chert	Other Siltstone	Total
Primary Flake								
Number	1	0	0	0	0	0	0	1
Row %	100.0	0	0	0	0	0	0	0.9
Column %	9.1	0	0	0	0	0	0	
Secondary Flake								
Number	1	1	0	6	1	27	0	36
Row %	2.8	2.8	0	16.7	2.8	75.0	0	33.3
Column %	9.1	50.0	0	60.0	100.0	33.8	0	
Tertiary Flake								
Number	6	1	1	1	0	36	2	47
Row %	12.8	2.1	2.1	2.1	0	76.6	4.3	43.5
Column %	54.5	50.0	50.0	10.0	0	45.0	100.0	
Microflake								
Number	1	0	0	2	0	12	0	15
Row %	6.7	0	0	13.3	0	80.0	0	13.9
Column %	9.1	0	0	20.0	0	15.0	0	
Shatter								
Number	2	0	1	1	0	4	0	8
Row %	25.0	0	12.5	12.5	0	50.0	0	7.4
Column %	18.2	0	50.0	10.0	0	5.0	0	
Tested Cobble								
Number	0	0	0	0	0	1	0	1
Row %	0	0	0	0	0	100.0	0	0.9
Column %	0	0	0	0	0	1.3	0	
Total								
Number	11	2	2	10	1	80	2	108
Row %	10.2	1.9	1.9	9.3	0.9	74.1	1.9	

material type, with lesser amounts of quartzite (10.2%), chalcedony (9.3%), and siltstone (2.8%). Tertiary or microflakes comprise the majority (57.4%) of the debitage, with lesser amounts of primary flakes (0.9%), secondary flakes (33.3%), shatter (7.4%), and tested cobbles (0.9%).

9.6 SUMMARY OF RESULTS

Two prehistoric components were identified within a 185 m^2 excavation block completed at the Bald Knob site during the data recovery phase of the Bairoil Archaeological Project. Component I represented at least several Early Archaic period (Great Divide phase) occupational episodes as indicated by radiocarbon age estimates of 6,610±90 and 5,980±90 years B.P. Component I cultural deposits were moderately to extensively deflated, and no well-defined activity areas were identified. Artifacts include a Paleoindian style point that had been reworked as a hafted scraper, a core, and a well-shaped mano, and six small, basin-shaped cultural features were associated. The types of artifacts and features suggest generalized activities that may have included animal and plant processing, although no subsistence remains (bone, seeds) were recovered.

The vast majority of cultural remains recovered during excavations are from Component II deposits. This component represented numerous occupations dating to the terminal Early Archaic/early Middle Archaic period (Green River phase) as indicated by multiple (reliable) radiocarbon age estimates ranging from 5,100±80 to 4,400±80 years B.P. Most cultural remains were recovered from within or near six housepits, and radiocarbon age estimates suggest that these housepits represented at least three separate prehistoric occupations. The Bald Knob site appears to have been repeatedly occupied, probably by the same cultural group, during late Altithermal or post-Altithermal times. The spatial patterning and density of cultural remains suggest that Component II occupations were of short-term duration. Activity areas were defined by the housepits, and also by concentrations of features and/or artifacts in exterior or yard areas. Temporally diagnostic projectile points are exclusively side-notched types which are representative of the Early Archaic period on the Northwestern Plains.

Component II cultural remains include 77 cultural features, flaked stone and groundstone tools, debitage, and a small sample of animal remains. Lithic analyses suggest that most bifacial tools were brought to the site as finished or nearly finished tools, with lithic manufacturing focused on production of expedient tools and/or maintenance of formal tools. Cultural features, other than housepits, included numerous deep bell-shaped, cylindrical, or basin-shaped hearths or firepits, and small unoxidized basin features. Very few subsistence remains (plant, animal) are associated with any of the large oxidized features that probably functioned as baking or roasting features. The lack of subsistence remains may indicate that processing of resource types that would leave scant archaeological remains, such as roots, tubers, greens, or boned meat was a major site activity. No evidence of storage features was noted, although it is possible that some of the larger oxidized features also served a storage function. Season of occupation could not precisely be determined, although some weak evidence of occupation within the warmer months (spring-fall) was noted.

A few artifacts were recorded from disturbed deposits that overlay Component II. Past excavations (Hoefer 1988) have suggested that a diffuse Late Prehistoric period component may have been disturbed by construction activities, and a possible arrow point fragment recovered during the current project supports this possibility.

10.0 SITE 48SW7107 (LOCALITY P-086)

This section presents the results of block excavations completed at Site 48SW7107 (Locality P-086) during the second phase of the Bairoil Archaeological Project. Three small excavation blocks were completed, with prehistoric components noted in each block. The components included two Late Prehistoric period (Uinta phase) components and a single Middle Archaic period (Pine Spring phase) component. The site setting, stratigraphy, results of excavations, and summary of results are discussed in the following subsections.

10.1 SITE SETTING

Site 48SW7107 is a prehistoric campsite that was recorded as a result of archaeological monitoring of surface blading for construction of the LSU 221 well pad and access road (Greer, Greer, Thompson, and Shields 1989). Site 48SW7107 is located about 1.1 km south of the town of Bairoil within the Lost Soldier oil field (Figure 1.2). It is situated on a level terrace or bench immediately north of Lost Soldier Creek, and extends upslope, and partially occupies an upper gravel or cobble-armored terrace of Pleistocene age. It occurs at an elevation of about 2,091 m. Alluvial deposits occur along the lower terrace, and shallow sand shadow or sheet deposits have accumulated along the lee side and top of the upper terrace. The investigations conducted by Mariah were concentrated on shallow aeolian deposits on top of the Pleistocene terrace.

Very few surface artifacts are present in undisturbed areas of the site. Cultural remains recorded during monitoring occurred chiefly within shallow sand-sheet deposits. Site 48SW7107 is part of the Lost Soldier site complex (Zale 1989), a series of sites and localities situated north of Lost Soldier Creek that extend for several miles within an area termed the Lost Soldier Creek environmental subunit (Berrigan 1988). Vegetation at the site is dominated by sagebrush and rabbitbrush with an understory of prickly pear cactus, and short grasses and forbs. A riparian plant community including dense stands of tall sagebrush is present along Lost Soldier Creek to the south of the site.

Construction monitoring and subsuquent salvage excavations at Site 48SW7107 recorded and investigated 20 cultural features, and more than 50 additional cultural features were noted but left unrecorded in accordance with BLM stipulations then in force (Greer, Greer, Thompson, and Shields 1989:1). The recorded features included four possible house floors, three middens, and a number of hearth or small pit features. Artifacts recovered from investigations included flaked and groundstone tools, debitage, several potsherds, and animal bone fragments. Four radiocarbon age estimates obtained from cultural features ranged from 860 ± 50 to $1,440 \pm 50$ years B.P., and most (14 of 16) recovered projectile points were Rose Spring Corner-notched types diagnostic of the Late Prehistoric period.

The initial phase of fieldwork completed for the Bairoil Archaeological Project in 1989 by Mariah included the excavation of a number of auger tests and ten 1 x 1 m test units between Site 48SW7107 (Locality P-086) and Site 48SW994 (Locality P-087) located to the northeast. Test excavations encountered single, intact buried prehistoric cultural levels in three areas within Site 48SW7107. Small block excavations were recommended for these three areas for the second phase of the project (Reust et al. 1990).

This report presents the results of investigations completed at Site 48SW7107 as shown in Figure 10.1. A 4 x 4 m area was investigated in the north portion (north block), and a 6 x 6 m area was excavated in the middle of the locality (middle block), with a 6 x 6 m block initially excavated to the south (south block).

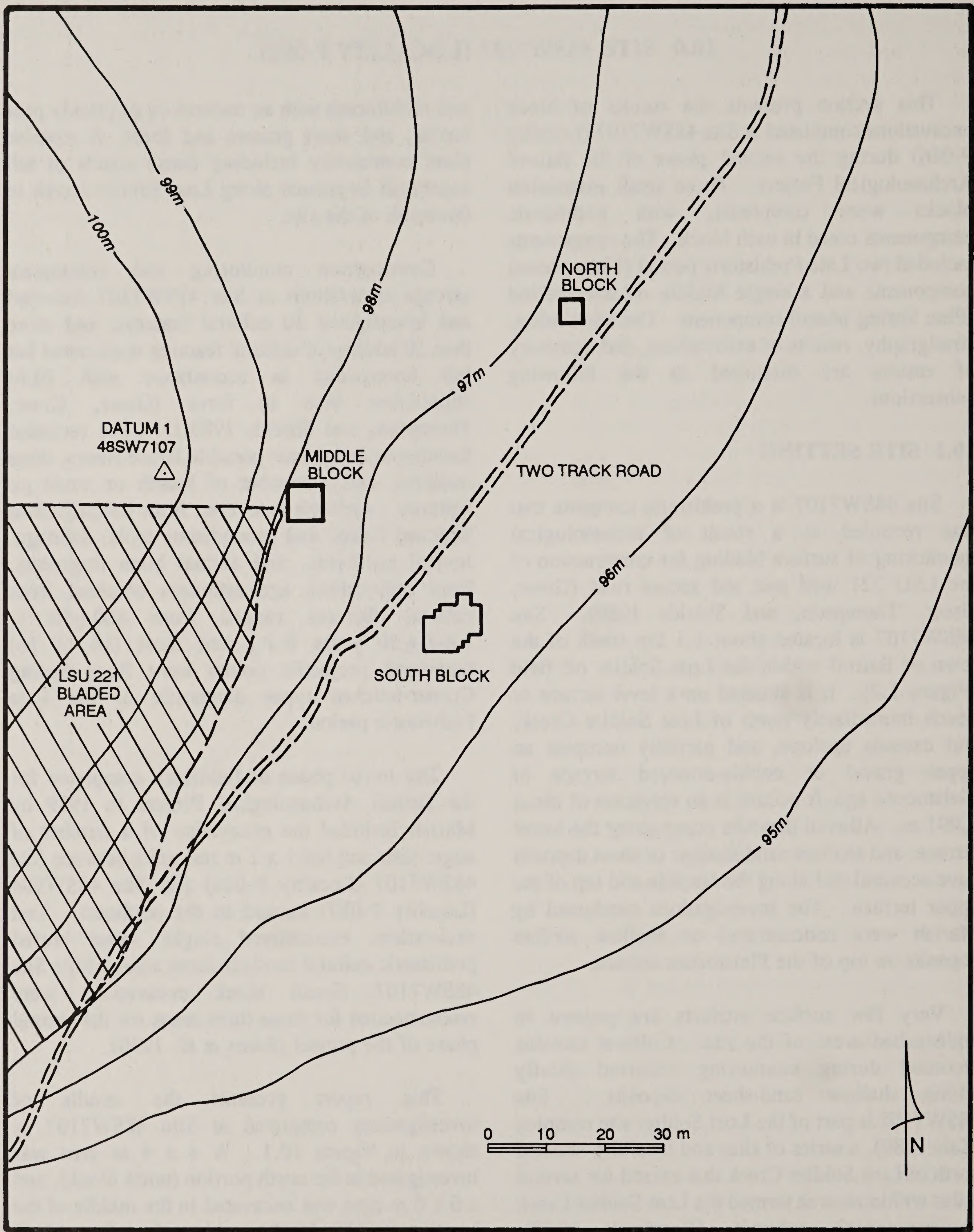


Figure 10.1 Contour Map Showing the Location of Excavation Blocks, Site 48SW7107 (Locality P-086).

Based on initial excavation results from the south block, and after a meeting of regulatory officials with Mariah and Amoco representatives in Bairoil in July 1990, an additional 34 m^2 area was excavated at the south block.

Figure 10.2 shows the grid designations for Site 48SW7107 with horizontal locations for the three blocks referenced from a single 100N 100E point located near the southwest corner of the middle block. Vertical measurements for each block were referenced from the top of a brass-tagged, blue, wooden post previously established as a site datum during the monitoring and salvage excavation project (Greer, Greer, Thompson, and Shields 1989). The top of the post was assigned an arbitrary elevation of 100.0 m. Excavation methodology followed standard archaeological procedures as outlined in Section 3.0 of this report. Figures 10.3-10.5 show the setting of the three small blocks excavated at Site 48SW7107.

10.2 STRATIGRAPHY

The three excavation blocks at Site 48SW7107 were located on an upper terrace north of Lost Soldier Creek within shallow aeolian sheet deposits. Natural deposits consist of mostly aeolian sands or silts, with a colluvial stratum marked by small gravels and large, unmodified stream cobbles underlying the aeolian materials. This gravel stratum is exposed on the surface in some deflated areas within Site 48SW7107. Prehistoric cultural components were identified within each of the three excavation blocks. The following subsections describe the natural and cultural deposits at Site 48SW7107.

10.2.1 Natural Stratigraphy

Natural strata were differentiated during excavations by color, degree of consolidation, texture, and calcium carbonate content. Similar natural deposits were noted in the three excavation blocks, with a gravel or cobble-laden colluvial deposit noted as the lowest natural deposit (Stratum A) in all blocks. Overlying this stratum in all blocks were one or more aeolian strata. In the following discussion, the strata are described from oldest (Stratum A) to youngest (Stratum B, F, or C) for each block.

10.2.1.1 Natural Stratigraphy - North Block

Depth of excavation was limited (30 cm) in the north block with two natural strata noted (Figure 10.6). Stratum A consisted of a pale brown, sandy loam that was extremely consolidated when dry. The stratum contained lag pebbles and larger lag quartzite and granitic cobbles and had a moderate to high calcium carbonate content. No cultural material was recovered from Stratum A.

Stratum B was a loose to moderately consolidated, brown, fine- to medium-grained sand. It contained the single cultural layer identified within the north block with some dispersed charcoal staining present. A radiocarbon age estimate of 1,390±70 years B.P. (Beta-41870) from a cultural feature indicates that deposition of this stratum was fairly recent. Rodent and root disturbances were fairly numerous in Stratum B.

10.2.1.2 Natural Stratigraphy - Middle Block

Five natural strata were identified in the middle block (Figure 10.7). Stratum A was a very consolidated, pale brown, sandy clay that contained a few small pebbles. It had a weak, subangular blocky structure and represented a colluvial deposit (Appendix A). No cultural material was recovered from Stratum A.

Stratum B was a moderately consolidated, very dark greyish brown, sandy loam. The dark color represented diffuse ash or charcoal staining, and Stratum B contained the single prehistoric component identified within the middle block. A radiocarbon date of 3,560±60 years B.P. (Beta-41539) obtained from a cultural feature indicates that dunal deposition at Site 48SW7107 likely predated 4,000 years ago.

Stratum C was a slightly consolidated, yellowish brown, loamy sand. It contained

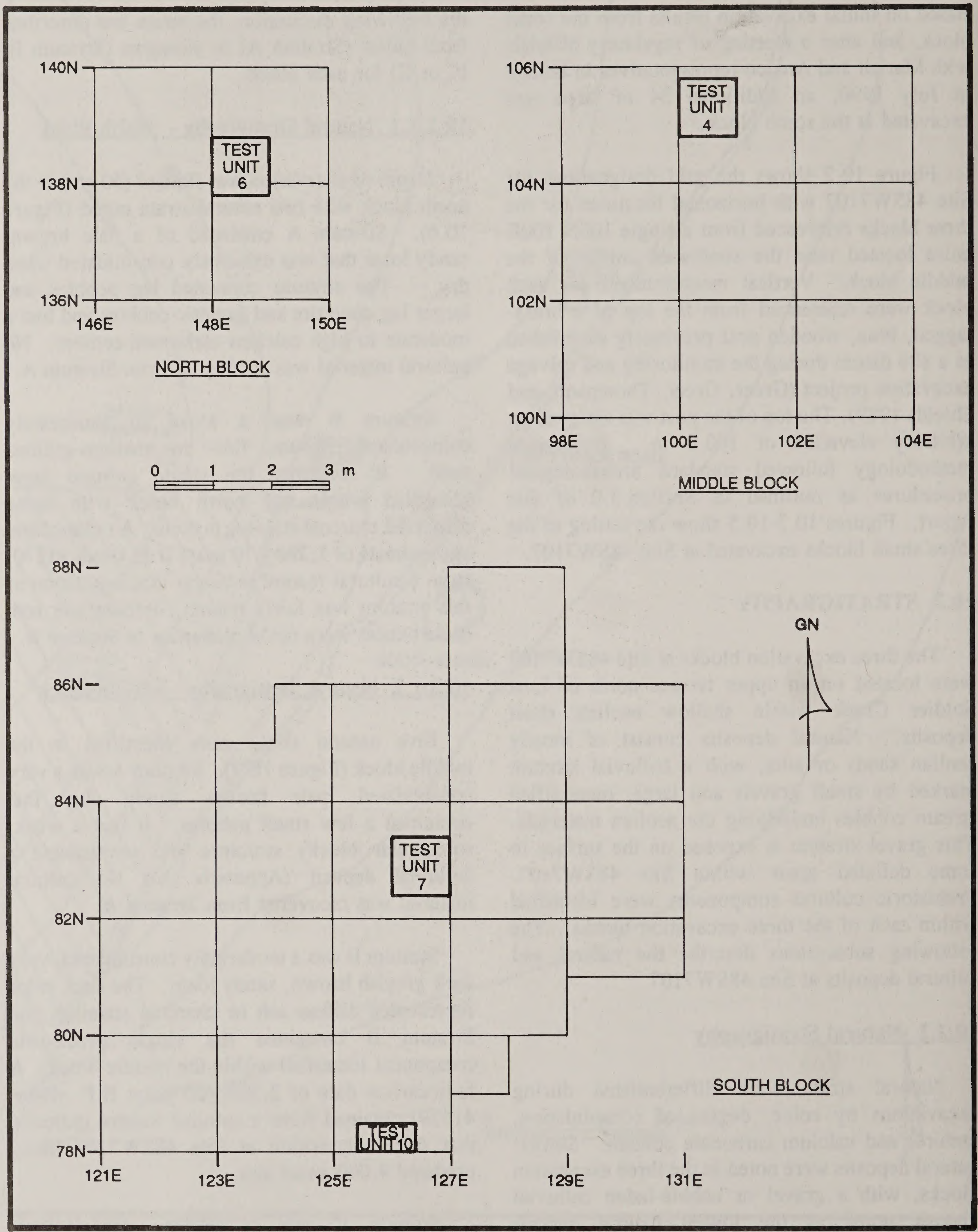


Figure 10.2 Plan Maps of Excavation Blocks, Site 48SW7107 (Locality P-086).

Figure 10.3 North Block Facing South, Site 48SW7107 (Locality P-086).

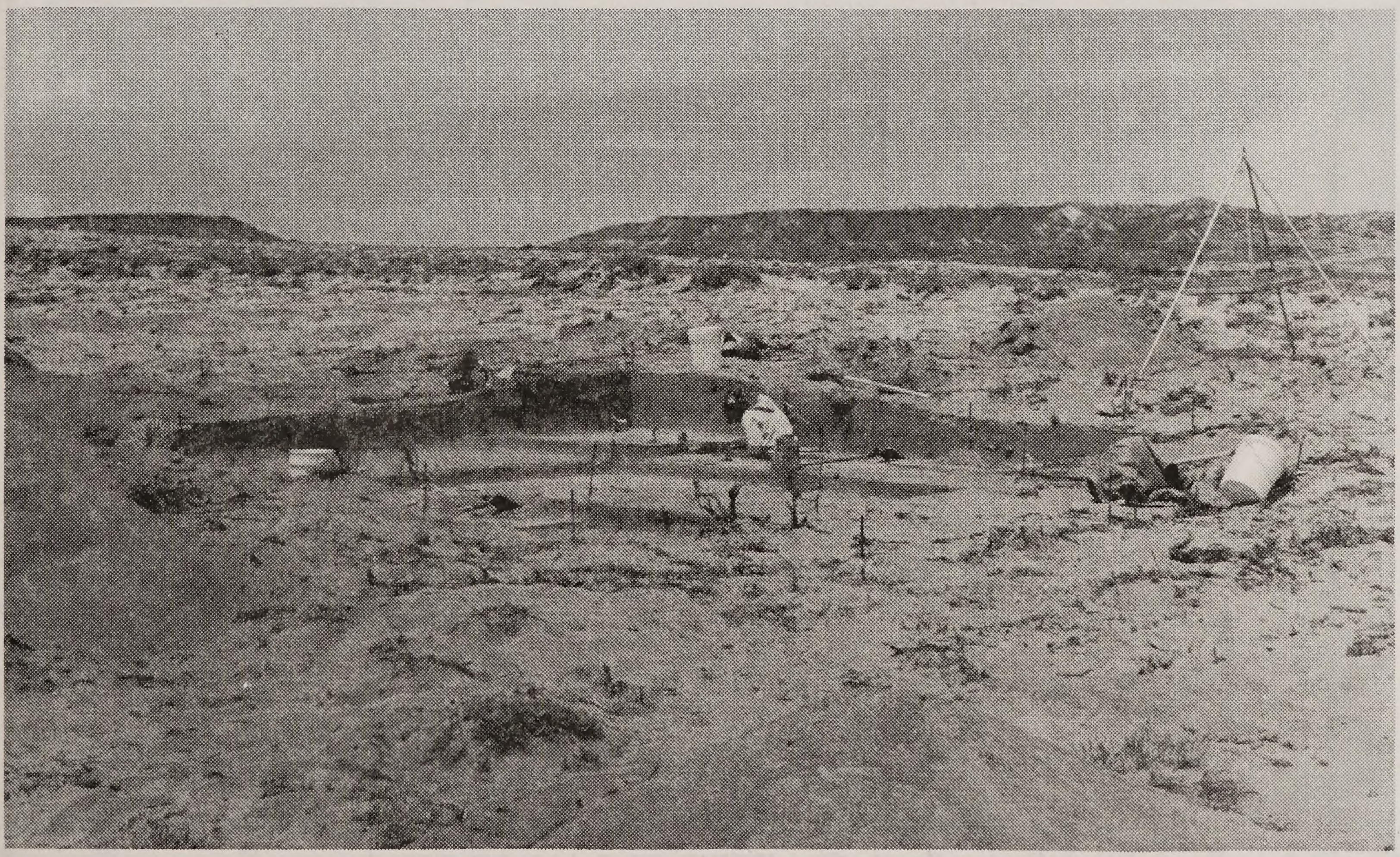


Figure 10.4 Middle Block Facing Northwest, Site 48SW7107 (Locality P-086).

Figure 10.5 South Block Facing South, Site 48SW7107 (Locality P-086).

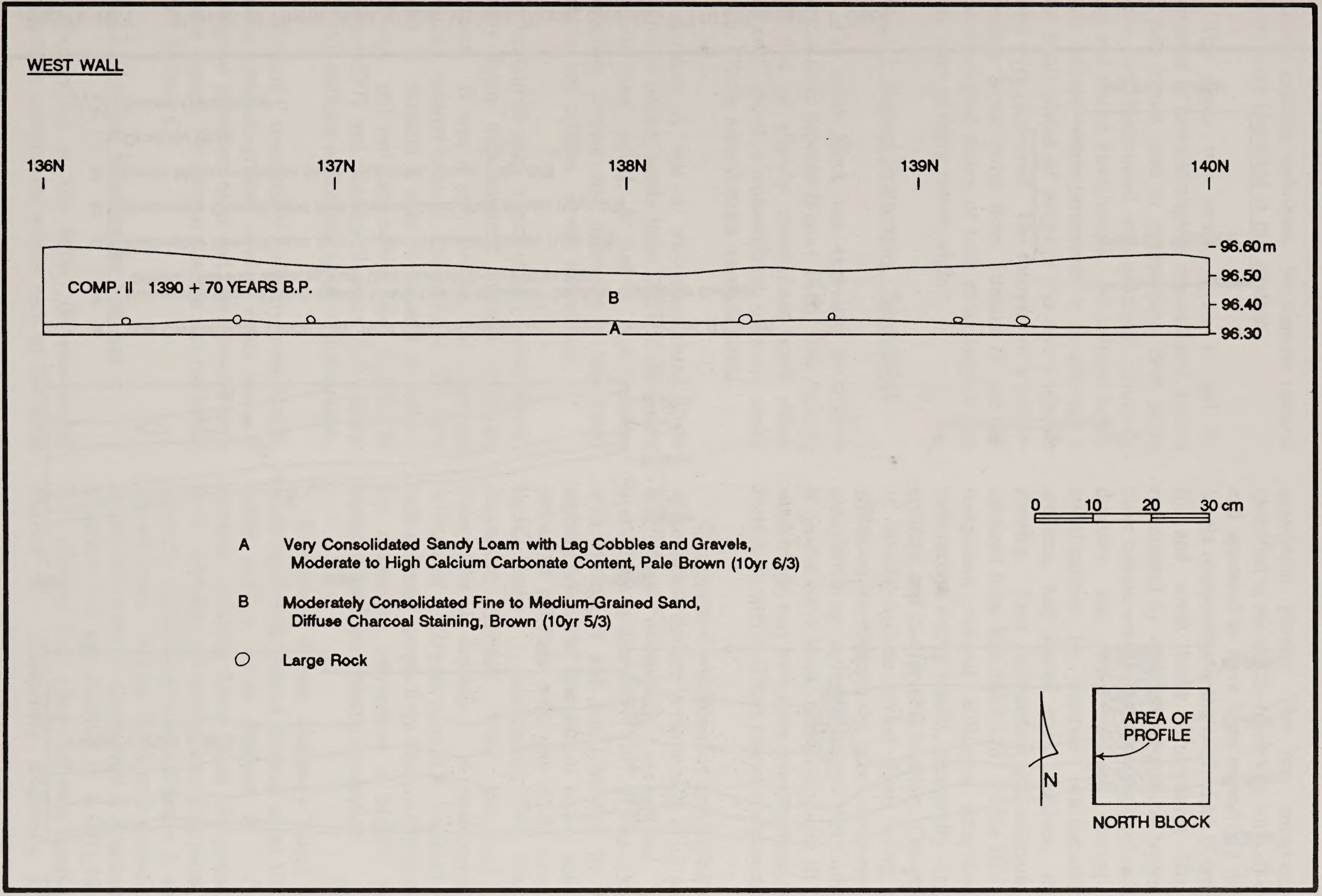


Figure 10.6 Profile of West Wall of the North Block, Site 48SW7107 (Locality P-086).

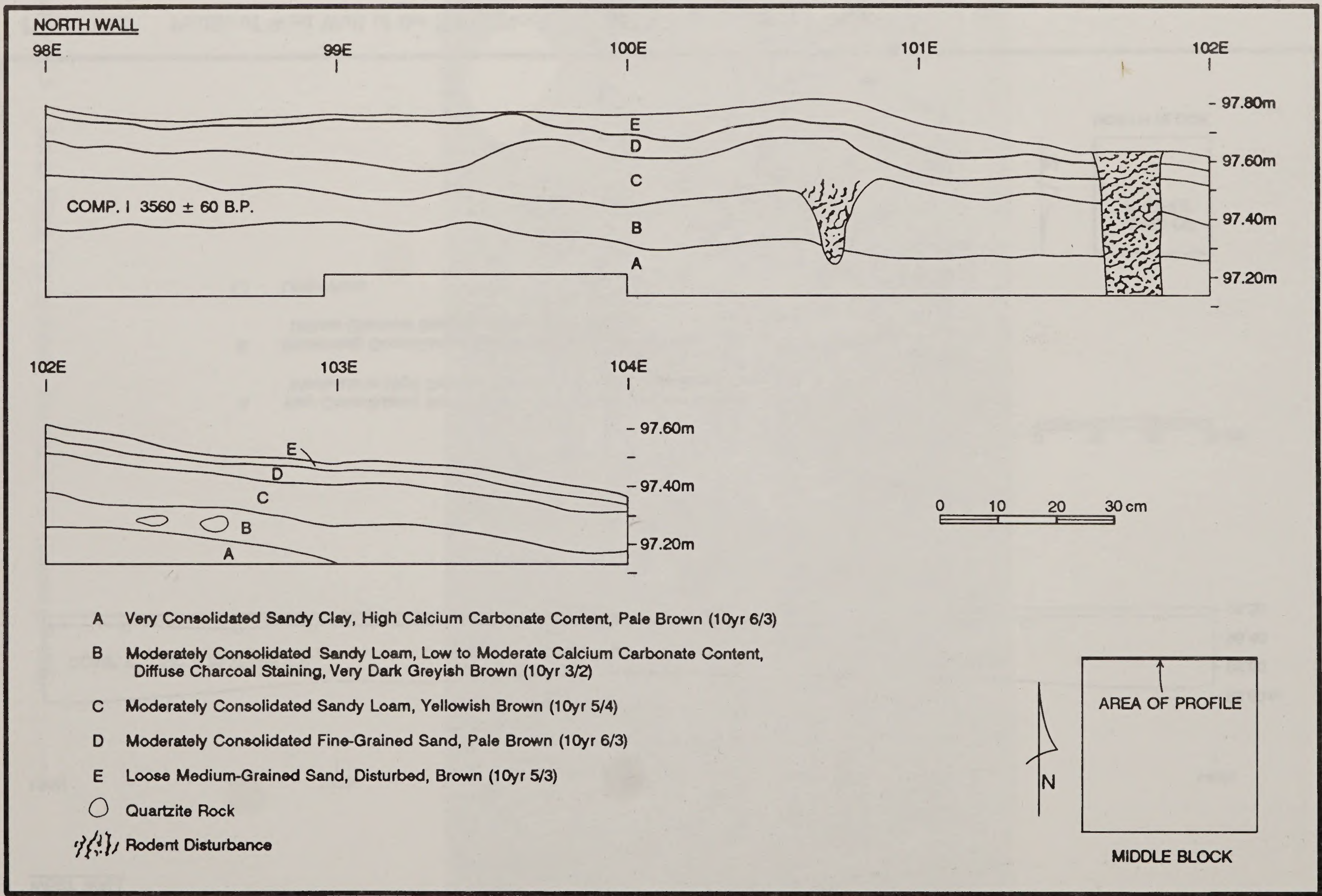


Figure 10.7 Profile of North Wall of the Middle Block, Site 48SW7107 (Locality P-086).

minimal calcium carbonate. No discrete cultural layers were identified in this stratum.

The upper two strata, Strata D and E, consisted of loose to slightly consolidated, brown or pale brown sand or sandy loam. Both strata were very bioturbated and contained numerous root and rodent disturbances. No cultural layers were defined within Stratum D or E, although a few small pieces of debitage and one projectile point were recovered. The recovery of a corner-notched arrow point from Stratum D and the unconsolidated nature of both strata suggest that they were of fairly recent origin.

10.2.1.3 Natural Stratigraphy - South Block

The south block was excavated in shallow aeolian sheet deposits (Figure 10.8). The deposits consisted of slightly consolidated sand which occurred above a consolidated colluvial sandy loam. Three natural strata were identified.

Stratum A was a well-consolidated, light yellowish brown, sandy loam that was the lowest natural level noted. It had a high calcium carbonate content and contained a few small pebbles and cobbles. It was noncultural.

Stratum B was a moderately consolidated, sandy loam with minimal calcium carbonate content. It was a grey stratum that contained staining, cultural features, and artifacts. The dark color of Stratum B may be related to cultural activity, and two radiocarbon dates (1,110±70 [Beta-41537] and 1,460±70 years B.P. [Beta-41538]) indicate recent deposition of this stratum.

Stratum C consisted of a slightly consolidated, brown, medium-grained sand or sandy loam. It contained numerous roots and represented a very recent deposit. No cultural material was recovered from Stratum C.

10.2.2 Cultural Stratigraphy and Age

Excavations at Site 48SW7107 encountered prehistoric components within each of the three excavation blocks. The one component (I) identified in the middle block was not well-defined and appeared to have been extensively deflated. Single components in the north block (Component II) and south block (Component III) were represented by well-defined cultural layers. The three components occurred within shallow aeolian deposits and were defined during field investigations by discrete concentrations of artifacts, heat-altered rock, features, and ash staining. Four radiocarbon age estimates were obtained from Site 48SW1707 (Table 10.1), with component cultural affiliation determined by radiocarbon dating results, temporally diagnostic artifacts, and stratigraphic location. Component I, of Middle Archaic period (Pine Spring phase) affiliation, represented the oldest component, and radiocarbon age estimates suggest that Component II (in the north block) and Component III (in the south block) may have been contemporaneous Late Prehistoric period (Uinta phase) components.

Component I was identified approximately 25-40 cm below surface in the middle block and was the oldest component encountered during excavations at Site 48SW7107. It was associated with Stratum B and was identified by diffuse staining, scattered heat-altered rocks, and a few pieces of debitage with one small unoxidized basin, Feature 1, associated. No temporally diagnostic artifacts were recovered from Component I deposits. A radiocarbon age estimate of 3,560±60 years B.P. obtained from a bulk sediment sample from Feature 1 indicates that the component represented a Middle Archaic period (Pine Spring phase) occupation.

Component II was shallowly buried in the north block with cultural material noted 10-20 cm below surface within Stratum B. Cultural remains, including flaked stone and groundstone tools, debitage, and animal bone fragments, were generally concentrated around Feature 2, a small, stained basin. A Late Prehistoric period (Uinta phase) affiliation for Component II is indicated by a radiocarbon age estimate of 1,390±70 years B.P. obtained from a bulk sediment sample from Feature 2. Temporally diagnostic artifacts

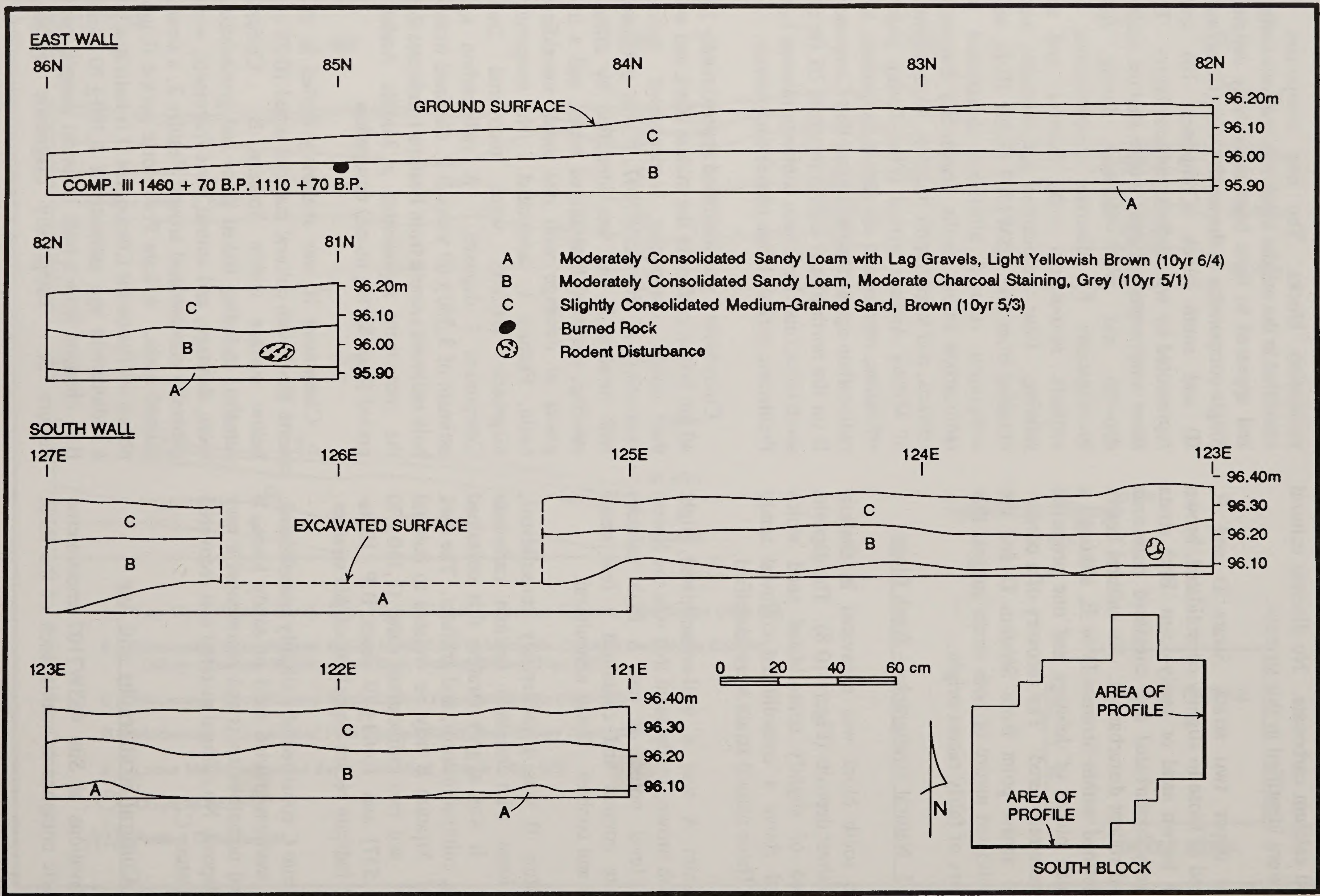


Figure 10.8 Profiles of South and East Walls of the South Block, Site 48SW7107 (Locality P-086).

Table 10.1 Uncorrected Radiocarbon Age Estimates and Calibrated Age Estimates, Site 48SW7107 (Locality P-086).

Component	Feature		Lab No.	Age Estimate	Calibrated Age Estimate (Years B.P.)[1]		
	Number	Type	(Beta-)	(Years B.P.)	Intercept(s)[2]	Range (one sigma)	Sample Type
III	5A	Rock-filled basin	41537	1110±70	1048, 995, 975	1168-954	Wood charcoal
III	6	Unoxidized basin	41538	1460±70	1350	1412-1305	Wood charcoal
I	1	Unoxidized	41539	3560±60	3857	3969-3736	Sediment
II	2	Unoxidized	41870	1390±70	1306	1351-1275	Sediment

1 Calibration based on Pearson et al. (1986).
2 If the estimate has more than three intercepts, the largest, middle, and smallest intercepts are included.

associated with Component II include a large corner/side-notched dart point and a large side-notched hafted knife. Similar artifacts are most commonly associated with Archaic period components, although they also occur with Late Prehistoric period components.

Most cultural remains collected from excavations at Site 48SW7107 were recovered from Component III, which occurred within the south block. Component III was encountered 10-30 cm below surface within Stratum B. It was delineated by moderately dark staining within most of the block, with much darker staining noted along the westernmost 2 m of the excavation block. Virtually no artifacts were associated with this darker staining, which appeared to be very organic, and probably was not of cultural origin. Nine small basin features were recorded, with flaked stone and groundstone tools, heat-altered rock, debitage, and animal bone fragments recovered. One stone circle was identified, with most Component III cultural remains recorded from excavation units within or immediately adjacent to the stone circle. Two radiocarbon age estimates (1,110±70 and 1,460±70 years B.P.) from wood charcoal samples collected from Features 5A and 6 suggest that Component III may have included several Late Prehistoric period (Uinta phase) occupations, although stratigraphically only one component could be identified. The spatial distribution of cultural remains associated with Component III also suggest that a single occupation may have been represented. Temporally diagnostic artifacts include a corner-notched arrow point and a large corner-notched hafted drill or knife.

A few artifacts and bone fragments were recovered from the upper 25 cm of unconsolidated deposits in the middle block. A discrete cultural layer could not be defined; hence, no component designation was made. These remains are briefly discussed in Section 10.6

10.3 COMPONENT I RESULTS

Component I dated to the Middle Archaic period (Pine Spring phase) and represented the oldest prehistoric component identified at Site 48SW7107. It was associated with Stratum B in the middle block and was defined by one small cultural feature with a very limited number of artifacts and heat-altered rock associated. Dispersed staining of varying intensity was noted throughout the excavation block, and this component appeared to have been extensively deflated.

10.3.1 Cultural Feature and Heat-altered Rock

One small cultural feature and a small amount of heat-altered rock were associated with Component I deposits. A few areas of very dark staining within the excavation block may indicate the location of other completely deflated features.

10.3.1.1 Unoxidized Basin

Feature 1 was a small unoxidized basin that was partially excavated during test excavations by Mariah in 1989 (Reust et al. 1990). Plan dimensions were 65 x 61 cm with a depth of 18 cm (Figure 10.9). The feature was identified by dark staining with no wood charcoal, oxidation, heat-altered rock, bone, or artifacts associated. Flotation of a 2.0 liter sample of feature fill produced no charred seeds. A radiocarbon age estimate of 3,560±60 years B.P. was obtained from a bulk sediment sample collected from Feature 1.

10.3.1.2 Heat-altered Rock

A total of 40 heat-altered rocks that weighed 2.235 kg was recovered from Component I (Table 10.2). Material types include three sandstone, three quartzite, and 34 granite rocks. The granite and sandstone rocks are mostly very small spalls or tabular fragments, and the quartzite rocks are mostly intact cobbles. None of the rock was associated with Feature 1, and no dense concentrations of heat-altered rock were noted.

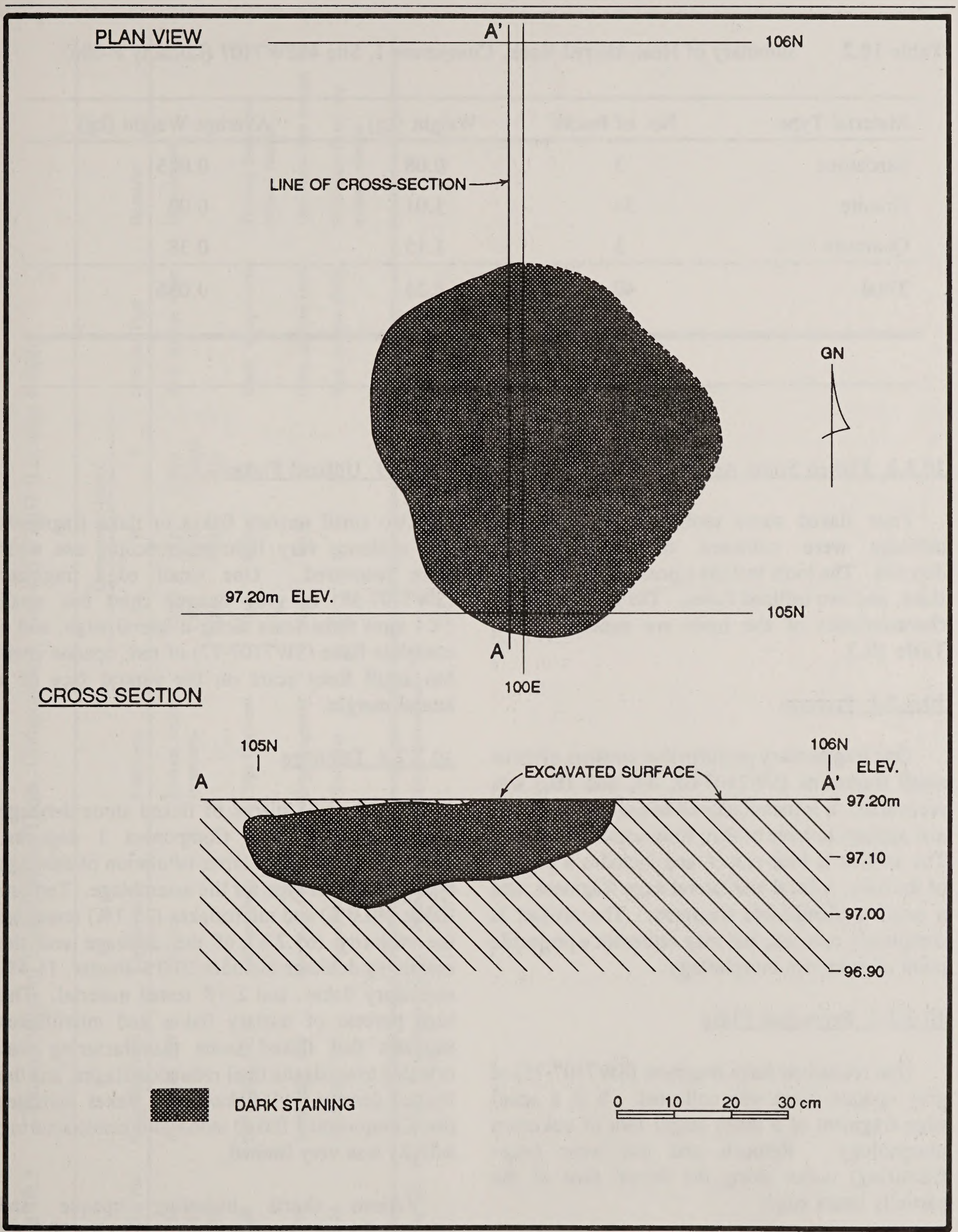


Figure 10.9 Plan View and Cross Section of Feature 1, Component I, Site 48SW7107 (Locality P-086).

Table 10.2 Summary of Heat-Altered Rock, Component I, Site 48SW7107 (Locality P-086).

Material Type	No. of Rocks	Weight (kg)	Average Weight (kg)
Sandstone	3	0.08	0.025
Granite	34	1.01	0.03
Quartzite	3	1.15	0.38
Total	40	2.24	0.056

10.3.2 Flaked Stone Artifacts

Four flaked stone tools and 35 pieces of debitage were collected from Component I deposits. The tools include a preform, a retouched flake, and two utilized flakes. The morphological characteristics of the tools are summarized in Table 10.3.

10.3.2.1 Preform

One fragmentary preform that consists of three small fragments (SW7107-67, 84, and 180) was recovered. It is manufactured of red, opaque chert and appears to have broken from exposure to heat. The artifact is heat-crazed and includes a portion of the base, a distal and lateral edge fragment, and a small unidentifiable fragment. The artifact is completely reduced, and may represent a projectile point of unknown morphology.

10.3.2.2 Retouched Flake

One retouched flake fragment (SW7107-75) of grey opaque chert was collected. It is a small edge fragment of a much larger tool of unknown morphology. Retouch and use wear (step-fracturing) occur along the dorsal face of the partially intact edge.

10.3.2.3 Utilized Flakes

Two small tertiary flakes or flake fragments that evidence very light macroscopic use wear were recovered. One small edge fragment (SW7107-58) of grey opaque chert has small (< 1 mm) flake scars along a lateral edge, and a complete flake (SW7107-77) of red, opaque chert has small flake scars on the ventral face of a lateral margin.

10.3.2.4 Debitage

A total of 35 pieces of flaked stone debitage was recovered from Component I deposits. Table 10.4 provides a cross-tabulation of debitage type by material type for the assemblage. Tertiary flakes (40.0%) and microflakes (25.7%) comprise the majority (65.7%) of the debitage and the remaining debitage includes 20.0% shatter, 11.4% secondary flakes, and 2.9% tested material. The high percent of tertiary flakes and microflakes suggests that flaked stone manufacturing was oriented towards the final reduction stages, and the limited density (< 1 flake/m^2) of flakes indicates that Component I flaked stone tool manufacturing activity was very limited.

Various cherts including opaque and semitranslucent material types comprise 80% of the debitage, with lesser amounts of quartzite (14.3%) and black siltstone (5.7%). Material

Table 10.3 Characteristics of Flaked Stone Tools, Component I, Site 48SW7107 (Locality P-086).

Catalog No.	Excavation Unit	Classification	Condition	Dimensions (mm)[1] L	W	T	Material Type	Remarks
84	102N 102E, NW	Preform	Broken, three fragments	5.5(p)	15(p)	2(p)	Red, opaque chert	Heat-crazed
67				13(p)	9(p)	2.5(p)		
180				8(p)	5(p)	2(p)		
58	104N 102E, NE	Utilized flake	Edge fragment	21(p)	17.5(p)	5.5	Black, opaque chert	Tertiary flake; one utilized margin
75	100N 102E, SW	Retouched flake	Edge fragment	17(p)	9(p)	2.5	Grey, opaque chert	One retouched margin
77	100N 102E, NE	Utilized flake	Complete	26	17	5.5	Red, opaque chert	Secondary flake; one utilized margin

[1] L = length, W = width, T = thickness; (p) = broken specimen, partial dimension.

Table 10.4 Cross-Tabulation of Debitage Type by Material Type, Component I, Site 48SW7107 (Locality P-086).

Debitage Type	Material Type: Quartzite	Red Chert	Black Siltstone	Other Chert	Total
Secondary Flake					
Number	0	1	0	3	4
Row %	0	25.0	0	75.0	11.4
Column %	0	20.0	0	13.0	
Tertiary Flake					
Number	2	2	1	9	14
Row %	14.3	14.3	7.1	64.3	40.0
Column %	40.0	40.0	50.0	39.1	
Microflake					
Number	0	0	1	8	9
Row %	0	0	11.1	88.9	25.7
Column %	0	0	50.0	34.8	
Shatter					
Number	3	2	0	2	7
Row %	42.9	28.6	0	28.6	20.0
Column %	60.0	40.0	0	8.7	
Tested Material					
Number	0	0	0	1	1
Row %	0	0	0	100.0	
Column %	0	0	0	4.3	2.9
Total					
Number	5	5	2	23	35
Row %	14.3	14.3	5.7	65.7	

types of the four flaked stone tool types are the same as the dominant material type (chert).

10.3.3 Groundstone Artifacts

Seventeen groundstone fragments of sandstone were collected from Component I deposits (Table 10.5). The fragments represent small segments of a much larger artifact(s), probably a metate. The 17 fragments were collected from the same excavation unit (104N 100E) which suggests that they may be derived from one large, very fragmented metate.

10.3.4 Animal Remains

Eight bone fragments and three tooth fragments that weighed a total of 4.3 g were recovered from Component I (Table 10.6). None were identifiable to species, with seven bone fragments identified as medium-large mammal, three tooth fragments medium mammal, and one innominate fragment jackrabbit size. Five fragments including one medium-large mammal, three medium mammal, and one jackrabbit size element are burned.

10.3.5 Plant Macrofossils

A 2.0 liter sample of stained sediment from Feature 1 was processed (floated) and examined for plant macrofossils. No charred seeds were identified, although one unburned goosefoot seed was recovered.

10.3.6 Spatial Distribution of Cultural Remains

The distribution of the single cultural feature, heat-altered rock, and tools associated with Component I is shown in Figure 10.10, and the figure also provides trend density maps for total debitage and total animal remains. Tools which were not found in place are mapped in the center of units from which they were recovered.

No well-defined activity area is indicated by the distribution of the various classes of remains, with only a limited number of artifacts and animal remains recovered. Generally, most cultural material was located in the east part of the excavation block which is downslope of the single cultural feature. The four flaked stone tools were located towards the east edge of the block, with all groundstone tools recovered immediately east of Feature 1. Debitage was most concentrated in the east-central portion of the block, with most bone recovered from near the northeast corner of the excavation.

10.3.7 Component I Summary

Component I represented a Middle Archaic period (Pine Spring phase) occupation and was the oldest of three prehistoric components investigated at Site 48SW7107. A radiocarbon age estimate of 3,560$\pm$60 years B.P. was obtained from Component I cultural deposits. No temporally diagnostic artifacts were associated with Component I. The component was identified chiefly in the east half of the middle block by one cultural feature, dispersed staining, and a small number of artifacts.

Component I cultural deposits were extensively deflated, and the limited density of cultural remains suggests that it represented an occupation of limited duration and/or intensity. Debitage density was very low (<1 flake/m^2), and the tool assemblage is limited with flaked stone and groundstone tools included. One preform, three retouched or utilized flakes, and numerous groundstone fragments (probably representing a single metate) comprise the Component I tool assemblage. Subsistence remains include 11 bone or tooth fragments representing medium-large mammals and a jackrabbit size animal, with no charred seeds recovered. Generally, the Component I cultural remains appear to represent a short-term campsite, with activities including animal processing. No evidence of season of occupation was determined from excavations.

10.4 COMPONENT II RESULTS

Component II was associated with Stratum B in the north block and represented a Late

Table 10.5 Characteristics of Groundstone Tools, Component I, Site 48SW7107 (Locality P-086).

Catalog No.	Excavation Unit	Classification	Condition	Dimensions (mm)[1] L	W	T	Weight (kg)	Material Type	Remarks
11	104N 100E, NE	Indeterminate fragment	Medial fragment	41	27	21	.023	Sandstone	Moderate unifacial use wear
99	104N 100E, N½	Indeterminate fragments	Medial fragments (16)	76	63	17	.09	Sandstone	Moderate to heavy use wear; one bifacial and 15 unifacial fragments
				48	27	20	.02		
				48	41	21	.035		
				37	27	22	.01		
				44	20	31	.025		
				40	34	21	.03		
				44	35	41	.08		
				40	23	26	.02		
				45	30	16	.02		
				46	35	39	.035		
				28	22	14	.01		
				26	20	13	.01		
				22	21	16	.01		
				51	23	19	.02		
				12	11	9	.01		
				12	11	11	.01		

[1] L = length; W = width; T = thickness.

Table 10.6 Summary of Animal Remains, Component I, Site 48SW7107 (Locality P-086).

Animal Size Category	Total Specimens No.	Total Specimens Wt. (g)	Burned Specimens No.	Burned Specimens %	Identifiable Elements
Medium-large mammal	7	2.8	1	14.3	--
Medium mammal	3	0.1	3	100.0	Tooth fragments (3)
Jackrabbit size	1	1.4	1	100.0	Innominate (ischium)
Total	11	4.3	5	45.5	

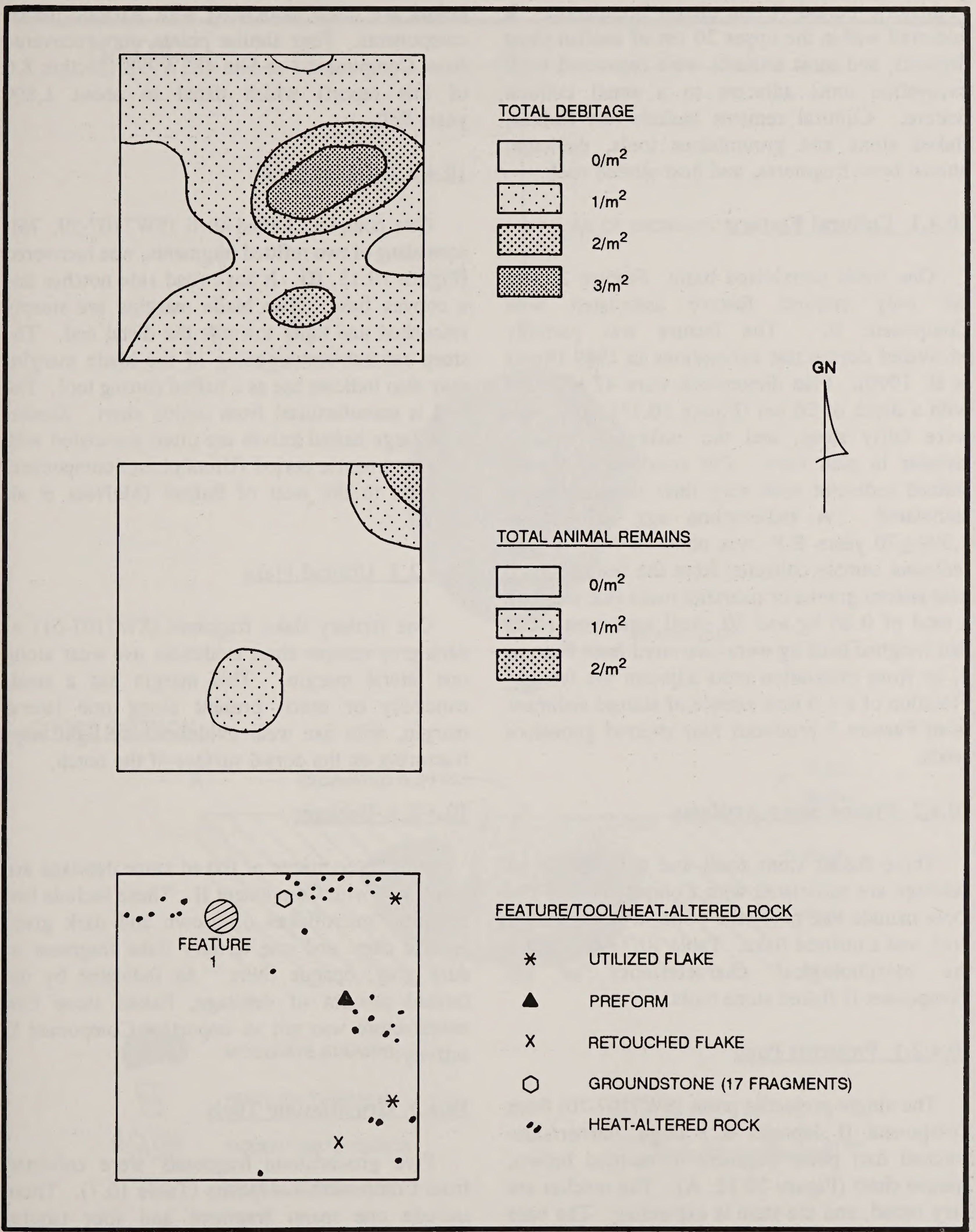


Figure 10.10 Plan Map with the Feature, Tools, and Heat-altered Rock Plotted and Trend Surface Maps for Debitage and Animal Remains, Component I, Site 48SW7107 (Locality P-086).

Prehistoric period (Uinta phase) occupation. It occurred within the upper 20 cm of aeolian sheet deposits, and most artifacts were recovered from excavation units adjacent to a small cultural feature. Cultural remains include one feature, flaked stone and groundstone tools, debitage, animal bone fragments, and heat-altered rock.

10.4.1 Cultural Feature

One small unoxidized basin, Feature 2, was the only cultural feature associated with Component II. The feature was partially excavated during test excavations in 1989 (Reust et al. 1990). Plan dimensions were 42 x 40 cm with a depth of 20 cm (Figure 10.11). Pit walls were fairly steep, and the basin was oval to circular in plan view. Fill consisted of darkly stained sediment with very little wood charcoal associated. A radiocarbon age estimate of 1,390±70 years B.P. was obtained from a bulk sediment sample collected from the feature. Ten heat-altered granite or quartzite rocks that weighed a total of 0.86 kg and 20 small sandstone rocks that weighed 0.13 kg were recovered from Feature 2, or from excavation units adjacent the feature. Flotation of a 4.0 liter sample of stained sediment from Feature 2 produced four charred goosefoot seeds.

10.4.2 Flaked Stone Artifacts

Three flaked stone tools and three pieces of debitage are associated with Component II. The tools include one projectile point, a large, hafted drill, and a utilized flake. Table 10.7 summarizes the morphological characteristics of the Component II flaked stone tools.

10.4.2.1 Projectile Point

The single projectile point (SW7107-70) from Component II deposits is a large, corner/side-notched dart point fragment of mottled brown, opaque chert (Figure 10.12, A). The notches are very broad, and the stem is expanding. The base is slightly convex, and the blade has a snap break across the distal end. Similar style projectile points are often associated with Archaic period components. Four similar points were recovered from Component I at Site 48SW998 (Section 8.0 of this report) which dated to about 1,800 years B.P.

10.4.2.2 Hafted Drill

One complete hafted drill (SW7107-29, 76), consisting of two refitted fragments, was recovered (Figure 10.12, B). It has broad side notches and a convex base. The blade margins are steeply retouched and taper towards the distal end. The steep retouch/resharpening of the blade margins may also indicate use as a hafted cutting tool. The tool is manufactured from oolitic chert. Similar style large hafted knives are often associated with Late Prehistoric period (Uinta phase) components in areas to the west of Bairoil (McNees et al. 1989).

10.4.2.3 Utilized Flake

One tertiary flake fragment (SW7107-61) of dark grey opaque chert evidences use wear along one lateral margin. This margin has a small concavity or notch present along one lateral margin, with use wear evidenced by light step-fracturing on the dorsal surface of the notch.

10.4.2.4 Debitage

Only three pieces of flaked stone debitage are associated with Component II. These include two complete microflakes of brown and dark grey, opaque chert and one tertiary flake fragment of dark grey, opaque chert. As indicated by the limited amount of debitage, flaked stone tool manufacture was not an important Component II activity.

10.4.3 Groundstone Tools

Five groundstone fragments were collected from Component II deposits (Table 10.7). These include one mano fragment and four tabular groundstone fragments which may represent a single large metate.

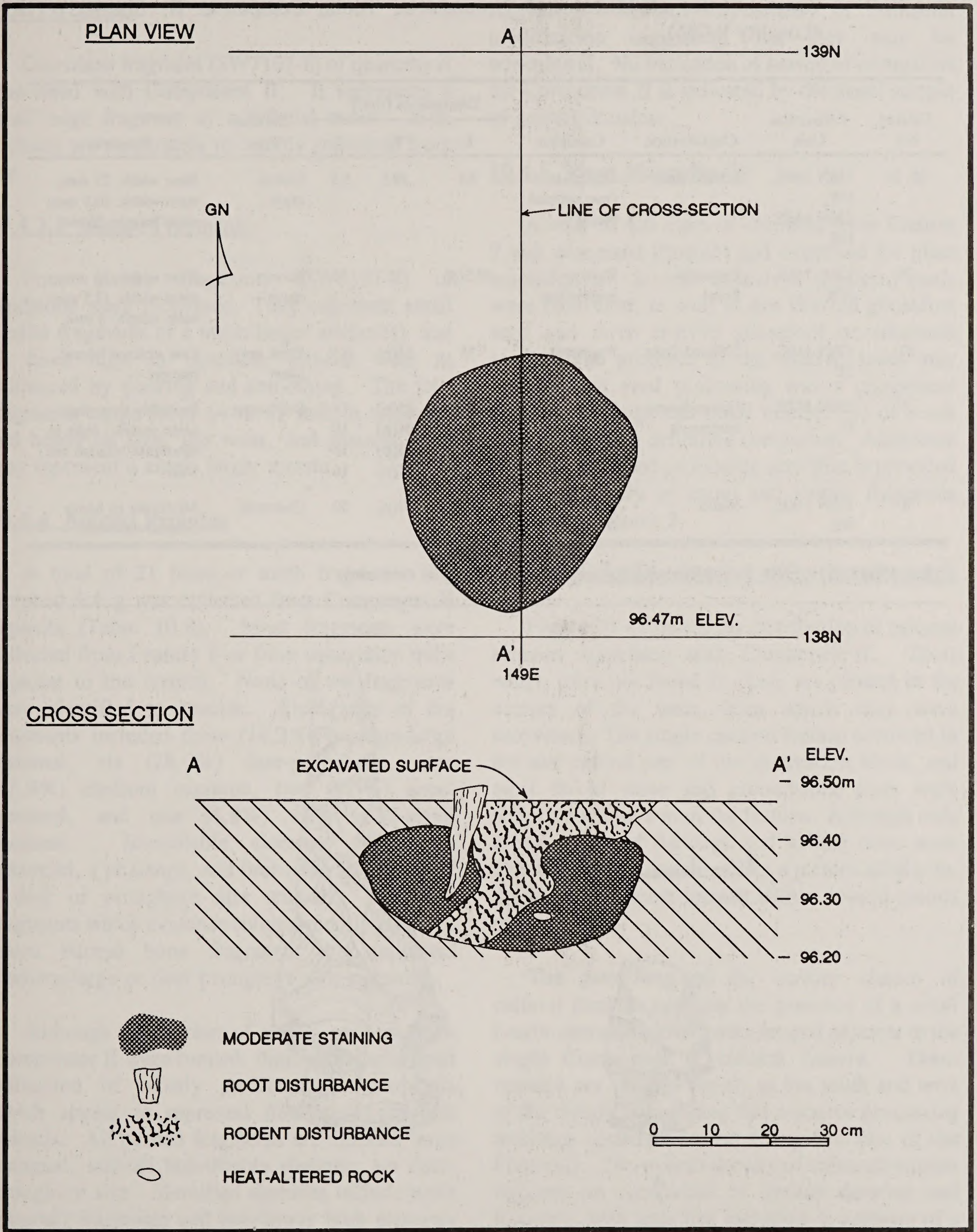


Figure 10.11 Plan View and Cross Section of Feature 2, Component II, Site 48SW7107 (Locality P-086).

Table 10.7 Characteristics of Flaked and Groundstone Tools, Component II, Site 48SW7107 (Locality P-086).

Catalog No.	Excavation Unit	Classification	Condition	Dimensions (mm)[1] L	W	T	Material Type	Remarks
29, 76	136N 148E, SW, 136N 146E, NE	Hafted drill	Complete (two refitted pieces)	83	29.5	8.5	Oolitic chert	Base width: 25 mm; stem width: 18.5 mm; stem length: 13 mm
70	136N 146E, NW	Projectile Point	Base and midsection	29.5(p)	18	6	Brown chert	Base width: 16 mm; stem width: 11.5 mm; stem length: 8 mm
61	138N 146E, SE	Utilized flake	Fragment	35	14(p)	4.5	Dark grey chert	One utilized lateral margin
7	138N 148E, E	Groundstone fragments	Medial fragments (4)	53(p) 38(p) 33(p) 18(p)	35(p) 34(p) 33(p) 16(p)	18 19 14 16	Sandstone	Probably from the same metate; light to moderate bifacial use wear
8	138N 148E, NE	Mano	Edge fragment	79(p)	37(p)	50	Quartzite	Moderate to heavy bifacial use wear

[1] L = length, W = width, T = thickness; (p) = broken specimen, partial dimension.

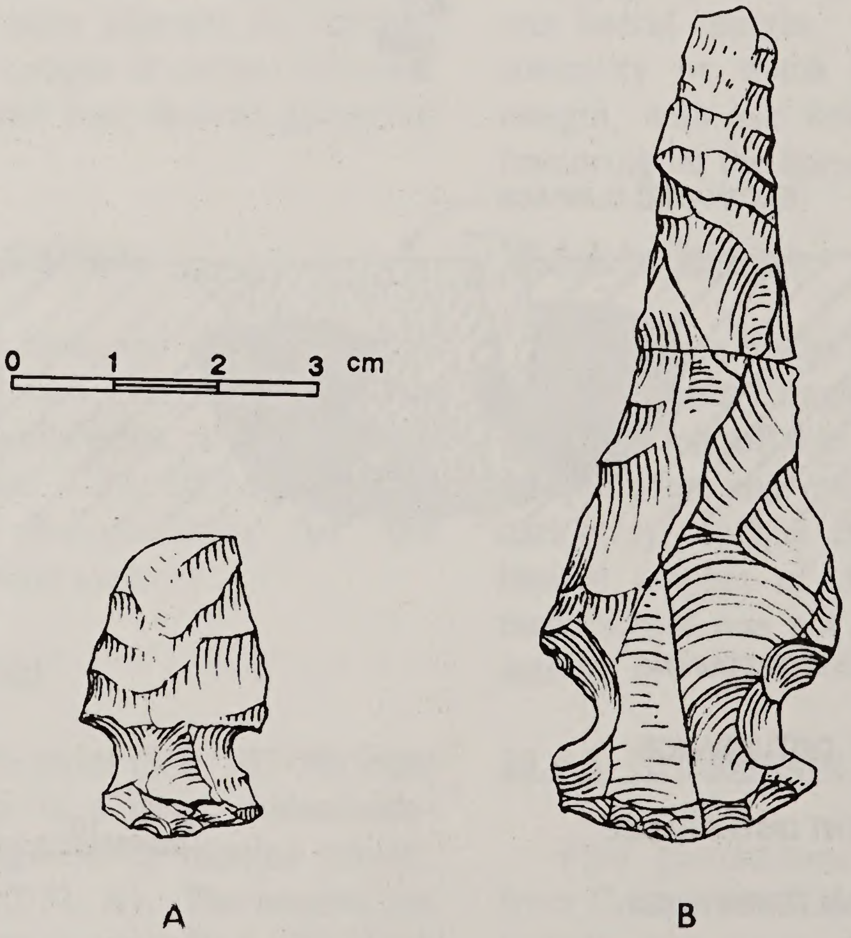


Figure 10.12 Selected Artifacts, Component II, Site 48SW7107 (Locality P-086). A) SW7107-70; B) SW7107-29, 76.

10.4.3.1 Mano

One mano fragment (SW7107-8) of quartzite is associated with Component II. It represents a small edge fragment of a bifacial mano. Both surfaces are moderately to heavily smoothed from use.

10.4.3.2 Metate Fragments

Four metate fragments (SW7107-7) of sandstone were recovered. They represent small medial fragments of a much larger artifact(s), and all have light to moderate bifacial wear as evidenced by pecking and smoothing. The four fragments range from 14 to 19 mm in thickness and based on size, use wear, and material type may represent a single larger metate.

10.4.4 Animal Remains

A total of 21 bone or tooth fragments that weighed 6.6 g was collected from Component II deposits (Table 10.8). Most fragments were collected from Feature 2 or from excavation units adjacent to the feature. None of the fragments were identified to species. Size range of the fragments included three (14.3%) medium-large mammal, six (28.6%) deer-pronghorn, nine (42.9%) medium mammal, two (9.5%) small mammal, and one (4.8%) very small-small mammal. Identifiable elements include a sesamoid, a phalange, and four tooth fragments of a deer or pronghorn size animal. The only fragments which evidence cultural modification are seven burned bone fragments that represent medium-large or deer-pronghorn size mammals.

Although the number of animal remains from Component II were limited, these remains suggest utilization of mostly medium-large mammals which appear to represent deer-pronghorn size animals. All burned fragments are medium-large mammal, and all identifiable elements are deer-pronghorn size. Identified elements include tooth (cranial) fragments and two lower limb elements representing at least one individual. The three very small-small mammal remains are very small fragments without evidence of cultural modification suggesting that they may be noncultural. No indication of season of occupation for Component II is indicated by the small sample of animal remains.

10.4.5 Plant Macrofossils

A total of 4.0 liters of sediment from Feature 2 was processed (floated) and examined for plant macrofossils. Sixteen uncharred (modern) seeds were recovered, as well as one charred goosefoot seed and three charred goosefoot or amaranth seeds. The presence of the charred seeds may indicate that seed processing was a component activity, although the small number (4) of seeds does not allow a definitive conclusion. Additional suggestion of seed processing activities is provided by the recovery of mano and metate fragments from near Feature 2.

10.4.6 Spatial Distribution of Cultural Remains

Figure 10.13 shows the distribution of cultural remains associated with Component II. Tools which were not found in place are plotted in the centers of the units from which they were recovered. The single cultural feature occurred in the east-central part of the excavation block, and most flaked stone and groundstone tools were collected within 2 m of the feature. Although only a few pieces of debitage and animal bone were collected, these items reflect a pattern similar to the tools with most located within several meters of the feature.

The patterning of the various classes of cultural remains suggests the presence of a small hearth-centered activity area located adjacent to the single Component II cultural feature. These remains are situated mostly to the south and west of the feature, suggesting that resource processing activities occurred on the downwind side of the Feature 2. The overall density of cultural remains suggests an occupation of limited duration and intensity, with activities including processing of a deer-pronghorn size animal and possibly plant processing.

Table 10.8 Summary of Animal Remains, Component II, Site 48SW7107 (Locality P-086).

Animal Size Category	Total Specimens		Burned Specimens		Identifiable Elements
	No.	Wt. (g)	No.	%	
Medium-large mammal	3	0.4	2	66.7	--
Deer-pronghorn size	6	1.4	1	16.7	Sesamoid (1); phalange (1); tooth fragments (4)
Medium mammal	9	3.6	4	44.4	--
Small mammal	2	1.1	--	--	--
Very small-small mammal	1	0.1	--	--	--
Total	21	6.6	7	33.3	

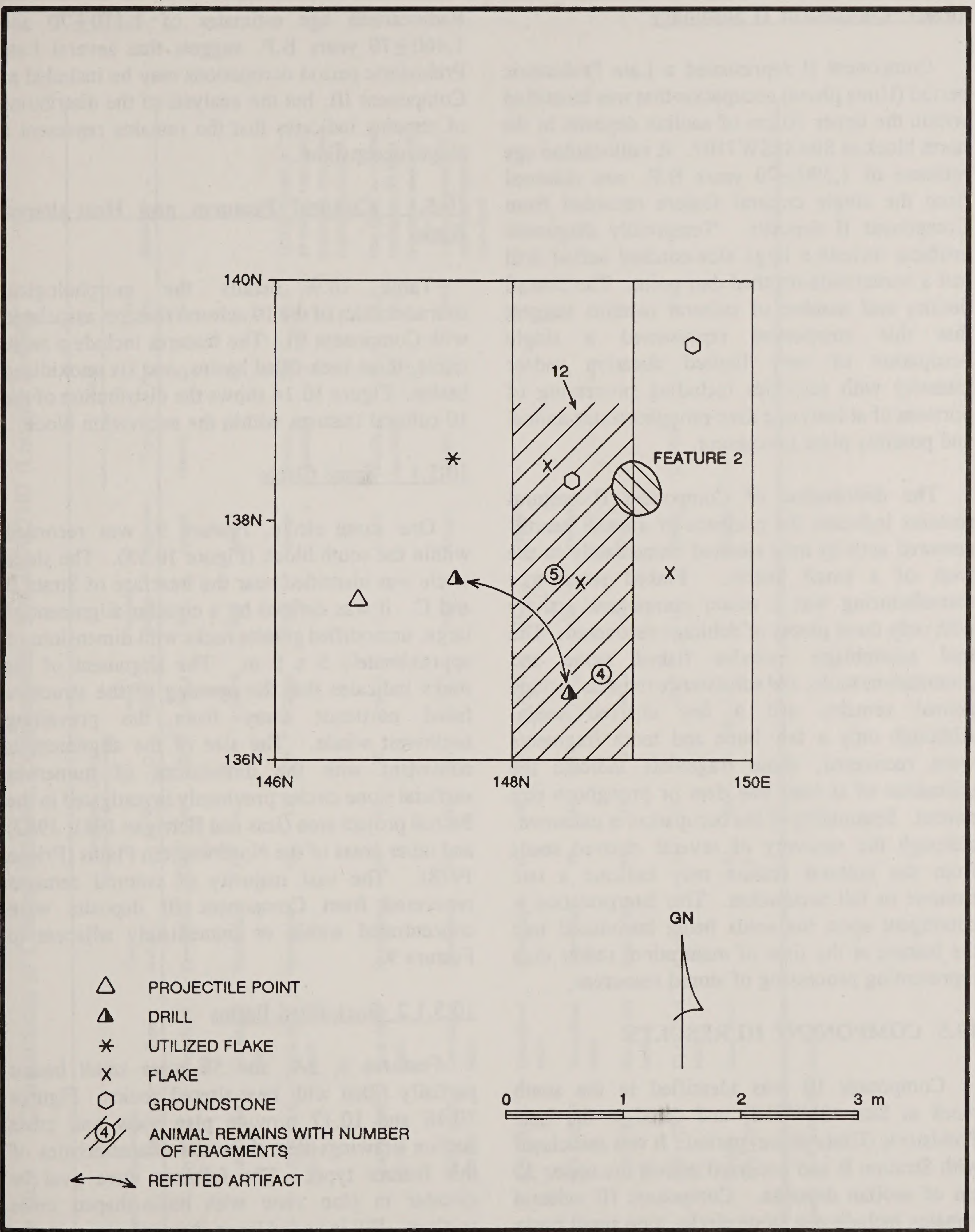


Figure 10.13 Plan Map Showing Distribution of Cultural Remains, Component II, Site 48SW7107 (Locality P-086).

10.4.7 Component II Summary

Component II represented a Late Prehistoric period (Uinta phase) occupation that was identified within the upper 20 cm of aeolian deposits in the north block at Site 48SW7107. A radiocarbon age estimate of 1,390±70 years B.P. was obtained from the single cultural feature recorded from Component II deposits. Temporally diagnostic artifacts include a large side-notched hafted drill and a corner/side-notched dart point. The overall density and number of cultural remains suggest that this component represented a single occupation of very limited duration and/or intensity with activities including processing of portions of at least one deer-pronghorn size animal and possibly plant processing.

The distribution of Component II cultural remains indicates the presence of a small hearth-centered activity area situated immediately to the west of a small hearth. Flaked stone tool manufacturing was a minor component activity with only three pieces of debitage recovered. The tool assemblage includes flaked stone and groundstone tools, and subsistence remains include animal remains and a few charred seeds. Although only a few bone and tooth fragments were recovered, these fragments indicate the utilization of at least one deer or pronghorn size animal. Seasonality of the occupation is unknown, although the recovery of several charred seeds from the cultural feature may indicate a late summer or fall occupation. This interpretation is contingent upon the seeds being introduced into the feature at the time of maturation, rather than representing processing of stored resources.

10.5 COMPONENT III RESULTS

Component III was identified in the south block at Site 48SW7107 and dated to the Late Prehistoric (Uinta phase) period. It was associated with Stratum B and occurred within the upper 30 cm of aeolian deposits. Component III cultural remains include one stone circle, nine small basin features, flaked and groundstone tools, debitage, heat-altered rock, bone, and plant macrofossils. Radiocarbon age estimates of 1,110±70 and 1,460±70 years B.P. suggest that several Late Prehistoric period occupations may be included as Component III, but the analysis of the distribuion of remains indicates that the remains represent a single occupation.

10.5.1 Cultural Features and Heat-altered Rock

Table 10.9 details the morphological characteristics of the 10 cultural features associated with Component III. The features include a stone circle, three rock-filled basins, and six unoxidized basins. Figure 10.14 shows the distribution of the 10 cultural features within the excavation block.

10.5.1.1 Stone Circle

One stone circle, Feature 9, was recorded within the south block (Figure 10.15). The stone circle was identified near the interface of Strata B and C. It was defined by a circular alignment of large, unmodified granite rocks with dimensions of approximately 5 x 5 m. The alignment of the rocks indicates that the opening of the structure faced northeast away from the prevailing southwest winds. The size of the alignment is consistent with the dimensions of numerous surficial stone circles previously investigated in the Bairoil project area (Jess and Berrigan 1981, 1982) and other areas of the Northwestern Plains (Frison 1978). The vast majority of cultural remains recovered from Component III deposits were concentrated within or immediately adjacent to Feature 9.

10.5.1.2 Rock-filled Basins

Features 3, 5A, and 5B were small basins partially filled with heat-altered rocks. Figures 10.16 and 10.17 provide plan view and cross section drawings that show the characteristics of this feature type. The features were oval or circular in plan view with basin-shaped cross sections. Fill included large charcoal pieces, heat-altered quartzite, sandstone or granite rocks, and stained sediment. No oxidation was present along

Table 10.9 Characteristics of Cultural Features, Component III, Site 48SW7107 (Locality P--086).

				Dimensions (cm)[1]						Rocks			
Feature No.	Excavation Unit	Type	Cross Section	L	W	D	Area (cm^2)	Volume (liters)	Oxidation	Type	No.	Weight (kg)	Remarks
3	80N 123E, SW	Rock-filled basin	Hemisphere	44	43	18	1,486.1	8.9	Absent	Granite	13	14.0	--
4	82-84N 121E, NE SE	Unoxidized basin	Hemisphere	56	47	6	3,369.6	22.5	Absent	--	--	--	--
5A	82-84N 121E, NE SE	Rock-filled basin	Hemisphere	66	55	20	3,369.6	22.5	Absent	Granite, Quartzite	18	19.0	1110±70 years B.P.; 19 flakes, four bone fragments, one metate fragment associated
5B	82-84N 125E, NE SE	Rock-filled basin	Hemisphere	57	45	18	2,042.8	12.3	Absent	Granite, Sandstone	29 2	8.2 0.2	One flake, two metate fragments, 32 bone fragments associated
6A	78-80N 123E, N½ S½	Unoxidized basin	Hemisphere	68	63	28	3,318.3	30.9	Absent	Granite	1	0.02	1460±70 years B.P.; one bone fragment associated
6B	82N 125E, C	Unoxidized basin	Hemisphere	82	66	13	4,300.8	18.6	Absent	--	--	--	--
7	80N 121E, C	Unoxidized basin	Hemisphere	80	60	4	3,848.5	51	Absent	--	--	--	--
8.1	80N 127E, NE	Unoxidized basin	Hemisphere	36	34	13	962.1	42	Absent	--	--	--	--
8.2	80N 127E, NE	Unoxidized basin	Hemisphere	26	25	7	510.7	1.2	Absent	Quartzite	1	0.05	--
9	78-84N 121-127E	Stone circle	--	52 0	500	--	204,270	--	Absent	--	--	--	--

[1] L = width, W = width, D = depth.

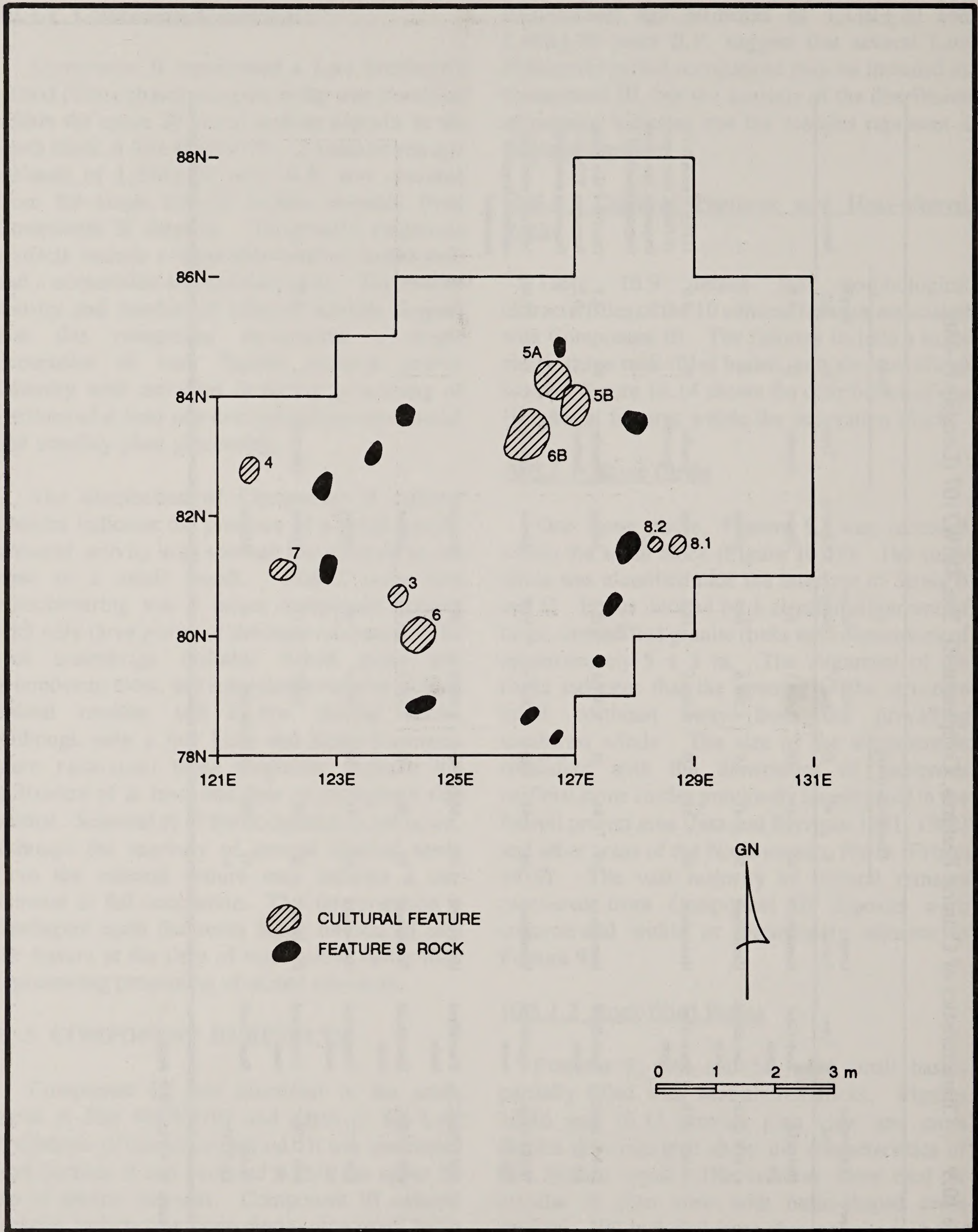


Figure 10.14 Distribution of Cultural Features Within the South Block, Component III, Site 48SW7107 (Locality P-086).

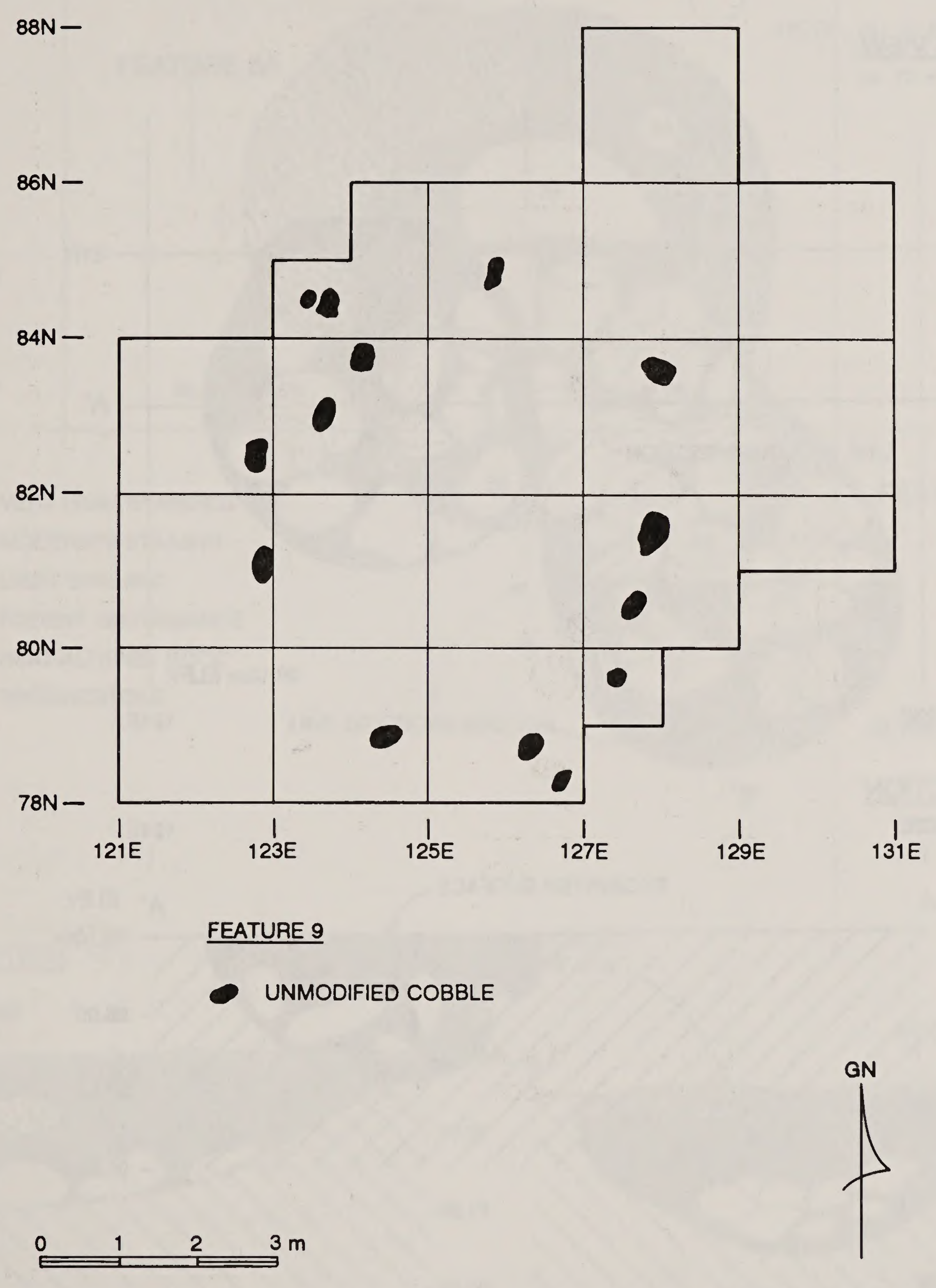


Figure 10.15 Plan View of Feature 9, Component III, Site 48SW7107 (Locality P-086).

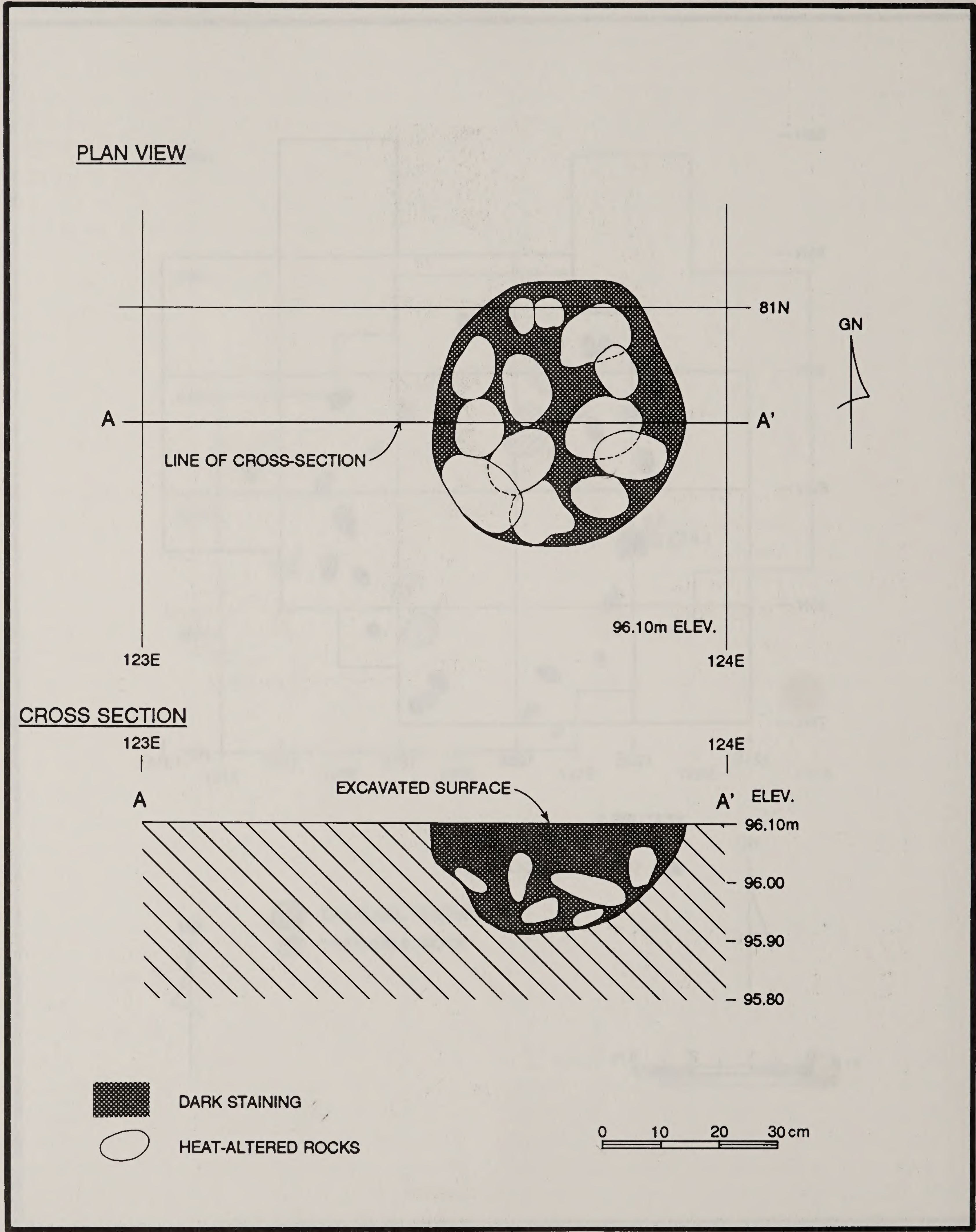


Figure 10.16 Plan View and Cross Section of Feature 3, Component III, Site 48SW7107 (Locality P-086).

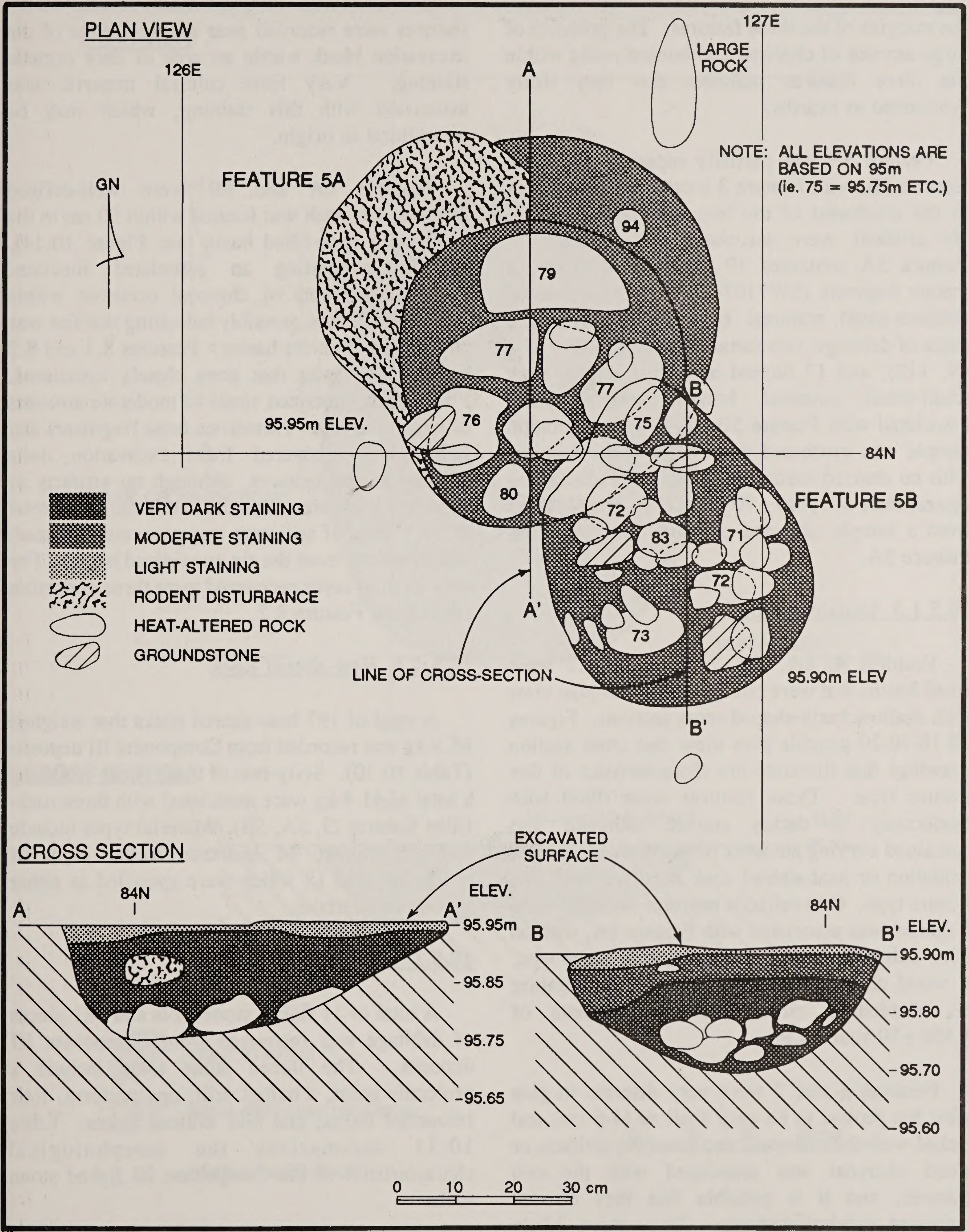


Figure 10.17 Plan Views and Cross Sections of Features 5A and 5B, Component III, Site 48SW7107 (Locality P-086).

the margins of the three features. The presence of large amount of charcoal and burned rocks within the three features indicates that they likely functioned as hearths.

Feature 5A was partially superimposed upon Feature 5B, with Feature 3 located several meters to the southwest of the two associated features. No artifacts were associated with Feature 3. Feature 5A contained 19 pieces of debitage, a metate fragment (SW7107-108), and four burned medium-small mammal bone fragments. One piece of debitage, two metate fragments (SW7107-69, 112), and 17 burned and 15 unburned very small-small mammal bone fragments were associated with Feature 5B. A 2.0 liter flotation sample was processed from each of the features with no charred seeds recovered. A radiocarbon age estimate of 1,110±70 years B.P. was obtained from a sample of wood charcoal collected from Feature 5A.

10.5.1.3 Unoxidized Basins

Features 4, 6A, 6B, 7, 8.1, and 8.2 were small basins that were circular to oval in plan view with shallow basin-shaped cross sections. Figures 10.18-10.20 provide plan view and cross section drawings that illustrate the characteristics of this feature type. These features were filled with moderately to darkly stained sediment and contained varying amounts of wood charcoal. No oxidation or heat-altered rock occurred with this feature type. One calcined medium-mammal bone fragment was associated with Feature 6A, with no other cultural material recovered this feature type. A wood charcoal sample collected from Feature 6A yielded a radiocarbon age estimate of 1,460±70 years B.P.

Features 4 and 7 were very discrete in plan view but proved to be very shallow (4-6 cm) and lacked well-defined cross sections. No artifacts or wood charcoal was associated with the two features, and it is possible that they do not represent cultural features. They more likely represent natural, shallow depressions that were incidentally filled with stained sediment. The two features were recorded near the west edge of the excavation block within an area of dark organic staining. Very little cultural material was associated with this staining, which may be noncultural in origin.

Features 6A and 6B were well-defined features, and each was located within 50 cm to the south of a rock-filled basin (see Figure 10.14), possibly suggesting an associated function. Moderate amounts of charcoal occurred within these two features, possibly indicating that fire was contained within the basins. Features 8.1 and 8.2 were small basins that were closely associated. Fill of each contained small to moderate amounts of wood charcoal. Numerous bone fragments and flakes was recovered from excavation units adjacent to the features, although no artifacts or bone was recovered from the two features. A total of 11.5 liters of sediment was processed (floated) and examined from the six unoxidized basins. The only charred seeds recovered were three goosefoot seeds from Feature 8.2.

10.5.1.4 Heat-altered Rock

A total of 197 heat-altered rocks that weighed 65.9 kg was recorded from Component III deposits (Table 10.10). Sixty-two of these rocks weighing a total of 41.4 kg were associated with three rock-filled features (3, 5A, 5B). Material types include 127 of granite, 44 quartzite rocks, eight of sandstone, and 18 which were specified as either granite or quartzite.

10.5.2 Flaked Stone Artifacts

A total of 11 flaked stone tools and 181 pieces of debitage was recovered from Component III deposits. The flaked stone tools include a projectile point, a hafted drill, one preform, four retouched flakes, and four utilized flakes. Table 10.11 summarizes the morphological characteristics of the Component III flaked stone tools.

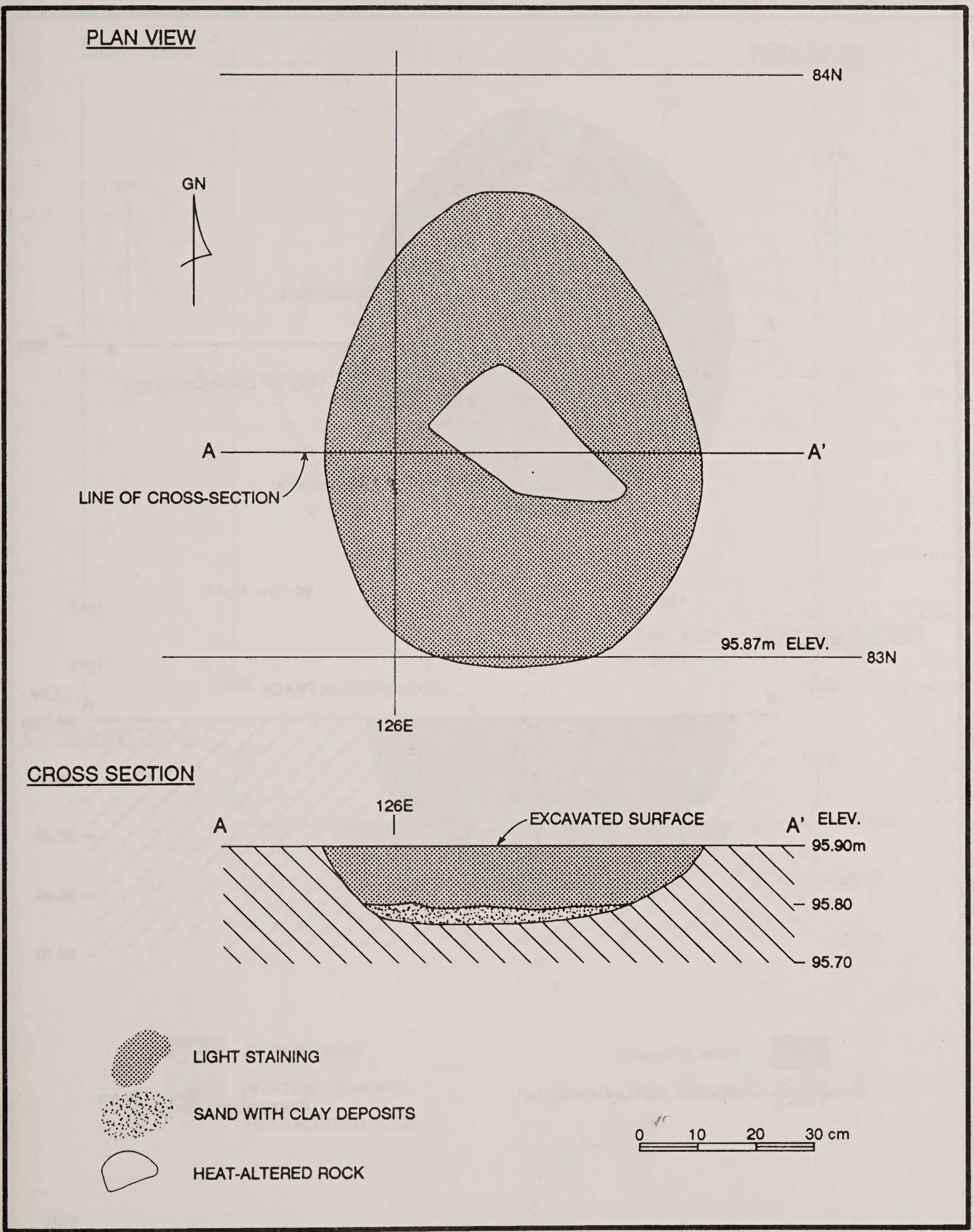


Figure 10.18 Plan View and Cross Section of Feature 6B, Component III, Site 48SW7107 (Locality P-086).

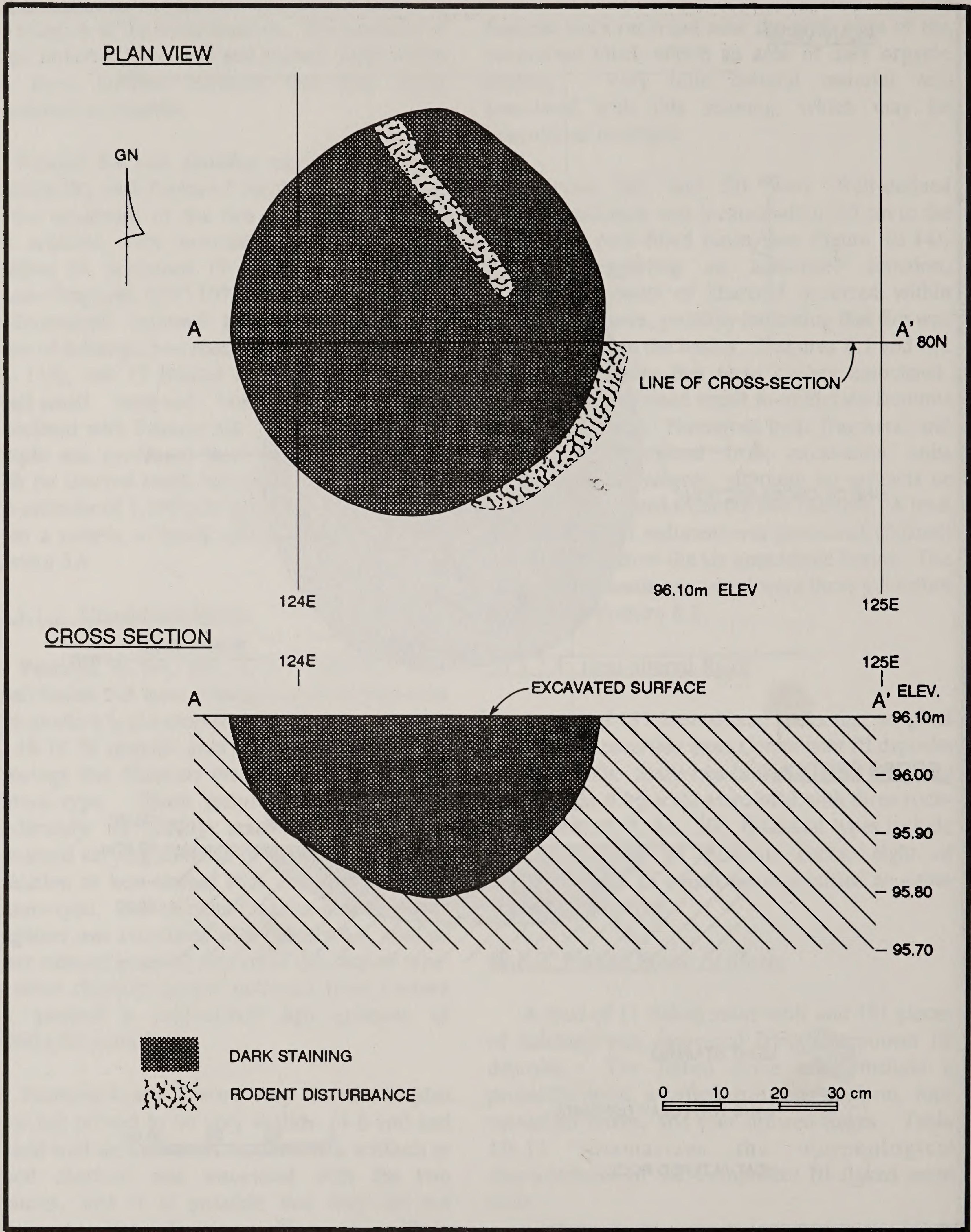


Figure 10.19 Plan View and Cross Section of Feature 6, Component III, Site 48SW7107 (Locality P-086).

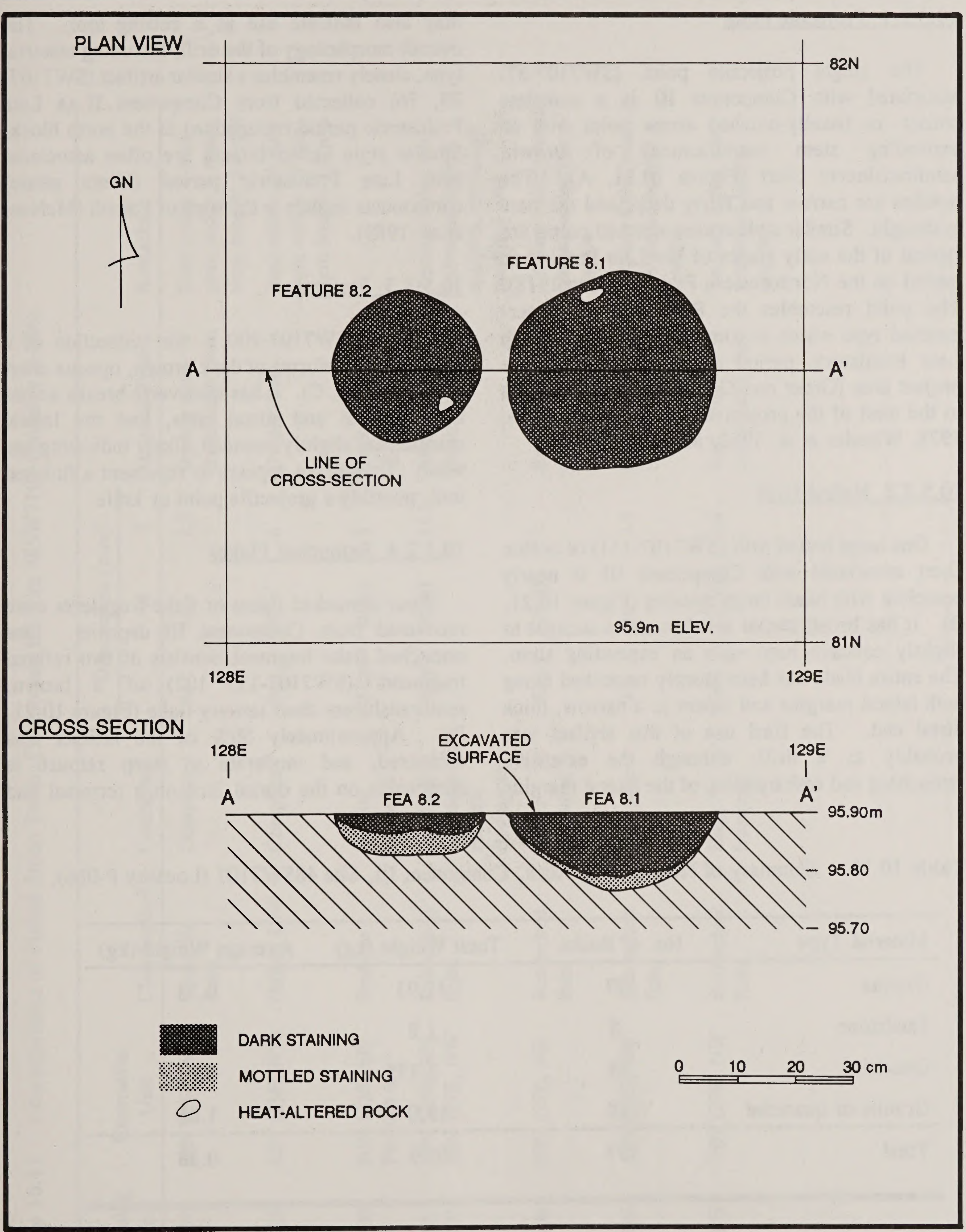


Figure 10.20 Plan Views and Cross Sections of Features 8.1 and 8.2, Component III, Site 48SW7107 (Locality P-086).

10.5.2.1 Projectile Point

The single projectile point (SW7107-57) associated with Component III is a complete corner- or basally-notched arrow point with an expanding stem manufactured of brown, semitranslucent chert (Figure 10.21, A). The notches are narrow and fairly deep, and the base is straight. Similar style corner-notched points are typical of the early stages of the Late Prehistoric period on the Northwestern Plains (Frison 1978). The point resembles the Rose Spring Corner-notched type which is commonly associated with Late Prehistoric period components within the project area (Greer and Greer 1989) and in areas to the west of the project area (McCracken et al. 1978, Wheeler et al. 1986, McNees 1989).

10.5.2.2 Hafted Drill

One large hafted drill (SW7107-111) of oolitic chert associated with Component III is nearly complete with blade tangs missing (Figure 10.21, B). It has broad corner notches and a straight to slightly concave base with an expanding stem. The entire blade has been steeply retouched along both lateral margins and tapers to a narrow, thick distal end. The final use of this artifact was probably as a drill, although the extensive retouching and resharpening of the lateral margins may also indicate use as a cutting tool. The overall morphology of the drill, including material type, closely resembles a similar artifact (SW7107-29, 76) collected from Component II (a Late Prehistoric period occupation) in the north block. Similar style hafted bifaces are often associated with Late Prehistoric period (Uinta phase) components in sites to the west of Bairoil (McNees et al. 1989).

10.5.2.3 Preform

Artifact SW7107-100 is the midsection of a thin biface (preform) of dark brown, opaque chert (Figure 10.21, C). It has transverse breaks across the proximal and distal ends, and the lateral margins are slightly rounded, likely indicating use wear. This biface appears to represent a finished tool, possibly a projectile point or knife.

10.5.2.4 Retouched Flakes

Four retouched flakes or flake fragments were recovered from Component III deposits. One retouched flake fragment consists of two refitted fragments (SW7107-13, 102) of a brown, semitranslucent chert tertiary flake (Figure 10.21, D). Approximately 50% of the artifact was recovered, and moderate to steep retouch is continuous on the dorsal face on a terminal end

Table 10.10 Summary of Heat-Altered Rock, Component III, Site 48SW7107 (Locality P-086).

Material Type	No. of Rocks	Total Weight (kg)	Average Weight (kg)
Granite	127	41.93	0.33
Sandstone	8	1.8	0.23
Quartzite	44	3.175	0.07
Granite or quartzite	18	19.0	1.06
Total	197	65.9	0.33

Table 10.11 Characteristics of Flaked Stone Tools, Component III, Site 48SW7107 (Locality P-086).

Catalog No.	Excavation Unit	Classification	Condition	Dimensions (mm)[1] L	W	T	Material Type	Remarks
57	80N 123E, NW	Projectile Point	Complete	34	14	2.5	Brown, semi-translucent chert	Base width: 8 mm; stem width: 6 mm; stem length: 3.5 mm
111	82N 125E, NW	Hafted Drill	Complete	54	27	6	Oolitic chert	Base width: 24 mm: stem width: 17 mm; stem length: 1.0 mm
100	80N 123E, SE, Feature 6	Preform	Medial fragment	27(p)	20(p)	5	Dark brown, opaque chert	--
13, 102	80N 125E, W½ 80N 127E, NW	Retouched flake	Proximal fragment (two refitted fragments)	38(p)	28(p)	11.5	Brown, semi-translucent chert	Tertiary flake; two retouched lateral margins, retouched proximal end
106	80N 127E, NE	Retouched flake	Distal fragment	20(p)	21(p)	3	Red, opaque chert	Tertiary flake; one retouched lateral margin
126	82N 127E, SW	Retouched flake	Complete	23	23	3.5	Grey, opaque chert	Tertiary flake; one retouched lateral margin
173	78N 127E, NW	Retouched flake	Edge fragment	39.5	17.5(p)	4.5	Red, semi-translucent chert	Tertiary flake; one retouched lateral margin

Table 10.11 (continued)

Catalog No.	Excavation Unit	Classification	Condition	Dimensions (mm)[1] L	W	T	Material Type	Remarks
51 66	82N 125E, NW 82N 123E, SE	Utilized flake	Complete (two refitted fragments)	27	19.5	4	Brown, semi-translucent chert	Tertiary flake; heat crazed; utilized lateral and distal margins
56	80N 123E, NE	Utilized flake	Complete	22	12	3	Red, opaque chert	Secondary flake; one utilized lateral margin
83	80N 125E, NE	Utilized flake	Complete	38	18.5	7	Chalcedony	Secondary flake; possible shatter
172	78N 127E, NW	Utilized flake	Proximal fragment	32(p)	21	5	Oolitic chert	Tertiary flake; one utilized lateral margin

[1] L = length, W = width, T = thickness; (p) = broken specimen, partial dimension.

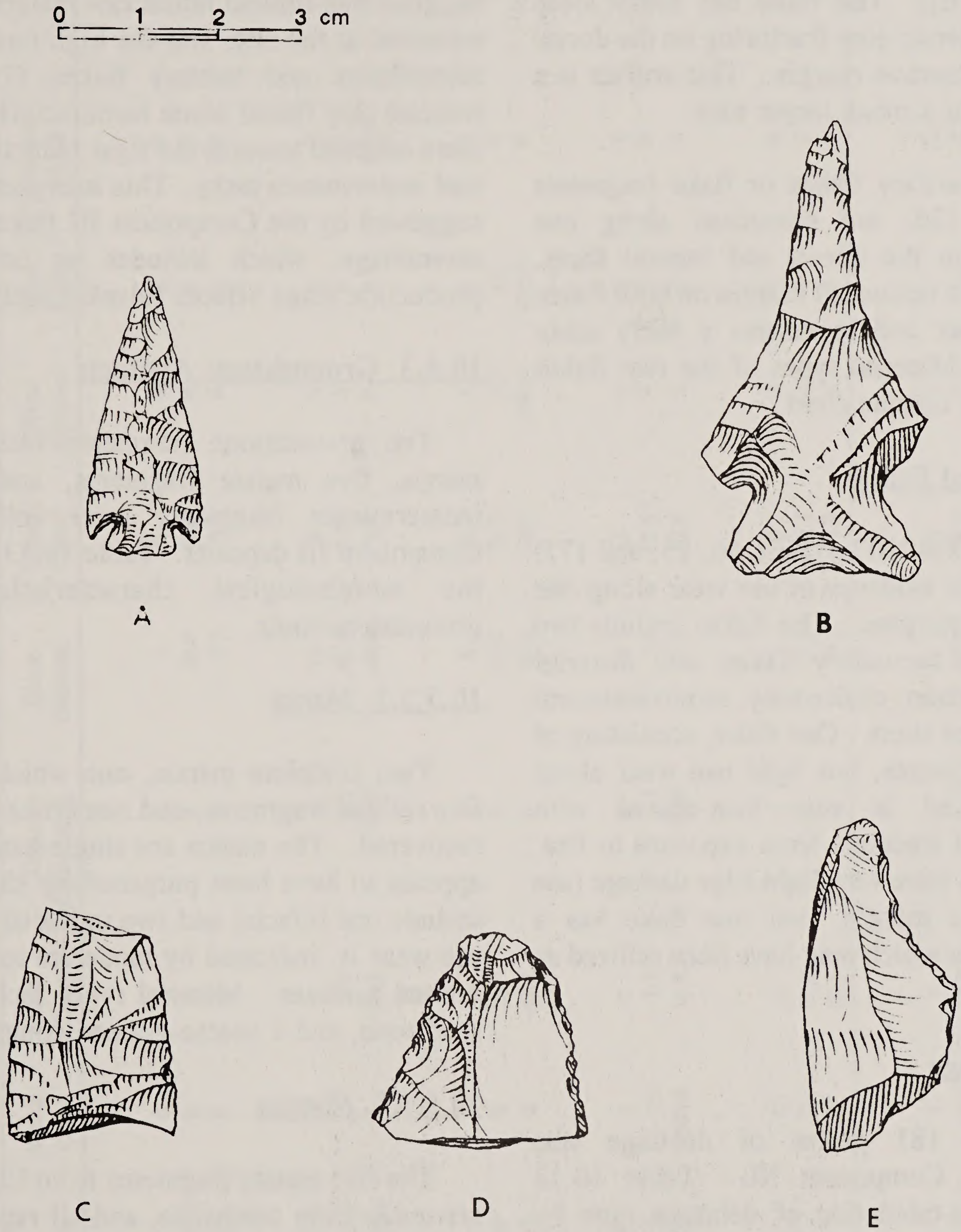


Figure 10.21 Selected Artifacts, Component III, Site 48SW7107 (Locality P-086). A) SW7107-57; B) SW7107-111; C) SW7107-100; D) SW7107, 13, 102; E) SW7107-173.

and along both lateral margins. It resembles an end/side scraper.

Artifact SW7107-173 is a retouched tertiary flake fragment of red, semitranslucent chert (Figure 10.21, E). The flake has fairly steep retouch and moderate step-fracturing on the dorsal surface on one concave margin. This artifact is a small fragment of a much larger tool.

Two small tertiary flakes or flake fragments (SW7107-106, 126) are retouched along one lateral margin on the dorsal and ventral faces, respectively. The retouched margin on both flakes is slightly convex and represents a fairly acute working edge. Material types of the two flakes are red and grey opaque chert.

10.5.2.5 Utilized Flakes

Four flakes (SW7107-51[66], 56, 83, and 172) have macroscopic evidence of use wear along one or more lateral margins. The flakes include two tertiary and two secondary flakes, and material types are oolitic chert, chalcedony, semitranslucent chert, and opaque chert. One flake, consisting of two refitted fragments, has light use wear along two margins and is very heat-crazed with numerous pot-lid fractures from exposure to fire. Two other flakes have very light edge damage (use wear) along one margin, and one flake has a natural projection which may have been utilized as a small graver.

10.5.2.6 Debitage

A total of 181 pieces of debitage was recovered from Component III. Table 10.12 provides a cross-tabulation of debitage type by material type for the assemblage. Chert is the dominant material type with various opaque, mottled, and semitranslucent types comprising 73.0% of the debitage. Black silicified siltstone equals 17.1% of the total, and 6.6% is quartzite. Small amounts of clear chalcedony, moss agate, petrified wood, and other siltstone are also included.

Microflakes comprise the greatest proportion (42.0%) of the debitage with lesser percentages of primary (2.8%), secondary (17.1), and tertiary (33.1%) flakes, and shatter (5.0%). The small number of primary and secondary flakes (19.9%) suggests that limited initial raw material reduction occurred at the site, and the high total percent of microflakes and tertiary flakes (75.1%) may indicate that flaked stone manufacturing activities were oriented towards the final reduction stages or tool maintenance tasks. This interpretation is also suggested by the Component III flaked stone tool assemblage, which includes no cores and no production stage bifaces (blanks, preblanks).

10.5.3 Groundstone Artifacts

Ten groundstone fragments including three manos, five metate fragments, and two small indeterminate fragments were collected from Component III deposits. Table 10.13 summarizes the morphological characteristics of the groundstone tools.

10.5.3.1 Manos

Two complete manos, one which consists of five refitted fragments, and one broken mano were recovered. The manos are single-hand, and none appears to have been purposefully shaped. They include one bifacial and two unifacial manos, and use wear is indicated by moderate to heavily ground surfaces. Material types include granite, sandstone, and a coarse-grained conglomerate.

10.5.3.2 Metates

The five metate fragments from Component III are made from sandstone, and all represent small portions of much larger artifacts. Each of the fragments is tabular and exhibits moderate to heavy unifacial use wear as indicated by smoothing and pecking. Three of the fragments were collected from cultural features and are heavily oxidized from exposure to heat.

Table 10.12 Cross-Tabulation of Debitage Type by Material Type, Component III, Site 48SW7107 (Locality P-086).

	Material Type								
Debitage Type	Quartzite	White Chert	Red Chert	Clear Chalcedony	Black Siltstone	Other Chert	Other Siltstone	Moss Agate	Petrified Wood	Total
Primary Flake										
Number	1	0	0	0	3	1	0	0	0	5
Row %	20.0	0	0	0	60.0	20.0	0	0	0	0
Column %	8.3	0	0	0	9.7	0.8	0	0	0	2.8
Secondary Flake										
Number	3	0	1	1	15	9	0	0	2	31
Row %	9.7	0	3.2	3.2	48.4	29.0	0	0	6.5	100.0
Column %	25.0	0	14.3	50.0	48.4	7.3	0	0	100.0	17.1
Tertiary Flake										
Number	4	0	3	0	8	43	1	1	0	60
Row %	6.7	0	5.0	0	13.3	71.7	1.7	1.7	0	0
Column %	33.3	0	42.9	0	25.8	34.7	100.0	100.0	0	33.1
Microflake										
Number	4	1	1	1	4	65	0	0	0	76
Row %	5.3	1.3	1.3	1.3	5.3	85.5	0	0	0	0
Column %	33.3	100.0	14.3	50.0	12.9	52.4	0	0	0	42.0
Shatter										
Number	0	0	2	0	1	6	0	0	0	9
Row%	0	0	22.2	0	11.1	66.7	0	0	0	0
Column %	0	0	28.6	0	3.2	4.8	0	0	0	5.0
Total										
Number	12	1	7	2	31	124	1	1	2	181
Row %	6.6	0.6	3.9	1.1	17.1	68.5	0.6	0.6	1.1	1.1

Table 10.13 Characteristics of Groundstone Tools, Component III, Site 48SW7107 (Locality P-086).

Catalog No.	Excavation Unit	Classification	Condition	Dimensions (mm)[1] L	W	T	Weight (kg)	Material Type	Remarks
39	80N 121E, SE	Mano	Complete	133	91	55	0.737	Conglomerate	Unsharpened, single-hand, heavy unifacial use wear
52	83.91N 126.26E	Metate	Fragment	244	115	16	0.969	Sandstone	Moderate to heavy unifacial use wear
68	84.20N 125.85E	Mano	Fragment	86	84	22	0.186	Sandstone	Single-hand, moderate use wear
71 72 73 131 174	81.27N 124.25E 81.25N 123.88E 82.10N 125.42E 84.35N 126.83E 84.30N 126.95E	Mano	Complete (five refitted fragments)	142	77	56	0.826	Granite	Unsharpened, single-hand, heavy bifacial use wear
69	83.83N 126.76E, Feature 5B	Metate	Fragment	93	68	33	0.213	Sandstone	Heavily oxidized, unifacial, moderate use wear
108	84.05N 126.43E, Feature 5A	Metate	Fragment	92	77	21	0.193	Sandstone	Heavily oxidized, unifacial, heavy use wear
112	83.66N 126.76E, Feature 5B	Metate	Fragment	95	77	36	0.029 0.014	Sandstone	Heavily oxidized, light unifacial use wear

Table 10.13 (continued)

Catalog No.	Excavation Unit	Classification	Condition	Dimensions (mm)[1] L	W	T	Weight (kg)	Material Type	Remarks
157	80N 127E, NW	Indeterminate	Two fragments	54 36	43 17	9 7	0.151	Sandstone	Very small groundstone fragment
177	84.45N 126.95E	Metate	Fragment	100	57	18	--	Sandstone	Small fragment, heavy unifacial use wear

[1] L = length, W = width, T = thickness.

10.5.3.3 Groundstone Fragments

Two small groundstone fragments of sandstone appear to represent small portions of a mano or metate. The two artifacts are moderately smoothed and pecked unifacially, and neither is oxidized.

10.5.4 Animal Remains

A total of 149 bone fragments, 24 tooth fragments, and one mussel shell fragment of probable cultural origin was associated with Component III deposits (Table 10.14). Most fragments are very small, and the total weight of the 174 fragments is only 13.5 g. None of the fragments were identifiable to species. One phalange is bison size, one carpal or tarsal is deer-pronghorn size, and one maxilla is ground squirrel size. The remaining fragments include 47 (27.0%) medium-large mammal, 23 (13.2%) medium mammal, five (2.9%) small-medium mammal, 11 (6.3%) small mammal, 84 (48.3%) small-very small mammal, and one mussel shell fragment. One hundred and eleven fragments (63.8% of total) are burned or calcined including 34 medium-large mammal, three medium mammal, five small-medium mammal, eight small mammal, and 61 very small-small mammal fragments.

The highly fragmented nature of the animal remains limits interpretations of species of animals processed, although the size ranges represented indicate utilization of a wide range of animal sizes. The three identifiable elements represent bison size, deer-pronghorn size, and ground squirrel size, and the size range of the unidentified fragments indicates utilization of animals ranging in size from bison to rabbit or smaller, and possibly freshwater mussels. The extreme fragmentation and small average size (0.1 g) of the bone, as well as the high percentage of carbonized fragments, suggest intensive processing activities. The bone and tooth fragments provide no information concerning seasonality of the component. The single freshwater mussel shell fragment suggests that occupation may have occurred sometime during warmer parts (spring-fall) of the year when mussels are most readily available. However, it is possible that the shell represents an ornamental item rather than subsistence remains, and as such may have been curated for a period of time.

10.5.5 Plant Macrofossils

Flotation samples were processed from the eight basin features associated with Component III with a total of 15.5 liters processed (Table 10.15). Forty-six uncharred goosefoot or grass seeds were recovered, with only three charred seeds identified. The charred seeds include three charred chenopodium or amaranth seeds collected from Feature 8.2.

10.5.6 Spatial Distribution of Cultural Remains

The distribution of cultural features and tools for Component III is shown in Figure 10.22. Tools that were not point plotted during excavations are mapped in the centers of the units from which they were recovered. The figure also indicates the locations of refits of two flaked stone tools and one mano. Figure 10.23 provides trend surface maps for total debitage, chert debitage, and siltstone debitage and also shows the distribution of heat-altered rock. Figure 10.24 provides trend surface maps for all animal remains, medium-large mammal remains, and small-very small mammal remains within the excavation block.

The stone circle, Feature 9, occupied the central part of the block, and the feature/tool map indicates three clusters of small basin features. As noted in subsection 10.5.1.3 of this report, the two westernmost features (Features 4 and 7) were poorly defined, lacked depth, and likely did not represent cultural features. They are not included on the feature/tool map or in the following discussion. Two of the feature clusters were located within the stone circle. Three features (Features 5A, 5B, and 6B) including two superimposed rock-filled basins and an unoxidized basin were recorded on the north edge of Feature

Table 10.14 Summary of Animal Remains, Component III, Site 48SW7107 (Locality P-086).

Animal Size Category	Total Specimens No.	Total Specimens Wt. (g)	Burned Specimens No.	Burned Specimens %	Identifiable Elements
Bison size	1	4.5	--	--	Phalange
Medium-large mammal	47	4.8	34	72.3	Tooth fragments (10)
Deer-pronghorn size	1	0.7	--	--	Carpal/tarsal
Medium mammal	23	0.9	3	13.0	Tooth fragments (14)
Small-medium mammal	5	0.1	5	100.0	--
Ground squirrel size	1	0.1	--	--	Maxille
Small mammal	11	0.6	8	72.7	--
Very small-small mammal	84	1.7	61	72.6	Vertebra
Mussel shell	1	0.1	--	--	--
Total	174	13.5	111	63.8	

Table 10.15 Plant Macrofossils Recovered from Feature Fill, Component III, Site 48SW7107 (Locality P-086).

Feature No.	Sample No.	Volume (liters)	No. of Charred Seeds	Taxon
3	4	2.0	0	-
4	10	2.0	0	-
5A	37	2.0	0	-
5B	43	2.0	0	-
6	31	2.0	0	-
6B	47	2.0	0	-
8.1	60	2.0	0	-
8.2	64	1.5	3	goosefoot or amaranth

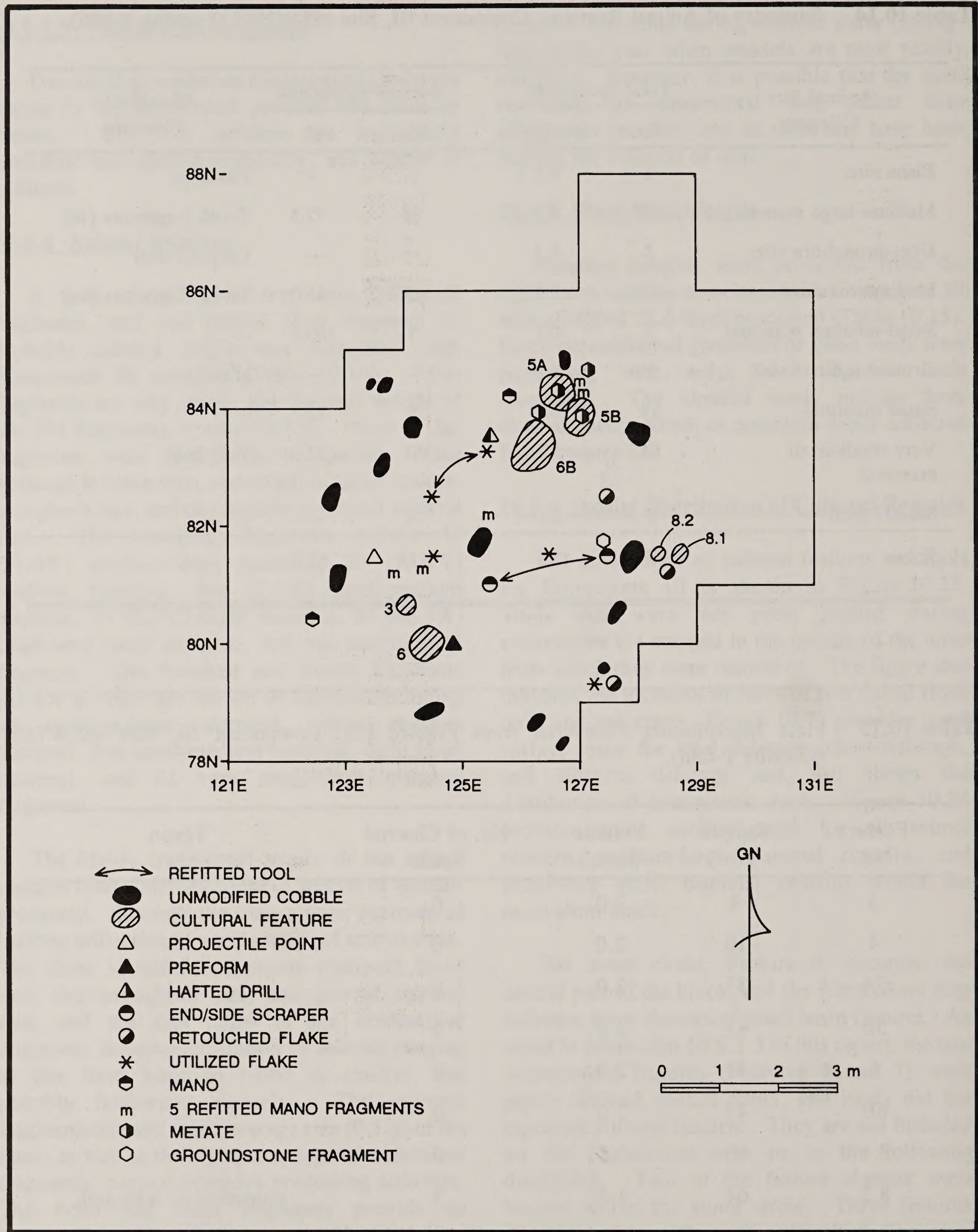


Figure 10.22 Plan Map with Features and Tools Plotted, Component III, Site 48SW7107 (Locality P-086).

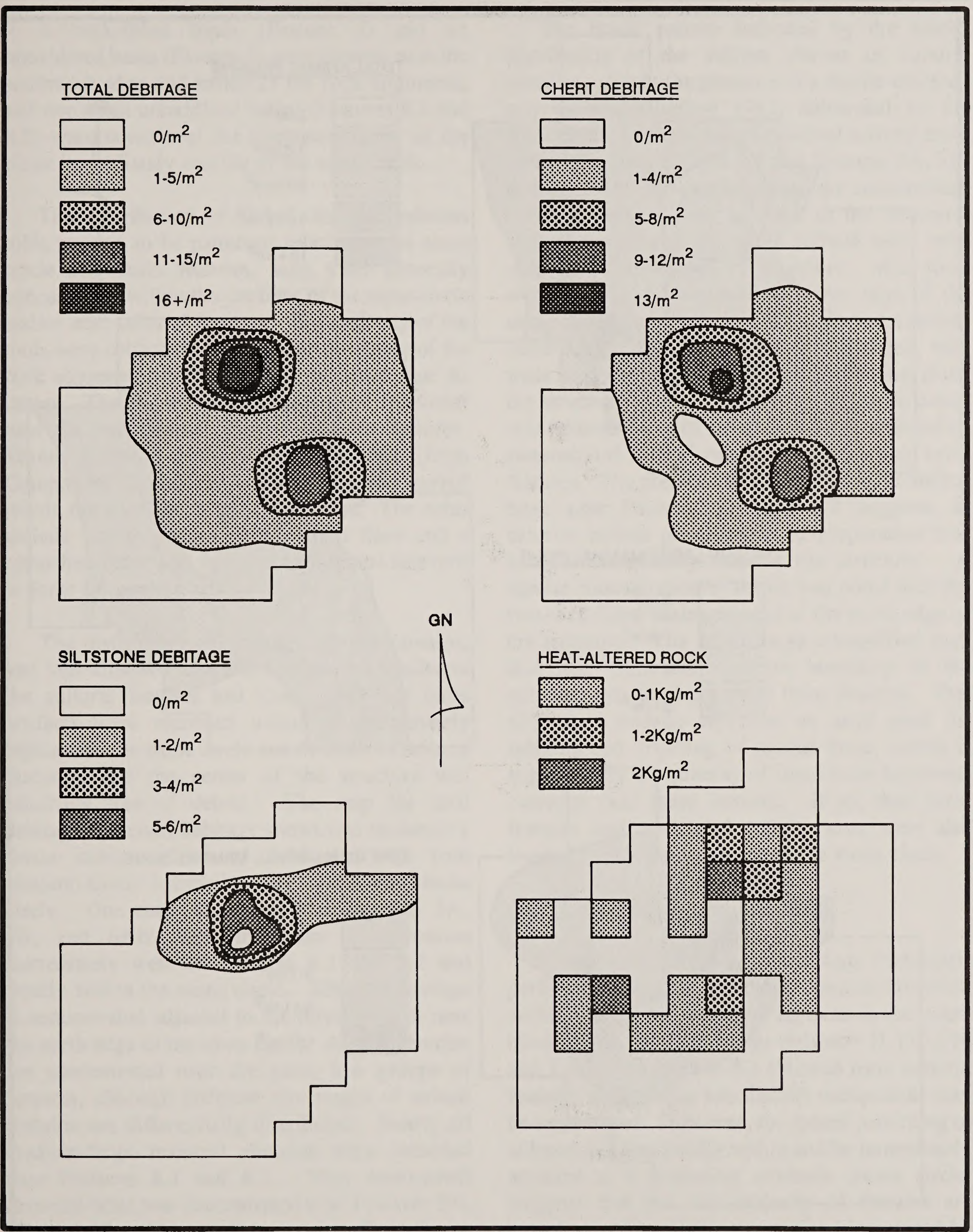


Figure 10.23 Trend Surface Maps for Total Debitage, Chert Debitage, Siltstone Debitage, and Heat-altered Rock, Component III, Site 48SW7107 (Locality P-086).

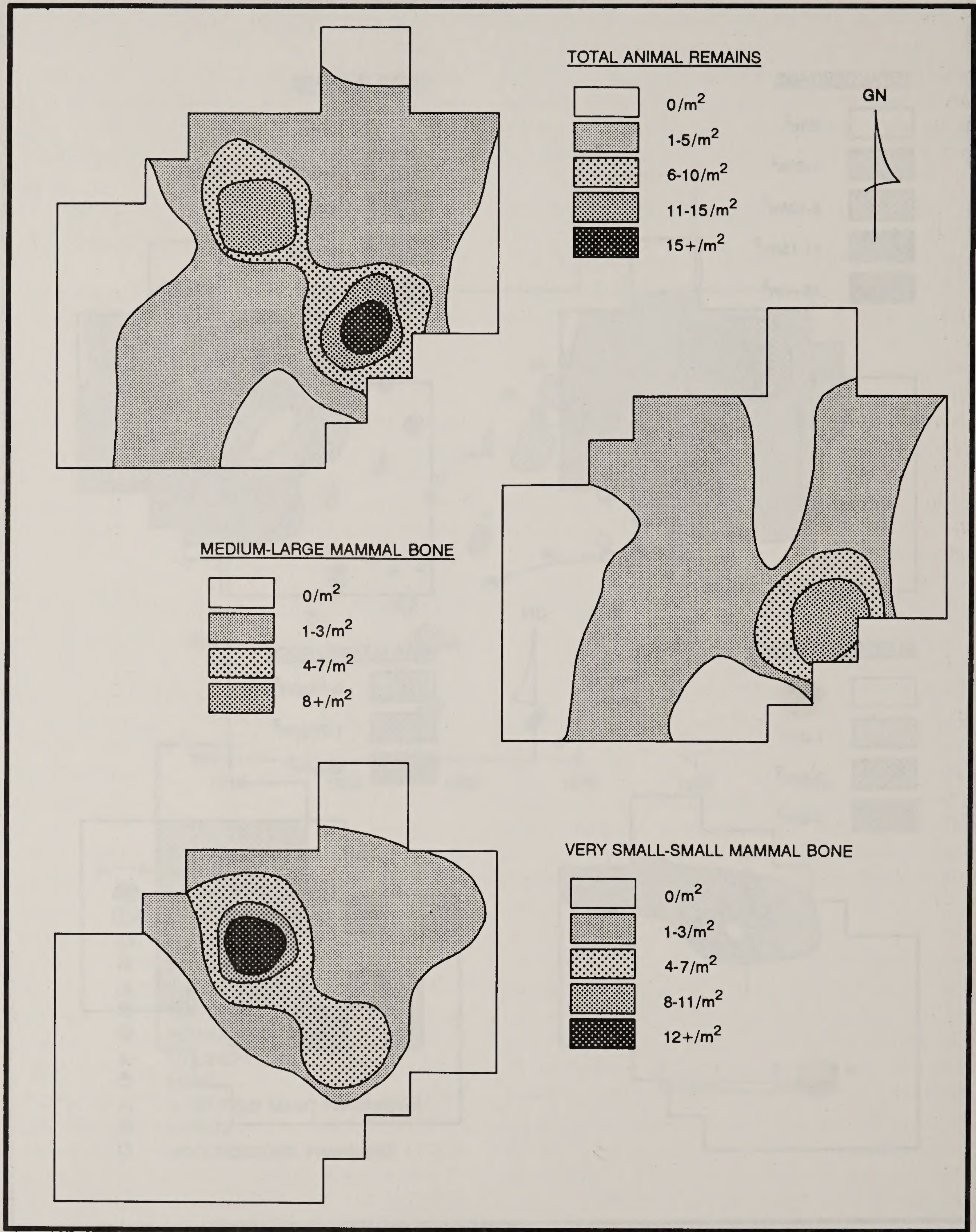


Figure 10.24 Trend Surface Maps for Total Animal Remains, Medium-Large Mammal Remains, and Small-Very Small Mammal Remains, Component III, Site 48SW7107 (Locality P-086).

9, a rock-filled basin (Feature 3) and an unoxidized basin (Feature 6) were situated near the southwest edge and inside of the rock alignment; and two small unoxidized basins (Features 8.1 and 8.2) were noted near the southeast corner of the block immediately outside of the stone circle.

The distribution of flaked and groundstone tools appears to be patterned relative to the stone circle and basin features, with tools generally concentrated within the confines of the stone circle and/or near cultural features. The majority of the tools were collected near the inner boundary of the rock alignment, with few tools recorded near its center. The majority of the tools were recovered near the two internal clusters of basin features. Three refitted tools were collected from Component III deposits, with all refits recovered within the confines of the stone circle. The refits include two fragments of a utilized flake and a retouched flake, and five mano fragments that refit to form a complete artifact.

The distribution of debitage, animal remains, and heat-altered rock reflects a pattern similar to the cultural features and tools. Most of these artifacts were recorded within or immediately adjacent to the stone circle and/or close to cultural features, and the center of the structure was relatively free of debris. The map for total debitage and chert debitage shows two moderately dense concentrations of debitage, with both concentrations located mostly within the stone circle. One concentration is near Features 5A, 5B, and 6AB, with the other concentration immediately west of Features 8.1 and 8.2 and mostly within the stone circle. Siltstone debitage is concentrated adjacent to the three features near the north edge of the stone circle. Animal remains are concentrated near the same two groups of features, although different size ranges of animal remains are differentially distributed. Nearly all medium-large mammal remains were recorded near Features 8.1 and 8.2. Very small-small mammal bone was concentrated near Features 5A, 5B, and 6B, with a smaller concentration of very small-small mammal bone occurring in the vicinity of Features 8.1 and 8.2.

The broad pattern indicated by the spatial distribution of the various classes of cultural remains suggests the presence of a shelter-centered activity area (Binford 1983) delineated by the stone circle, and two hearth-centered activity areas around Features 8.1 and 8.2 and Features 5A, 5B, and 6B. All classes of remains are concentrated within or immediately adjacent to the structure, and all portions of the three refitted tools were recovered from within the structure. Most tools were recovered from near the inner edge of the stone circle, and Binford (1983) observed a similar pattern from study of the Nunamiut Eskimo, with tools used within a confined space often lost along the structure edges. The center of the structure was relatively free of cultural remains, with debris concentrated around two groups of smaller basin features. The presence of a high density of animal bone near Features 8.1 and 8.2 suggests an exterior animal processing/food preparation area located immediately east of the structure. A similar concentration of debris was noted near the two rock-filled basins situated at the north edge of the structure. The single large unmodified rock that may form the northern boundary of the structure was located next to these features. This rock may actually represent an anvil used for splitting and crushing of animal bone, which is suggested by the quantity of small bone fragments recorded near these features. If so, then these features and associated activity area were also located immediately outside of the stone circle.

10.5.7 Component III Summary

Component III represented a Late Prehistoric period (Uinta phase) residential campsite identified within the upper 30 cm of deposits in the south block. Two radiocarbon age estimates (1,110$\pm$70 and 1,460$\pm$70 years B.P.) obtained from cultural features suggest that two distinct occupations may be represented. However, the spatial patterning of cultural remains mostly within and/or immediately adjacent to a habitation structure (stone circle) suggests that the vast majority of remains are associated with a single occupation represented by the stone circle. The limited density of cultural remains and the spatial patterning of remains suggests that this occupation was of limited duration. Debitage density was very limited ($2.6/m^2$), and only 173 bone and tooth fragments were associated with Component III. The spatial patterning of the various classes of remains indicates a lack of refuse cleaning, with the absence of cleaning also suggesting that a short-term occupation is represented (Brooks and Yellen 1987, Binford 1987).

Although artifact density is limited, a fairly diverse sample of flaked and groundstone tools was recovered. The flaked stone tools include a projectile point, a hafted drill, a projectile point or knife blade fragment, an end/side scraper, and seven retouched or utilized flakes. Groundstone tools include three mano or mano fragments, five metate fragments, and two unidentifiable groundstone fragments. The vast majority of the debitage consists of small tertiary flakes or microflakes, suggesting that lithic manufacture was oriented towards the final reduction stages and/or tool maintenance tasks. The absence of production stage bifaces and cores also supports this interpretation.

Subsistence related remains include a fairly diverse assemblage of animal remains and several charred seeds. Animal remains are limited in number and taxonomically identifiable elements, although the size classes represented indicate that a variety of animals was processed. Evidence of utilization of large herbivores, including bison size, deer-pronghorn size, rabbit size, and rodent size remains and possibly freshwater mussels (bivalve) was noted, with no evidence of utilization of more than one animal from any size class recovered. The highly fragmented nature of the bone suggests very intensive processing activities. Three charred seeds were recovered from flotation samples, and the mano and metate fragments suggest that seed processing was probably a component activity.

Seasonality of occupation could not be conclusively determined from the Component III cultural remains, although the presence of a few charred seeds and a freshwater mussel shell fragment provide weak evidence that occupation may have taken place during the warmer months of the year. The seeds represent goosefoot or amaranth which mature in the late summer or fall, and mussels are available for collection in warmer months prior to freezing weather. This interpretation of a warm season occupation is contingent upon the seeds representing processing activities at the time of seed maturation (rather than as stored resources), and with the mussel shell fragment representing a food item rather than a curated ornamental artifact.

10.6 CULTURAL REMAINS NOT ASSIGNED TO COMPONENT

A few artifacts were recovered from 0- 25 cm below surface in the middle block in association with an unconsolidated or slightly consolidated sand. Due to the paucity of artifacts, the lack of a defined cultural layer, and the unconsolidated nature of the sediments, no component designation was assigned. Artifacts include a projectile point and a groundstone fragment, a few pieces of debitage, and several bone fragments. No cultural features or heat-altered rock were recorded.

The point (SW7107-26) is complete and is manufactured from a yellowish-brown, opaque chert (Figure 10.25). Dimensions are 27 x 15.5 x 3 mm, with a base width of 12 mm, a stem width of 8 mm, and a stem length of 4 mm. The corner notches are fairly broad, and the base is slightly convex. Similar style projectile points are generally associated with Late Prehistoric period components in the Northwestern Plains (Frison 1978). The groundstone fragment (SW7107-27) is a small, angular fragment of sandstone that is very smoothed (ground) on one facet. It appears to represent a small portion of a mano or metate.

Fifteen pieces of debitage -- including five microflakes, five tertiary flakes, three secondary flakes, and one piece of shatter -- were also noted. Twelve of the flakes are chert, two are quartzite, and one chalcedony flake was collected. Two unburned bone fragments including a possible cranial fragment of a small-medium mammal and a small fragment of a medium-large mammal bone were also recovered.

Based on stratigraphic location and one temporally diagnostic projectile point, these remains probably date to the Late Prehistoric period. The projectile point is a small, corner-notched artifact that is generally similar to a Rose Spring Corner-notched type. Previous salvage excavations conducted 15-25 m to the west of the middle block GAC encountered a well-defined Late Prehistoric period cultural layer dated to 1,080 years B.P. with multiple features (including two possible house floors), numerous artifacts, and animal remains (Greer, Greer, Thompson, and Shields 1989). The proximity of the middle block to this previously investigated component probably indicates that the cultural remains are related or scattered from this component.

10.7 SUMMARY OF RESULTS

Site 48SW7107 (Locality P-086) is situated on a terrace north of Lost Soldier Creek, and past salvage excavations conducted to the west and northeast of the current project area recorded many cultural features and obtained numerous radiocarbon dates (Zale 1989) which are pertinent to the current project. It is important to place the current investigations, especially the two Late Prehistoric period components (II and III), in context with these previous investigations. Salvage excavations completed at Site 48SW994 (Locality P-087) to the northeast recorded 67 features and obtained 14 radiocarbon dates ranging from 660 to 2,440 years B.P. (Greer, Greer, and Garcia 1989). Salvage excavation conducted immediately to the west recorded 19 features (with a number of features unrecorded) and obtained four radiocarbon dates ranging from 860 to 1,440 years B.P. (Greer, Greer, Thompson, and Shields 1989). Cultural features recorded in both areas included multiple house floors, roasting pits, and other features. The previous investigations, and the excavation reported in this document and summarized below, indicate extensive occupation especially during the Late Prehistoric period (Uinta phase) on terraces adjacent to Lost Soldier Creek.

Three small block excavations (16 m^2, 36 m^2, and 70 m^2) were completed at Site 48SW7107 with single prehistoric components identified within each block. Four radiocarbon age estimates (3,560, 1,460, 1,350, and 1,110 years B.P.), stratigraphic information, and temporally diagnostic artifacts indicate that one Middle Archaic period (Pine Spring phase) and two Late Prehistoric period (Uinta phase) components are represented. Limited numbers of cultural remains were collected from Components I and II, with a more diverse and larger assemblage of remains recovered from Component III. The assemblages of cultural remains associated with each component suggest utilization of different resource types (animal plant, lithic), with individual component activities apparently not directed towards a specific resource type. As such, these components appear to represent short-term residential campsites, rather than functionally more specific site types.

Although the sites appear to be similar in function, the overall density of remains from the three components suggests that Components I and II represent very short-term occupations, and Component III remains suggest a more intensive and longer-term occupation. Cultural remains

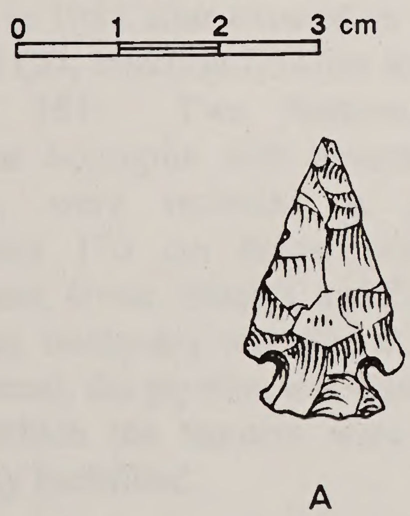


Figure 10.25 Projectile Point (SW7107-26) Not Assigned to Component, Site 48SW7107 (Locality P-086).

from Component I, a Middle Archaic period (Pine Spring phase) component, are extensively deflated, and a discrete activity area could not be identified. Component II (Late Prehistoric period/Uinta phase) represented a very short-term occupation delineated by a small, hearth-centered activity area, with tasks including the processing of one deer-pronghorn size animal and possibly seed processing. The patterning of Component III (Late Prehistoric period/Uinta phase) cultural remains is indicative of a shelter-centered activity area with all remains clustered within or immediately adjacent to a stone circle (structure), and with two exterior work areas noted near the structure. Prehistoric activities, other than habitation, included intensive processing of a diverse range of animals (bison size, deer-pronghorn size, and rabbit size and smaller animals), possibly seed processing, and flaked stone tool manufacture (final shaping, tool rejuvenation). Very little evidence of season of occupation of the three components was recovered, with some weak evidence indicated by a few charred seeds that Components II and III may have represented summer or fall occupations.

11.0 SITE 48SW7085 (LOCALITY P-100)

This section summarizes the results of data recovery excavations at Site 48SW7085 (Locality P-100) conducted by Mariah in 1990. Past archaeological investigations had suggested that intact prehistoric cultural remains, including housepits, were present at Site 48SW7085. No intact components were noted during the current project within a (24 m^2) excavation block as detailed below. The following subsections describe the site setting, stratigraphy and excavation results, and provide a summary of results.

11.1 SITE SETTING

Site 48SW7085 is situated northwest of the town of Bairoil along a lower east facing terrace of Abel Creek at an elevation of approximately 2,126 m (Figures 1.1 and 1.2). It is within Amoco's Lost Soldier oil field, in the 40 acre administrative block designated as Site 48SW7085. Two active oil wells (Lost Soldier Unit Wells 16 and 161) operate within 92 m of this locality. Ground cover at the site itself is dominated by sagebrush, rabbitbrush, shortgrasses, and prickly pear cactus, with a more riparian ecotone situated within 61 m along the intermittent stream and lowest terrace tread of Abel Creek.

Possible buried cultural remains were recognized in 1988 after excavation of a pipeline trench for a CO_2 injection/flowline to Lost Soldier Unit Well 161. Two features, tentatively identified as housepits with associated internal subfeatures, were recorded at a depth of approximately 170 cm below present ground surface (Greer, Greer, Shields, and Zettel 1989:5). The site was minimally recorded at that time by GAC personnel, the pipeline was installed, and the trench in which the features were located was subsequently backfilled.

Investigations at this locality were undertaken by Mariah personnel during 1989 with limited testing in the area of the original pipeline trench. Two backhoe trenches and eight 1 x 1 m test units were excavated to relocate the original remains identified by GAC during construction monitoring (Reust et al. 1990: 82). At a depth of approximately 150 cm below ground surface, the southernmost backhoe test encountered what appeared to be intact cultural deposits consisting of dark staining and oxidation. Test Units 7A and 7B adjoining the southern backhoe trench also encountered darkened soils and apparent oxidation. No flaked stone or bone artifacts were recovered from Test Unit 7A or 7B; however, four possible prehistoric flaked stone artifacts were recovered from the other six test units.

Evaluation of site deposits continued in 1990 with the opening of a 4 x 6 m block of units along the southwest edge of the original pipeline trench (Figure 11.1). Horizontal proveniences were referenced from the southwest corner of the block which was designated 100N 100E (Figure 11.2). Due to the amount of overburden covering the remains, roughly 1 m of sediments was removed by heavy equipment prior to the actual set-up of the grid system. All vertical elevations were referenced from a single datum represented by the top of the 1988 yellow-capped rebar set by GAC personnel as a site location marker, with the rebar assigned an arbitrary elevation of 100.0 m. Archaeological excavation within the 24 m^2 block began between 99.25 and 99.0 m, dependent upon the contours of the bladed surface after overburden removal. Figure 11.3 provides a view of the completed excavation block at Site 48SW7085.

11.2 STRATIGRAPHY

Site 48SW7085 is situated on the disturbed tread of a terrace on the south side of Abel Creek. Site deposits consist of large, stream-rounded cobbles and boulders, sand, silt and clays. Much of the deposit appears to be the result of recent (i.e., historic) human activity and is probably

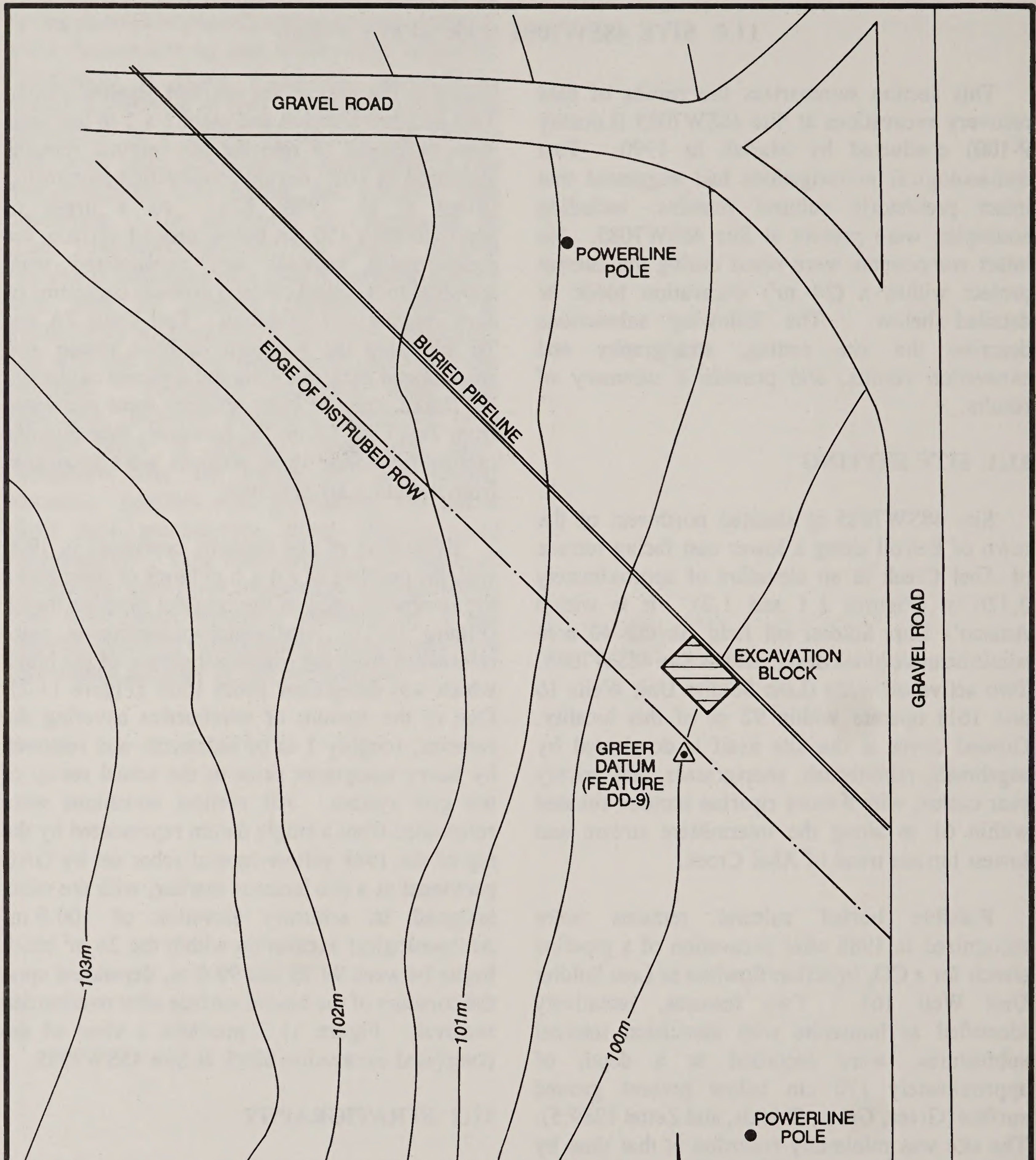


Figure 11.1 Contour Map Showing Location of Excavation Block, Site 48SW7085 (Locality P-100).

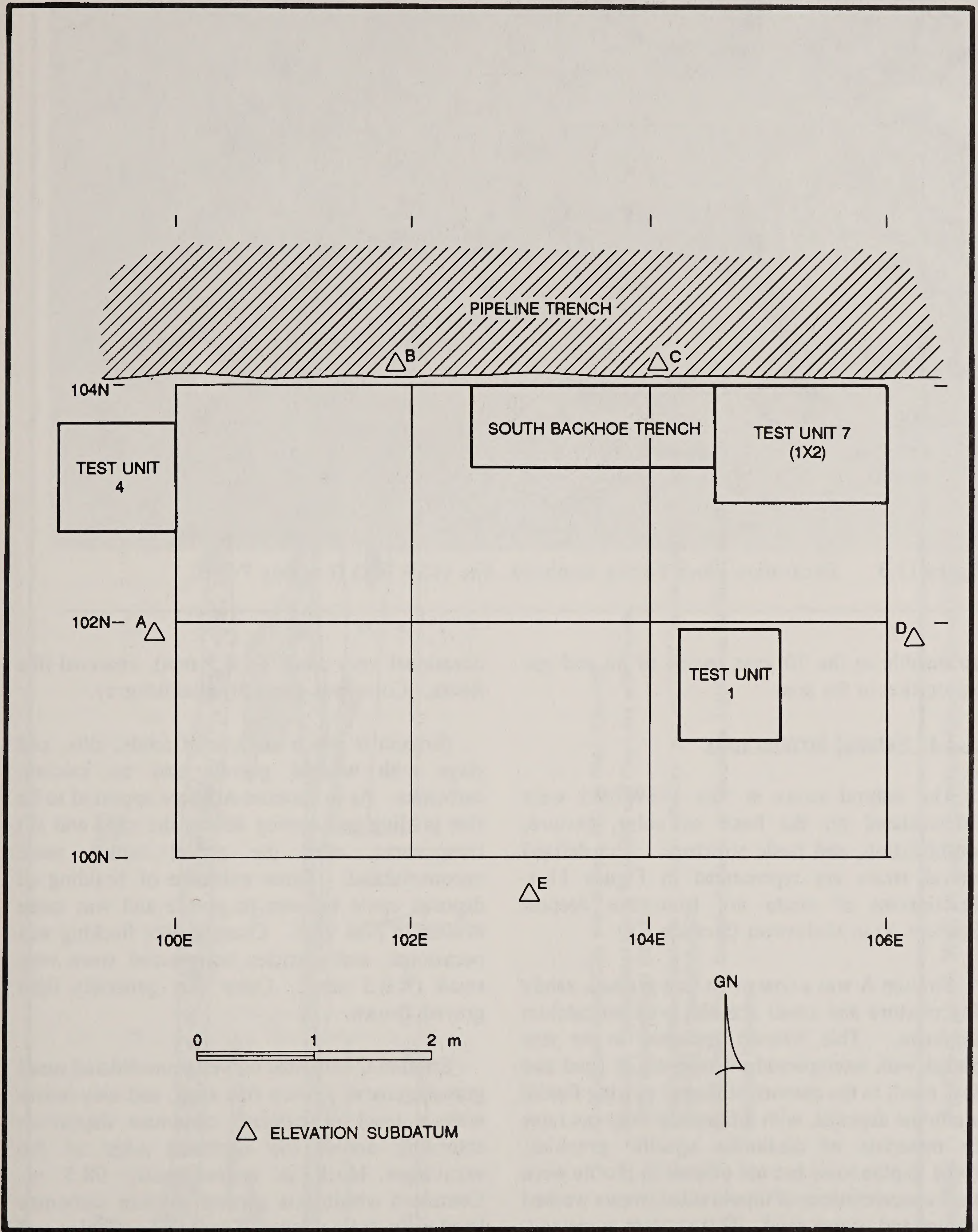


Figure 11.2 Plan Map of Excavation Block, Site 48SW7085 (Locality P-100).

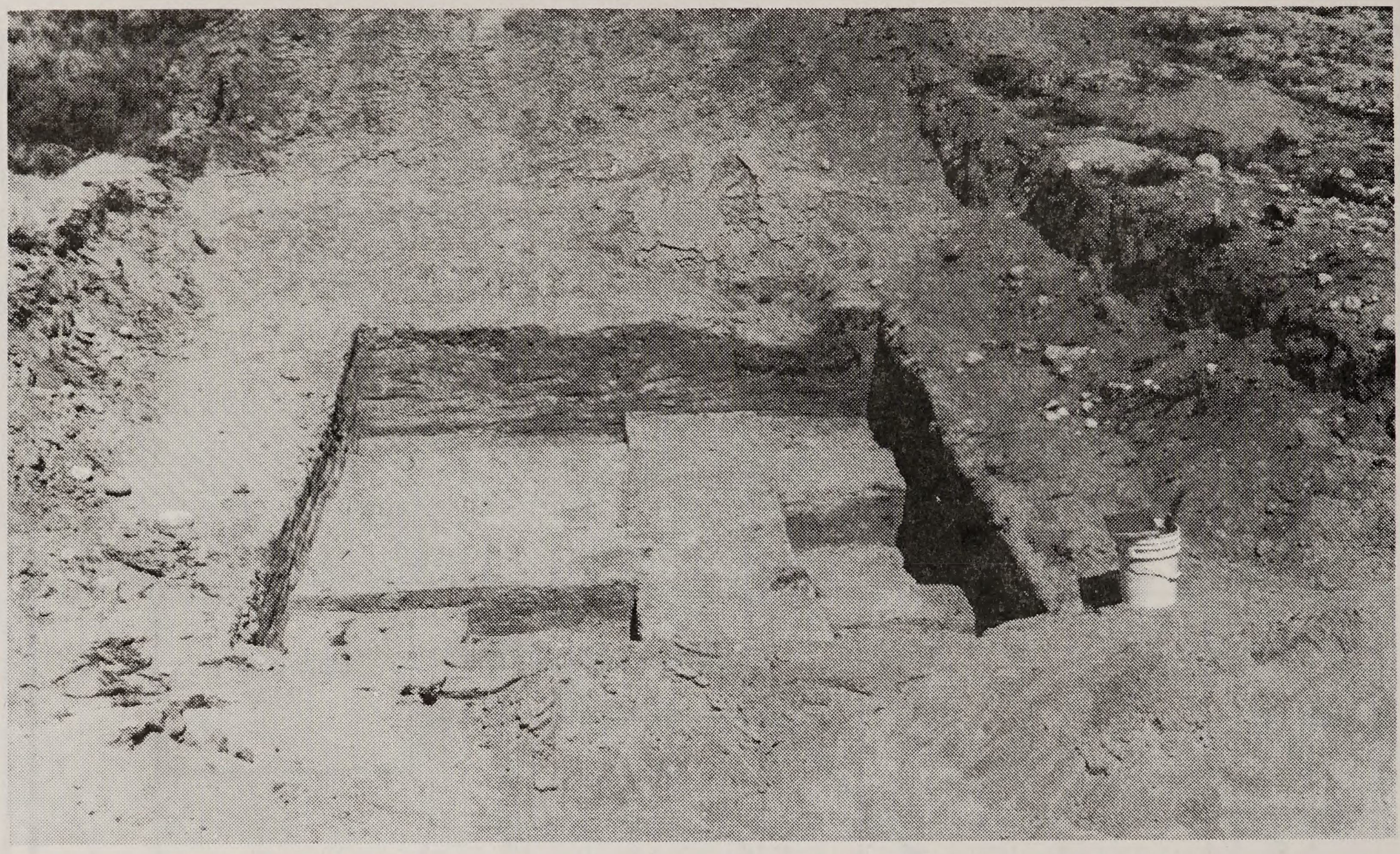


Figure 11.3 Excavation Block Facing Southeast, Site 48SW7085 (Locality P-100).

attributable to the 70 year record of oil and gas exploration in the area.

11.2.1 Natural Stratigraphy

The natural strata at Site 48SW7085 were differentiated on the basis of color, texture, consolidation, and basic structure. The defined natural strata are represented in Figure 11.4. Descriptions of strata are from the deepest (Stratum A) to shallowest (Stratum E).

Stratum A was a coarse- to fine-grained, sandy clay mixture and small gravels, with no calcium carbonate. This stratum appeared to be size graded with interspersed microlevels of sand and clay, much in the manner of slower moving fluvial or alluvial deposits, with differential drop-out rates for materials of dissimilar specific gravities. Noted in plan view but not evident in profile were small concentrations of interbraided stream washed pebbles and coarse sand. This stratum contained occasional very small (<0.5 mm), charcoal-like flecks. Color was generally pinkish-grey.

Stratum B was a mixture of sands, silts, and clays with washed gravels and no calcium carbonate. As in Stratum A, there appeared to be size grading and sorting among the sand and silt components, with the gravel lenses more unconsolidated. Some evidence of braiding of deposits could be seen in profile and was more evident in plan view. Charcoal-like flecking was occasional, and particles represented were very small (<0.5 mm). Color was generally light greyish brown.

Stratum C consisted of well-consolidated small gravels, coarse to very fine sand, and clay lenses with a level of calcium carbonate deposition extending across the northeast edge of the excavation block at approximately 98.5 m. Contained within this general calcium carbonate level were distinct areas of apparent oxidation and concentrated dark staining (see section 11.1.2

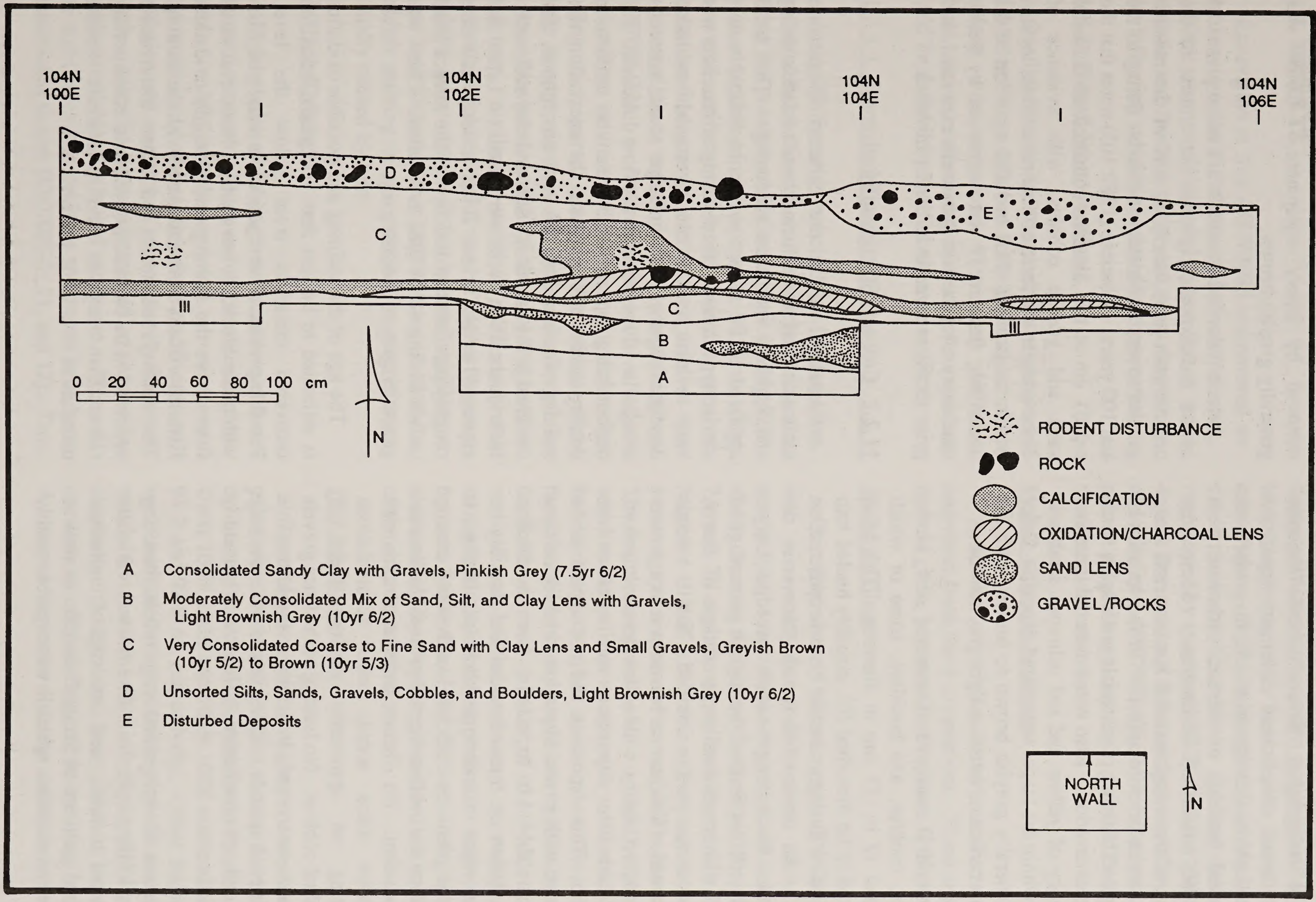


Figure 10.4 Profile of North Wall of the Excavation Block, Site 48SW7085 (Locality P-100).

Cultural Stratigraphy). Several discrete lenticular shaped areas of calcium carbonate deposition occurred above this elevation and may represent downward leaching of calcium carbonate from previously disturbed sediments. Some size grading of deposited material has occurred along these lenticular formations. Probable alluvial sorting and braiding of materials were again noted during excavation. Also noted was the increased frequency of yellow and red ochreous sandstone clasts within the larger segregated deposits. Color was generally greyish brown to brown, with the calcium carbonate lenses a light grey to white.

Stratum D consisted of unsorted silts, sands, gravels, cobbles, and boulders, some of which exceeded 12 in (32 cm) in diameter. This level appeared to be disturbed fill, possibly hauled into this location during an earlier historic construction phase. An unrecorded trench transverses the excavation block along the northwest edge. Large, granitic cobbles formed the highest percentage of the fill with much smaller percentages of cherts, chalcedonies, and silicified fossil woods represented. Calcium carbonate was not present as a distinct entity within this level; however, some carbonate deposition was seen on the cobbles. This deposition did not appear to be consistent with in situ formation in which calcium carbonate should be expected to form the thickest accumulation on the undersides and possibly on vertical edges of undisturbed cobbles. Rather, it appeared that the calcium carbonate coating present on the cobbles formed prior to the Stratum D deposition. No distinct patterns of carbonate deposition were noted, with accumulations appearing on apparently random areas of individual cobbles. No lensing of the finer gravels and sands was noted, indicating a single massive depositional episode. The stratum was relatively loose and unconsolidated. Color was generally greyish brown.

Stratum E represented very recent trenching and backfilling episodes. The fill was variously compacted to loose, and consisted of intermixed disturbed portions of Strata C and D, as well as surface materials which were subsequently removed by heavy equipment. Color was generally greyish brown.

Modern surface materials are not represented in the archaeological profile but consist of the organic root zone, surficial duff of the modern ground cover, and historic artifacts, dating to the last 100 years. Albanese (1989:103) notes that the top 61 cm at this location consisted of colluvial sand and granite cobbles, with evidence of disturbance in the form of historic artifacts located within the profile. This bed and a portion of the underlying Stratum D were removed by heavy machinery after the test units were excavated, and prior to the excavation of the 24 m^2 block.

11.2.2 Cultural Stratigraphy

Contained within the Stratum C calcium carbonate level was a distinct band of dark staining and apparent oxidation reddening. This band appeared to be a very well-consolidated water-carried type deposit. Size sorting of materials was very evident, with the presumed oxidation deposited together with the larger sorted materials along alluvial meanders in the flow direction. The dark staining appeared to be relatively uniform in density across the profile. In excavation this staining was noted to be very amorphous, and confined to the finer sand, silt, and clay sediments. Individual carbon flecks were small (< 1 mm) and appeared to all orient along a long axis that roughly parallels the direction of the terrace tread on which Site 48SW7085 is situated. Color was generally grey to reddish grey.

The age of the staining and possible oxidation is estimated to be less than 100 years, based on recovered materials from below the level. Possible prehistoric artifacts were recovered from within the block; however, they were recovered from above the staining and possible oxidation. Historic artifacts were associated with the staining. The stained sediments and other disturbances appeared to be the result of oil field construction, rather than any in situ prehistoric human occupation.

11.3 RESULTS

Excavation at Site 48SW7085 encountered no prehistoric cultural features or heat-altered rock. Artifacts recovered included a few flaked stone artifacts and modern paper and glass fragments. The following subsections describe these remains.

11.3.1 Flaked Stone Artifacts

One flaked stone tool fragment and eight pieces of debitage were collected from excavations. The artifacts were recovered from many different levels, and no cultural layer or intact component could be defined by the flaked stone artifacts.

11.3.1.1 Retouched Flake

A single bifacially retouched tool fragment was recovered from the area near the dark staining and within the possible oxidation in Unit 102N 102E, at an elevation of approximately 98.5 m. The recovered artifact was found within a zone of stream washed gravels of the same relative size and sorted sands and clays. The tool fragment (SW7085-33) is manufactured of a clear chalcedony with a bifacially retouched edge ending in a spurred graver. The bifacial edge angle is approximately 40° and is denticulate in form. Maximum length of the tool fragment is 22.8 mm, maximum width is 14.3 mm, and maximum thickness is 7.5 mm. The tool fragment exhibits no evidence of fire-induced spalling or other heat alteration that might be expected if the reddish staining of the surrounding matrix were actually caused by heat.

11.3.1.2 Debitage

Eight pieces of debitage were recovered from the main excavation block and the surrounding test units. All were recovered from levels stratigraphically above the Stratum C staining oxidation and encompass approximately 90 cm in depth. Material types represented appear to be locally available cherts and quartzites. Three of the eight recovered debitage specimens have been classified as shatter (SW7085-1, 11, and 12). Two flakes (SW7085-15 and 36) may be the result of tool sharpening and have been classified as microflakes. Both are complete and less than 1 cm in maximum dimension. Tertiary flakes are represented by specimens SW7085-2 and SW7085-4, and the primary flake category contains only one specimen (SW7085-3). All of the recovered pieces of debitage are less than 2.75 cm in maximum dimension.

11.3.2 Historic Artifacts

A number of modern historic artifacts were recovered from block excavations. These artifacts include glass, paper, and cellophane artifacts.

11.3.2.1 Glass

One fragment of historic glass (SW7085-19) was recovered in good context from the stratigraphic level of the staining and oxidation within Stratum C, below the level of Test Units 7A and 7B and the south backhoe trench. The fragment is 1.65 x 0.7 cm and appears to be the seam edge of a square or rectangular bottle or jar. The fragment appears to have a slight purple hue, which could indicate an age prior to World War I. In addition to the glass specimen recovered from the excavation block, purple-hued glass was noted northwest of and outside of the block in the vertical wall of the machinery excavated area, stratigraphically at the approximate contact level between Strata C and D. This type of glass was also seen on the present ground surface southeast of the excavation block.

11.3.2.2 Paper

Two fragments of a coarse newsprint-type paper were recovered in good context from below the level of staining and oxidation in Stratum C in Units 100N 100E and 102N 102E at elevations of 98.2 and 97.9 m, respectively. Other fragments were noticed during screening of the excavated matrix from several units of the block but were originally thought to have blown into the excavation units during recurrent wind storms. Additional fragments disintegrated upon attempted collection. Both recovered paper specimens (SW7085-40 and 42) contain legible inked lettering on one surface; however, both are very small (less than 1.5 cm^2 each) and contain no indication of printing date. A fine layer of light grey clay adheres to the reverse side of both specimens.

11.3.2.3 Cellophane

Three pieces of cellophane (SW7085-41) were also recovered from excavated context below the stratigraphic level the staining and oxidation in Stratum C, in Unit 100N 104E at an elevation of 98.2 m. These pieces appear to be the remains of a matchbook or box cover advertising pumps and related oil field products.

11.3.3 Animal Remains

Animal bone represents the greatest amount of material recovered from the excavation block. Of the bone recovered 90%, or 112 bones and bone fragments, were identified as probably recent and intrusive to the deposits (See Table 11.1). Taxa identified in this category include prairie dog, ground squirrel, pocket gopher, and mouse. Twelve other bone specimens represent small to large and bison size mammals and are considered to be nonintrusive. Vertical distribution of these remains encompasses an estimated 60 cm including Stratum C. Fifty percent of this category are burned. All nonintrusive specimens are less than 6 cm in length and exhibit rounding of broken edges and a slight polishing and erosion of exposed surfaces. This type of destruction is consistent with water transport of faunal specimens and the tumbling and abrasive actions of water-lain sediments. The rodent bone recovered during excavation, in contrast to the nonintrusive specimens, exhibits sharp borders on broken edges and very limited destruction of cortical surfaces.

11.4 SUMMARY AND CONCLUSIONS

In 1988, two possible house features were ascertained in profile during examination of a CO_2 flowline trench to Lost Soldier Well Unit 161 (Greer, Greer, Shields, and Zettel 1989). Several occupational episodes were proposed for the features at that time based upon demarcated levels of light colored clays within the purported structures and several layers of possible oxidation seen in the profile of an interior subfeature. The original investigators tentatively assigned these features to the Early Archaic period (about 5,750 B.P.).

Subsequent investigations in the area by personnel from Mariah in 1989 and 1990 located a dark stained level with apparent oxidation present adjacent to GAC's investigated location. Due to the presence of the now buried CO_2 flowline pipe, the original profile was not reexposed; however, two backhoe test trenches and a series of eight 1 x 1 m test excavations established the location of the recorded features. Subsequently, a 24 m^2 excavation block was opened to the south and bordering on the original trench. Excavations within the block revealed a very amorphous, dark, possibly charcoal-produced staining extant over most of the south end of the block which was confined to the finer silt and sand sediments, at an elevation of approximately 98.5 to 98.3 m. A pink to red-hued staining was occasionally noted among the larger-grained sand and gravel lenses at the same elevations and over the same areas. This staining tended to follow the contours of the washed sand and gravel lenses. Very thin lenses (1-2 cm) of light grey, silty clay were intermixed between the washed lenses and sandy sediments. When moist, these clay lenses became very difficult to sift, adhering to the sides and clogging the mesh of the 1/8 inch screens used by the excavators.

Archaeological excavations at Site 48SW7085 recovered both prehistoric and historic artifacts. All prehistoric artifacts and nonintrusive bone were recovered stratigraphically above historic artifacts, indicating a historically recent disturbance of sediments. In addition to the stratigraphic inversion of artifacts, an unrecorded trench was noted in excavation and in the profile of the 100E and 100N walls of the excavation block trending almost due north to south (paralleling the current roadbed) and originally

Table 11.1 Summary of Animal Remains, Site 48SW7085 (Locality P-100).

Animal Size Category	Total Specimens		Burned Specimens		Remarks
	No.	Wt. (g)	No.	%	
Bison size	1	7.4	--	--	--
Medium to large mammal	9	7.2	4	44.4	--
Small to medium mammal	2	0.2	2	100.0	--
Prairie dog	1	0.2	--	--	Mandible - intrusive
Ground squirrel	6	0.1	--	--	Mandibles - intrusive
Pocket gopher	4	0.2	--	--	Teeth - intrusive
Mouse	1	0.1	--	--	Mandible - intrusive
Rodent size	100	11.0	--	--	Intrusive
Total	124	26.4	6	4.8	

excavated into Stratum C. One vertical wall and the floor of the old trench remained in the 100E profile while the trench retained its original squared aspect along the 100N profile. Measurements of this trench indicate a maximum width of 66 cm (approximately 24 inches), probably the width of the backhoe bucket used in its excavation. The old trench remained open long enough for at least one distinct wash episode to occur. Noted in the floor of the trench during reexcavation were size sorted sands and gravels. Overlying these sorted sediments and filling the trench were the large cobble and gravel deposits (Stratum D). A lens of white calcium carbonate deposition was located immediately below the floor of the old trench in Stratum C. The floor of the old trench lay at approximately 98.6 m in the 100N profile, or near 1.5 m below the present ground surface, stratigraphically equal to or approaching the level of Stratum C.

The dark staining located during testing in 1989 probably represents the same dark stain noted by GAC personnel in the CO_2 flowline trench during post-trenching inspection for exposed cultural features in 1988. The dark staining of soils noted within the excavation block in 1990 also corresponded in elevation with the dark stain and feature floors indicated in GAC profiles. While several layers of white to grey, nonlocal, kaolin-like clays were indicated within the proposed features by the original investigators (Greer, Greer, Shields, and Zettel 1989: 4), subsequent excavations at the site failed to locate these levels. Rather, the clay lenses located during block excavations tended to be more bentonitic in nature and, while grey in color, appeared to be fluvial in origin, grading into fine silts and sands and interbraided with other lenses. The calcium carbonate lenses of Stratum C exhibit a white to grey color range with rather indistinct boundaries, and individual lenses tend to overlie other lenses and the general calcium carbonate level.

The possible large interior hearth shown in the 1988 profile indicated the presence of several levels of oxidation (Greer, Greer, Shields and Zettel 1989). While this feature itself was not relocated, areas of pink to red staining were noted intermixed with the coarser sands and gravels of Stratum C, and intermittently located over approximately the same southern area of the block as the darker stain. The reddish staining did not appear to be the result of intense heat-induced oxidation of soils, as may be expected to occur in and around prehistoric hearths. This stain may be the result of natural weathering of the red and yellow ochreous sandstones, or possibly an iron oxide deposit from rusting metals. A very similar fan-shaped pink to reddish staining of fluvial sands was seen in and along Abel Creek near Site 48SW998, adjacent to a rusting drainpipe. In addition, the 1988 profile revealed that the large hearth (GAC Feature 1-1) was approximately 66 cm (24 in) wide at the bottom, the same width as the old backhoe trench located in the northern area of the excavation block.

The dark stain itself may be the result of redeposited charcoal dispersed over a large area by repeated flooding or wash episodes. It is also possible that some of this stain is the result of early oil field production. Much of the stain seemed to be made up of minute, very uniform flecks (<0.5 mm across and <1 mm long) that tended to orient along the direction of the terrace tread. This type of occurrence may represent capillary type absorption of oil into the stratum. A similar situation is evident approximately 107 m due north of Site 48SW7085 where crude oil has been wicked into the soils of the modern surface by vegetation roots.

The recovery of historic artifacts from stratigraphic levels below that of the recorded features indicates that this is a very recently disturbed area. While nine prehistoric flaked stone artifacts were recovered from excavated contexts, all were recovered from levels above historic artifacts and probably were redeposited out of their original context. Due to the depth from which the historic artifacts were recovered, it appears that the disturbed sediments in the block location extend at least 2 m below the present ground surface. Rodent disturbance in the locations of the recovered historic artifacts appeared to be minimal, with most of the intrusive rodent bone collected from above the levels of the historic artifacts.

The presence of bentonitic type clays often used in oil recovery routines, historic artifacts (at least one, SW7085-41, connected with the oil industry), possible oil and rust stained sediments, and unrecorded backhoe trenches within the excavation block indicates that the disturbance at this location is extensive and attributable to oil field construction, rather than any in situ prehistoric human occupation.

12.0 THE TOWER SITE - SITE 48SW127

This section presents the results of block excavations at the Tower site (Site 48SW127). One 5 x 6 m block was excavated, with one poorly defined prehistoric component encountered. The following subsections discuss the site setting, stratigraphy, and excavation results and provide a summary of results.

12.1 SITE SETTING

The Tower site is located approximately 10 km northwest of Bairoil, Wyoming along the Amoco CO_2 Spur Pipeline (Figure 1.1). The site is on a south sloping hillside 0.5 km north of Crooks Creek and about 1 km west of Lost Soldier Creek (Figure 12.1). It occurs at an elevation of 2,297 m. The area topography is rolling hills covered with granite cobbles and gravels. Vegetation is predominantly sagebrush and shortgrasses, with stands of willow along the stream courses to the north and west. The pipeline ROW is dominated by a disturbed plant community.

A stone structure 2 m in diameter was recorded when the site was initially surveyed (Bellar 1974). Subsequent efforts to relocate the structure failed (Moore et al. 1987). In 1986 the site was impacted by construction of the Amoco CO_2 Spur Pipeline. Construction activities were monitored by OAI. Eleven subsurface features were recorded, two of which were linear stains exposed in the pipeline trench wall (Features T88 and T91). Feature T88 yielded a radiocarbon date of 4,220±100 years B.P., and Feature T91 was dated at 5,130±110 years B.P. Both were interpreted as being possible housepits. In the fall of 1989, Mariah conducted archaeological testing of the Tower site. The testing was completed during the initial phase of the Bairoil Archaeological Project (Reust et al. 1990). A backhoe was used to reopen the pipeline trench to locate the two stains. Feature T88 could not be found. Feature T91 was relocated, and a 1 x 1 m test unit was excavated down to the stain. Feature T91 was determined to be of probable cultural origin, possibly a housepit. Based on testing results, a 5 x 6 m block to encompass Feature T91 was recommended for the second phase of investigations for the Tower site.

A 5 x 6 m block which encompassed Feature T91 was set up on the north side of the reopened pipeline trench (Figure 12.2). The excavation grid was offset east from true north by 15° to conform to the orientation of the trench. The unstable edge of the pipeline trench made staking the south grid line difficult, so the next meter north was selected as the 100 N line. As excavation continued, a portion of the sloping trench wall became incorporated into the block creating five partial 1 x 1 m units (Figures 12.3-12.5). Vertical grid elevations were established from a permanent datum set on the site during construction monitoring by OAI. This datum is a wooden post with a metal tag bearing the site number. The top of the post was given the arbitrary elevation of 100.0 m.

12.2 STRATIGRAPHY

The Tower site is situated on the southern slope of a low, east-west trending hill that terminates at Lost Soldier Creek 1.2 km to the east. The natural strata consist of alluvial deposits, granite cobbles, and gravels. The following subsections describe the natural and cultural deposits at the site.

12.2.1 Natural Stratigraphy

Natural strata encountered during excavation were differentiated by color, degree of consolidation, texture, presence of rocks and gravels, and calcium carbonate content. Seven natural strata were recognized in wall profiles (Figures 12.6 and 12.7). They are described in the following discussion from the lowest (Stratum A) to the uppermost (Stratum G). With the

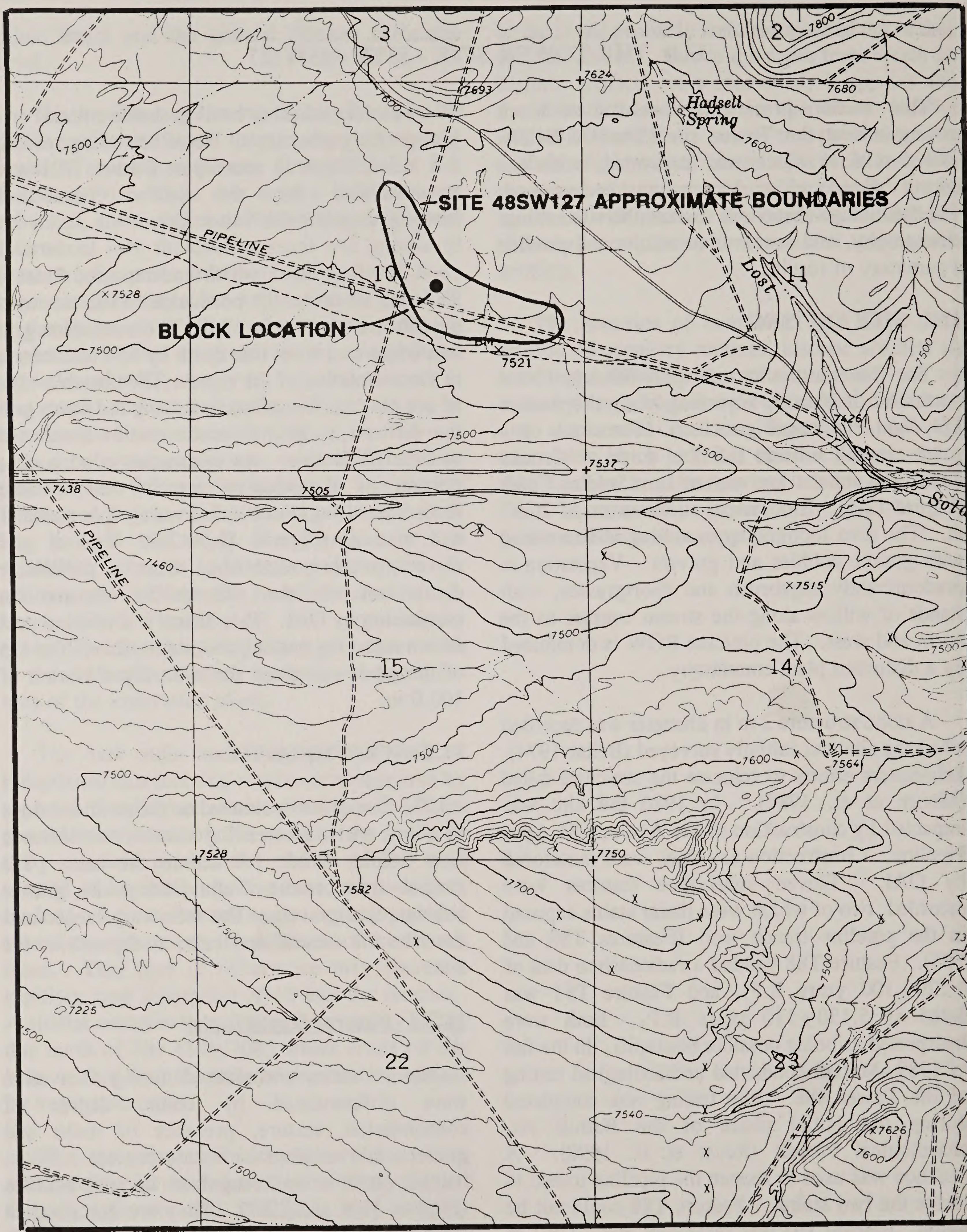


Figure 12.1 Location of the Tower Site, Taken from Hadsell Spring, Wyoming, USGS 7.5' Series (1961).

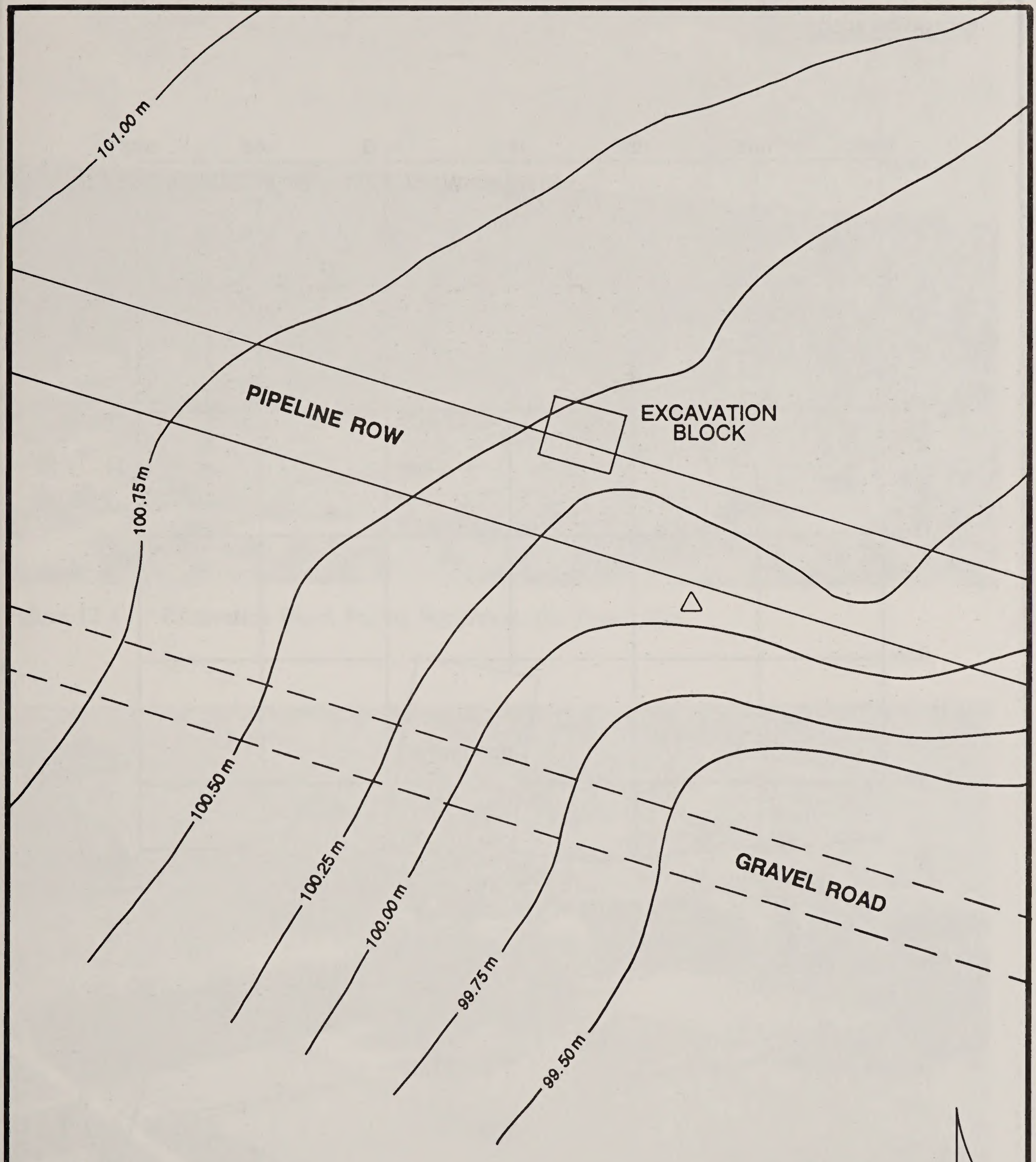


Figure 12.2 Contour Map Showing Location of Excavation Block, the Tower Site.

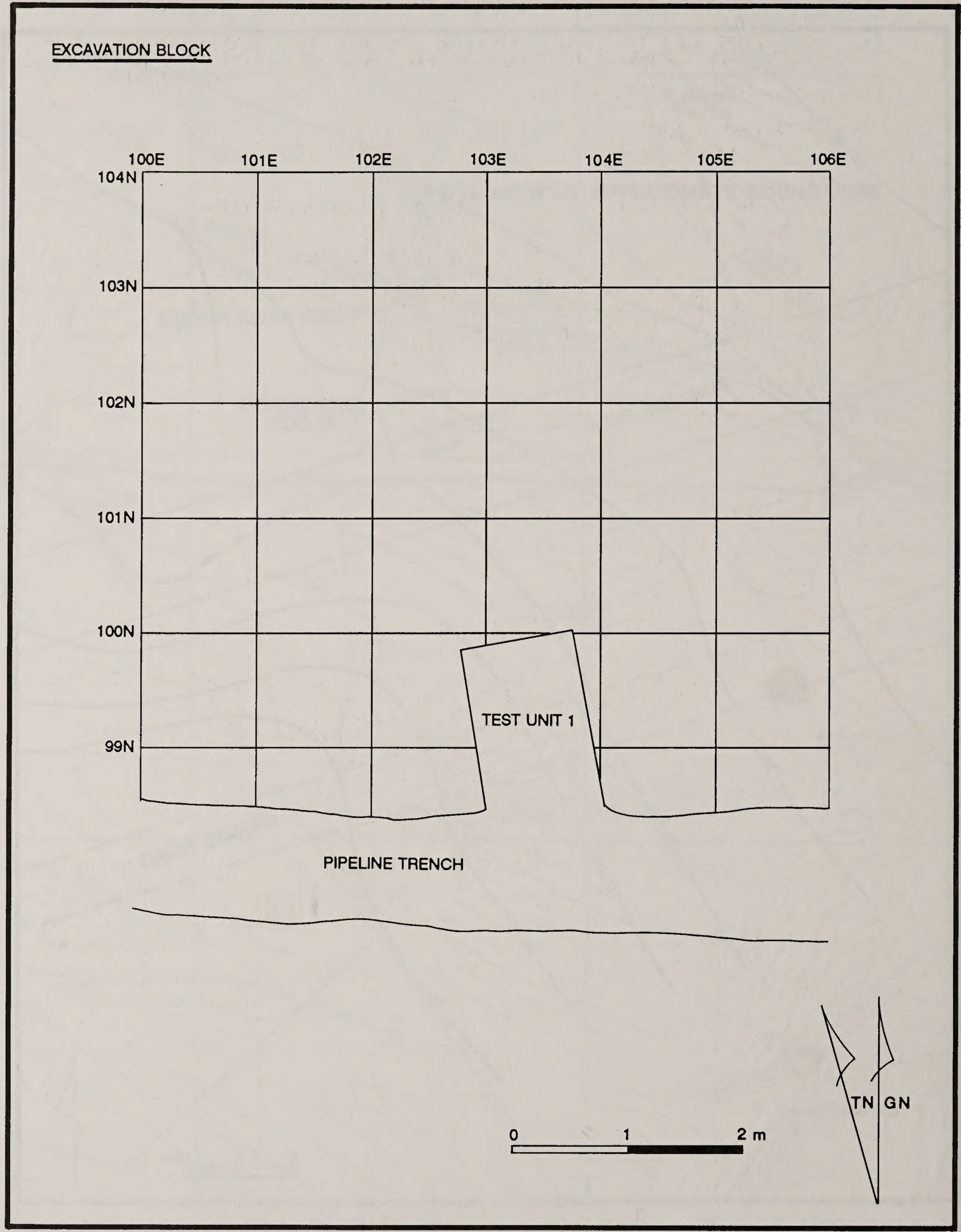


Figure 12.3 Plan Map of Excavation Block, the Tower Site.

Figure 12.4 Excavation Block Facing Northwest, the Tower Site.

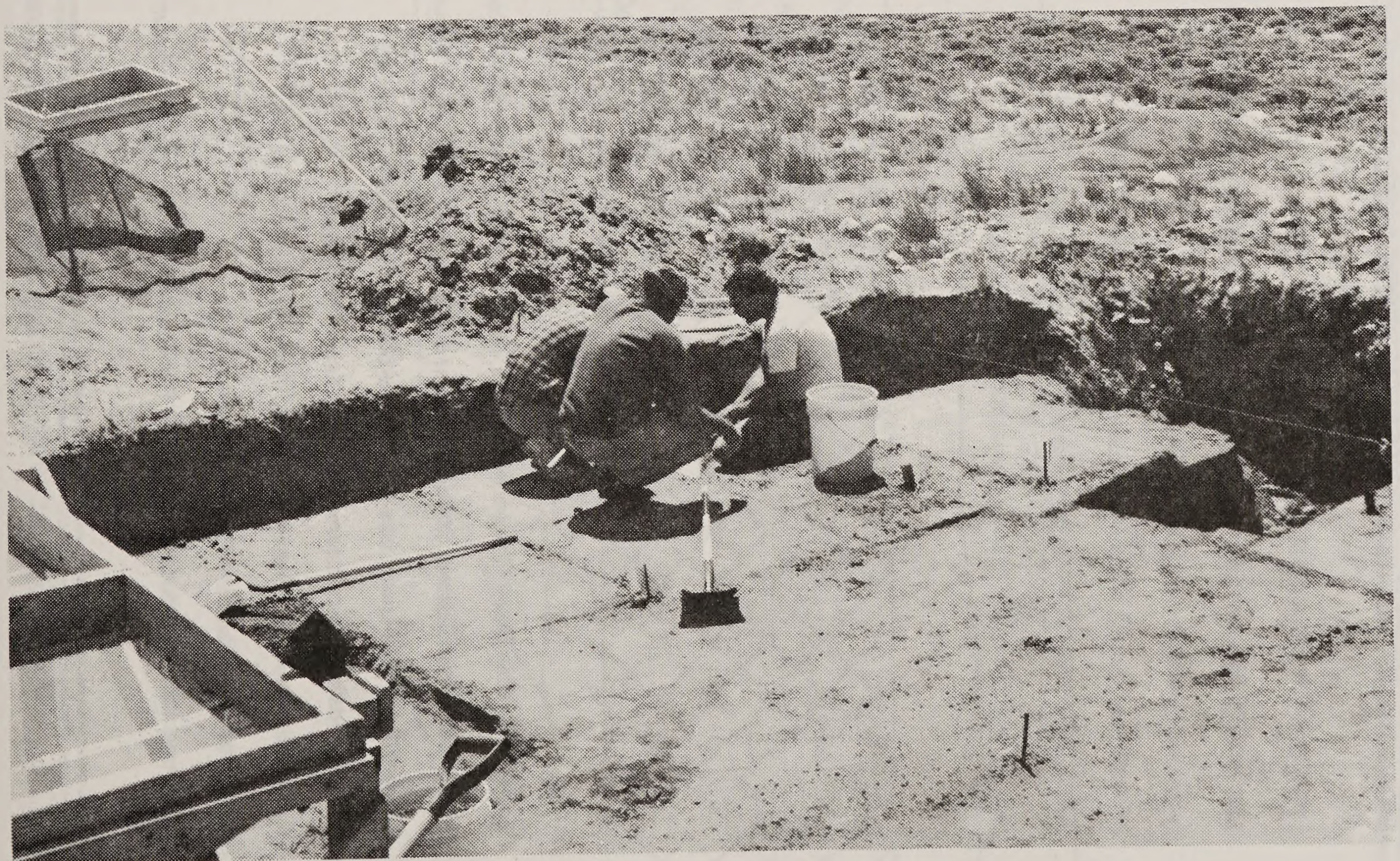


Figure 12.5 Excavation Block Facing Southeast, the Tower Site.

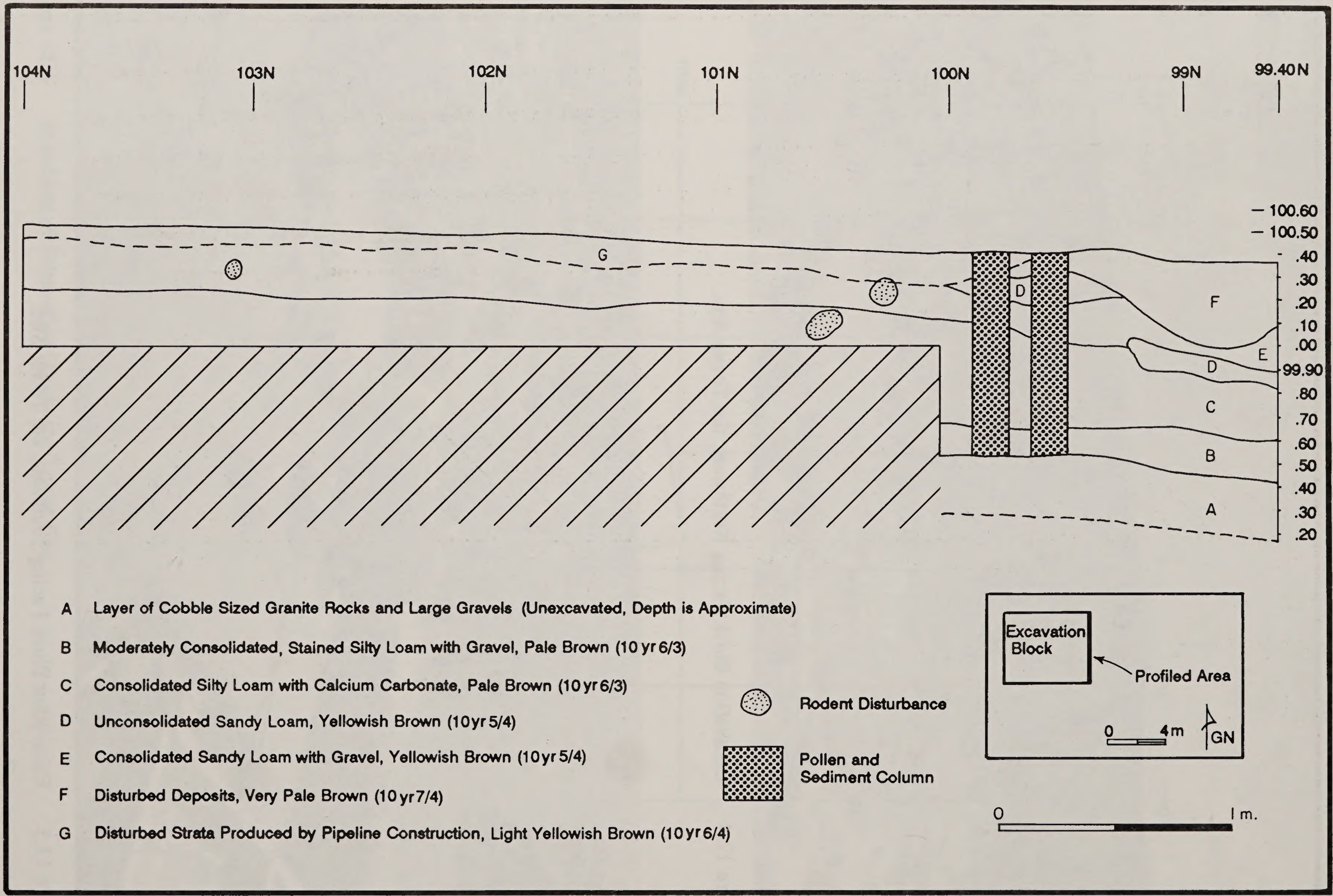


Figure 12.6 Profile of East Wall of Excavation Block, the Tower Site.

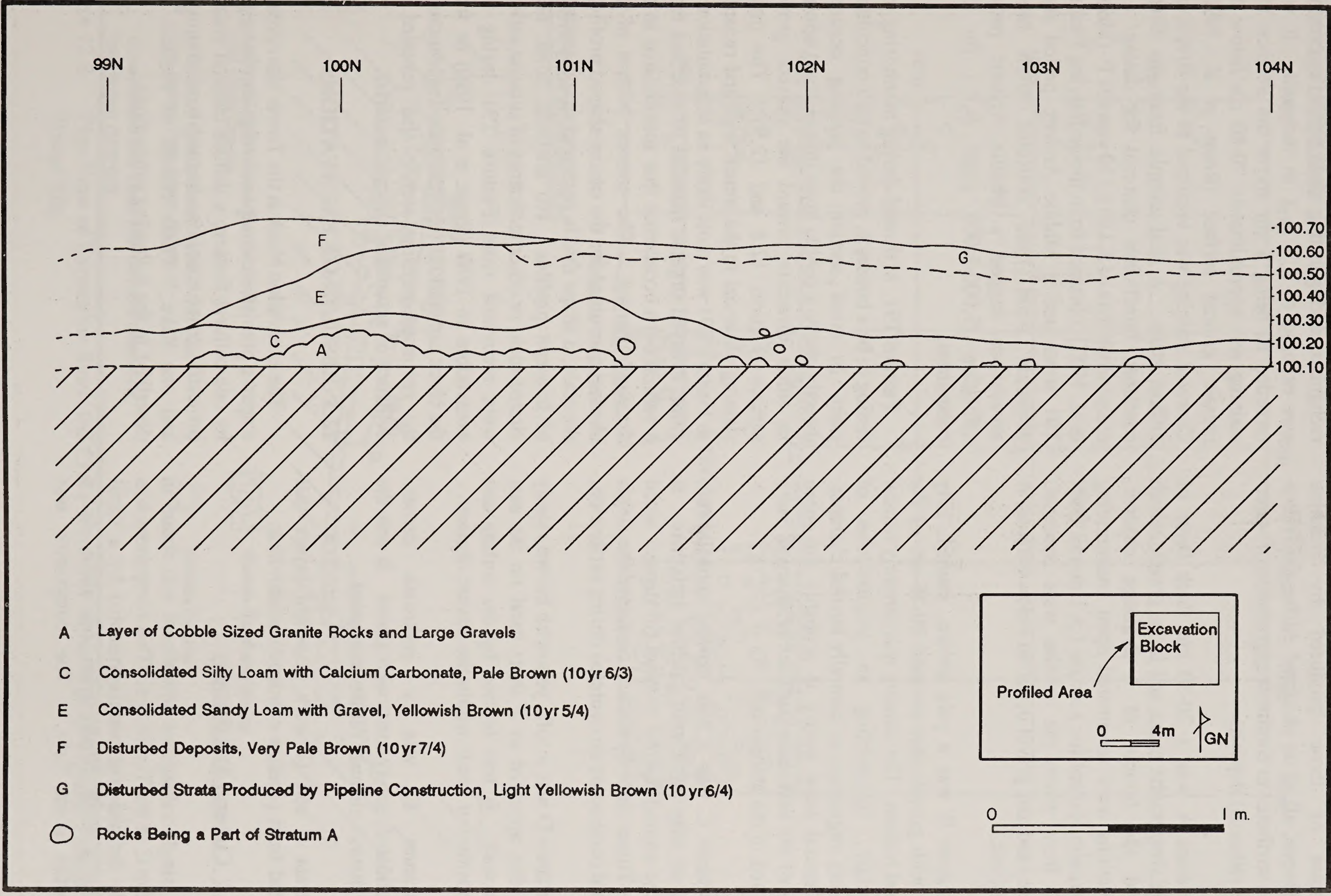


Figure 12.7 Profile of West Wall of Excavation Block, the Tower Site.

exception of those produced by machine disturbance, all strata observed during excavation can be attributed to continual aggradation of water-borne (alluvial) deposits.

Stratum A was a 20-30 cm thick layer of cobble size granite rocks and large gravels which marked the bottom of a drainage channel. Excavations were terminated upon encountering this stratum, except for a single 1 x 1 m unit (99N 103E) from which the cobbles were removed. Coarse sand and gravel occurred below Stratum A in this unit.

Stratum B was a pale brown, stained, silty loam with gravel, that covered 20-25 cm of the channel bottom. The staining was certainly natural in origin, representing an accumulation of decaying vegetation or naturally burned charcoal. The natural burn theory is probably the more likely of the two since particles of charcoal were observed in the stained soil.

Stratum C was a pale brown, consolidated, sandy or silty loam with calcium carbonate. It was the second distinct channel fill deposit noted at the Tower site. Stratum C contained the single cultural component encountered during excavation.

Stratum D was a soft, yellowish brown, sandy loam that appeared as a short band on the east block wall. It was formed by the sorting and redeposition of sands within the stream channel.

Stratum E was a yellowish brown, consolidated, sandy loam with gravel. It was the third distinct channel fill deposit noted.

Strata F and G were disturbed layers that resulted from pipeline construction activities.

12.2.2 Cultural Stratigraphy

A single subsurface component was found in Stratum C at the Tower site. This component was poorly defined and was represented by a small feature, a small diffuse stain, one flake, and a projectile point base. The component was recognized during testing when part of the feature was exposed in a 1 x 1 m test unit. It was recorded as being 5 cm above the Feature T91 staining and approximately 70-80 cm below the present ground surface (Reust et al. 1990). Charcoal staining was localized to the firepit and diffuse stain. A soil sample from the firepit contained insufficient charcoal for dating. A radiocarbon date of 5,130 $\pm$ 110 years B.P. (Moore et al. 1987) obtained from the underlying Feature T91 strata and a Middle Archaic period style projectile point base collected from block excavations suggest a Middle Archaic period affiliation (5,000-3,000 years B.P.) for the component.

Feature T91, evaluated during monitoring and testing to be a housepit, proved to be a noncultural stain. In cross section the staining occurred directly above a cobble layer that inclined upward in either direction toward the present ground surface (Figures 12.8 and 12.9). The major staining observed in the trench wall and recorded as Feature T91 was most likely an accumulation of either decayed organic material or charcoal from a natural burn occurrence that accumulated in the drainage channel. The convex bottom of the channel accounted for the saucer-shaped profile of the stain, a shape that is commonly representative of housepit profiles. No artifacts, bone, heat-altered rock, or other indicators of cultural activity were recovered from Feature T91 during test excavations in 1989 (Reust et al. 1990) or from the block excavations reported here. Inspections of the reopened pipeline trench also revealed no evidence of associated cultural material.

12.3 RESULTS OF EXCAVATIONS

The excavation block at the Tower site revealed a sparse prehistoric component that was identified by one cultural feature, a diffuse cultural stain, a projectile point base, one burned bone fragment, and one flake. These classes of remains are described in the following subsections.

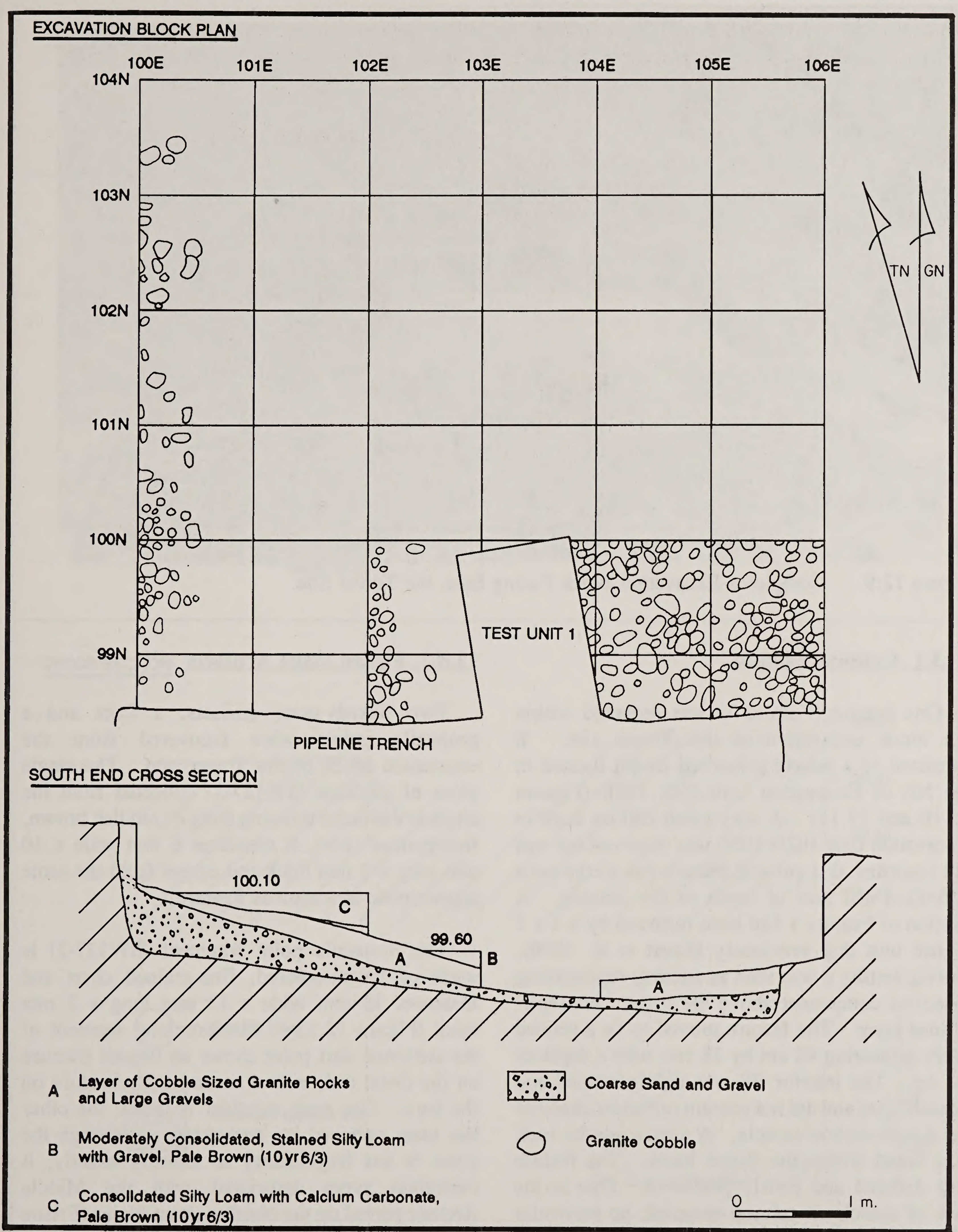


Figure 12.8 Plan View of Excavation Block and Cross Section of North Wall of Pipeline Trench, the Tower Site.

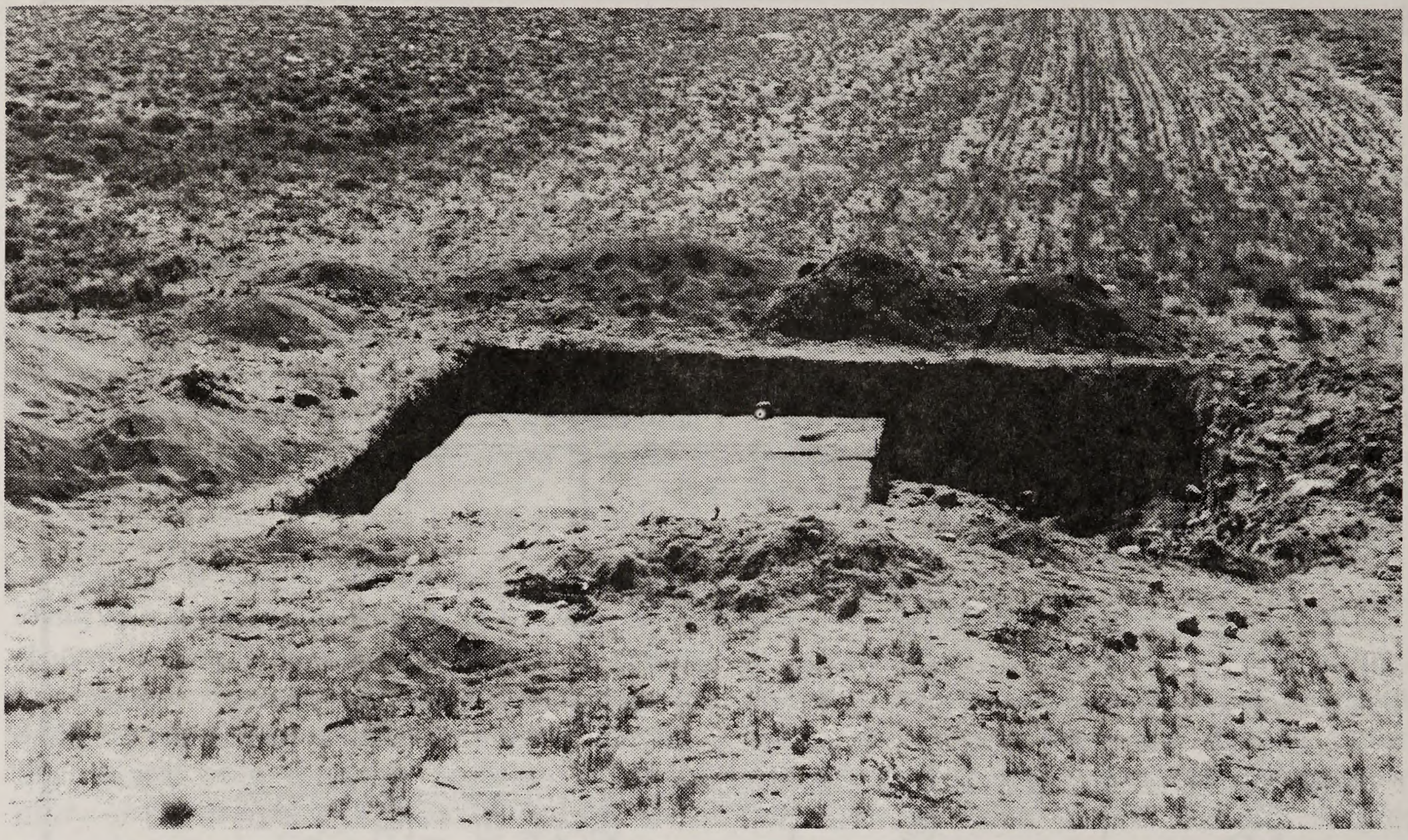


Figure 12.9 Completed Excavation Block Facing East, the Tower Site.

12.3.1 Cultural Feature

One feature (Feature 1) was recorded within the block excavation at the Tower site. It consisted of a poorly preserved firepit located in the NE of Excavation Unit 99N 102E (Figures 12.10 and 12.11). A very small diffuse stain in Excavation Unit 102N 105E was observed but was not recorded as a cultural feature due to the poor definition and lack of depth of the staining. A portion of Feature 1 had been removed by a 1 x 1 m test unit dug previously (Reust et al. 1990). During testing it was seen as staining representing a second component above the major "housepit" stained layer. The feature proved to be a stained basin measuring 42 cm by 38 cm, with a depth of 14 cm. The interior fill was lightly stained and consolidated and did not contain sufficient charcoal for a radiocarbon sample. A single granite rock was found within the firepit basin. The feature was deflated and poorly preserved. Due to the lack of associated cultural material, no particular function can be attributed to Feature 1.

12.3.2 Flaked Stone Artifacts

Two flaked stone artifacts, a flake and a projectile point, were recovered from the excavation block of the Tower site. The single piece of debitage (SW127-1) collected from the block is a bifacial thinning flake of reddish brown, fine-grained chert. It measures 5 mm wide x 10 mm long x 1 mm thick and comes from the same approximate elevation as Feature 1.

The projectile point fragment (SW127-2) is made of cream-colored, fine-grained chert and measures 15 mm wide x 13 mm long x 3 mm thick (Figure 12.12). The proximal segment of the stemmed dart point shows an impact fracture on the distal end, with a second such fracture on the base. One stem shoulder is intact; the other has been removed by reworking. Although the point is too fragmentary to identify exactly, it resembles types associated with the Middle Archaic period on the Northwestern Plains (Frison 1978).

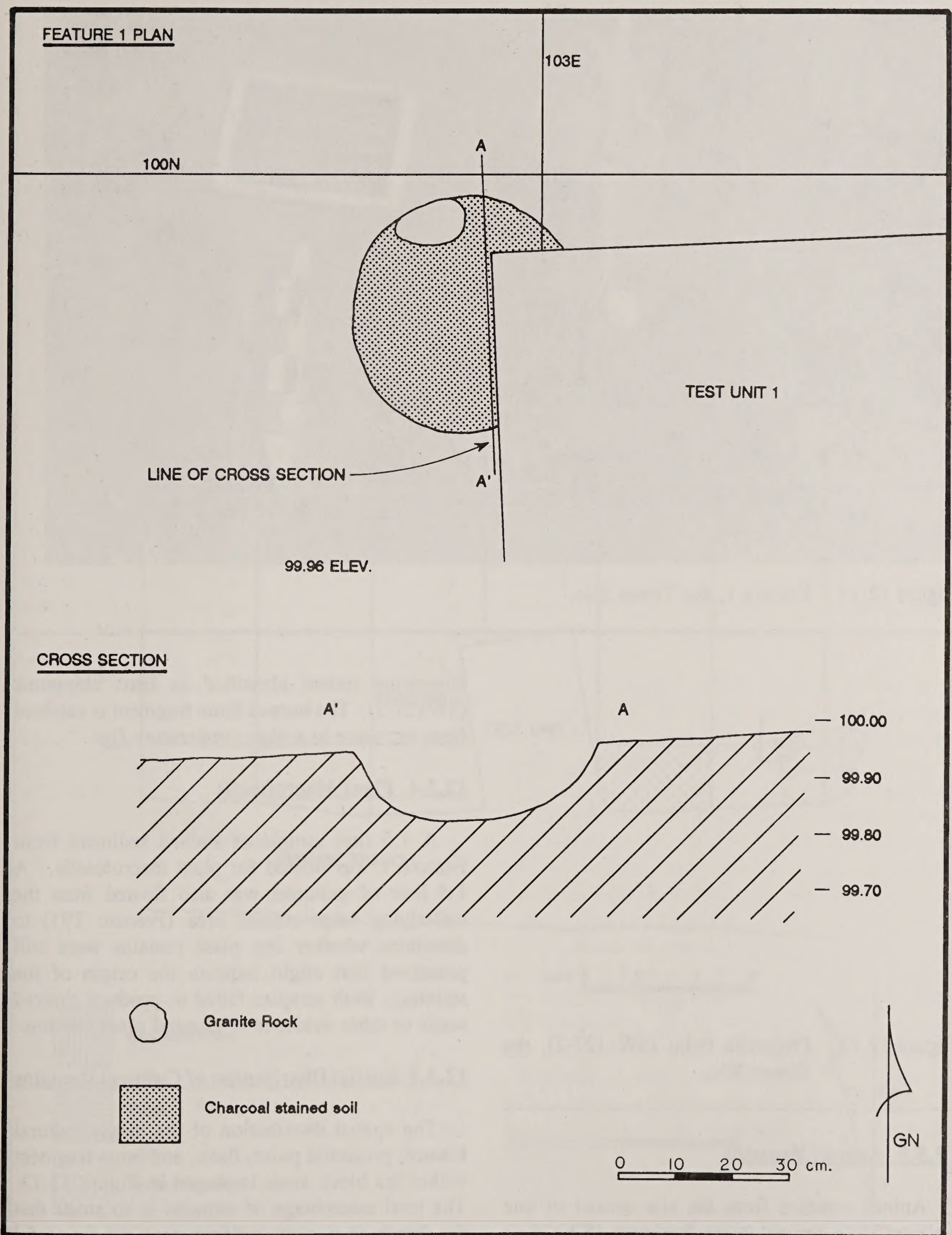


Figure 12.10 Plan View and Cross Section of Feature 1, the Tower Site.

Figure 12.11 Feature 1, the Tower Site.

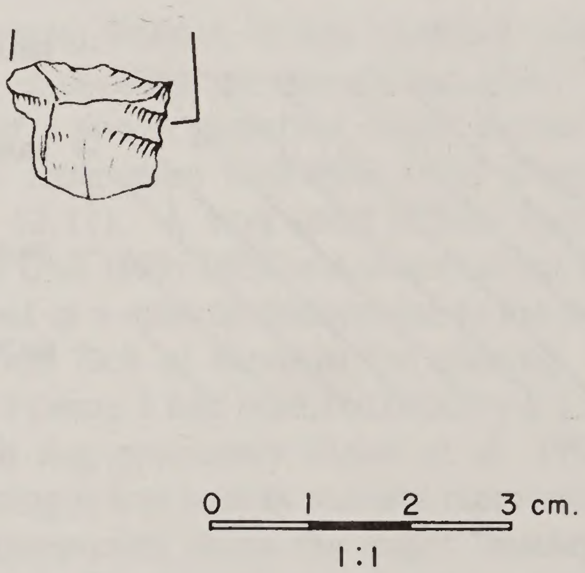


Figure 12.12 Projectile Point (SW 127-2), the Tower Site.

12.3.3 Animal Remains

Animal remains from the site consist of one unidentifiable burned bone fragment (SW127-4) and 25+ bone fragments from an intrusive burrowing rodent identified as least chipmunk (SW127-3). The burned bone fragment is calcined from exposure to a high temperature fire.

12.3.4 Plant Macrofossils

A 1.5 liter sample of stained sediment from Feature 1 was floated for plant macrofossils. A 1.5 liter of sediment was also floated from the underlying large stained area (Feature T91) to determine whether any plant remains were still preserved that might indicate the origin of the staining. Both samples failed to produce charred seeds or other evidence of charred plant remains.

12.3.5 Spatial Distribution of Cultural Remains

The spatial distribution of the single cultural feature, projectile point, flake, and bone fragment within the block areas is shown in Figure 12.13. The total assemblage of remains is so small that the distribution of the artifacts provides no useful information. The bone, flake, and projectile point

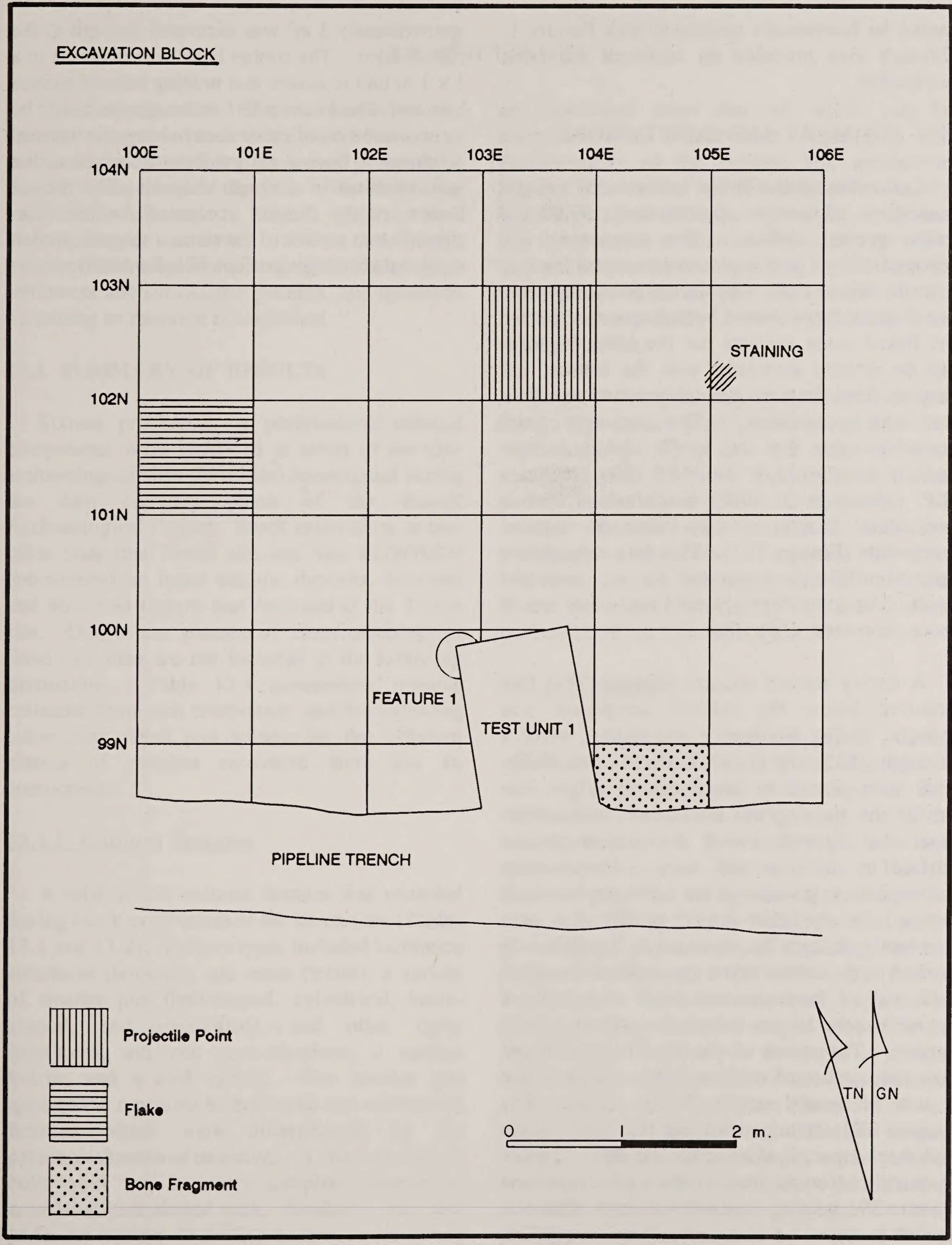


Figure 12.13 Plan Map Showing Distribution of Cultural Remains, the Tower Site.

cannot be functionally associated with Feature 1, although they probably do represent the same occupation.

12.4 SUMMARY AND CONCLUSIONS

Excavations at the Tower site revealed a single prehistoric component approximately 50-60 cm below ground surface. The component was represented by a poorly preserved cultural feature, a small diffuse stain, a projectile point fragment, one flake, and one burned bone fragment. Neither the flaked stone artifacts nor the bone fragment can be directly associated with the feature, but they are from the same general level and represent the same component. The projectile point resembles types that date to the Middle Archaic period. A radiocarbon date of 5,130±110 years B.P. (Moore et al. 1987) was obtained from a noncultural stratum directly below the cultural component (Feature T91). This date supports the cultural affiliation suggested by the projectile point. The component probably represents one or more short-term camp sites.

A darkly stained stratum (Feature T91) that occurred below the cultural component was thought, during monitoring and testing, to be a housepit (Moore et al. 1987, Reust et al. 1990). This stain proved to be of natural origin. In profile the staining was situated above a cobble layer that tapered toward the present ground surface to the east and west. The staining followed the orientation of the cobble layer, which resulted in the dish-shaped profile that was previously thought to represent a housepit. A portion of the cobble layer was exposed along the west wall of the excavation block at a depth of approximately 50 cm below the present ground surface. The extent of the layer northward and size and number of cobbles clearly indicated that it was of natural origin (Figure 12.8). The Feature T91 stratum overlying the cobble layer was then suspected of being natural also. In order to quickly ascertain whether the cobble layer and Feature T91 staining were cultural, excavation was limited to three 1 x 1 m units along the pipeline trench. An area of the stain measuring approximately 3 m^2 was excavated through to the cobble layer. The cobble layer was removed in a 1 x 1 m unit to assure that nothing cultural existed beneath. The Feature T91 staining appeared to be an accumulation of either decayed organic material or charcoal from a natural burn occurrence that was deposited in a stream channel. The convex bottom of the channel accounted for the dish-shaped cross section of the stain, a shape that often represents housepit profiles (Hoefer 1988).

13.0 DISCUSSION

The first part of this section summarizes the descriptive results of excavations completed at nine archaeological sites during the second phase of the Bairoil Archaeological Project. The following subsections discuss in detail project area chronology, activity area analyses, paleoenvironmental interpretations for the project, settlement and subsistence patterns, and questions pertaining to resource management.

13.1 SUMMARY OF RESULTS

Sixteen prehistoric or protohistoric cultural components were identified at seven of the nine archaeological sites (localities) investigated during the data recovery phase of the Bairoil Archaeological Project. Block excavations at two other sites (the Tower site and Site 48SW7085) encountered no intact cultural deposits, although one disturbed feature was recorded at the Tower site. Due to the absence of intact components, these two sites are not included in the following discussions. Table 13.1 summarizes remains collected from each component, and the following subsections detail and summarize the different classes of remains recovered from the 16 components.

13.1.1 Cultural Features

A total of 232 cultural features was recorded during block excavations at the seven sites (Tables 13.1 and 13.2). Feature types included habitation structures (housepits and stone circles), a variety of smaller pits (bell-shaped, cylindrical, basin-shaped, and rock-filled), and other types (postholes, ash/rock concentrations, a surface hearth, and a tool cache). The smaller pits appeared to represent both thermal and nonthermal features which were differentiated by the presence/absence of oxidation. A characteristic of both types was a nearly complete absence of associated heat-altered rock. Similarly, very few of the pit features (including thermal features) had any associated wood charcoal, which may be attributable to preservation factors. Fill characteristics of the thermal and nonthermal features were similar and consisted of moderately to darkly stained sediment. Generally, it appears that the presence or absence of oxidized pit edges may not be a reliable indicator of feature function in the project area, as sediments at some sites do not appear to readily evidence oxidation from exposure to fire.

Table 13.2 summarizes the distribution of each feature type by temporal period and phase. The vast majority (72%) of the features were associated with the three Early/Middle Archaic period (Green River phase) components. No cultural features were associated with two prehistoric components, Component III (Late Prehistoric period/Firehole phase) at the Abel Creek site and Component V (Late Archaic period-Besant) at Site 48CR4681.

13.1.1.1 Housepits

Five housepits were recorded during excavations at the Bald Knob site (Component II) with a single housepit encountered at Site 48CR4686. An additional housepit within the excavation block at the Bald Knob site was previously excavated (Hoefer 1988). The six housepits recorded during curring investigations were associated with Early/Middle Archaic period (Green River phase) occupations dating between 5,100 and 4,400 years B.P. (Table 13.2). Four of these features had previously been impacted by pipeline trenches, and all housepits were of similar morphology. The housepits were oval to circular in plan view and had shallow dish or basin-shaped cross sections. The maximum dimension of each was between 250 and 350 cm, with depth ranging from 10 to 54 cm. The housepits were identified in plan view by discrete moderate to dark staining, and each contained multiple subfeatures. Most housepits were characterized by a central hearth

Table 13.1 Summary of Cultural Remains.

Site No./ Name	Component No.	Age (years B.P.)	Cultural Features	Flaked Stone Tools	Groundstone Tools	Other Tools	Debitage	Animal Remains	Plant Macrofossils
48CR4681	I	7,490-7,110	8	3	1	0	144	282	0
Bald Knob	I	6,610-5,980	6	2	1	0	59	0	0
48CR4681	II	6,050	6	8	5	1	282	466	0
Bald Knob	II	5,100-4,400	77	63	29	2	1,418	62	2
Plant	I	5,030-3,830	71	25	32	3	775	1,356	0
48CR4686	I	4,990-4,330	19	4	1	0	52	387	0
48CR4681	III	4,840-4,340	16	18	13	0	795	725	0
48CR4681	IV	3,750-3,520	6	23	1	0	2,513	718	0
48SW7107	I	3,560	1	4	17	0	35	11	0
Abel Creek	I	1,790	5	8	4	1	455	1,986	0
48CR4681	V	--	0	14	0	0	700	107	0
48SW7107	II	1,390	1	3	5	0	3	21	4
48SW7107	III	1,460-1,110	10	11	9	0	181	174	3
Abel Creek	II	1,260	3	5	0	0	36	78	0
Abel Creek	III	--	0	4	0	0	185	240	0
Stone Circle	I	230	2	0	0	1	6	292	0

Table 13.2 Summary of Cultural Feature Types by Temporal Period and Phase.

Temporal Period (phase)	Feature Type											Total
	Housepit	Stone Circle	Bell-shaped Pit	Cylindrical Pit	Oxidized Basins	Unoxidized Basins	Rock-filled Basins	Post-holes	Ash or Rock Concentration	Surface Hearth	Tool Cache	
Protohistoric period	--	1	--	--	--	--	1	--	--	--	--	2
Late Prehistoric period (Uinta phase)	--	1	--	--	--	8	4	--	1	--	--	14
Late Archaic period (Deadman Wash phase)	--	--	--	--	--	6	1	--	3	--	--	10
Middle Archaic period (Pine Springs phase)	--	--	--	3(o)[1]	5	6	1	--	2	--	--	17
Early/Middle Archaic period (Green River phase)	6	--	5	10(o) 4(u)[2]	53	70	3	3	12	1	1	168
Early Archaic period (Great Divide phase)	--	--	--	1(u)	2	7	1	--	2	--	--	13
Paleoindian period	--	--	--	--	1	7	--	--	--	--	--	8
Total	6	2	5	18	61	104	11	3	20	1	1	232

[1] (o) = oxidized.
[2] (u) = unoxidized.

(surface or subsurface), with most other subfeatures representing small unoxidized basins. The walls and floors of the structures were unprepared and unlined, and each appeared to represent a habitation structure. No evidence of type of superstructure was noted, although possible postholes were recorded within two structures. A characteristic of the six housepits was a very limited amount of cultural material recovered from the fill and floor of the structures, a pattern typical of most housepits previously excavated in the region (Hoefer 1988, Reiss 1991).

Numerous housepits of similar morphology have been reported from southern Wyoming in recent years, with most housepits associated with Early or Middle Archaic period (Green River phase) components that date 6,000-4,300 years B.P. (Smith and Reust 1992). Most of previously recorded housepits ranged from 3 to 4 m in diameter and were characterized by shallow depressions ranging from 15 to 70 cm in depth, with multiple interior features recorded within all housepits (Hoefer 1988). Past investigations suggested that these housepits represented both warm and cold weather habitations (Harrell and McKern 1986, Eakin 1987, Smith and Reust 1992), and this feature type is most commonly recorded in a foothill setting. Five housepits recorded during this project were recorded in a foothill setting on the slope of Bald Knob, with one housepit recorded on a broad plain (Lost Soldier Flats).

13.1.1.2 Stone Circles

Single stone circles were completely excavated within block excavations at two sites during the current project. These stone circles were 5-6 m in diameter and were defined by circular alignments of large, granite cobbles. The stone circles likely represented habitation structures, and each contained one or more internal features (hearths). The dimensions of the two features fell within the size range of numerous stone circles previously recorded near Bairoil (Jess and Berrigan 1981, 1982) and within the Northwestern Plains (Frison 1978).

The stone circles included one of Late Prehistoric period (Uinta phase) affiliation, with the second feature possibly representing a Protohistoric occupation (Table 13.2). One of 14 stone circles exposed on the surface of the Stone Circle site was completely excavated, and this feature represented a Protohistoric occupation dated at 230±60 years B.P. A central hearth was the only feature recorded within this stone circle, and a very limited amount of cultural material was associated. The other stone circle was recorded at Site 48SW7107 (Component III), and this feature was encountered in a subsurface context. This stone circle had multiple internal features and possibly two well-defined exterior work areas associated. Two radiocarbon age estimates (1,460 and 1,110 years B.P.) indicate a Late Prehistoric period (Uinta phase) affiliation.

13.1.1.3 Bell-shaped Pits

Five bell-shaped pits were recorded, and all were associated with Component II at the Bald Knob site which represents a Early/Middle Archaic period (Green River phase) component (Table 13.2). Three of these features had been extensively impacted by a pipeline trench. This type was characterized by deep pits (>50 cm) that had relatively small surface openings with excurvate walls. The walls and floor of the five features were heavily oxidized, and fill consisted of stained sediment that contained very little wood charcoal or heat-altered rock. Three of the bell-shaped pits were recorded as subfeatures within housepits.

The extensive oxidation of the pit walls suggested that heat was produced or contained in these features, although the extensive oxidation probably indicated that fire was contained within the features. One function of these features types may have been as processing features, perhaps as roasting or baking pits, although very little heat-altered rock or other cultural material was recovered from the features. Several bone fragments were recovered from two of the features, and flotation of 10 liters of fill from the pits produced no charred plant remains.

Resources processed within these features may have included types which would leave minimal archaeological evidence, such as boned meat, roots, tubers, or other perishable plant parts. The location of three of the bell-shaped features within housepits may also have indicated their use as a heat source for warming the structures. No indication of use as storage features was noted, although this type of usage cannot be ruled out.

On this project, bell-shaped features were associated only with a Green River phase component. Similar features were recorded within Green River phase housepits at the Crooks site located west of Bairoil (McKern 1987). At the Crooks site, this feature type was interpreted as a storage facility and/or roasting feature for food processing. Most bell-shaped features in the region have previously been associated with Late Prehistoric period (Uinta phase) components in southern Wyoming (Harrell 1987, Wheeler et al. 1986, Creasman et al. 1982, McKibbin et al. 1989) and in the project area (Greer and Greer 1989). Bell-shaped pits recorded during the Shute Creek project in southwest Wyoming contained large quantities of charred goosefoot seeds (Firebaugh 1986), as did bell-shaped pits at the Buffalo Hump site (Harrell 1987) suggesting that during the Uinta phase this feature type may have been utilized for a storage and/or seed processing function.

13.1.1.4 Cylindrical Pits

This feature type consisted of deep pits (>25 cm) with vertical to slightly incurvate walls and with slightly rounded to flat floors. Eighteen features of this type were recorded, and this type occurred primarily in Early/Middle Archaic period (Green River phase) components (Table 13.2). Cylindrical pits included those with oxidized and unoxidized walls, and very little heat-altered or wood charcoal (as with other feature types) was associated with most examples of this feature type. Unlike the current project, previous investigations in the project area recorded this feature type (designated as roasting pits) from most prehistoric periods, although most roasting pits postdated 2,800 years B.P. (Greer and Greer 1989). The presence of intense oxidation in most of these features suggested use as baking or roasting pits similar to the function listed above for the bell-shaped pits. Few artifacts were recorded from this feature type, which limits interpretations of function.

13.1.1.5 Oxidized Basins

Oxidized basins are unfilled and unlined basins identified by oxidized margins. The presence of oxidation suggests that heat was produced or contained within the basins. The volume of this type of feature was generally much less than the bell-shaped or cylindrical features. Oxidized basins (61) were recorded in Middle Archaic (Pine Spring phase) through late Paleoindian period components, and oxidized basins represented the second most prevalent type recorded during the Bairoil project (Table 13.2). This type represented simple, unlined basin-shaped firepits or hearths, a feature type commonly recorded in dunal sites in southern Wyoming (Wheeler et al. 1986, Harrell 1989). Few heat-altered rocks were associated with the oxidized basins, and a few bone fragments were collected from this feature type. No charred seeds were recovered from flotation samples from a number of oxidized basins. These basins likely functioned as multipurpose firepits or hearths, with a number of possible uses, e.g., cooking, heating of rocks, heat production, etc.

13.1.1.6 Unoxidized Basins

Unoxidized basins (104) were recorded in components ranging in age from the Late Prehistoric (Uinta phase) to the late Paleoindian period and this type of feature represents the most common type recorded for the Bairoil Archeological Project (Table 13.2). These basins lacked oxidation but were otherwise morphologically similar to the oxidized basins. As with the oxidized basins, virtually no heat-altered rock or wood charcoal was associated with this feature type. It is possible that some of these features may have represented partially deflated oxidized basins, with oxidized areas removed by erosion. Past investigations in the project area have recorded numerous similar features (defined as ash pits) within most prehistoric periods (Greer and Greer 1989). Similar features recorded at other sites within the Wyoming Basin have been attributed to possible plant processing or storage uses (O'Brien 1982, Armitage et al. 1982, Smith and Creasman 1988), although plant remains or evidence of stored resources was seldom recovered. No indication of either function was noted during the current project, and the function(s) of these features at Bairoil is unknown. Unoxidized basins were the most common feature type associated with housepits investigated during the current project.

13.1.1.7 Rock-filled Basins

Rock-filled basins (11) were recorded in components representing all cultural periods except the terminal Paleoindian (Table 13.2). This type of feature was similar in general morphology (size and shape) to the oxidized and unoxidized basins, and the distinguishing characteristic was the presence of a large number of heat-altered rocks within the basins. The sediment matrix of this feature type was darkly stained. Although the presence of heat-altered rock and charcoal within these basins suggested that heat was contained within the basins, most of these features had unoxidized boundaries. Small amounts of animal bone were associated with most of these features, suggesting that they were used for cooking/ processing subsistence resources.

13.1.1.8 Postholes

The possible postholes (3) recorded were associated with the Early/Middle Archaic period (Green River phase) component at the Bald Knob site, and two of the features were located within housepits. This type of feature was defined by small, oval or circular stains that in cross section had straight to slightly inward sloping walls with rounded bases. The shallow nature (4-6 cm) of these small diameter stains precluded a definite identification as postholes. Numerous possible postholes were recorded in multiple Early Archaic period housepits at the Split Rock Ranch site to the north of the current project area (Eakin 1987) and at Medicine House to the southeast of Bairoil (McGuire et al. 1984).

13.1.1.9 Ash/Rock Concentrations

Twenty features representing this type of feature were recorded in components dating from the Late Prehistoric through the Early Archaic periods (Table 13.2). These features represented surface scatters of stained sediment (ash) and/or concentrations of heat-altered rocks. Cross sections of these features revealed no evidence of prepared basins. Most of these features probably represented tailings redeposited from nearby hearths, firepits, or stone-boiling features rather than in situ activity areas. It is possible that some of the larger concentrations of heat-altered rock without associated staining may have represented open cooking or roasting platforms.

13.1.1.10 Surface Hearth

One discrete area of oxidation was recorded near the center of an Early/Middle Archaic period (Green River phase) housepit at the Bald Knob site. The feature consisted of two layers of dense oxidation separated by a thin layer of unoxidized sediment, with no evidence of a prepared basin. Similar shallow, central oxidized areas have been recorded within other housepits excavated in south-central Wyoming (McKern 1987, Eakin 1987). This feature type likely functioned as a central hearth within a habitation structure, with a number of possible uses including heating, lighting, cooking, etc.

13.1.1.11 Tool Cache

The single tool cache was associated with an Early/Middle Archaic period (Green River phase) component at the Plant site. The cache consisted of a hammerstone, a biface, and five modified cobbles recorded within a small depression or pit. The size of the pit conformed to the size of the tool cluster, and the pit was dug apparently to conceal the artifacts. These artifacts do not appear to represent formal tools, and they represent at least three distinct material types. The tools are heterogeneous in form, with retouch ranging from bifacial to unifacial, and edge angles vary from acute to fairly steep. They appear to represent large, multifunctional tool types, and most were manufactured from tabular pieces of raw material. Source areas for the material types are unknown, although patination on both faces of most of these tools suggests that they originated on a cobble (desert pavement) surface. Numerous cobbles occur along Camp Creek Hill, a prominent ridge that bounds the project area on the north. It is possible that the materials were collected from this ridge, although casual inspection of this area suggests that most cobbles are of non-toolstone material (granite or diorite). Toolstone quality material appears to occur in very low densities and generally consists of chert or chalcedony cobbles that are smaller than the tools included in the cache.

Artifact caches are fairly uncommon in prehistoric sites in Wyoming, although caches dating from the Paleoindian period (Frison 1978) to the Late Prehistoric period have been documented in the region (Laurent and Eckerle 1983). Most of these caches consisted of bifaces including large numbers of Paleoindian projectile points from the Larson cache from the Killpecker dune field in southwest Wyoming (Frison 1978), numerous large blanks of tiger chert from the John Gale site in south-central Wyoming (Miller et al. 1991), numerous small bifaces (preforms) from the Timber Creek cache in the Powder River Basin (Laurent and Eckerle 1983), and a cache of six scrapers and one flake from the McKean site in northeast Wyoming (Kornfeld et al. 1990).

The number of tools (7) and the morphological characteristics of the individual tools in the Plant site cache bear a strong resemblance to the cache from the McKean site (Kornfeld et al. 1990). Both caches represent Middle Archaic period occupations that date between 5,000 and 4,000 years B.P. The two caches are characterized by partially reduced flakes or tabular pieces of raw material which have been reduced or retouched to form a variety of working edges (steep and acute, bidirectional and unidirectional) with multiple possible uses (cutting, scraping). Lithic resources near both sites are characterized by very low densities of poor quality materials, and the caching of tools suggests that the two sites were occupied repeatedly by the same cultural group (probably as part of a seasonal round) with the tools likely cached for retrieval in a following season. Cultural deposits at both the Plant site (see Section 5.0) and at the McKean site (Kornfeld et al. 1990) have been interpreted to represent multiple or repeated occupations based on other criteria.

<u>13.1.2 Flaked Stone Artifacts</u>

Varying numbers of different classes of flaked stone artifacts were recovered from the 16 components investigated at Bairoil (Table 13.3). The following subsections discuss the artifacts recovered, by the artifact classes used in the artifact analyses for this project.

<u>13.1.2.1 Projectile Points</u>

Twenty-five bifaces with hafting modifications identified as projectile points are sufficiently complete to compare with established typologies from the region. Five other projectile points are too fragmentary to be compared with established types. The artifacts include a variety of types, and based on morphological attributes such as size, base shape, and notch form, this sample was divided into a number of types. The projectile points include 23 that are classified as large points that appear to represent either dart or spear points, with two small, thin points likely representing arrow points. The projectile points occurred in components ranging from approximately 7,500 to 500 years of age, and the main goal of the typology was to identify projectile point types that are chronological indicators for different cultural periods within the project area. Most of the projectile points are small base fragments, with a number of types represented by only one or several specimens. With a larger sample of more complete specimens, some of the discrete types identified by this small sample might fall within

Table 13.3 Summary of Flaked Stone Tools.

Site No./ None	Component No.	Projectile Points	Hafted Bifaces	Bifaces	Retouched Flakes	Utilized Flakes	Cores	Modified Cobble	Total
48CR4681	I	1	--	--	2	--	--	--	3
48CR4681	II	--	--	1	4	1	2	--	8
48CR4681	III	3	1	3	6	5	--	1	19
48CR4681	IV	7	--	7	4	3	1	1	23
48CR4681	V	3	--	3	6	1	1	--	14
Abel Creek	I	4	--	1	1	2	--	--	8
Abel Creek	II	1	--	1	1	2	--	--	5
Abel Creek	III	1	--	2	--	1	--	--	4
48SW7107	I	--	--	1	1	2	--	--	4
48SW7107	II	1	1	--	--	1	--	--	3
48SW7107	III	1	1	1	4	4	--	--	11
Plant	I	4	1	3	--	9	2	6	25
48CR4686	I	--	--	--	--	2	1	--	3
Bald Knob	I	--	1	--	--	--	1	--	2
Bald Knob	II	4	--	13	11	26	9	--	63
Total		30	5	36	40	59	17	8	195

the variability represented by larger groups. Figure 13.1 shows the temporal distribution of the identified types which are discussed below.

The one Type I bifurcate stemmed projectile point was associated with a terminal Paleoindian component (I) at Site 48CR4681 which dated to about 7,500-7,100 years B.P. The hafting element margins are very heavily ground, and similar bifurcate or split-stemmed artifacts recovered from the Medicine Lodge Creek site in northern Wyoming date to 9,300 years B.P. (Frison 1978:30). The point most closely resembles a Pryor Stemmed type, and this type generally occurs in terminal Paleoindian contexts on the Northwestern Plains that date between 8,500 and 7,000 years B.P. (Frison 1978:24-27, Frison and Gray 1980).

One Type II bifurcate stemmed point was collected from two Middle Archaic period components (III and IV) at Site 48CR4681 that dated between 4,900 and 3,500 years B.P. These points are base fragments which have straight to slightly expanding stems with concave bases. This type resembles Hanna type points from the Northwestern Plains (Wheeler 1954), which is one of several diagnostic point types representative of the Middle Archaic period McKean complex (Mulloy 1954, Frison 1978). These points also resemble Pinto series artifacts from the Great Basin (Harrington 1957).

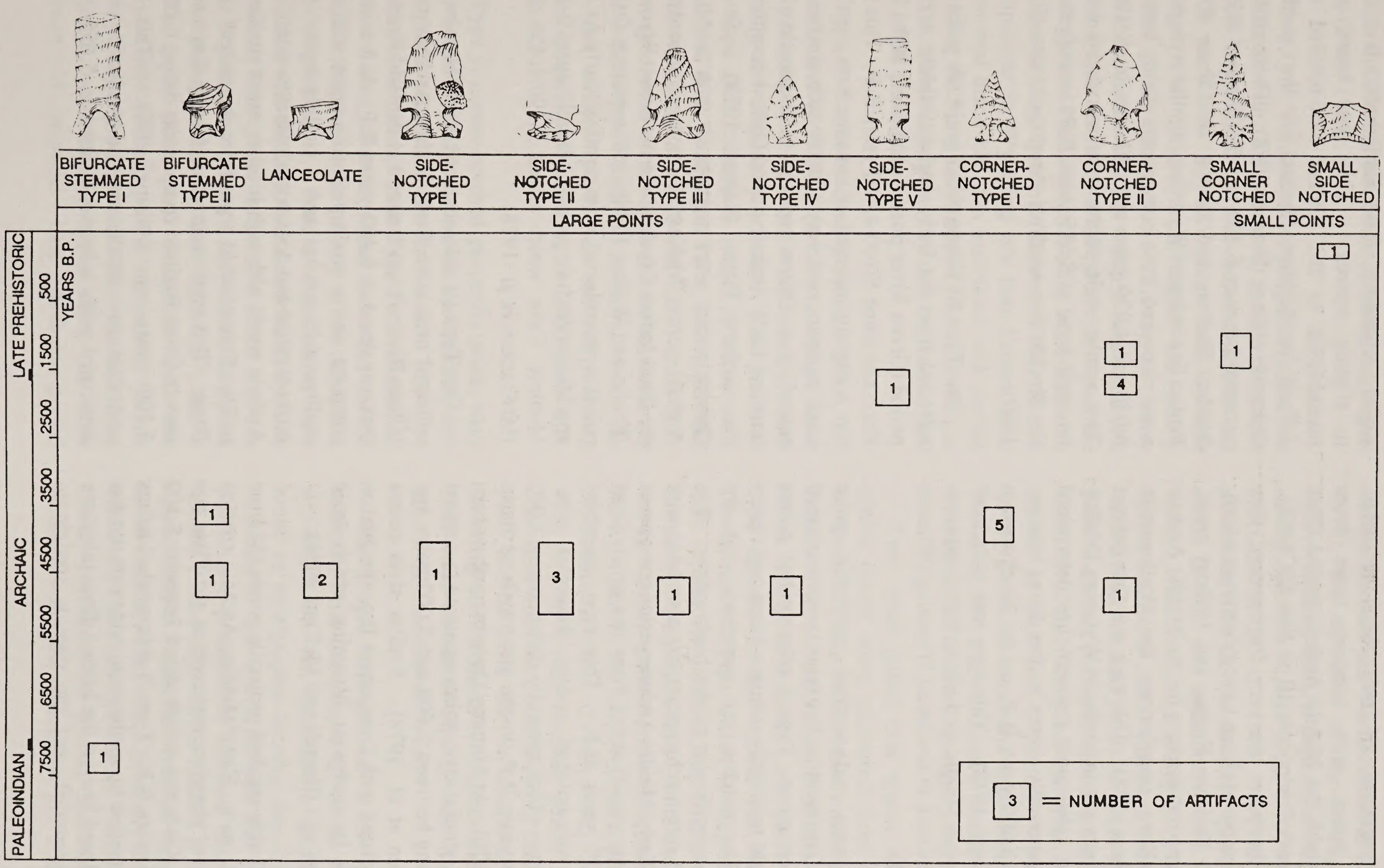


Figure 13.1 Temporal Distribution of Projectile Point Types.

Base fragments of two large lanceolate projectile points with concave bases were associated with the Middle Archaic period (Pine Spring phase) Component III at Site 48CR4681. Although the bases are very fragmentary, they closely resemble McKean Lanceolate types which, along with Duncan, Hanna, and Mallory types, serve as temporal markers for the Middle Archaic period McKean complex on the Northwestern Plains (Frison 1978). This type was first defined at the McKean site in northeast Wyoming (Mulloy 1954), and subsequent research has determined that this type usually occurs in sites dating between 5,000 and 3,000 years B.P. on the Northwestern Plains (Frison 1978). This type was associated with numerous Middle Archaic period components near Shute Creek in southwest Wyoming (Wheeler et al. 1986).

Nine large side-notched projectile point fragments (representing five types) were recovered during excavations. Type I side-notched points have straight to slightly concave bases and square tangs. The notches are symmetric and are oriented perpendicular to the blade edges. The one Type I side-notched point was associated with the single Early/Middle Archaic period component (Green River phase) at the Plant site which dated 5,030-3,830 years B.P. This type resembles Northern side-notched and/or Bitterroot side-notched types which generally date between 7,000 and 5,000 years B.P. in the eastern Great Basin (Aikens 1970). At Mummy Cave in northwestern Wyoming, similar style points occurred in cultural layers dating between 7,600 and 5,600 years ago (McCracken et al. 1978). Similar style points were associated with Component II at the Maxon Ranch site in southwest Wyoming which dated 4,800 years ago (Harrell and McKern 1986).

Type II side-notched projectile points (3) were associated with Early/Middle Archaic period (Green River phase) components at the Plant site and Bald Knob site which dated between 5,100 and 3,830 years B.P. Type II side-notched points are characterized by moderate to wide side notches that are placed low on the blade. Base tangs are generally rounded, and the stem is straight to slightly expanding. Base configuration is straight to slightly convex. This type bears some resemblance to the Rocker side-notched type defined at Sudden Shelter on the northern Colorado plateau (Holmer 1978). These artifacts occurred between 6,800 and 5,300 years B.P. at Sudden Shelter, and during the Shute Creek Project in southwest Wyoming, similar style points were recovered from components dating between 6,030 and 4,930 years ago (Wheeler et al. 1986). Two similar style points were associated with a housepit dated at 5,655 years B.P. investigated at the Sinclair site south of the project area (Reust 1989).

One Type III side-notched projectile point was collected from the Early Archaic/Middle Archaic period (Green River phase) component at the Bald Knob site dated 5,100-4,400 years B.P. This type has a slightly indented or concave base, rounded basal margins, and very shallow side notches. It resembles an Oxbow type that is diagnostic of the terminal Early Archaic period Oxbow complex on the northern Plains (Reeves 1973). Several Oxbow points were associated with a Middle Archaic period McKean Complex component at the Dead Indian Creek site in northwest Wyoming (Frison and Walker 1984), and numerous Oxbow points were collected from terminal Early Archaic and Middle Archaic period Cultural Layers 9-14 at Mummy Cave which dated 3,290-2,455 B.C. (McCracken et al. 1978).

One Type IV side-notched projectile point was collected next to an Early/Middle Archaic period (Green River phase) housepit at the Bald Knob site that was dated at 4,400 years B.P. It is a small, complete, fairly crude projectile point with very shallow side notches and a straight base. It is fairly atypical and does not conform to established Archaic types, although it bears some similarities to Elko Side-notched types from the eastern Great Basin. This type occurred at Hogup Cave in the eastern Great Basin in components dating 6,000 to 3,100 years ago (Aikens 1970). This type resembles two small, untyped projectile points associated with a housepit dated at 5,655 years

B.P. at the Sinclair site to the south of the project area (Reust 1989).

One Type V side-notched projectile points was associated with Component V at Site 48CR4681 which is estimated to date between 2,000 and 1,500 years B.P. Type IV points have low side notches with ground basal edges and nearly parallel blade margins. This type closely resembles the Besant type which is diagnostic of a terminal Late Archaic period cultural group on the Northwestern Plains which is often associated with communal bison hunting (Reeves 1978). Besant occupations in Wyoming are best known from communal bison kill sites associated with corrals including the Ruby and Muddy Creek sites (Frison 1978). These sites generally date between 1,800 and 1,650 years B.P.

Type I corner-notched projectile points are characterized by slightly concave to straight bases and generally wide or broad notches that are both laterally and diagonally oriented. Five points of this type that include a range of sizes were associated with Component IV at Site 48CR4681 which was dated at 3,750 and 3,520 years B.P. Most specimens of this type closely resemble the Pelican Lake type which is a temporal marker for the Late Archaic period on the Northwestern Plains, generally occurring after 3,000 years B.P. (Frison 1978).

Type II corner-notched projectile points have very broad to fairly narrow corner notches, and most have prominent convex bases. This type appears to be distinct from Type I corner-notched (Pelican Lake) points discussed above and had the broadest temporal span of any of the identified types (Figure 13.1). Four of these points were associated with the Late Archaic period component (Deadman Wash phase) at the Abel Creek site, one Type II point was from a Late Prehistoric period (Uinta phase) context at Site 48SW7107, and a similar style point was associated with the Early/Middle Archaic period component (Green River phase) at the Plant site. This type resembles unnamed corner-notched types which are most common in terminal Late Archaic period components on the Northwestern Plains (Frison 1978), and numerous similar style points were recovered from cultural deposits at Mummy Cave dating between 2,800 and 2,000 years B.P. (McCracken et al. 1978). This type also resembles Elko Corner-notched types of the Great Basin (Heizer and Baumhoff 1961). This type spans a wide time range at Hogup Cave occurring between 6,000 to 1,200 years ago (Aikens 1970). Elko Corner-notched points occurred in Early and Middle Archaic period components dating between about 6,100 to 2,900 years ago at the Shute Creek project in southwest Wyoming (Wheeler et al. 1986), and at the Deadman Wash site in southwest Wyoming, this type occurred in components dating between 6,800 to 400 years ago (Creasman 1984).

Two small points that appear to represent arrow points were recovered from prehistoric components. One corner/basally notched type was recovered from Component III at Site 48SW7107 which was dated at about 1,400 years B.P. This type appears to fall within the Rose Spring Corner-notched type which is diagnostic of the Late Prehistoric period (Uinta phase) in areas to the west of the project area (Smith and Creasman 1988). Corner-notched arrow points are typical of the early part of the Late Prehistoric period on the Northwestern Plains (Frison 1978). Numerous Rose Spring Corner-notched points have been recovered from components dating between 1,660 years to 900 years B.P. in southwest Wyoming including the Taliaferro site (Smith and Creasman 1988) and numerous sites on the Shute Creek project (Wheeler et al. 1986).

The single side-notched arrow point was collected from Component III at the Abel Creek site which was not radiocarbon dated, although based on stratigraphic location the component is estimated to date within the past 600 years. The point has a prominently concave base with side notches placed high on the blade. It bears some resemblance to Plains Side-notched types from the Northwestern Plains which generally date between 1,150 and 750 years ago (Kehoe 1966). The point closely resembles the Desert Side-notched type which is common throughout the Intermountain

West (Holmer and Weder 1980). Numerous points of this type were recovered from the Eden-Farson site in southwest Wyoming which dated 230 years ago (Frison 1971), and a similar point was recovered from Component VIII at the Taliaferro site which postdates 1,000 years B.P. (Smith and Creasman 1988).

13.1.2.2 Hafted Bifaces

Five large hafted bifaces that represent knives, drills, or scrapers were collected from excavations (Table 13.3). These tools are larger than the projectile points described above, and the lateral and/or distal margins evidence extensive retouch and use wear. One large stemmed or lanceolate biface resembles a Paleoindian projectile point, and the distal end has been steeply retouched and is heavily step-fractured from use as a scraper. This artifact was recovered from an Early Archaic period (Great Divide phase) context at the Bald Knob site, suggesting that it was collected by the prehistoric occupants of the site and reworked for use as a scraper.

One large side-notched hafted knife was associated with Middle Archaic period components (Pine Spring and Green River phases) at Site 48CR4681 (Component III) and at the Plant site.

Each biface evidences heavy use wear and resharpening of the blade margins.

The final two hafted bifaces represent large side/corner-notched drills from two Late Prehistoric period (Uinta phase) components at Site 48SW7107. The blade margin of each is steeply reworked to taper to a long, narrow distal end or bit. Similar style hafted bifaces are often associated with Uinta phase components to the west of Bairoil (McNees et al. 1989, Smith and Creasman 1988).

13.1.2.3 Other Flaked Stone Artifacts

Table 13.3 summarizes the flaked stone tool assemblages from the 16 components. No flaked stone tools were recovered from the single component at the Stone Circle site, and generally small numbers of flaked stone tools were associated with most of the other 15 components. The cultural deposits of the four components (the Plant site, Site 48CR4681-Components III and IV, and the Bald Knob site-Component II) with the greatest numbers of flaked stone tools appear to represent palimpsests that include remains from multiple occupational episodes, which probably accounts for the higher number of tools from these components. As Table 13.3 indicates, expedient tools (retouched/utilized flakes) represent the most common tool type, with few formal tools or bifaces recovered from most components.

The small number of bifacial artifacts indicates that a complete bifacial manufacturing sequence is not represented by assemblages of flaked stone tools from most components. The recovered bifaces are generally small fragments of finished tools, with very few intermediate stage bifaces noted. Most bifacial tool manufacturing appears to have been oriented towards the further reduction of blanks or preforms brought to the sites, or to the resharpening and/or repair of finished tools. The cache of partially reduced tools from the Plant site supports the idea that lithic manufacturing was focused on artifacts that were brought to the sites as partially reduced cobbles or bifaces. The lack of a complete manufacturing sequence is also suggested by the small number (17) of cores, with cores collected from only seven of the 16 components. Nine of the 17 cores were collected from Component II at the Bald Knob site.

Debitage was recovered from each of the 16 components, with sample sizes ranging from 3 to 2,513 specimens (Tables 13.1 and 13.4). Table 13.4 lists the percentages of each identified debitage type for the 16 components. As the table indicates, very low percentages of primary flakes representing initial reduction (decortication) were recovered from all components, with percentages averaging much less than 5% for components with large debitage samples. The total number of cortical flakes (primary and secondary) range from 10% to 20% for most of these components, with the vast majority of debitage comprising tertiary

Table 13.4 Percentages of Debitage Types by Cultural Component.

Site No./ Name	Component No.	No. of Debitage	Percent of Debitage Type					
			Primary	Secondary	Tertiary	Microflake	Shatter	Other
48CR4681	I	144	4.2	15.3	40.3	30.7	9.7	--
48CR4681	II	282	1.1	10.3	53.9	24.1	10.6	--
48CR4681	III	795	1.5	13.8	49.8	24.8	10.7	.1
48CR4681	IV	2513	2.8	11.4	49.9	28.1	7.7	--
48CR4681	V	700	3.3	12.6	52.4	25.9	5.7	--
Abel Creek	I	455	0.2	3.1	30.3	63.7	2.6	--
Abel Creek	II	36	--	27.8	50.0	16.7	--	5.6
Abel Creek	III	185	--	2.2	16.2	80.5	1.1	--
48SW7107	I	35	--	11.4	40.0	25.7	20.0	7.9
48SW7107	II	3	--	--	33.3	66.7	--	--
48SW7107	III	181	2.8	17.1	33.1	42.0	5.1	--
48CR4686	I	52	7.7	15.4	32.7	23.1	19.2	1.9
Plant	I	775	1.8	5.4	55.6	30.8	6.1	.3
Bald Knob	I	59	--	22.0	42.4	27.1	6.8	--
Bald Knob	II	1418	1.0	19.2	44.1	23.1	11.1	1.2
Stone Circle	I	6	33.3	--	--	66.7	--	--

flakes or microflakes from all components. Although the presence of cortex was not recorded for microflakes, the size (< 1 cm) of these flakes indicates that most were noncortical types. The low number of cortical flakes and the corresponding high percentage of noncortical types suggests that most debitage was derived from the latter stages of lithic manufacture, likely representing reduction of partially reduced raw material (cores, blanks, and preforms), and tool maintenance or tool resharpening activities.

Figure 13.2 summarizes the material types of debitage and flaked stone tools collected during this project, and the results are presented by grouping components representing the same phase or cultural period. Very little change through time in material type utilization is indicated by relative frequencies of the dominant material types (chert, chalcedony, quartzite, and siltstone) in either debitage or flaked stone tools. Chert dominates or co-dominates during each temporal period represented except during the Firehole phase (late Late Prehistoric period) where quartzite materials are slightly more common. The period was represented by a single component which may have biased the sample.

Although no detailed study of lithic sources occurring near the project area was undertaken, most flaked stone artifacts are probably from sources near the project area. Casual observation of lithic materials on Camp Creek Hill, a prominent ridge that bounds the project area to the north, revealed small cobbles of red and brown chert, clear chalcedony, black siltstone, and quartzite. Densities of the various material types of toolstone quality raw material appear to be very low along this ridge. The high percentage of small flakes from most components precluded a firm identification of most material types, although several nonlocal material types were identified. Debitage analysis suggests that most tools were brought to the sites as finished or partially reduced bifaces, with initial reduction activities very limited in the 16 components. This may indicate a number of the small resharpening flakes were derived from curated tools that represent non-local sources. Very small amounts of obsidian identified as small microflakes were recovered from Component II at the Bald Knob site and from Component III at the Abel Creek site, and several ignimbrite flakes were associated with the late Paleoindian period component (I) at Site 48CR4681. The source area for these materials is unknown, although the nearest source is probably the Yellowstone area in northwest Wyoming or as small lag pebbles in southwest Wyoming. Two large hafted drills of oolitic chert were associated with Late Prehistoric period components (II and III) at Site 48SW7107, and this chert type probably originated from a source area in the Red Desert area west of Bairoil.

13.1.3 Other Artifacts

In this subsection, other artifacts including groundstone tools, abraders, bone tools, anvils, ocher, and a ceramic sphere are summarized. Table 13.5 lists these artifacts by associated component.

Groundstone artifacts were collected from 12 components, with the largest number associated with two Early Archaic/Middle Archaic period (Green River phase) components at the Plant and Bald Knob sites, although groundstone was recovered from components of all ages. A few fragments are small portions of larger artifacts of indeterminate morphology, although most groundstone tools are either metate or mano fragments. The vast majority of the metate fragments were manufactured of tabular sandstone slabs, and most are unshaped. The manos include shaped and unshaped specimens, with most manufactured of granite. The material types represented by the groundstone artifacts appear to be available locally on Camp Creek Hill which bounds the project area on the north.

The only bone tools and ocher fragments collected and one hammerstone were associated with the Early Archaic/Middle Archaic period (Green River phase) component at the Plant site. The bone tools represent two awls manufactured from a deer or pronghorn metacarpal, and from an

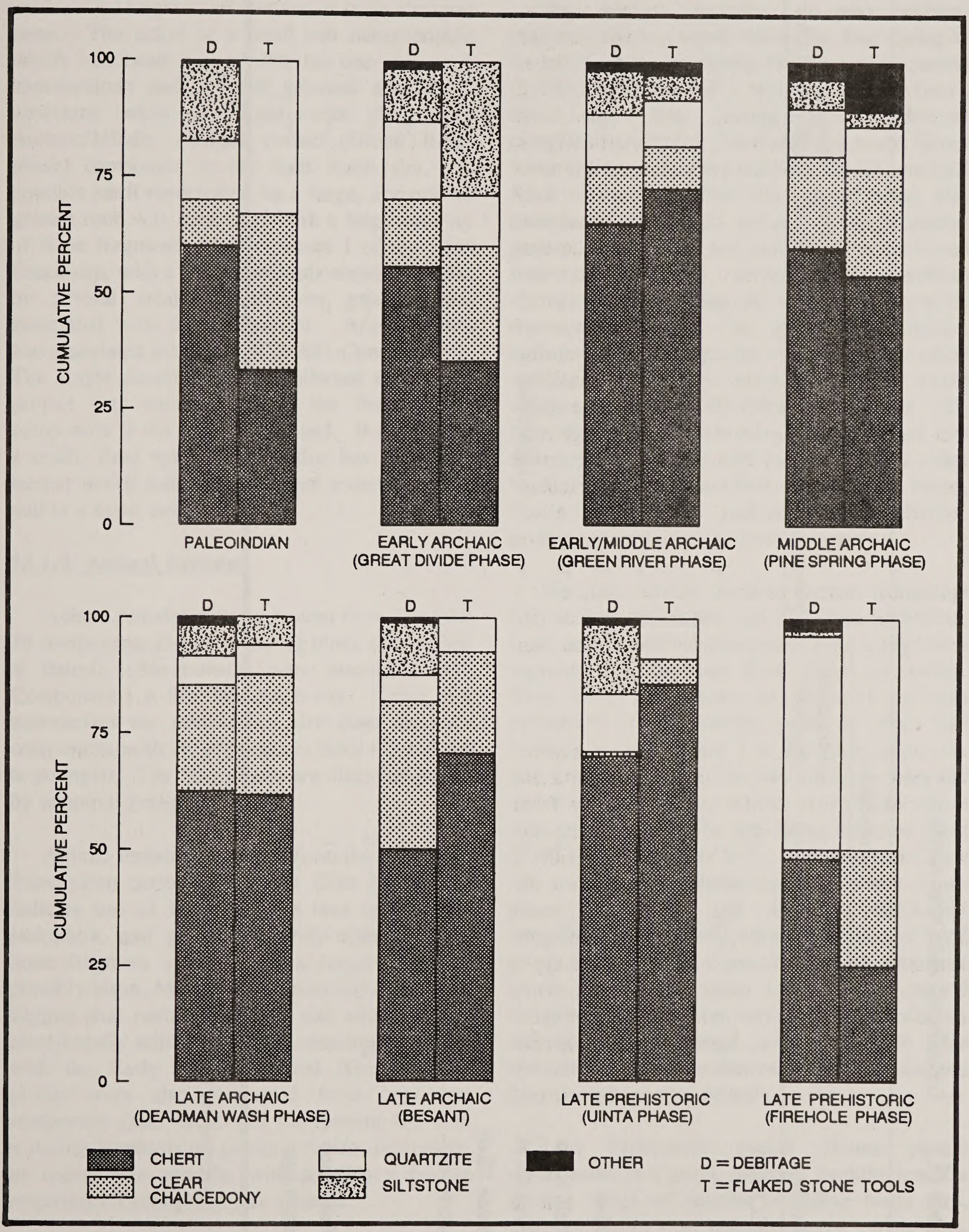


Figure 13.2 Material Types of Debitage and Tools by Cultural Period and Phase.

Table 13.5 Groundstone and Other Artifacts.

		Groundstone								
Site No.	Component No.	Metate[1]	Mano	Indeterminate fragment	Hammerstone	Anvil	Abrader	Bone Awl	Ceramic sphere	Ocher
48CR4681	I	1	--	--	--	--	--	--	--	--
	II	5(3)	--	--	--	1	--	--	--	--
	III	13	--	--	--	--	--	--	--	--
	IV	1	--	--	--	--	--	--	--	--
Plant	I	18	11	--	1	--	--	2	--	--
Bald Knob	II	27	2	--	1	--	1	--	--	1
Abel Creek	I	4	--	--	--	1 (possible)	1	--	--	--
Stone Circle	I	--	--	--	--	--	--	--	1	--
48SW7107	I	16(1)	--	1	--	--	--	--	--	--
	II	4(1)	1	--	--	--	--	--	--	--
	III	5	3	2	--	--	--	--	--	--
Bald Knob	I	--	1	--	--	--	--	--	--	--
48CR4686	I	1	--	--	--	--	--	--	--	--

[1] ( ) = estimated total number of artifacts

unidentified fragment of medium or large mammal bone. The ocher is a small red ocher nodule which has been ground flat on one side. A hammerstone and a small grooved abrader of sandstone were associated with the Early Archaic/Middle Archaic period (Green River phase) component at the Bald Knob site. A possible anvil represented by a large, unmodified granite rock was associated with a large quantity of bone fragments in Component I of the Abel Creek site, with a small sandstone abrader defined by several small striations or grooves also associated with this component. Another anvil was associated with Site 48CR4681-Component II. The single ceramic artifact collected during the project was recovered from the Protohistoric component at the Stone Circle site. It consists of a small, fired sphere or ball that has no visible temper which was collected from a central hearth within a stone circle.

13.1.4 Animal Remains

Animal remains were recovered from 15 of the 16 components identified during block excavations at Bairoil. No remains were associated with Component I at the Bald Knob site. Table 13.6 summarizes the remains by size class for each component, with the components listed from oldest to youngest. The components are discussed below by temporal period and phase.

Animal remains recovered from the single late Paleoindian period component (Site 48CR4681) indicate use of at least three taxa (pronghorn, jackrabbit, and ground squirrel) with only one bone fragment identified as a larger mammal, possibly bison. Most remains from this component suggest that rabbit to coyote size animals were most heavily utilized. Animal remains associated with the Early Archaic period (Great Divide phase) were also recovered from only one component (Site 48CR4681-Component II), with a similar emphasis on pronghorn size, jackrabbit, or rodent size animals. with possibly a greater emphasis on pronghorn size animals.

The highest diversity of taxa utilized prehistorically occurred within the four dating to the late Early Archaic/early Middle Archaic period (5,100-3,800 years B.P.), which include the Green River and Pine Spring phase (McKean complex)/occupation. Taxa associated with Green River phase components (Site 48CR4686, the Bald Knob site, and the Plant site) include bison, elk, pronghorn, jackrabbit, ground squirrel, pocket gopher, sage grouse, and possibly other birds and freshwater mussels. Overall, most identified elements from the Green River phase components represent jackrabbit size or smaller animals, perhaps indicating a greater exploitation of smaller animals. The single intact Pine Spring phase component (Site 48CR4681-Component III) represented a McKean complex component that was contemporaneous with the Green River phase components, and identified taxa include bison, deer-pronghorn size, jackrabbit size, avifauna, ground squirrel, and freshwater mussels.

The late Middle Archaic period component (IV) at Site 48CR4681 was identified by Pelican Lake corner-notched dart points suggesting that it represented a Deadman Wash phase component. Taxa identified indicate an emphasis on both pronghorn and jackrabbits, with no other taxa identified. Component I at the Abel Creek site and Component V at Site 48CR4681 represented terminal Late Archaic period occupations which were of relative similar age dating between about 2,000 and 1,500 years B.P., with the Abel Creek site component representing a Deadman Wash phase component, and the Site 48CR4681 component may have represented another cultural group identified by distinctive Besant projectile points. Although these Late Archaic period components may have represented two distinct cultural groups, animal remains at both sites indicate utilization exclusively of bison size and deer-pronghorn size animals.

Late Prehistoric period (Uinta phase) components as a group reflected exploitation of a diverse range of animals including bison size, deer-pronghorn size, jackrabbit size, rodent size, and possibly freshwater mussels. The three

Table 13.6 Summary of Animal Remains.

Site No./ Name	Component No.	No. of Specimens	Large Mammal	Medium Mammal	Small Mammal	Very Small Mammal	Large-Medium Mammal	Medium-Small Mammal	Small-Very Small Mammal	Large-Very Small Mammal	Bird	Mussel Shell	Identified Taxa (# of elements)
48CR4681	I	282	1	2	136	7	--	31	98	7	--	--	Pronghorn (1); deer-pronghorn size (1); jackrabbit (3); ground squirrel (3)
48CR4681	II	466	--	7	160	18	--	132	139	10	--	--	Pronghorn (1); deer-pronghorn size (5), jackrabbit (1); ground squirrel (9)
Bald Knob	II	62	--	14	--	--	23	10	--	10	2	3	Small bird (2 eggshells)
Plant	I	1,356	43	164	34	69	367	511	16	128	23	1	Bison (1); bison size (9); elk (1); pronghorn (1); deer-pronghorn size (16); jackrabbit (18); jackrabbit size (16); ground squirrel (20); pocket gopher (1); owl size (1); sage grouse (5); bird size (3)
48CR4686	I	387	--	3	10	6	11	3	353	--	--	1	Pronghorn (1); deer-pronghorn size (1); jackrabbit size (5); shrew size (1)
48CR4681	III	735	2	24	317	40	--	160	124	7	50	1	Bison (2); deer-pronghorn size (24); jackrabbit size (10); ground squirrel (4); bird size (50)

Table 13.6 (continued)

Site No./ Name	Component No.	No. of Specimens	Large Mammal	Medium Mammal	Small Mammal	Very Small Mammal	Large-Medium Mammal	Medium-Small Mammal	Small-Very Small Mammal	Large-Very Small Mammal	Bird	Mussel Shell	Identified Taxa (# of elements)
48CR4681	IV	718	--	13	221	3	--	218	251	12	--	--	Pronghorn (6); deer-pronghorn size (7); jackrabbit size (13)
48SW7107	I	11	--	3	1	--	7	--	--	--	--	--	Jackrabbit size (1)
Abel Creek	I	1,986	163	167	--	16	1,640	--	--	--	--	--	Bison size (143); deer-pronghorn size (51)
48CR4681	V	107	1	79	--	1	9	11	2	4	--	--	Bison (1); pronghorn (17); deer-pronghorn size (33)
48CR7107	II	21	--	15	2	--	3	--	1	--	--	--	Deer-pronghorn size (7)
48CR7107	III	174	1	24	11	1	47	5	84	--	--	--	Bison size (1), deer-pronghorn size (1); ground squirrel size (1)
Abel Creek	II	78	6	9	--	1	48	13	1	--	--	1	Deer-pronghorn size (3)
Abel Creek	III	240	8	9	2	-	192	22	7	-	-	-	Bison size (6); deer-pronghorn size (1); jackrabbit size (1)
Stone Circle	I	292	-	-	1	-	291	-	-	-	-	-	Deer-pronghorn size

components (Component II at the Abel Creek site and Components II and III of Site 48SW7107) did not have large assemblages of animal remains (Table 13.6), suggesting that individual components represented very short-term occupations focused on only one or several animals and/or that animal processing activities were conducted in conjunction with other activities (habitation, plant processing, etc.). Animal remains from the single late Late Prehistoric period Firehole phase component (Component III of the Abel Creek site) suggest utilization of bison size, deer-pronghorn size, and jackrabbit size animals, although a large total number of remains was not associated. Deer-pronghorn size animals appear to have been the only taxon utilized during the single Protohistoric component (Stone Circle site) identified on this project.

13.1.5 Plant Macrofossils

Table 13.7 summarizes the results of flotation samples processed from numerous cultural features recorded in components at Bairoil. Samples were collected from all feature types and from components of all ages. Flotation samples were processed from 113 cultural features with a total volume of 284.2 liters of sediment floated. The small numbers of charred seeds (9) collected indicate very little evidence of seed processing. Seven charred goosefoot seeds were collected from two Uinta phase components at Site 48SW7107, with two charred seeds recovered from fill samples collected from a Green River phase housepit (Feature 35) at the Bald Knob site. Past flotation analyses within the project area and in other areas of the Wyoming reflect a similar pattern, with most charred seeds recovered from Late Prehistoric period (Uinta phase) components (Cummings 1989, Smith 1988).

Metates and/or manos, which are generally indicative of plant processing activities, were collected from 10 of the 16 components, with a number of groundstone artifacts associated with most of these components (Table 13.5). The groundstone tools suggest that the small number of charred seeds may not be indicative of the relative amount of plant processing activities, with the scant seed recovery possibly due to poor preservation. Virtually none of the cultural features recorded during the current project had preserved small or large charcoal fragments, suggesting that woody vegetative material is either poorly preserved or was completely combusted within the features. Flotation samples were processed from both thermal and nonthermal feature types, perhaps indicating that preservation factors rather than absence of seed processing activities are in part responsible for the limited seed recovery. However, the presence of the groundstone tools may indicate the processing of other parts of the plant such as roots, tubers or greens that would not have been preserved in the archaeological record.

13.2 CHRONOLOGY

This section incorporates the results of the Bairoil Archeological Project with past area cultural resource projects in order to summarize the cultural chronology of the Bairoil vicinity. Numerous radiocarbon dates have been obtained and many cultural components have been identified during past archaeological monitoring, salvage, and testing projects conducted in the vicinity of the Lost Soldier and Wertz oil fields (Moore et al. 1987, Latady et al. 1987, Greer and Greer 1989). Thirty-five additional radiocarbon age estimates were obtained and 16 components were identified during the Bairoil Archeological Project as discussed in previous sections of this report. A summary of these components and radiocarbon dates, and integration of these results with past cultural resource management projects will be presented in the following subsections. As stipulated in the DRP for the Bairoil Archeological Project (Zale 1989), the relationship of the newly identified cultural components with the cultural-historical sequence proposed for the Wyoming Basin (Metcalf 1987, Zier et al. 1983) is also briefly evaluated.

Table 13.7 Summary of Plant Macrofossils from Flotation Samples.

Site No./ Name	Component No.	No. of Features Sampled	Total Volume (liters)	Results
Plant	I	22	39.7	No charred seeds
48CR4686	I	19	65.75	No charred seeds
Abel Creek	I	5	11.0	No charred seeds
Abel Creek	II	1	3.0	No charred seeds
48SW7107	I	1	2.0	No charred seeds
48SW7107	II	1	4.0	Charred goosefoot seeds (4)
48SW7107	III	8	15.5	Charred goosefoot seeds (3)
Bald Knob	I	2	4.0	No charred seeds
Bald Knob	II	28	86.5	Charred goosefoot seeds (2)
Stone Circle	I	1	2.0	No charred seeds
48CR4681	I	5	12.0	No charred seeds
48CR4681	II	5	11.25	No charred seeds
48CR4681	III	10	18.0	No charred seeds
48CR4681	IV	5	9.5	No charred seeds
Total		113	284.2	9 charred seeds

13.2.1 Radiocarbon Dating Results

A total of 35 radiocarbon age estimates was obtained from wood charcoal and sediment samples collected from cultural features during the Bairoil Archaeological Project. The 35 estimates range in age from 230±60 to 7,490±70 years B.P. Radiocarbon age estimates (uncorrected and noncalibrated) have been presented in previous report sections for individual sites (and components), and Table 13.8 summarizes the uncorrected dates obtained during the project. Figure 13.3 shows the temporal distribution of the 35 estimates and their relationship to established cultural-historical sequences (Frison 1978, Metcalf 1987) that are pertinent to the project area. To facilitate comparisons with past archaeological investigations in the region, Frison's (1978) chronology is used exclusively in the next two report subsections, and the final subsection briefly discusses the project components relative to Metcalf's (1987) chronology.

The distribution of radiocarbon dates obtained from the current project indicates occupation of the project area from the Protohistoric until the

Table 13.8 Radiocarbon Age Estimates, the Bairoil Archaeological Project.

Site No./ Name	Component No.	Feature No.	Radiocarbon Age (years before present)	Sample Type	Lab Sample No. (Beta-)
48CR4681	I	34	7,490 ± 70	Sediment	41527
48CR4681	I	44	7,230 ± 100	Sediment	41528
48CR4681	I	46	7,110 ± 100	Sediment	41530
Bald Knob	I	53.1	6,610 ± 90	Sediment	42682
48CR4681	II	15	6,050 ± 100	Sediment	41522
Bald Knob	I	45	5,980 ± 90	Sediment	41548
Bald Knob	II	5.6	5,100 ± 80	Sediment	42684
48CR4686	I	8	4,990 ± 80	Sediment	41541
48CR4686	I	1.4	4,930 ± 30	Sediment	41540
Plant	I	64	5,030 ± 80	Sediment	41536
Plant	I	18	4,920 ± 80	Sediment	41534
Plant	I	45	4,840 ± 80	Sediment	41535
48CR4681	III	16	4,840 ± 90	Sediment	41523
Plant	I	55	4,810 ± 70	Sediment	41533
Bald Knob	II	8.1	4,760 ± 90	Sediment	41545
Bald Knob	II	15.5	4,710 ± 70	Sediment	41546
48CR4681	III	28	4,670 ± 70	Sediment	41525
48CR4681	--	29	4,550 ± 90	Sediment	41526
Bald Knob	II	17.1	4,530 ± 70	Sediment	41547
Bald Knob	II	20.1	4,530 ± 110	Sediment	41549
Bald Knob	II	58	4,430 ± 80	Sediment	42683
Bald Knob	II	35.1	4,400 ± 80	Sediment	41551
48CR4681	III	45	4,340 ± 80	Sediment	41529
48CR4686	I	7	4,330 ± 70	Sediment	41542
Plant	I	47	3,830 ± 80	Sediment	41532
48CR4681	IV	20	3,750 ± 80	Sediment	41524
48SW7107	I	1	3,560 ± 60	Sediment	41539

Table 13.8 (continued)

Site No./ Name	Component No.	Feature No.	Radiocarbon Age (years before present)	Sample Type	Lab Sample No. (Beta-)
48CR4681	IV	7	3,520 ± 60	Sediment	41521
Bald Knob	II	5.2	3,500 ± 60	Sediment	41550
Abel Creek	I	4	1,790 ± 60	Sediment	41543
48SW7107	III	6	1,460 ± 70	Wood charcoal	45538
48SW7107	II	2	1,390 ± 70	Sediment	41870
Abel Creek	II	1	1,260 ± 80	Sediment	41544
48SW7107	III	5A	1,110 ± 70	Wood charcoal	41537
Stone Circle	I	1	230 ± 60	Wood charcoal	41531

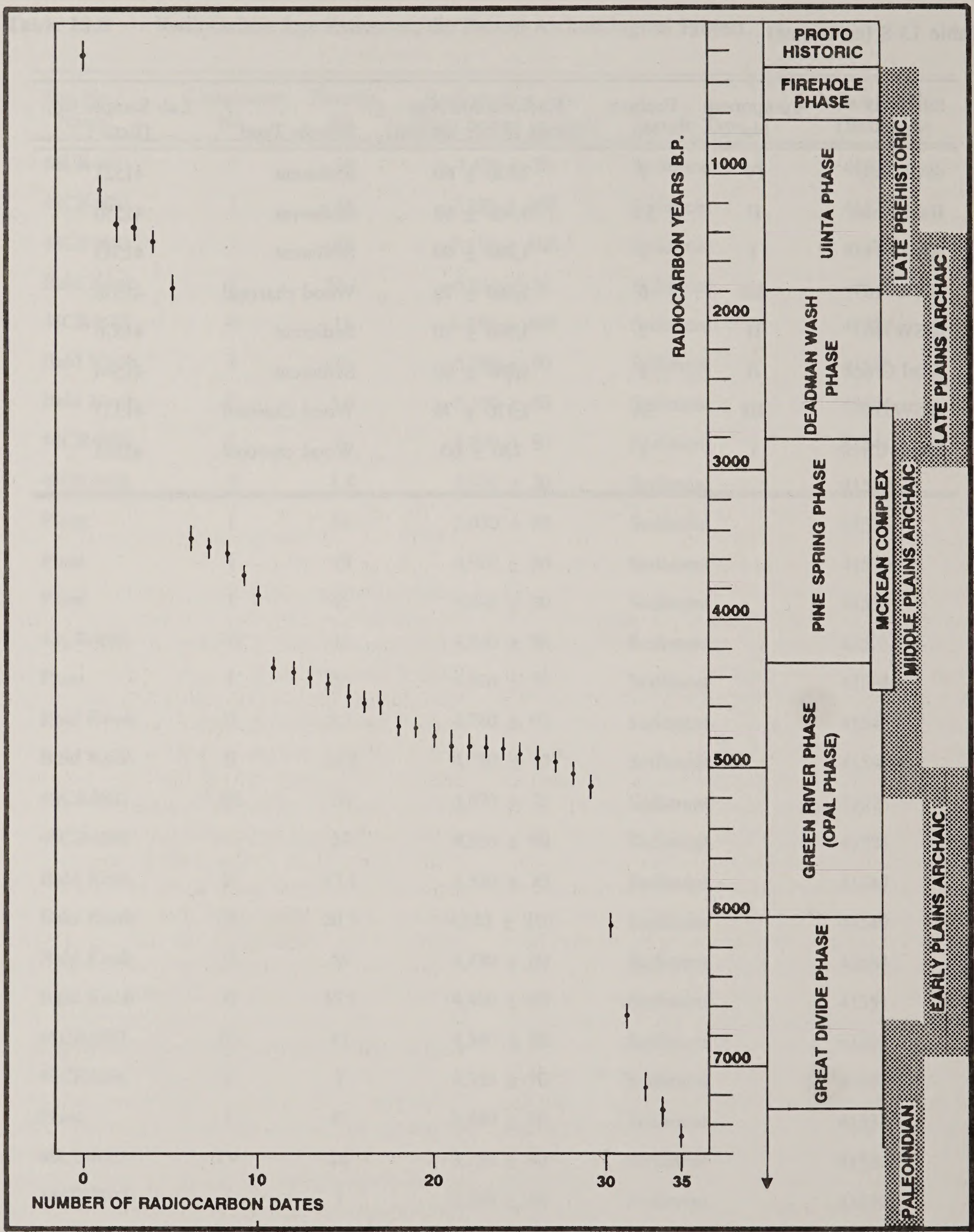


Figure 13.3 Distribution of Radiocarbon Age Estimates Relative to Pertinent Cultural-Historical Sequences (Frison 1978, Metcalf 1987).

late Paleoindian period, although continuous occupation is not indicated. Figure 13.3 shows that the greatest frequency of dates overlaps the terminal Early Archaic/early Middle Archaic periods with greater than 54% of the project dates occurring between 4,300 and 5,100 years B.P. Several other, less dense groupings of dates are indicated, including the Late Prehistoric period (1,400-1,000 years ago), the Middle Archaic period (3,800-3,500 year B.P), and the late Paleoindian period (7,500-7,100 years B.P). Few radiocarbon age estimates occur within the latter part of the Middle Archaic period, during much of the Late Archaic period, or during the Early Archaic period between 5,900 and 5,100 years ago.

Assessment of the significance of the peaks (and gaps) in the distribution of the 35 radiocarbon dates obtained during this project is limited by the nature of the sample of sites from which the dates were obtained. The nine sites investigated constituted a nonrandom sample of sites, with larger excavation blocks placed in sites with a high potential for architectural remains. Most components within these sites dated to the Middle/Early Archaic period; hence, the excavation of large blocks resulted in the recording of a much larger number of features (and the collection and submission of more samples for radiocarbon dating) from components representing these cultural-historical periods. Detailed analyses of the distribution of radiocarbon dates obtained from past projects in the Bairoil vicinity and within the Wyoming Basin have been presented in past Amoco sponsored projects completed near the project area, and these are summarized below.

Past cultural resource management projects completed in the vicinity of Bairoil have obtained 142 radiocarbon dates (Zale 1989:16-18) with many of these dates obtained near the current project area (Greer and Greer 1989:16-22, 23). Listings of previous radiocarbon dates are provided in the above referenced reports. Greer and Greer (1989) include a detailed discussion of the temporal distribution of these dates, as well as a comparison with all radiocarbon dates previously obtained from the Wyoming Basin. Figure 13.4 is adapted from their summary report of 1987-1988 investigations (Greer and Greer 1989: Figure 16-7) and presents a statistically smoothed curve that compares the project area dates with other southwest Wyoming radiocarbon dates. The figure indicates similar frequency distributions for the project area and the Wyoming Basin, although specific percentages differ slightly. The greatest frequency of dates in the Wyoming Basin occurs in the Late Prehistoric period (1600-600 years B.P.), with a much lower number of dates within the Late Archaic period, a relatively high frequency of dates in the early Middle Archaic and late Early Archaic periods (ca. 5,500-4,000 years B.P.), and few dates predating 7,000 years B.P.

The results of the Bairoil Archeological Project (Figure 13.3) generally concur with the frequencies shown in Figure 13.4, with peaks of dates within the Late Prehistoric period and during the Middle/Early Archaic periods. The major differences between the Bairoil Archaeological Project dates and the Wyoming Basin radiocarbon age estimates include relatively higher percentages of Early/Middle Archaic period dates (5,100-4,200 years B.P.) from Bairoil with a corresponding decreased frequency during the Late Prehistoric period, and a moderate frequency of dates (representing one component) between 7,500 and 7,100 years B.P. The radiocarbon ages of approximately 8,000 years ago from sites such as Culley's Dump (Moove et al. 1987) appeared upon additional test excavations, to be from features created by natural processes rather than from cultural activities (Reust et al. 1990).

13.2.2 Bairoil Project Cultural Components

A total of 15 prehistoric components and one protohistoric component was identified within block excavations completed during the Bairoil Archaeological Project. Temporal affiliation of 14 components was determined by radiocarbon dating results and/or temporally diagnostic artifacts, with the relative age of two components determined by stratigraphic location and temporally diagnostic

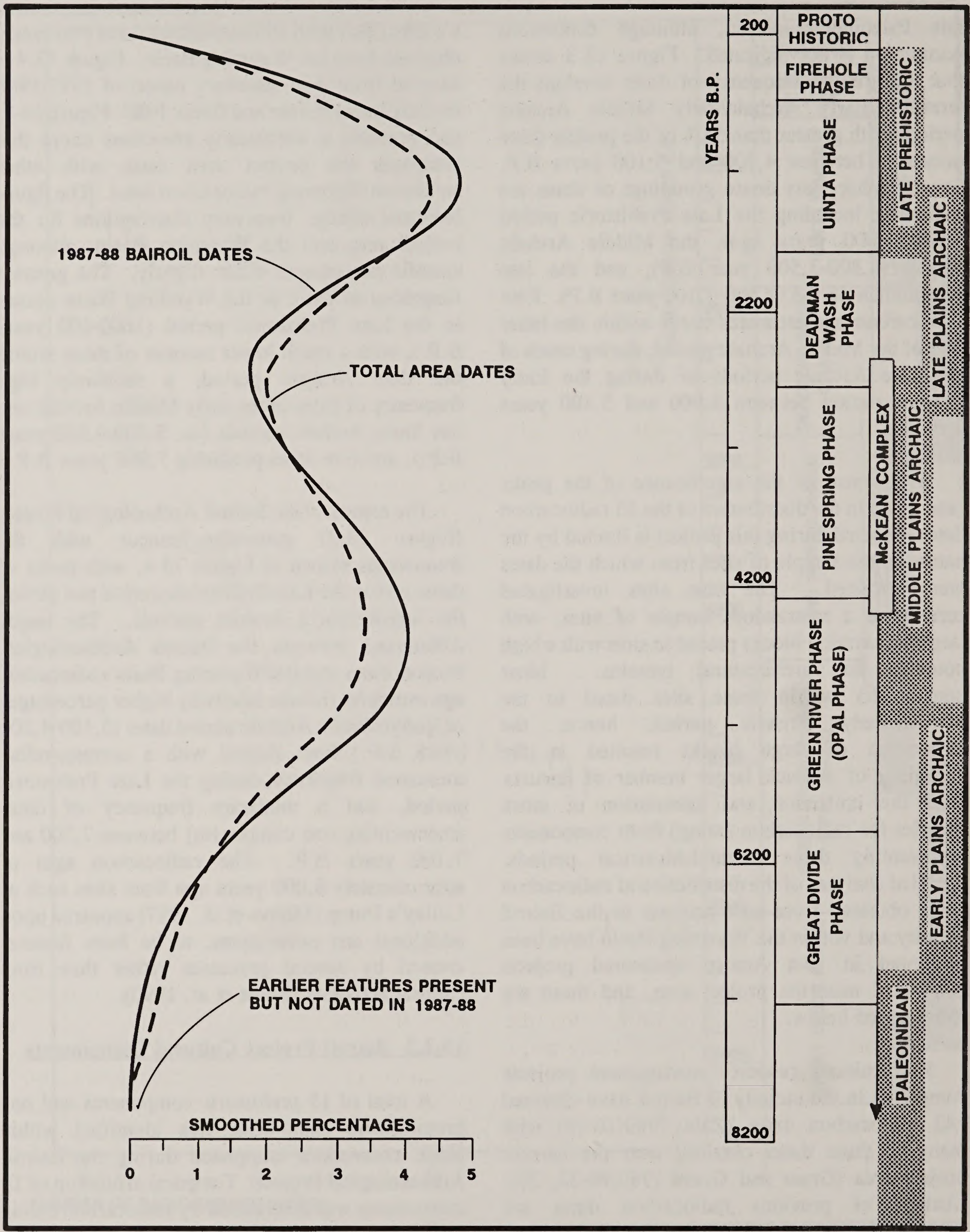


Figure 13.4 Comparison of Project Area Radiocarbon Dates with Southwest Wyoming Radiocarbon Dates (adapted from Greer and Greer 1989).

projectile points. As used in this report, the term "cultural component" refers to the smallest archaeologically definable temporal unit of cultural remains which could be analytically distinguished within a site. Due to the lack of stratigraphic separation between cultural features, some components (as discussed in previous sections of this report) represent multiple occupations on stable land surfaces that span at least several hundred years or more as indicated by radiocarbon dating results. Several examples include Component II at the Bald Knob site with numerous features including housepits recorded within the same cultural layer with accepted radiocarbon dates ranging between 5,100 and 4,400 years B.P., and Component I of Site 48CR4681 with three dates ranging from 7,490 to 7,110 years B.P.

Table 13.9 summarizes the total number of components identified within the Bairoil vicinity. The table includes the 16 components recorded during the current project and 58 components identified during past archaeological projects in the Bairoil vicinity as summarized by Greer and Greer (1989:16.16.). Like the distributional patterns of the radiocarbon dates (Figure 13.2), the greatest number of components occur within the Middle Archaic (37.8%) and Late Prehistoric periods (21.6%), with slightly fewer components recorded during the Early Archaic (20.3%) and Late Archaic (16.2%) periods and with few components dating to the Protohistoric (1.4%) and Paleoindian periods (2.8%). Relative to past summaries of Wyoming Basin radiocarbon dates (Wheeler et al. 1986, Metcalf 1987), the Bairoil vicinity data indicate a much greater percentage (nearly 60%) of prehistoric components dating to the Early/Middle Archaic periods, and with a much diminished percentage of Late Prehistoric period (21.6%). This suggests that the period of greatest intensity of occupation in the Bairoil vicinity occurred during the Early/Middle Archaic periods, and secondarily during the Late Prehistoric period. The differences may also be the results of preservation of certain land surfaces.

13.2.3 Discussion of Components by Metcalf's Phases

The sequence of prehistoric components in southwest Wyoming is usually addressed as part of a broader scheme for the Northwestern Plains defined by Frison (1978). This sequence is divided from early to late into the Paleoindian, Early Plains Archaic, Middle Plains Archaic, Late Plains Archaic, Late Prehistoric, and Protohistoric periods with each period defined by distinctive projectile point styles. For discussion purposes, the Plains designation within the Archaic period is deleted in this report. Using patterns in the frequency distribution of radiocarbon dated components with minimal reference to phase diagnostic traits, Metcalf (1987; Zier et al. 1983) has developed a cultural-historical scheme specifically for the Wyoming Basin. Metcalf divides the prehistoric chronology of the region (from earliest to latest) into the Paleoindian, Great Divide, Green River, Pine Spring, Uinta, and Firehole phases, and Protohistoric. The current project is situated near the northeast edge of the area considered by Metcalf (1987) in his cultural-historical outline, and results of excavations suggest that both the Metcalf (1987) and Frison (1978) chronologies are pertinent to the project components. Table 13.10 summarizes the placement of the 16 components within the two schemes, and the following discussion briefly summarizes each of the components relative to the assigned cultural affiliation.

13.2.3.1 Paleoindian Period

The Paleoindian period (about 12,000-7,300 years B.P.) in the region is characterized by a number of complexes identified by distinctive large lanceolate or stemmed projectile points, with subsistence oriented towards large mammals. Based on radiocarbon dating results (7,490-7,110 years B.P.) and one projectile point fragment, Component I of Site 48CR4681 appeared to represent several terminal Paleoindian occupations. The projectile point is the base of a split-stemmed biface with ground basal margins and may represent a Pryor Stemmed type which generally

Table 13.9 Summary of Cultural Components Identified Within the Bairoil Project Area.

	Cultural Historical Period						
Reference	Protohistoric	Late Prehistoric	Late Archaic	Middle Archaic	Early Archaic	Paleo-indian	Total
Mariah (current report)	1	4	2	6	2	1	16
Greer and Greer (1989)	0	12	10	22	13	1	58
Total[1]	1(1.4)	16(21.6)	12(16.2)	28(37.8)	15(20.3)	2(2.7)	74

[1] = number and percent.

Table 13.10 Cultural Affliation of Cultural Components.

Site/ Component No.	Age (Years B.P.)	Cultural-Historical Period (Frison 1978)	Phase (Metcalf 1987)	Diagnostic Elements (this project)
48CR4681/I	7,490-7,110	Paleoindian	Paleoindian	Split-stem projectile point (possible Pryor stem)
Bald Knob/I	6,610-5,980	Early Archaic	Great Divide	None
48CR4681/II	6,050	Early Archaic	Great Divide	None
Bald Knob/II	5,100-4,400	Middle Archaic	Green River	Housepits; side-notched projectile points
Plant/I	5,030-3,830	Middle Archaic	Green River	Side-notched projectile points
48CR4686/I	4,990-4,330	Middle Archaic	Green River	Housepit
48CR4681/III	4,840-4,340	Middle Archaic	Pine Spring	McKean complex projectile points
48CR4681/IV	3,750-3,520	Middle Archaic	Deadman Wash	Pelican Lake projectile points
48SW7107/I	3,560	Middle Archaic	Pine Spring	None
Abel Creek/I	1,790	Late Archaic	Deadman Wash	Corner-notched projectile points
48CR4681/V	--	Late Archaic	--	Besant projectile points
48SW7107/II	1,390	Late Prehistoric	Uinta	Side/corner-notched hafted drill/knife; corner-notched dart point
48SW7107/III	1,460-1,110	Late Prehistoric	Uinta	Corner-notched arrow point, side/corner-notched hafted drill/knife; stone circle
Abel Creek/II	1,260	Late Prehistoric	Uinta phase	None
Abel Creek/III	--	Late Prehistoric	Firehole	Side-notched arrow point
Stone Circle/I	230	Protohistoric	Protohistoric	Stone circle

dates from about 8,500-7,000 years B.P. (Frison 1978). Associated cultural features include a number of small pits that probably functioned as general-purpose firepits or hearths. Subsistence activities indicated by Component I cultural remains represent a generalized archaic hunting and gathering orientation focused on pronghorn, jackrabbits, and rodents and possibly plant processing, rather than specialized big game hunting that is typical of the earlier stages of the Paleoindian period. The overwhelming majority of animal remains from this component represent jackrabbit or smaller animals.

13.2.3.2 Great Divide Phase

The Great Divide phase (7300-5900 years B.P.) is the earlier of two phases identified by Metcalf (1987) within Frison's (1978) Early Archaic period. Components dating to this phase generally have minimal diagnostic material, and subsistence activities indicate generalized hunting-gathering with pronghorn and smaller mammals procured. Temporally diagnostic artifacts are large side-notched or stemmed projectile points (McKibbin et al. 1989). Component II (6,050 years B.P.) of Site 48CR4681 and Component I of the Bald Knob site (6,610-5,980 years B.P.) represented Great Divide phase components. No diagnostic Early Archaic period artifacts were obtained from the two components although a reutilized Paleoindian projectile point was associated with the Bald Knob site component. Each component was identified by small basin features, and flaked stone, and groundstone tools, with animal remains collected from Site 48CR4681 generally indicating utilization of deer-pronghorn and smaller animals. Groundstone artifacts from both components suggested that subsistence activities may have included plant processing. The remains from both components are nondescript and without temporally or culturally diagnostic elements, and they are similar to remains typical of most Archaic period components in the region.

13.2.3.3 Green River Phase

The Green River phase represents the second part of the Early Archaic period and was initially separated from the preceding Great Divide phase by a peak in the number of radiocarbon dates (Metcalf 1987). Subsuquent investigations have suggested that this peak no longer exists and that the Green River phase should extend from about 6,000 to 4,300 years B.P. (McKibbin et al. 1989). This range correlates with the temporal distribution of housepits which represent the most culturally diagnostic trait identified with this phase. A variety of side-notched dart points or hafted knives (Newberry and Harrison 1986) is characteristic of this phase, as with the preceding Great Divide phase, with subsistence remains indicating an emphasis on smaller animals and plant processing (Eakin 1986). The latter part of this phase (5,000-4,300 years B.P.) overlaps with the Middle Archaic period which is identified by the presence of McKean complex stemmed and lanceolate projectiles. Results obtained from the current project suggest that Green River phase cultural groups and Middle Archaic period (Pine Spring phase) McKean complex groups occupied the project area between 5,000 and 4,300 years B.P. The assignation of individual components to either the Pine Spring or Green River phase is based on the types of associated projectile points and/or the presence of housepits. A recent appraisal of the Green River phase by Metcalf (McKibbin et al. 1989) proposed a name change from the Green River to the Opal phase as suggested by Wheeler et al. (1986) to avoid confusion with the previously identified Green River phase for the northern Colorado Plateau (Schroedl 1976).

Three sites investigated during the Bairoil Archaeological Project including Component II at the Bald Knob site and single components at Site 48CR4686 and the Plant site represented Green River phase occupations. These components were identified on the basis of radiocarbon dates, the presence of side-notched projectile points (two components), and housepits (two components). Green River phase remains from the Bald Knob site date between 5,100 and 4,400 years B.P., with four side-notched projectile points and six housepits associated. As noted in Section 9.0, the distribution of radiocarbon dates suggests that possibly three periods of occupation were represented by the six housepits. Associated cultural remains include numerous cultural features such as deep, heavily oxidized cylindrical and bell-shaped pits, flaked and groundstone tools, debitage, and a limited number of animal remains. Site 48CR4686 had one housepit and 18 oxidized or unoxidized basin features, with no temporally diagnostic artifacts and few other artifacts associated. Radiocarbon age estimates for the component at Site 48CR4686 range from 4,990 to 4,330 years B.P. Subsistence remains indicate utilization of a broad range of animals including pronghorn, jackrabbit, rodents, and freshwater mussels with little evidence of plant processing activities. No housepits were recorded from the Plant site, although a number of deep oxidized and unoxidized pits and one flaked stone tool cache were recorded. Four of five radiocarbon dates range from 5,030 to 4,810 years B.P., and a number of side-notched projectile points or knives are associated. Animal remains indicate that a broad range (bison to rodent size) of animals were utilized, and numerous groundstone artifacts suggest plant processing activities, although no plant macrofossils were recovered.

As noted above, housepits represent a common element within many Green River phase components. Housepits recorded during this project are similar to most previously investigated housepits and are defined by shallow oval depressions (25-50 cm) that are about 3 m in diameter. A characteristic of most housepits, including the six excavated during the current project, is the presence of multiple subfeatures and the association of a very limited amount of cultural remains.

13.2.3.4 Pine Spring Phase

The Pine Spring phase as defined by Metcalf (1987) dates from about 4,800-4,300 to 2,800 years B.P. and occurs within the Middle Plains Archaic period as defined by Frison (1978). Within the Wyoming Basin, the beginning of the Middle Archaic period (Pine Spring phase) is marked by the initial occurrence of McKean complex artifacts (McKibbin et al. 1989). Sites dating to the Middle Archaic period within the Northwestern Plains typically contain distinctive projectile point types assigned to the McKean complex, including McKean Lanceolate, Duncan, Hanna, and Mallory types. Components dating to this general period in areas to the west sometimes contain side- or corner-notched dart points (Newberry and Harrison 1986, McGuire and Bertram 1986), as well as lanceolate and stemmed varieties typical of the McKean complex (Wheeler et al. 1986). These two distinct morphological classes of projectile points (McKean complex and side/corner-notched types) may be indicative of two distinct cultural groups (or at least influences from two distinct areas) which are sometimes grouped within the Middle Archaic period (Pine Spring phase). As noted in the discussion of the Green River phase, components within the project area dating to the early Middle Archaic period (Frison 1978) include one component with diagnostic artifacts representative of the McKean complex, and multiple components with side-notched projectile points distinctive from the McKean complex.

Two of the components appear to represent Pine Spring phase occupations based on radiocarbon dates and/or temporally diagnostic artifacts. As noted above, McKean complex style artifacts are interpreted to represent the Pine Spring phase, with the corner- and side-notched types more typical of the earlier Green River phase. Three fragmentary projectile points including two McKean Lanceoloate types and one Hanna type indicate that Component III at Site 48CR4681 represented a Pine Spring phase component, and three radiocarbon dates (4,840-4,340 years B.P.) suggest that it also represented multiple Middle Archaic period occupations. Cultural remains, including faunal remains and groundstone tools, indicate that a broad spectrum hunting and gathering adaptation was represented by this component. Component I at Site

48SW7107 was dated at 3,560 years B.P. and may have represented a Pine Spring phase occupation, although no temporally or culturally diagnostic artifacts were obtained from this component. Cultural remains are sparse and suggest an adaptation similar to that described for Component III at Site 48CR4681.

13.2.3.5 Deadman Wash Phase

The Deadman Wash phase occurs between 2,800 and 1,800 years ago (Metcalf 1987), and cultural traits associated with this phase have not been well-defined. This phase correlates with the Late Plains Archaic period (Frison 1978), and most sites within the regions which date to this period are characterized by large side- or corner-notched projectile points, including Mummy Cave (McCracken et al. 1978) and Spring Creek Cave (Frison 1965), although McKean style points were noted along with corner-notched types at the Deadman Wash site (Creasman 1984). The Late Plains Archaic period in the Northwestern Plains is characterized mostly by corner-notched dart points similar to Pelican Lake types, as well as other large corner-notched types (Frison 1978). Based on evidence from extensive investigations on the Shute Creek project in southwest Wyoming, Wheeler et al. (1986) suggest the restriction of the Deadman Wash phase to between 2,800 and 2,500 years B.P.

Based on radiocarbon dating results and/or temporally diagnostic projectile point styles, three components investigated during the Bairoil Archaeological Project occur within this phase. Two radiocarbon age estimates (3,750 and 3,520 years ago) place Component IV of Site 48CR4681 within the Middle Archaic period, although temporally diagnostic artifacts are side- and corner-notched varieties more similar to Late Plains Archaic period types. The range of types includes those resembling Pelican Lake types, as well as some reminiscent of Yonkee style points. The context of the two dated cultural features and Component IV artifacts may represent an erosional and/or stable land surface, and there is a possibility that multiple occupations are represented. This component may represent little known cultural groups which appear towards the terminal Middle Archaic period (Frison 1991). The types of cultural remains indicate a generalized hunting and gathering subsistence pattern for Component IV.

Component I of the Abel Creek site was dated at 1,790 years B.P., and the four temporally diagnostic projectile points or hafted knives represent a similar type. The points are a large, expanding stem, corner-notched variety with convex bases that are generally dissimilar to Pelican Lake types. Site activities appear to have been oriented towards intensive processing of bison size and deer-pronghorn size animals.

Component V of Site 48SW4681 was undated, but based on the recovery of a Besant dart point and stratigraphic location probably dated between 2,000 and 1,500 years B.P. Besant materials on the Northwestern Plains are generally associated with a sophisticated bison hunting adaptation (Frison 1991). The lack of cultural features limits interpretations of Component V activities, although very little groundstone was recovered which may indicate an orientation towards hunting activity. Animal remains represent both bison size and deer-pronghorn size animals, with no smaller animals identified. Although this component occured within the temporal range of the Deadman Wash phase (Metcalf 1987), the material culture is dissimilar.

13.2.3.6 Uinta Phase

After a transition period from about 1,800 to 1,600 years ago, the Uinta phase continues to about 650 years ago in the Metcalf chronology (McKibbin et al. 1989). The Uinta phase corresponds with the first part of the Late Prehistoric period on the Northwestern Plains (Frison 1978). A large increase in the frequency of radiocarbon dates marks this period, as does the widespread use of bow and arrow hunting technology rather than the dart-based technology of the Archaic periods. Most temporally diagnostic artifacts are small, corner-notched dart points representative of Rose Spring Corner-notched types, and ceramics also occur at a few sites. Subsistence remains indicate utilization of a variety of large and small animals, and a greater exploitation of seeds from weedy species (Smith and Creasman 1988). Small housepits have also been documented from Uinta phase sites (Harrell 1989).

Based on radiocarbon dating results and/or temporally diagnostic artifacts, three Uinta phase components were identified at Bairoil. A radiocarbon age estimate of 1,260 years ago was obtained from Component II at the Abel Creek site. Subsistence remains suggest that limited processing of one or more deer-pronghorn size animals was the main activity. Components II and III from Site 48SW7107 represented the Uinta phase. Component II was dated at 1,390 years ago and was identified by one small hearth-centered activity area. Activities were oriented toward processing of one pronghorn. Two radiocarbon age estimates (1,460 and 1,110 years B.P.) were obtained from Component III, though the spatial distribution of remains suggests that only one occupation is represented. The cultural remains are associated with a stone circle with two external work or resource processing areas situated adjacent to the structure. Component activities included processing of a variety of animals including bison size, deer-pronghorn size, and rabbit size and smaller. Temporally diagnostic artifacts collected from the two Uinta phase components at Site 48SW7107 include a corner-notched arrow point, one large side- or corner-notched hafted knife or drill from each component, and a large side- or corner-notched dart point from Component II. The large hafted knives/drills are similar to tools collected from Uinta phase components to the west of the project area (McNees et al. 1989).

13.2.3.7 Firehole Phase

The final phase proposed by Metcalf (1987) is the Firehole phase, which dates from about 650 years ago to the start of the Protohistoric period (McKibbin et al. 1989). In southwest Wyoming, this phase is distinguished from the Uinta phase by a decreased number of radiocarbon dates, the introduction of small side-notched arrow points, and Intermountain Ware (Shoshonean) pottery. This phase corresponds with the latter stages of Frison's (1978) Late Prehistoric period. The single Firehole phase component identified during the Bairoil Archaeological Project was heavily impacted by erosion, which limits interpretations of activities. No cultural features were associated, and no radiocarbon dates were obtained, although one small side-notched projectile point suggests that Component III at the Abel Creek site represented a Firehole phase occupation. No cultural features were associated with Component III, and activities included processing of a variety of animals including bison size, pronghorn size, and jackrabbit size.

13.2.3.8 Protohistoric Period

As defined by Metcalf (1987), the Protohistoric period begins at the time of European settlement on the continent (300 years B.P.) and ends in the early 1800s. Protohistoric sites have seldom been investigated in the area. Two sites in southwest Wyoming have been reported including the Eden-Farson site (Frison 1971) and the Skull Point site (McGuire 1977). Neither site had trade goods associated with the aboriginal component. The single component investigated at the Stone Circle site dated to 230 years B.P., but no temporally or culturally diagnostic artifacts were associated. Artifacts include several pieces of debitage and a ceramic ball or sphere. Subsistence activities appear to have been focused exclusively on deer-pronghorn size animals. Based on tribal distributions at the time of European contact, the occupants of Site 48SW2613 were probably a Shoshonean cultural group (Cowie 1958, Bamforth 1987).

13.3 ANALYSIS OF SITE ACTIVITIES

One of the major research topics of the DRP for the Bairoil Archaeological Project was the analysis and identification of site activities (Zale 1989). The delineation of the kinds of activities, the time of year of occupation, and the location of the prehistoric activities at individual sites is the first step toward determining site function. Eventually, the functions of individual sites will provide background for developing regional settlement and subsistence models.

For this analysis, two approaches were used to obtain clues concerning site activities and site function. First, as proposed in the DRP (Zale 1989), the kinds of cultural remains recovered from individual sites excavated during the Bairoil Archaeological Project are considered in relation to three idealized activity area types as hypothesized by Creasman et al. (1985). Each of the three idealized activity area types -- plant processing, animal processing, and residential -- is defined by a specific set of archaeological attributes. The other focus of the site activity analysis is the examination of the spatial patterning of the archaeological remains, or site structure (Binford 1983). Though both cultural and natural processes contribute to the resulting patterning in the archaeological record, the study of these patterns can reveal some information concerning the use of space by the prehistoric inhabitants. Understanding the use of space can then provide clues about site activities and function. The discussion of site structure relies on the results of ethnoarchaeological research of modern hunters and gatherers and analogies from ethnohistorical and ethnographical sources.

13.3.1 Comparisons to the Idealized Activity Area Types

As required by the DRP (Zale 1989), the three idealized activity area types -- plant processing, animal processing, and residential -- hypothesized by Creasman et al. (1985) are tested using data resulting from sites excavated during the Bairoil Archaeological Project. Each of these idealized activity area types is defined by specific set of archaeological attributes that can be compared with data from each excavated site. These comparisons can then be used to type each excavated component or activity area to one of the three hypothesized types.

Ideally, each activity area within a site component should be compared with the idealized activity area types separately. However, it was not possible to separate individual activity areas within the sites or components excavated during the Bairoil Archaeological Project, and all remains from excavated components are lumped together. The first difficulty in separating individual activity areas was delineating their boundaries and determining what should be considered an activity area. Ethnoarchaeological research of modern hunters and gatherers has shown that most site activities occur within the household areas which are often composed of a structure and outside domestic work areas (Bartram et al. 1991, O'Connell 1987, O'Connell et al. 1991, Yellen 1977). Activities occurring in these household areas usually overlap spatially, and the resulting remains from the different activities cannot be separated archaeologically. Another problem with separating individual activity areas for this analysis was the limited number of remains recovered from several of the large blocks excavated at some of the sites. Dividing the recovered remains into smaller units than the entire component would have created sample sizes too small for comparisons. Lumping remains from entire components should not change the results of this analysis because similar types and density of remains were recovered throughout each of the component and site areas.

Following Smith and Creasman's (1988) summary of the model, 14 archaeological attributes are used to distinguish the three idealized activity area types (Table 13.11). Attribute 1, the presence of hearths, is a requirement for all activity area types. The presence of anvils, hammerstones, fleshing tools, and/or cleaver/choppers, Attribute 2, is a trait only for animal processing areas. Plant processing and residential areas should contain groundstone (Attribute 3). For Attribute 4, pollen washes from groundstone should yield pollen from economic plants with one or two species dominating, and negative and positive results should be obtained from groundstone belonging to residential areas. Feature fill from plant processing and residential

Table 13.11 Summary of Hypothetical Attributes for the Three Idealized Activity Area Types as Presented in the DRP and Hypothesized by Creasman et al. (1985) (after Smith and Creasman 1988).

Hypothesized Attribute	Plant Processing[1]	Animal Processing[1]	Residential[1]
1. Hearths	+	+	+
2. Anvil, hammerstone, fleshing tool, and/or cleaver/chopper	-	+	-
3. Groundstone	+	-	+
4. Positive results from pollen wash of groundstone	+	NA	+ and -
5. Economic plant remains from features	+	-	+
6. Economic plant remains from occupation floor	+	-	+
7. Index of groundstone to flaked lithic tools	Greater than 10.0	Less than 2.0	2.0-10.0
8. Number and type of economic animal species present	2 or fewer small to medium and 1 or no large animals	More than 1 large animal	Total of 3 or more species
9. Large animal percentage of bone elements present of total skeleton	Less than 20%	Greater than 50%	20-50%
10. Bone elements represent butchering units	-	-	+
11. Bone elements crushed and broken	-	+	-
12. Flaked debitage constituents:			
Primary Flakes	Less than 5%	Less than 5%	2%
Secondary Flakes	Less than 5%	Less than 5%	10%
Tertiary Flakes including micro and submicroflakes	Less than 90%	Less than 90%	84%
Other types	Less than 5%	Less than 5%	4%
13. Diversity of flaked stone artifact types	Low	Higher	Highest
14. Patterned distribution of cultural material	+	+	+

[1] + = present
- = absent
NA = not applicable.

areas should yield economic plant remains (Attribute 5). Plant processing and residential areas should produce either plant macrofossil or plant microfossil remains of economic plants (Attribute 6).

Attribute 7, the index of groundstone to flaked stone tools, is computed by the number of groundstone tools divided by the number of flaked stone tools multiplied by 100. This index should be greater than 10 for plant processing activity area types, less than two for animal processing areas, and between two and 10 for residential activity areas. Attribute 8 concerns the number and type of economic animal species that should occur in each activity area type. Two or fewer small to medium animals and one or no large animals should be present at plant processing areas; remains of more than one large animal should occur at animal processing areas; and residential areas should have three or more species present. The percentage of large animal bone elements of total skeleton for Attribute 9 is calculated by dividing the number of observed bone elements of a species by the total number of bones in the skeleton (roughly 175) and multiplying by 100. The percentage should be less than 20 for plant processing areas, greater than 50 for animal processing areas, and between 20 and 50 for residential areas. Butchering units should occur only at residential areas (Attribute 10). Crushed and broken bone elements (Attribute 11) should be present only at animal processing areas.

Attribute 12 concerns the percentages of the various flake types expected for each of the activity area types. The distribution of flake types hypothesized for residential areas is 84% tertiary, 10% secondary, 2% primary, and 4% other. Animal and plant processing areas should contain less than 90% tertiary flakes. The diversity of flaked stone artifacts, Attribute 13, is figured by the number of types observed in a specific sample divided by the total number of possible tool types. In this analysis, 11 was used as the total possible number of tool types. According to the model, the diversity of flaked stone tools should be lowest for plant processing areas and highest for residential activity areas. Attribute 14 notes that the distribution of cultural remains should be patterned for each of the activity area types.

The 14 attributes were computed for the data from Components I, III, and IV at Site 48CR4681, Component II at the Bald Knob site, Site 48CR4686, the Plant site, the Abel Creek site, and Component III at Site 48SW7107. These sites and components were chosen to encompass all cultural historic periods (Late Paleoindian-Late Prehistoric periods) present at sites excavated during the Bairoil Archaeological Project and to include the three environmental zones (foothill, dunal flat, and riparian) present in the area. Additionally, the chosen sites contained the largest and most diverse samples of recovered remains of the excavated sites and components. The results of the analysis are provided in Table 13.12.

A comparison of the results from the sites and components excavated during the Bairoil Archaeological Project with the hypothesized attributes for the three activity area types indicates that, depending on the attribute, a mixture of activity area types is suggested for most components or sites. The comparisons suggest that most sites or components are residential or plant processing according to Attributes 2 and 3, animal processing according to Attributes 5 and 11, plant processing according to Attributes 7 and 9, and residential according to Attributes 8 and 10. For some attributes such as Attribute 12 (flaked debitage constituents) the data from the excavated sites and components did not correspond to any of the activity area types.

General observations of the data from these sites and components including the spatial analysis of the remains indicate that most are short-term residential camps occupied by foragers during the winter or spring. Several of the sites contain the remains of structures (housepits and stone circles), and examination of the horizontal distribution of the recovered remains at many of the sites suggested the presence of household or domestic activity areas which is considered to be an attribute of residential camps (see discussion in

Table 13.12 Summary of Data from Select Components Excavated During the Bairoil Archaeological Project for Comparisons with the Hypothetical Idealized Activity Area Types.

	Hypothesized Attributes	Site 48CR4681			Bald Knob Site	Site 48CR4686	Plant Site	Abel Creek Site	Site 487107
		CI	CIII	CIV	CII				CIII
1.	Hearth	+	+	+	+	+	+	+	+
2.	Anvil, hammerstone, fleshing tool, etc.	-	+	-	-	-	+	-	-
3.	Groundstone	+	+	+	+	+	+	+	+
4.	Positive results from pollen wash of groundstone	NA	NA	NA	NA	NA	NA	NA	NA
5.	Economic plant remains from features	-	-	-	+	-	-	-	+
6.	Economic plant remains from occupation floor	-	-	-	-	-	-	-	-
7.	Index of groundstone to flaked stone artifacts	33.0	68.0	4.3	46.0	25.0	136.0	62.0	81.0
8.	Number and type of animal species present:								
	Number of large animals	2	2	1	1	1	3	2	2
	Number of small animals	3	6	2	4	3	7	1	4
	Total number of species	5	8	3	5	4	10	3	6
9.	Percentage of bone elements present of total								
	skeleton:	NA	2.28%	NA	NA	NA	6.8%	2.28%	0.57%
	Bison	0.57%	NA	NA	0.57%	NA	1.1%	0.57%	0.57%
	Large mammal	2.28%	NA	1.7%	NA	NA	4.0%	NA	NA
	Pronghorn	NA	2.28%	1.7%	NA	7.7%	NA	2.8%	1.1%
	Deer-Pronghorn size								
10.	Bone elements represent butchering units	+	+	-	-	+	+	+	-
11.	Bone elements crushed and broken	+	+	+	+	+	+	+	+

Table 13.12 (continued)

	Hypothesized Attributes	Site 48CR4681			Bald Knob Site	Site 48CR4686	Plant Site	Abel Creek Site	Site 487107
		CI	CIII	CIV	CII				CIII
12.	Flaked debitage constituents:								
	Primary Flakes	4.2%	1.5%	2.8%	1.0%	7.7%	1.8%	0.02%	2.8%
	Secondary Flakes	15.3%	13.8%	11.4%	19.2%	15.9%	5.4%	3.1%	17.1%
	Tertiary Flakes	71.0%	74.6%	78.0%	67.5%	55.8%	86.4%	94.0%	75.1%
	Other Types	9.7%	10.8%	7.7%	12.3%	21.9%	6.3%	2.6%	5.0%
13.	Index of diversity of flaked stone artifact types	.18	.64	.64	.64	.19	.55	.36	.45

[1] + = present
- = absent
NA = not applicable.

Section 13.3.2). Most of the sites and components yielded only a limited number of remains and lacked refuse disposal areas, indicating short-term occupations of highly mobile hunters and gatherers. The function of some of these sites and components is discussed in more detail in Section 13.3.2.

One problem with the idealized activity area type model is the assumption that the plant processing, animal processing, and residential activities occur in segregated areas across space in a site or within a regional settlement system. Ethnoarchaeological research of modern hunters and gatherers has shown that most activities are not segregated and most activities at camps occur within the household areas which are often composed of a structure and outside domestic work areas (Bartram et al. 1991, O'Connell 1987, O'Connell et al. 1991, Yellen 1977). Activities occurring in these household areas usually overlap spatially and the resulting remains from the different activities cannot be separated archaeologically. Activities conducted within household activity areas include animal and plant processing, cooking, tool production and maintenance, visiting, and sleeping. Household activity areas should contain remains representing several of these activities. The spatial analysis of the recovered remains from some of the components detailed in Section 13.3.2 indicates that activities were not segregated at the sites excavated for the Bairoil Archaeological Project and remains representing several kinds of activities were recovered from the same area.

The idealized activity area type model also assumes that the prehistoric inhabitants of Wyoming were collectors with a logistical mobility strategy, in contrast to foragers with a residential mobility strategy. According to Binford (1980), collectors using a logistical mobility strategy send task forces to specialized sites where foods are collected and processed for larger groups at residential base camps. Foragers with a residential mobility strategy move residential camps to the desired resource and collect foods for immediate use. Hunters and gatherers with a logistical mobility strategy would have task-specific sites where activities such as animal or plant processing would be the major focus. This settlement strategy could produce animal or plant processing sites or activity areas as suggested by the activity area type model. However, data from sites excavated during the Bairoil Archaeological Project and other excavated sites (McNees et al. 1989, Smith and Creasman 1988) in southwest Wyoming indicate that the prehistoric hunters and gatherers of the area used a residential mobility strategy. Studies have also shown that intensive activities such as the processing of seeds occurred at residential camps at least during the Late Prehistoric period (Harrell 1989, Smith and Creasman 1988).

Similar problems in computing and comparing the various attributes were encountered with the data from the Bairoil Archaeological Project as with previous studies (Harrell 1989, Smith and Creasman 1988). For example, problems have arisen in relating data from excavated sites to the hypothesized attributes concerning animal remains (Attributes 8-11). Due to the fragmentary nature of most of the recovered bones, only a small sample was identified to elements and species, creating a limited amount of information suitable for comparisons. Another problem is the simple notation of the presence and absence of plant macrofossil and microfossil remains for the attributes concerning plant remains (Attributes 4-6). The occurrence of high frequencies of pollen from an economic species in a feature or on an occupation floor could represent quite different activities than the recovery of thousands of charred seeds. The index of groundstone to flaked stone artifacts (Attribute 7) was misleading for most sites and components examined for the Bairoil Archaeological Project because of the small sample size of flaked stone tools. As with previous studies (Harrell 1989, Smith and Creasman 1988), the percentage of flake types (Attribute 12) did not correspond to any of the idealized activity area types. Because the flake types are defined by the amount of cortex, the percentages of each type in a collection depend partly on the type of material. For the index of diversity of flaked stone artifacts

(Attribute 13), the proposed model provides no quantified criteria to evaluate the model. Additionally, the model does not state how many of the 14 attributes need to represent a certain activity area type for the activity area to be classified as that particular type.

Lumping all sites or activity areas into only three groups can be misleading and eliminates the possibility of studying other types of activities and obtaining information concerning the variation and diversity of activities in the region. Though the proposed model has considerable problems, attempting to group sites into various functional types using a particular set of attributes is a step toward exploring problems of a more regional nature. However, the model needs to be revised so the attributes to be tested to reflect the diversity and range of site types in the region. The attributes should take into consideration the type of mobility strategy (logistical and residential), modes of predation (search and pursuit), and occupancy duration (Chatters 1987).

The examination and comparison of the spatial distribution of features and other remains with the results of ethnoarchaeological studies of modern hunters and gatherers provide clues to the prehistoric inhabitants' use of space and kinds of activities at a site. Studying the spatial relationship of the remains can provide information concerning the season of occupation, length of stay, kinds of activities, and whether resources were processed for storage or immediate consumption at the site. This information can then be used to determine site type and function. Obtaining a clearer understanding of the prehistoric inhabitants' use of space will eventually allow the development of archaeological attributes that can be used to define the various site types in the region. For example, ethnoarchaeological research and the examination of the use of space at four components excavated during the Bairoil Archaeological Project have shown that most activities at a residential camp occur in household activity areas and the remains from these activities are not segregated (see Section 13.3.2). The presence of household activity areas where several kinds of activities are represented could be an attribute of residential camps. Section 13.3.2 explores the use of space at four of the components excavated during the Bairoil Archaeological Project.

13.3.2 Site Structure and the Use of Space

This section focuses on the use of space at four components excavated during the Bairoil Archaeological Project. Understanding the use of space can provide clues about site activities and function which can lead to the development of site types in a settlement system of the region. An understanding of the use of space of the prehistoric inhabitants can be obtained from examination of the spatial patterning of the archaeological remains, or site structure (Binford 1983). Though both cultural and natural processes contribute to the resulting patterning in the archaeological record, the study of these patterns can reveal some information concerning the use of space by the prehistoric inhabitants. The discussion on site structure relies on the results of ethnoarchaeological research of modern hunters and gatherers and analogies from ethnohistorical and ethnographical sources.

The four excavated components examined in this section are Component I at Site 48SW7107, Site 48CR4686, Component II at the Bald Knob site, and the Plant site. Component I at Site 48SW7107 contained a buried stone circle dating to the Late Prehistoric period; Site 48CR4686 and Component II at the Bald Knob site consist of housepits belonging to the Early Archaic period; and the Plant site an Early Archaic period site lacking housepits. These components were fairly intact which allowed examination of site structure. Additionally, this analysis provides an opportunity to obtain clues concerning the use of space at sites containing different kinds of structural remains (stone circles and housepits) dating to different cultural-historical periods.

13.3.2.1 Component III at Site 48SW7107

One occupation layer that was fairly intact that could provide some information concerning site function by examining site structure is Component III at Site 48SW7107. This component had radiocarbon ages of 1,110 and 1,460 years ago which places the component within the Late Prehistoric period (Uinta phase). Though the radiocarbon ages are separated in time, the component appears to represent a single occupation. This component provided an opportunity to examine the use of space at a Late Prehistoric period site with a stone circle.

The excavated portion of the component contained a stone circle and two generalized, outside work areas (Figure 13.5). The stone circle consisted of a circular alignment of large, unmodified granite rocks measuring approximately 5-6 m in diameter. This alignment of rocks probably represents a structure that was made of hides or brush. The alignment of the rocks indicates that the opening of the structure faced northeast away from the southwest prevailing winds. Within and near the back of the structure were two pit features, a rock-filled basin and an unoxidized basin which probably represent some type of hearths. Recovered remains in the back of the structure are sparse and consist of only a projectile point, preform, a utilized flake, and two metate fragments. The other portions of the metate were recovered from the central, outside activity area.

The back portion of the housepit was probably used for sleeping. Individuals could have slept in the areas immediately around the hearths as shown by Hayden's (1979) ethnoarchaeological studies in Australia. Ethnoarchaeological studies have shown that sleeping areas and hearths were not used exclusively for sleeping, but other activities occurred in the area (Binford 1983, Hayden 1979, O'Connell 1987). These activities could range from eating a meal to manufacturing and repairing tools. The presence of the few flaked stone tools and metate fragments could represent craft production and tool maintenance activities conducted in the sleeping area. As noted by Binford (1983) from a study of the spatial distribution of remains within a Nunamiut Eskimo structure, tools used within a confined space are often lost along the edges which may be the case near the back of the structure at Site 48SW7107.

The three pit features with associated debitage and small/very small mammal bone concentrations located in front of the structure opening represents the generalized, central domestic work area. Ethnoarchaeological studies of modern hunters and gatherers have shown that many of the day-to-day endeavors take place in areas just outside of structures (Binford 1983, O'Connell 1987, Yellen 1977). Many hunters and gatherers have outside cooking hearths where generalized domestic activities take place. Remains from several activities such as cooking, eating, and the manufacture and maintenance of tools and equipment are often not segregated in generalized, domestic activity areas (Yellen 1977).

As evidenced by the remains associated with the three outside hearths, activities such as cooking and maintenance of tools occurred in the generalized domestic work area at Site 48SW7107. The meals cooked in the area probably consisted of primarily small mammals. The unmodified rock located just north of the features may have served as a anvil for processing the small mammals. The presence of groundstone suggests that some type of plant processing was also an activity in the area. The plant processing probably focused on plant parts other than seeds, because the three features lacked charred seeds. Plant parts such as roots and tubers would not be preserved in the archaeological record. The absence of bifaces in the early stages of reduction and the presence of mostly tertiary and microflakes indicate that tool maintenance activities occurred at the site and tool manufacturing was not important at the site.

The two hearths, the debitage concentration, and the medium/large mammal bone concentration located along the east side of the structure appear to be another outside hearth-centered activity area.

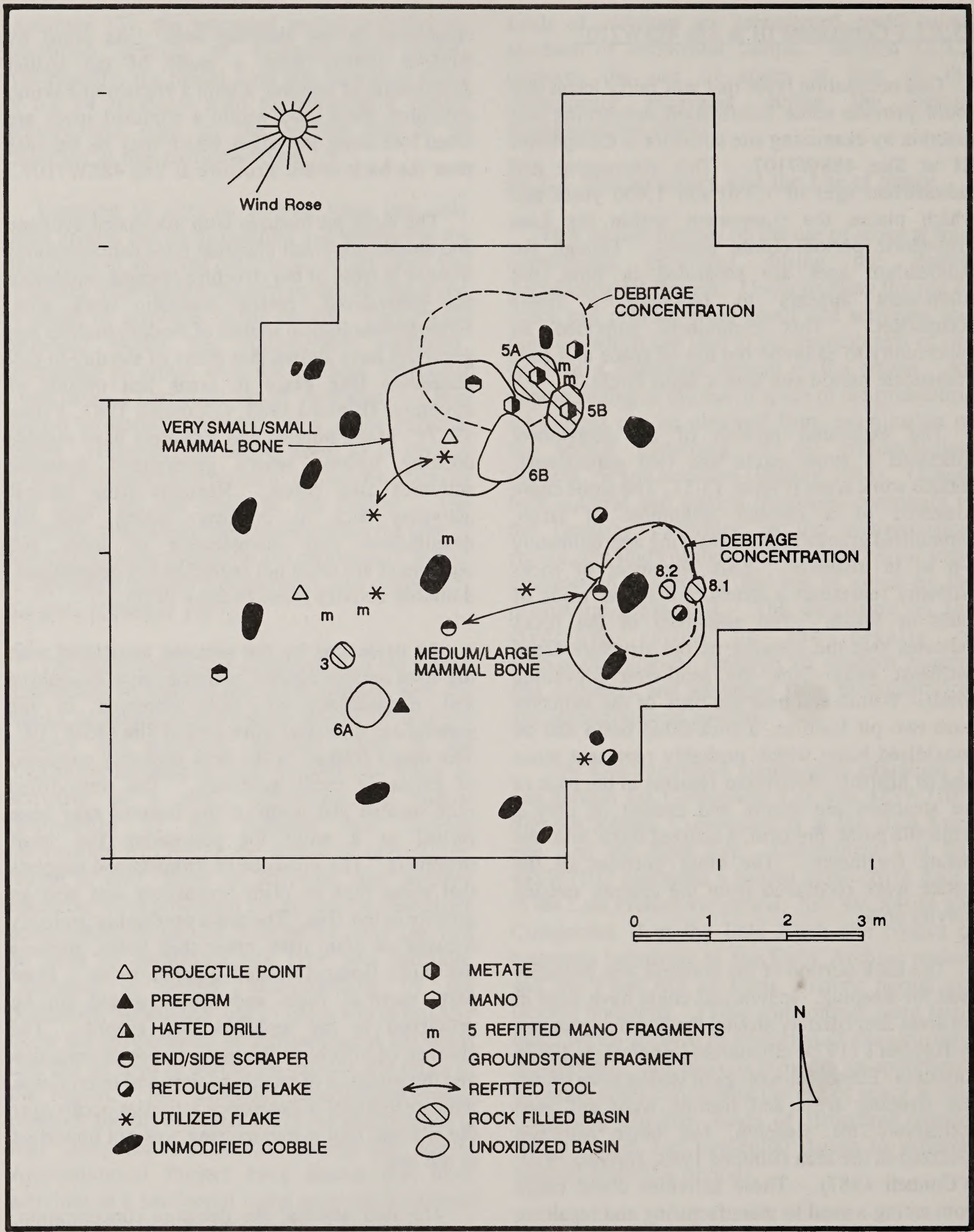


Figure 13.5 Spatial Distribution of Cultural Remains, Component III, Site 48SW7107 (Locality P-086).

This area may represent a men's work area as described by Binford (1983) for the Nunamiut Eskimo. In this area, away from the central domestic and sleeping areas, men may have sat and maintained flaked stone tools, and possibly processed portions of a large mammal. As with the central domestic work area, the remains of activities in this area are not segregated.

Site 48SW7107 contained a sheltered sleeping area, a generalized kitchen work area, and a possible men's work area. Similar remains observed by Yellen (1977) during his ethnoarchaeological studies of a !Kung Bushman camp were the result of a family unit's nuclear use area. According to Binford (1987), the presence of sleeping and kitchen work areas or family use nuclear use areas may characterize residential camps. He notes that residential camps are the base of operations for the domestic unit and the site structure should reflect domestic activities. Domestic facilities should be central in the organization of site space at residential camps. If this is the case, Site 48SW7107 appears to represent the operations of a domestic unit and was probably a residential camp of foragers. Foragers have a settlement organization in which the residential camps are moved to the desired resource (Binford 1980).

The presence of general scatters of remains and the lack of refuse disposal areas with dense concentrations of remains suggests that refuse cleaning was not practiced by the prehistoric inhabitants Site 48SW7107. The lack of refuse cleaning indicates that the site was occupied only for a short time (Brooks and Yellen 1987). Generally, if the inhabitants of a site plan to spend some time at a location, the area will be maintained to some degree (Binford 1987). The recovery of only a small number of remains also indicates that Site 48SW7107 was a short-term camp. Only 181 pieces of debitage and 149 bone fragments were found during the excavation of the 70 m^2 block area. The remains appear to represent only a few episodes of cooking meals, tool maintenance, and sleeping.

Direct evidence of the season of occupation is lacking at the site. The presence of a mussel shell suggests an occupation sometime between the spring and fall. The recovery of only three charred goosefoot seeds suggests that the seeds were incorporated into the feature due to the natural seed rain present in the soil at the time of site occupation and not the processing of the seeds by the prehistoric inhabitants. If this is the case, the site was probably not occupied during the late summer and fall when seed resources are available.

13.3.2.2 Site 48CR4686

Another site containing evidence of a structure is Site 48CR4686. This single component site consisted of a housepit, 19 pit features, some fire-altered rock, and a limited number of artifacts (Figure 13.6). The component has radiocarbon ages of 4,990, 4,930, and 4,330 years ago which indicate an Early Archaic period (Green River phase) age. Though one of the radiocarbon ages is approximately 600 years younger than the other two, the site most likely represents only a single occupation. This site provides an opportunity to examine the site structure of an Early Archaic housepit site.

The excavated portion of Site 48CR4686 contained a housepit and two concentrations of pit features. One group of pit features was just east of the housepit, and the other set was a few meters to the south. The housepit measured at least 2.5 m in diameter and contained four interior pit features. Most artifacts and bone remains were concentrated within the housepit. The rest of the excavation block is characterized by almost no artifacts and bone. A total of 38 of the 52 pieces of recovered debitage and 337 of the 387 recovered bone fragments were found within the housepit.

Apparently, most cooking, eating, and tool manufacture and maintenance activities took place within the housepit. As indicated by the recovered debitage types and size, tool manufacture and maintenance activities involved most stages in the

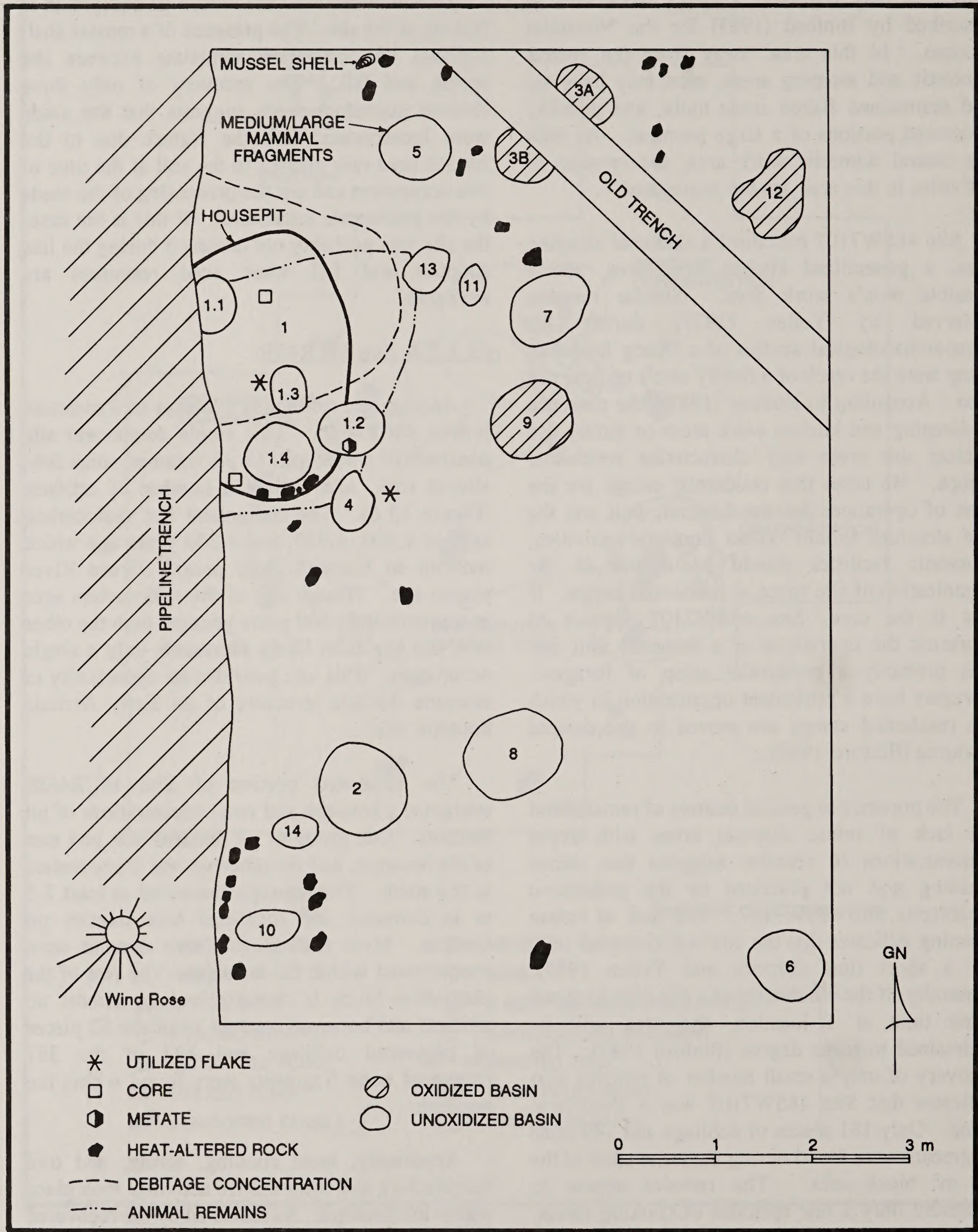


Figure 13.6 Spatial Distribution of Cultural Remains, Site 48CR4686 (Locality P-078).

flaked stone tool reduction sequence. However, most of this effort was probably focused on the final shaping and/or rejuvenation of small tools, rather than the initial reduction stages. The recovery of only 38 pieces of debitage within the housepit indicates that flaked stone tool manufacture and maintenance activities was only a minor activity probably associated with other domestic activities.

Most of the recovered bones are small fragments that were not identifiable to taxon, and 135 of these specimens are burned. The highly fragmented nature of the bone and the number of burned fragments suggest an intensive level of processing. The bone was probably processed for juice and grease (Vehik 1977, Binford 1978). The vast majority of these fragments represent very small or small mammals. One specimen was identified as pronghorn, and two specimens represent a deer-pronghorn size mammal. Other specimens were identified as jackrabbit size. Apparently, pieces of several kinds of animals were processed within the housepit. As evidenced by the small number of bone fragments, the processing for bone grease and juice was probably for immediate use and not intensive production for storage or later use.

Overall, the activities represented in the housepit are general domestic endeavors including preparation of meals using bone juice or grease and the maintenance of flaked stone tools. It appears that these activities were not segregated in the housepit as is often the case with domestic work areas (Yellen 1977). The recovery of only a few remains indicates that the housepit was used for only a short time. The housepit may have been covered with a sagebrush windbreak which would have required little labor to construct, but would have provided a wind-free, shaded work and sleeping area (Smith and Reust 1992). This housepit is similar to and probably represents similar activities as other excavated Early Archaic period housepit sites in the Wyoming Basin including the Maxon Ranch site (Harrell and McKern 1986), the Crooks site (McKern 1987), and the Bald Knob site discussed in Section 13.3.2.3. Each of these housepit sites also yielded only a limited diversity and quantity of remains. These sites are believed to represent winter or spring, short-term occupations (Smith and Reust 1992). In contrast, the Sinclair site (Smith and Reust 1992) and the Split Rock Ranch site (Eakin 1987) contained relatively large numbers of artifacts, as well as charred plant macrofossils. These sites may have been occupied during the late summer or fall.

In addition to the housepit, a concentration of pit features, some with oxidized sides, was excavated to the east of the housepit. One unoxidized basin, Feature 5, was located near 11 medium/large mammal bone fragments and a pronghorn phalange. Two other features contained one bone fragment each. No charred seeds were recovered from the features during the plant macrofossil analysis. The paucity of recovered remains within and in the vicinity of these features makes it difficult to determine the function and use of this area of the site. These features may represent a communal activity area of a camp where items such as roots or tubers were roasted (Bartram et al. 1991, O'Connell et al. 1991). The remains of roots and tubers would not be preserved in the archaeological record. However, these features may have been the remains of warming fires. Similar features were found at the Plant and Bald Knob sites, other Early Archaic sites excavated during the Bairoil Archaeological Project.

Another group of features similar to those discussed above occurred south of the housepit. As with the other features the recovered remains were limited. Again, the function of these features is unknown.

No direct evidence of the season of occupation was recovered during the excavations. The presence of a mussel shell suggests an occupation sometime between the spring and fall. The lack of charred seeds indicates that the site was probably not occupied in the late summer and fall for the collection and processing of seeds resources. The site was probably occupied during the late winter or spring possibly for the processing of root or tuber resources. Other excavated housepit sites similar to Site 48CR4686 appear to have been occupied during the winter and spring (Smith and Reust 1992).

As evidenced by the fairly limited amount of recovered remains, the site appears to have been occupied for only a short time. The housepit and other outside features would have required little labor to construct. The settlement system of these prehistoric people required a high mobility, but it is unclear whether the site represents a residential camp of foragers, or a logistical camp of collectors. The scant evidence suggests that the excavated portion of the site may be the remains of a camp of a domestic unit. In that case the site would be a residential camp of foragers. However, the pit features may represent the remains of some type of processing activity of a logistical camp.

13.3.2.3 Component II at Bald Knob Site

Another Early Archaic period (Green River phase) housepit site excavated during the Bairoil Archaeological Project is the Bald Knob site. Six housepits were identified within the 185 m^2 excavation block. This site provides an opportunity to examine the spatial distribution of remains both within and between housepits. However, the six housepits may not represent contemporaneous occupations. The area may have been revisited and reused several times over several hundred years. Acceptable radiocarbon ages for the housepits ranged between 5,100 and 4,400 years ago. If the housepits represent different occupations, these occupations could not be separated in the archaeological record and have been included as one component. Conversely, the housepits may represent only one or two occupations, and the range of radiocarbon ages may be the result of sampling error.

The excavation block at the Bald Knob site contained six housepits, three areas with concentrations of pit features, and a few additional pit features adjacent to some of the housepits (Figure 13.7). As with Site 48CR4686, the quantity and diversity of recovered remains at the Bald Knob site are limited. The excavations at the Bald Knob site yielded only 63 flaked stone tools; 1,488 pieces of debitage; and 29 groundstone fragments. Only 57 bone or tooth fragments were recovered, and flotation analysis of 87.7 liters of feature fill produced only two charred goosefoot seeds.

According to ethnoarchaeological studies of modern hunters and gatherers, residential camps usually consist of household areas, communal areas, and specialized activity areas (Bartram et al. 1991, O'Connell 1987, O'Connell et al. 1991, Yellen 1977). A household area is occupied by a household group and is where most activities at a camp take place. In these areas, household members prepare and consume food, manufacture and maintain tools, sleep, and entertain guests. These areas generally have a structure and interior and exterior hearths. Communal areas are often used for activities similar to household areas and are usually marked by at least one hearth. Special activity areas include activities that require more space and are messy.

The six housepits probably represent a portion of the remains of household areas. As with Site 48CR4686, these housepits may have been covered with a sagebrush windbreak which would have required little labor to construct, but would have provided wind-free, shaded work and sleeping areas. Overall, the remains of the housepits are fairly similar. Each of these housepits contained several interior features and some had exterior features. At least one of the pit features in most of the housepits was a fairly deep, cylindrical or bell-shaped hearth or roasting pit with oxidized sides. Generally, these features lacked animal bone, charred plant macrofossils, and other debris. Because of these features' depth, they may have functioned as roasting pits for roots or tubers, traces of which would not be preserved in the archaeological record. Smaller pit features and oxidized sediment were also present within most housepits. These features may represent warming fires for sleeping or eating.

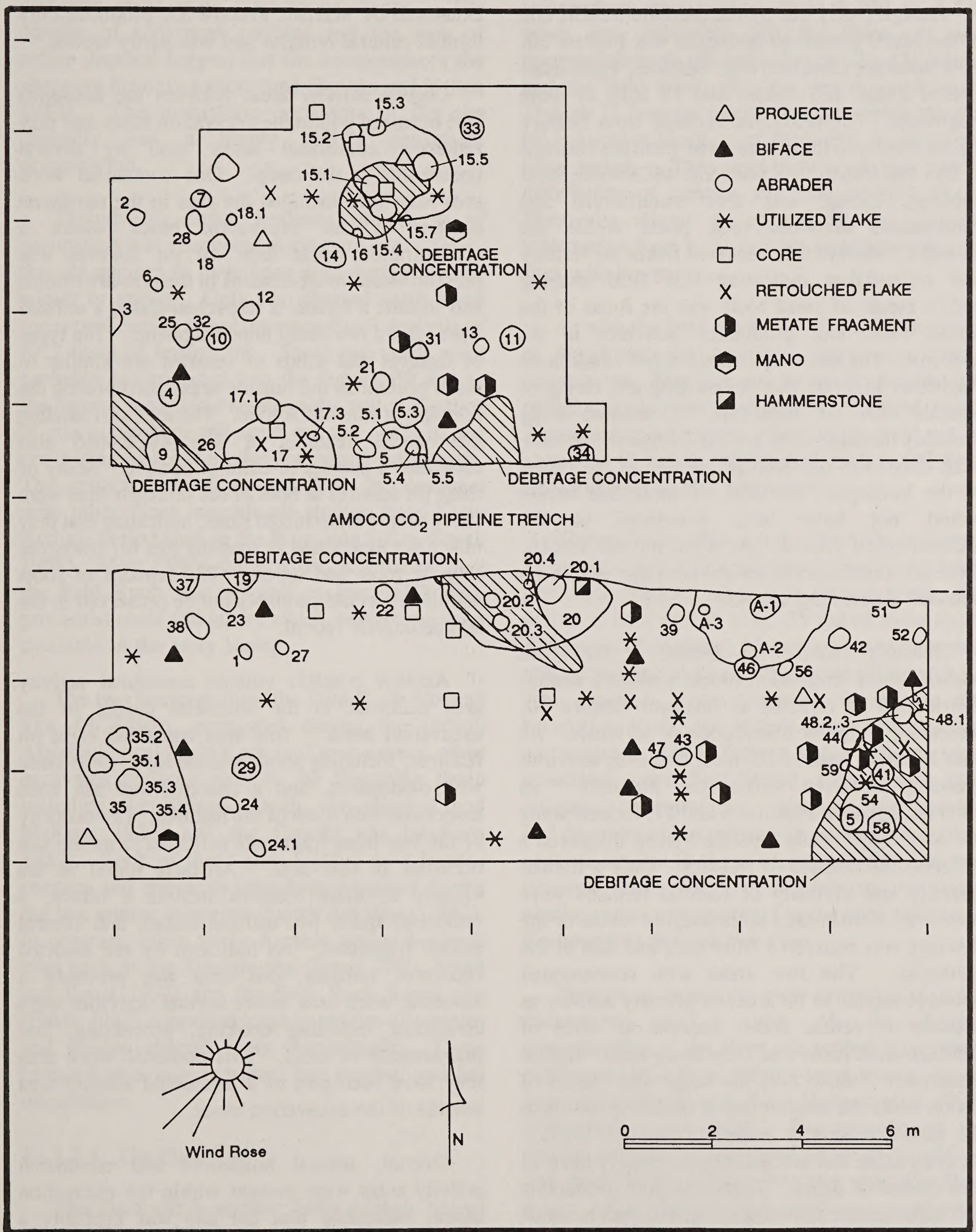


Figure 13.7 Spatial Distribution of Cultural Remains, Component II, Bald Knob Site.

Though partly cut by the pipeline trench, one of the better preserved housepits was Feature 20. This housepit contained four features, eight heat-altered rocks, 165 flakes, and 19 bone or tooth fragments. The recovered remains from Feature 20 are similar to those recovered from the housepit at Site 48CR4686. As with Site 48CR4686, most cooking, eating, and tool manufacture and maintenance activities took place within the housepit. Most of the recovered flakes are tertiary and microflakes indicating that final shaping and/or repair of small tools was the focus of the flaked stone tool production activities in the housepit. The recovery of only a few small bone fragments suggests that the cooking and eating of animals were not important. Consumed foods probably included roots and tubers that would have been roasted in the deep pit located in the center of the housepit. Remains of roots and tubers would not have been preserved in the archaeological record. As with Site 48CR4686, these remains from the several activities within the housepit are not segregated.

Housepit Feature 15, located in the north portion of the excavation block, yielded a similar distribution of remains as housepit Feature 20, indicating a similar distribution of activities. As with housepit Feature 20, most domestic activities probably occurred within the housepit. In contrast, housepit Features 5 and 17, located along the north edge of the pipeline trench, displayed a different distribution of remains. Only a limited quantity and diversity of cultural remains were recovered from these two housepits. Most of the debitage was recovered from west and east of the housepits. The two areas with concentrated debitage appear to be areas of primary activity as opposed to refuse areas, because all sizes of debitage were recovered from these areas. Refuse areas often contain only the larger size classes of debris while the smaller pieces of debris remain at the primary activity areas (O'Connell 1987). Activity areas that are not cleaned usually have all size classes of debris. Therefore, tool production and maintenance activities associated with housepit Features 5 and 17 appear to have been conducted just outside of the housepits. The final housepit excavated by Mariah, Feature 35, produced only limited cultural remains and was partly eroded.

Outside activity areas between the housepits also occurred within the excavation block and may represent communal areas used by several households at the camp. One communal work area may have included the area in the northwest portion of the excavation block where a concentration of at least 10 pit features was present. Recovered remains in the area are limited and include a biface, a retouched flake, a utilized flake, and a few small bone fragments. The types of features and kinds of remains are similar to those present in the outside areas surrounding the housepit at Site 48CR4686. The area surrounding the outside features at Site 48CR4686 also contained a paucity of cultural remains. Many of these pit features at both of the housepit sites were fairly deep with oxidized sides, indicating that they may have functioned as roasting pits for resources such as roots and tubers. The remains of roots and tubers would probably not be preserved in the archaeological record.

Another possible outside communal activity area occurred in the southeast corner of the excavation block. This area contained eight pit features, including some with straight, deep sides with oxidization, and a charcoal and ash stain associated with some of the features. The majority of the few bone fragments collected from the site occurred in this area. Artifacts found in the vicinity of these features include a biface, a retouched flake, two utilized flakes, and several metate fragments. As indicated by the assorted recovered remains, this area was probably a domestic work area where several activities were conducted including cooking, processing, and maintenance of tools. This domestic work area may have been part of a household activity area outside of the excavation block.

Overall, several household and communal activity areas were present within the excavation block, indicating that the site was probably a residential camp of foragers (Binford 1980). According to Binford (1987), the presence of domestic areas may characterize camps. The paucity of recovered remains and the lack of refuse disposal suggest that the occupations at the site were for only a short time (Brooks and Yellen 1987). The prehistoric occupants of the site probably had a highly mobile settlement organization.

Though no direct evidence of season of occupation was recovered during the excavations, the site appears to have been used during the late winter or spring. Only two charred seeds were recovered during the plant macrofossil analysis of 87.7 liters of feature fill. These two seeds were probably incorporated into the feature fill due to the natural seed rain present in the soil at the time of site occupation and were not the result of the processing of seeds by the prehistoric inhabitants. The general lack of charred seeds is consistent with other plant macrofossil studies from Early Archaic period sites in the Wyoming Basin (Smith 1988). Most likely, the prehistoric inhabitants at the Bald Knob site, as well as Site 48CR4686, processed roots and tubers which would have been available in the early spring.

The two housepit sites, the Bald Knob Site and Site 48CR4686, excavated during the Bairoil Archaeological Project are similar to several other excavated housepit sites in the Wyoming Basin including the Maxon Ranch site (Harrell and McKern 1986) and the Crooks site (McKern 1987). Each of these sites yielded only limited remains and appear to have been occupied during the late winter or spring (Smith and Reust 1992). In contrast, other Early Archaic period housepit sites such as the Sinclair site (Reust 1989, Smith and Reust 1992) and the Split Rock Ranch site (Eakin 1987) contained large quantities of remains and yielded charred plant macrofossils. These housepit sites may represent late summer and fall occupations.

13.3.2.4 The Plant Site

The Plant site is another Early Archaic period (Green River phase) site excavated during the Bairoil Archaeological Project. The site has radiocarbon ages ranging from 5,030 to 3,830 years ago, indicating that the Plant site was occupied through the same time as Site 48CR4686 and the Bald Knob site, the two housepit sites. Though 71 features were excavated within the 192 m^2 excavation block at the Plant site, no housepits were noted. The examination of the spatial distribution of remains and site activities at the Plant site allows an opportunity to compare information from a site lacking housepits with two sites with housepits.

As with the Bald Knob site, the one component at the Plant site probably represents several occupations. The area was probably revisited and reused several times over several hundred years. The remains from these occupations could not be separated in the archaeological record and have been included as one component.

The excavation block at the Plant site contained 71 features including hemispherical and cylindrical pits, rock scatters, and large stained areas; 466 pieces of heat-altered rock; 25 flaked stone tools; 776 pieces of debitage; 34 groundstone fragments; and 1,356 bone and tooth fragments (Figure 13.8). The features were scattered throughout the excavation block, but at least four concentrations are evident. These feature concentrations were associated with heat-altered rock, bone, and debitage concentrations; however, the quantity and diversity of the remains in general are limited and are similar to those recovered from the two housepit sites. Many of the features also were similar to those encountered in the areas outside of the housepits at these two sites.

Though no housepits were present within the excavation block, some of the feature concentrations at the Plant site probably represent portions of household activity areas where several domestic activities took place (Bartram et al. 1991, O'Connell et al. 1991). The majority of the limited number of recovered debitage is tertiary and microflakes which indicates that the final stages of production and maintenance of tools occurred within these household activity areas. However, the recovery of only 776 pieces of

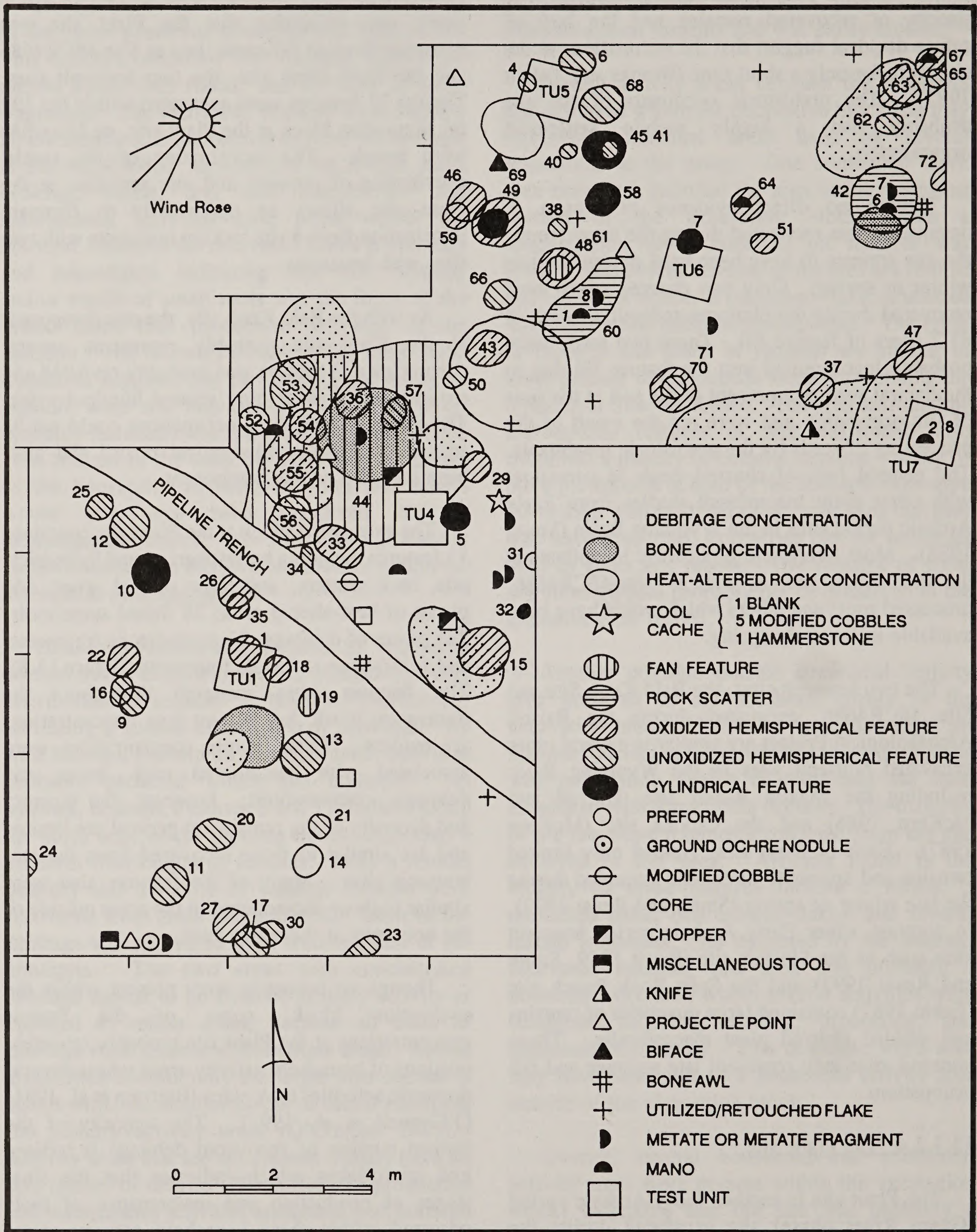


Figure 13.8 Spatial Distribution of Cultural Remains, the Plant Site (Locality P-069).

debitage suggests that tool production and maintenance were only minor activities at the site. Bison, elk, pronghorn, jackrabbit, and sage grouse were among the identified taxa represented in the collection of animal remains from the site. A wide variety of animals was processed and consumed in these household areas. The fragmentary nature of most of the bone indicates that the animals were intensively processed, probably for juice and grease (Vehik 1977, Binford 1978). As evidenced by the small number of bone fragments in any one area of the excavation block, the processing for bone grease and juice was probably for immediate use and not for intensive production for storage or later use. The presence of groundstone fragments associated with some of the feature concentrations suggests that plant parts were also processed in these household areas. Because the features lacked charred seeds, roots and tubers--which would not be preserved in the archaeological record--were probably processed at the site. The groundstone could have been used for processing small animals as well.

Several of the cylindrical features were similar to pit features excavated at the two housepit sites, Site 48CR4686 and the Bald Knob site. These pits may have functioned as roasting pits for roots and tubers and may have been used as described by Smith (1974). According to Smith (1974), the Ute would place roots in a pit with a layer of grass and heated rocks and damp grass in the bottom. Above the roots, another layer of grass and heated rocks was put in the pit. Finally, the oven was covered with cold rocks and dirt and left 24 hours. The heat-altered rock found associated with some of these features may have been used in this baking or roasting process.

As with the other three sites discussed in this section, the remains of several different activities occurred in the same area and were not segregated. This pattern is consistent with the results of ethnoarchaeological studies of modern hunters and gatherers. Many of these studies have shown that several kinds of activities including cooking, eating, tool maintenance and production, and other processing activities take place around central hearths of domestic work areas of household activity areas (O'Connell 1987, Yellen 1987). The presence of household activity areas with general domestic work areas could be an attribute of residential camps.

The Plant site probably functioned as a short-term residential camp that was reused over several hundred years. The fairly limited number of recovered remains and the lack of evidence of refuse cleaning indicate that the site was occupied for only a short time (Brooks and Yellen 1987). The presence of overlapping features in the excavation block suggests that the brief occupations occurred a number of times through the years. Evidence that the site area was a favorite spot for repeated use comes from the recovery of a modified cobble tool cache within the excavation block. The modified cobbles were apparently buried in a pit to be used at a later date. The artifacts in this cache are expedient tools that display evidence of use that were probably buried in the pit for anticipated reuse. The cache from the Plant site is different than the biface caches that have been recorded in the Northwestern Plains over the past few years (Miller et al. 1991). The recorded biface caches usually contain blanks or preblanks that have been buried in anticipation of further reduction and tool manufacture, while the cache from the Plant site consists of actual tools.

Evidence of a spring or early summer occupation for the site comes from the recovery and analysis of an immature bison bone, tooth wear from an elk mandible, and bird eggshell. The lack of charred plant macrofossils from feature fill provides evidence that the site was not occupied during the late summer or fall. The Plant site may have been occupied slightly later in the year than Site 48CR4686 and the Bald Knob site, the two housepit sites dating to the same period as the Plant site. The different season of occupation of the Plant site may explain why housepits were not present at the site; however, the evidence of the season of occupation of the two housepit sites is sketchy at best. The three sites may actually have been occupied during the same season and represent the same portion of the seasonal round of the prehistoric inhabitants of the area.

13.3.2.5 Summary

The results of the analysis of the use of space at four components of the Bairoil Archaeological Project indicate that they contained household activity areas where several different kinds of activities were conducted in the past. The remains from these activities are not segregated. These results are consistent with information from ethnoarchaeological studies which show that most camp activities are carried out within household activity areas. The components probably represent short-term residential camps of foragers using a residential mobility strategy occupied in the winter or spring. One of the activities represented at the Early Archaic period sites was the processing of roots or tubers in roasting pits or ovens. It appears that short-term residential camps were a major site type in the Bairoil area, at least during the Early Archaic and Late Prehistoric periods.

13.4 SUMMARY OF PALEOENVIRONMENTAL INVESTIGATIONS

Sediment and pollen analyses were conducted in conjunction with the data recovery phase of the Bairoil Archaeological Project to help reconstruct paleoenvironmental conditions in the project area and region. Michael McFaul and William Doering of LaRamie Soils Service performed the sediment analysis. Jannifer W. Gish, project palynologist of Mariah, performed the pollen analysis. This section summarizes the paloenvironmental interpretations derived by McFaul and Doering and by Gish from the results of their respective analyses. The complete technical reports detailing the methodology and results of sediment and pollen analyses are included in this report as Appendix A and Appendix B, respectively.

13.4.1 Results of Geoarchaeological Investigations

The sediment analysis was based on samples taken from each sediment unit identified in wall profiles within excavation blocks at four localities (Abel Creek site, Bald Knob site, Plant site, and Site 48CR4681). The sediment units were identified, and analyzed sediment samples were collected by McFaul or Doering. McFaul also conducted field examinations of stratigraphic profiles at seven of the nine investigated sites, with the Tower site and the Stone Circle site not inspected. The Tower site was previously inspected by McFaul (1989) during the testing phase of the Bairoil Archaeological Project and the Stone Circle site was not inspected due to the lack of natural deposition. A radiocarbon age estimate of 7,490±70 years B.P. from Site 48CR4681 provided the oldest absolute time reference and a radiocarbon date of 1,280±80 years B.P. from the Abel Creek site provided the most recent absolute time reference for sites from which sediments were analyzed.

Sediment analysis at four sites provides evidence of very general depositional trends and soil formation events that indicate fluctuating climatic conditions during the Holocene (Figure 13.9). Three periods of aeolian deposition were noted with initial deposition (EI) predating 7,500 years B.P. and ending about 6,050 years ago, EII deposition occurring between 5,950 and 2,000 years ago, and EIII deposition postdating 2,000 years B.P. Three periods of soil formation (paleosols) were defined based on field inspections and sediment analysis, with the earliest noted within terminal EI deposits at Site 48CR4681 that were older than 5,950 years. Two periods of soil formation were noted within EII, with the earliest representing a post-Altithermal soil dating between 5,000 and 3,500 years B.P., and the second EII paleosol dating about 3,500-2,500 years B.P. Weak soil development was also noted in EIII sediments dating between 2,000 and 1,000 years B.P., with stream incision postdating 1,000 years B.P. (Appendix A).

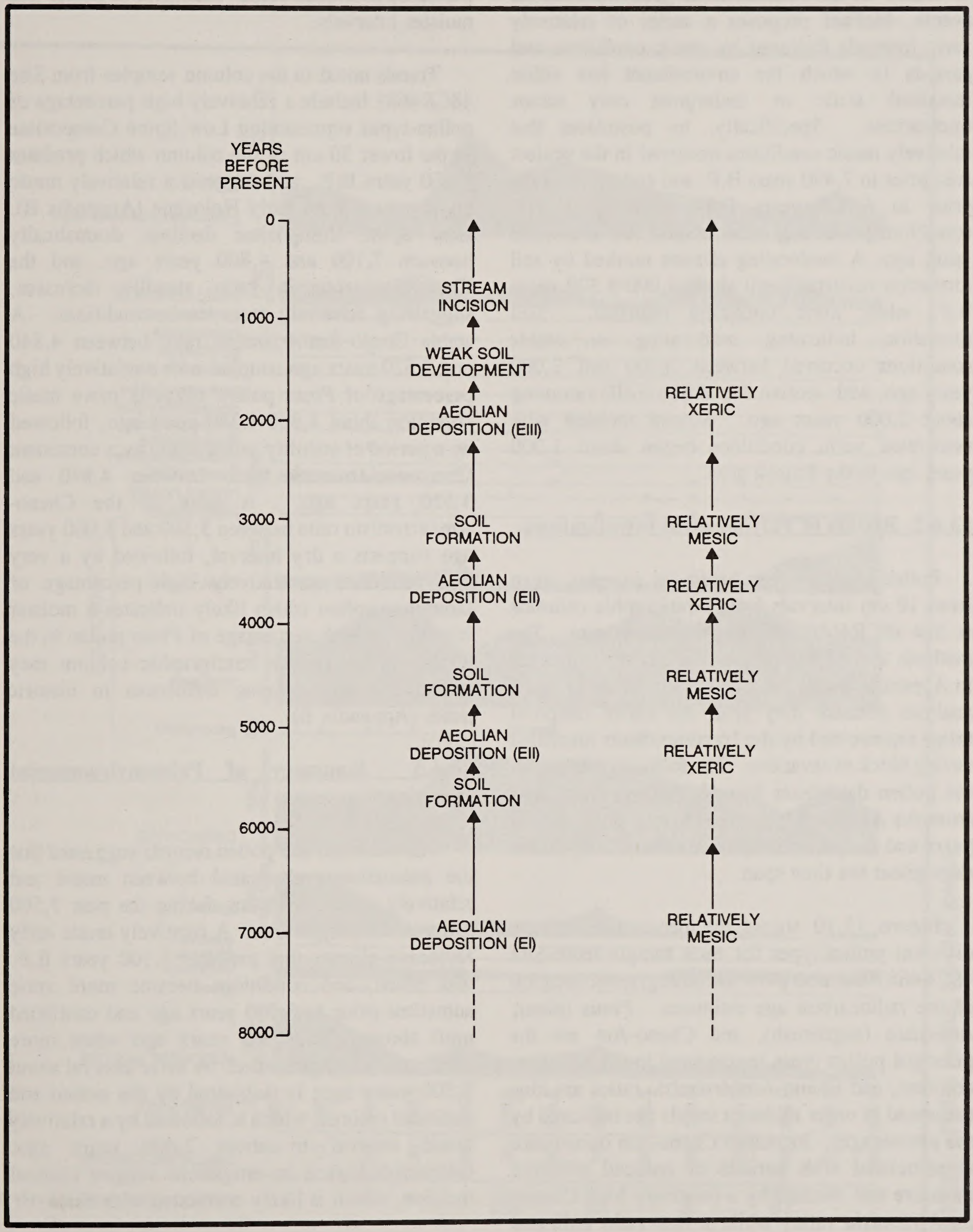


Figure 13.9 Geomorphological and Paleoenvironmental Reconstruction for the Project Area.

Based on the reconstructed geomorphological events, McFaul proposes a series of relatively xeric intervals followed by mesic conditions and periods in which the environment has either remained static or undergone only minor fluctuations. Specifically, he postulates that relatively mesic conditions occurred in the project area prior to 7,490 years B.P. and ended sometime prior to 6,000 years B.P., with more arid conditions prevailing to between 5,000 and 4,500 years ago. A moderating climate marked by soil formation occurred until about 4,000-3,500 years B.P. when xeric condition returned. Soil formation indicating moderating or stable conditions occurred between 3,500 and 2,000 years ago, with aeolian deposition (EIII) resuming about 2,000 years ago. Stream incision with associated xeric conditions began about 1,000 years ago in the Bairoil area.

13.4.2 Results of Palynological Investigations

Pollen analysis was based on samples taken from 10 cm intervals from stratigraphic columns at Site 48CR4681 and the Abel Creek site. The methods and results of this analysis are presented in Appendix B. These two sites were selected for analysis because they span the entire temporal range represented by the 16 components identified during block excavations. The following discusses the pollen data from Site 48CR4681. The data from the Abel Creek site spans only the last 2000 years and the pollen frequencies were fairly stable throughout the time span.

Figure 13.10 shows the percentages of the different pollen types for each sample from Site 48CR4681 and also plots the stratigraphic location of the radiocarbon age estimates. *Pinus* (pine), *Artemisia* (sagebrush), and Cheno-Am are the principal pollen types represented in the sediment columns, and Cheno-Am/*Artemisia* ratios are also presented in order to detect trends not indicated by the percentages. Increased Cheno-Am occurrence is associated with periods of reduced effective moisture and marked by a relatively high Cheno-Am/*Artemisia* ratio, while a low ratio indicates increased *Artemisia* values indicative of cooler and moister intervals.

Trends noted in the column samples from Site 48CR4681 include a relatively high percentage of pollen types representing Low Spine Compositae in the lower 30 cm of the column which predates 7,100 years B.P., and suggests a relatively mesic climate during the early Holocene (Appendix B). Low Spine Compositae declines dramatically between 7,100 and 4,800 years ago, and the Cheno-Am/*Artemisia* ratio steadily increases, suggesting relatively more xeric conditions. A stable Cheno-Am/*Artemisia* ratio between 4,840 and 3,520 years ago coupled with a relatively high percentage of *Pinus* pollen suggests more mesic condition about 4,840-4,340 years ago, followed by a period of stability as indicated by a consistent Cheno-am/*Artemisia* ratio between 4,840 and 3,520 years ago. A peak in the Cheno-Am/*Artemisia* ratio between 3,500 and 3,000 years ago suggests a dry interval, followed by a very low ratio and a relatively high percentage of Graminae pollen which likely indicates a moister interval. A high percentage of *Pinus* pollen in the upper 20 cm of the stratigraphic column may reflect livestock grazing influences in historic times (Appendix B).

13.4.3 Summary of Paleoenvironmental Investigations

The sediment and pollen records suggested that the paleoclimate alternated between mesic and relatively xeric conditions during the past 7,500 years in the project area. A relatively mesic early Holocene climate that predates 7,100 years B.P. was noted, and conditions became more xeric sometime prior to 6,000 years ago and continued until about 5,000-4,500 years ago when more mesic conditions prevailed. A xeric interval about 3,500 years ago, is suggested by the pollen and sediment records, which is followed by a relatively mesic interval to about 2,000 years ago. Geomorphological investigations suggest channel incision, which is likely correlated with xeric

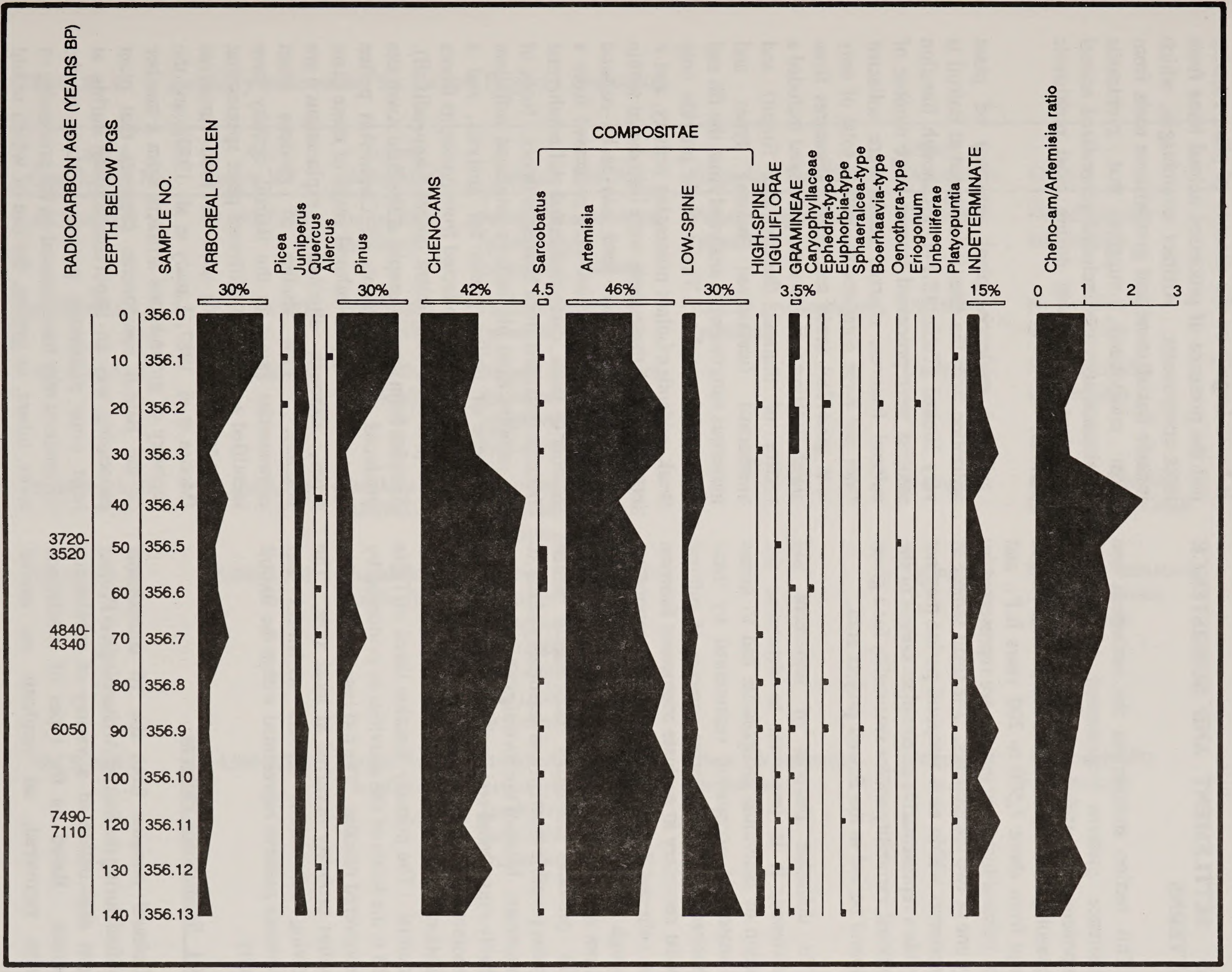


Figure 13.10 Pollen Profile, Site 48CR4681.

conditions, began approximately 1,000 years ago in the project area.

13.5 SETTLEMENT AND SUBSISTENCE PATTERNS

This section summarizes the settlement and subsistence patterns represented by the 16 components identified during the Bairoil Archaeological Project. These components ranged in age from about 7,500 to 200 years B.P., and most cultural-historical periods are represented by only one or two components. The small sample of components within each temporal period may not provide a representative or complete sample of the functional variability and/or seasonality for a given temporal period in the Bairoil project area.

To delineate patterns of settlement and subsistence, it is important to determine the function of individual components and to assess the season of occupation represented by these components. Representative samples of cultural remains necessary to evaluate component function were collected from each of the 16 components, although good evidence of season of occupation was not recovered from most components. Table 13.13 provides summary information which includes possible function and seasonality of the 16 components. Most of the investigated components probably represented residential camps of one sort or another, but only components with remains of habitation structures are listed in Table 13.13 as residential. The primary function listed in Table 13.13 is the focus of site activities as evidenced by the recovered remains. The full range of domestic activities probably occurred at most sites. The following subsections discuss settlement and subsistence patterns represented within the Bairoil vicinity.

13.5.1 Subsistence Patterns

Cultural remains from the 16 components identified during the Bairoil Archaeological Project suggest exploitation of a variety of subsistence resources. Based on the types of subsistence remains recovered, an emphasis on animal resources is indicated for most components investigated during this project. This assessment is based largely on the absence of plant remains and the presence of processed animal bone from most components. Artifact assemblages, which include flaked stone and groundstone tools from most components, suggest that prehistoric subsistence activities included generalized animal and plant procurement during most prehistoric periods.

Direct evidence (plant remains) of plant utilization from the sites investigated at Bairoil is very limited (Table 13.14). Although flotation samples were processed from a large number of cultural features, charred seeds were collected from just three components, with a total of only nine goosefoot seeds recovered. Features from which flotation samples were processed included a variety of thermal (hearth and firepit) and nonthermal (unoxidized basins) types and numerous samples were analyzed from the fill and floors of housepits. These seeds provide only weak evidence of plant processing activity, and it is as likely that these seeds were introduced within the features by natural seed rain as by cultural activity. Pollen samples were processed from a number of small, discrete thermal and nonthermal features (pits) and from housepits floors. None of the samples from pit features produced sufficient numbers of pollen grains for analysis, and a number of samples collected from housepits floors also produced insufficient counts (Appendix B). Samples from three housepits at the Bald Knob site produced elevated counts of Cheno-Am pollen types which suggests cultural usage of these plant types, although alternative explanations are possible. Past studies of modern plant communities extant in the Bairoil vicinity have identified a number of different plant species that ethnographically were used as food resources (Moore et al. 1987, Latady et al. 1989), and the recovery of groundstone artifacts from a number of the Bairoil components suggests that plant processing was an important activity during at least some prehistoric periods. Many of the occupations may have focused on the processing of roots, tubers, or greens, the use of which would

Table 13.13 Summary Information for Bairoil Project Components.

Site/ Component No.	Age (years B.P.)	Setting (deposition)	Primary Function	Secondary Function	Season of Occupation	Criteria
48CR4681/I	7,490-7,110	Dunal flats (aeolian)	Animal procurement, (pronghorn, jackrabbit, rodent)	Plant procurement (possible)	Unknown	No seasonality information
48SW5982/I	6,610-5,980	Foothills (aeolian)	Plant procurement (possible)	Animal procurement (possible)	Unknown	No seasonality information
48CR4681/II	6,050	Dunal flats (aeolian)	Animal procurement (pronghorn, jackrabbit), plant procurement	--	Unknown	No seasonality information
Bald Knob/II	5,100-3,500	Foothills (aeolian)	Residential, animal procurement, plant procurement	--	Spring-fall	Eggshell, charred seeds, mussel shell
Plant/I	5,030-3,500	Dunal flats (aeolian)	Animal procurement (bison, elk, pronghorn, jackrabbit, rodent, freshwater mussels, bird), plant procurement	--	Spring-fall	Eggshell, immature animal remains, mussel shell
48CR4686/I	4,990-4,330	Dunal flats (aeolian)	Residential, animal procurement (pronghorn, jackrabbit, rodent, freshwater mussels)	Plant procurement (possible)	Unknown	No seasonality information

Table 13.13 (continued)

Site/ Component No.	Age (years B.P.)	Setting (deposition)	Primary Function	Secondary Function	Season of Occupation	Criteria
48CR4681/III	4,840-4,340	Dunal flats (aeolian)	Animal procurement (bison, pronghorn, jackrabbit, rodent, freshwater mussels, birds), plant procurement	--	Spring-fall	Eggshell, mussel shell
48CR4681/IV	3,750-3,520	Dunal flats (aeolian)	Animal procurement (pronghorn, jackrabbit)	Plant procurement (possible)	Unknown	No seasonality information
48SW7107/I	3,560	Riparian (aeolian)	Animal procurement (jackrabbit size, deer-pronghorn size)	Plant procurement (possible)	Unknown	No seasonality information
Abel Creek/I	1,790	Riparian (aeolian)	Animal procurement (deer-pronghorn size), plant procurement	Plant procurement (possible)	Unknown	No seasonality information
48CR4681/V	--	Dunal flats (aeolian)	Animal procurement (bison, pronghorn)	--	Unknown	No seasonality information
48CR7107/II	1,390	Riparian (aeolian)	Animal procurement (deer-pronghorn size), plant procurement	--	Late summer-fall	Charred seeds
48SW7107/III	1,460-1,110	Riparian (aeolian)	Residential, animal procurement (bison size, deer-pronghorn size, freshwater mussels, rodent size), plant procurement	--	Spring-fall	Charred seeds, mussel shell

Table 13.13 (continued)

Site/ Component No.	Age (years B.P.)	Setting (deposition)	Primary Function	Secondary Function	Season of Occupation	Criteria
Abel Creek/II	1,260	Riparian (alluvial)	Animal procurement (deer-pronghorn size, bison size)	--	Unknown	No seasonal indicators
Abel Creek/III	--	Riparian (aeolian)	Animal procurement (bison size, deer-pronghorn size, jackrabbit size)	--	Unknown	No seasonal indicators
Stone Circle/I	230	Foothills (colluvial)	Residential, animal procurement (pronghorn)	--	Unknown	No seasonal indicators

Table 13.14 Summary of Groundstone Tools and Plant Macrofossils.

Site No.	Component No.	Age (years B.P)	Groundstone[1]	Charred seeds
48CR4681	I	7,460-7,110	1 edge ground cobble	None
	II	6,050	5 (3) metate fragments	None
	III	4,840-4,340	13 metate fragments	None
	IV	3,750-3,520	1 metate fragment	None
48CR4686	I	4,990-4,330	1 metate fragment	None
Plant	I	5,030-3,830	18 metate fragments, 11 manos	None
Bald Knob	I	6,610-5,980	1 mano	None
	II	5,100-4,400	27 metate fragments, 2 manos	2 goosefoot
Abel Creek	I	1,790	5 metate fragments	None
48SW7107	I	3,560	16 (1) metate fragments	None
	II	1,390	4 (1) metate fragments, 1 mano	4 goosefoot
	III	1,460-1,110	5 metate fragments, 3 mano fragments	3 goosefoot

[1] ( ) = estimated total number of artifacts.

most likely not be preserved in the archaeological record.

Groundstone tools were collected from 12 of the 16 components, with single groundstone artifacts associated from four of these components (Table 13.14). The groundstone tools appear to represent either metates or manos, and similar tools are generally interpreted to represent plant processing tools. Similar artifacts, especially manos, have also sometimes been associated with small animal (rodent) processing (Frison 1978, Yohe II et al. 1991). Inferring the extent of plant resource utilization indicated by the groundstone tools is limited by the lack of preserved floral resources. Most groundstone tools represent small fragments of larger artifacts or are heat-altered, therefore no pollen washes were completed. The number of groundstone artifacts recovered from components dating to the Early Archaic period (Great Divide phase) and the late Early Archaic/Middle Archaic period (Green River phase/Pine Spring phase) strongly suggests that plant processing was an important activity during these cultural periods, as do the groundstone artifacts collected from the two early Late Prehistoric period (Uinta phase) components at Site 48SW7107. Weak indications of plant processing (as indicated by one or several groundstone fragments) were recovered from other Middle Archaic period components, with no firm indications of plant processing in the two Late Archaic period components or in the components dating to the late Late Prehistoric period (Firehole phase) and Protohistoric period.

Animal remains were collected from all components identified at Bairoil with the exception of an Early Archaic period component (I) at the Bald Knob site. The absence of animal remains from this component may be attributable to preservation factors rather than to a lack of animal processing activities. Relatively small numbers of animals remains were collected from most of the other 15 components (Table 13.15), and few bone specimens were identified to species. No more than one individual (MNI) of any species or animal size class was identified from the 15 components. Although few elements were identified to taxa, a variety of animals size ranges is represented in most components. Figure 13.11 summarizes the number of animal remains and the number of size classes (or taxa) recovered from the 15 components.

Components I (7,490-7,110 years B.P. [terminal Paleoindian]) and II (6,050 years B.P.[Early Archaic period-Great Divide phase]) at Site 48CR4681 represent the oldest components with faunal remains investigated during the Bairoil Archaeological Project. The assemblages from the two components are generally similar, with both dominated by deer-pronghorn size and jackrabbit size or smaller animals. The Paleoindian component also contained one unidentifiable large mammal element suggesting that larger mammals (bison size) may have been utilized, although the single large mammal bone fragment comprises much less than 1% of the total assemblage from this component. As a group (and individually) the four cultural components dating 5,100-3,800 years B.P. that represent terminal Early Archaic/early Middle Archaic period (Green River and Pine Spring phases) have the most diverse assemblages, with a total of nine taxa or size classes identified from these components. Two of the components consist of at least six size classes that include bison, elk, deer-pronghorn, jackrabbit, ground squirrel, other rodents, sage grouse, other birds, and freshwater mussels. Two components that date later (3,750-3,520 years B.P.) in the Middle Archaic period (Pine Spring phase) have assemblages similar to the Early Archaic and late Paleoindian period components at Site 48CR4681, with only deer-pronghorn and jackrabbit size animals represented. The two Late Archaic period components (Deadman Wash phase and Besant) estimated to date between 2,000 and 1,600 years B.P. have distinctive faunal assemblages represented exclusively by bison size and deer-pronghorn size animals. The three early Late Prehistoric period (Uinta phase) components (1,460-1,110 years B.P.) have relatively small assemblages (Figure 13.11). One component contains mostly deer-pronghorn size remains, a second component has both large (bison size) and

Table 13.15 Minimum Number of Individual (MNI) for Each Size Class of Animal Remains.

Site/ Compound No.	Age (years B.P.)	No. of Specimens	Bison Size	Elk	Pronghorn Size	Large Mammal	Medium Mammal	Jack-rabbit Size	Ground Squirrel	Rodent Size	Sage Grouse	Bird Size	Freshwater Mussel	Total
48CR4681/I	7,490-7,110	282	--	--	1	1	--	1	1	--	--	--	--	4
48CR4681/II	6,050	466	--	--	1	--	--	1	1	--	--	--	--	3
48CR4681/III	4,840-4,340	725	1	--	1	--	--	1	1	--	--	1	1	6
48CR4681/IV	3,750-3,520	718	--	--	1	--	--	1	--	--	--	--	--	2
48CR4681/V	--	107	1	--	1	--	--	--	--	--	--	--	--	2
48CR4686/I	4,990-4,330	387	--	--	1	--	--	1	--	1	--	--	1	4
Plant/I	5,030-3,830	1,356	1	1	1	--	--	1	1	1	1	1	1	9
Abel Creek/I	1,790	1,986	1	--	1	--	--	--	--	--	--	--	--	2
Abel Creek/II	1,260	78	--	--	1	1	--	--	--	--	--	--	--	2
Abel Creek/III	--	240	1	--	1	--	--	1	--	--	--	--	--	3
48SW7107/I	3,560	11	--	--	--	--	1	1	--	--	--	--	--	2
48SW7107/II	1,390	21	--	--	1	--	--	--	--	--	--	--	--	1
48SW7107/III	1,460-1,110	174	1	--	1	--	--	--	1	--	--	--	1	4
Bald Knob/II	5,100-4,400	62	--	--	1	--	--	--	--	--	--	1	1	3
Stone Circle/I	230	292	--	--	1	--	--	--	--	--	--	--	--	1
Total			6	1	14	2	1	8	5	2	1	3	5	48

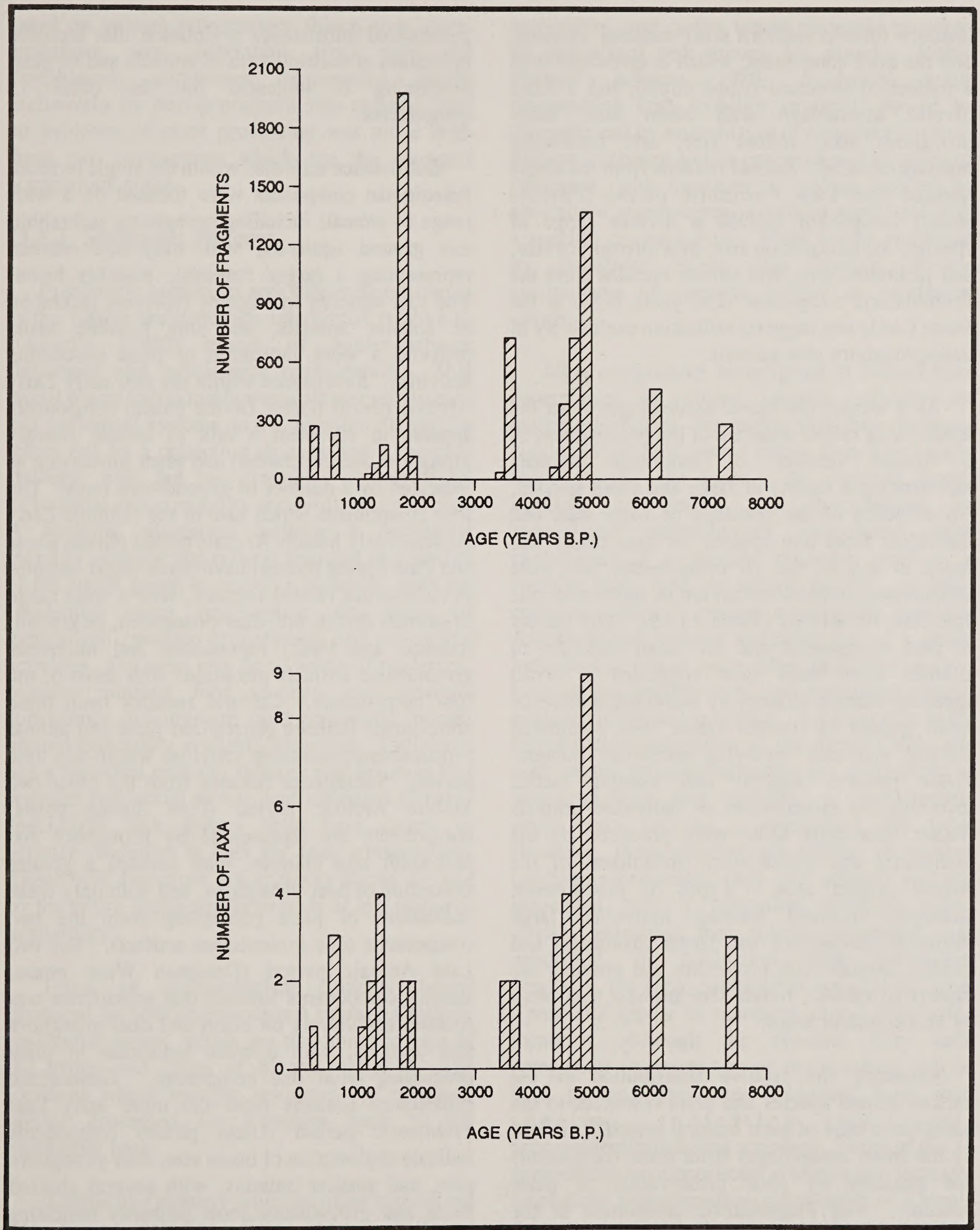


Figure 13.11 Summary of Number of Animal Remains and Number of Taxa (Size Classes) for Each Component.

medium (deer-pronghorn size) mammal remains, and the third component, which is associated with a habitation structure (stone circle), has a more diverse assemblage with bison size, deer-pronghorn size, rodent size, and freshwater mussels included. Animal remains from the single undated late Late Prehistoric period (Firehole phase) component include a diverse range of species, including bison size, deer-pronghorn size, and jackrabbit size, and animal remains from the Protohistoric component (230 years B.P.) at the Stone Circle site suggests utilization exclusively of deer-pronghorn size animals.

As a whole, the faunal assemblages from the Bairoil area reflect a pattern of the procurement of a limited number of individual animals representing a variety of large and small species. No evidence of the presence of more than one individual from any species (or size class) was noted in any of the 16 components, and most assemblages indicate utilization of more than one size class of animals (Table 13.15). The variety of taxa represented and the small numbers of animals from each taxa suggested a broad spectrum hunting strategy by individual hunters or small groups of hunters rather than communal hunting activities involving numerous hunters. These patterns suggest that hunting tactics involving the procurement of individual animals (rather than mass kills) were practiced by the prehistoric and protohistoric inhabitants of the Bairoil project area. Types of procurement strategies included hunting individual large mammals (pronghorn and larger mammals) and smaller animals with projectiles and possibly the capture of rabbits, rodent size animals, and birds by snares and/or traps.

Assessing the relative contribution of the various animal species and plant resources to the subsistence base of each cultural period is limited by the small assemblages from some components and possibly by poor preservation of plant remains. The Protohistoric component at the Stone Circle site is the single component that has definitive evidence of exploitation of a single animal species (probably deer-pronghorn). A generalized subsistence orientation that included utilization of multiple taxa of animals and/or plant processing is indicated for the other 15 components.

Subsistence activities within the single terminal Paleoindian component were focused on a wide range of animals including pronghorn, jackrabbit, and ground squirrels, with only one element representing a larger mammal, possibly bison. The vast majority of remains represent jackrabbit or smaller animals, and one possible mano provides a weak indication of plant processing activities. Subsistence within the two early Early Archaic period (Great Divide phase) components appears to represent a mix of animal (mostly pronghorn and jackrabbit) and plant processing as indicated by a number of groundstone tools. The four components which date to the terminal Early Archaic/early Middle Archaic period (Green River and Pine Spring phases) have much larger samples of subsistence related remains, with a wide range of animals (bison, elk, deer-pronghorn, jackrabbit, rodents, and birds) represented and numerous groundstone artifacts associated with three of the four components. Cultural remains from these components indicate generalized plant and animal procurement/processing activities within this time period. Subsistence remains from the other two Middle Archaic period (Pine Spring phase) components are represented by pronghorn and jackrabbit size animals, with perhaps a greater utilization of deer-pronghorn, and with only weak indications of plant processing from the two components (one groundstone artifact). The two Late Archaic period (Deadman Wash phase, Besant) components indicate that subsistence was focused exclusively on bison and deer-pronghorn size animals, with a weak indication of plant processing from one component. Generalized subsistence remains from the three early Late Prehistoric period (Uinta phase) components indicate exploitation of bison size, deer-pronghorn size, and smaller animals, with several charred seeds and groundstone tools probably indicating plant processing activities from at least several of the components. The single late Late Prehistoric period (Firehole phase) component subsistence was based on animal procurement (bison size, deer-pronghorn size, jackrabbit size) with the Protohistoric component represented nearly exclusively by deer-pronghorn size remains, and no evidence of plant processing was noted with these two components which are the youngest occupations noted.

13.5.2 Settlement Patterns

Prehistoric settlement and subsistence patterns in the region are generally interpreted relative to Binford's (1980) model of hunter-gatherer settlement and subsistence organization. This model places individual hunter-gatherer subsistence and settlement systems on a continuum defined on either end by a collecting strategy and a foraging strategy, with the two strategies contrasted by differential group mobility and settlement systems. A foraging adaptation includes a residential mobility strategy that reflects frequent movements of the social group to resource locations, with the residential camp representing the locus of generalized resource procurement and processing activities. Foragers rely on a variety of resources, practice minimal food storage, and schedule subsistence procurement (and residential moves) around seasonally available resources. Collectors use a logistical mobility strategy that involves less frequent residential moves, and collectors dispatch specialized task groups from base camps to procure resources in bulk for later consumption. These bulk resources are typically stored for use by the entire group during periods of low resource availability.

Types of archaeological contexts (sites) produced by both organizational strategies include residential camps, which are the domestic base of the group and locus of diverse activities, and locations where specific resources are procured and/or processed for transport back to the residential base.

A collecting strategy produces other specialized site types including field camps used by specialized task forces, stations which are used to gather information on resource locations and availability, and caches where resources procured by specialized task groups are stored. Within Binford's scheme (1980), residential camps representing both mobility strategies should be characterized by assemblages or remains associated with procurement and/or processing of a variety of resources, with locations or caches typified by specialized assemblages or remains associated with a specific resource type. Field camps employed by collectors might also contain diverse assemblages of remains similar to residential camps.

Most components investigated at Bairoil have assemblages of cultural remains indicative of multiple activities, suggesting that they represent residential or field camps rather than functionally more specific site types. As outlined above, locations and caches are characterized by specialized assemblages associated with exploitation of a specific resource, such as a specific plant type or animal species, or lithic resource. Bairoil project components typically contain faunal remains indicating use of a single individual of one or more different animal species, have various feature types, and sometimes contain evidence of plant processing. An exception is the Protohistoric occupation at the Stone Circle site with animal remains indicating use exclusively of deer-pronghorn size animals, a characteristic which may indicate a specialized site type. However, these remains are limited in number (perhaps representing only one animal) and are associated with a habitation structure (stone circle), indicating that animal processing was conducted in conjuction with habitation. Similarly, the three components noted at the Abel Creek site appear to represent animal processing localities, although the remains from each component represent two or more animal species (and perhaps only one individual from each species), indicating small-scale procurement/processing activities. None of the 16 components have consistent evidence that indicates large-scale procurement or processing of a single resource type, and as such all appear to represent residential or field camps that were loci of generalized subsistence activities.

Past archaeological work in the Bairoil area has suggested that a degree of sedentism may have existed during some prehistoric periods (Moore et al. 1987, Greer and Greer 1989), with this assessment apparently based on the large numbers of types of cultural features (including possible housepits or house floors) recorded during archaeological monitoring projects. The 16 investigated components provide little support for this interpretation, with all components representing short-term campsites which served as bases for generalized resource procurement. Cultural groups that used the project area were likely highly mobile, and the occupations probably represent only a segment of a seasonal round of activities. It is possible that some components represent field camps of logistical groups utilizing a collecting strategy, although most components probably represent short-term campsites of small cultural groups that pursued a foraging mobility strategy, at least during the season of occupation represented by the components.

The relatively small number of flaked stone and groundstone tools, debitage, and animal remains suggests that the Bairoil components represent occupations of limited duration and/or intensity. The cultural remains from components have previously been discussed (Section 13.1), and Table 13.16 summarizes the densities of different classes of flaked stone artifacts and features. Tool and debitage densities should reflect the duration of occupation and/or intensity of tool use, and the limited density of these classes of artifacts suggests the that Bairoil components represent short-term occupations. The pattern of limited densities of different classes of remains is probably reflective of a foraging mobility strategy involving short-term occupations with frequent moves of the residential group. Residential camps of collectors should represent longer-term occupations, which would result in relatively more prehistoric activity and hence a greater density and/or diversity of cultural remains. No midden or refuse areas, which are generally indicative of longer-term occupations (Schiffer 1976, Brooks and Yellen 1987), were recognized at the 16 components which further suggests the 16 components represent fairly short-term occupations. The recovered remains from most components suggest that only short-term domestic activities representing residential camps were the major focuses of most occupations in the Bairoil Project Area.

Past investigations within the project area have defined three principal environmental zones as foothill, dunal flat, and riparian settings (Berrigan 1988, Greer and Greer 1989). As outlined by Greer and Greer (1989), the foothill zone includes Bald Knob and the Pleistocene terraces that extend throughout the Lost Soldier well field, the dunal flats zone includes the broad plain (Lost Soldier Flat) within the Wertz well field, and the riparian zone includes settings near drainages. Table 13.17 summarizes the setting by temporal period of the 16 components investigated by Mariah and combines these components with 58 components previously recorded in the Bairoil vicinity (Greer and Greer 1989). During the current project, the most components (43.8%) were recorded from the dunal flats, with 37.5% from a riparian setting and 18.8% from foothills. The combined sample indicates the highest density of components within the riparian zone (43.2%) with lesser numbers associated with the dunal flats (29.7%) and foothills setting (27.0%). Past geoarchaeological studies have suggested that the areas with greatest potential for preserved cultural material in the Bairoil vicinity are within aeolian sheet, dunal deposits, and alluvial sediments (McFaul 1987), and the vast majority of cultural components previously recorded in the Bairoil vicinity (and investigated during the Bairoil Archaeological Project) have been from these depositional settings. Fourteen of the 16 components investigated by Mariah were contained within aeolian deposits, with single components associated with alluvial and colluvial deposition.

Several patterns are indicated by the distribution of components by temporal period within individual environmental zones (Table 13.17). The majority of Late Prehistoric period (75%) and Late Archaic period (50%) components are located in the riparian zone with only about

33% of the combined Middle and Early Archaic periods components located within this setting. Conversely, the vast majority (77%) of components within the dunal flats represent either Middle or Early Archaic period occupations, with only 18% representing Late Archaic or Late Prehistoric components. Similarly, the foothill zone is dominated (60%) by Middle or Early Archaic period components with a very low density of Late Prehistoric (10%) or Late Archaic period (20%) components. The low number of Late Archaic and Late Prehistoric components (and the high number of older components) within the dunal flats zone probably reflects the age of dunal deposits on Lost Soldier Flats (Greer and Greer 1989). Lost Soldier Flats is characterized by extensive buried dunal deposits that predate 4,500 years B.P. (Albanese 1989) which are covered by as much as 1 m of colluvium in most areas; hence, most occupations would necessarily be of Middle Archaic period age, or older.

Settlement models proposed for the Wyoming Basin have generally focused on differential seasonal use of various parts of the basin and surrounding mountains. One of the earlier models was proposed by Sanders et al. (1982) and posited a settlement pattern with a yearly round that

Table 13.16 Debitage, Tool, and Feature Densities for Bairoil Project Components.

Site No./ Name	Component No.	Age (years B.P)	Tool/m^2	Debitage/m^2	Feature/m^2	Debitage/ Feature
48CR4681	I	7,990-7,110	0.09	4.4	0.24	18.0
Bald Knob	I	6,610-5,980	0.02	0.7	0.07	5.8
48CR4681	II	6,050	0.15	4.7	0.1	47.0
Bald Knob	II	5,100-4,400	0.36	7.7	0.42	18.4
Plant	I	5,030-3,830	0.14	4.0	0.38	10.8
48CR4686	I	4,990-4,330	0.07	0.9	0.32	2.7
48CR4681	III	4,840-4,340	0.20	8.8	0.18	49.7
48CR4681	IV	3,750-3,570	0.26	27.9	0.07	418.8
48SW7107	I	3,560	0.11	1.0	0.03	35.0
Abel Creek	I	1,790	0.16	9.1	0.1	91.0
48CR4681	I	--	0.16	7.8	--	--
48SW7107	II	1,390	0.19	0.2	0.06	3.0
48SW7107	III	1,460-1,110	0.16	2.5	0.14	17.4
Abel Creek	II	1,260	0.25	1.8	0.15	12.0
Abel Creek	III	--	0.08	3.7	--	--
Stone Circle	I	230	0	0.1	0.02	3.0

Table 13.17 Bairoil Vicinity Components by Setting and Cultural-Historical Period.[1]

Setting	Protohistoric	Late Prehistoric	Late Archaic	Middle Archaic	Early Archaic	Paleoindian	Total
Foothill	1(1)	2	4	7(1)	5(1)	1	20(3)
Dunal flats	--	2	2(1)	11(4)	6(1)	1(1)	22(7)
Riparian	--	12(4)	6(1)	10(1)	4	0	32(6)
Total	1(1)	16(4)	12(2)	28(6)	15(2)	2(1)	74(16)

[1] ( ) includes number of components Bairoil Archaeological Project.

included use of mountainous areas in the summer, exploitation of the foothills in the spring and fall, and occupation of the basins in the winter. Recent investigations have documented numerous spring-fall occupations within the Wyoming Basin (Smith and Creasman 1988, Harrell 1989) which suggests that the model may not fully account for prehistoric settlement patterns in the region. Several revisions to this seasonal model have been proposed recently (Hassler 1987, McNees et al. 1989, Smith and Creasman 1988), and these models suggest that winter settlement took place in uplifted area adjacent to the basin in order to obtain critical resources (firewood and animals) and/or greater protection from the elements. Group dispersion into the adjacent basins and foothills began in the spring with the basins exploited mostly during the warmer seasons.

Very little firm evidence for addressing various seasonality models was obtained from the 16 components (Table 13.13). Only five of the 16 components have types of subsistence remains that provide some indication of season of occupation. These remains include bird eggshell with eggs available for collection in the spring, mussel shell which were probably obtained during the warmer months, and a few charred goosefoot seeds, which, if charred at the time of maturation, indicate a late summer or fall occupation. One immature bison phalange collected from the Plant site represents an individual approximately six month of age, which is the firmest seasonal indicator recovered from the entire project. Although a large total amount of animal bone was recovered from the 16 components, no fetal bone of large herbivores (which would be a firm indicator of late winter or early spring occupations) was identified which suggests that most components may have been warm season occupations. Similarly, very few charred seeds (with charred seeds usually indicating late summer or fall occupations [Smith and Creasman 1988, Smith 1988]) were associated with the components. Additionally, the sites investigated during the Bairoil Archaeological Project lack evidence of intensive seed processing in the late summer and fall such as the Taliaferro and Buffalo Hump sites located in the basin indicating that the Bairoil sites was occupied during other times of the year (Harrell 1986, Smith and Creasman 1988). This negative evidence may indicate most components represent late spring or early summer occupations.

Seasonality information was obtained from several cultural-historical periods or phases, including three components which represent the Early/Middle Archaic period (Green River and Pine Spring phases) and two components that date to the early Late Prehistoric period (Uinta phase). Limited information (eggshell, an immature bison element, mussel shell, charred seeds) suggests that the Green River and Pine Spring phase components include spring through fall occupations, with the Uinta phase components representing (as indicated by charred seeds) late summer or fall occupations. Numerous large, heavily oxidized roasting or baking pits were associated with the three Green River phase components, although relatively limited amounts of subsistence remains (bone, charred seeds) were recovered from these components. The number of baking or roasting pits suggests fairly intensive processing activities, and the lack of associated subsistence remains suggests that resources processed were types which would leave minimal archaeological evidence, such as roots or tubers. Roots or tubers in the project area are available in the spring (Latady et al. 1987), which may be the season of occupation of at least some of these components. Housepits were associated with two of the Green River phase components, and similar housepits in the region have been interpreted to represent shelters for protection from harsh winter or early spring climates (McGuire et al. 1984, Newberry and Harrison 1985, Harrell and McKern 1986), although other Green River phase housepits probably represent warm season habitations (Eakin 1987, Smith and Reust 1992). No evidence of season of occupation was recovered from the six Green River phase housepits investigated during the Bairoil Archaeological Project.

Paleoenvironmental reconstructions based on geoarchaeological (sediment) and pollen analyses suggest that climatic conditions have fluctuated between relatively xeric and mesic conditions within the past 7,500 years. The large number of radiocarbon dates obtained from various Bairoil projects (Zale 1989, Greer and Greer 1989) suggests that there has been continuous occupation of the project area for the past 7,000 years (see Section 13.2) which includes all climatic regimes. Potential implications of past climatic changes would include changes in the number and/or types of plant and animal resources available for exploitation, and possibly changes in the predictability of resource location. Concomitant changes in prehistoric settlement and subsistence patterns might be reflected in number and types of animals and plants exploited, changes in environmental zones utilized, and changes in mobility and/or resource procurement strategies. Results of the Bairoil Archaeological Project suggest that prehistoric adaptation in the project during all cultural periods represents a generally consistent pattern. All occupations appear to represent short-term occupations by small cultural groups using a foraging mobility strategy, and subsistence patterns indicate generalized small-scale animal procurement and/or plant processing activities. The absence of changes in settlement and subsistence patterns represented by the 16 cultural components suggests that no definite correlations are reflected between changing paleoenvironmental conditions and cultural adaptations in the project area.

13.6 QUESTIONS PERTAINING TO RESOURCE MANAGEMENT

In addition to research issues concerning the lifeways of the prehistoric inhabitants of the area, the DRP also detailed two questions pertaining to the management of the cultural resources of the area (Zale 1989). The first question concerns whether the excavation of undisturbed areas between and including features produced information that is significantly different than data produced by excavations focused on specific features found during construction. The second question focuses on the identification of housepits and house floors using attributes that can be recognized when these features are exposed in construction contexts.

During the development of the Lost Soldier and Wertz oil fields during 1987 and 1988, 153 prehistoric localities with over 550 investigated features were found during archaeological monitoring of construction activities (Greer and Greer 1989). When features were found during these investigations, they were recorded, the fill was excavated, and samples for radiocarbon dating and flotation were taken. In most cases no attempt was made to excavate areas surrounding the features, which were often disturbed due to construction activities. These field methods yielded some information on a large sample of features as can be seen from Greer and Greer's (1989) summary report. Information obtained included morphological description of the features, content of feature fill, and radiocarbon age. Based on this information the features were divided into feature types. Among identified feature types were ash pits, roasting pits, firepits, house floors, cooking areas, housepits, middens, and postholes.

However, this information is quite limited for developing an understanding of the lifeways of the prehistoric inhabitants of the area and leads to unfounded speculations. For example, based on limited information Greer and Greer (1989) and Moore et al. (1987) speculate that the prehistoric people of the area during some time periods lived in sedentary villages for at least part of the year and practiced horticulture. These conclusions are based on the presence of what were thought to be numerous housepits representing villages with elaborate houses. More extensive excavations consisting of large block areas at some sites during the Bairoil Archaeological Project has shown that the inhabitants throughout most of the prehistory were highly mobile foragers with a residential mobility strategy. These prehistoric people, at least during the Early Archaic period, probably used the Bairoil area in the winter and spring possibly to collect and process roots and tubers.

The actual features and contents are only a small portion of the archaeological record preserved at sites in the Bairoil area and are only a small part of the area used for activities by the prehistoric people. The results of ethnoarchaeological studies of modern hunters and gatherers have shown that most site activities occurred in areas surrounding features (Binford 1983, O'Connell 1987, Yellen 1977). Most debris from site activities was often left in these areas surrounding the features, except when refuse disposal was practiced at longer term sites (Binford 1987). To obtain some understanding of the function of the sites in the area, the spatial patterning of the archaeological remains including features, as well as the debris surrounding the features needs to be examined (see Section 13.3.2). Though both cultural and natural processes contribute to the resulting patterning in the archaeological record, the study of these patterns can reveal some information concerning the use of space by the prehistoric inhabitants. Understanding the use of space can provide clues about site function and settlement organization. Therefore, investigation of only the actual features from archaeological sites yields only limited information and much that could be learned from the archeological record concerning the lifeways of the prehistoric inhabitants is lost.

Given the limited time and money allowed for most archaeological investigations, the best approach to learning is to extensively investigate a few sites following a data recovery plan with research issues, instead of trying to partly record every possible cultural feature in the area. The sites to be excavated should be selected based on the data requirements of the research questions. Block excavations at the selected sites should reveal valuable information that could be used to advance the understanding of the lifeways of the prehistoric people of an area. In contrast, attempting to partly record all features without regard to project research questions provides information of limited use. Investigating only the features yields only information concerning feature type, contents, and age, and the full range of site activities and function remains unknown.

The second management issue detailed in the DRP involves the identification of housepits when they are exposed in construction contexts (Zale 1989). During the past several years over 100 features initially identified as housepits or house floors have been found during construction activities in the Bairoil area (Greer and Greer 1989, Moore et al. 1987). These features were usually found in profile in pipeline trench walls and consisted of dark stains of various shapes and sizes (usually over a meter in length). Based on this limited information these features have been identified as housepits, and a settlement organization based on sedentary occupation of the

Bairoil area has been proposed (Greer and Greer 1989, Moore et al. 1987).

Because of problems of identifying possible housepits in profile of pipeline trenches, Hoefer (1988) developed several attributes that could be used to distinguish housepits from other features in pipeline trench walls. These attributes were formulated following a review of the characterizes of excavated housepits in southwest Wyoming. Using these attributes, Hoefer (1988) rated the housepits identified by Moore et al. (1987) in the Amoco CO_2 Pipeline trench west of Bairoil. Features were rated from 1 (highly probable) to 4 (highly unlikely).

Several of the features rated by Hoefer (1988) were investigated by Mariah during the test excavations for the Bairoil Archaeological Project (Reust et al. 1990) and the block excavations detailed in this report. During the test excavations, five possible housepit features (T148, T149, T150, T151, and T152) from the Crooks Creek site (Site 48FR113) were investigated using 1 x 1 m and 1 x 2 m test units (Reust et al. 1990). Four of the features were rated by Hoefer as 3 (unlikely), and one was given a 2 (possible). The results of the test excavations indicated that all were of natural origin. The results of test excavations of three possible housepit features (T180A, T180B, and T184) at the Sand Trap site (Site 48FR2064) indicated that the features were probably the result of natural soil formation (Reust et al. 1990). Each of these three features was rated as 3 (unlikely) by Hoefer (1988). Test excavations at the Cully's Dump site (Site 48SW6275) produced no evidence that the three investigated features (T57, T58, and T59) were of cultural origin (Reust et al. 1990). These features were also rated as 3 (unlikely) by Hoefer (1988). The results of test excavations of Feature T91 (rated as 2 [possible] by Hoefer [1988]) at the Tower site (Site 48SW127) suggested that it was a possible housepit. Block excavation conducted at the site showed that the feature was actually part of an old drainage (see Section 12.0 of this report). Two features (T23 and T26) at the Bald Knob site rated as 1 (highly probable) and 2 (possible) by Hoefer (1988) and excavated during the Bairoil Archaeological Project proved to be housepits (see Section 9.0 of this report).

Two additional features identified as housepits during the 1987-1988 investigations conducted by Greer and Greer (1989) were excavated during the Bairoil Archaeological Project. These features were not rated by Hoefer (1988). One of these features was from Site 48SW7085. Though most researchers who examined the feature in profile within a pipeline trench believed it to be a stratified housepit, the results of block excavations showed it to be the remains of a historic well drilling mud hole with the remains of a backhoe trench (see Section 11.0). The other investigated feature occurred at Site 48CR4686. The results of block excavations indicated that the feature was a housepit. Additionally, Features 4, 5, and 6 at Site 48CR4631 originally recorded during the 1987-1988 investigations as the remains of house floors were tested during the test excavation phase of the Bairoil Archaeological Project (Reust et al. 1990). Test excavations failed to confirm the presence of house floors.

Overall, Hoefer's (1988) rating of the possible housepit features found during the Amoco CO_2 Pipeline Project was able to predict whether the features were housepits. All investigated features rated as 3 (unlikely) turned out not to be housepits. However, two features rated as 2 (possible) from the Crooks Creek site and Tower site also proved not to be housepits. The feature at the Tower site required a block excavation to completely determine its nature. It appears that Hoefer's (1988) rating system has some merit, especially in predicting when a feature is not a housepit.

Hoefer's (1988) or a similar system could be used as a first step in determining whether a feature found in profile is actually a housepit. However, in many cases, especially in questionable ones, additional archaeological investigations would need to be conducted to completely prove the presence of a housepit. In many cases, all that would be required to obtain the necessary information would be 1 x 1 m test units. Several features were shown not to be housepits during the test excavations for the Bairoil Archaeological Project based on 1 x 1 m or 1 x 2 m test units (Reust et al. 1990). In some cases, however, more extensive excavations may be required. These test excavations should be conducted soon after discovery so that the true nature of the features is known, allowing for correct management decisions and limiting false speculations concerning the site and area.

14.0 MANAGEMENT SUMMARY

This section summarizes the results of block excavations completed during the second phase of investigations for the Bairoil Archaeological Project. Management recommendations for the project area are presented in the final subsection of this report.

14.1 SUMMARY OF ARCHAEOLOGICAL INVESTIGATIONS

Two phases of archaeological investigations were conducted by Mariah for the Bairoil Archaeological Project. The initial phase consisted of evaluative testing of 16 sites in 1989 (Reust et al. 1990), Block excavations that included 873 m^2 were completed at nine of these sites in 1990 during the data recovery phase of investigations. The nine sites were selected for block excavations based on their potential to yield data pertinent to the research goals posed in the DRP (Zale 1989).

Block excavations at two sites (Site 48SW7085 and the Tower site) produced no evidence of intact cultural components, with a total of 16 components encountered at the remaining seven sites. Thirty-five radiocarbon age estimates were obtained from these sites, and the age of the 16 components ranged from the terminal Paleoindian (7490 years B.P.) to the Protohistoric (230 years B.P.) period. Cultural affiliation of the 16 components included one terminal Paleoindian, two Early Archaic period (Great Divide phase), three terminal Early Archaic/Middle Archaic period (Green River phase), three Middle Archaic period (Pine Spring phase), two terminal Late Archaic period (Deadman Wash phase and Besant), three Late Prehistoric period (Uinta phase), one late Late Prehistoric period (Firehole phase), and one Protohistoric period component. Based on radiocarbon dating results, several of the components represented multiple occupations which lacked stratigraphic separation (as discussed in the individual site descriptions). Integration of the results of past archaeological projects (which included greater than 140 radiocarbon dates and numerous cultural components) with the current Bairoil Archaeological Project indicated nearly continuous occupation in the project area from the late Paleoindian to the Protohistoric period, with the greatest intensity of occupation occurring during the Early and Middle Archaic periods.

A large number (232) of cultural features were identified within the current block excavations. The vast majority (72%) of the features were associated with the three terminal Early Archaic/Middle Archaic period (Green River phase) components. Feature types included habitation structures (housepits and stone circles), a variety of thermal and nonthermal pits, postholes, ash/rock concentrations, and one cache of seven flaked stone tools. Habitation structures included six housepits associated with two terminal Early Archaic/Middle Archaic period (Green River phase) components and single stone circles investigated from a Late Prehistoric period (Uinta phase) and a Protohistoric period component.

Generalized subsistence activities, which included processing or procurement of animal and plants, are indicated for most of the 16 components. Very few charred seeds were collected from numerous flotation samples although groundstone artifacts, which probably reflect plant processing activities, were recovered from many components. Animal remains from most components represent two or more species, with no more than one individual of a particular species identified from any component. Within the project area, flaked stone tool manufacture was focused on the latter manufacturing stages and tool maintenance activities, possibly reflecting the limited quantities of toolstone quality raw material that occur in the vicinity of Bairoil. The density and spatial patterning of cultural remains from all components suggest that the components represent residential camps of small cultural groups utilizing a foraging mobility strategy. The limited density of cultural remains and the lack of midden development within all components indicate that short-term occupations are represented. Although a number of the components, especially those dating to the Early/Middle Archaic period (Green River phase), appear to represent palimpsests of multiple occupations, the overall density of cultural remains for all components is still relatively low.

14.2 MANAGEMENT RECOMMENDATIONS

The data recovery phase of the Bairoil Archaeological Project represents the most recent in a series of large cultural resource management projects sponsored by Amoco that have been conducted in the vicinity of Bairoil. These projects included Class III inventories of the Wertz and Lost Soldier oil fields conducted by Larson (1978) and by Amoco and the BLM (Bies et al. 1985), with Class III survey, testing, and monitoring of the 20.8 mi (33.3 km) long main CO^2 pipeline completed by OAI for Amoco in 1985 and 1986 (Moore et al. 1987). Numerous survey, testing, monitoring, and salvage projects were also conducted in the two well fields in 1987 and 1988 in conjunction with Amoco's Enhanced Oil Recovery Project (Greer and Greer 1989). Moore et al.(1987: 1-3) evaluated 12 sites and recorded 484 cultural features, and Greer and Greer (1989: 16-1) noted 580 features at 160 localities. The large number of cultural features and the number of possible structural features encountered in buried contexts by Moore et al. (1987) and Greer and Greer (1989) provided the basis for the testing (Reust et al.1990) and data recovery phases of the Bairoil Archaeological Project (this document), and the results of these past projects are pertinent to the management recommendations presented below.

The initial phase of the Bairoil Archaeological Project completed by Mariah consisted of the testing of 16 archaeological sites recorded by Moore et al. (1987) and Greer and Greer (1989). These 16 sites were judged by the BLM (Zale 1989) to have the greatest potential to yield information relevant to understanding the lifeways of the prehistoric inhabitants of the Bairoil area. Many of these sites had been recorded as containing probable structural features (housepits, house floors, or stone circles). Of the 16 sites, testing determined nine contained intact cultural deposits. Test excavations showed that many of the features recorded as housepits were actually the result of natural processes. Intact cultural deposits were encountered at seven of the nine sites during the data recovery phase, with structural remains encountered at four sites including housepits (6) and stone circles (2) and a total of 232 cultural features were excavated. These features as well as possible features evaluated during the testing phase included examples of all types recorded by previous monitoring projects at Bairoil.

The data recovery investigations obtained a tremendous amount of information concerning the known site types in the Lost Soldier and Wertz well fields and provided many insights about the lifeways of the prehistoric inhabitants over the past 7,500 years. The Bairoil area is one of the most intensively archaeologically investigated areas in the State of Wyoming. The archaeological research has shown that highly mobile hunters and gatherers probably using a residential mobility strategy visited the area through the years as part of their seasonal round. Most site types representing most time periods and including sites with housepits and house floors appear to be the remains of short-term camps. The Bairoil area does not appear to have been used prehistorically any more intensively than other portions of the Wyoming Basin and may actually have been used less extensively than other areas in the region. The large number of known sites and features in the Lost Soldier and Wertz well fields is mostly the result of the intensive investigations.

Because of the extensive amount of archaeological work conducted in the area over the past several years, probably all site types present in the two well fields are known and have been studied at many different levels of investigation including large block excavations. In most areas, additional archaeological work in the Lost Soldier and Wertz well fields would probably not yield significant information not already obtained during the numerous previous projects. The amount of future archaeological work in the Lost Soldier and Wertz well fields should be of a limited nature and should focus principally on site types previously not recorded and investigated in the area. Most likely, other site types not previously recorded during the intensive archaeological investigations probably do not occur in the area.

The results of the current data recovery project as well as past projects should to be integrated into the Bairoil Cultural Resource Management Plan prepared by the BLM for the Lost Soldier and Wertz well fields. The following management recommendations are provisional and are presented for consideration for inclusion in this plan.

(1) Class III surveys of the Lost Soldier and Wertz oil fields have been completed, although past reviews have suggested these inventories may not comply with current standards (BLM 1988). No further inventory should be required for areas determined by regulatory officials to have been previously surveyed in an acceptable manner. Further Class III inventory in the Bairoil area is recommended only for areas that will be impacted and that have not been inventoried at an acceptable level. Due to the large number of past archaeological projects, a Class I file search should be completed prior to the initiation of any ground disturbing project. Highly disturbed areas that have been investigated at a Class III level where additional archaeological investigations would not be necessary should be delineated in the Cultural Resource Management Plan.

(2) Production in the two oil fields has been continuous from prior to 1920 until the present, hence much of the area has previously been disturbed by pipelines, well pad, or other facility construction. Future developmental or construction projects undertaken should be confined to previously disturbed ROWs where potential for intact cultural remains is very limited. If activities are restricted to disturbed areas, no archaeological survey, monitoring, or trench inspections should be required. If the new project is likely to exceed the depth of the previously disturbed ground, then auger testing or additional trench inspections may be required.

(3) Archaeological monitoring, trench inspection, or auguring should be conducted for ground disturbing activities only within previously undisturbed areas. Treatment of features recorded in trenches should be limited to the recordation of locational and stratigraphic data. Cultural features and other remains noted during monitoring of areas of extensive horizontal disturbance (well pads) should be evaluated on a case-by-case basis to determine whether the newly discovered remains could provide new information concerning the prehistoric inhabitants of the area. If the newly discovered remains are similar to previously investigated remains, then no further work should be required. Additional work should be required only if the investigations could provide information that could be used to address data gaps not previously considered. Current data gaps will be discussed in the Cultural Resource Management Plan.

(4) Past geomorphological investigations have determined much of the northern portions of the Wertz and Lost Soldier oil fields represented by Camp Creek Hill are characterized Pleistocene age or older surface cobble deposits (McFaul 1987, Albanese 1989). Due to the age of the deposits, virtually no potential for intact subsurface cultural remains exists in this area, hence no archaeological monitoring,

trench inspection, or auguring should be required, where it can be determined from the geomorphology that deposits are pre-Holocene.

(5) All identified site and feature types recorded to date within the project area were investigated during the current data recovery project or previous projects. Since all recorded site types have been investigated, it is recommended that future data recovery projects focus mostly on previously uninvestigated site or feature types. Significant site types as listed by the BLM (1988) investigated during the data recovery project include housepits/house floors, stone circles, late Paleoindian period remains, and stratified buried deposits. Other significant site types listed by the BLM (1988) not investigated include ceramic sites with 10 or more sherds, kill sites/bone beds, and eagle traps. Significant, intact remains representing these site types are not known in the area, and as evidenced by the intensive amount of previous archaeological work in the area, probably do not exist in the two well fields. Significant remains requiring additional investigations in the future include buried, intact early Paleoindian remains, human remains, and unique remains. Additional excavations would have to be justified in the context of the previous work in the Bairoil area.

If a particular feature or site type is found in an environmental zone or other unusual setting where it has not been previously recorded, this may raise a research question for which data recovery may be necessary. Also, if the feature or site type offers an exceptional opportunity for data recovery, such as remarkable preservation or unique contextual association, then additional data recovery should be considered. Finally, a site with previously known feature types may have significance under other criteria than just its potential to yield information. For example, a housepit may be so well-preserved and so representative of the data from previously recorded housepits that it may have significance and preservation value under Criterion C of the NRHP criterion for evaluation. Further, if a site has importance of Native American traditional practitioners, then this value must also be addressed.

(6) All future Class III inventories in the Bairoil Archaeological District should include some sort of statistically valid auger sampling for areas considered to have a high potential for subsurface features, particularly sand dune areas, alluvial flats, and colluvial terraces.

The two phases of investigations completed by Mariah were conducted under the DRP for Historic Properties at Bairoil (Zale 1989), which is a component of the Bairoil Cultural Resource Management Plan to be prepared by the BLM. The two phases of archaeological investigations have addressed the objectives posed by the DRP, and no further work is recommended for the current project. Future work in the Lost Soldier and Wertz well fields should be limited to only special cases as outlined above.

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APPENDIX A:

Geoarchaeological and Paleoclimatic Interpretations of Soil/Sediment Relationships at Seven Archaeological Sites Preserved in Eolian and Alluvial Deposits Near Bairoil and Wertz, Wyoming

By

Michael McFaul
William Doering

GEOARCHAEOLOGIC AND PALEOCLIMATIC INTERPRETATIONS OF SOIL/SEDIMENT RELATIONSHIPS AT SEVEN ARCHAEOLOGIC SITES PRESERVED IN EOLIAN AND ALLUVIAL DEPOSITS NEAR BAIROIL AND WERTZ, WYOMING

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By

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INTRODUCTION

Cultural materials at six of the seven archaeologic sites in the Bairoil/Wertz locality are preserved in a package of three Holocene eolian sediment units. The three eolian units are:

1) EI (ca. early Holocene to 6050 yr BP),
2) EII (5950 to ca. 2000 yr BP), and
3) EIII (ca. 2000 to < 1000 yr BP).

The bulk of the cultural materials are associated with the 5950 to ca. 2000 yr BP eolian unit

A combination of radiocarbon dates from cultural features and interpretations of soil/sediment relationships indicate that occupation of the study area was relatively continuous from ca. 5000-1500 yr BP. The fact that three Holocene eolian units were deposited in Lost Soldier Flats and that the second of these events was interrupted by a period of soil formation, indicates that environmental conditions fluctuated during the Holocene. Therefore, relatively continuous occupation and climatic diversity suggest that human occupation of the Lost Soldier physiographic zone was not climate dependent as suggested by Eckerle (1989).

The integrity of cultural materials preserved within eolian sediments and the fine-grained Abel Creek alluvium is judged to be high (ie. minimal disturbance) due to the nature of these depositional processes. However, evidence of localized erosion and the wide range of radiocarbon dates within some horizons suggests that erosion compressed some cultural components.

METHODOLOGY

Geoarchaeologic investigations at seven archaeological sites (48SW998, 48SW5982, 48SW7085, 48SW7107, 48CR4139, 48CR4681 and 48CR4686) in the Bairoil-Wertz vicinity were designed to:

1) document the geologic and pedologic processes preserved in the soil/sediment profiles and
2) define the paleoclimatic trends responsible for development of the soil/sediment profiles.

Specific on-site procedures included a detailed description of site terrains (see McFaul 1987; Albanese 1989) and representative soil/sediment profiles (Krumbein and Sloss 1963; Soil Survey Staff 1960; Guthrie and Witty 1982; Birkeland 1984). Where possible, attempts were made to locate representative profiles near sample columns yielding archaeologic, pollen, and/or radiocarbon data.

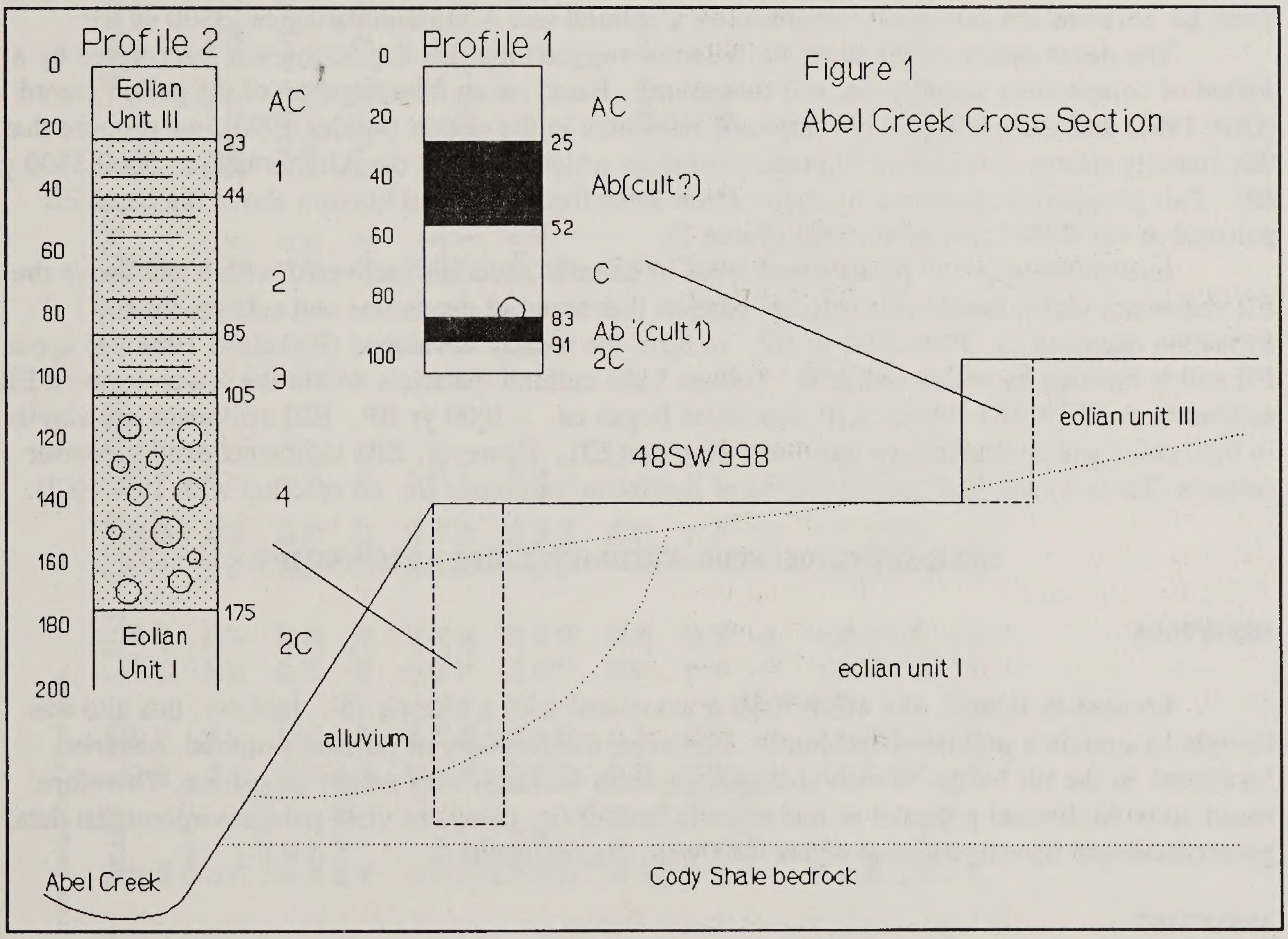
Soils and sediments at four of the seven sites (48SW998 [Abel Creek], 48SW5982 [Bald Knob], 48CR4139 [Plant], and 48CR4681) were selected for laboratory analysis based upon their potential to: 1) yield geoarchaeologic and paleoenvironmental data, 2) refine existing field descriptions (Albanese 1989; McFaul 1987; McFaul and Latady 1987), and 3) facilitate future identification of representative soil/sediment units. Laboratory procedures included the determination of particle size (Bouyoucos 1962) and percent calcium carbonate (Piper 1950).

PHYSIOGRAPHY/SOIL-SEDIMENT CHARACTERISTICS

The seven sites (48SW7085, 48SW5982, 48SW998, 48SW7107, 48CR4686, 48CR4139, and 48CR4681) included in this investigation are located in the Lost Soldier Flat sub-zone of the Lost Soldier-Separation Flats physiographic zone (Gaylord 1982). The east-west trending Lost Soldier Flat is a gently-sloping (11 m/km after McFaul 1987:Fig. 2), low-relief alluvial plain which is incompletely rimmed by cobble-armored pediment benches (see Guyton 1960; Jaworowski 1985, 1989).

Terrains on the flat are grouped into two categories by their depositional histories. These groups are an extensive alluvial/colluvial plain and the eolian deposits mantling this plain. In the upper reaches of the flats, the alluvial plain is an eroded (strath) surface developed upon the Cody Shale (Reynolds 1968). This strath surface grades from the base of the Pleistocene, cobble-armored benches, or their remnants (ie. Bald Knob), to Abel-Lost Soldier Creek drainage (see Toe Slope mapping unit [McFaul 1987: Figures 1 and 2]).

Narrow deposits of Holocene alluvial fill, approximately 122 m wide (Albanese 1989:35), are inset within the strath plain (McFaul 1987: Figure 1) and are exposed in the cutbanks of two Abel Creek fill terraces at site 48SW998. The tread of the older terrace or T2 is approximately 4.5 m above the intermittent Able Creek (McFaul 1987:Figure 3). The T2 profile exhibits a diverse depositional history consisting of approximately 2 m of cross bedded eolian sands, overlain by bedded alluvium and a more recent eolian deposit (Figure 1). The younger T1 terrace is composed entirely of alluvium and inset within the modern channel approximately 0.8-1.25 m (Albanese 1989:22) above the modern channel.



Excluding the historic dump fill at 48SW7085 and the recent (< 1260 yr BP) T2 alluvium at the Abel Creek site (48SW998), cultural materials at the other sites are preserved exclusively in eolian sediments. Three separate periods of eolian deposition (EI, EII, and EIII) are recognized. The oldest or EI is characterized by its basal stratigraphic position, color hues (2.5Y), and soft consistence (values $\leq$ 1.0 kg/cm^2). Although these sediments typically lack evidence of soil development, this investigation (see 48CR4681) and a previous investigation at the Abel Creek site (McFaul 1987:Figure 3) noted a >5950 yr BP paleosol with a soil A horizon and a Stage I+ accumulation of calcium carbonate (see Gile et al. 1966; Birkeland 1984:Appendix I). The absence of soil development on EI sediments elsewhere in the study area suggests a period of erosion preceded deposition of the EII sediments.

Browner EII sands (10YR hues) mantle the early-mid Holocene EI sediments. The middle Holocene EII sediments are distinguished by their massive structure and hard consistence (values commonly $\geq$ 4.5 kg/cm^2). Soil/sediment relationships suggest that two paleosols of differing ages developed on the EII sediments. Although similar in color, structure, and consistence, these two paleosols are characterized by differing degrees of calcium carbonate accumulation and position in the EII sediments. The older, basal paleosol exhibits a Stage I+ to II carbonate accumulation with segregated carbonate filaments and/or masses within a carbonate-whitened (20-90% of the surface area) soil Bk horizon. In contrast, pedogenic carbonates in the younger, upper EII soil are disseminated and there is no visible accumulation. In locations where both paleosols are preserved, these Bk horizons are commonly separated by a cultural soil A horizon dating ca. 3500 yr BP.

The development of the basal EII paleosol suggests that EII deposition was interrupted by a period of comparative stability (ie. soil formation). Based on an interpretation of the pollen record (Gish 1991) and analogous soil development elsewhere in the region (Reider 1990), we propose that this stability relates to the mesic climatic conditions which followed the Altithermal ca. 5000-3500 yr BP. This proposal is supported by radiocarbon dates from a cultural horizon above the basal EII paleosol at 48CR4681 and 48SW5982 (Table 1).

Interpretation of the position and types of cultural materials recovered within and above the EII sediments which mantle this paleosol suggest that renewed deposition and subsequent soil formation occurred ca. 3500-2000 yr BP. In turn, the weakly developed (Birkeland 1984:24) upper EII soil is mantled by eolian unit EIII. Pelican Lake cultural materials within the lower segment EIII sediments at 48CR4681 implies EIII deposition began ca. >2000 yr BP. EIII sediments are similar in both color and consistence to those of eolian unit EII. However, EIII sediments exhibit coarser textures (Table 1) and lack accumulations of pedogenic carbonate (ie. no reaction with 10% HCl).

SITE SPECIFIC SOIL-SEDIMENT RELATIONSHIPS

48SW7085

Located in Bairoil, site 48SW7085 is associated with a historic fill. Initially, this site was thought to contain a prehistoric pit house. However, the recovery of randomly-spaced, historic "artifacts" in the fill by the Mariah archaeologic team indicates very recent deposition. Therefore, based upon the limited potential of this historic landfill (ie. dump) to yield paleoenvironmental data, geoarchaeologic investigations at 48SW7085 were discontinued.

48SW7107

Site 48SW7107 is preserved within an eolian sand shadow approximately 0.43 km (1408 ft) south of South Camp. This shadow developed in the lee of a Pleistocene, cobble-armored terrace or bench that flanks Lost Soldier Creek. In the middle excavation block, the dune sediments are deposited on colluvium (ca. 40 cm thick) that exhibits a stripped, structural paleosol with an argillic (Bt) soil horizon (Figure 2).

Table 1. Laboratory Results from Selected Profiles.

Sample ID	Sediment Unit	Horizon	% Sand	% Silt	% Clay	Texture	% CaCO3	Radiocarbon/Archaeologic dates (years B.P.)
48CR4681	EIII	AC	77.09	5.09	17.82	SL	0	possible Besant artifact (2000-1500)
Profile 1	EIII	Ab (cult 1)	69.40	20.40	10.20	SL	0	
	EIII	C	64.39	20.35	15.26	SL	0	Pelican Lake artifacts (3000-2000)
	EII	2Ab (cult 2)	51.67	33.07	15.26	L	0.5	3520±90, 3750±80
	EII	2Bkb	49.33	27.87	22.80	L	1.5	4340±80, 4670±70, 4840±90
	EI	3Ab> Bkb2 (cult 3)	67.03	15.22	17.75	SL	2.5	6050±100
	EI	3C	68.19	10.60	21.21	SCL	3.0	7110±110, 7230±100, 7490±70
48CR4139	EIII	AC	77.29	12.62	10.09	SL	0	
Profile 1	EII	2Bkb	64.48	17.76	17.76	SL	0.5	
	EII	2Ab> Bkb2 (cult 2)	66.86	17.84	15.29	SL	0.5	3830±80, 4810±70, 4840±80, 5030±80
	EII	2Bkb3	61.52	20.52	17.96	SL	1.0	
	EII	2Bkb4	71.66	12.88	15.46	SL	1.0	
	EI	3C	81.80	7.80	10.40	LS	0	
48SW998	EIII	AC	77.24	20.23	2.53	LS	0	
Profile 1	EIII	Ab (cult ?)	82.39	15.09	2.52	LS	0	artifacts post-date 1000
	EIII	C	84.92	12.57	2.51	LS	0	
	EIII	Ab' (cult 1)	87.40	10.08	2.52	S	1.0	1790±60
	EI	2C	97.46	2.54	0.00	S	0.5	
48SW5982	EII	Bw	54.41	27.86	17.73	SL	1.5	
Profile 1	EII	Bk	51.65	22.90	25.45	SCL	5.5	
	EII	Bk2	51.53	28.06	20.41	L	11.0	
	EII	C	69.65	17.70	12.65	SL	2.5	
	EII	Ab>Bkb (cult 2)	74.50	12.75	12.75	SL	1.0	3500±60, 4400±80, 4530±70, 4530±70, 4710±70, 4760±90, 5980±90
	EI	2C	68.55	18.34	13.10	SL	1.0	

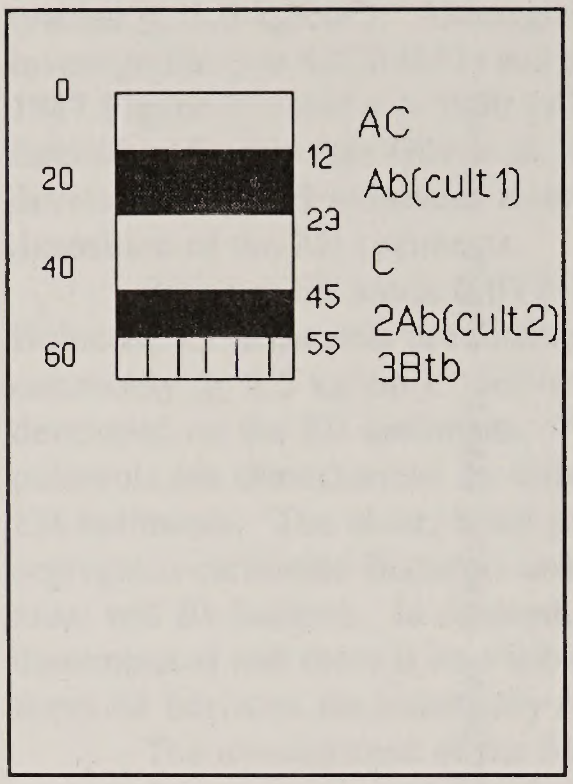


FIGURE 2
48SW7107
PROFILE 1 - MIDDLE BLOCK - NORTH WALL
BAIROIL, WY
PROFILED BY W.DOERING, 10-5-90

PROFILE DESCRIPTION

DEPTH (cm)	SEDIMENT UNIT	HORIZON	CHARACTERISTICS/COMMENTS
0-12	E III	AC	Yellowish brown (10 YR 5/4 d) sandy loam; massive; non-effervescent.
12-28	E III	Ab (cult 1)	Brown (10 YR 5/3 d) sandy loam; massive; non-effervescent.
28-45	E III	C	Light yellowish brown (10 YR 6/4 d) loamy sand; massive; non-effervescent.
45-55	E II	2Ab (cult 2)	Pale brown (10 YR 6/3 d) sandy loam; massive; non-effervescent; bulk soil date=3560±60 yr BP.
55-63 (TD)	colluvium	3Btb	Light yellowish brown (2.5 Y 6/4 d) sandy clay; weak, coarse, subangular blocky structure; common (50%), moderately thick, clay skins on ped faces; non-effervescent.

Radiocarbon dating of cultural materials preserved within the basal eolian sediments mantling this argillic horizon indicates soil formation and subsequent erosional stripping of this paleosol predates 3560±60 yr BP. The thickness of illuvial clay (argillans) coating the ped faces in the truncated argillic horizon implies that this paleosol dates early Holocene or older soil (see Birkeland 1984:Chapter 3). However, additional dating is needed to substantiates this implication in light of a reference by Albanese (1989:42) to "well-developed" argillic horizons in colluvial deposits which post-date 4500 yr BP and the clay skins at 48SW998 which are developed on the alluvium that dates < 1260±80 yr BP feature (Figure 5).

The 3560 yr BP radiocarbon age of cultural materials preserved within the basal eolian sediments mantling the argillic paleosol also suggests that these eolian sediments correlate with the upper or more recent EII sediments. This correlation implies that the older EI and lower EII sediments are stripped. Furthermore, cultural components which predate deposition of the upper EII sediments should be concentrated on the stripped surface.

Soil/sediment relationships and additional radiocarbon dates (1460±70 and 1110±70 yr BP) from the south block of 48SW7107 indicate that the sand sheet is younger and thinner on the downwind margins. Thus, the soil/sediment relationships suggest that only the upper EII sediments and eolian unit EIII at 48SW7107 have the capability to preserve and separate cultural components *in situ*.

48SW998 (Abel Creek)

The Abel Creek site (48SW998) is located east of the Bairoil "Y" between Wyoming Highway 73 and the northeast flank of Bald Knob. Evidence of two periods of eolian deposition interrupted by alluvial deposition is exposed in a cutbank profile of the Abel Creek T2 terrace (Figure 1). The position, sediment characteristics, and radiocarbon-dating of cultural materials in the eolian units suggests that these sediments correlate with eolian units EI and EIII. The absence of eolian unit EII implies that: 1) it was not deposited in this locale (ie. its deposition was discontinuous) or 2) it was eroded prior to deposition of eolian unit EIII. The occurrence of cultural A horizons within the EIII sediments suggests that deposition of this unit was on going during these occupations.

The origin and age of the basal, single-grained eolian (EI) sands is inferred from their stratigraphic position (Figures 3 and 4) and their similarity to the >5950±120 yr BP eolian sands upstream (McFaul 1987:Figure 3). The position of EI sediments directly upon bedrock suggests that prior to the initiation of EI deposition, probably in the late Pleistocene-early Holocene, Abel Creek downcut to bedrock and then temporarily abandoned this portion of its channel (see Figure 1).

Following EI deposition (<5950 yr BP), Abel Creek reoccupied this former channel and deposited of a bedded alluvial sequence (Figures 3 and 4). Radiocarbon dating of cultural materials preserved in the eolian unit (EIII) mantling the alluvium suggests that Abel Creek had again abandoned this channel prior to 1790±60 yr BP (Figure 4) and that eolian deposition had resumed. The existence of radiocarbon-dated cultural materials in the north block of 48SW998 preserved in alluvium indicates on-going alluviation < 1260±80 yr BP and suggests EIII deposition had ended.

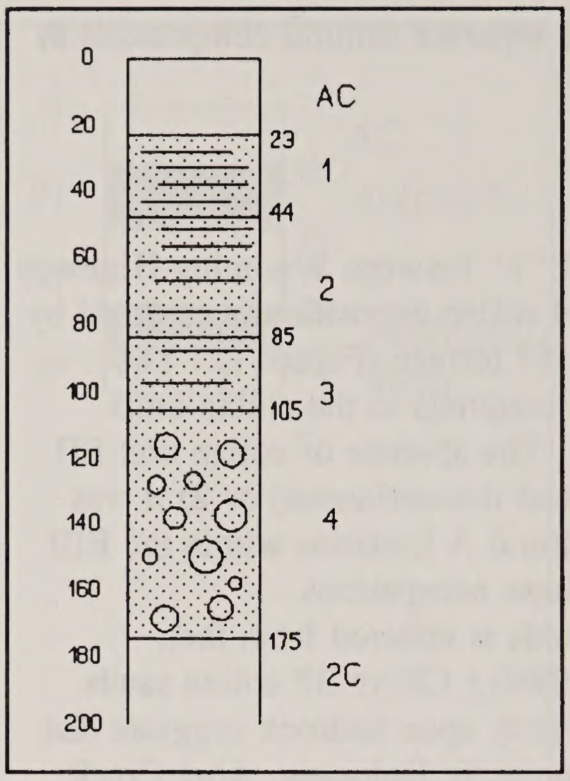


FIGURE 3
ABEL CREEK SITE (48SW998)
PROFILE 2 - SOUTH BLOCK - SOUTH WALL
BAIROIL, WY
PROFILED BY M.MCFAUL AND W.DOERING, 10-3-90

*2C at base of profile is the same well-sorted sand as at the base of profile 1. This suggests that the alluvium is channel fill cut into dune with E II sediments deposited on top.

PROFILE DESCRIPTION

DEPTH (cm)	SEDIMENT UNIT	HORIZON	CHARACTERISTICS/COMMENTS
0-23	E III	AC	Light yellowish brown (10 YR 6/4 d) loamy sand; massive; p=4.0; non-effervescent.
23-44	alluvium	1	Fine-grained, laminated alluvium.
44-85	alluvium	2	Interbedded (5 cm) with fine-grained, parallel beds and coarse-grained cross beds.
85-105	alluvium	3	Fine-grained laminated alluvium with CaCO3 (many [35%], violently effervescent carbonates in fine, irregular, segregated filaments).
105-175	alluvium	4	Poorly-sorted, matrix-supported (sand) gravels; clasts (<5 cm) are sub-rounded quartzite.
175-200 (TD)	E I	2C	Yellow (2.5 Y 7/6 d) sand; single grain; p=<1.0; non-effervescent.

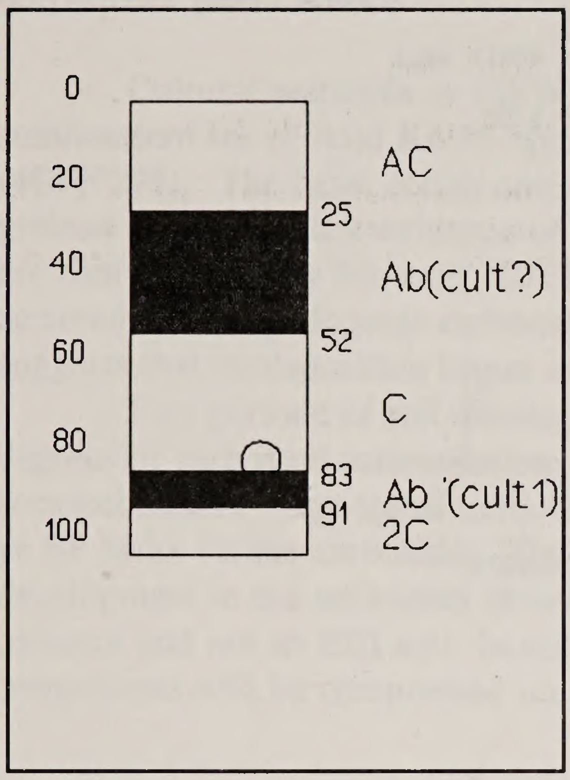


FIGURE 4
ABEL CREEK SITE (48SW998)
PROFILE 1 - SOUTH BLOCK - SOUTH WALL
BAIROIL, WY
PROFILED BY M.MCFAUL AND W.DOERING, 10-3-90

PROFILE DESCRIPTION

DEPTH (cm)	SEDIMENT UNIT	HORIZON	CHARACTERISTICS/COMMENTS
0-25	E III	AC	Light yellowish brown (10 YR 6/4 d) loamy sand; massive; p=3.5; non-effervescent.
25-52	E III	Ab (cult ?)	Brown (10 YR 5/3 d) loamy sand; massive; p=4.5+; non-effervescent.
52-83	E III	C	Light yellowish brown (10 YR 6/4 d) loamy sand; massive; p=4.0; non-effervescent.
83-91	E III	Ab′ (cult 1)	Light yellowish brown (10 YR 6/4 d) sand; massive; p=4.5+; non-effervescent; bulk soil date 1790$\pm$60 yr BP.
91-100 (TD)	E I	2C	Yellow (2.5 Y 7/6 d) sand; single grain; p=<1.0; non-effervescent.

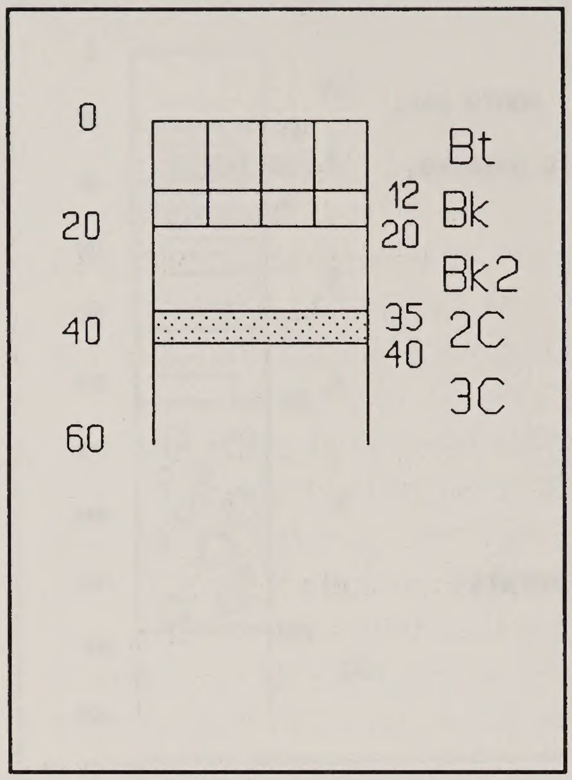


FIGURE 5
ABEL CREEK SITE (48SW998)
PROFILE 3 - NORTH BLOCK - NORTH WALL
BAIROIL, WY
PROFILED BY W.DOERING, 10-5-90

PROFILE DESCRIPTION

DEPTH (cm)	SEDIMENT UNIT	HORIZON	CHARACTERISTICS/COMMENTS
0-12	fine-gr alluvium	Bt	Yellowish brown (10 YR 5/4 d); strong, medium, subangular blocky structure; common (40%), moderately thick, clay skins on ped faces; violently effervescent, disseminated carbonates.
12-20	fine-gr alluvium	Bk	Pale yellow (2.5 Y 7/4 d); strong, medium, subangular blocky structure; violently effervescent, disseminated carbonates; bulk soil date=1260±80 yr BP.
20-35	fine-gr alluvium	Bk2	Pale yellow (2.5 Y 7/4 d); weak, medium, subangular blocky structure; violently effervescent, disseminated carbonates.
35-40	gravels	2C	poorly-sorted, matrix-supported gravels; violently effervescent, disseminated carbonates.
40+ (TD)	E III	3C	Light yellowish brown (2.5 Y 6/4 d); massive; violently effervescent, disseminated carbonates.

48SW5982 (Bald Knob)

Cultural materials at 48SW5982 are preserved in eolian sediments deposited in the southeastern lee of Bald Knob, approximately 536 m (1760 ft) south of the Abel Creek site (48SW998). The basal eolian unit or EI is characterized by light olive brown (2.5Y5/4), single-grained sands that lack evidence of soil development (Figure 6). The EII sediments which mantle EI are characterized by browner (10YR) hues, massive structure, harder consistence, and an accumulation of pedogenic carbonate. Radiocarbon dating of the cultural materials at the base of EII suggests that its deposition begun as early as 6610±90 yr BP (Figure 7).

Two periods of soil development are recognized in the EII sediments by their differing degrees of carbonate accumulation. The basal paleosol (ca. 6610 to 3500 yr BP) includes accumulations of segregated carbonate filaments, whereas the paleosol that developed after 3500±60 yr BP lacks visible carbonate. The degree of pedogenic carbonate accumulation and structural development in the sediments above the 3500 yr BP cultural horizon suggests this is the upper EII paleosol and not an EIII soil In turn, the absence of EIII sediments implies that the EIII-age cultural components will be compressed on the upper EII sediments.

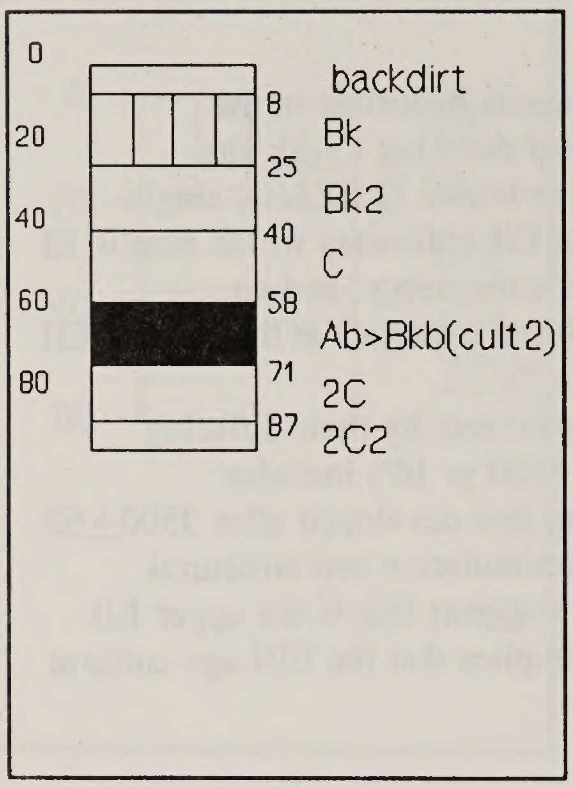


FIGURE 6
BALD KNOB SITE (48SW5982)
PROFILE 2 - SOUTH WALL
BAIROIL, WY
PROFILED BY W.DOERING, 10-5-90

PROFILE DESCRIPTION

DEPTH (cm)	SEDIMENT UNIT	HORIZON	CHARACTERISTICS/COMMENTS
0-8	backdirt	---	---
8-25	E II	Bk	Yellowish brown (10 YR 5/4 d) sandy clay loam; moderate, medium, subangular blocky structure; slightly effervescent, disseminated carbonates.
25-40	E II	Bk2	Pale brown (10 YR 6/3 d) loam; massive; violently effervescent, disseminated carbonates.
40-58	E II	C	Pale brown (10 YR 6/3 d) sandy loam; massive; violently effervescent, disseminated carbonates.
58-71	E II	Ab>Bkb (cult 2)	Brown (10 YR 5/3 d) sandy loam; massive; common (3%), violently effervescent carbonates in fine, irregular segregated filaments and masses.
71-87	E I	2C	Light olive brown (2.5 Y 5/4 m) sandy loam; single grain; violently effervescent, disseminated carbonates.
87-92 (TD)	E I	2C2	Light olive brown (2.5 Y 5/4 m) sandy clay loam; massive; violently effervescent, disseminated carbonates.

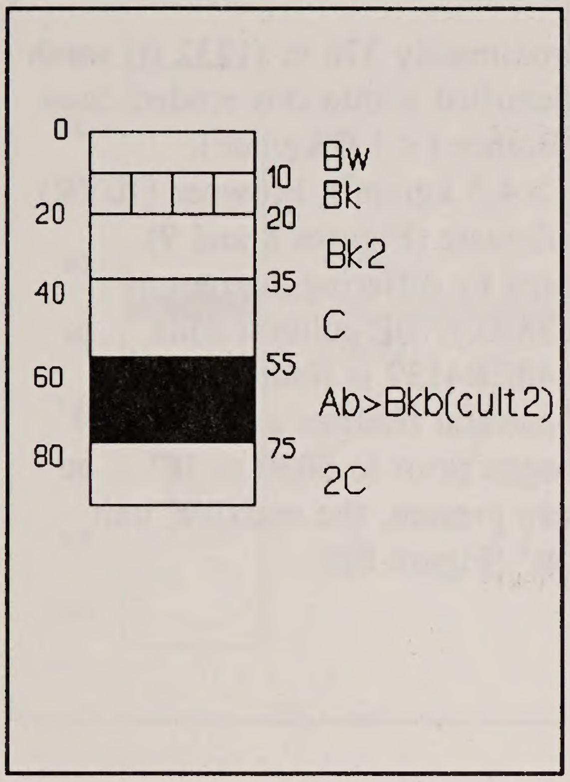


FIGURE 7
BALD KNOB SITE (48SW5982)
PROFILE 1 - SOUTH WALL
BAIROIL, WY
PROFILED BY W.DOERING, 10-5-90

PROFILE DESCRIPTION

DEPTH (cm)	SEDIMENT UNIT	HORIZON	CHARACTERISTICS/COMMENTS
0-10	E II	Bw	Light yellowish brown (10 YR 6/4 d) sandy loam; massive; non-effervescent.
10-20	E II	Bk	Yellowish brown (10 YR 5/4 d) sandy clay loam; moderate, medium, subangular blocky structure; slightly effervescent, disseminated carbonates.
20-32	E II	Bk2	Pale brown (10 YR 6/3 d) loam; massive; violently effervescent, disseminated carbonates.
32-55	E II	C	Pale brown (10 YR 6/3 d) sandy loam; massive; violently effervescent, disseminated carbonates.
55-75	E II	Ab>Bkb (cult 2)	Brown (10 YR 5/3 d) sandy loam; massive; common (5%), violently effervescent carbonates in fine, irregular, segregated masses; bulk soil dates=3500±60 yr BP, 4400±80 yr BP, 4530±70 yr BP, 4530±110 yr BP, 4710±70 yr BP, 4760±90 yr BP, 5980±90 yr BP, and 6610±90 yr BP.
75-90 (TD)	E I	2C	Light olive brown (2.5 Y 5/4 m) sandy loam; single grain; violently effervescent, disseminated carbonates.

48CR4139 (CO_2 Plant)

Site 48CR4139 is preserved in a partially truncated dune approximately 376 m (1232 ft) south of Highway 73 near the Wertz CO_2 plant. Three eolian units were identified within this eroded dune. The basal eolian unit, EI is characterized by 2.5Y hues and soft consistence (< 1.0 kg/cm^2). Sediments in the overlying eolian unit (EII) have harder consistence (> 4.5 kg/cm^2), browner (10YR) colors and depending upon age visible accumulations of pedogenic carbonate (Figures 8 and 9).

The existence of two paleosols within EII sediments is suggested by differing degrees of carbonate accumulation in the horizons above and below the 5030 to 3830 yr BP cultural zone. Preservation of the upper segments of the EII soil and of unit EIII at 48CR4139 is limited due to natural and/or human disturbance (Figure 9). Radiocarbon dating of cultural features at 48CR4139 preserved within the basal EII paleosol indicates that EII deposition began prior to 5030 yr BP (Figure 8) imply that a soil-forming ended ca. 3830 ± 80 yr BP. Where present, the massive, unit EIII sands are non-effervescent with consistence values of 4.5+ kg/cm^2 (Figure 8).

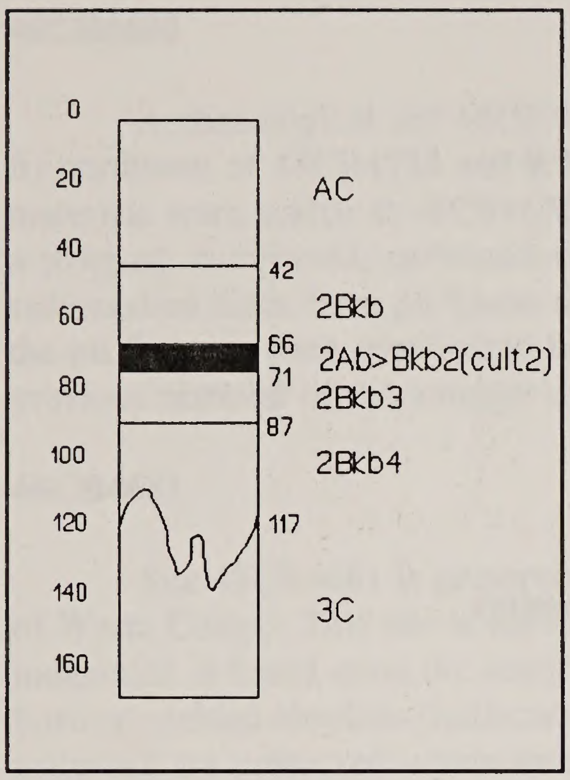


FIGURE 8
PLANT SITE (48CR4139)
PROFILE 1 - SOUTH WALL
BAIROIL, WY
PROFILED BY M.MCFAUL AND W.DOERING,
10-3-90

PROFILE DESCRIPTION

DEPTH (cm)	SEDIMENT UNIT	HORIZON	CHARACTERISTICS/COMMENTS
0-42	E III	AC	Light yellowish brown (10 YR 6/4 d) sandy loam; massive; p=4.5+; non-effervescent.
42-66	E II	2Bkb	Pale brown (10 YR 6/3 d) sandy loam; massive; p=4.5+; slightly effervescent, disseminated carbonates.
66-71	E II	2Ab> 2Bkb2 (cult 2)	Dark brown (10 YR 4/3 d) sandy loam; massive; p=4.5+; common (5%), violently effervescent carbonates in fine, irregular, segregated filaments; bulk soil dates=3830±80 yr BP, 4810±70 yr BP, 4840±80 yr BP, 4920±80 yr BP, and 5030±80 yr BP.
71-87	E II	2Bkb3	Light yellowish brown (10 YR 6/4 d) sandy loam; massive; p=4.5+; common (20%), violently effervescent carbonates in medium, irregular, segregated masses and filaments.
87-117	E II	2Bkb4	Pale brown (10 YR 6/3 d) sandy loam; massive; p=4.5+; many (45%), violently effervescent carbonates in large, irregular, segregated masses and medium, irregular, segregated filaments; Stage II accumulation; diffuse, irregular boundary.
117-167 (TD)	E I	3C	

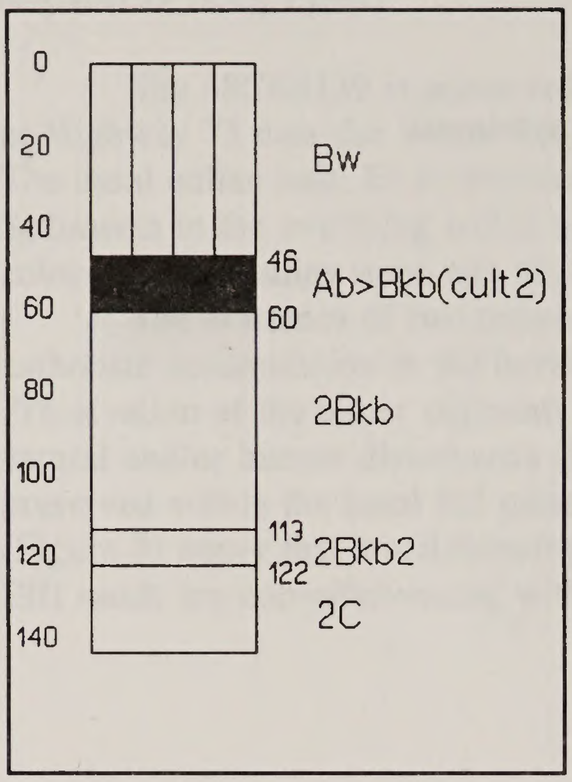


FIGURE 9
PLANT SITE (48CR4139)
PROFILE 2 - EAST WALL
BAIROIL, WY
PROFILED BY W.DOERING, 10-5-90

PROFILE DESCRIPTION

DEPTH (cm)	SEDIMENT UNIT	HORIZON	CHARACTERISTICS/COMMENTS
0-46	E II	Bw	Pale brown (10 YR 6/3 d) sandy loam; weak, medium, subangular blocky structure; p=4.5+; non-effervescent.
46-60	E II	Ab>Bkb (cult 2)	Dark brown (10 YR 4/3 d) sandy loam; massive; p=4.5+; violently effervescent, disseminated carbonates.
60-113	E II	2Bkb	Light yellowish brown (10 YR 6/4 d) sandy loam; massive; p=4.5+; common (20%), violently effervescent carbonates in fine, round, segregated masses and filaments.
113-122	E II	2Bkb2	Pale brown (10 YR 6/3 d) sandy loam; massive; p=4.5+; many (90%), violently effervescent carbonates in large, round, segregated masses, Stage II+ accumulation.
122-142 (TD)	E I	2C	Light yellowish brown (2.5 Y 6/4 m) loamy sand; massive; p=<1.0; violently effervescent, disseminated carbonates.

48CR4686

Archaeological site 48CR4686 is preserved in eolian sediments approximately 0.16 km (528 ft) northwest of 48CR4139 and 0.43 km (1408 ft) south of Wertz Camp. Diagnostic cultural materials were scarce at 48CR4686, although there is abundant evidence of pit house excavation into a stripped, compacted, carbonate-rich soil Bk horizon. The degree of soil compaction together with radiocarbon dates from pit house samples (4990±80, 4930±90, and 4330±70 yr BP) suggests that the pit features were constructed in EII sediments. Additional interpretation at 48CR4686 was by previous removal of the younger diagnostic soil/sediment units.

48CR4681

Site 48CR4681 is preserved within an eolian sand sheet approximately 0.75 km (2464 ft) west of Wertz Camp. This site is the most geoarchaeologically significant site in the study area. This judgement is based upon the occurrence of a stacked soil/sediment sequence in which all but one horizon yielded absolute (radiocarbon) and/or relative (archaeologic) age-datable materials. Datable materials are preserved within three distinct eolian units that range in age from 7490±70 yr BP to ≤1500 yr BP.

The yellowish (2.5Y) basal eolian unit (EI) contained cultural features that radiocarbon dated 7490±70, 7230±100, and 7110±100 yr BP (Figure 10). These are the oldest dates returned from the sites in this study area. Their position in EI sediments indicate on-going early Holocene eolian deposition and that humans occupied the locality during the latter stages of this event. Based upon textural comparisons with the overlying EII sediments (Table 1) and radiocarbon dating of cultural features within the upper EI sediments, we propose that EI deposition ended prior to 6050±100 yr BP (Figure 10). An EI pollen assemblage which is "reflective of greater mesicality" and "substantially different from the sagebrush grassland that characterizes the site area today" suggests that at least the latter segments of EI deposition occurred under a more mesic environment (Gish 1991:9).

The EI sediments are mantled by the brown hued (10YR), loamy EII sediments which, unlike the EII sediments at 48SW5982 and 48CR4139, do not evidence the more recent EII paleosol. The basal EII paleosol at 48CR4681 is characterized by a stripped, carbonate-rich soil Bk horizon morphologically similar to those described in other locales. The correlation of the EII paleosol at 48CR4681 with the basal EII paleosol at the other sites is supported by radiocarbon dated cultural materials from both the 2Bkb horizon (4840±90, 4670±70 and 4340±80 yr BP) and the overlying 2Ab horizon (3520±90 and 3750±80 yr BP, see Figure 10).

The absence of the upper EII sediments at 48CR4681 and the recovery of four Pelican Lake (3000-2000 yr BP) projectile points in the lower EIII, immediately above the basal EII, suggests that the area witnessed an erosional event prior to deposition of the eolian EIII. Recovery of Besant-like point fragments 0-5 cm below the modern ground surface suggest that once EIII deposition began at 48CR4681, it continued until ca. 1500 yr BP. The presence of a paleosol (Ab horizon) within the EIII sediments implies that a brief post-Pelican Lake period of landscape stability interrupted EIII deposition. A post-Pelican Lake soil is also evident in the EIII sediments at 48SW998.

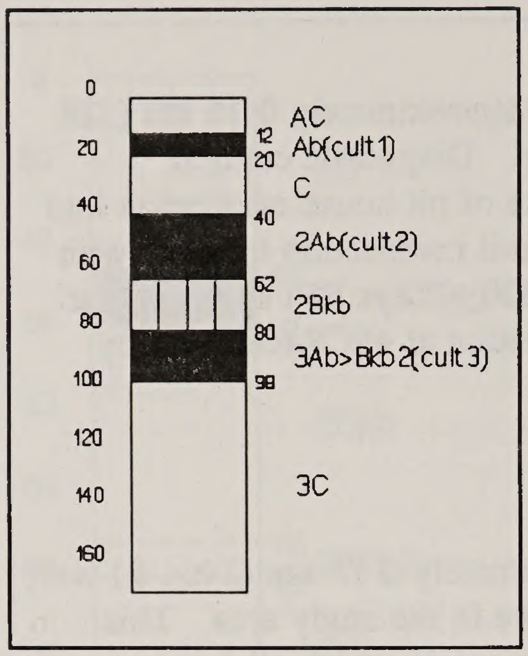


FIGURE 10
48CR4681
PROFILE 1 - SOUTH WALL
BAIROIL, WY
PROFILED BY M.MCFAUL AND W.DOERING, 10-3-90

PROFILE DESCRIPTION

DEPTH (cm)	SEDIMENT UNIT	HORIZONCHARA CTERISTICS/C OMMENTS	
0-12	E III	AC	Light yellowish brown (10 YR 6/4 d) sandy loam; massive; p=4.5+; non-effervescent; Bassant point (2000-1500 yr BP).
12-20	E III	Ab (cult 1)	Yellowish brown (10 YR 5/4 d) sandy loam; massive; p=4.5+; non-effervescent.
20-40	E III	C	Light yellowish brown (10 YR 6/4 d) sandy loam; massive; p=4.5+; non-effervescent; Pelican Lake artifacts (3000-2000 yr BP) at contact with 2Ab horizon.
40-62	E II	2Ab (cult 2)	Pale brown (10 YR 6/3 d) loam; massive; p=4.5+; non-effervescent; bulk soil dates=3520±90, 3750±80 yr BP.
62-80	E II	2Bkb	Pale brown (10 YR 6/3 d) loam; weak, coarse, subangular blocky structure; p=4.5+; few (2%), slightly effervescent carbonates in fine, irregular, segregated filaments; bulk soil dates=4340±80, 4670±70, 4840±90 yr BP.
80-98	E I	3Ab> 2Bkb2(cult 3)	Light brownish gray (10 YR 6/2 d) sandy loam; weak, medium, subangular blocky structure; p=4.5+; many (35%), violently effervescent carbonates in fine, irregular, segregated filaments and large, round, segregated masses; Stage I+ accumulation; bulk soil date=6050±100 yr BP.
98-170 (TD)	E I	3C	Light yellowish brown (2.5 Y 6/4 m) sandy clay loam; massive; p=3.0; slightly effervescent, disseminated carbonates; bulk soil dates= 7110±100, 7230±100, 7490±70 yr BP.

GEOARCHAEOLOGIC INTERPRETATIONS AND CORRELATION WITH PALEOCLIMATIC MODELS

This reconstruction is based upon our interpretations of soil/sediment relationships, pollen assemblages (Gash 1991), and the absolute and relative-age-dates associated with seven archaeologic sites in the Bairoil-Wertz vicinity (Tables 2 and 3). Radiocarbon and archaeologic dating of cultural materials at six of the seven archaeologic sites in the locality indicates that humans occupied Lost Soldier Flat, at least intermittently, from 7490±70 yr BP until ca. 950 yr BP. These occupations occurred despite changes in paleoenvironmental conditions that are indicated by three distinct periods of eolian deposition.

Initial deposition of eolian sediments (EI) probably correlates with the late Pleistocene/early Holocene period of eolian deposition noted in the region (Ahlbrandt 1973; Gaylord 1982; McFaul 1987; Albanese 1989). Although the precise time frame associated with the initiation of EI deposition is unclear, radiocarbon dating of cultural materials preserved in EI sediments at 48CR4681 suggests that eolian deposition was on-going to 7110 yr BP and that it continued until ca. 6050±100 yr BP. Pollen records (Gash 1991) suggest and greenish colored sediment hues (2.5Y) imply that the later phases of EI deposition occurred under mesic climatic conditions. However, the lack of an EI soil implies that this proposed mesic event was not of sufficient duration/strength to produce soil development or that this evidence has been stripped by Altithermal erosion. If these sediments were stripped then the associated cultural components (Late Paleoindian-Early Archaic) will be compressed on this stripped surface.

Radiocarbon dating of cultural materials preserved in the sediment unit mantling EI at 48SW5982, 48CR4139, and 48CR4681 suggests that an initial period of EII deposition occurred during the Altithermal, probably as a result of increased aridity. The ca. 3500-5000 yr BP period of soil formation which followed the initial EII deposition is evidenced by Stage I-II carbonate accumulations (see Gile et al. 1966; Birkeland 1984:Appendix 1). This period of soil development and is also concurrent with the bulk of the cultural materials recovered at the locality. We propose that this increased cultural activity may reflect more mesic post-Altithermal climatic conditions. Corroborating evidence of mesic conditions during this period includes a greater availability of herbaceous plant cover (Gish 1991) and the construction of pit houses reflecting more sedentary lifestyles.

The deposition of EII sediments which resumed after 3500 yr BP was subsequently followed by another period of soil formation. The weak structural and carbonate development in the upper EII soil implies this soil-forming interval was relatively brief or lacked intensity. In addition, the absence of these sediments at some sites suggests that an erosional event followed this soil forming interval. Such an event would have also acted to compressed associated cultural components on this stripped surface.

Pelican Lake points recovered within the lower EIII sediments indicate that the subsequent deposition of eolian unit EIII began prior to 2000 yr BP. Besant points recovered near the surface suggest that EIII deposition continued to ca. 1500 yr BP, and possibly through 1000 yr BP (48SW998: Profile 1). However, the presence of a weak, buried paleosol within the EIII sediments suggests an interruption in EIII deposition.

Finally, the occurrence of cultural materials at these predominately eolian locales is important. The low energy nature of eolian deposition is conducive to the preservation of environmental records and the *in situ* preservation/separation of cultural components.

Table 2. Paleoenvironmental Reconstruction

Field		Lamont-Bairoil		Lamont-Bairoil		Lamont-Bairoil		Ferris Dune Field		Killpecker Dune
YEARS BP (1973)		This study		Albanese (1989)		McFaul (1987)		Gaylord (1982)		Ahlbrandt
0										
1000										
						Abel Creek downcutting				
	1790	EIII deposition								
2000			2000							
		deflation								
		soil formation (Bk horizon)								
3000				soil formation					3000	
		2nd EII deposition			3290					
	3500					alluviation				
		deflation								
4000										
		soil formation (Stage I-II Bk horizon)								2nd eolian interval
	4340		4500							
5000		1st EII deposition								
							5500	2nd eolian interval		
	6050				5950					
		deflation ?				soil formation	6460			
	7110	soil formation ?						1st eolian interval	7000	
	^			eolian deposition	^		7660			
			9000							
	?	EI deposition								
10000					?	eolian deposition	10000	eolian deposition		
									10600 11250	1st eolian interval
				alluvial deposition	^					
						pulsational fan-like deposition (mastodon bone)				
			15000							
15000										

Table 3. Paleoclimatic Reconstruction

Years BP	Climatic conditions	Geomorphic/pedogenic process
0		
1000	arid	stream incision
		weak soil deveopment
2000		EIII deposition/ alluviation
	mesic	
3000		
		upper EII soil formation
	arid	
		upper EII deposition
4000		
	mesic	lower EII soil formation (Stage I-II $CaCO_3$)
5000		
		lower EII deposition
	arid	
6000		EI soil formation
	mesic	
7000		EI deposition

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APPENDIX B:

Bairoil Pollen Results

By

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Bairoil Pollen Results

Jannifer W. Gish
Palynologist/Botanist

April, 1991

1.0 INTRODUCTION

Eighty-three pollen samples were evaluated in the Bairoil study. These included 80 samples from both features and environmental control sequences in natural deposits at five sites and three surface control samples. The objectives of the pollen analysis were to provide an assessment of past environmental conditions in the region and a perspective of plant use at the various sites.

The Bairoil project area surrounds the town of Bairoil, north of Rawlins, in Sweetwater County, southcentral Wyoming. Site elevations range from 6800 to 7000 feet. Surface samples were collected at elevations ranging from 6780 feet along Abel Creek to 7980 feet in the Green Mountains north of the study area. Sites 48CR4139, 48CR4681, and 48CR4686 occur on alluvial plains at the base of low hills. These sites are characterized by sagebrush (*Artemisia* sp.) grassland communities. Site 48SW998 extends along stream terraces on both sides of Abel Creek in a sagebrush community. Site 48SW5982 is located on a hillslope in a sagebrush shrubland community. The five sites are all within five miles of each other.

2.0 METHODS AND DATA PRESENTATION

The eighty-three pollen samples were processed chemically by John G. Jones of the Texas A & M University Palynology Laboratory, College Station, Texas. A zinc bromide flotation technique was used in the extraction. Lycopodium tracer spores were added to the samples to provide an index to pollen abundance and pollen recovery success rate in the extraction process.

Thirty-three of the 83 samples failed to produce sufficient pollen abundances to achieve pollen counts in a reasonable amount of time (Table 1). Of the other 50 samples, 200 grain combined arboreal and non-arboreal pollen counts (AP and NAP) were obtained for 30 samples; 100 grain counts were obtained for the remaining 20 samples. The best preservation was seen in the surface samples and in stratigraphic sequences through natural deposits. Pollen abundance and preservation was consistently poor in samples from hearth fill contents. This attribute of the base warrants further comment.

The fill in the hearth features from the Bairoil sites contained abundant ash and charcoal; the pollen extracts contained abundant particulate charcoal. It seems evident that the pollen

Table 1. Bairoil Project Pollen Sample Proveniences.

Site	Feature Type	cm below PGS	Horizon, Level, or Feature Number		Pollen Sample Number	IP	Context
Surface Control Pollen Samples							
48SW998 Elev. 6780 ft.		0			3		sagebrush steppe
48SW5982 Elev. 6850 ft.		0			1		sagebrush steppe
Green Mountain foothills Elev. 7980 ft.		0			2		transitional sagebrush steppe/ conifer forest
48CR4139	Hearth	---	10		10	X	fill
	Control	---	NF		73		north of Feature 10
	Hearth	---	18		119	X	fill
	Control	---	NF		126		east of Feature 18
	Control	---	NF		221		north of Feature 36
	Control	---	NF		493		east of Feature 46
	Hearth	---	47		368	X	fill
	Control	---	NF		369		south of Feature 47
	Hearth	---	55		420	X	fill
	Control	---	NF		425	X	east of Feature 55
	Hearth	---	63		451	X	fill
	Control	---	NF		459		north pf Feature 63
	Hearth	---	64		485	X	fill
48CR4681	Column	5 - 10	VIII	1	356.0		sand
		12 - 17	VII	2	356.1		sand
		23 - 28	VI	3	356.2		sand
South Wall of		34 - 39	V	4	356.3		sand
Pollen Column A,		45 - 50	IV	5	356.4		sand
Natural Deposits		55 - 60	IV	6	356.5		sand
		65 - 70	IIIA	7	356.6		sand
		75 - 80	III	8	356.7		sand
		85 - 90	II	9	356.8		sand
		95 - 100	II	10	356.9		sand
		105 - 110	I	11	356.10		sand
		115 - 120	I	12	356.11		sand
		125 - 130	I	13	356.12		sand

Table 1 (Continued).

Site	Feature Type	cm below PGS	Horizon, Level, or Feature Number	Pollen Sample Number	IP	Context
48CR4686	Housepit	---	1	106	X	floor
	Housepit	---	1	109		floor
	Housepit	---	1	112		floor
	Housepit	---	1	113	X	floor
	Housepit	---	1	117		floor
	Housepit	---	1	119		floor
	Housepit	---	1	123		floor
	Housepit	---	1	135	X	floor
	Housepit	---	1	146	X	floor
	Housepit	---	1.1	71	X	floor
	Housepit	---	1.2	92	X	floor
	Housepit	---	1.3	75	X	floor
	Housepit	---	1.4	153	X	floor
	Unknown	---	10	89	X	fill
	Unknown	---	14	139	X	fill
48SW998	Column	0 - 5	E	17		loamy sand
		10 - 15	D	17.1		sandy loam
		20 - 25	D	17.2		sandy loam
Pollen Column from		30 - 35	D	17.3		sandy loam
South Wall of		40 - 45	C	17.4		sandy loam
Excavation Block		50 - 55	C	17.5		sandy loam
		60 - 65	B	17.6		sandy loam
		70 - 75	B	17.7		sandy loam
		80 - 85	B	17.8	X	sandy loam
		90 - 95	A	17.9		sandy loam
48SW5982	Hearth		8.1	128	X	fill
	Control		NF	145	X	north of Feature 8.1
	Hearth		14	134	X	fill
	Control		NF	140		south of Feature 14
	Housepit		17	194		floor
	Housepit		17	232		floor
	Hearth		17.1	190	X	fill
	Control		NF	187		north of Feature 17.1
	Housepit		20	304	X	floor
	Housepit		20	331		floor
	Housepit		20	339	X	floor
	Housepit		20	348		floor
	Housepit		20	360		floor
	Housepit		20	372		floor
	Housepit		20	380		floor
	Hearth		20.1	312	X	fill

Table 1 (Continued).

Site	Feature Type	cm below PGS	Horizon, Level, or Feature Number	Pollen Sample Number	IP	Context
48SW5982	Pit		20.2	401	X	fill
	Pit		20.3	405	X	fill
	Hearth		33	321	X	fill
	Control		NF	326	X	east of Feature 33
	Housepit		35	377		floor
	Housepit		35	387	X	floor
	Housepit		35	393	X	floor
	Housepit		35	408		floor
	Housepit		35	442		floor
	Housepit		35	448	X	floor
	Housepit		35	470		floor
	Housepit		35	512		floor
	Housepit		35.1	491	X	floor

was not preserved in these contexts due to the completeness of the original burning. Actual hearth fill is generally not conducive to good pollen preservation; such fill material is more useful for flotation analysis. When pollen samples are collected from hearths and other thermal features, it is generally more productive to collect samples from the base and sides of the features or the area immediately around the features. Adequate recovery of pollen can result from sampling the base and sides of hearths since incompletely burned organic matter and pollen can filter down through the feature fill over time and become deposited where fire hardening of the soil matrix forms a more impermeable layer. Sampling the perimeters of such features can also be productive since material from spillage is likely to be preserved. In this study, eleven hearth fill samples were studied; unfortunately, none produced sufficient pollen for counts.

3.0 SURFACE RESULTS

Two of the three surface pollen samples were collected adjacent to site locations, while the third was collected at a higher elevation in the mountains for contrast. Sample 1 was collected near Site 48SW5982 and Sample 3 near 48SW998. These two sampling locations are at similar elevations of 6850 and 6780 feet, respectively. Sagebrush shrubland communities predominate at both locations. At 48SW998, associated plants included big sagebrush (*Artemisia tridentata*), greasewood (*Sarcobatus* sp.), rabbitbrush (*Chrysothamnus* sp.), shrub saltbushes (*Atriplex* spp.), grasses and forbs. At 48SW5982, associated plants included big sagebrush, rabbitbrush, saltbush, prickly pear (*Opuntia* sp.), grasses, and forbs. Sample 2 was collected in the south foothills of the Green Mountains at 7980 feet. This latter location was characterized by a transitional sagebrush steppe/pine forest plant community. Associated plants included aspen (*Populus tremuloides*), limber pine (*Pinus flexilis*), juniper (*Juniperus* sp.), big sagebrush, grasses, and forbs.

The pollen records for Samples 1 and 3 are quite similar (Table 3). Both counts are dominated by sagebrush pollen in the non-arboreal pollen (NAP). Moderately low values of Cheno-am pollen are evident. Low values of Low- and High-spine Compositae, greasewood, and grass are also evident. Other NAP representations include joint-fir (*Ephedra*), plantain (*Plantago*), rose family (Rosaceae), and prickly pear (*Platyopuntia*, in archaic terminology). In the arboreal pollen (AP), the pines are moderately well represented. Spruce (*Picea*), juniper, and oak (*Quercus*) are also evident. These AP occurrences all reflect extra-regional genera. Long-distance transport of pollen from these wind-pollinated taxa accounts for the representations. The Green Mountains, only a few miles away, are the most likely source.

On the whole, these two sagebrush dominated counts are consistent with the modern sagebrush grassland community. The presence of saltbush at the two sites is not as clearly expressed as one would expect. Saltbushes are, however, palatable to livestock, and it is possible grazing pressure has affected the saltbush proportion of the vegetation composition to the extent that reproduction and pollen dispersal are inhibited. The region has a history of continuous grazing (Moore et al. 1987).

Table 2 Scientific and Common Names and Abbreviations.

Scientific Name	Common Name	Abbreviations
ARBOREAL TAXA		
Alnus	Alder	
Betula	Birch	
Juniperus	Juniper	Ju
Picea	Spruce	
Pinus	Pine fragments/3	
Pinus edulis-type	Pinyon-type Pine	P. ed
P. ponderosa-type	Ponderosa-type Pine	P. po
Pseudotsuga	Douglas-fir	
Quercus	Oak	
Shepherdia	Buffaloberry	
NON-ARBOREAL TAXA		
Artemisia	Sagebrush	Ar
Boerhaavia-type	Spiderling-type	
Caryophyllaceae	Pink Family	
Cheno-am	Chenopodiaceae (Goosefoot Family) and Amaranthus (Amaranth)	Ch
Ephedra nevadensis-type	Joint-fir	
E. torreyana-type	Joint-fir	
Eriogonum	Wild Buckwheat	
Euphorbia-type	Spurge-type	
Gramineae	Grass Family	Gr
High-spine Compositae	Compositae group including Helianthus (Sunflower)	
Liguliflorae	Liguliflorae Tribe in the Compositae	
Low-spine Compositae	Compositae Group including Ambrosia (Bursage)	
Oenothera-type	Evening-primrose-type	
Phlox	Phlox	
Plantago	Plantain	
Platyopuntia	Prickly Pear	
Portulacaceae	Purslane Family	
Rosaceae	Rose Family	
Sarcobatus	Greasewood	Sa
Sphaeralcea-type	Globe-mallow-type	
Umbelliferae	Parsley Family	

OTHER ABBREVIATIONS

IP	Insufficient Pollen
NF	Non-feature

Table 3 Pollen Results from Surface Samples and 48CR4139.

Site:	48SW 998	48SW 5982	Green Mtn.	48CR 4139					
Feature:				NF	NF	NF	NF	NF	NF
Pollen Sample:	3	1	2	73	126	221	493	369	459
ARBOREAL POLLEN									
Picea	1.0	2.0	X	1.0			X		
Pseudotsuga							X		
Pinus edulis-type	12.5	17.0	27.5	23.0	4.0	8.0	3.5	2.0	5.5
P. ponderosa-type	11.5	7.0	23.5	1.0	0.5				0.5
Pinus	0.5	0.5	1.0	1.0					1.0
Juniperus	5.5	4.5	5.0	4.0	4.0	7.0	1.0	4.0	9.0
Quercus		0.5	0.5	1.0					
NON-ARBOREAL POLLEN									
Low-spine Compositae	2.0	2.5	3.5	5.0	8.0	8.0	8.0	11.0	5.0
High-spine Compositae	1.0	2.0	1.5		0.5			1.0	0.5
Artemisia	45.5	44.0	23.5	31.0	45.5	21.0	46.5	36.0	38.5
Liguliflorae					0.5				
Cheno-am	11.5	11.5	3.5	22.0	31.5	52.0	35.5	38.0	36.5
Sarcobatus	4.5	2.5		1.0	X				
Gramineae	2.5	2.5	8.0	1.0	1.5			1.0	0.5
Caryophyllaceae			0.5						
Ephedra nevadensis-type	0.5	X		1.0	0.5	1.0			
E. torreyana-type		0.5			0.5				
Plantago		0.5							
Eriogonum			0.5						
Rosaceae		0.5							
Umbelliferae			1.0						
Platyopuntia	X	X			X		0.5		
% Unknowns	1.5	2.0	0.5	8.0	3.0	3.0	5.0	7.0	3.0
Total	200	200	200	100	200	100	200	100	200
Aggregates	Ar-2a	Ar-2a	(Ar-50)	---	Ch-6b	(Ar-10)	Ar-2b	---	Ch-2a
a - 1 d - 15	(Gr-5)	Ch-3a				Ch-3	Ch-3b		
b - 5 e - 25		(P.po-2)							
c - 10 f - 50									

Samples with IP: 48CR4139 PS 10, 119, 368, 420, 425, 451. 485

Only perennial shrubs were recorded in the vegetation lists for the sites, and it is unclear if correlates for all the NAP pollen representations are extant in the modern flora. The general flora list for the Bairoil project area by Moore et al. (1987) also lists perennial shrubs and trees and provides a detailed listing of grasses, but not much detail on forbs since it is oriented towards range species that are palatable to livestock. It seems plausible, however, that local sources are present at the sites for the taxa seen in the NAP representation. A possible exception is the joint-fir presence in both counts. As a perennial shrub, one would expect presence of joint-fir to be noted in the site vegetation descriptions or in the Moore et al. (1987) chapter, but it is not listed in either source. Possibly the pollen reflects long-distance wind transport of pollen from extra-regional sources.

The results from these two counts suggest that fairly strong correlations between the sagebrush dominated vegetation and sagebrush dominated pollen rain can be expected. The saltbush expression might be variable. Greasewood can be expected to be present in low percentages, but this does not necessarily directly relate to on-site presence. NAP taxa diversity, overall, can be expected to be low. The AP taxa are fairly well represented considering the shrub vegetation at the site. It could be that the moderate values are related to some suppression of NAP pollen rain in the overall pollen assemblage due to overgrazing. Moderately high conifer values are seen in several other samples in the study and, as will be discussed, it is possible these all reflect with surficial contexts. Thus, contrasts in the pollen rain could be related more to historic impacts on vegetation than broad environmental or climatic changes.

The third surface sample, Sample 2, from the Green Mountains reveals a markedly different pollen rain, as was anticipated. The count is strongly dominated by pine pollen. The AP taxa diversity is similar to the other two counts. In the NAP, the sagebrush value is suppressed and the NAP diversity is quite different. Occurrences of the pink family (Caryophyllaceae), buckwheat (*Eriogonum*), and parsley family (Umbelliferae) are evident. Greasewood, joint-fir, rose family, and prickly pear were not observed. The grass value is higher in Sample 2 than in the other two surface samples. As at the other sites, vegetation recording involved perennials, and it is not clear if all of the taxa have correlates in the modern vegetation at the sampling location. All of these, however, are plausible for the region. Some members of the Caryophyllaceae and Umbelliferae families favor moist settings, and imply a somewhat mesic situation at the Sample 2 locality. On the whole, the pine dominance in the pollen rain correlates well with the conifer composition of the sampling location. The pollen rain assemblage is very different from any that would be anticipated for the prehistoric sites in this study.

4.0 RESULTS BY SITE

All five sites produces pollen data. Due to the poor recovery in feature contexts, the results have more of a bearing on past vegetation conditions than past use of plants.

4.1 48CR4139

Site 48CR4139 is located at the base of a low hill on dunes that protrude out onto an alluvial plain. Site elevation is about 6600 feet. The dominant plant community is sagebrush grassland. Associated plants include prickly pear, rabbitbrush, with saltbush further out on the plain.

Site 48CR4139 is a non-architectural site consisting of a substantial number of hearths and other thermal and non-thermal pit features. Occupational components date from the late Archaic to the Protohistoric; although the bulk of the features are Late Archaic, and date as early as 5000 B.P.

Thirteen pollen samples were evaluated from this site. These included six hearth fill samples and seven control samples for the hearths. Out of these 13 sample, only six control samples produced data (Table 3). The poor preservation in all the feature samples appears to be an attribute of the hearth ash matrices that were sampled.

The dominant pollen taxon in the six control samples varied between sagebrush and Cheno-am (which includes saltbush), with co-dominance (less than five percent difference) of these two taxa expressed in two samples (369 and 459). Other NAP taxa represented in the samples include Low- and High-spine Compositae, Liguliflorae, greasewood, grass, joint-fir, and prickly pear. Arboreal pollen percentages are generally low with the exception of PS 73 where a 23 percent pinyon-type pine pollen value was recorded. This sample is anomalous, and the reason for the higher pine value is unclear. It could be that this is a surficial sample, reflecting enhancement of extra-regional pollen taxa due to suppression of certain elements of the natural background as a result of grazing pressure. Depth of the sampling locus is unknown, and it is not certain that this is a plausible explanation for the Sample 74 record. Other AP taxa are represented in the six samples include spruce, Douglas-fir, ponderosa-type pine, undifferentiated pine, juniper, and oak. All of these reflect wind-pollinated plants and the pollen values probably all relate to long-distance wind-transport of pollen from extra regional sources. The Green Mountains, which attain heights over 8000 feet, are a potential source area.

On the whole, the six pollen records suggest a sagebrush/saltbush community existed in the past. This does not necessarily mean the setting differed greatly from the sagebrush grassland that characterizes the site today. Saltbush occurs near the site and a natural composite picture of such proximity could be co-dominance or alternative dominance of Cheno-am versus sagebrush pollen. Although this was not seen in the two surface samples from 48SW998 and 48SW5982, it is possible both surface samples were affected by historic and modern impacts on vegetation (grazing). The 48CR4139 records might reflect a more natural pollen rain expression of regional sagebrush and saltbush communities. Alternatively, the more significant values of Chen-am pollen might reflect a shift in sagebrush and saltbush community distributions in the past. Saltbush might have occurred closer to the site at one time or been intermixed with the sagebrush. Such differences would most likely relate to local factors of dune development on the alkali plain rather than any major change in environmental or climatic conditions.

4.2 48CR4681

Site 48CR4681 is located along the base of a flat-topped hill. Elevation is 6680 feet above sea level. The dominant plant community is sagebrush grassland. Associated plants include prickly pear and rabbitbrush.

Site 48CR4681 is a non-architectural site consisting of a number of hearths and other thermal and non-thermal pit features (?). The time period of occupation dates from the terminal Paleo-Indian/early Late Archaic period around 7400 B.P. through the Late Archaic at around 1600 B.P.

All 13 stratigraphic samples through a natural deposit of sands at this site produced counts (Table 4 and 5). Cheno-am and sagebrush pollen either dominate or co-dominate in all 13 counts, with the exception of the deepest sample where Low-spine Comositae co-dominates with sagebrush. With the exception of globemallow-type (*Sphaeralcea*-type), taxa diversity does not differ from that already seen at 48CR4139 or in the surface samples. Some consistent changes in the pollen rain are demonstrated by depth in the pollen column. The uppermost sample from Level 1 exhibits fairly high AP values. This may reflect the fairly recent deposition with historic modification of the background pollen rain postulated previously. The AP values are moderate to low in the remaining samples, and are particularly low in the deeper samples, from Level 8 through Level 13. This AP decrease corresponds to a greater Compositae representation in the deeper samples. Both High-spine Compositae and the Liguliflorae taxon occur more consistently in the deeper samples. Low-spine Compositae percentages are particularly notable in Levels 11 through 13, which pre-date 7000 B.P. Rare occurrences of Caryophyllaceae and Unbelliferae pollen also are found in two of the deeper samples. All of these attributes together suggest a greater herbaceous diversity in substantially earlier times. Such a change could be reflective of greater mesicality in site setting in the past. Certainly, the overall community type seems to have been substantially different from the sagebrush grassland that characterizes the site area today.

4.3 48CR4686

Site 48CR4686 is located about 200-300 yards northeast of 48CR4139 and is similarly situated at the base of a low hill on dunes that protrude out onto an alluvial plain. The dominant plant community is sagebrush grassland. Associated plants include prickly pear and rabbitbrush, with some saltbush further out on the plain.

Site 48CR4686 consists of hearths, other thermal and non-thermal features, and at least on housepit. Occupation dates to the Late Archaic. An intramural feature (Feature 1.4) in the housepit yielded a date of 4930 ± 90 B.P.

Table 4 Pollen Results from 48CR4681.

Horizon:	VIII	VII	VI	V	IV	IV	IIIA
Sediment/Soil:							
Level:	1	2	3	4	5	6	7
ARBOREAL POLLEN							
Picea	1.0	0.5					
Pseudotsuga	X					X	
Pinus edulis-type	10.0	5.5	3.0	6.0	5.5	4.0	10.0
P. ponderosa-type	11.0	3.0		1.0	X		
Pinus	3.0	1.5			0.5	2.5	1.5
Juniperus	3.5	6.0	2.5	4.0	1.5	1.5	1.5
Quercus				2.0		0.5	X
Alnus	0.5						
NON-ARBOREAL POLLEN							
Low-spine Compositae	4.0	6.0	5.5	11.0	2.0	2.0	6.5
High-spine Compositae		1.0	1.0				
Artemisia	28.0	42.0	42.0	22.0	33.5	29.0	32.5
Liguliflorae					0.5		
Cheno-am	28.5	24.5	28.5	50.0	46.5	46.5	46.0
Sarcobatus	1.5	1.0	1.5		1.5	4.5	0.5
Gramineae	3.5	1.5	3.0			0.5	
Caryophyllaceae							
Ephedra nevadensis-type		X				0.5	
E. torreyana-type							
Euphorbia-type							
Sphaeralcea-type							
Boerhaavia-type		0.5					
Oenothera-type					0.5		
Eriogonum		X					
Umbelliferae							
Platyopuntia	X						
% Unknowns	5.5	7.0	13.0	4.0	8.0	8.5	1.5
Total	200	200	200	100	200	200	200
Aggregates	P.ed-2a	Ju-3a	Ar-2a	Ch-3a	Lo-2a	Ch-3a	Ch-3b
a - 1 d - 15	Ar-2a	Ch-4b	Ch-4b		Ch-10b		
b - 5 e - 25	Ch-8a						
c - 10 f - 50							

Samples with IP: none

Table 5 Pollen Results from 48CR4681.

Horizon:	III	II	II	I	I	I
Sediment/Soil:						
Level:	8	9	10	11	12	13
ARBOREAL POLLEN						
Picea						
Pseudotsuga	X					
Pinus edulis-type	2.5	0.5	3.0	1.0		2.0
P. ponderosa-type	0.5					
Pinus		0.5		0.5		0.5
Juniperus	1.0	2.5	2.0	4.0	2.0	3.5
Quercus					1.0	
Alnus						
NON-ARBOREAL POLLEN						
Low-spine Compositae	4.0	8.5	6.5	17.0	19.5	29.5
High-spine Compositae	1.0	1.0	1.5	2.0	2.0	3.0
Artemisia	42.5	37.0	45.5	36.5	32.5	31.5
Liguliflorae	1.0	1.5	0.5	2.5	2.0	1.5
Cheno-am	42.0	33.0	33.5	20.5	35.0	21.5
Sarcobatus	1.5	0.5	1.0	X		0.5
Gramineae		1.0	0.5	0.5	0.5	0.5
Caryophyllaceae						0.5
Ephedra nevadensis-type	0.5	0.5				
E. torreyana-type						
Euphorbia-type				0.5		0.5
Sphaeralcea-type		0.5				
Boerhaavia-type						
Oenothera-type						
Eriogonum						
Umbelliferae	0.5					
Platyopuntia	X	X	0.5	X		
% Unknowns	3.0	13.0	5.5	15.0	5.5	5.0
Total	200	200	200	200	200	200
Aggregates	Ch-4b	Ch-4a	---	(Ar-8)	Ch-2a	---

a - 1 d - 15
b - 5 e - 25
c - 10 f - 50

Samples with IP: none

Fifteen pollen samples were studied from this site; five produced data (Table 6). These were all floor samples from the Feature 1 housepit. Feature 1.4 in the housepit produced a date of 4930 ± 90 B.P.

All five samples are dominated by either Cheno-am or sagebrush pollen, or exhibit co-dominance of these two taxa (Sample 112). Taxa diversity is very limited. This, in part, reflects the low abundance of pollen in these samples; only 100 grain counts were obtained. Taxa represented in the samples include Low- and High-spine Compositae, greasewood, grass, and prickly pear in the NAP, and spruce, pines, and juniper in the AP. For the most part, the proportions are comparable to those seen elsewhere. Only in Sample 119 is a Cheno-am value of 56.0 percent somewhat outstanding. Numerous Cheno-am species produce edible greens and seeds (Kirk 1970), and some cultural plant use might be indicated here. On the whole, however, the records are consistent with the modern vegetation setting of on-site sagebrush dominance and nearby saltbush presence.

4.4 48SW998

Site 48SW998 is located on the south side of Green Mountain on stream terraces along both sides of Abel Creek. Elevation is 6785 feet above sea level. The dominant plant community is a sagebrush/saltbush/greasewood shrubland. Other associated plants include prickly pear cactus (*Opuntia* sp.), rabbitbrush (*Chrysothamnus* sp.), shadscale (*Atriplex* sp.), and various forbs and grasses. A riparian community, which included willow and sedges, existed historically along the creek. The vegetation has been greatly modified through blading and other forms of disturbance and the riparian zone is no longer extant.

Site 48SW998 is a non-architectural site consisting of hearths, and other thermal and non-thermal features. Occupation date to the Late Archaic period.

Nine of ten stratigraphic samples through the sandy loam deposit that comprises this site produced counts (Table 7). With the exception of the deepest sample, sagebrush pollen consistently dominates the records at this site. Co-dominance of Cheno-am and sagebrush pollen is evident in the deepest sample. Taxa diversity is similar to the other sites, but the proportions are somewhat different. Low- and High-spine Compositae are moderately well represented; the Low-spine Compositae percentages approach those in the deeper sample at 48CR4681. Unlike this other site, however, there is no marked increase by depth; higher percentages occur in several samples throughout the sequence. Liguliflorae occurs in four of the 12 counts. Greasewood and grass are consistently represented. Occasional taxa in the NAP include mustard family (Cruciferae), joint-fir, rose family, and the parsley family. Sample 17.1, in the upper part of the sequence, had the greatest diversity of taxa (15). this probably reflects better preservation in the more recent horizons rather than any vegetative change over time. As elsewhere, the uppermost sample yielded the highest proportion of AP taxa. This lends further support to the view that the moderately high AP values are related to historic influence on vegetation and associated pollen rain. The AP values were also high in the surface control sample from the site vicinity, as discussed earlier. Other

Table 6 Pollen Results from 48CR4686.

Feature:	1	1	1	1	1
Pollen Sample:	109	112	117	119	123
ARBOREAL POLLEN					
Picea		1.0			
Pinus edulis-type	7.0	10.0	6.0	2.0	11.0
P. ponderosa-type		4.0	4.0		1.0
Pinus	1.0	2.0	2.0		1.0
Juniperus	12.0	4.0		1.0	3.0
NON-ARBOREAL POLLEN					
Low-spine Compositae	13.0	4.0	9.0	9.0	4.0
High-spine Compositae		1.0	1.0		1.0
Artemisia	23.0	29.0	26.0	29.0	32.0
Cheno-am	31.0	31.0	42.0	56.0	38.0
Sarcobatus		1.0			1.0
Gramineae	2.0	1.0	2.0		
Platyopuntia	1.0			1.0	
% Unknowns	10.0	12.0	8.0	2.0	8.0
Total	100	100	100	100	100
Aggregates	---	---	Ch-2a	---	Ar-3a

a - 1 d - 15
b - 5 e - 25
c - 10 f - 50

Samples with IP: 48CR4686 PS 106, 113, 135, 146, 71, 92, 75, 153, 89, 139

Table 7 Pollen Results from 48SW998.

Horizon:									
Sediment/Soil:									
Pollen Sample:	17	17.1	17.2	17.3	17.4	17.5	17.6	17.7	17.9
ARBOREAL POLLEN									
Picea	X								
Pseudotsuga	X		X						
Pinus edulis-type	14.0	6.5	2.5	3.0	0.5	0.5	X		
P. ponderosa-type	5.0	X	1.0	0.5	0.5	0.5			1.0
Pinus	2.5	0.5	1.5	0.5					
Juniperus	8.5	5.0	3.5	6.0	3.0	1.0	2.0	2.0	4.0
Quercus		0.5							
Betula					0.5				
Shepherdia								0.5	
NON-ARBOREAL POLLEN									
Low-spine Compositae	5.0	12.5	10.5	18.5	19.5	17.0	11.5	21.0	17.0
High-spine Compositae	1.5	3.5	3.5	1.0	1.0	1.0	2.0	1.0	1.0
Artemisia	37.5	38.5	45.0	36.5	41.0	42.5	44.5	45.5	32.0
Liguliflorae		0.5		0.5			0.5	0.5	
Cheno-am	21.0	21.0	24.5	26.0	27.5	30.0	29.5	27.5	35.0
Sarcobatus	1.0	2.5	2.0	1.0	1.5	3.0	2.5		
Gramineae	2.5	3.5	2.5	3.0	3.5	3.0	2.0	1.0	1.0
Caryophyllaceae									
Cruciferae		0.5							
Ephedra nevadensis-type			X	0.5			0.5		
E. torreyana-type									
Euphorbia-type									
Sphaeralcea-type									
Boerhaavia-type									
Oenothera-type									
Eriogonum									
Rosaceae		0.5							
Umbelliferae									
Platyopuntia		2.0							
% Unknowns	1.5	2.5	3.5	3.0	1.5	1.5	5.0	1.0	9.0
Total	200	200	200	200	200	200	200	200	100
Aggregates	(P.ed-2)	---	Gr-2a	---	Sa-2a	Lo-2a	Ar-2b	---	---

Aggregates:
a - 1 d - 15
b - 5 e - 25
c - 10 f - 50

Samples with IP: none 48SW998 PS 17.8

notable taxa in the AP include birch (*Betula*) and buffaloberry (*Shepherdia*); both suggestive of moist conditions.

On the whole, the pollen records suggest a sagebrush shrubland with saltbush and greasewood, comparable to the modern setting, characterized the site in the past. The past existence of a riparian community along Abel Creek is not well reflected in the pollen rain. The only possible indices of this are the birch and buffaloberry occurrences. These might reflect past local presence of riparian arboreals, but wind or water transport (overbank flooding) from source elsewhere are possibilities. One does not see any evidence of the willow and sedges that historically characterized the creek bottom. Possibly riparian vegetation was never particularly well developed at this location.

4.5 48SW5982

Site 48SW5982 is located on a hillslope east of Bald Knob. Elevation is 6850 feet above sea level. The dominant plant community is sagebrush/saltbush shrubland. Associated plants include prickly pear cactus, rabbitbrush, and various forbs and grasses.

This site consists of housepits, hearths, and other thermal and non-thermal features. Occupation dates to the Early and Middle Archaic periods, with radiocarbon ages spanning 6500 to 3500 B.P.

Twenty-nine pollen samples were evaluated from this site. These included samples from three housepits, hearth fill samples, and controls. Two control and 12 housepit floor samples produces data (Tables 8 and 9).

Unlike the other sites, the results in the 48SW5982 are more erratic and do suggest some cultural influences. This can, in part, be seen by first examining the two control sample counts and contrasting the results with the feature samples.

The two control samples (Samples 140 and 187) exhibit dominance of Cheno-am pollen, but the sagebrush values are also high. Taxa diversity is similar to that expressed elsewhere in the study region. The records are suggestive of a sagebrush/saltbush community in the past, with some greasewood (Sample 140).

Taxa diversity in the 12 feature samples is also similar to what has been seen elsewhere, but the Cheno-am values are substantially higher in most samples. This is the case for all three of the housepits, Features 17, 20, and 35. Sample 512 is an exception, but in the 11 other floor samples, Cheno-am percentages range from 48.0 to 68.0 percent. Cheno-am aggregates are notable in Samples 194 and 380. Cheno-am values above 50.0 percent are uncommon at the other sites, and aggregates are few and small in size. These higher than usual Cheno-am values in the feature samples at 48SW5982 are strongly suggestive of actual use of chenopodiaceous species. As previously mentioned, numerous species produce edible greens and seeds (Kirk 1970) and are important summer food resources, so use is plausible. The

Table 8 Pollen Results from 48SW5982.

Feature:	NF	17	17	NF	20	20	20
Pollen Sample:	140	194	232	187	331	348	360
ARBOREAL POLLEN							
Picea	0.5				0.5	0.5	
Pseudotsuga			1.0				
Pinus edulis-type	12.0	18.0	7.0	4.0	8.5	12.0	2.0
P. ponderosa-type	4.0	3.0	4.0		4.0	7.0	3.0
Pinus	0.5	1.0	2.0		2.0	0.5	1.0
Juniperus	2.0	1.0			6.0	3.0	2.0
Quercus		1.0					
NON-ARBOREAL POLLEN							
Low-spine Compositae	4.5	4.0	2.0	7.0	3.5	0.5	
High-spine Compositae	0.5					0.5	
Artemisia	25.5	9.0	17.0	34.0	18.0	23.0	18.0
Liguliflorae	0.5			1.0			
Cheno-am	44.0	55.0	62.0	46.0	56.5	49.5	68.0
Sarcobatus	0.5	2.0				0.5	1.0
Gramineae	2.5	2.0	1.0	1.0		1.0	
Ephedra nevadensis-type	0.5	1.0					
Platyopuntia						X	
% Unknowns	2.5	3.0	4.0	7.0	1.0	2.0	5.0
Total	200	100	100	100	200	200	100
Aggregates	Ch-3b	Ch-25b	Ch-2b	---	---	Ar-2a	Ar-2a
						Ch-3b	Ch-8a

a - 1 d - 15
b - 5 e - 25
c - 10 f - 50

Samples with IP: 48SW5982 PS 128, 145, 134, 190, 304, 339

Table 9 Pollen Results from 48SW5982.

Feature:	20	20	35	35	35	35	35
Pollen Sample:	372	380	377	408	442	470	512
ARBOREAL POLLEN							
Abies	1.0						
Picea			0.5	X	1.0		
Pseudotsuga			X				
Pinus edulis-type	8.0	11.0	12.5	13.0	4.0	7.0	13.0
P. ponderosa-type	4.0	2.0	2.0	2.0	1.0		3.0
Pinus	1.0		1.0	1.0	1.0	2.0	3.0
Juniperus	1.0	4.5	2.0		4.0		1.0
NON-ARBOREAL POLLEN							
Low-spine Compositae	4.0	3.5	1.0	2.0	2.0	5.0	
High-spine Compositae				1.0	2.0		
Artemisia	19.0	20.0	27.5	21.0	17.0	23.0	25.0
Cheno-am	53.0	55.0	48.0	56.0	56.0	57.0	31.0
Sarcobatus	3.0		0.5		2.0		1.0
Gramineae		2.0	0.5	1.0	1.0		12.0
Ephedra nevadensis-type			0.5				
Phlox					2.0		
Portulacaceae					1.0		
Rosaceae				1.0			
Platyopuntia	2.0						3.0
% Unknowns	5.0	2.0	4.0	2.0	6.0	6.0	8.0
Total	100	200	100	100	100	100	100
Aggregates	Ch-3a Sa-2a	Ch-4a (Ch-90)	Ch-5b	Ch-2a	Ch-4b	---	Ch-2b Gr-3a

a - 1 d - 15
b - 5 e - 25
c - 10 f - 50

Samples with IP: 48SW5982 PS 312, 401, 405, 321, 326, 387, 393, 448, 491 one sample that lacked a high Cheno-am value, Sample 512, exhibited moderately high values of both sagebrush and Cheno-am pollen, which is more suggestive of natural background pollen rain. These 11 samples are the only ones in the Bairoil study that consistently suggest cultural use of plant foods. The three housepits all date around 4500 B.P., and a contemporaneous summer occupation might be in evidence.

5.0 SUMMARY AND CONCLUSIONS

The 50 pollen samples from the Bairoil Project that produced data provide information on past environmental setting and limited data on past plant use. At most of the sites, the past vegetation setting seems comparable to modern conditions for each site. Site 48CR4681 is an exception, and a more mesic vegetation setting with a substantial abundance of herbaceous plants possibly characterized the site in earlier times with a shift towards more shrubby and drier conditions occurring in the latter half of the sites depositional history. Here, as elsewhere, another shift occurs in the upper, recent historic horizon. This is seen as an increase in arboreal pollen rain and is probably related to some suppression of NAP species due to livestock grazing rather than any historic increase in arboreals at higher elevations.

Evidence for plant use is rare in this study. The Cheno-am taxon might be enhanced in one sample from the housepit at 48CR4686, and might also be enhanced in several samples from three housepits and 48SW5982. These are the only indications for plant use suggested by the pollen results. It is probably no coincidence that all of the houses date to about the same time, around 4500 to 5000 B.P. Whether this is related to environmental factors is unclear at this time. The pollen data from this study suggests conditions were not substantially different from more recent times.

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one sample that lacked a high Cheno-am value, suggest the [illegible] contained high values of both sagebrush and Cheno-am pollen, which is more suggestive of natural background pollen rain. These 11 samples are the only ones in the Bairoil study that consistently suggest cultural use of plant foods. The three housepits all date around 4500 B.P. and a contemporaneous summer occupation might be in evidence.

5.0 SUMMARY AND CONCLUSIONS

The 50 pollen samples from the Bairoil Project has produced little specific information on past environmental setting and limited data on past plant use. At most of the sites, the past vegetation setting seems comparable to modern conditions for each site. Site 48CR4681 is an exception, and a more mesic vegetation setting with a substantial abundance of herbaceous plants possibly characterized the site at earlier times with a shift towards more shrubby and drier conditions occurring in the latter half of the sites' depositional history. Here, as elsewhere, another shift occurs in the upper, mostly historic, deposits. This is seen as an increase in arboreal pollen and this is tentatively related to some suppression of NAP species due to livestock grazing rather than any historic increase in arboreals at higher elevations.

Evidence for plant use is rare in this study. The Cheno-am taxon might be enhanced in one sample from the housepit at 48CR4681, and might also be enhanced in several samples from three housepits and 48SW992. These are the only indications for plant use suggested by the pollen results. It is probably no coincidence that all of the housepits date to about the same date, around 4500 to 3000 B.P. Whether this is related to environmental factors is unclear at this time. The pollen data from this study suggests conditions were not substantially different from more recent times.

6.0 REFERENCES CITED

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