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VIA OVERNIGHT DELIVERY

Mr. Dane L. Finerfrock
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Division of Radiation Control
Department of Environmental Quality
168 North 1950 West
P.O Box 144850
Salt Lake City, UT 84114-4850

Re: Research Design for Archaeological Recovery on Ten Sites, White Mesa Mill Cell 4B Tailings Area

Dear Mr. Finerfrock:

Enclosed you will find one (1) CD, and two (2) hard copies, of the Research Design for Archaeological Recovery on Ten Sites, Cell 4B Tailings Area, White Mesa Mill. I would appreciate you forwarding one of the copies to the Utah State Historic Preservation Office ("SHPO") as soon as possible. The other hard copy and the CD are for your files. The Report was prepared for Denison Mines (USA) Corp. by Abajo Archaeology, in support of the Cell 4B tailings license amendment request. This is the final report required to fully implement the archaeological recovery program within the Cell 4B tailings area.

The archaeologists have committed to working through December and January to complete the field work and the SHPO is aware that the Research Design will soon be available for their review.

If you have any immediate questions please feel free to contact me at 303 389-4160.

Yours very truly,

DENISON MINES (USA) CORP.

Harold R. Roberts
Executive Vice President, US Operations

cc: Ron F. Hochstein
Dave C. Frydenlund
Steven D. Landau

A RESEARCH DESIGN FOR ARCHAEOLOGICAL DATA RECOVERY ON TEN SITES IN THE WHITE MESA MILL CELL 4B PROJECT AREA, SAN JUAN COUNTY, UTAH

Jonathan D. Till

November 2009

ABAJO ARCHÆOLOGY

A Research Design for Archaeological Data Recovery on Ten Sites in the White Mesa Mill Cell 4B Project Area, San Juan County, Utah

Prepared For:

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November, 2009

Abstract

This document serves two purposes: to provide a report of archaeological test excavations on ten sites in the Cell 4B project area of Denison Mines (USA) Corporation's White Mesa Mill, and to present a research design for archaeological data recovery at these same sites. The ten sites, which are found in the Mill's Cell 4B project area, are as follows: 42Sa6393, 42Sa6397, 42Sa6757, 42Sa8014, 42Sa28128, 42Sa28129, 42Sa28130, 42Sa28131, 42Sa28133, and 42Sa28134. All of the sites contain significant archaeological deposits. Therefore, all sites are eligible for nomination to the National Register of Historic Places (NRHP) (36 CFR 60.4). Nine of the sites date to the prehistoric period, while 42Sa28131 is an historic site that apparently dates to the A.D. 1940s.

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Chapter 1: Introduction and Locational Context

Denison Mines (USA) Corp. proposes to construct Tailings Cell 4B on their White Mesa Mill facility. The proposed cell has long been planned, but not constructed. The proposed cell would be excavated, lined, and used in the permanent storage of uranium ore tailings from the mill facility. It is understood that these construction activities could pose adverse effects to any historic properties in the project area.

This document serves two purposes: to provide a report of archaeological test excavations on ten sites in the Cell 4B project area of Denison Mines (USA) Corporation's White Mesa Mill, and to present a research design for archaeological data recovery at these same sites. Abajo Archaeology produced this document at the request of Mr. Harold Roberts, Executive vice President, and Mr. David Turk, Radiation Safety Officer, both of Denison Mines (USA) Corp. This manuscript is being prepared for the client, Denison Mines (USA), and the Division of Radiation Control, Department of Environmental Quality, State of Utah. The archaeological test excavations were conducted under an excavation permit issued on September 23, 2009, by the Utah Public Lands Policy Coordination Office.

Scope of Work

Abajo Archaeology has conducted a cultural resource inventory (archaeological survey) of the area proposed for the construction and development of Cell 4B (Till 2009a). A total of 14 sites were located in the surveyed area as a result of the cultural resource inventory. Table 1 describes the sites as we understood them based on their surface manifestations at the time of the survey. In order to understand the nature and extent of the subsurface deposits at each of these sites, Mr. Harold Roberts, Executive Vice President, and Mr. David Turk, Radiation Safety Officer, both of Denison Mines (USA) Corp, requested that Abajo Archaeology develop and conduct a testing program for the ten sites in the proposed project area (please note that this area is different than, but included within, the area surveyed). These sites are: 42Sa6393, 42Sa6397, 42Sa6757, 42Sa8014, 42Sa28128, 42Sa28129, 42Sa28130, 42Sa28131, 42Sa28132, and 42Sa28134.

The testing program was conducted for the client, Denison Mines (USA) Corp. This monograph documents these testing results, and includes a research design for data recovery at the ten tested sites. This document is being tendered to Denison Mines (USA) Corp. for submittal to Mr. Dane Finerfrock, Division of Radiation Control, Department of Environmental Quality, State of Utah. This report and research design is also being submitted to Ms. Lori Hunsaker (Deputy Preservation Officer, State Historic Preservation Office) and Mr. Kelly Beck (Utah Public Lands Policy Coordination Office) for review.

Specifically, this document accomplishes the following: (1) reports on the nature and extent of cultural features found within each of the ten sites; (2) provides a general methodology for data recovery in the project area; (3) provides a site-specific set of proposals for data recovery on each of the affected sites.

Table 1. Sites by Component and Function, White Mesa Mill Cell 4B Survey

Site Number	Components	Suggested Function	Comments
42Sa6391	Pueblo II	habitation	May have two pit structures.
42Sa6392	Pueblo II	seasonal habitation	Small adobe feature may be indicated.
42Sa6393	Pueblo II	habitation	Based on artifact scatters, two or three households may be indicated.
42Sa6397	Basketmaker III	unknown	Small adobe feature may be indicated. Given the artifact scatter, it seems likely that domestic features are present.
	possible Pueblo II	unknown	
42Sa6431	Basketmaker III	unknown	Known features include a burial, a hearth, and a lens of burned adobe.
	Pueblo II	habitation	A midden with a diverse assemblage of materials is present that suggests the presence of a habitation.
42Sa6757	Basketmaker III	habitation	Previously excavated by Abajo Archaeology (Davis 1985). Portions of the midden are still intact. Small subsurface features may still be present.
42Sa8014	Pueblo I	seasonal habitation	Previously excavated by Abajo Archaeology (Davis 1985). Small subsurface features may still be present.
42Sa28128	Pueblo II and/or Pueblo III	limited activity	The remains of ephemeral structures or small subsurface features may be present.
42Sa28129	Basketmaker III and/or Pueblo I	limited activity	The remains of ephemeral structures or small subsurface features may be present.
	Pueblo II	limited activity	
42Sa28130	Pueblo II	limited activity	The remains of ephemeral structures or small subsurface features may be present.
42Sa28131	Unknown historic	camp	The remains of ephemeral structures or small subsurface features may be present.
42Sa28132	possible Basketmaker III	limited activity	The remains of ephemeral structures or small subsurface features may be present.
42Sa28133	Unknown Aboriginal	limited activity	The remains of ephemeral structures or small subsurface features may be present.
42Sa28134	Unknown Aboriginal	limited activity	The remains of ephemeral structures or small subsurface features may be present.

Environmental Context

This section provides the environmental context for the Cell 4B project area. This considers the legal location of the project, it's geological setting, climate, and the biological communities found within the immediate area.

Project Area Location

The Cell 4B project area is situated on the crest and gently sloped flanks of two finger ridges on the north end of White Mesa (Figure 1). The mesa's western and eastern margins drop precipitously into Cottonwood and Recapture canyons, respectively. The project area has an approximate rhomboid shape that covers an area of about 55.7 acres (22.5 hectares) in Sections 32 and 33 of Township 37 South, Range 22 East (Figure 2).

Geological Setting

The White Mesa Mill occupies the top, and gently sloped eastern face, of a low but prominent ridge near the divide of White Mesa. Situated in the Blanding Basin Section of southeastern Utah, the surrounding landscape is characterized by a multitude of mesas and buttes flanked by canyon drainages (Stokes 1986:235-6). The area's primary water courses flow from north to south, draining the Abajo Mountains to the north and run to the San Juan River to the south. White Mesa is flanked by two of these north-to-south drainages: Cottonwood Wash to the west and Recapture Wash to the east. Westwater Canyon, a significant tributary to Cottonwood Wash, is also to the west of the project area.

The caprock of White Mesa is mostly composed of Cretaceous Period rock, including interbedded sandstones and shales associated with the Dakota and the underlying Burro Canyon formations. In places, remnants of the later Cretaceous Mancos Shale may be found overlying the harder caprock. In areas, White Mesa harbors remnant outwash deposits of alluvial cobbles and pebbles, materials that derive from ancient fluvial stream beds. These lag deposits consist primarily of the igneous rock from the Abajo Mountains, but include varieties of chert, chalcedony, and quartzites as well. The slopes of White Mesa consist of relatively soft, vari-colored shales associated with the Morrison Formation.

White Mesa's flanking canyons provide seasonal water as the result of snow melt in the mountains and higher elevations. In times of rain, the drainage bottoms run, too, and occasionally flash with tumultuous rage. The more dependable sources of water occur as seeps and springs. These are often found below the rim of the mesa, where the permeable sandstone caprock comes into contact with impermeable shales. In several better examples of this phenomenon, large Pueblo III period aggregated communities have been built around these water sources.

Mesa top sediments in and around the mill property are dominated by a reddish-brown, very fine aeolian sand and silt. Davis and others (2003:6) note that this loam ranges considerably in depth from a few centimeters to several meters; the mantle of sediment in the project area is generally represented by the deeper end of that scale. Poorly developed B horizons, and

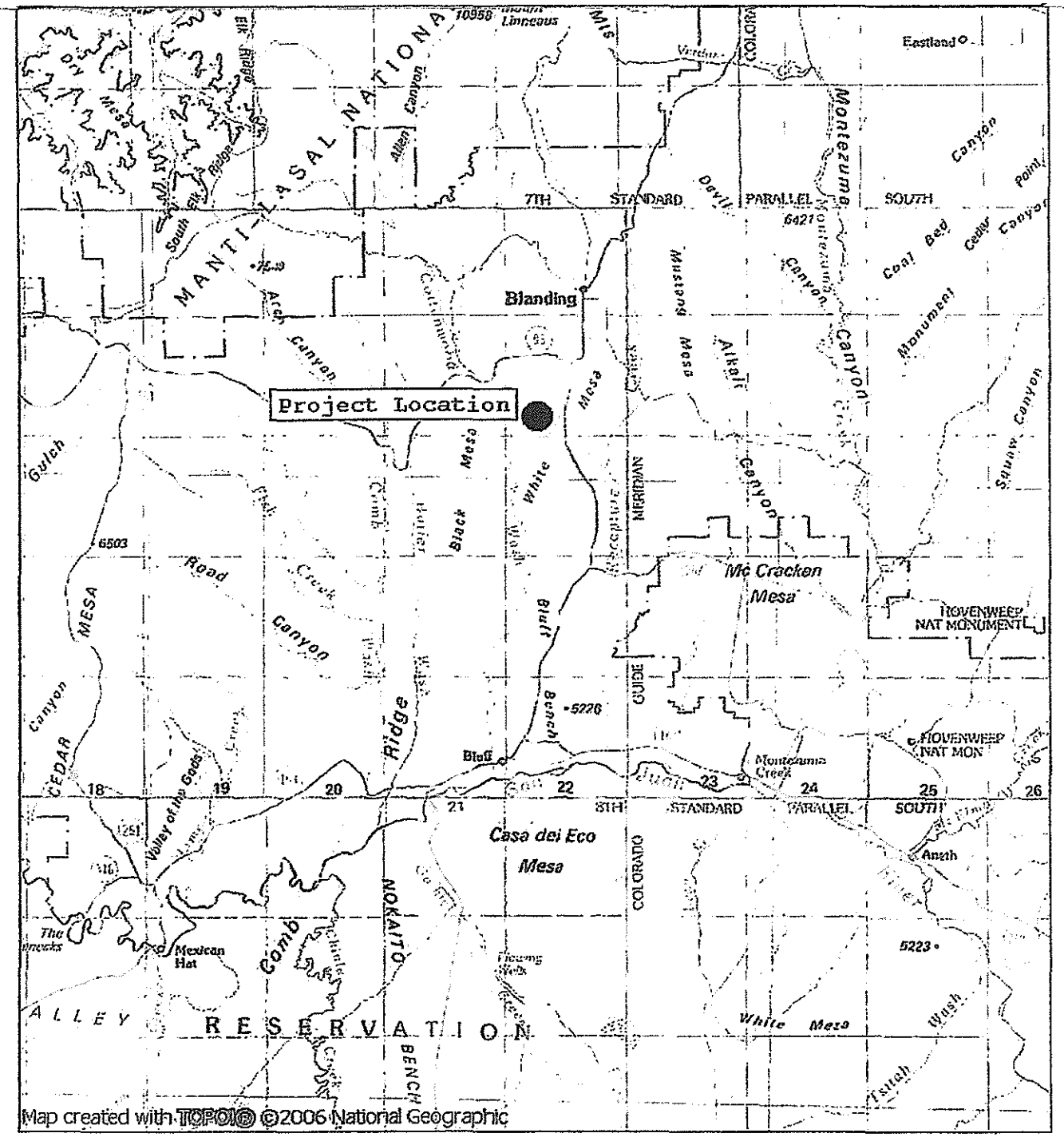

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Figure 1. Project Location Map, Denison Mines White Mesa Mill, San Juan County, Utah.

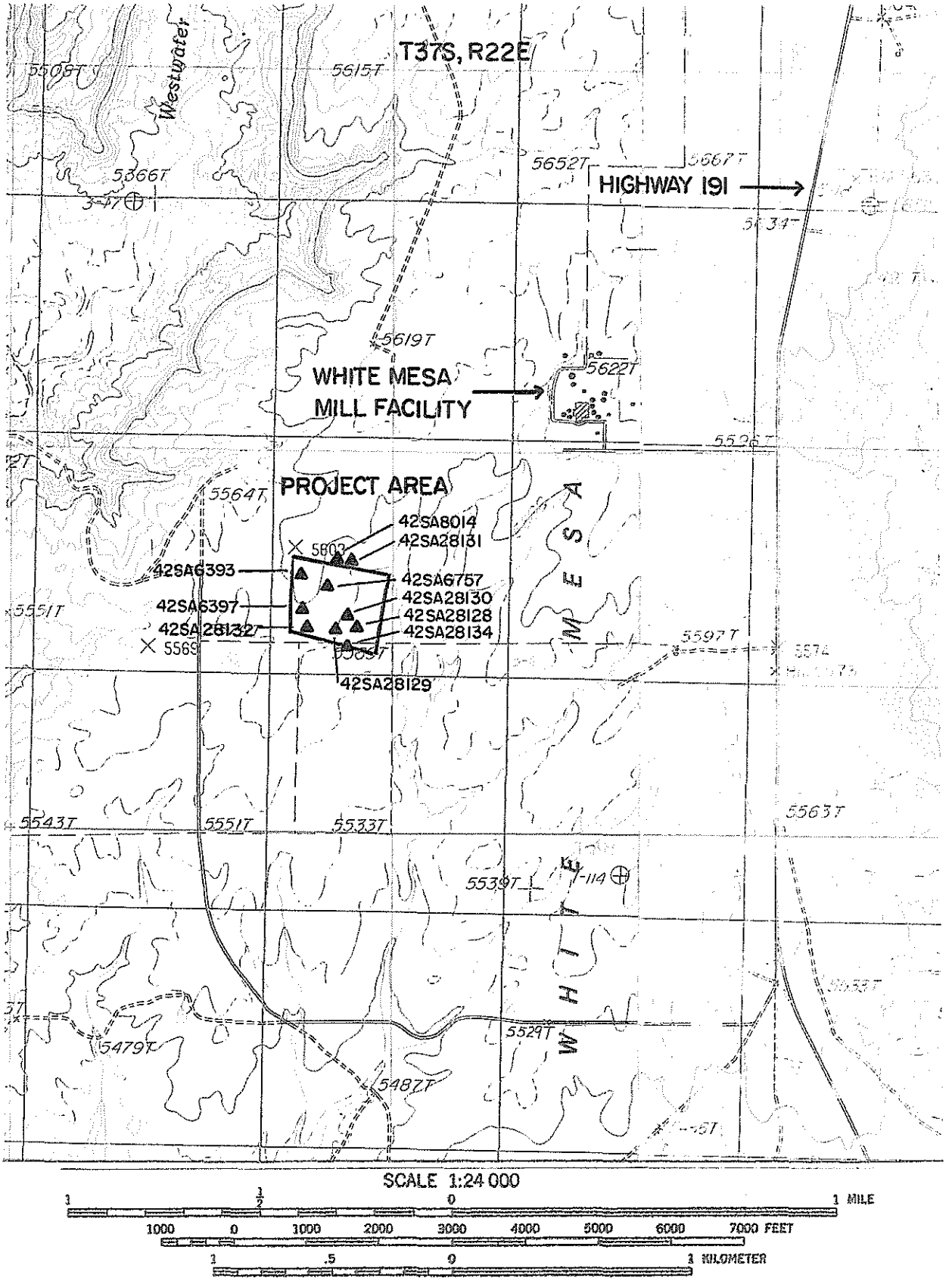

Figure 2. Denison Mines White Mesa Mill Cell 4B Project Map showing the location of Archaeological Sites.

moderately developed caliche-rich soil horizons, have formed in the White Mesa sediments wherever depth and stability have allowed. Agenbroad (1985:175-183) argues for a correlation between "caliche highs" and the location of pithouses, suggesting that the caliche substrate provided desirable construction characteristics for pit structures.

Climate

Precipitation and temperature combine to provide a marginal, but possible, agricultural environment. The rainfall regime may be described as generally "bimodal" (Cordell 1997:36-41), which describes a pattern of precipitation that includes summer rains and winter snow. Southeastern Utah falls near the edge of a line separating bimodal and summer dominant precipitation patterns, underscoring the unpredictable nature of rainfall in the Mesa Verde region. Annual precipitation varies from 8 to 16 inches, with an average of about 12 inches for nearby Blanding. White Mesa straddles an interesting pale between the relatively rain-rich uplands and the water-poor lower elevations. Local lore has it that the southern stretches of White Mesa supported dryland farming efforts in the early 1920s, so much so that water literally ran off the southern end of White Mesa by way of irrigation ditches in one year (Winston Hurst, personal communication with Jonathan Till, 2009). Shirttail Corner, which lies immediately north of the project area, seems to mark the boundary between continuously cultivated dryland farms to the north, and occasional but mostly fallow dryland efforts to the south (Davis and others 2003:6).

Temperatures are such that they provide for an average frost-free period of 153 days in Blanding. There is considerable variability in this frost-free period, however, emphasizing the hazards of depending on a 120-day corn-growing season. The average temperature in July is 23 degrees Celsius (74 degrees Fahrenheit); the average temperature in January is 10 degrees Celsius (50 degrees Fahrenheit).

Biological Community

The various landscapes of White Mesa include a variety of environments that range from the ecotone between ponderosa pine and pinyon-juniper woodland, found in the northern reaches of White Mesa, to the desert steppe on its southern margins. Pinyon-juniper and big sagebrush communities tend to dominate the intermediate elevations of White Mesa, which includes the White Mesa Mill property.

The faunal community is described in some detail by Dames and Moore (1978: Appendix D), which is summarized by Casjens (1980: Table 2-3). The only big game species observed during the course of Abajo's survey and testing projects have been mule deer. An abundance of desert cottontail and black-tailed jackrabbit have also been noted. The nearby canyons of Big Westwater and Cottonwood Wash provide riparian habitat, environs rich for a variety of wildlife.

The landscape of the White Mesa Mill property has been radically altered in historic times. These alterations have come about as the result of historic ranching and farming practices as well as the development of the White Mesa Mill. The surface of the project area has been chained and railed, plowed, and seeded. Davis (1985:9) notes that much of this disturbance took place in the 1920s and 1930s. As a consequence of these activities, the project area's vegetation

probably does not reflect the plant life that would occur there naturally. Currently, the local ecology is characterized by grasslands with mostly immature sagebrush, snakeweed, and prickly pear. Annual plants common to the project area's terrain include cheatgrass, mustard, and heron's bill. Occasional instances of juniper and Mormon tea hint at the area's original ecology. At the west rim of the mesa, juniper and big sage are common. It seems likely that the mesa's interior represented an ecotone between the sagebrush and pinyon-juniper ecozones.

Chapter 2: Cultural-Historical Overview

Several current, textbook syntheses of prehistory in the North American Southwest are widely available, and serve to put the proposed project into a temporally deep and spatially broad context (e.g. Cordell 1997; Kantner 2004; Lekson 2009). Perhaps of more immediate interest are several overviews that consider southeastern Utah and the encompassing Mesa Verde region (Hurst 1992; Lipe and others 1999; Noble 2006; Rohn 1989). All of these documents should be consulted for information regarding the broad patterns of cultural development in the region surrounding the project area.

The following overview summarizes the cultural history of the project area in terms of established "periods" that very generally based upon the changing subsistence economies and material culture of ancestral Pueblo society (Table 2). Pre-agricultural societies are summarized by the PaleoIndian and Archaic periods. Ancient agricultural Puebloan societies are described in terms of the Pecos Classification (Kidder 1927; Lipe and others 1999).

PaleoIndian Period

The PaleoIndian period, as it is expressed in the North American Southwest, is generally summarized in terms of the Llano, Folsom, and Plano complexes which seem to vary in date according to region (Schroedl 1991). In this particular case, Black and Metcalf (1986) are referenced to provide dates for the PaleoIndian Period in the project area. The Llano complex (ca. 12000 - 11000 Before Present or "B.P.") is characterized by the presence of Clovis points, presumably used to dispatch megafauna such as the mammoth. The Folsom complex (ca. 11000 - 10000 B.P.) describes a culture that utilized the Folsom point and is particularly associated with *Bison antiquus*, an ancient form of bison. The Plano complex (ca. 10500 - 7500 B.P.) does not generally occur on the Colorado Plateau with any great frequency although points from this complex have been reported (Black and Metcalf 1986; Tipps 1988).

The generally accepted dates for the onset of the PaleoIndian period in western North America begin around 9500 B.C. The earliest date for PaleoIndian occupation in Utah, yielded by the lowest cultural levels of Danger Cave in northwest Utah, bottoms out around 9450 B.C. (Schroedl 1991). At the Lehner Mammoth site in southern Arizona, hearths in a PaleoIndian mammoth kill site context have likewise been carbon-dated to somewhere between 9000 and 10,000 B.C. (Haury and others 1959).

The PaleoIndian lifeway has been generally described as being centered around the hunting of Pleistocene megafauna (Jennings 1973; Martin 1990), hence the occurrence of large-sized points. However, it is important to keep in mind that subsistence data for these sites is lacking with the exception of kill sites distant to the project area and the inferred functions of paleo-tool assemblages. Kill sites certainly indicate that large game animals played a role in paleo-subsistence economies. As Schroedl (1991:6) noted, the question is probably not whether they were big-game hunters that excluded gathering activities, but the degree to which game hunting played a role in the paleo-subsistence economy.

Table 2. Archaeological Chronology of the Four Corners Region, by Year and Pecos Classification Periods*

Dates	Periods	Distinctive Characteristics
AD 1300 to 1600	Pueblo IV	Large plaza-oriented pueblos in Rio Grande and Western Pueblo areas; low kiva to room ratio; kachina cult widespread; corrugated replaced by plain utility types; B/w pottery declines relative glaze ware types.
AD 1150 to 1300	Pueblo III	Also known as the "great pueblo" period; large pueblos; high kiva to room ratios; cliff dwellings; towers; triwalls; corrugated gray and elaborate B/w pottery, plus red or orange pottery in some areas; abandonment of the Four Corners region by 1300.
AD 900 to 1150	Pueblo II	Also associated with the "Chaco phenomenon," which refers to an apparent general settlement pattern consisting of a community center and dispersed households or "unit pueblos." A community center will include some configuration a great house, great kiva, bermed middens, and roads; unit pueblos are composed of a kiva and a surface masonry roomblock; corrugated gray ware becomes the predominant cooking pottery.
AD 750 to 900	Pueblo I	Large villages in some areas; habitations consist of a "protokiva" (i.e. pithouse) plus surface roomblock of jacal or simple masonry; great kivas; cooking pottery is dominated by neckbanded gray ware; initial development and use of red ware pottery.
AD 500 to 750	Basketmaker III	Habitation is formal pithouse with surface storage pits, cists, or rooms; dispersed settlement with occasional small villages; occasional great kivas; development of first true cooking pottery, which is "plain gray"; bow and arrow generally replaces the atlatl; beans added to cultigens.
AD 50 to 500	Basketmaker II (late)	Habitation is shallow pithouse plus storage pits or cists; dispersed settlement with small low density villages in some areas; pottery, if present, is a self-tempered "mud ware"; atlatl and dart; corn and squash by no beans; upland dry-farming in addition to floodplain farming.
1500 BC to AD 50	Basketmaker II (early)	Long-term seasonal use of caves for camping, storage, and burial; camp and limited activity sites in open; no pottery; atlatl and dart; corn and squash; cultivation may be primarily floodplain or run-off based.
6500 BC to 1500 BC	Archaic	Subsistence based on wild foods; high residential mobility; low population density; shelters and open sites; altatl and dart.
pre-6500 BC	PaleoIndian	Subsistence based on wild foods, but with a focus on large game animals, many of which are now extinct; high residential mobility; low population density; distinctive spear and/or dart points; no apparent ground stone technology.

*Adapted from Lipe (1994)

The artifacts most diagnostic of the PaleoIndian period are projectile points. These are generally assumed to have been hafted onto spears or perhaps dart shafts. Archaeologists recognize two basic point categories for the PaleoIndian period: fluted points and stemmed/shouldered points (Schroedl 1991:2-5). Clovis points and Folsom points represent the fluted types, and are perhaps the most well-known and recognized. Other artifact types that distinguish PaleoIndian assemblages include distinctive end and side scrapers.

Several interesting PaleoIndian components occur relatively near the project area. These include the Lime Ridge Clovis site (Davis 1986, 1989), a rock art site along the banks of the San Juan River, and a multicomponent lithic scatter located only several miles south of the project area (Westfall and others 2003). Two isolated fluted points have been reported in the area. A Clovis point fragment was recently discovered in Comb Wash (Westfall 2009:26-7), and a Folsom projectile point fragment was discovered while recording a multicomponent site on the southern edge of White Mesa just several miles south of the project area (Westfall 1995:64). Also of note is the documentation of a PaleoIndian point fragment found immediately south of White Mesa on the upper end of Big Bench (Moore and Owens 2003:260).

Archaic Period

Typically, the term "Archaic" refers to a human population organized in small groups with a high degree of residential mobility to best employ a hunter-gatherer subsistence strategy. In the case of this report, "Archaic" is used to describe the time period in which this lifestyle was the prevalent *modus operandi* of the prehistoric populations that occupied the Four Corners region from roughly 6000 B.C. - A.D.1. Several reviews of the long-lasting Archaic period have been generated for the Mesa Verde region and adjacent landscapes (e.g. Berry and Berry 1986; Geib 1996; Jennings 1978; Lipe and Pitblado 1999; Matson 1991).

Archaic tool assemblages begin to appear even as Plano point technology is still being utilized, especially on the High Plains. However, generally speaking, the Archaic period is differentiated from the PaleoIndian in its tool assemblage and presumed subsistence strategies. Instead of the lanceolate points of the PaleoIndian period, Archaic peoples possessed smaller, notched points that were hafted to darts and propelled by an atl-atl. That plants play an important dietary role in the Archaic lifeway is evident through the introduction of ground stone implements.

The change in subsistence strategy is grounded in a basic environmental change from a cooler and moister climatic regime to the modern xeric landscapes of the North American Southwest. This arid environment required a subsistence strategy that emphasized a knowledge of the spatial and seasonal availability of food resources.

Several classification schemes for the Archaic period have been developed, focusing mainly on particular broad areas in the region of the North American Southwest. Of particular use for the project area are those classifications proposed by Schroedl (1976) for the northern Colorado Plateau and by Irwin-Williams (1979) for the Four Corners area. Irwin-Williams (1979) believes that the Archaic populations of the Four Corners could be subsumed under the "Oshara Tradition." The Oshara Tradition is sequentially organized into five phases:

Jay Phase	5500 - 4800 B.C.
Bajada Phase	4800 - 3300 B.C.
San Jose Phase	3300 - 1800 B.C.
Armijo Phase	1800 - 800 B.C.
En Medio Phase	800 B.C. - 400 A.D.

Hurst (1992:37) succinctly summarizes the characteristics of each of these phases.

> Irwin-Williams suggested that the Jay Phase represents the occupation of the Four Corners area by Archaic peoples from the San Dieguito complex to the west, following the eastward retreat of the big game hunting PaleoIndian cultures in the face of Holocene climatic changes. Jay and Bajada phase sites were thought to reflect occupation by nomadic hunting and gathering microbands who repeatedly reoccupied certain favorable localities in a "relatively unstructured continuing annual round." The San Jose phase saw significant population increase during an interval of increased effective precipitation and ameliorated restrictions on local resource bases (Irwin-Williams 1979:38). The Armijo phase witnessed the introduction of Mexican cultigens including maize into the economy, resulting in the production of seasonal food surpluses and population aggregations into macroband encampments. The En Medio phase is equivalent to the Basketmaker II culture as defined in the San Juan drainage, and marks the emergence of a fully horticultural Anasazi culture, probably in response to population pressure and resultant shrinkage of foraging territories.

It is probably no wonder that little extensive work has been done with Archaic sites in the general vicinity of the project area. The nondiagnostic remains of Archaic period camps, often manifested as lithic debris scatters or hearth remains, are probably frequently documented as "unknown aboriginal" (IMACS 1990). Historically, archaeologists may have overlooked the lackluster Archaic sites, passing them by for the more interesting Puebloan sites. In addition, Archaic sites are susceptible to burial, erosion, or reuse by subsequent populations. However, recent survey data have contributed more to our knowledge of the Archaic population in the project area's vicinity (e.g. Honeycutt and Fetterman 1985; Whitten and others 1986; Bond and others 1992; Montgomery 1994). One general pattern that emerges is the tendency for Archaic period sites to occur on canyon rim or canyonhead locations (Whitten and others 1986; Montgomery 1994). Davis and others (2003: Table 2) report that only four Archaic components have been documented on the mill property.

Recent data recovery or excavation phase work has also considerably contributed to our knowledge of this time period. Greater detail is available regarding lithic procurement sites and their possible Archaic affiliations (Montgomery 1994; Westfall and others 2003). A rock shelter/cave located just west of Comb Wash, Old Man Cave, with an Early Archaic component (equivalent to the Jay phase) has been partially excavated (Davidson and others 1994). One habitation site of interest, perhaps bridging the gap between the Archaic and the preceding Basketmaker period, has been excavated near the project area and is discussed further below (Westfall and others 2004).

Basketmaker II Period

The end dates for the Archaic period, and the beginning date for the early Basketmaker period, are often blurred in spite of the seemingly concrete numbers assigned to them. Until recently, this number has been the firm A.D.1. The earliest Basketmaker manifestation, labeled Basketmaker II, is generally defined as a preceramic agricultural population that preceded the Puebloan tradition. Cultigens, and maize in particular, were passed from prehistoric Mexican populations into the North American Southwest. Currently the earliest evidence for maize on the Colorado Plateau comes from Three Fir Shelter on Arizona's Black Mesa and dates to 3900 B.P. (Smiley 1993). Agriculture as a subsistence strategy does not seem firmly established on the Plateau until 1500 - 1000 B.C. (Matson 1991; Lipe 1993).

Excellent overviews and discussions exist for the Basketmaker II period (Matson 1991; Hurst 1992, 2004; Lipe 1999). Basketmaker II rock shelter sites, perhaps the site type that most frequently captures our imaginations for this period, are well described by Kidder and Gurnsey (in Hurst 1992:42) and others (Lindsay et al. 1968; Hurst 1993). Rock art that appears to date to this period is also extensively discussed (Schaafsma 1980; Manning 1992; Cole 1993; Pachak 1994).

Like the ephemeral nature of the Archaic period habitation sites, Basketmaker II habitation sites are often prone to natural obscuration, obliteration, or reoccupation. In spite of this, data recovery via excavation has occurred at nearby sites with Basketmaker II components (Davis 1984; Richins and Talbot 1989; Westfall 2003). As with the Archaic period, documented Basketmaker II components are rare on the mill property (n=3) (Davis and others 2003: Table 2).

Basketmaker III Period

The termination of the Basketmaker II and the commencement of Basketmaker III occurs around A.D. 500. Reed (2000) has recently produced an edited volume that examines the Basketmaker III period in the Four Corners region, and Hurst (2004) has produced the most exhaustive summary of Basketmaker III data in southeastern Utah.

Hurst (1992:47) defines the Basketmaker III as

> that interval of Anasazi culture history during which the Anasazi of the Four Corners area were (1) producing a pottery assemblage dominated by Lino style gray ware and lacking both San Juan Red Ware and banded or corrugated gray ware; and 2) inhabiting substantial, semi-subterranean pithouses with associated noncontiguous, circular/ovoid storage cists.

Associated with the Basketmaker III household is the establishment of the "Prudden unit" settlement pattern (Prudden 1914, 1918; Roberts 1939). This long-lasting architectural footprint consists of the pithouse or kiva bracketed to the south by a formal midden area, and to the north by above-ground storage features (which consist of cists in the Basketmaker III period and

pueblo structures in the following Pueblo periods). Elsewhere Lipe has referred to this persistent architectural pattern as the "San Juan pattern" (Lipe 2006:293).

In addition, the Basketmaker III acquired the bow and arrow and the cultigen, beans. It is probably no coincidence that beans and the introduction of the first, well-made cooking pottery co-occur. In contrast to the Basketmaker II, this later manifestation of the Basketmaker Anasazi is abundant in the Four Corners region and is discussed in many sources that describe work near the project area (e.g. Neily 1982; Davis 1985; Hurst 1992, 2004).

The Basketmaker III settlements seem to range in size from single pit houses to larger communities of 10+ pithouses with satellite storage structures. These larger communities also have a large pithouse/community room per settlement that could have been incipient great kivas. Such sites occur near the project area in Recapture Wash at Villa Gavilan (Jacklin 1985) and near Bluff, Utah (Neily 1982). Still, the primary settlement pattern for Basketmaker III society is one that is "extensive" (households scattered over a broad area of landscape) in contrast to "intensive" (households that are clustered or aggregated into a very small area). An intensive landscape use strategy only becomes apparent with the Pueblo I period.

Pueblo I Period

The Pueblo period has been extensively covered in many overviews for the American Southwest and the smaller Mesa Verde region (Allison and others in press; Cordell 1997; Kantner 2004; Lipe and others 1999; Hurst 1992; Nickens 1982; Rohn 1989). Only some general characteristics will be mentioned here in conjunction with specific site examples and past archaeological projects that occur in the immediate vicinity of White Mesa.

The Pueblo I Period approximately spans the years from A.D. 750 to A.D. 900 in the Mesa Verde region. Like the Basketmaker III settlements, Pueblo I communities often consisted of one to a dozen pithouse structures with associated satellite rooms. The storage cists of the Prudden unit are replaced by above-ground jacal structures, and pithouse architecture changes rather dramatically as well. Although farther afield, the Duckfoot Site, excavated by Crow Canyon just five miles west of nearby Cortez, Colorado, offers some good insight into the structure of a small Pueblo I settlement or "hamlet" (Lightfoot 1994; Lightfoot and Etzkorn 1993).

However, while Pueblo I communities are frequently small, and not aggregated, the onset of what has been defined as the Pueblo I period is coincident with the region's first aggregated communities, most notably "Site 13" on Alkali Ridge, which is just east of White Mesa (Brew 1946). This community was probably established by the A.D. 760s, and is coincident with the introduction of a very different pottery ware, San Juan Red Ware (Allison 2008; Allison and others in press). Early Pueblo I communities apparently increase in number into the first decade of the ninth century, but significantly wane in frequency throughout southeastern Utah during the middle portion of that century.

By the late A.D. 800s, Pueblo I populations in southeastern Utah are again on the rise, particularly in elevations above 6000 feet as well as to locations beside large, major drainages

such as Montezuma Creek, Recapture Wash, and Cottonwood Wash. Two late Pueblo I communities flank White Mesa: Climax Village is due west of the Mill property in Cottonwood Wash, and Parker Village is nearly equidistant to the east in Recapture Wash. While no Pueblo I period components are immediately apparent in the Cell 4B project area, Pueblo I period sites have been excavated on the Mill property and in the nearby vicinity (e.g. Davis 1985; Talbot and others 1982; Bussey n.d. in Hurst 1992:55).

Pueblo II Period

The Pueblo II period, which runs approximately from A.D. 900 to A.D. 1150, is characterized by the so-called "Chaco phenomenon" (Irwin-Williams 1972). This social phenomenon had its apparent center in Chaco Canyon of northwestern New Mexico, but became manifest across much of the northern Southwest. Community centers associated with the Chaco phenomenon exhibited great variability in detail, but also regularity in architectural footprint. These centers, often referred to as "great house" sites, generally include a great house, a great kiva, one or more "roads" that approach the site, and large site-encircling earthen berms. Hurst and Till (2009) describe how this "great house pattern" manifests itself in the project area. Most pueblo communities associated with these centers, particularly those in southeastern Utah, appear to consist of dispersed households or clusters of households (Cameron 2009; Jalbert and Cameron 2000; Mahoney 2000).

While still abiding by the Prudden unit pattern, household architecture was prone to change during the Pueblo II period. For example, jacal structures of the preceding period are replaced by above-ground masonry buildings and the pithouse structures assume the architectural elements that define "kivas." The attributes that appear to be generally unique to kivas are pilasters, which are indicative of a different roofing technique, a southern recess, and a ventilator system that usually articulates with the southern recess.

During the earlier years of the Pueblo II period, there appears to be high climatic variability but a general increase in precipitation. The climate then appears to stabilize in the latter part of the period and the relatively high amount of effective moisture is maintained. Although these climatic variables seem to encourage a Pueblo II expansion into the higher elevations up to just below 7000 feet, those areas around the Dolores and La Plata rivers are abandoned (Hurst 1992; Rohn 1989). Indeed, there seems to be an overall increase in population across much of the Four Corners region, the area of the project not excluded. In the later portion of the Pueblo II period, the Cedar Mesa area west of Comb Ridge begins to be repopulated. There is some debate with regard to the population density and settlement patterns of this period. Some argue that, in spite of an overall population increase, there is a "dispersal" of the population away from their aggregated villages of the Pueblo I period (Hurst 1992:59). However, Rohn (1989:157) believes that there could be an overall increase in the average Pueblo II community size for the Four Corners area.

It is important to note here the presence of several Pueblo II period "community centers" within the vicinity of the project area. One of these, which has been variously called Quartzite Ruin, Black Mesa Ruin, and the Black Mesa Great House, lies due west of the project area on Black Mesa. This site appears to be the closest known great house site to the project area. In

addition to the great house structure itself, the site is situated with a network of prehistoric roads and associated sites (Hurst and Till 2009). Cottonwood Falls (42Sa5222) is arguably the largest of the great house sites in southeastern Utah. This site lies to the northwest in Cottonwood Canyon, and includes the great house, at least one great kiva, and an interesting complex of prehistoric roads. Finally, to the north, is the Edge of the Cedars Ruin (42Sa700), in Blanding, Utah. This site includes a great house, a great kiva, and a possible prehistoric road (Hurst 2000). All three of these sites may have figured prominently in the lives of the Pueblo II period occupants of sites in the Cell 4B project area.

Pueblo II period sites have been excavated near the project area (e.g. Baker 1990; Davis 1985; Firor and others 1998; Nielson and others 1985). The substantial Pueblo II ruin at the Edge of the Cedars Museum in Blanding, Utah has been partially excavated. These efforts, however, were poorly documented (Hurst and others 1995:15). Firor and others (1998) report on a middle Pueblo II period site with a Mesa Verde-style kiva as well as a pitstructure that is executed in a style typical of the Pueblo I period. Casjens (1980a) reports similar variability for pitstructures excavated earlier on the White Mesa Mill property at two sites: 42Sa7754 (Three Meter Isle) and 42Sa6437 (Proton Point).

Pueblo III Period

The Pueblo III period dates from approximately A.D. 1150 to A.D. 1300. This period could be characterized as the greatest source of current interest and controversy for many archaeologists. It certainly appears to have been a time of upheaval and/or change for at least some of the populations with Puebloan affiliations. Hurst (1992:67) summarizes these changes, observing that

> ...the Pueblo III period is characterized by localized abandonments and population shifts; a concomitant decrease in the number and increase in the average size of habitation sites (due in large part to the shift in large-community settlement pattern from the great house community pattern to more intensive aggregation into tightly-clustered complexes of contiguous households); widespread intensification of the water and soil conservation technologies that appeared during the previous period; the full flowering of the classic architectural-ceramic complexes by which the Mesa Verde and Kayenta expression of the Anasazi culture are best known (Kidder 1965); the extensive territorial expansion of the Mesa Verdean architectural/ceramic complex; and the widespread occupation of defensible locations and locations with dependable water sources during the decades immediately preceding the general abandonment.

Pueblo III community structures are typically above-ground masonry rooms, often contiguous with other rooms. These are truly "pueblo" structures, which are aggregations of single rooms into room blocks, some of which are multistory. The pithouses (or kivas) are still maintained as an important element of Anasazi architecture. An important and interesting architectural element of the time is the "tower," which is usually one or two stories in height and generally circular.

The earlier half of this period is characterized by the apparent maintenance of the Chaco phenomenon, albeit with differences. Often termed the "post-Chaco" period, it appears that at least some of the region's great house sites are re-inhabited or at least reconfigured (Cameron 2009). However, by the mid-1200s, the great house phenomenon appears to be replaced by the "Great Pueblo" way of life (sensu Kantner 2004:159-181).

Scholars note an overall decrease in the number of habitation sites in the Four Corners region during the Pueblo III period as populations aggregated into larger communities. Of particular note is the florescence of large pueblo communities in the Montezuma Valley area east of the project area (e.g. Hurst 1992; Rohn 1989; Lipe and Ortman 2000). These Montezuma Valley communities are often located on or near canyon rims (Lipe and Varien 1999).

Hurst and others (1995:16) note that although a number of large Pueblo III sites occur around the edges of White Mesa, none of these has been the subject of extensive scientific scrutiny. Two relatively large, late Pueblo III period sites are known in the immediate vicinity of the Cell 4B project area (Ruin Spring and Radon Ruin). Both sites are apparent villages in canyon-head contexts and include towers in their architecture. Abajo Archaeology did a thorough surface documentation of a Pueblo III site, known as "Moki Island," just north of Blanding (Montgomery and Montgomery 1988). Two Pueblo III cliff dwellings on White Mesa's northwestern margin have been somewhat studied through excavation techniques. Excavations have taken place at Westwater 5-Kiva Ruin but remain largely unreported. This project documented a 25-room pueblo that dated to the mid-1200s (Lindsay and Dykman 1978). Less extensive, but better documented test excavations were undertaken at Big Westwater Ruin, a site half the size of 5-Kiva Ruin (Lindsay 1981). Big Westwater Ruin is located just a few kilometers northwest of the White Mesa Mill.

More immediately, Neilson (1980) reports on an excavated site with apparent Pueblo III period domestic features on the mill property. This site, 42Sa6437 (Proton Point), yielded evidence for pitstructures that were not typical of the Mesa Verde type kiva. One of these features was recently excavated on the mill property at the late Pueblo III site, 42Sa27732 (Till, in progress). A late Pueblo III period site with a similar Mesa Verde type kiva was excavated by Alpine Archaeology at 42Sa7660 (Happy Salamander Site), which is very near to the White Mesa Mill (Greubel 1998).

Protohistoric Period

By the early 1300s the Puebloan depopulation of the Four Corners region was complete. It seems likely that the local Anasazi population moved southward to join other pueblo groups in the Rio Grande and Little Colorado River drainages. Hurst (1992:72) notes evidence of occasional prehistoric Hopi, Zuni, and Jemez Pueblo ceremonial visits to the area. This evidence manifests itself through pottery artifacts and apparent shrines, and is underscored with verbal accounts of these travels.

The dates for the entry of Athapaskan peoples into the Four Corners region are rather uncertain. However, Spanish accounts from the early 1700s indicate that Ute and Navajo ("Dine") populations were inhabiting the area around the Sleeping Ute Mountain.

Historic Period

Little detail will be given here concerning the historic period of the project area, which has been documented in other places (Davis and others 2003; Hurst and others 1993; McPherson 1995). Only eight previously documented sites on the mill property have been designated as historic; of these, six sites lack diagnostic attributes to assign cultural affiliation.

Features associated with the Navajo and Ute peoples are steadily receiving more recognition and understanding as archaeologists become more aware of their presence. A number of Native American historic sites have been recorded in the near vicinity of the project area (e.g. Hurst 1981; Montgomery 1994; Westfall 1995). Only two sites have been assigned specific cultural affiliations, one of which is Navajo and the other is Ute.

Although it is apparent that the Spanish had some minimal knowledge of the area, it was not until the 1850s that Anglo-Americans recorded their first visits to the area (McPherson 1995). The LC Ranch began its cattle operations in Recapture Wash below White Mesa in the 1870s. Settlement of the area began in earnest, however, in 1880 when Mormon settlers first arrived at the present location of Bluff. Dissatisfied with the their environment, in 1904 a group of Bluff Mormons headed north to the flats of White Mesa below the Abajo Mountains and founded the community of Grayson (renamed Blanding). Soon after this date, the town of Monticello was founded. The economy of these early towns, like many frontier communities, initially revolved around land-based extractionist industries such as livestock, mining, and timber. In addition to these industries, recreation is now rapidly becoming an economic mainstay for the region, due in part to the public's fascination with the prehistoric occupants of the North American Southwest.

Chapter 3: Previous Work in the Cell 4B Project Area

Down at the Mill: A Very Brief History of Archaeological Investigations Conducted on the White Mesa Mill Property

The White Mesa Mill property has been the subject of varying degrees of scrutiny by archaeologists in the past 30 years. Several archaeological surveys on the property have documented scores of sites on the mill property (e.g. Berge 1975; Casjens and Seward 1980; Fike and Lindsay 1976; Thompson 1977). Many of these sites have subsequently been tested and excavated (Agenbroad and others 1981; Berge 1983; Casjens 1980a; Davis 1985; Lindsay 1978; Nielson 1979; Sargent 1979; Till, in prep.). Excavated site data on the mill property are reported in Table 3. The importance of these data is not to be trivialized—this data set constitutes one of the larger bodies of excavated site data in the Four Corners region, and has the great potential to inform archaeological research in ways that right-of-way projects cannot.

A relatively recent Class I inventory of this material by Davis and others (2003) summarizes some of the gross survey data generated by these earlier efforts. Their summary indicates that the highest proportion of components documented on White Mesa date to the Pueblo II period (32%), followed by Pueblo I period components (24%), Pueblo III period components (15%), and Basketmaker III period components (14%) (Davis and others 2003: Table 2).

We have compiled a site database that considered temporal components and functions (Till 2009a:15-18). Using this database, Tables 4 and 5 illustrate the frequencies of components and how these components cross-tabulate with function. Table 4 generally mirrors the results obtained by Davis and others (2003), indicating that Pueblo II period sites are the most prevalent, followed in frequency by Pueblo I, Basketmaker III, and Pueblo III periods sites. However, it also suggests that many of these sites were in use during important "transitional" times between the highly generalized Pecos periods. Thus, under scrutiny, many of the sites may derive from the late Basketmaker III/early Pueblo I and late Pueblo I/early Pueblo II transitions.

Table 5 may indicate an important trend in settlement strategy as it is correlated with time. Very tentatively, it appears as though there is a 2:1 ratio of habitation sites to limited activity sites for the Basketmaker III, Pueblo II, and Pueblo III periods. In contrast, there is a 1:1 ratio of these site types in the Pueblo I period. However, Table 5 shows that the sample size of pure Pueblo I period sites is fairly small relative to the less-defined "PI to PII" range of sites. A greater understanding of the chronology of these sites may have significant bearing on understanding changing settlement patterns through time. These changes may indicate significantly different strategies for inhabiting and using the mesa's interior, which in turn, may have significant implications for social structure and strategy as they are correlated with larger historical trends in Puebloan history.

Table 3. Excavated Site Data, White Mesa Mill

Site Number	Site Name	Excavation Status	Component	Possible Function	Company	Author (Date)
42Sa6396		Excavated	BMIII	Habitation	Abajo Archaeology	Davis (1985)
			PII	Habitation		
42Sa6403		Excavated	BMIII	Seasonal Habitation	Abajo Archaeology	Davis (1985)
42Sa6757		Excavated	BMIII	Habitation	Abajo Archaeology	Davis (1985)
42Sa8014		Excavated	PI	Seasonal Habitation	Abajo Archaeology	Davis (1985)
42Sa9937	Aromatic Village	Excavated	early PII	Habitation	BYU/CRMS	Talbot and others (1982)
42Sa7754	Three Meter Isle	Excavated	early to middle PII	Habitation	Antiquities Section	Casjens (1980)
42Sa6385	Radon Ridge	Excavated	PII	Habitation	Antiquities Section	Casjens (1980)
42Sa6437	Proton Point	Excavated	PIII	Habitation	Antiquities Section	Casjens (1980)
42Sa6388	Half-Life house	Excavated	early PI	Habitation	Antiquities Section	Casjens (1980)
			PII	Limited Activity		
42Sa6387	Isotope Slope	Excavated	PII	Possible Habitation	Antiquities Section	Casjens (1980)
42Sa6697	Reactor Ridge	Excavated	early PI	Habitation	Antiquities Section	Casjens (1980)
			PII	Limited Activity/Burial		
42Sa6386	J/Psi Point	Excavated	early PI	Habitation	Antiquities Section	Casjens (1980)
42Sa6686	Plasma Point	Excavated	PI	Habitation	Antiquities Section	Casjens (1980)
42Sa6436	Tailings Terrace	Excavated	PI	Habitation	Antiquities Section	Casjens (1980)
			early PII	Limited Activity		
42Sa6435	Alpha House	Excavated	early to middle PII	Habitation	Antiquities Section	Casjens (1980)
42Sa6404	Barium Bottoms	Excavated	PI	Limited Activity	Antiquities Section	Casjens (1980)
			PII	Limited Activity		
42Sa6383		Tested	PI	Unknown	Antiquities Section	Casjens (1980)
42Sa6685		Tested	PII-PIII	Limited Activity	Antiquities Section	Casjens (1980)
42Sa7753		Tested	early PI	Limited Activity	Antiquities Section	Casjens (1980)
42Sa7870		Tested	early PI	Unknown	Antiquities Section	Casjens (1980)
42Sa8015		Tested	PII-PIII	Unknown	Antiquities Section	Casjens (1980)
42Sa8017		Tested	BMIII-PIII	Limited Activity	Antiquities Section	Casjens (1980)
42Sa6382		Tested	early PI	Unknown	Antiquities Section	Casjens (1980)
			PII	Unknown		
42Sa6381		Excavated	middle PIII	Seasonal Habitation	Plano	Agenbroad and others (1981)
42Sa6698		Excavated	BMIII	Habitation	Plano	Agenbroad and others (1981)
			PII	Seasonal Habitation		
42Sa6420		Tested	PI	Unknown	Plano	Agenbroad and others (1981)
			PII	Unknown		
42Sa6384		Excavated	BMIII	Habitation	Antiquities Section	Sargent (1979)
42Sa27732		Excavated	late PIII	Habitation	Abajo Archaeology	Till (in prep.)

Table 4. Site Components by Count and Percent, White Mesa Mill		
Period	**N**	**%**
Archaic	2	0.8
Late Archaic to BMII	2	0.8
BMIII	14	5.8
BMIII to PI	24	10.0
PI	17	7.1
PI to PII	30	12.4
PII	35	14.5
PII to PIII	33	13.7
PIII	11	4.6
BMIII to PII	8	3.3
PI to PIII	8	3.3
BMIII to PIII	5	2.1
Pueblo, not further specified	2	0.8
Unknown Aboriginal	42	17.4
Historic, not further specified	5	2.1
Historic Navajo	1	0.4
Historic Ute	1	0.4
Historic Anglo	1	0.4
TOTAL	241	100.0

Table 5. Site Components by Possible Function, White Mesa Mill

Period	Habitation		Seasonal Habitation		Camp		Limited Activity		Granary		Quarry		Unknown		Not Described		TOTAL	
	N	%	N	%.	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Archaic							2	100.0									2	100.0
Late Archaic to BMII							2	100.0									2	100.0
BMIII	9	64.3			1	7.1	4	28.6									14	100.0
BMIII to PI	20	83.3					4	16.7									24	100.0
PI	8	47.1	1	5.9			8	47.1									17	100.0
PI to PII	27	90.0	1	3.3			2	6.7									30	100.0
PII	23	65.7	1	2.9			9	25.7	1	2.9	1	2.9					35	100.0
PII to PIII	28	84.8					4	12.1	1	3.0							33	100.0
PIII	7	63.6					4	36.4									11	100.0
BMIII to PII	6	75.0					2	25.0									8	100.0
PI to PIII	7	87.5					1	12.5									8	100.0
BMIII to PIII	4	80.0					1	20.0									5	100.0
Pueblo, not further specified							2	100.0									2	100.0
Unknown Aboriginal	4	9.5			3	7.1	20	47.6	4	9.5	1	2.4	10	23.8			42	100.0
Historic, not further specified					2	40.0							1	20.0	2	40.0	5	100.0
Historic Navajo					1	100.0											1	100.0
Historic Ute					1	100.0											1	100.0
Historic Anglo					1	100.0											1	100.0
TOTAL	143	59.3	3	1.2	9	3.7	65	27.0	6	2.5	2	0.8	11	4.6	2	0.8	241	100.0

Archaeological Survey of the Cell 4B Project Area

In July, 2008, Abajo Archaeology conducted a cultural resource inventory (archaeological survey) of the area proposed for the construction and development of Cell 4B at the Denison Mines (USA) White Mesa Mill. Archaeologist Mark Bond conducted the survey, with assistance by Jonathan Till, who conducted follow-up work in the project area in the spring of 2009 (Till 2009a).

A total of 14 sites were located or re-located during the project's survey. However, the sites in the project area proper are ten. These sites are: 42Sa6393, 42Sa6397, 42Sa6757, 42Sa8014, 42Sa28128, 42Sa28129, 42Sa28130, 42Sa28131, 42Sa28132, and 42Sa28134. Figure 2 illustrates these locations relative to the approximate Cell 4B boundary. At the time of this writing (November, 2009) we have not received a project area map showing the exact bounds of the Cell 4B project area relative to UTM coordinates or legal land status coordinates, so our Figure 2 is approximate, but based on our observations on the ground of surveyed corners.

Archaeological Testing Methods in the Cell 4B Project Area

Abajo Archaeology first generated base-line maps for each site. As each base-line map was created, the field crew established a 4-meter metric grid on each site. Wooden grid stakes were placed along one or more cardinal axes within the site. Each base-line map will be used to guide, control, and report data recovery excavations on the site being investigated.

The 4-meter grid on each site will assist archaeologists in their efforts to provenience artifacts and ecofacts from the site in question. Abajo Archaeology uses a provenience system derived from the Dolores Archaeological Project (Wilshusen and others 2000) and Crow Canyon Archaeological Center (2001). This system is widely used in the Mesa Verde region; by using this provenience system, we make this body of data comparable with a much larger data set within the Four Corners region. The system basically assigns a unique number, a "provenience designation" or "PD," to a specific horizontal and vertical context on a site. Artifacts that are found in that context are documented with a particular number for that specific provenience.

Figure 3 illustrates a hierarchical structure for our provenience system. The most generalized unit of space at a site is, of course, the site number itself. After that, the PD system recognizes generalized, overarching contexts within the site, called "study units." Table 6 describes the several kinds of study units used in field documentation.

Several techniques, varying in intensity and destructiveness, were used to conduct subsurface test investigations. The techniques may include auger probes, shovel probes, small test trenches that usually measure no more than 1 square meter in area, backhoe trenches, and even road maintainer scrapes. With a few exceptions, the general order of testing activities on each site was: 1) auger/shovel probes; 2) test unit excavation and, when necessary, backhoe excavation; 3) road maintainer scrapes. These activities are described below.

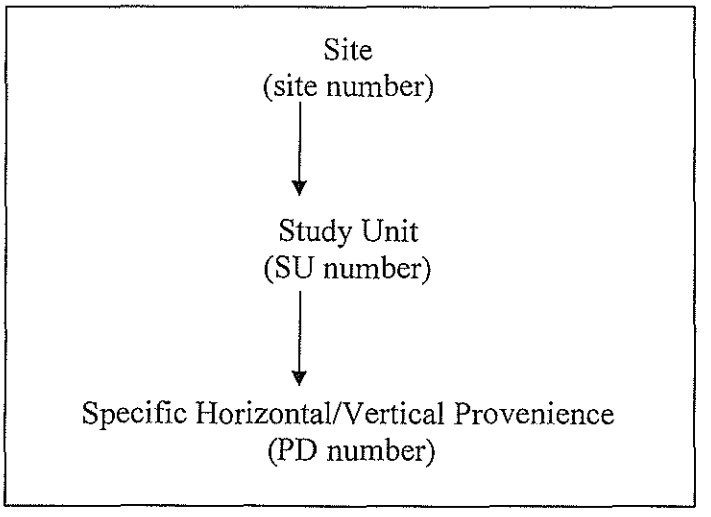

Figure 3. Provenience Heirarchy,
White Mesa Cell 4B Project, Abajo Archaeology

Table 6. Study Unit Types

Study Unit Type	Abbreviation	Definition
General	GEN	Describes a general site context. Often used when an object is disassociated from its original context.
Structure	STR	Refers to an architectural context, usually a space bounded by walls, floor, and roof.
Nonstructure	NST	Refers to a cultural entity, but nonarchitectural. Such features would include middens and plazas.
Arbitrary	ARB	This designation often applies to excavation units that are exploratory in nature and subjectively, often strategically, placed.
Backhoe Trench	BHT	Mechanically excavated, usually large, exploratory units.
Auger Probe	AUG	Refers to a cylindrical unit excavated by an auger.
Isolated Find	ISO	Usually used during survey.
Other	OTH	Defined on a case by case basis.

Most sites were tested with auger probes. This excavation technique used an 8-in. auger bits on a Bobcat tractor, and a 3 1/2-in. hand auger. Auger probes were usually excavated at two-meter intervals. Field archaeologists occasionally "tightened" the spacing of these auger probes to better identify the presence or absence of cultural deposits. Data that were recorded for each auger probe included observations of sediment texture, color, the presence and/or absence of cultural materials, and the nature of other inclusions in the sediment. Fill from auger excavations was screened through ¼-inch mesh. All artifacts retrieved from auger probes were provenienced according to their individual auger probe (the "AUG" study unit—see Table 6), but no vertical subdivision will be made in this provenience. These artifacts were collected for cataloging and, at later dates, analysis and curation. Upon their completion, auger probes were backfilled for reasons of safety.

Hand-excavated test units generally measured no more than 1 square meter in area. In those instances where units were situated without knowing if the context being explored was a cultural entity, those units were designated as arbitrary units, which are their own study units (or "ARB"—see Table 6). In several instances, apparent midden areas were explored. These known, nonstructural entities received their own study unit designations. Therefore, test units in the middens are known only by their southwestern corner coordinates. Test unit excavations were mostly conducted full-cut, i.e., with no vertical subdivision. The fill from the test units were screened through ¼-inch mesh. Like auger and shovel probes, cultural materials were collected and provenienced with their associated test units. Stratagraphic data were recorded and, in those instances where cultural stratigraphy was noted, one or more profiles were drawn and photographed. Profile illustrations are provided in this report.

If no features were apparent on the surface, or discovered as the result of testing, a road maintainer (i.e. road grader) was used to systematically scrape sediments from the surfaces of sites, or in areas immediately surrounding sites, to remove A Horizon sediments that can obscure subsurface feature outlines. The depths for road maintainer scrapes were finely adjusted to suit the context. Archaeologist Mark Bond monitored all of the road maintainer scraping activities. We were ably assisted by White Mesa Mill's heavy equipment operator, Tyrone Blackhorse, who did superlative work. Artifacts observed in scraped fill or back-dirt, and not in the context of an archaeological feature, were retrieved and provenienced with a general, sub-surface PD (provenience designation) number established for that particular site.

When subsurface features were located, scraping ceased in that location. Artifacts retrieved in association with the feature were assigned a general PD for that particular feature. These features were assigned temporary "Discovery Feature" numbers. The plan views of these features were briefly described in terms of color (but not with a Munsell color chart), size, and shape. These data are recorded in this report in tabular format. A few features were subjected to exploration with judgmental, hand-excavated test units to test for integrity and extent.

Abajo Archaeology made extensive and initial use of the road maintainer at two previously investigated sites, 42Sa6757 and 42Sa8014. With the exception of 42Sa6757 and 42Sa8014, road maintainers were only used after a site has been investigated with all other testing techniques outlined above. With the exception of 42Sa6757 and 42Sa8014, a surface

collection of all artifacts in those gridded portions of the site to be scraped was be made; these artifacts were provenienced according to their location within the 4-m grid established on the sites.

We used a backhoe at 42Sa6393 to re-open backhoe trenches that had been previously excavated by the Antiquities Section to test the sites. Archaeologist Mark Bond was present to monitor all backhoe excavations, again conducted by Tyrone Blackhorse. One new backhoe trench was excavated at 42Sa6393 to investigate the ridgeline on the west side of the project area. The details of these activities are discussed below with the site's testing results. Artifacts observed in the course of backhoe excavations were collected, but assigned only a general provenience. For backhoe work, this provenience was according to the particular trench (the "BHT" study unit—see Table 6).

Archaeological Testing Results in the Cell 4B Project Area

As noted earlier, 14 sites were originally located on the White Mesa Mill property for the Cell 4B Project. As four of these sites (42Sa6391, 42Sa6392, 42Sa6431, and 42Sa28133) are outside of the Cell 4B bounds, these were removed from consideration for archaeological testing. However, in an effort to protect these sites during construction activities, Denison Mines has arranged for Abajo Archaeology staff to erect plastic barrier fence around the sites' perimeters.

Evaluative testing was conducted on 42Sa6393, 42Sa6397, 42Sa6757, 42Sa8014, 42Sa28128, 42Sa28129, 42Sa28130, 42Sa28131, 42Sa28132, and 42Sa28134. The kinds of testing activities for each site were defined in Abajo Archaeology's testing proposal (Till and others 2009). The results of the this evaluative testing are reported specifically for each site below.

Tables 7 and 8 tally the features discovered during the test excavations of the sites in the Cell 4B project area. Table 7 enumerates the total number of subsurface features (n = 78) discovered during the course of archaeological testing. Three other known or anticipated features are present at 42Sa6397 (including an anticipated jacal surface structure and two small pit features). Most or all of the features found at 42Sa8014, 42Sa28128 - 42Sa28132, and 42Sa28133 are relatively small features (e.g. firepits, "burned areas," and postholes).

Sites 42Sa6757, 42Sa6393, 42Sa6397, and 42Sa28129 yielded evidence of intensive use and occupation by prehistoric peoples. Table 8 summarizes the pit structures (n=10) located during testing. These include eight or nine pithouses. Eight of the nine features are found within the western half of Cell 4B. This is an important point to raise for the project's scheduling purposes—initial work will be focused on the eastern half of the Cell 4B project area. Consequently, we propose to concentrate initial data recovery work in this portion of the cell. The one pit structure at 42Sa28129, which lies in the eastern half of the cell, will have priority for investigation. Conveniently, most of the pit structures, features which typically require considerable time to excavate, are located at sites (42Sa6393 and 42Sa6397) found on the ridgeline that extends along the western edge of the project area.

Table 7. Discovery Feature Counts by Site, White Mesa Mill Cell 4B Project	
Site Number	Discovery Features (N)
42Sa6393	10
42Sa6397	12
42Sa6757	22
42Sa28128	7
42Sa28129	10
42Sa28130	3
42Sa28131	1
42Sa28132	12
42Sa28134	1
TOTAL	78

Table 8. Pit Structure Counts by Site, White Mesa Cell 4B Project		
Site Number	Pit Structure Counts	Comments
42Sa6757	3	Two (one burned, one unburned) of the features are probable pithouses; the fourth is a small pit structure (ca. 2 m in diameter)
42Sa6393	4	All four are probable pithouses (one burned, three unburned)
42Sa6397	1	Unburned possible pithouse
42Sa28129	1	Small, unburned pit structure (ca. 2.5 to 3 m in diameter)
TOTAL	9	

A single site, 42Sa6393, yielded evidence for an extensive, though shallow (ca. 10 to 20 cm thick), midden (formal "trash" deposits). This site also has a relatively well preserved prehistoric ground surface. We anticipate that the site will yield a number of other small pit features, and perhaps an additional pithouse.

Before proceeding further, we should note that no human remains were located during the course of testing activities.

Site 42Sa6393

Site 42Sa6393 was recorded as a scatter of pottery and lithic artifacts that is located just west of the crest of a finger-ridge on the north end of the project area (Figure 2) (Till 2009a). Evaluative testing has demonstrated the presence of at least four pithouses, two middens (Nonstructures 1 and 2), and indications of a well-preserved prehistoric ground surface (Figure 4).

The site was initially recorded by Thompson (1977), and tested by the Antiquities Section in spring of 1978 (Lindsay 1978). However, Antiquities Section archaeologists apparently combined it with 42Sa6391, which is about 100 meters to the west. Further compounding the problem, the site designation "42Sa6393" was applied to a locus of cultural materials well to the south of Thompson's 42Sa6393. Apparently, Thompson's site 42Sa6397 was misidentified as 42Sa6393 (Till 2009a:22, 34-35).

We believe that three parallel backhoe trenches were excavated by the Antiquities Section to test this location for significant subsurface cultural materials (Lindsay 1978; Nielson 1979); however, only two of the trenches were actually reported (Till and others 2009). Nielson (1979) reported the presence of a pit structure in one of the trenches, but did not indicate which trench. We re-excavated these trenches to establish the location of this pit structure (discussed below).

Bond originally recorded two concentrations of artifacts (Artifact Clusters 1 and 2) for the site. During evaluative testing these concentrations were determined to be probable middens, and were designated Nonstructures 1 and 2, respectively (Figure 4). Evaluative testing has demonstrated that both study units are indeed shallow middens.

Evaluative testing activities on the site included controlled surface collections, auger probes, test unit excavations, backhoe trench excavations, and blading. These activities resulted in the location of 10 discovery features (Table 9).

Surface Collections

Surface collections focused on a 28- by 32-m block in the Nonstructure 2 area (Figure 4). These collections were made prior to the passage of heavy machinery in the northeast portion of

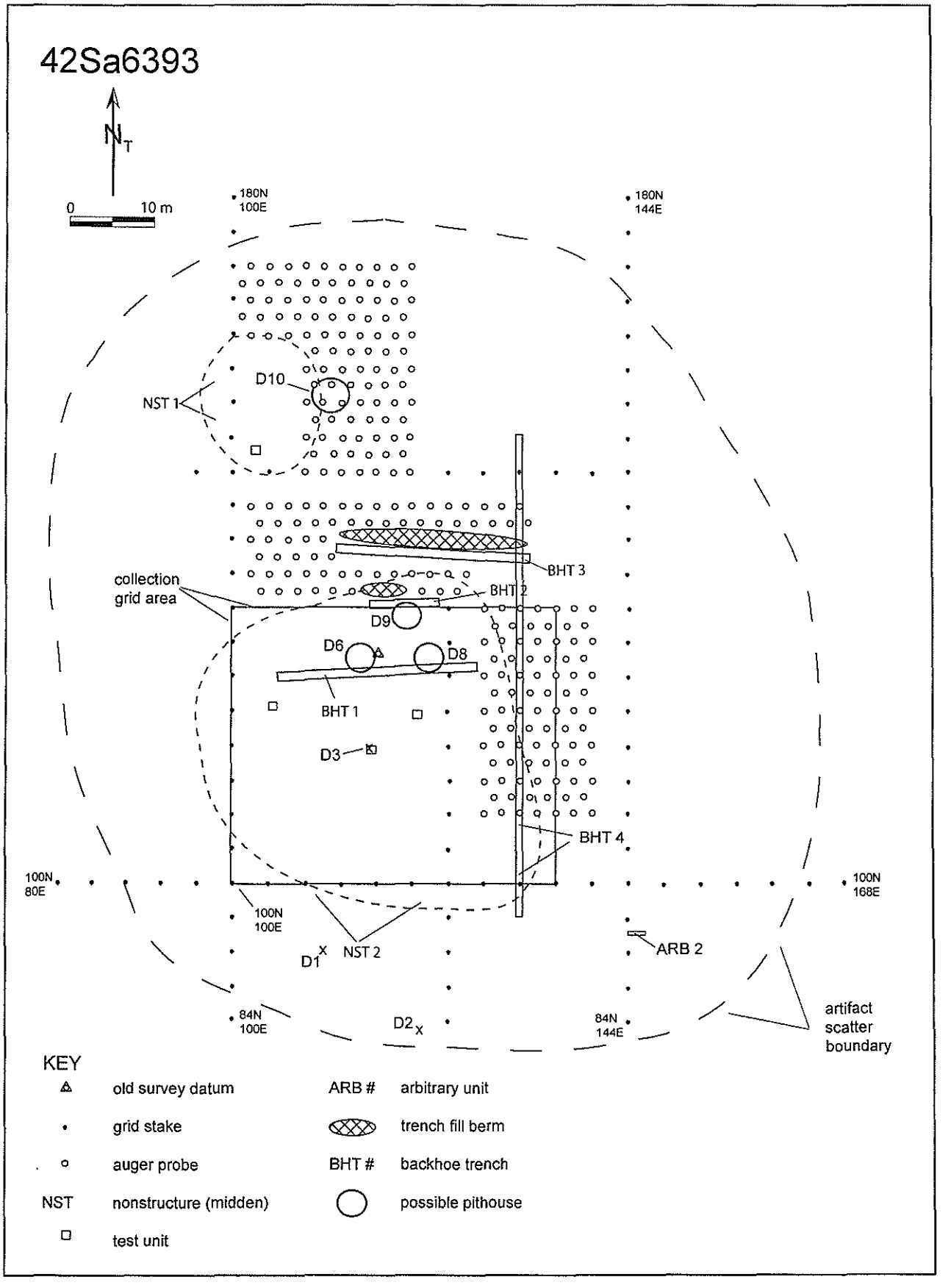

Figure 4. Site 42Sa6393, Testing Results

Table 9. Discovery Features, Site 42Sa6393			
#	Shape	Size (m)	Description
1	Unknown	Unknown	Small cluster of sherds, a shaped stone disk, and a probable artiodactyl foot bone. The sherds appear to be from the shoulder and neck of a white ware olla. The shaped stone disk may have served as a jar lid. Thus, this feature may represent a buried pottery vessel that has yet to be fully defined.
2	Amorphous	Ca. 0.5 in diameter	Light gray sediment stain.
3	Unknown	Unknown	Possible slab-lined pit feature found in 1- by 1-m unit N115/E115.
4	Unknown	Unknown	This is the west-most feature in BHT 1. In profile it appears as a pit feature with a width of about 90 cm. It could be a relatively small pit feature or pit structure, or it could represent the corner of a pithouse.
5	Circular	Ca. 0.6 in diameter	This is an apparent circular feature discovered in the floor of BHT 1. It may be an oddly oriented vent shaft associated with Discovery Feature 6, a probable pithouse.
6	Unknown	At least 2.5 in diameter	This is an apparent pithouse bisected by BHT 1. It appears to be the southern portion of the structure. While its shape is not definite, it appears to be sub-rectangular. The room appears to be unburned.
7	Unknown	Ca. 1.0 in diameter	This is an apparent unburned pit feature that was bisected by BHT 1. The feature may be a bell-shaped pit or something similar.
8	Unknown	At least 2.5 in diameter	This is an apparent unburned pit structure that was bisected by BHT 1. It may be an unburned pithouse. Artifacts were observed associated with its fill.
9	Unknown	At least 2.6 in diameter	This is an apparent pithouse bisected by BHT 2. The room appears to be unburned.
10	Unknown	Ca. 3.5 in diameter	This is a burned pit structure found in the NW corner of the site. The feature is associated with Nonstructure 1, a discrete midden area. The feature is burned, and may be a pithouse.

this area, and in anticipation of later, more intensive work in Nonstructure 2 during data recovery.

Relative to other sites in the project area, surface collections recovered a high number of artifacts. Artifact types include pottery, lithic debitage, and ground stone. An informal assessment of the pottery assemblages from both middens are representative of middle Pueblo II period occupation (i.e. the middle decades of the 11th century).

Auger Probes

Auger probes were excavated by two means, by machine and by hand. A total of 302 auger probes, illustrated in Figure 4, were excavated by these methods. Auger probe excavations located a probable burned pit structure (Discovery Feature 10) in the northwestern portion of the site (Figure 4 and Table 9). The feature is located in the eastern margin of a discrete sheet midden, Nonstructure 1. It seems likely that activities associated with the occupation of DF-10 resulted in these midden deposits.

Test Units

Five test units were excavated, the locations and dimensions of which are provided in Table 10 and Figure 4. In Nonstructure 1, Unit N150/E102 demonstrated the presence of a shallow but significant midden deposit. Documented as Stratum 1 in Figure 5, this cultural deposit is a loose, light brown (no Munsell) sandy clay loam with large quantities of pottery, lithic debitage, and ground stone artifacts. Also observed were burned adobe, charcoal, and non-human bone. This stratum is about 5 cm deep. Stratum 2 is a moderately compact, relatively homogenous reddish brown (no Munsell) sandy clay loam with a relatively higher clay content. While the first 5 cm of this sediment yielded artifacts, no cultural materials were found below this. Some rodent disturbance was observed in association with Stratum 2.

Table 10. Test Unit Location, Size, and Orientation, Site 42Sa6393

Study Unit	SW Corner	Size	Orientation
NST 1	N150/E102	1- by 1-m	north-to-south
NST 2	N115/E115	1- by 1-m	north-to-south
NST 2	N120/E104	1- by 1-m	north-to-south
NST 2	N119/E120	1- by 1-m	north-to-south
ARB 2	N94/E144	0.5- by 2.0-m	east-to-west

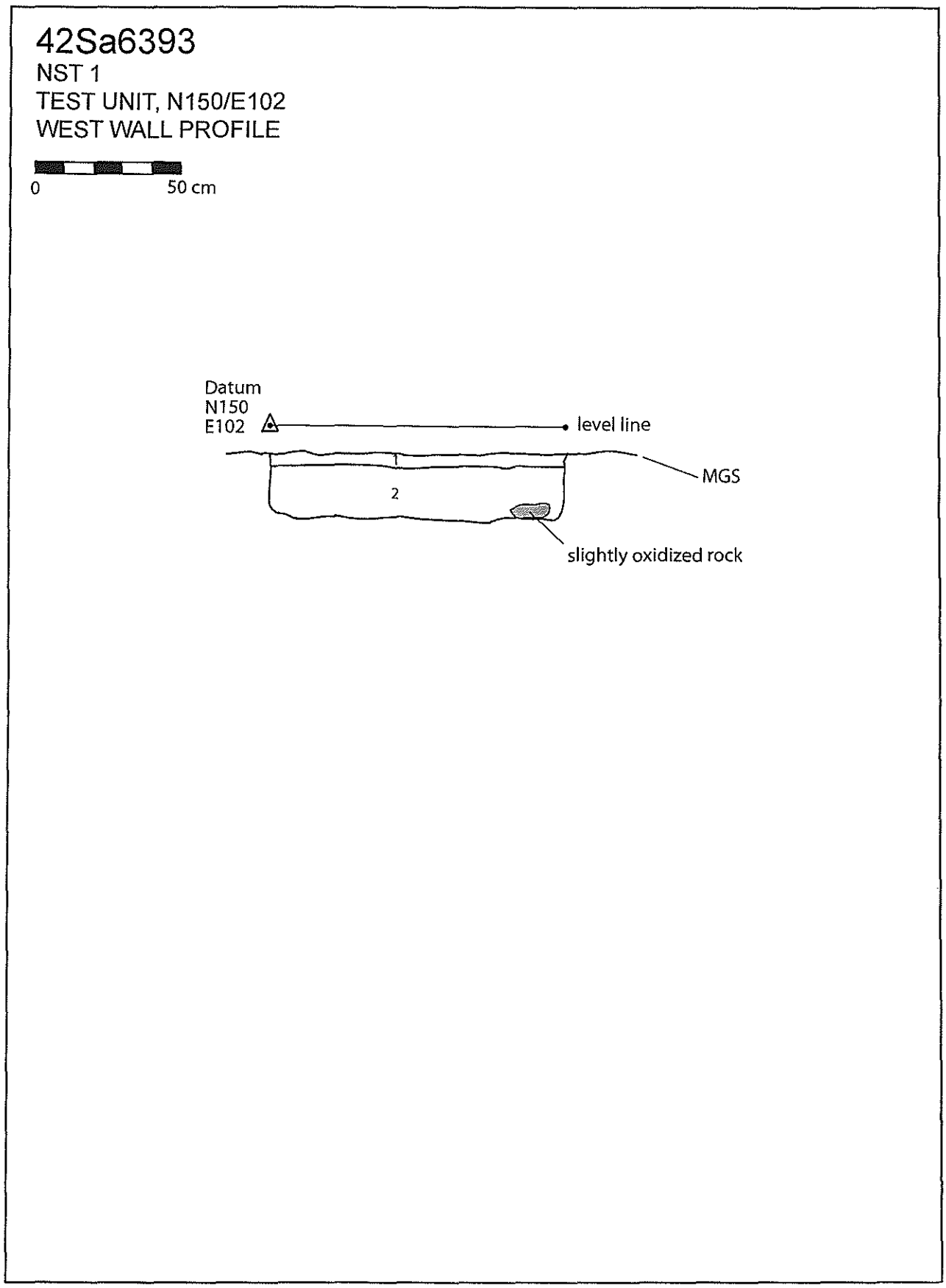

Figure 5. Site 42Sa6393, NST 1, Test Unit, West Wall Profile.

Three test units were placed within Nonstructure 2. Two of the units (Unit N115/E115 and N120/E104) were emplaced to characterize the depth of the midden deposits. Unit N115/E115 also yielded evidence of an intact prehistoric ground surface, which warranted the excavation of Unit N119/E120, which attempted to characterize the horizontal extent of this intact surface.

Unit N115/E115 yielded evidence of a shallow midden and prehistoric ground surface (Figure 6). Stratum 1 consists of a very loose, reddish brown (5YR 4/4) sand with relatively high quantities of cultural materials. This stratum is only 2 to 3 cm thick. Stratum 2 is a loose, dark reddish brown (2.5YR 3/4) sandy clay loam with high quantities of cultural materials that include pottery and lithic debitage. Stratum 2 measures 5 to 10 cm thick. Stratum 3 represents the apparent prehistoric ground surface. This sediment is mottled by flecks of caliche, but is generally yellowish red (5YR 5/6). The surface is distinguished by the presence of several flat-lying artifacts and Discovery Feature 3, a possible slab-lined pit feature. In profile, this surface is only 2 to 3 cm thick. Stratum 4 underlies this surface and consists of an extremely compact, red (2.5YR 4/6) sediment that is void of cultural materials.

Unit N120/E104 indicates only slightly thicker midden deposits in the western portion of Nonstructure 2 (Figure 6). Stratum 1 consists of a loose, red (2.5YR 5/6) sandy clay loam with some artifacts. This stratum is about 5 cm thick. Stratum 2 is a compact, red (2.5YR 5/8), sandy clay loam with moderate amounts of cultural materials that include pottery and lithic debitage. Flecks of caliche and small pebbles are also present in the sediment. Stratum 2 is 5 to 10 cm thick. Stratum 3 is a compact, light red (2.5YR 6/8) sandy clay loam with flecks of caliche and a higher clay content. No cultural materials were recovered from this sediment.

Unit N119/E120 was excavated to better understand the potential for the prehistoric ground surface's lateral extent (Figure 6). Stratum 1 consists of a very loose, yellowish red (5YR 4/6), sandy clay loam with some artifacts and organic duff. This sediment ranges from 3 to 5 cm thick. Stratum 2 is a moderately compact, yellowish red (5YR 4/6) silt with abundant amounts of cultural materials. It measures 10 to 15 cm thick. Stratum 2 has a distinct and flat boundary with the underlying Stratum 3. Stratum 3 is composed of a very compact, dark red (2.5YR 4/8) sediment that is void of artifacts; however, a few flecks of charcoal were observed near the sediments contact with Stratum 2. While no flat-lying artifacts were observed in association with the contact between Strata 2 and 3, the nature of this contact suggests the possibility that the prehistoric ground surface could still exist in this location, and that no significant disturbances have obscured this contact.

Arbitrary Unit 2 is a test unit that was excavated in the southeast corner of the site (Figure 4 and Table 10). This unit was established to investigate a low density scatter of sandstone rock and artifacts. Four strata were defined by the unit (Figure 7). Stratum 1 consists of a very loose, reddish brown (5YR 4/4) sandy clay loam with moderate amounts of organic detritus. Stratum 2 is a moderately compact, yellowish red (5YR 5/6) sandy clay loam; one artifact was observed with this stratum. Stratum 3 is a moderately compact, red (2.5YR 4/6) sandy clay loam; one small flake was recovered from Stratum 3. Root and rodent disturbance is evident in this stratum. Stratum 4 is a very compact, yellowish red (5YR 4/6), silt with no artifacts or other inclusions.

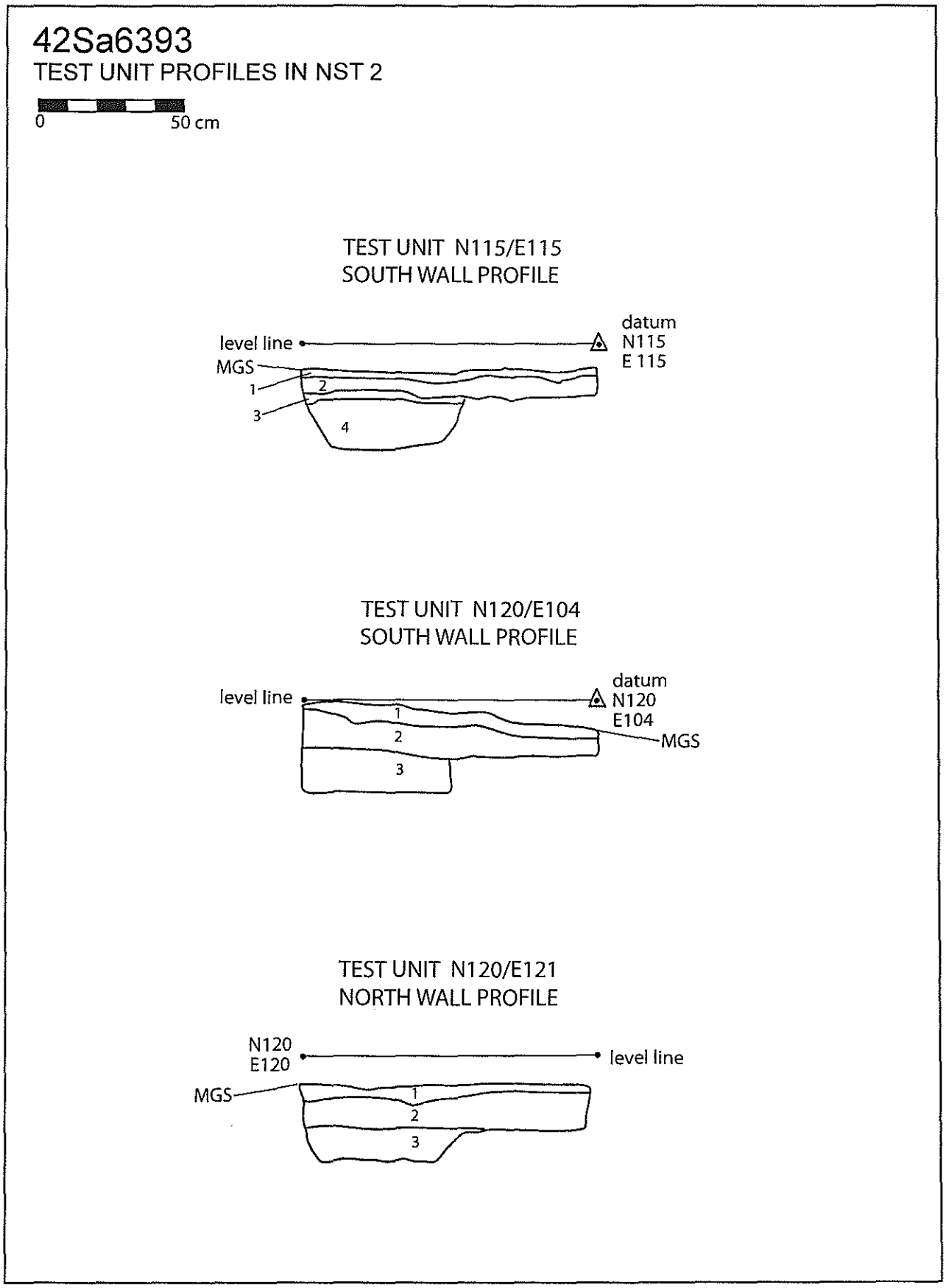

Figure 6. Site 42Sa6393, NST 2, Test Unit Profiles.

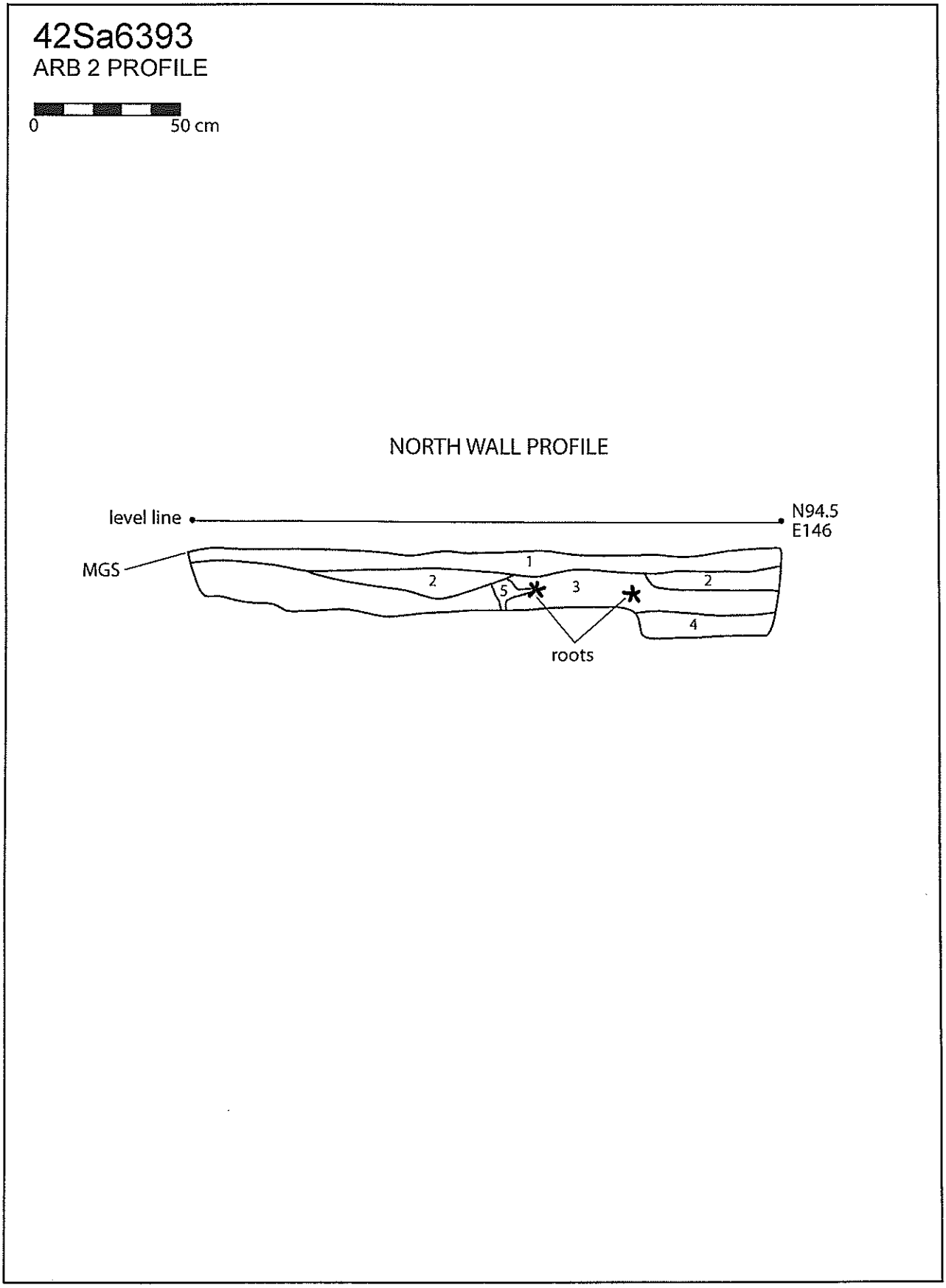

Figure 7. Site 42Sa6393, ABR 2, Profile.

Backhoe Trenches

Four backhoe trenches (BHT) were excavated, or re-excavated, on the site (Figure 4). As noted above, we suspect that three of these trenches were dug by Antiquities Section archaeologists, though we could only find documentation for two of them (Lindsay 1978:71; Nielson 1979:19-24). All three trenches have an east-to-west orientation, are parallel to each other, and are found in the approximate center of the site. Nielson and Lindsay indicated that the trenches were nearly the same length (7 to 8 m); since these are at variance with the north-most trench (BHT 3), which is significantly longer, we believe that BHT 1 and 2 correspond with the reported trenches. We are unsure as to which of BHT 1 and 2 contained the reported pit structure since both trenches provided evidence of pit structures (described below). BHT 4 is a newly excavated trench. This is a north-to-south oriented trench that is situated in the southeast portion of the site. Each backhoe trench is discussed below.

BHT 1 is the southmost of the three previously excavated trenches (Figure 4). It is about 22 m in length and reached a maximum depth of about 120 cm below modern ground surface; the trench was extended beyond its original length on either side to look for more features. Indeed, five subsurface features (Discovery Features 4 through 8) were found in the trench. These are discussed below, following a description of the trench's stratigraphy.

Four strata were basic to BHT 1 (Figure 8). Missing from this description is the surficial duff—these sediments had effectively been removed along the margins of BHT 1 before the profile could be documented. Since the sediments here are comparable to those in BHT 2, we start our profile in BHT 1 with Stratum 2. Stratum 2 consists of a moderately compact, yellowish red (5YR 4/6) sandy clay loam with occasional caliche inclusions, charcoal, and artifacts. As this sediment overlies the perimeters of most or all of the features found in BHT 1, this stratum is probably a post-occupational sediment. This sediment appears to vary in thickness from 10 to 30 cm, but is typically 20 cm thick. The contact between Stratum 2 and the underlying Stratum 3 probably represents the prehistoric ground surface.

Stratum 3 is a very compact, reddish yellow (5YR 6/6) sandy clay loam with greater amounts of caliche. No artifacts or charcoal were observed in this stratum. Cultural features had been excavated into this stratum and into the underlying Stratum 4. Stratum 3 seems to range in thickness from 30 to 50 cm.

Stratum 4 is a very compact, pink (5YR 7/4) clayey silt that is dominated by caliche. No artifacts or charcoal were observed in this stratum. This sediment seems to form between 50 and 70 cm below modern ground surface.

As noted above, five discovery features were located in BHT 1. The fill for Discovery Feature 4 is documented in Figure 8 as Stratum 5. As noted in Table 9, the size of this feature is unknown—it may represent a small, subsurface pit feature that measures about 90 cm in diameter and may "bottom out" at 25 cm below its surface of origin at the contact between Stratum 2 and 3. However, the feature as its revealed in the profile may be the corner of a much

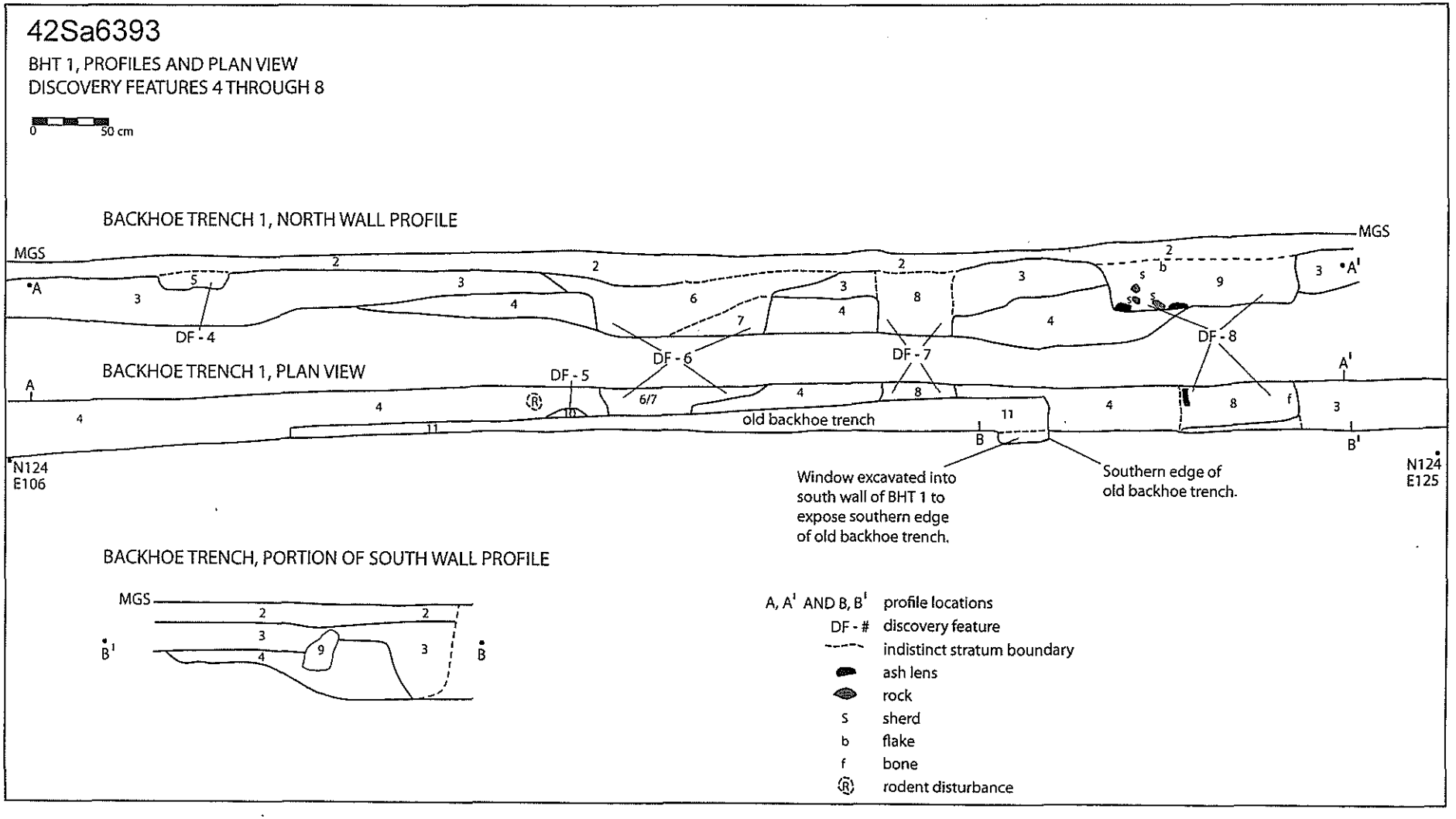

FIGURE 8. Site 42Sa6393, Backhoe Trench 1, Profiles and Planview.

larger pit structure. The fill in the feature consists of a yellowish red (5YR 4/6) sandy clay loam with flecks of caliche and an occasional pocket of ashy soil.

Discovery Feature 5 was apparent in the bottom of BHT 1, but was not observed in the trench's profile (Figure 8). This apparently circular feature was also cut by the original backhoe trench excavated by the State. The fill, represented by Stratum 10, consists of a yellowish red (5YR 4/6 or 5/6) silt with flecks and small chunks of caliche. One possible sandstone cobble was noted in the feature. Discovery Feature 5 may represent a separate, very deep subsurface pit feature. An alternative interpretation is that the feature could be a vent shaft associated with nearby Discovery Feature 6.

Discovery Feature 6 was observed in both the north wall profile of BHT 1 as well as in the trench's bottom (Figure 8). Table 9 notes that the feature is probably an unburned, deep pithouse. The subsurface room has essentially vertical walls that are cut into the Stratum 4 sediment. Based upon the profile, the structure's subsurface walls are at least 45 cm high. The structure's floor is not apparent in the bottom of the trench (see Figure 8 and compare profile with plan view). However, the room does seem to suddenly constrict, indicating that the trench may have clipped the very southern edge of the pit structure. Although the room constricts, the plan view suggests a southwest "extension" of the structure, perhaps an antechamber. As noted above, the immediately adjacent DF-5 could be associated with the room, perhaps as an oddly placed vent shaft.

The fill in DF-6 consists of two similar strata, Strata 6 and 7. Stratum 6 is a yellowish red (5YR 5/6), silt with occasional flecks and chunks of caliche. Stratum 6 overlies Stratum 7, which is found on the east side of the feature (Figure 8). The boundary between the two strata is indistinct. Stratum 7 is essentially the same, though its structure and position tentatively suggest that this sediment may represent melted roof and/or wall fall debris.

Discovery Feature 7 is also present in BHT 1's north wall profile and its bottom (Figure 8). Both the profile and the plan view suggest that this is a pit feature with vertical walls that were dug into the caliche-rich Stratum 4. The feature appears to be about 1 m wide. Table 9 indicates that the feature may be a bell-shaped pit; although the walls do not "bell," their relatively narrow width suggest that this feature is not associated with a habitation, but perhaps some other function such as storage. It is interesting to note that the plan view suggests the possibility that the feature just starts to widen to the south (Figure 8). Stratum 8 describes the feature's fill. This sediment is a yellowish red (5YR 5/6) silt with chunks of caliche. No artifacts were observed. Above Stratum 4, the lateral boundary between the feature's fill and Stratum 3 is indistinct. Similarly, the feature's articulation with Stratum 2 is also unclear, making the feature's surface of origin all but certain.

Discovery Feature 8 is east of D-7, and is observable in BHT 1's north and south profiles, as well as some of the trench's plan view (Figure 8). As noted in Table 9, the feature is an apparent pit structure, and probably a pithouse. The feature's vertical walls were evidently excavated into both Strata 3 and 4. The floor of the feature is also apparent, indicating that the structure had been excavated below the prehistoric ground surface by about 60 cm. The feature's fill, represented by Stratum 9, consists of a yellowish red (5YR 4/6) silt that contains flecks of

charcoal and chunks of caliche. Artifacts and ash-stained soil were noted throughout, but particularly along the bottom of the structure on the feature's west side (Figure 8). The small "window" of D-8's fill in the south wall profile suggests that this is a remnant of the room's southwest corner; thus, it appears that the south portion of the room was taken out by the backhoe trench's excavation. Artifacts observed in association with D-8 include pottery, lithic debitage, and non-human bone.

BHT 2 is located about 7 m north of BHT 1. The trench is approximately 7 m long, approximately the same length as the previously excavated trench, and reached a maximum depth of 90 cm below modern ground surface. One pit feature, Discovery Feature 9, was observed in the trench and is discussed further below.

Discovery Feature 9 is an apparent pithouse (Figure 9 and Table 9). The structure is defined in the south profile of BHT 2, which yielded four strata. Stratum 1 is a loose, strong brown (7.5YR 4/6—slightly damp) silty loam. No artifacts, charcoal, or caliche was observed with Stratum 1. This stratum, which measures 5 to 20 cm thick, represents the surface sediment. Stratum 2 is a slightly hard, yellowish red (5YR 4/6—slightly damp) silt. Roots are present, and occasional flecks of caliche were observed. This stratum represents a post-abandonment sediment that partially filled the depression left by the pithouse. The contact between Stratum 2 and Stratum 4 represents the prehistoric ground surface into which the structure had been excavated. Stratum 3 represents the fill of the structure. This stratum consists of a yellowish red (5YR 5/6) silt. Occasional flecks of charcoal and caliche, as well as a few artifacts, were noted as inclusions in this stratum. Some of the sediments may represent superstructural fill. Stratum 4 is a very hard, yellowish red (5YR 5/6) silt with ribbons of caliche. This sediment represents the B Horizon.

Discovery Feature 9 was excavated into Stratum 4 to a depth of about 40 cm below prehistoric ground surface. Based on the profile, the feature appears to be about 2.6 m in diameter. Since the feature was only exposed in the south face of the trench, the very north edge of the structure was clipped by the trench. If the structure is circular in shape, then its width could be larger than it appears in the profile. The eastern side of the structure's profile suggests that the room may have had a low encircling bench. Slumped, caliche-rich sediments on the west side of the D-9 profile may represent some structural collapse of the bench or perhaps rooffall. The structure does not appear to have burned. If structural members had been removed, this might account for the slump or collapse of the caliche-rich sediment.

Two other backhoe trenches, BHT 3 and 4, were excavated on the site. Since neither of these yielded evidence of cultural materials, the profiles of these trenches were not drawn. One of these, BHT 3, we believe had been excavated by the Antiquities Section but went unreported. The trench was re-excavated, but no cultural stratigraphy was observed in the trench. The trench is just north of BHT 2 and measures about 22.5 m long. BHT 4 was excavated for this project. It is a north-to-south oriented trench that measures about 52 m long. We situated this trench along the crest of the ridgeline to test whether subsurface cultural features had been placed along this high point. No cultural stratigraphy was observed in BHT 4. Thus, it seems that most of the site's occupation was focused on the gentle slope just west of the ridge's crest.

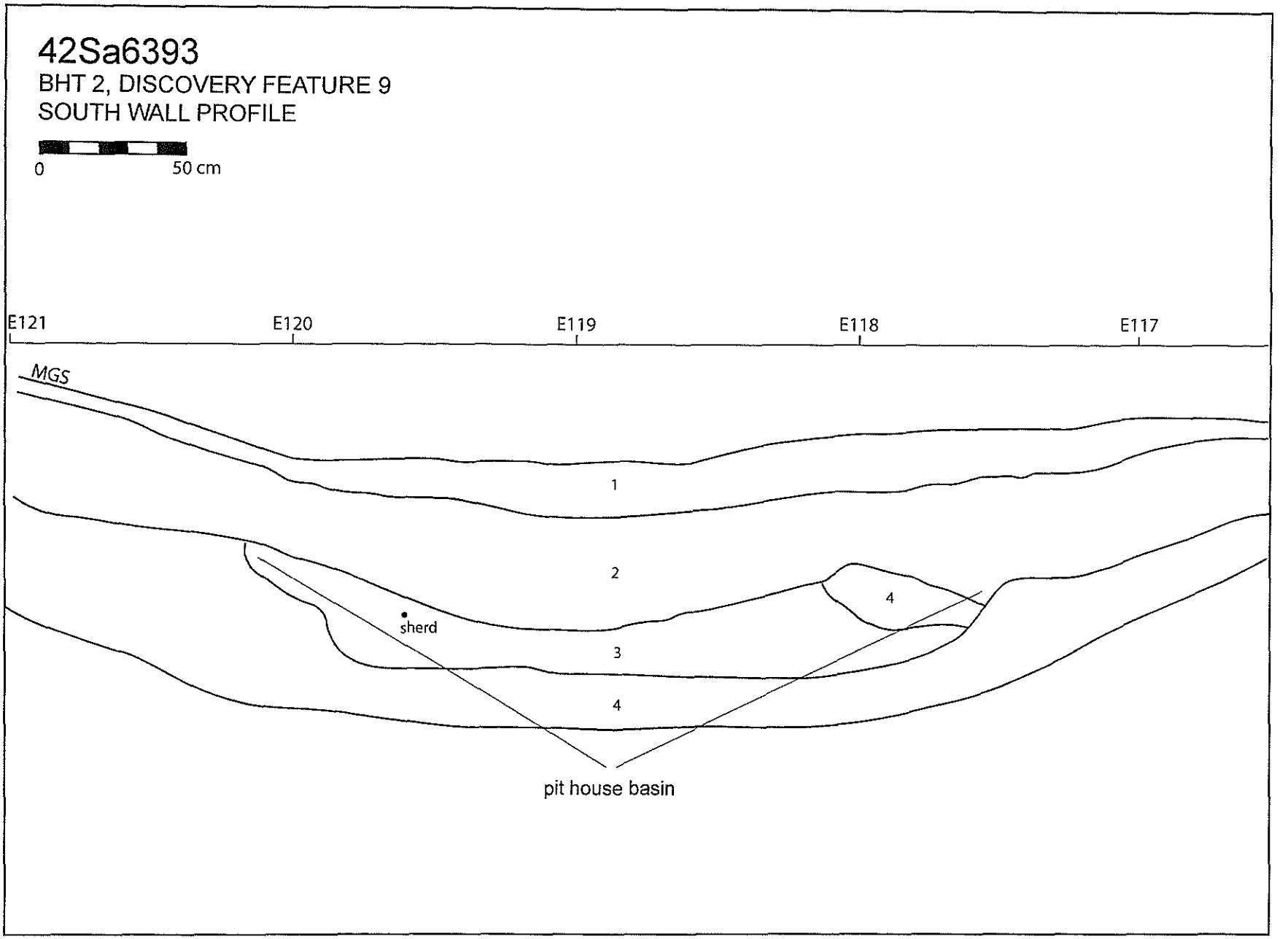

Figure 9. Site 42Sa6393, Backhoe Trench 2, Discovery Feature 9, Profile.

Blading

The landscape immediately south of the N100 line, east of the E148 line, and the northeastern corner of the site (north of BHT 3) was bladed by a road grader. These activities resulted in the location of two features, Discovery Features 1 and 2. These features are summarized in Table 9. Field Director Mark Bond noted that a cluster of Brushy Basin chert cores (n=7) and associated debitage came to light in the 4- by 4-m grid unit N108/E136, indicating a locus of lithic reduction activity associated with one material type. Other artifacts were retrieved during blading activities, including pottery, lithic debitage, ground stone, an historic rifle cartridge, and a tchamahia fragment.

Site 42Sa6397

Site 42Sa6397 lies on the same ridge crest as 42Sa6393 (Figure 2). The site was originally recorded by Thompson (1977), but was erroneously tested under the site number 42Sa6393 by the Antiquities Section in 1978 (Dykman 1978b). Confusing the issue further, Nielson (1979:51-52) reports that he revisited 42Sa6397 and determined that testing or further mapping of the site was not required. We can only speculate that Nielson encountered 42Sa28132, which is indeed a sparse scatter of artifacts. Till (2009:37-40) describes the history of site number conflation in greater detail in the project's recent archaeological survey report.

The Antiquities Section excavated seven backhoe trenches to test the site for significant stratigraphy or subsurface features. Two of the trenches located subsurface cultural features, both of which were classified as "storage pits" (Dykman 1978b).

The site measures about 60 meters in diameter (Figure 10). The site was re-recorded as a scatter of pottery, chipped stone debitage, and a number of lithic tools. Two concentrations of cultural materials were defined and are referred to as Artifact Clusters 1 and 2 (AC-1 and AC-2). A concentration of burned jacal, Feature 1, is contained within AC-1. Previous investigations on the site are apparent by the presence of a steel, 3/4 pipe datum. The faint remnants of the seven backhoe trenches, which were apparently backfilled, are barely visible. A collector pile in AC-2 included plain gray pottery and a neckbanded sherd. Additionally, a collector pile at the site datum included pottery and lithic artifacts.

The site's pottery assemblage suggests at least two components: a substantial Basketmaker III component and a relatively minor Pueblo II component. However, the site's occupation may be more complex. Neckbanded pottery, and the red ware, may signal an intermediate occupation during the Pueblo I period.

Evaluative testing activities on the site included controlled surface collections, auger probes, test unit excavations, and blading. These activities resulted in the location of 10 discovery features (Table 11).

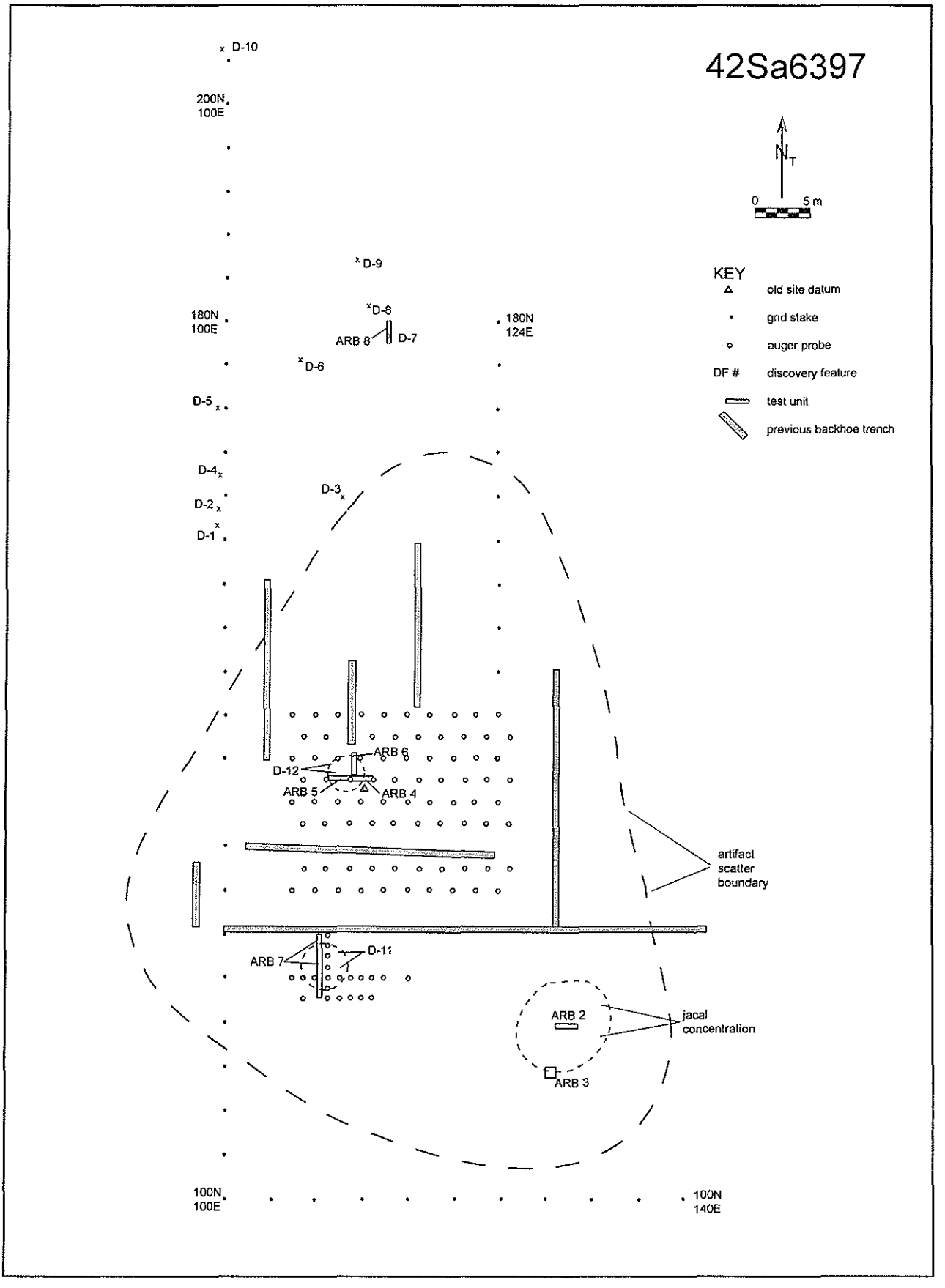

Figure 10. Site 42Sa6397, Testing Results

Table 11. Discovery Features, Site 42Sa6397			
#	Shape	Size (m)	Description
1	Amorphous	Ca. 0.45 in diameter	Light gray sediment stain.
2	Amorphous	Ca. 0.25 in diameter	Light gray sediment stain.
3	Amorphous	Ca. 0.6 in diameter	Gray sediment stain.
4	Amorphous	Ca. 0.15 in diameter	Light gray sediment stain.
5	Oval	Ca. 0.55 (N/S) by 0.35 (E/W)	Gray sediment stain. Probable firepit.
6	Not recorded	Ca. 0.2 in diameter	Dark gray sediment stain.
7	Oval	Ca. 4 (N/S) by 5 (E/W)	Large sediment stain, varying in degrees of gray. A dark gray sediment stain with charcoal is in the NW quadrant of the feature. This sediment stain was tested with ARB 8, which indicated a firepit or roasting pit that measures 1 m in diameter.
8	Amorphous	Ca. 0.45 in diameter	Dark gray sediment stain with charcoal.
9	Amorphous	Ca. 0.4 in diameter	Gray sediment stain.
10	Amorphous	Ca. 0.4 in diameter	Light gray sediment stain.
11	Unknown	Ca. 4.5 in diameter	This is the possible pithouse found in ARB 7. Auger probes suggest that the feature's floor is about 1 m below modern ground surface, or 0.8 m below prehistoric ground surface. The feature is probably unburned.
12	Unknown	Ca. 2.0 in diameter	This is a possible masonry surface room found in ARB 4, 5, and 6. The feature consists of a scatter of mostly small, unshaped sandstone blocks. One edge-scabbled slab, perhaps a "door" slab, was also documented. No surface of origin was visually identifiable, though it is probably about 30 cm below modern ground surface.

Surface Collection

Controlled surface collections on the site occurred in 4- by 4-m units between grid lines N112 and N148. These surface collections resulted in a variety of artifact types including pottery, lithic debitage, and ground stone artifacts. The grid unit at N136/E112 included a collectors pile near the site's old survey datum.

Auger Probes

Auger probes were excavated by two means, by machine and by hand. A total of 101 auger probes, illustrated in Figure 10, were excavated by these methods. Field archaeologist Gary Duncan recommended supplemental auger probes in the vicinity of what became Discovery Feature 11.

Test Units

Seven test units were excavated, the locations and dimensions of which are provided in Table 12 and Figure 10. These units were documented as ARB 2 through ARB 8. Their descriptions follow.

Table 12. Test Unit Location, Size, and Orientation, Site 42Sa6397			
Study Unit	SW Corner	Size	Orientation
ARB 2	N116/E129	0.5- by 2.0-m	east-to-west
ARB 3	N111/E128	1- by 1-m	north-to-south
ARB 4	N138/E111	0.5- by 2.0-m	east-to-west
ARB 5	N138/E109	0.5- by 2.0-m	east-to-west
ARB 6	N138.5/E111	0.5- by 2.0-m	north-to-south
ARB 7	N118/E108	0.5- by 6.0-m	north-to-south
ARB 8	N178/E114	0.5- by 2.0-m	north-to-south

Arbitrary Units 2 and 3 were situated in a concentration of jacal found in the southeast corner of the site (Figure 10), which was identified as "Feature 1" during the Cell 4B cultural inventory (Till 2009a:38). Figure 11 documents the profile of ARB 2. Stratum 1 is a loose, reddish yellow (5YR 6/6), sandy clay loam with small amounts of sandstone gravel and pebbles. This surface sediment is only about 5 cm thick. Stratum 2 is a very compact, yellowish red (5YR 4/6), sandy clay loam with a few artifacts and small pieces of adobe. The east half of the unit was excavated a little further in an attempt to understand the location of the B Horizon and the prehistoric ground surface, neither of which were located.

Arbitrary Unit 3 did better. This unit's profile documents four strata (Figure 11). Stratum 1 consists of a loose, reddish brown (5YR 4/4), sandy clay loam with organic detritus, occasional artifacts, and small fragments of adobe. This surficial duff is only about 5 cm thick. Stratum 2 consists of compacted, thin laminae of yellowish red (5YR 4/6), aeolian silt. No artifacts were present, but fragments of adobe were observed throughout. Stratum 2 is about 5 cm thick. Its contact with the underlying Stratum 3 appears to represent the prehistoric ground surface. Stratum 3 is a very compact, blocky, red (2.5YR 4/6), sandy clay loam with no cultural materials. We believe that this sediment represents relatively undisturbed soil on the ridge crest, a quality shared with the site to the north, 42Sa6393. A slight depression in the upper surface of Stratum 3 appears to have captured some yellowish red (5YR 4/6) sandy clay loam. This small pocket of sediment, identified as Stratum 4, is capped by an oxidized sandstone rock. It is possible that this little feature represents a shallow posthole.

A cluster of three test units (ARBs 4, 5, and 6) were placed in the approximate center of the site to investigate an area of relatively high artifact density (Figures 10 and 12). This portion of the site had been described as an "artifact cluster" during the project's cultural inventory (Till 2009a). Ultimately, these units defined Discovery Feature 12, an apparent masonry structure of unknown configuration (Table 11).

Arbitrary Units 4 and 5 yielded a continuous profile (Figure 13). Stratum 1 is a very loose, yellowish red (5YR 4/6), aeolian silt with organic detritus. The stratum measures 5 to 10

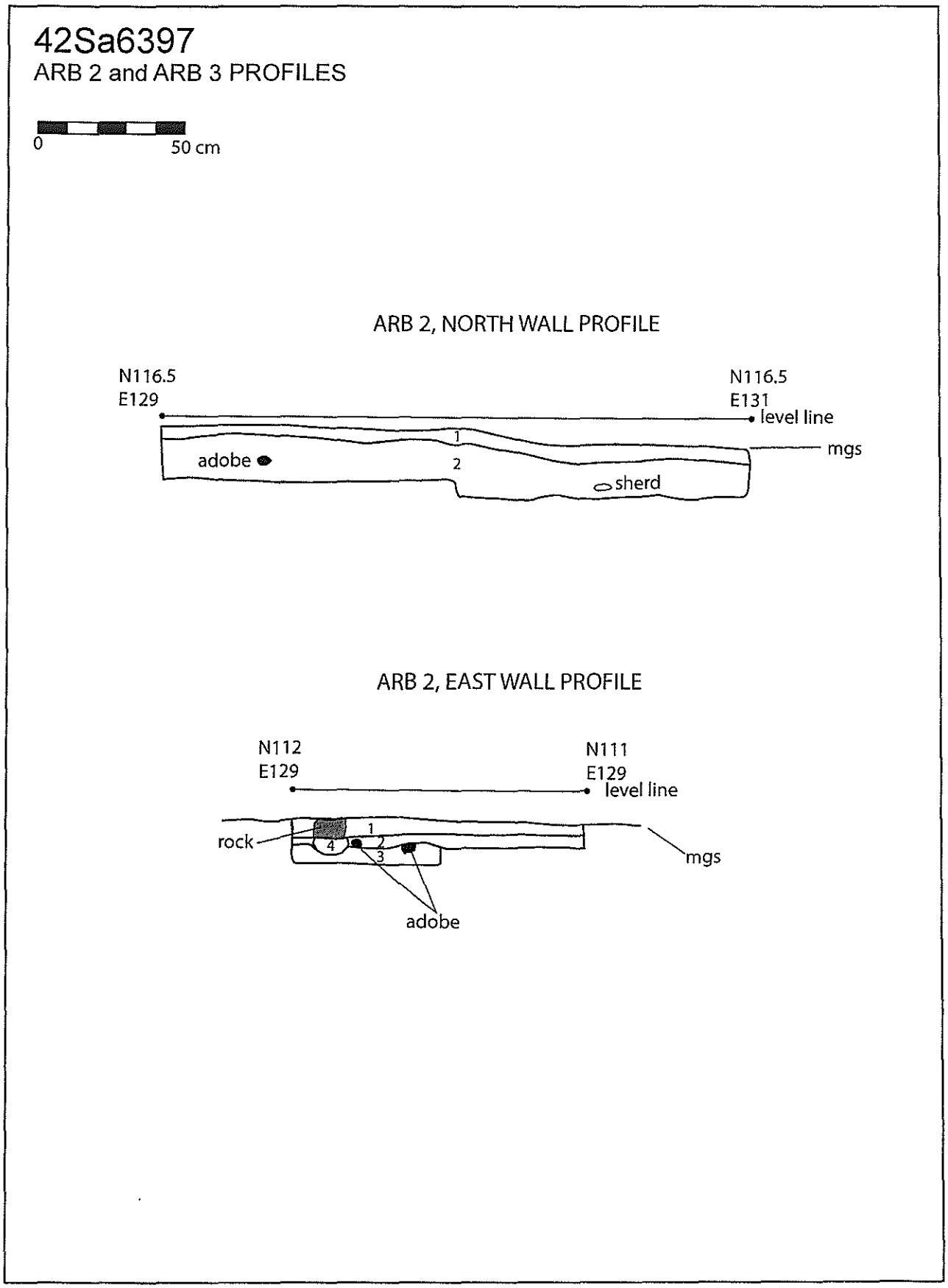

Figure 11. Site 42Sa6397, ARB 2 and ARB 3 Profiles.

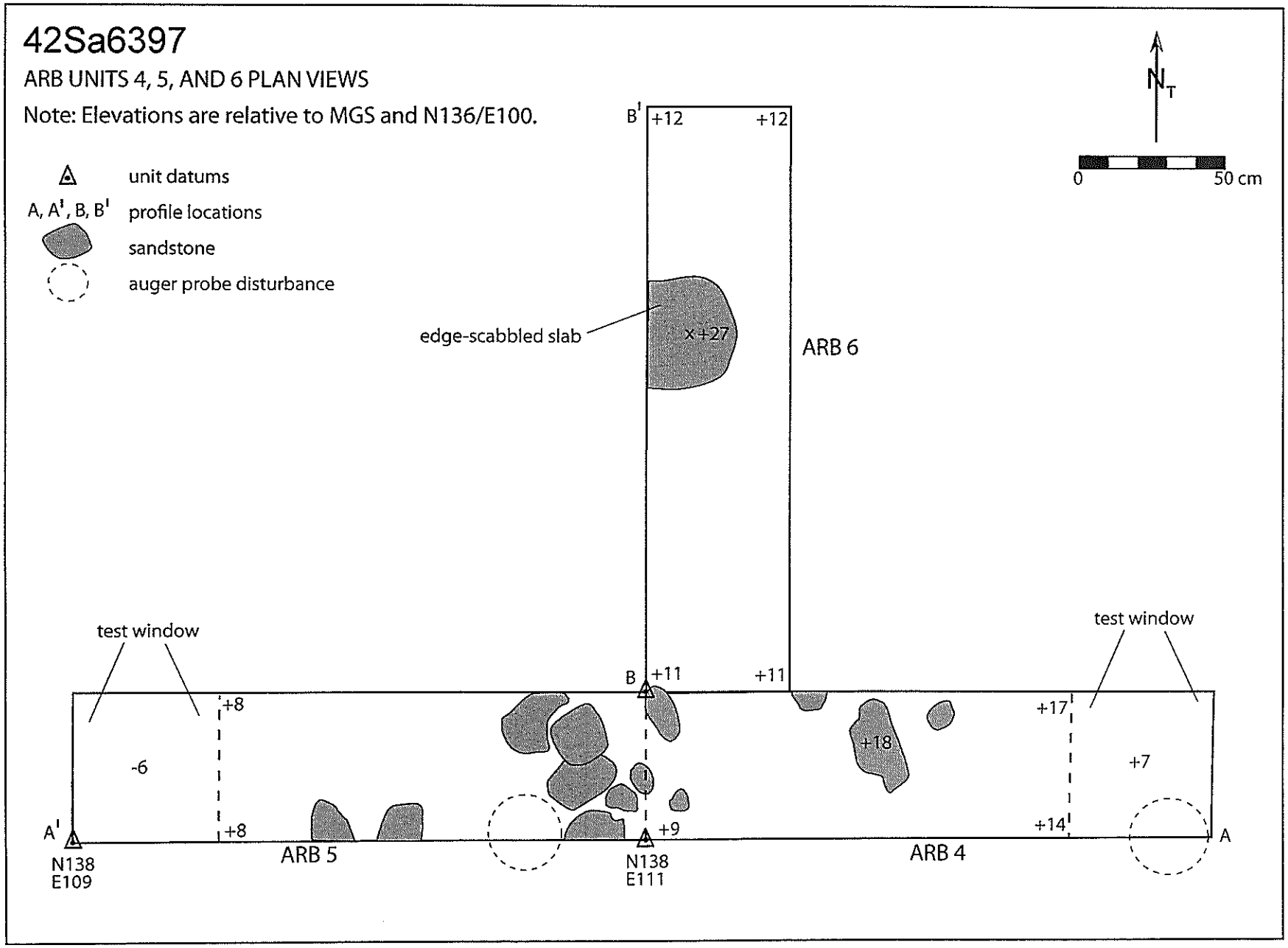

Figure 12. Site 42Sa6397, ARB Units 4, 5, and 6 Planviews.

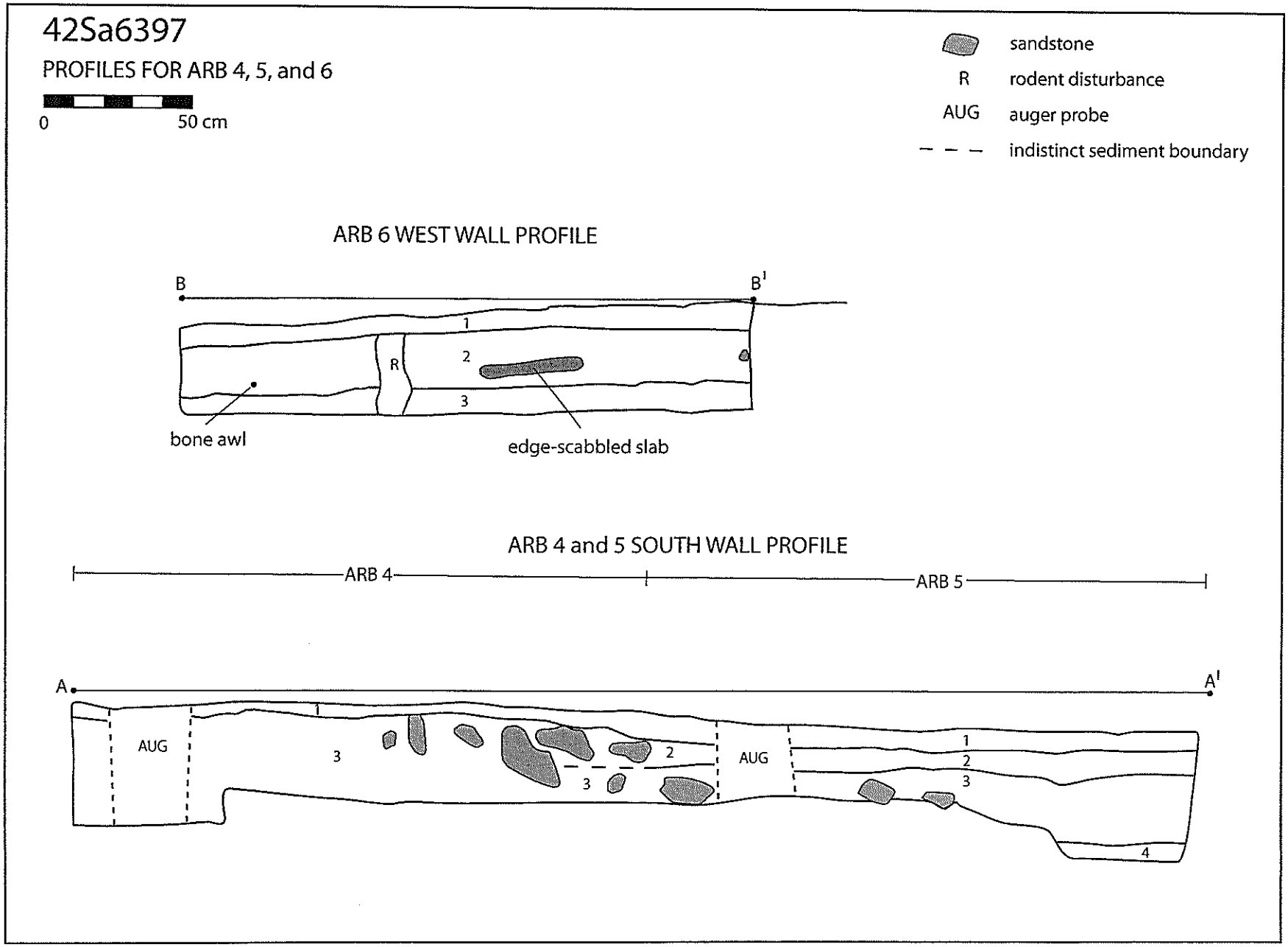

Figure 13. Site 42Sa6397, ARB 4, 5 and 6 Profiles.

cm thick. Stratum 2 is composed of a compact, red (2.5YR 4/8), silty loam with artifacts (including pottery, debitage, and ground stone). This stratum is better identified in the western portion of this area, and becomes indistinguishable as one moves east, and merges with the underlying Stratum 3. Stratum 2 appears to be a post-occupational deposit. Stratum 3 is a very compact, red (2.5YR 4/6), silty loam that appears to be about 25 cm thick (particularly as it is exposed in ARB 5). This stratum is notable for its high frequency of apparent sandstone masonry, most of which is unshaped. The frequency of both artifacts and rock diminishes with depth. The profile for ARBs 4 and 5 suggest a basin-shaped distribution of the rock, sloping downward from east to west. It seems likely that a prehistoric ground surface is contained somewhere within Stratum 3, perhaps at the lower contact between sandstone and sediment. The underlying Stratum 4 consists of a very compact, red (2.5YR 5/8), silty loam. No artifacts or sandstone were observed in Stratum 4.

Arbitrary Unit 6 documents the northern extent of D-12. The fill from this unit differs considerably from ARBs 4 and 5, particularly in terms of the frequency of sandstone rubble, which is much lower in ARB 6. Stratum 1 is essentially the same as in the other two units (Figure 13). Stratum 2 is a post-occupational deposit that consists of a moderately compact, red (2.5YR 4/6), silty clay loam with occasional artifacts and charcoal. This stratum is notable for the presence of a well-shaped, edge-scabbled sandstone slab. This object may be a door slab for a storage feature. The object is flat-lying, suggesting that it may rest on a prehistoric ground surface. The underlying Stratum 3 is a compact, yellowish red (5YR 4/6), silty clay loam with no cultural inclusions.

Arbitrary Unit 7 documents Discovery Feature 11, a pit structure in the southern portion of the site, a feature that is evident at the surface as a very shallow depression (Figure 10). Three strata were documented by the excavation of this long, hand-dug trench (Figure 14). Stratum 1 is a loose, brown (no Munsell), silty clay loam with organic detritus. Fine laminations of sediment in this 5-cm-thick deposit reflects the occasional alluvial deposition of soil in this location. Stratum 2 is a compact, dark brown (no Munsell), silty clay loam with occasional artifacts and flecks of charcoal. Auger probes indicate that this homogenous, relatively clean sediment is about 90 to 100 cm thick, and terminates in its contact with Stratum 3. Outside the apparent pitstructure walls, Stratum 2 is no more than 10 cm thick. We did not distinguish this post-depositional sediment between the structure's interior and exterior; it appears that the contact between Stratum 2 and 3 is the prehistoric ground surface. Stratum 3 is a very compact, reddish brown (no Munsell), silt with occasional caliche flecks or veining. While the structure's shape is not known, it appears to have a width of about 4.5 meters. The pitstructure is unburned.

Arbitrary Unit 8 was excavated to define a portion of Discovery Feature 7, which appears to be a firepit (Table 11). This feature was located in the northern reaches of the site while removing the surface sediments with a road grader (Figure 10). Thus, a good portion of the overlying sediments were removed prior to the unit's excavation. This large sediment stain, which covers an area measuring 4- by 5-m, may harbor several smaller feature. Figure 15 illustrates the shape and profile of a firepit. As defined here, Stratum 1 is a light brown (no Munsell) silt with occasional flecks of charcoal; this stratum is interpreted as the sediment immediately surrounding the feature. Stratum 2 is a dark brown (7.5YR 3/4) silt with abundant amounts of fine charcoal. Stratum 3 is a yellowish red (5Y 4/6) sediment. Stratum 4 is virtually

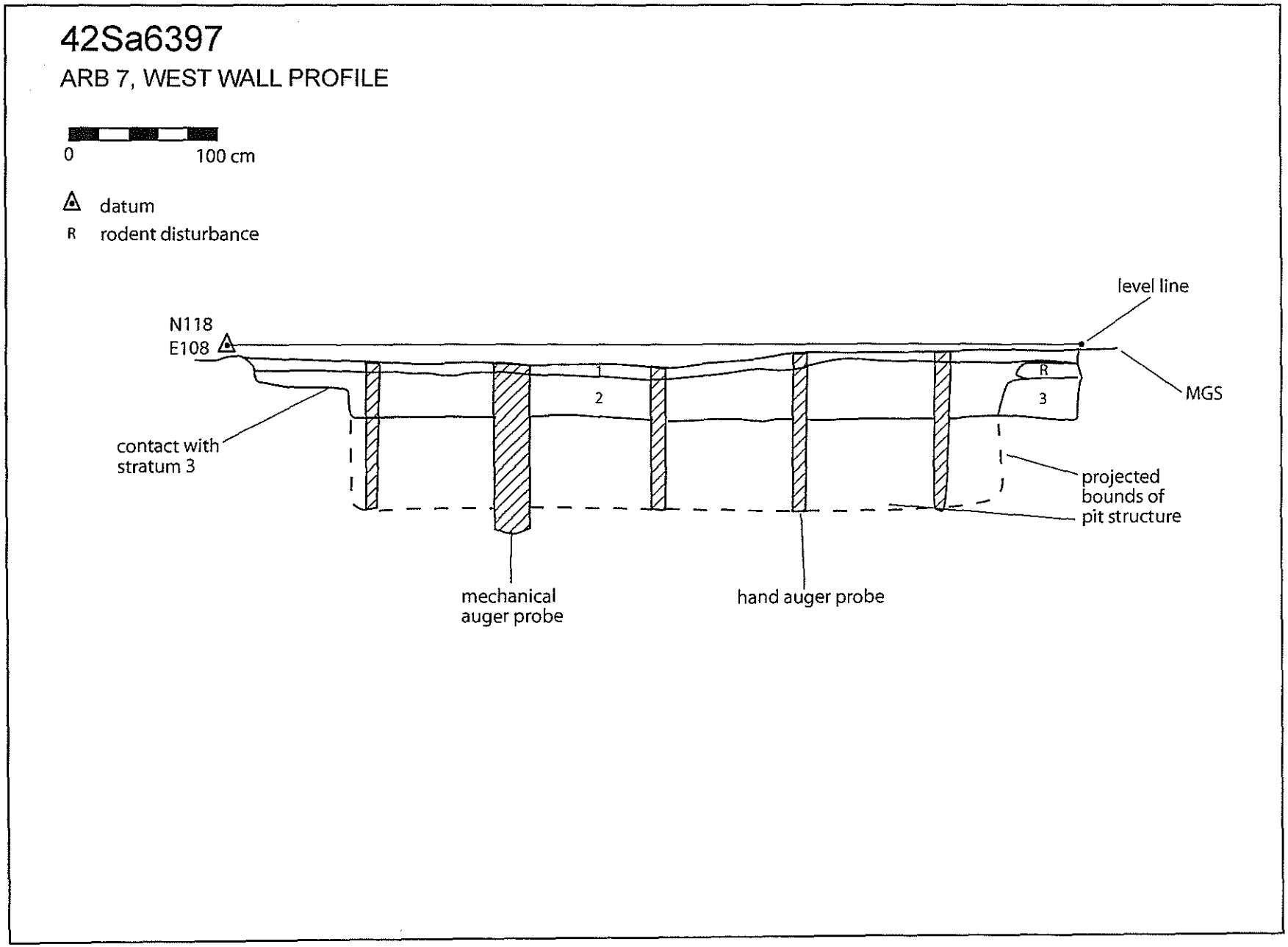

Figure 14. Site 42Sa6397, ARB 7, West Wall Profile.

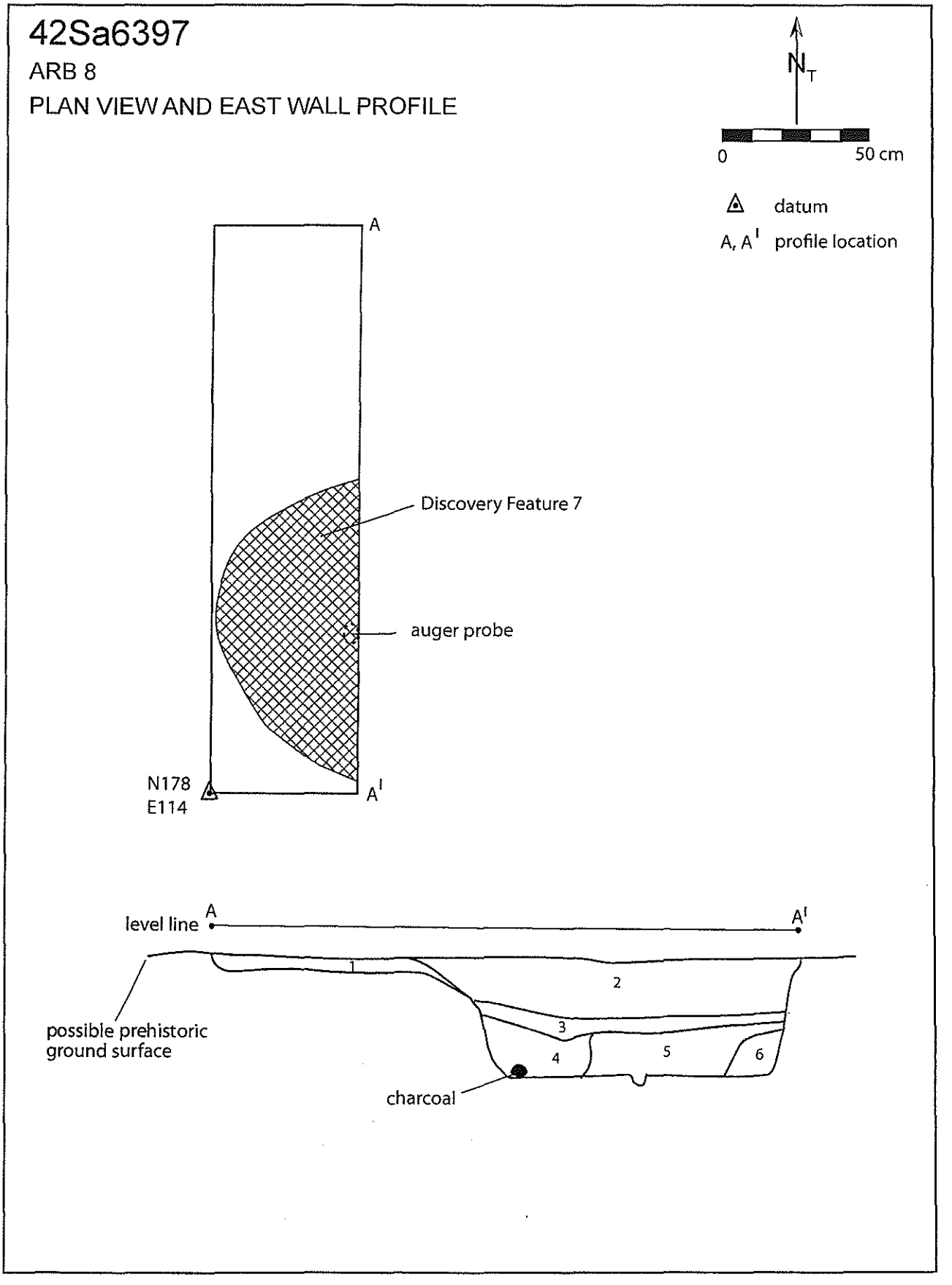

Figure 15. Site 42Sa6397, ARB 8, Planview and East Wall Profile.

identical to Stratum 2. The adjacent Stratum 5 is a loose material that comprises mostly charcoal. Archaeologist Gary Duncan noted that charcoal from pinyon, juniper, and sage was distinguishable. This sediment is essentially black (10YR 2/1). Stratum 6 is a compact, reddish brown (no Munsell), silt with occasional flecks of charcoal. We suggest that Stratum 6 represents a modification to the original pit, that Stratum 4 represents fill associated with clean-out and redeposition, and that Stratum 5 represents primary hearth fill, perhaps the last use or uses of the feature. Stratum 3 may represent a natural redeposition event of sediments removed from the feature's original excavation. This is capped by post-abandonment sediments (Stratum 2) that are rich with cultural debris. The firepit is about 100 cm in diameter. Since Figure 15 suggests that surface of origin for the feature may have only just been bladed away, the feature was originally excavated to a depth of about 45 to 50 cm deep.

Blading

The site was bladed north of the N156 grid line. Blading activities stripped approximately 20 to 30 cm of sediment from the surface, and down to the top of the B Horizon. These activities revealed the presence of Discovery Features 1 through 9 (Table 11 and Figure 10). The area of Discovery Feature 7, a portion of which is described above, may harbor a few more firepits or informal hearths.

Site 42Sa6757

This site is located along a ridge slope near the north end of the project boundary (Figure 2). Site 42Sa6757 has previously undergone data recovery efforts (Davis 1985). These excavations show that 42Sa6757 was a Basketmaker III habitation with at least one pit structure that may have been a year-round dwelling, and other smaller structures that may have served as seasonal habitations or food processing facilities (Figure 16). One of the excavated structures, Feature 2, yielded a non-cutting date of A.D. 627 (Davis 1985:151).

Excavation of the site documented a total of five features, including two pit structures, two very small habitations or field houses, and a hearth (Davis and others 1985:128-164). The midden is fairly shallow and does not appear to be more than 15 cm thick. This cultural deposit is partially buried under 3 to 5 cm of aeolian sediments. This area was tested by backhoe trenches, but otherwise not systematically sampled.

This site had been excavated by Abajo Archaeology during a previous data recovery project (Davis 1985), so evaluative testing activities were kept to a minimum. These activities included a small set of hand-auger excavations and blading (Figure 17). As a result of these measures, 22 discovery features were located (Table 13).

Auger Probes

A small grid of 14 auger probes was excavated by hand at 42Sa6757 after blading activities had revealed Discovery Feature 4 (Figure 17). This feature originally appeared as a relatively large, oval-shaped concentration of dark, ashy sediments with adobe and artifacts. Its appearance was consistent with a pithouse. While attempting to shovel scrape the freshly bladed

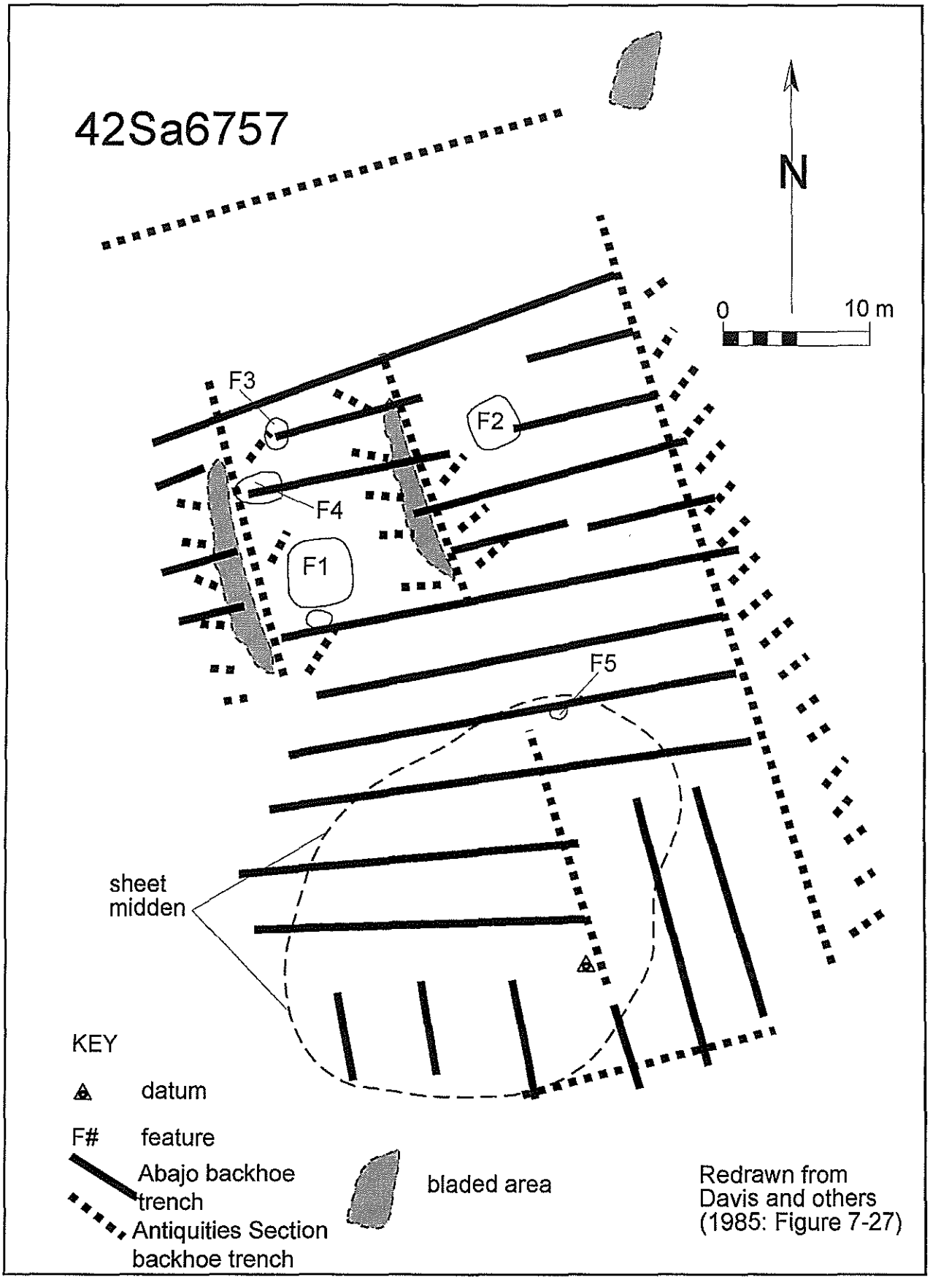

Figure 16. Site 42Sa6757, Post-Excavation Map.

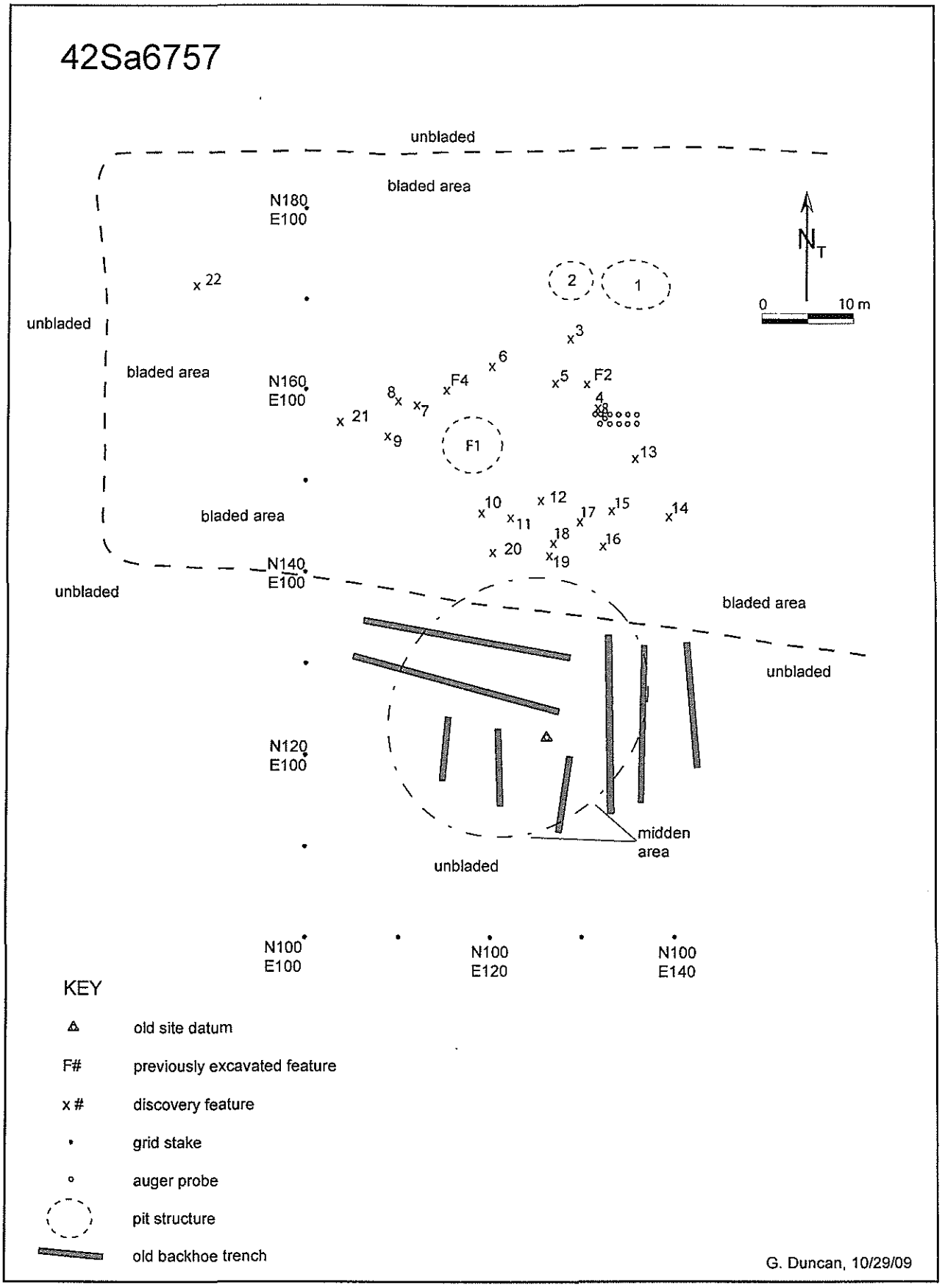

Figure 17. Site 42Sa6757, Testing Results

Table 13. Discovery Features, Site 42Sa6757			
#	Shape	Size (m)	Description
1	Oval	5 (N/S) by 6 (E/W)	Large, dark gray sediment stain with charcoal. Probable pithouse. About 45 cm deep.
2	Oval	5 (N/S) by 6 (E/W)	Large, light gray sediment stain. Probable pithouse. About 40 cm deep.
3	Round	1.75 in diameter	Light gray sediment stain. Possible small pit structure.
4	Oval	0.7 (N/S) by 1.4 (E/W)	Dark gray sediment stain.
5	Unknown	0.15 (?) in diameter	Concentration of azurite balls. Three were collected but more are known to be present. These may have been contained within a small pit that has yet to be defined.
6	Unknown	Unknown	Possible upright slab feature of unknown size.
7	Amorphous	Ca. 0.3 in diameter	Small sediment stain. Possible extramural pit.
8	Round	Ca. 0.17 in diameter	Small sediment stain. Possible posthole.
9	Amorphous	Ca. 0.3 in diameter	Small, gray sediment stain.
10	Round	Ca. 0.4 in diameter	Dark gray sediment stain with charcoal. Possible firepit.
11	Amorphous	Ca. 1.0 in diameter	Small concentration of oxidized rock and sediment. May be a burned area.
12	Unknown	Unknown	Small locus of bone.
13	Round	Ca. 0.6 in diameter	Dark gray sediment stain with charcoal. Probable extramural firepit just southeast of Discovery 4.
14	Amorphous	Ca. 0.9 in diameter	Small set of brown, linear sediment stains with charcoal. Probably rodent burrows with cultural fill.
15	Round	Ca. 0.11 in diameter	Small dark gray sediment stain. Possible posthole.
16	Amorphous	Ca. 0.25 in diameter	Dark brown sediment stain with charcoal and a few oxidized rocks. May be a burned area.
17	Amorphous	Ca. 30 in diameter	Brown sediment stain with several fragments of burned rock. May be a burned area.
18	Unknown	Ca. 0.65 in diameter	Large, in-situ sandstone rock on area of relatively loose sediments. Possible pit feature.
19	Round	Ca. 0.13 in diameter	Small, dark gray sediment stain. Possible posthole.
20	Amorphous	Ca. 0.12 in diameter	Small concentration of charcoal.
21	Oval	0.45 (E/W) by 0.50	Dark gray sediment stain with charcoal. Possible firepit.
22	Amorphous	Ca. 0.3 in diameter	Dark gray sediment stain. Probable burned area.

surface to define the feature's edges, it became apparent that the original large sediment stain may not represent an in-situ cultural feature. We decided that systematically placed auger probes would help determine the size of the feature. Auger probes indicated that a feature was present, but that the surrounding cultural sediments were probably backfill materials from a nearby feature that had been previously excavated by Abajo Archaeology, Feature 4 (Davis 1985:157-164).

Blading

Blading on the site occurred only north of grid line N130 (Figure 17). We did not blade the whole surface of the site at this time so as to preserve intact midden deposits to the south (this area of the site will be systematically sampled during the data recovery phase). Much of the northern portion of the site had been previously trenched. However, in an east-to-west swath that was about 8 m wide, no trenches had been excavated. It was in this area that the road grader located two large sediment stains, probable pithouses (Discovery Features 1 and 2). In addition to these features, blading activities documented 20 other small features. These are described in Table 13. Of particular interest is Discovery Feature 5, which appears to be a collection of azurite spheres, or "blue balls." These artifacts have been observed in other Basketmaker III assemblages, including the nearby Casa Coyote site (42Sa3775) (Hurst 2004; McAndrews 2004:376). This artifact type was also documented on a Basketmaker III site (42Sa26349) during a survey of the nearby Comb Wash Campground (Desroziers 2005).

Site 42Sa8014

Site 42Sa8014 is located near the base of the same ridge slope that 42Sa6757 occupies (Figure 2). Like 42Sa6757, the site was excavated by Abajo Archaeology (Davis 1985). These excavations documented a small pit structure and an associated cist (Figure 18). Pottery assemblages associated with both features suggest that the two were probably contemporaneous. One absolute date, a C-14 sample from the floor of Feature 1, yielded a date of 1455±130 B.P. Considering the pottery assemblages, this seems far too early to accurately represent the feature's occupation. Bond (1985:274) recommends that the site dates to the late Pueblo I period. Based on the pottery assemblage, it seems likely that the site was in use sometime during the late ninth and/or early tenth century. The site was interpreted as a seasonal habitation that was occupied during the late Pueblo I period.

Blading

Since the site had been previously excavated, evaluative testing activities were limited to blading. A road grader was used to systematically remove overlying sediments from the site. Archaeologist Mark Bond was present to monitor the road grader, an optimal arrangement as Bond was the supervising archaeologist for the previous excavations at 42Sa8014. Blading activities revealed 10 discovery features. These features are described in Table 14, and their locations are indicated on Figure 19.

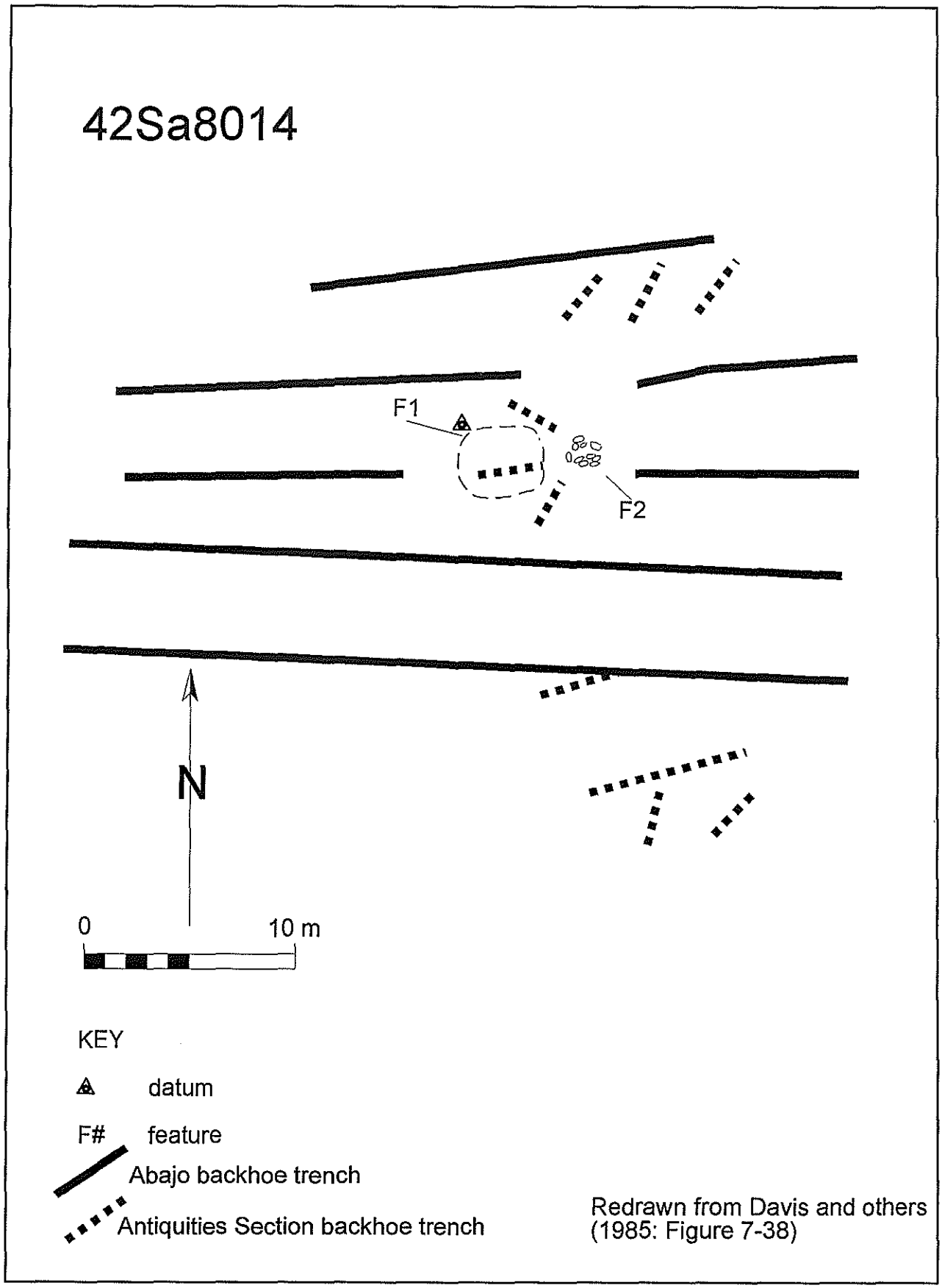

Figure 18. Site 42Sa8014, Post-Excavation Map.

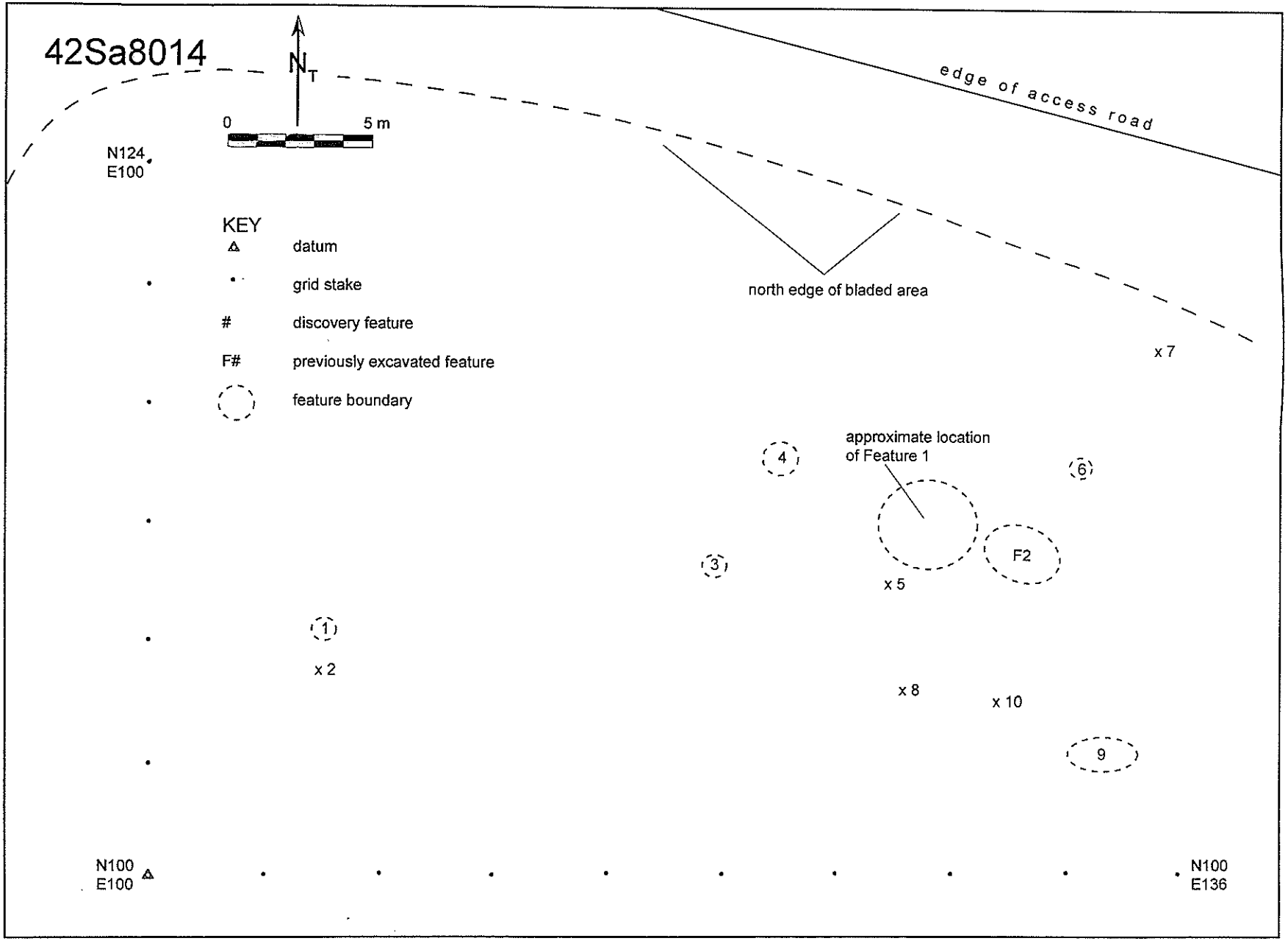

Figure 19. Site 42Sa8014, Testing Results

Table 14. Discovery Features, Site 42Sa8014			
#	Shape	Size (m)	Description
1	amorphous	Ca. 0.9 in diameter	Light gray sediment stain. May be associated with the redeposition of cultural materials in an old, shallow drainage.
2	Unknown	Unknown	Large rock. May be associated with the drainage noted with D-1.
3	amorphous	Ca. 0.5 in diameter	Light gray sediment stain.
4	Unknown	Ca. 1.2 in diameter	Concentration of artifacts, particularly Plain Gray pottery sherds. May be an old collectors pile.
5	Unknown	Unknown	Large rock. May be associated with extramural activities associated with the site's previously excavated Feature 1 (a shallow pit structre), which was probably immediately north of this rock.
6	amorphous	Ca. 0.5 in diameter	Light gray sediment stain.
7	amorphous	Ca. 0.2 in diameter	Gray sediment stain.
8	amorphous	Ca. 0.15 in diameter	Gray sediment stain.
9	amorphous	Ca. 2.3 (E/W) by 0.9 (N/S)	Gray sediment stain with rodent disturbance.
10	amorphous	Ca. 0.15 in diameter	Gray sediment stain.

Site 42Sa28128

The site is situated on a relatively flat plain a few hundred meters east of a low, sandy ridge crest (Figure 2). Site 42Sa28128 was recorded as a scatter of lithic and pottery artifacts (Figure 20) (Till 2009a). The site is one of a cluster of four small sites in the southeast corner of the project area.

Cultural materials on the site's surface included a scatter of pottery sherds, debitage, and several ground stone tools. The only temporally diagnostic artifact recorded on the site was a corrugated jar body sherd, which suggested that the site dated after A.D. 950. The surface treatment of the white ware sherds is consistent with this assessment. Considering the site's size, its location, and the focus on ground stone, the site was interpreted as a the locus of specialized activities such as food processing.

Evaluative testing activities on the site included controlled surface collections, auger probes, test unit excavations, and blading. These activities resulted in the location of seven discovery features (Table 15).

Surface Collections

Surface collections were subjective, and occurred only when artifacts were observed. Only a small number of artifacts were collected by this method; artifact types included pottery, chipped stone artifacts, and ground stone artifacts.

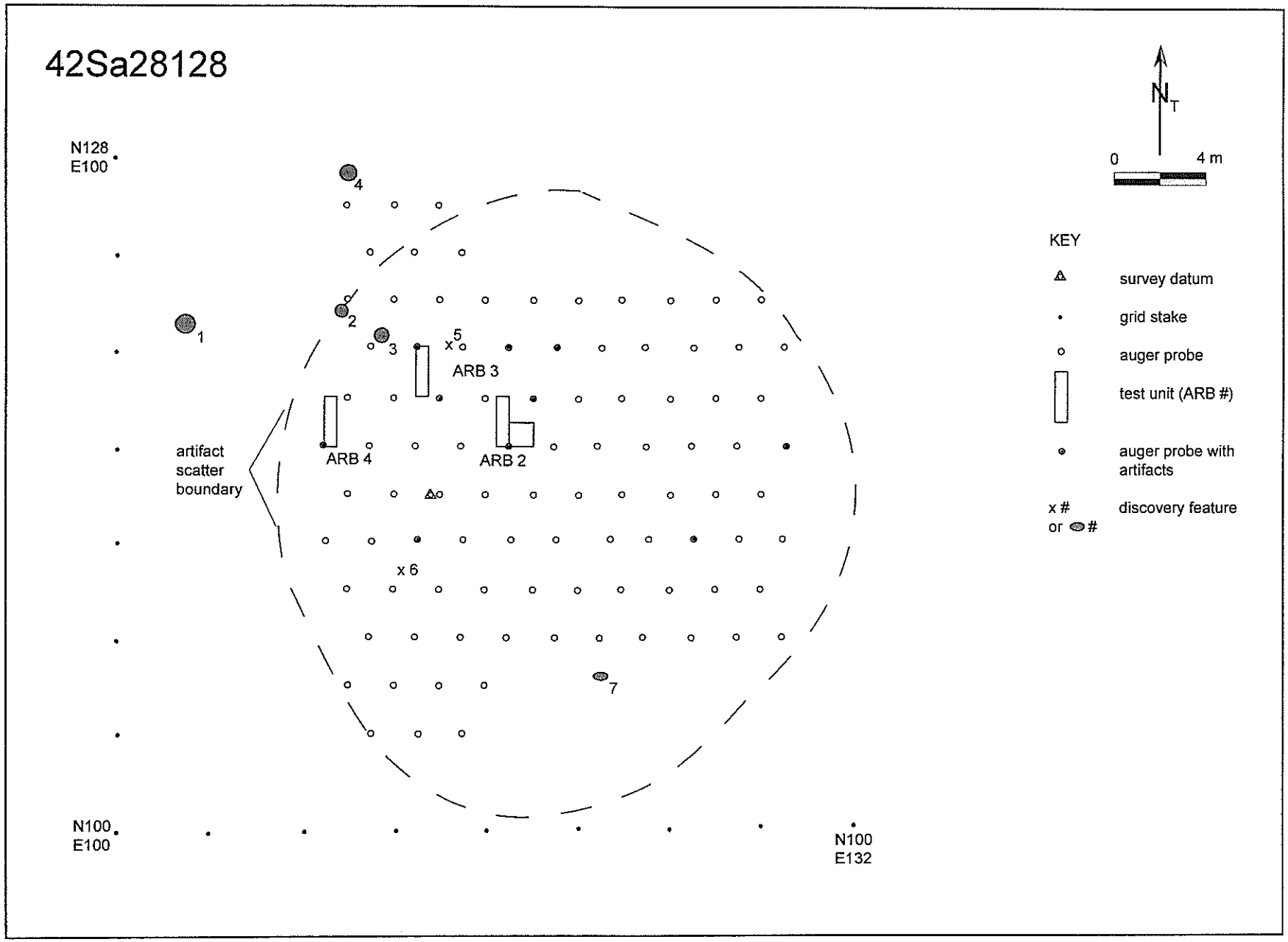

Figure 20. Site 42Sa28128, Testing Results

Table 15. Discovery Features, Site 42Sa28128			
#	Shape	Size (m)	Description
1	Amorphous	Ca. 0.7 in diameter	Light gray sediment stain.
2	Round	Ca. 0.35 in diameter	Gray sediment stain with flecks of charcoal. One flake in fill.
3	Amorphous	Ca. 0.6 in diameter	Light gray sediment stain--immediately east of Feature 2.
4	Round	Ca. 0.65 in diameter	Dark gray sediment stain with a few pieces of oxidized sandstone.
5	Round	Ca. 0.15 in diameter	Dark gray sediment stain with charcoal.
6	Unknown	Unknown	Slab metate with modified red ware sherd. Possible pit feature.
7	Oval	Ca. 0.25 (N/S) by 0.45 (E/W)	Gray sediment stain with flecks of charcoal and a few pieces of oxidized sandstone. Perimeter sediments may be oxidized.

Auger Probes

A total of 95 auger probes, illustrated in Figure 20, were excavated on the site. A cluster of auger probes with artifacts and relatively looser sediments prompted the placement of three test units in the north central portion of the site (Figure 20).

Test Units

Three test units were excavated, the locations and dimensions of which are provided in Table 16. Arbitrary Unit 2 originally started as a 0.5- by 2.0-m unit, but was expanded to include an adjacent 1.0- by 1.0-m to investigate a sediment anomaly (which was later determined to be rodent disturbance). The unit actually permitted our first good look at the project area's "valley" sediments, and so substantially structured our interpretation of the project area's depositional processes and history (Figure 21). Stratum 1, as illustrated in the unit's 1.0- by 1.0-m extension, consists of a loose, yellowish red to reddish yellow (5YR 5/6-6/6), sandy clay loam with a high organic content from modern vegetation. Artifacts are also occasionally present in this stratum, which is 5 to 10 cm thick. Stratum 2 is a moderately compact, yellowish red (5YR 4/6), sandy clay loam. Most of the artifacts found in this unit came from this stratum, which measures 15 to 20 cm thick. Some rodent disturbance is evident in this stratum. Stratum 2 is interpreted as disturbed plow zone sediments, and results from the mixture of the site's prehistoric ground surface and overlying artifact-bearing sediments with the underlying B Horizon soils. The B Horizon is represented by Stratum 3, which consists of a very compact, yellowish red (5YR 5/6), sandy clay loam with occasional flecks of caliche. No artifacts were recovered from this stratum, and caliche flecks did increase in frequency at 45 cm below modern ground surface.

Table 16. Test Unit Location, Size, and Orientation, Site 42Sa28128			
Study Unit	SW Corner	Size	Orientation
ARB 2	N116/E116.5	0.5- by 2.0-m	north-to-south
ARB 3	N118/E113	0.5- by 2.0-m	north-to-south
ARB 4	N116/E109	0.5- by 2.0-m	north-to-south

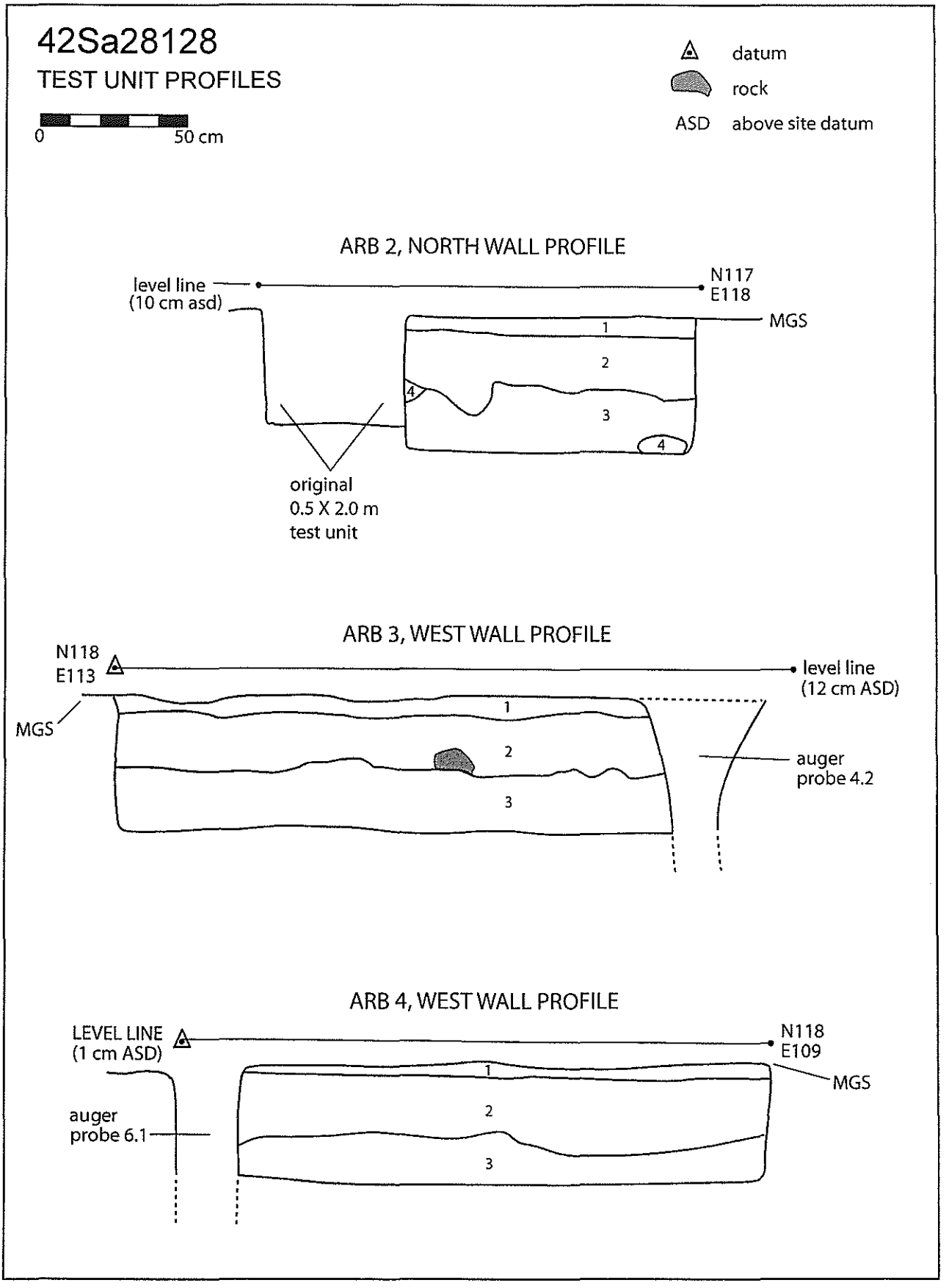

Figure 21. Site 42Sa28128, Test Unit Profiles.

Arbitrary Unit 3 documented a similar stratigraphic sequence (Figure 21). Stratum 1 is a loose, yellowish red (5YR 5/6), sandy clay loam with organic detritus. Occasional artifacts were noted in this stratum, which was 5 to 7 cm thick. Stratum 2 is a compact, yellowish red (5YR 4/6-5/6), sandy clay loam. Most of the unit's artifacts derived from this stratum, which was about 20 cm thick. This stratum is interpreted to represent disturbed plow zone sediments. Stratum 3 is a compact, yellowish red (5YR 5/6) silt, which probably represents the B Horizon sediments. One artifact was retrieved from this stratum.

Arbitrary Unit 4 also revealed three stratigraphic units (Figure 21). Stratum 1 is a loose, strong brown (5YR 4/6) sandy clay loam with organic detritus. Artifacts were present in this stratum, which was about 5 cm thick. Stratum 2 is a moderately compact, yellowish red (5YR 4/6) sandy clay loam with artifacts and a low frequency of organic detritus. This stratum, which is interpreted as disturbed plow zone sediments, measured about 20 to 30 cm thick. Stratum 3 consists of a compact, yellowish red (5YR 5/6), sandy clay loam with some veins of caliche. Stratum 3 is interpreted as the undisturbed B Horizon sediment.

Blading

Blading activities occurred across the entire surface of the site. As a result of this work, seven discovery features were located (Table 15 and Figure 20). Most of these features were located in the northwestern quadrant of the site, that same general portion of the site that was the focus of test unit excavations. The attributes of these features are such that most of the seem to represent firepits.

Site 42Sa28129

The site is situated on a very slight rise in an otherwise flat terrain and is approximately 100 m west of 42Sa28128 (Figure 2). The site was recorded as a scatter of lithic and pottery artifacts (Figure 22) (Till 2009a). Cultural materials documented on the site's surface included pottery, lithic debitage, and several ground stone tools. The small pottery assemblage suggested that the site probably dates to the Pueblo II period or later. The small artifact assemblage and the site's setting suggest that this location harbored a limited activity site.

Evaluative testing activities on the site included controlled surface collections, auger probes, test unit excavations, and blading. These activities resulted in the location of 10 discovery features (Table 17).

Surface Collections

Controlled surface collections occurred in 4- by 4-m units across the whole site. These surface collections resulted in a small number of artifacts and a variety of artifact types including pottery, lithic debitage, and ground stone artifacts.

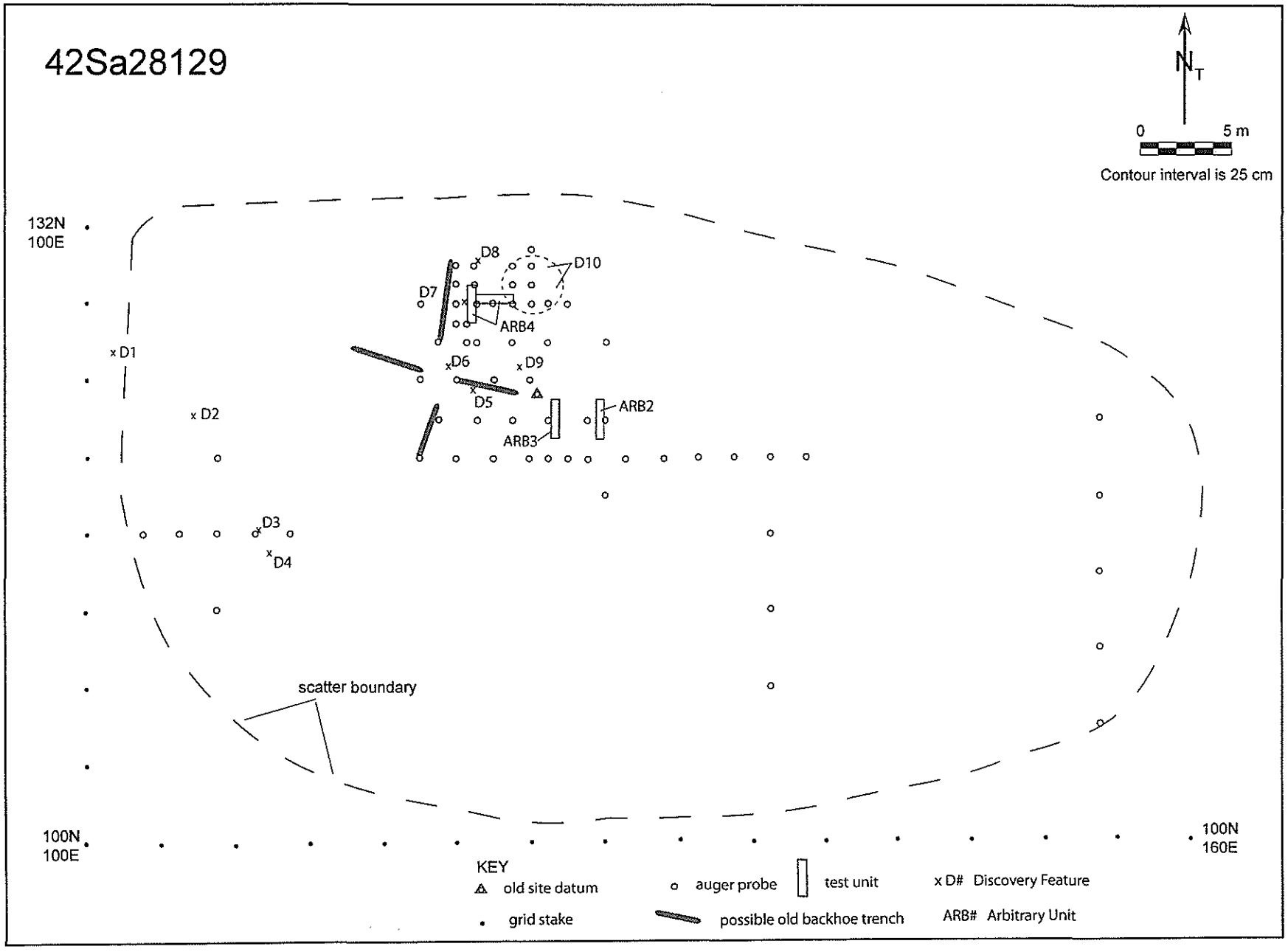

Figure 22. Site 42Sa28129, Testing Results

Table 17. Discovery Features, Site 42Sa28129			
#	Shape	Size (m)	Description
1	Unknown	Unknown	An apparent buried Mancos Corrugated jar. The top of the jar was clipped by the road grader. The jar's neck orifice measures 19 cm in diameter. The jar is probably in a pit, which probably conforms to the size of the jar, and remains to be defined.
2	Round	Ca. 0.5 in diameter	Dark gray sediment stain with charcoal. Probable firepit.
3	Unknown	Unknown	Flat-lying grinding slab fragment.
4	Round	Ca. 0.25 in diameter	Gray sediment stain.
5	Round	Ca. 0.2 in diameter	Light gray sediment stain. May have been clipped by an old backhoe trench.
6	Round	Ca. 0.2 in diameter	Gray sediment stain.
7	Unknown	Unknown	Large sandstone slab. May represent an extramural feature associated with D-10.
8	Amorphous	Ca. 0.25 in diameter	Light gray sediment stain. May represent an extramural feature associated with D-10.
9	Unknown	Ca. 0.3 in diameter	Small cluster of rocks.
10	Round	Ca. 3.5 in diameter	Possible shallow pit structure. Only the southwest corner of the feature was exposed in ARB 4.

Auger Probes

A total of 29 auger probes, illustrated in Figure 22, were excavated on the site. Results from several of the auger probes, including the presence of artifacts and sandstone rock, prompted the placement of two test units, Arbitrary Units 2 and 3, in the approximate center of the site (Figure 22). Subsequent blading activities revealed a cluster of features in this same area as well as a relatively high frequency of artifacts. These results further compelled the placement of Arbitrary Unit 4, a small set of test units that was situated just north of Units 2 and 3 (Figure 22).

Test Units

Three test units were excavated, the locations and dimensions of which are provided in Table 18. Arbitrary Unit 2 yielded a profile that indicated the presence of a plow zone, or area of disturbed sediments (Figure 23). Stratum 1 consists of a very loose, yellowish red (5YR 5/6), sandy clay loam. This sediment is about 9 cm thick. Some cultural materials were recovered from this surficial sediment, as well as a moderate frequency of recent vegetal materials. Stratum 2 is a moderately compact, yellowish red (5YR 4/6), sandy clay loam. Most of the artifacts (sherds, lithic debitage, and a piece of ground stone) recovered from this unit came from Stratum 2. This stratum is approximately 10 to 15 cm thick, and appears to represent disturbed cultural deposits, perhaps a plow zone that basically destroyed a buried prehistoric ground surface and an associated overlying cultural horizon. Stratum 3 consists of a compact, reddish yellow (5YR 6/6), sandy clay loam with no artifacts. Flecks of caliche appear in the lower reaches of this sediment. The bottom of Stratum 3, as exposed in this unit, probably represents the top of the B Horizon. Extensive rodent disturbance is also apparent in the unit—these creatures appear to

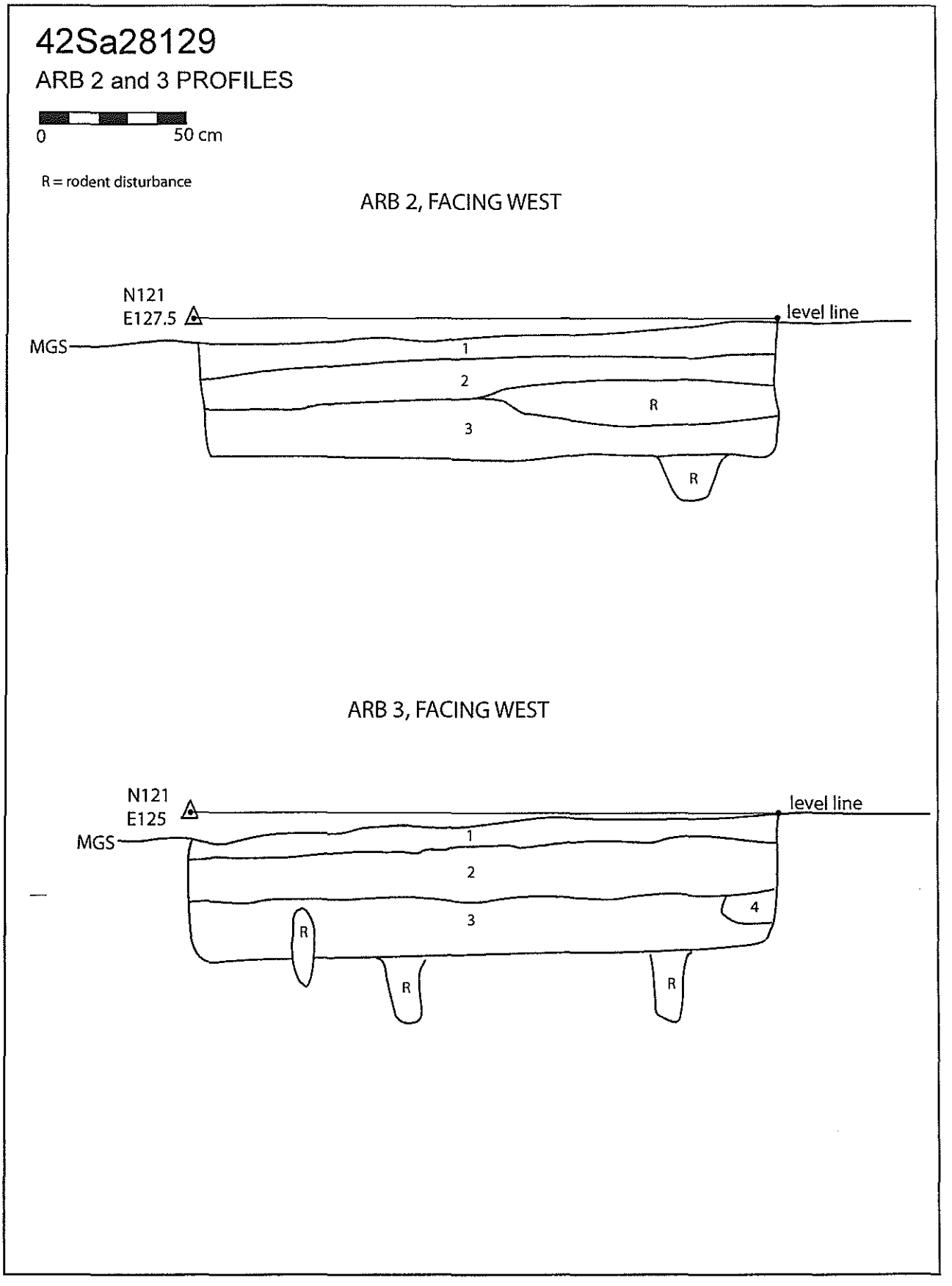

Figure 23. Site 42Sa28129, ARB 2 and 3 Profiles.

have followed the contact between the looser Stratum 2 sediments and the hard, undisturbed sediment represented by Stratum 3.

Table 18. Test Unit Location, Size, and Orientation, Site 42Sa28129

Study Unit	SW Corner	Size	Orientation
ARB 2	N121/E127.5	0.5- by 2.0-m	north-to-south
ARB 3	N121/E125	0.5- by 2.0-m	north-to-south
ARB 4[1]	N127/E120.5	Irregular	Variable

[1]See Figure 24 and text for size and orientation.

Arbitrary Unit 3 is similar in profile (Figure 23). Stratum 1 consists of a loose, yellowish red (5YR 5/6), sandy clay loam with modern organic materials and some artifacts. This sediment is 5 to 10 cm thick. Stratum 2 is a moderately compact, yellowish red (5YR 5/6), sandy clay loam with small chunks of caliche and cultural materials. This stratum is 15 to 20 cm thick, and appears to represent disturbed plow zone sediments with cultural materials. Stratum 3 is a compact, yellowish red (5YR 4/6) silt with frequent flecks of caliche. The sediments in this test unit were heavily disturbed by rodent activity. The chunks of caliche in Stratum 2 may represent backhoe-deposited sediments from the underlying B or C Horizons (discussed further below).

The excavation of Arbitrary Unit 4 in the north-central portion of the site was inspired by the location of buried features during blading activities (discussed below). In addition, we noted a relatively high frequency of artifacts (including pottery, lithic debitage, and ground stone) in this area as it was bladed. An additional anomaly observed in this location was a "cross" of caliche-rich sediments (Figure 22). Field Director Mark Bond tendered the likely interpretation that this feature represents a "backhoe-trench artifact," perhaps the remnants of backhoe trenches that had been excavated into the site at an earlier date while looking for cultural features. While no documentation has been found to strengthen this hypothesis, Bond's suggestion is consistent with the remnants of other exploratory backhoe trenches excavated by Antiquities Section archaeologists in the 1970s. For an example of such, refer to the plan map of Site 42Sa8014 in Davis (1985: Figure 7-38). The implication is that archaeologists had earlier found good reason to investigate this location for subsurface cultural features.

Arbitrary Unit 4 is actually a T-shaped set of units that was situated to bisect the location of Discovery Feature 7, which consisted of a flat-lying sandstone slab that had been found during blading activities (Figures 22 and 24). Additional hand-excavated auger probes indicated a possible pit structure just to the east of D-7, prompting an extension of Arbitrary Unit 4 to the east. This extension captured the southwestern "corner" of a subrectangular or round pit structure, designated Discovery Feature 10 (Figure 24 and Table 17). Based on the curvature exposed, the feature appears to measure about 3 m in diameter.

Figure 24 illustrates the stratigraphic profiles yielded by the excavation of Arbitrary Unit 4. One must keep in mind that 20 to 30 cm of the overlying sediments had been removed prior to the unit's excavation. Stratum 1 consists of a compact, yellowish red (5YR 4/6) silt with

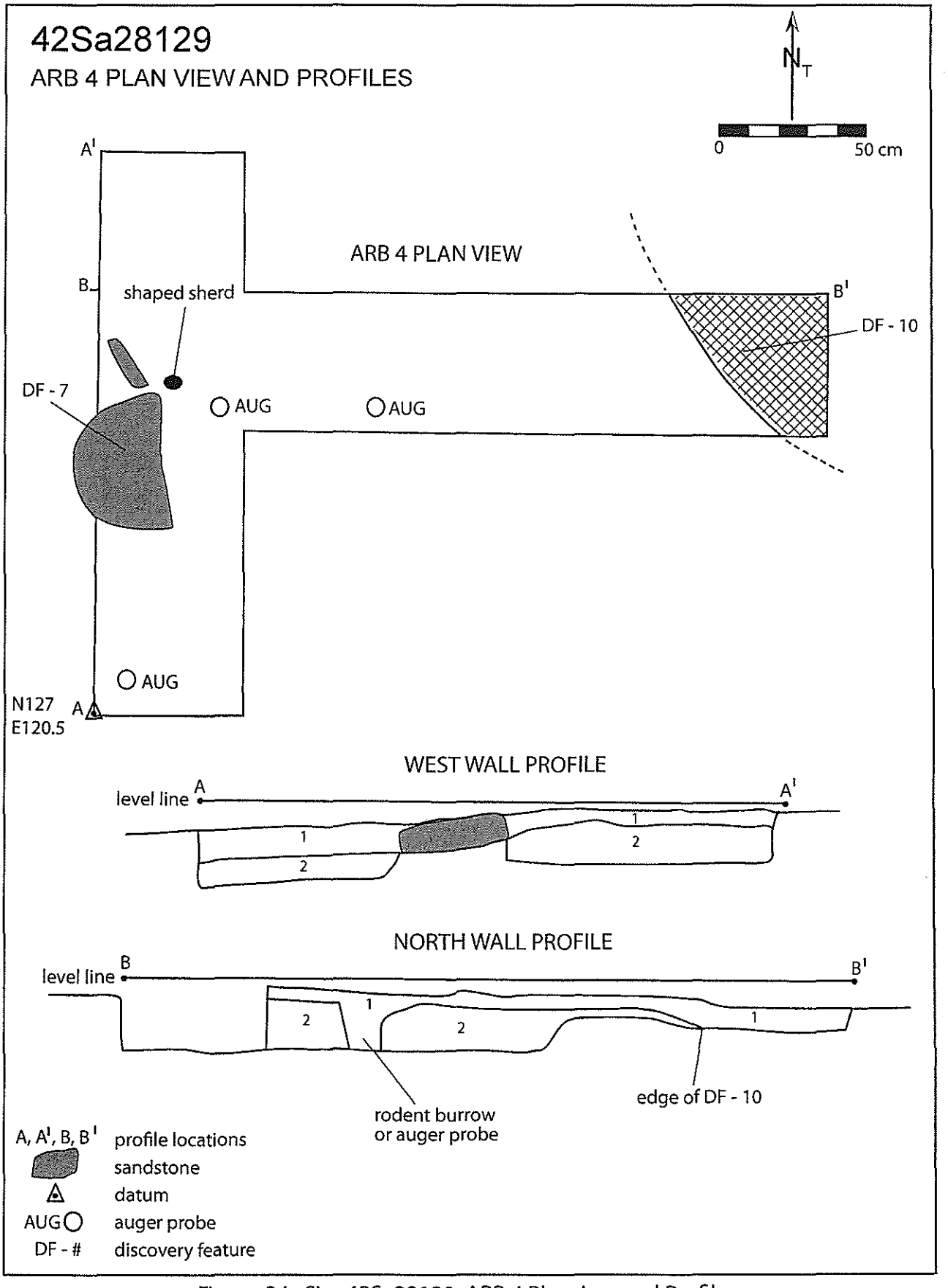

Figure 24. Site 42Sa28129, ARB 4 Planview and Profile.

occasional flecks of charcoal, small fragments of white sandstone, and artifacts. This stratum is interpreted as the remnants of the plow zone sediment. Stratum 2 represents the underlying B Horizon sediment. It is a very compact, yellowish red (5YR 5/6) silt with flecks of caliche. No charcoal or artifacts are present in this stratum.

Blading

Blading activities occurred across the entire surface of the site. As a result of this work, Discovery Features 1 through 9 were located (Table 17 and Figure 22). As noted above, most of these features were located in the northwestern and north-central portions of the site. Most of these features are relatively small sediment stains, and may represent small firepits or postholes. Discovery Feature 1 is notable as it appears to be a buried corrugated jar. Features 5 through 9 probably represent extramural features associated with the larger pit structure, D-10 (Figure 22).

Site 42Sa28130

The site was recorded as a scatter of pottery and lithic artifacts (Till 2009a). Located on relatively flat terrain with a slight slope to the southeast, the scatter was confined to an area that measures approximately 30 m north/south by 60 m east/west (Figure 25).

Site 42Sa28130 is one site in a cluster of four small sites in the southeastern corner of the project area (Figure 2). The very small pottery assemblage on the surface suggested that the site may date to the Pueblo II period. The site may have been the locus of specialized activities such as food-processing.

Evaluative testing activities on the site included controlled surface collections, auger probes, test unit excavations, and blading. These activities resulted in the location of two discovery features (Table 19).

Table 19. Discovery Features, Site 42Sa28130

#	Shape	Size (m)	Description
1	Unknown	Ca. 0.5 in diameter	A metate, slightly on edge, in what may be small pit. Possible mealing locus.
2	Amorphous	Ca. 0.5 in diameter	Sediment stain with charcoal. May be an informal firepit.
3	Unknown	Ca. 0.25 in diameter	Possible corrugated jar. Only the bottom portion of the vessel (ca. 10 cm) may still be present.

Surface Collections

Controlled surface collections occurred in 4- by 4-m units across the whole site. These surface collections resulted in a small number of artifacts, including pottery, lithic debitage, and .22 casings.

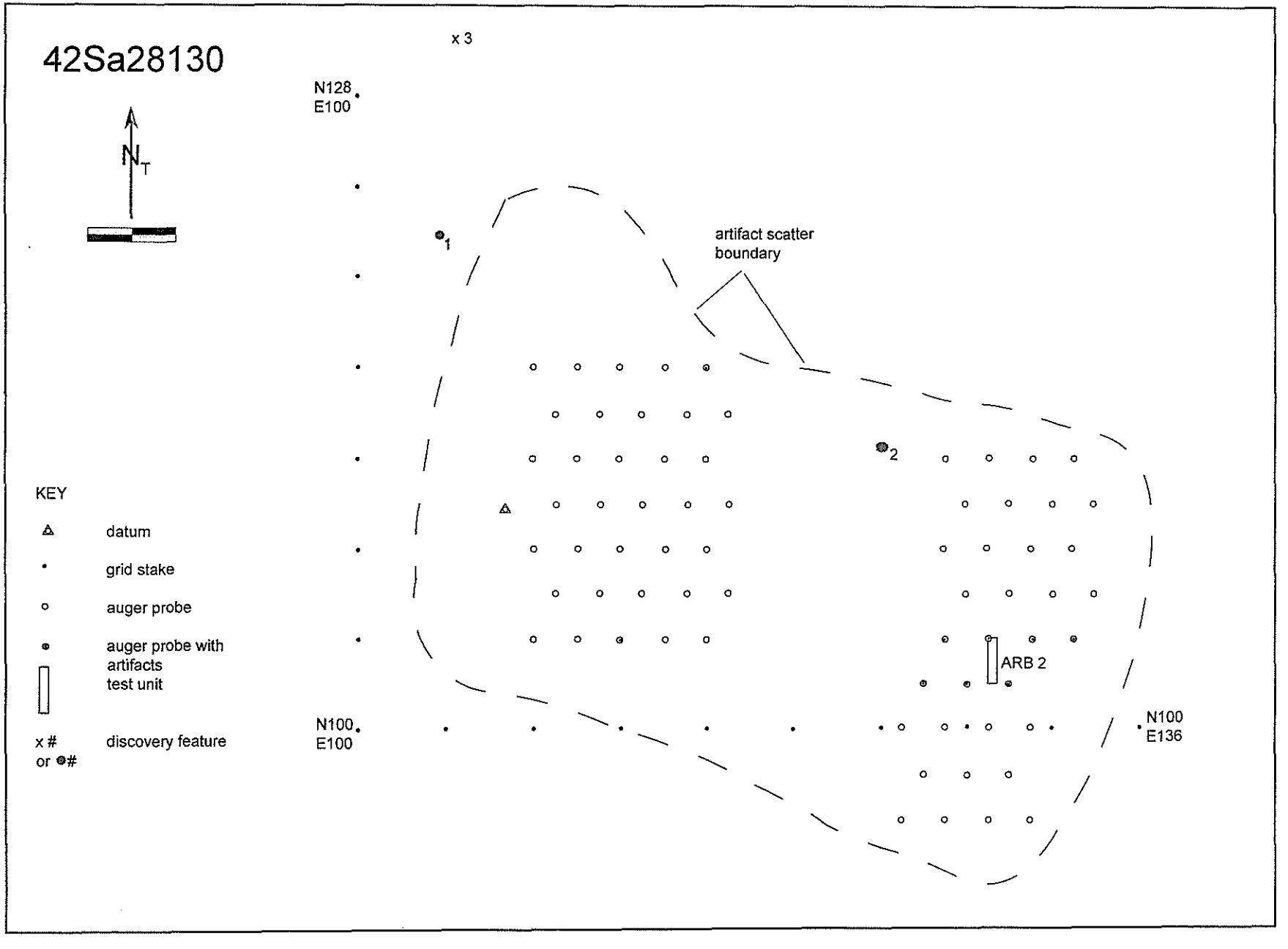

Figure 25. Site 42Sa28130, Testing Results

Auger Probes

A total of 69 auger probes, illustrated in Figure 25, were excavated on the site. A series of auger holes with relatively looser sediments led to the placement of a test unit, Arbitrary Unit 2, in the southeast quadrant of the site (Figure 25).

Test Unit

Only one test unit, Arbitrary Unit 2, was excavated on the site. This unit a revealed a stratigraphy similar to other sites in the project area "valley" (Figure 26). Stratum 1 is a loose, brown (no Munsell) sandy clay loam with a moderate amount of organic detritus. Stratum 2 is a loose, reddish brown (no Munsell) sandy clay loam. Stratum 3 is a very compact, "slightly redder" (no Munsell) silt with veins of caliche. No artifacts were recovered from any of these sediments, though a sherd had been retrieved from the auger probe in the unit's northwest corner. Aside from the absence of cultural materials, the stratigraphy observed at this site is consistent with other sites in the valley. Thus, Stratum 2 represents a mixed sediment of plow zone soils, and Stratum 3 represents a relatively undisturbed B Horizon sediment. The near lack of cultural material suggests the relatively "light footprint" of the ancient human behavior in this particular place.

Blading

Blading activities occurred across the entire surface of the site. As a result of this work, three discovery features were located (Table 19 and Figure 25). One of these, D-3, appears to represent a buried (but truncated) corrugated vessel.

Site 42Sa28131

The site's topographic location might be described as the bottom of a small valley, or alluvial bottomland, along the north edge of the project boundary (Figure 2). The site was recorded as an historic camp with a single feature and a few historic artifacts (Figure 27) (Till 2009a).

Feature 1, a campfire, may have been lined with small sandstone slabs and may be as large as 1.2 m in diameter. The artifact assemblage includes fragments of sanitary-seal tin cans and a rifle cartridge. The rifle cartridge is a 2 1/8-inch long, British .303 cartridge with a rebated rim. It has a VPT 42 headstamp, dating its creation in 1942. The cartridge probably came to the United States soon after the cessation of World War II.

The historic artifacts suggest that the site might date to A.D. 1945. The cultural affiliation of the site is difficult to assess. It could have resulted from Anglo, Ute, or Navajo farmers, hunters, ranchers, or passers-though.

Evaluative testing activities on the site included judgmental surface collections, auger probes, test unit excavations, and blading. No new features were located by these means; however, a test unit emplaced over the apparent historic firepit verified its significance.

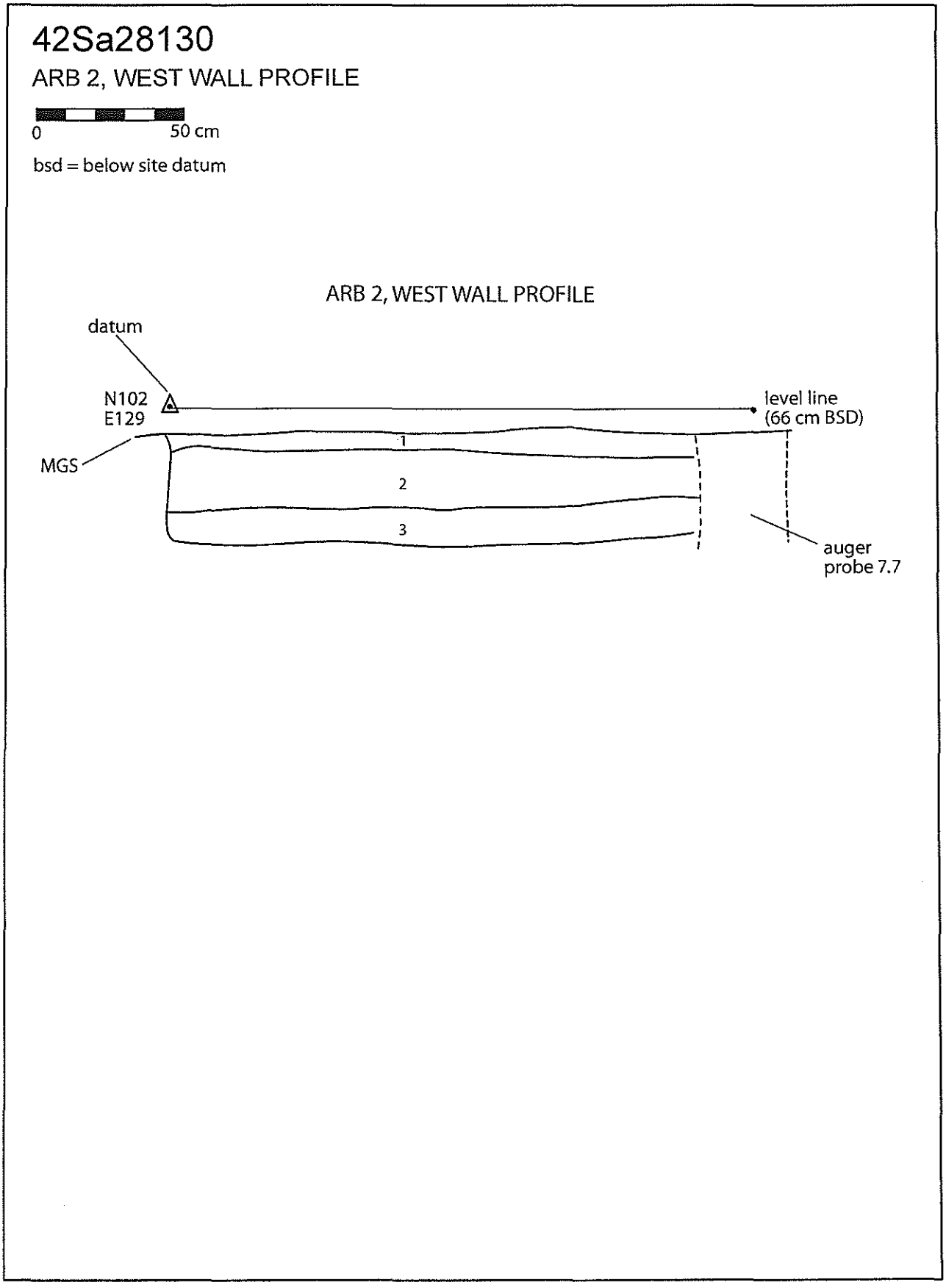

Figure 26. Site 42Sa28130, ARB 2, Profile.

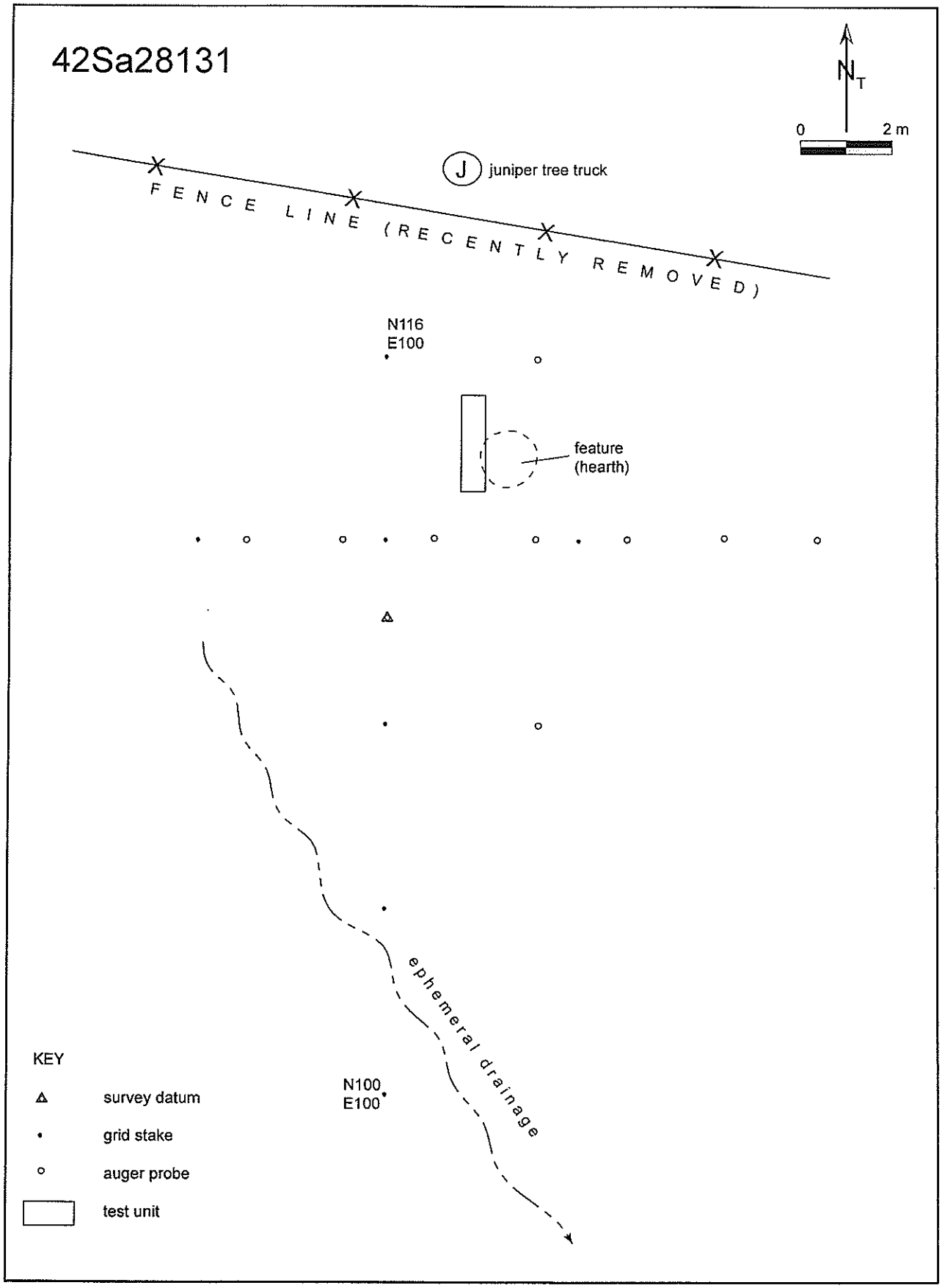

Figure 27. Site 42Sa28131, Testing Results

Surface Collections

Surface collections were made on a judgmental basis. Only one tin can fragment was collected outside the test unit.

Auger Probes

A total of 10 auger probes were excavated on the site (Figure 27). None of these located indications of cultural materials.

Test Unit

This test unit, Arbitrary Unit 2, is a north-south oriented unit that measures 0.5- by 2.0-m. The unit was placed with the southwest corner at N113/E101.6. The unit identified four strata (Figure 28). Stratum 1 is a very loose, yellowish red (5YR 4/6), silty loam. Organic detritus is a major component of the stratum, which is 10 to 15 cm thick. Stratum 2 immediately underlies Stratum 1, and is a very compact, red (2.5YR 4/6) silt with caliche inclusions. This sediment is interpreted as a shallow manifestation of the B Horizon. Stratum 3 consists of pockets of caliche soils between Strata 1 and 2, and may represent rodent disturbed sediments; indeed, rodent disturbance greatly churned the soils throughout the fill of the unit. Finally, Stratum 4 consists of hearth fill sediments that were exposed in the east edge of the unit. These sediments consist primarily of ash. Also recovered from Stratum 4 was a fragment of a burned tin can. This small exposure of the hearth sediments represent the very western edge of the hearth feature itself.

Blading

Excepting the area immediately surrounding the historic hearth feature, the entire surface of the site was bladed. No new features were located as a result of this work.

Site 42Sa28132

The site is situated on the slope of a finger-ridge, the crest of which is just to the west (Figure 2). Site 42Sa28132 was recorded as a small, prehistoric artifact and rock scatter (Till 2009a) (Figure 29). The artifacts include a few items of lithic debitage and several plain gray jar body sherds. The site may well be associated with the early component (possibly Basketmaker III) on nearby 42Sa6397, which lies just north on the crest of the finger-ridge. Having said this, archaeologist Mark Bond identified several Mesa Verde Black-on-white sherds as the site was bladed, suggesting that more than one component may be represented at the site.

Evaluative testing activities on the site included controlled surface collections, auger probes, and blading. These activities resulted in the location of 12 discovery features (Table 20).

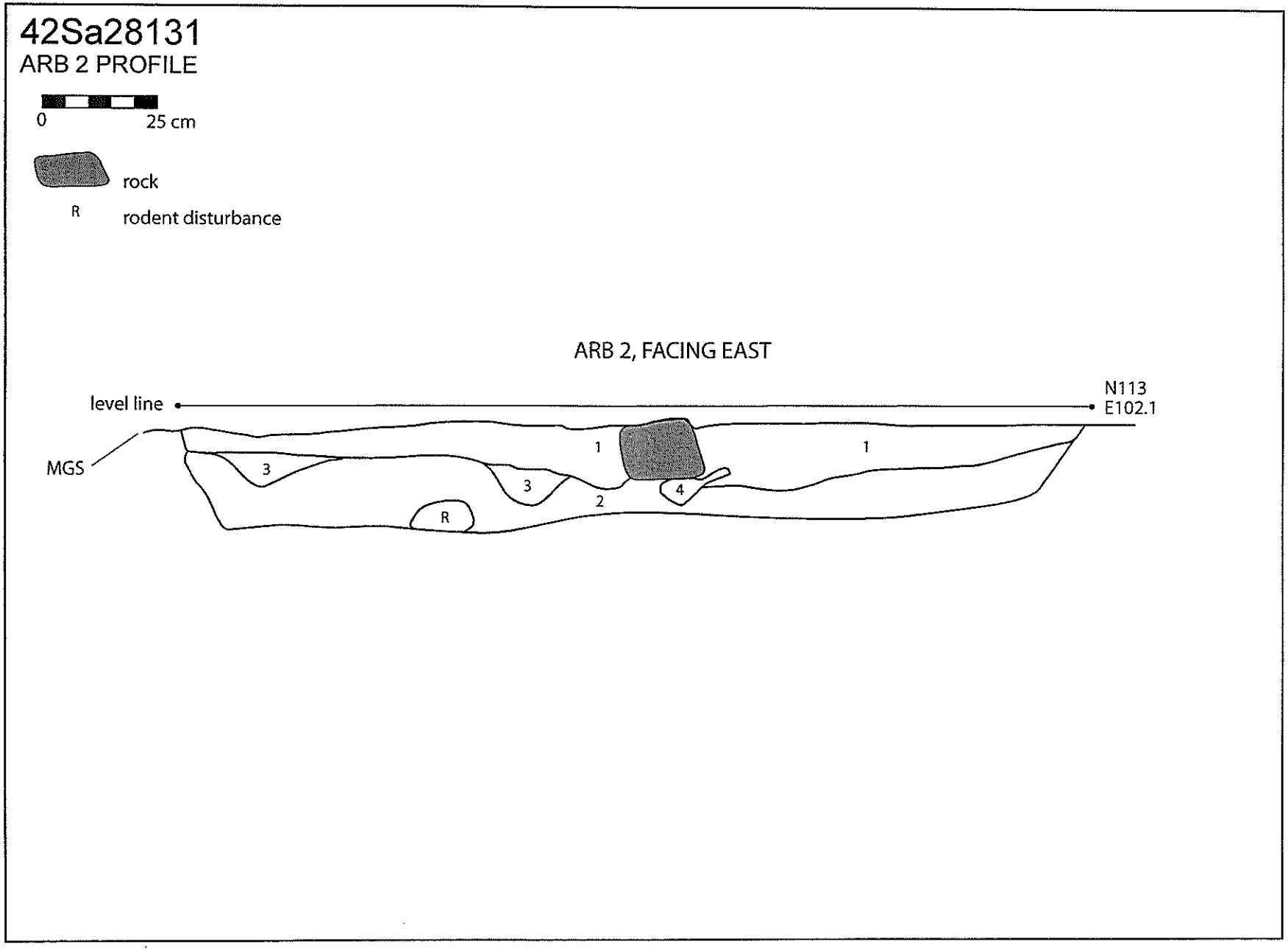

Figure 28. Site 42Sa28131, ARB 2, Profile.

Table 20. Discovery Features, Site 42Sa28132			
#	Shape	Size (m)	Description
1	Oval	Ca. 1.3 (N/S) by 2.75 (E/W)	This feature consists of several small amorphous sediment stains contained within an east-to-west oriented, oval-shaped area.
2	Unknown	Ca. 0.5 in diameter	Possible corrugated jar or large sherd associated with charcoal.
3	Oval	Ca. 1.5 (N/S) by 3.75 (E/W)	Small scatter of sandstone rock, several Plain Gray sherds, and a few fragments of groundstone. Possible surface structure remains.
4	Oval	Ca. 1.5 (N/S) by 2.25 (E/W)	Light gray sediment stain with charcoal.
5	Amorphous	Ca. 0.6 in diameter	Dark gray sediment stain with charcoal.
6	Amorphous	Ca. 0.5 in diameter	Dark gray sediment stain with charcoal.
7	Oval	Ca. 1.5 (N/S) by 2.0 (E/W)	This feature consists of several small amorphous dark gray sediment stains in an east-to-west oriented, oval-shaped area. Possible firepit with associated postholes.
8	Amorphous	Ca. 0.1 in diameter	Very small dark gray sediment stain. Possible posthole.
9	Amorphous	Ca. 0.6 in diameter	Dark gray sediment stain with charcoal.
10	Amorphous	Ca. 0.1 in diameter	Very small dark gray sediment stain. Possible posthole.
11	Amorphous	Ca. 0.7 (N/S) by 1.2 (E/W)	Dark gray sediment stain with charcoal.
12	Amorphous	Ca. 0.3 cm in diameter	Small, dark gray sediment stain.

Surface Collections

Controlled surface collections occurred in 4- by 4-m units across the whole site. These surface collections resulted in a small number of artifacts and a variety of artifact types including pottery, lithic debitage, and ground stone artifacts. One tin can lid was also collected.

Auger Probes

A total of 17 auger probes, illustrated in Figure 29, were excavated on the site. In the near complete absence of cultural materials in the probes, and the very low count of artifacts on the surface, no test units were established. Rather, the site was bladed to remove overlying sediments to the contact with B Horizon sediments.

Blading

Excepting a portion of the site's grid stakes, the entire surface of the site was bladed. This work resulted in the definition of Discovery Features 1 through 12. Figure 29 and Table 20 provide the locations and descriptions of these features. Most of the features appear to represent firepits and postholes. Discovery Feature 3 may represent the location of a small surface-architecture feature.

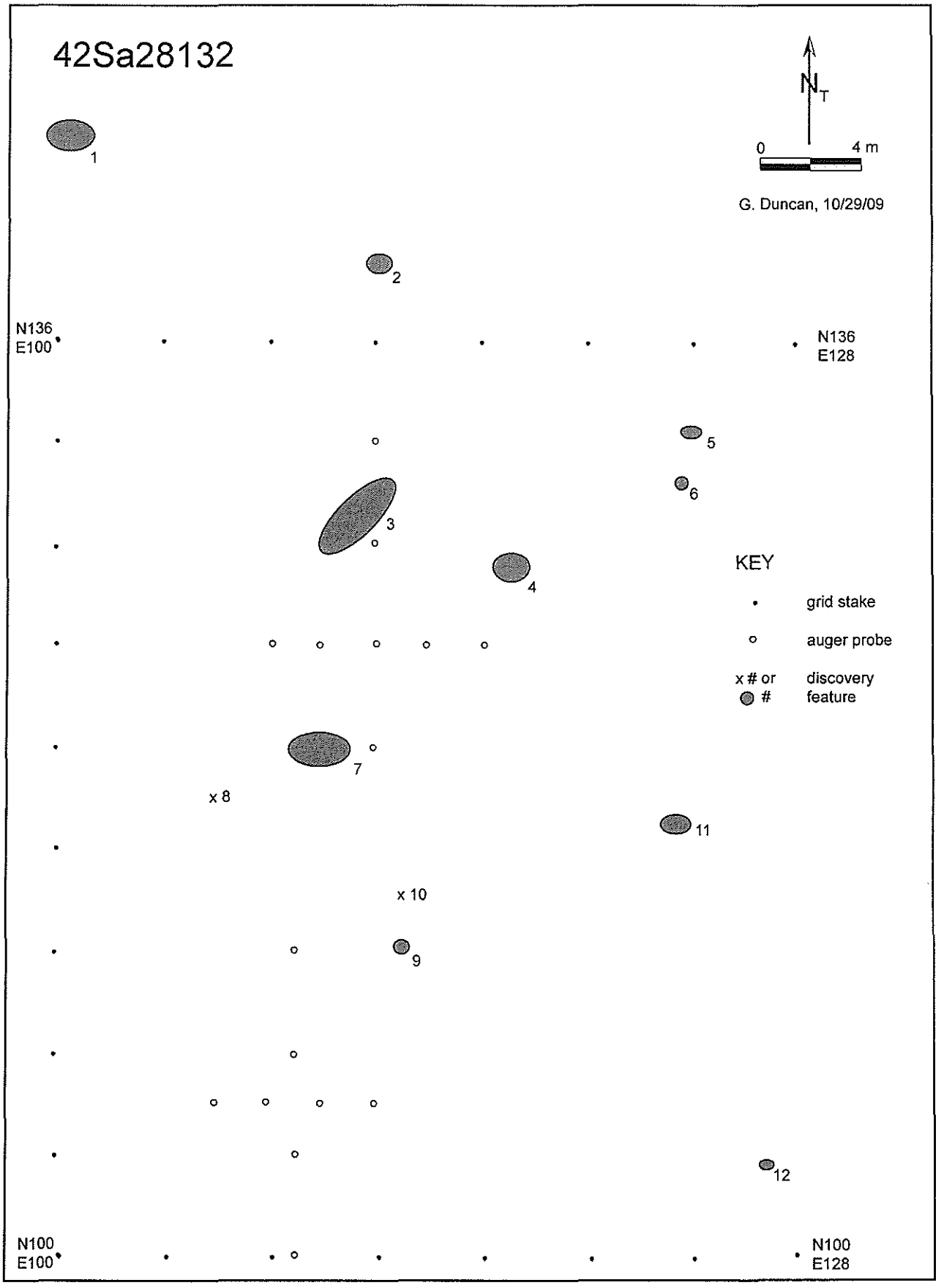

Figure 29. Site 42Sa28132, Testing Results

Site 42Sa28134

The site occupies the crest of a small finger-ridge that rises just slightly above the grassy flats of White Mesa (Figure 2). The site was recorded as a small scatter of lithic artifacts (Till 2009a) (Figure 30). The surface assemblage included several pieces of lithic debitage and two ground stone tools.

Site 42Sa28134 is difficult to assess for its temporal association. However, like the other three small sites in this corner of the project area, this site may represent the remains of a limited activity site, such as a food-processing feature.

Evaluative testing activities on the site included controlled surface collections, auger probes, test unit excavations, and blading. These activities resulted in the location of one discovery feature.

Surface Collections

Controlled surface collections occurred in 4- by 4-m units across the whole site. These surface collections resulted in a small number of artifacts, most of which was lithic debitage.

Auger Probes

A total of 73 auger probes, illustrated in Figure 30, were excavated on the site. Soft sediments in the northern and central auger probe lines suggested the possibility that underlying, compact sediments had been disturbed. This general area was examined by the placement of a single test unit, Arbitrary Unit 2.

Test Units

Arbitrary Unit 2 is a north-to-south oriented test unit that measures 0.5- by 2.0-m with a southwest corner at N116/E111. Three strata were defined in this unit (Figure 31). Stratum 1 is a loose, light brown (no Munsell), sandy clay loam with organic detritus. A few small fragments of burned sandstone were also noted in Stratum 1, which was about 9 cm thick. Stratum 2 is a moderately compact, reddish brown (no Munsell) sandy clay loam. This stratum is about 20 to 25 cm thick. Stratum 2 is interpreted as disturbed plow zone sediments. The interface between Stratum 2 and the underlying Stratum 3 is considered the bottom of the plow zone. Stratum 3 is a compact reddish brown (no Munsell) silt with caliche becoming substantially more frequent at about 80 cm below modern ground surface, indicating the top of the B Horizon.

Blading

The entire surface of the site was bladed, resulting in the location of one feature, Discovery Feature 1. This feature consists of a small, amorphous, gray sediment stain, measuring about 30 cm in diameter, found in the very north end of the site.

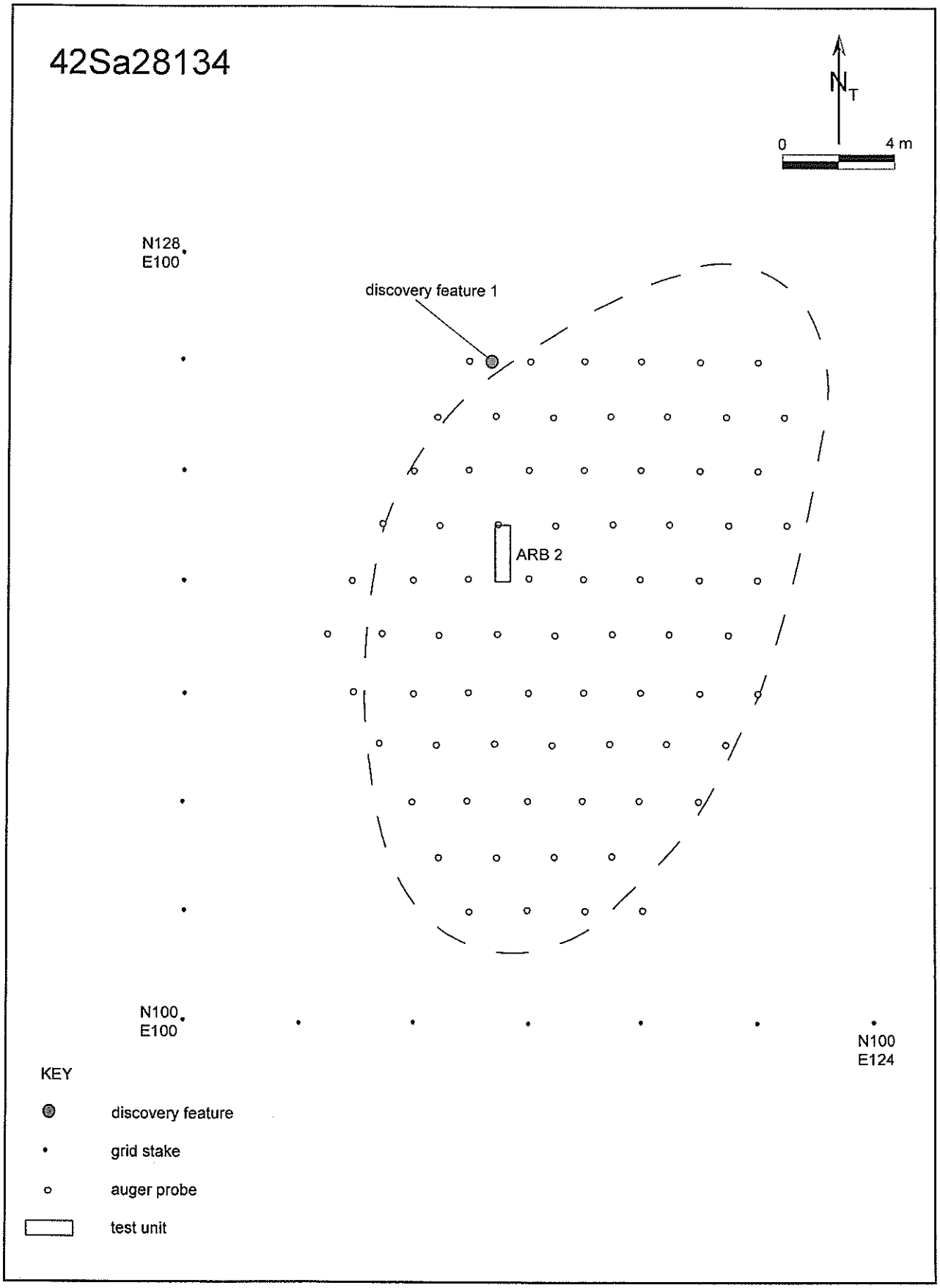

Figure 30. Site 42Sa28134, Testing Results

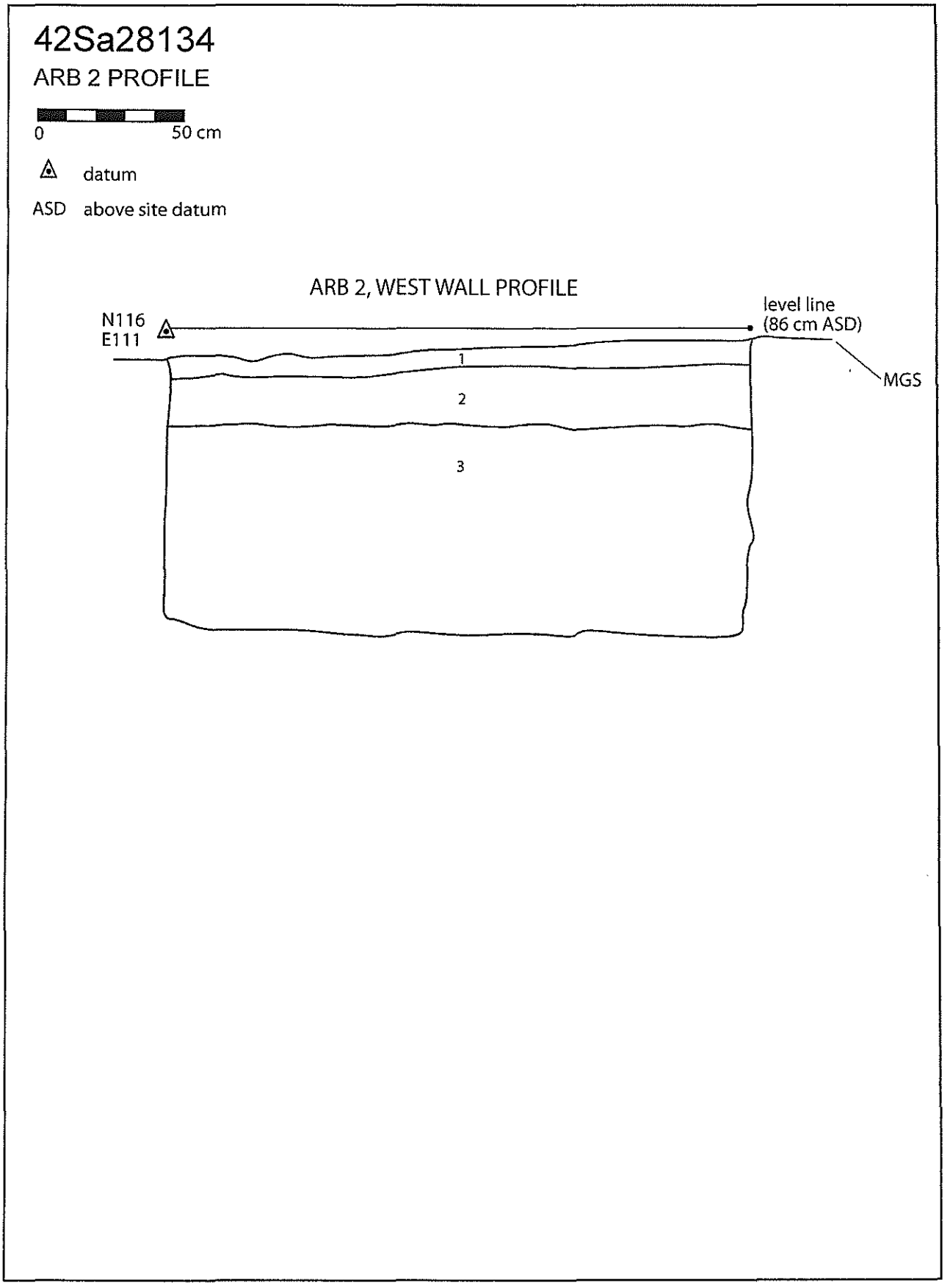

Figure 31. Site 42Sa28134, ARB 2, Profile.

Chapter 4: Research Design

This chapter lists a number of questions that data recovery at the ten sites in the Cell 4B project area might be able to answer. This chapter organizes these questions under several research domains: environment, chronology, subsistence, settlement, social organization, and technology. This chapter also describes how Abajo Archaeology would implement the research design through field methods, curation, and reporting.

Theoretical Underpinnings

The basic theoretical orientation that underlies the archaeological testing efforts for this project can be described as scientific. We affiliate our efforts with the over-arching field of North American anthropology, and follow a processual archaeology approach to our field work, laboratory research, and reporting (sensu Binford 1962; Cordell 1994). Attributes of this approach include an expectation of explanation for observed patterns in the archaeological record, an assumption that archaeological materials represent elements of the prehistoric society that created these materials, and that these social elements are interrelated and compose the social whole. Considering the whole as a system, a change in one or more elements results in the patterned and predictable change in other elements.

Having recognized our scientific orientation, we recognize that many of our results will also focus on the historical element of Southwestern archaeology. "History" is again coming to the fore of our discipline as witnessed in popular archaeology texts (e.g. Lekson 2008), in dissertation research (e.g. Glowacki 2006, Ortman in progress), and in recent archaeological research in southeastern Utah (e.g. Allison and others in press; Hurst 2000; Till 2009b). As Hurst (2000:78) has noted through the words of others, we must strive to learn *what* happened before we can adequately grapple with *why* things happened. The historical particulars have tremendous relevance to our nomothetic pursuits. Recent watersheds in our knowledge of ancient Puebloan history have led to a much greater understanding of what and why certain processes have occurred in the pre-Hispanic past. But just as importantly, "history" probably resonates with the lay public, particularly in southeastern Utah, much more strongly than archaeology's scientific orientation. The contributions of archaeology become more relevant to more people when an historic perspective plays a strong role in our research.

Research Domains

We have developed a set of six research domains for consideration in this research design. However, other multiple-site excavation projects on White Mesa have generated research designs as well. These have helped inform our proposed research design. Therefore, we summarize the research considerations of others here in Table 21.

Environment

The broad issue under this domain is essentially instrumental in that it involves the construction of a paleoenvironmental model. This domain has resonance with this project in that the region's environmental regimes through time directly influenced individual and community

Table 21. Research Problems/Hypotheses Developed for Excavation Projects Near the White Mesa Mill	
	Davis (1985)[1]
1	Subsistence and settlement practices vary through time on White Mesa.
2	Site function differs across White Mesa.
3	Habitation structures and other features have functionally distinct areas within them.
4	The archaeological record reflects the socio-behavioral processes through which prehistoric communities were organized.
5	Evidence for trade and other relations with foreign cultural groups exists on White Mesa.
6	Although White Mesa pottery is of the Mesa Verde ceramic tradition, most of the pottery made on White Mesa was locally made.
7	The quality of lithic craftsmanship is governed by the material utilized, not by the technology of the knapper.
8	There were paleoenvironmental/climatic shifts during the Anasazi occupation on White Mesa.
	Casiens (1980)[2]
1	Natural climatic conditions changed through time.
2	Human habitation affected the natural environment.
3	Although limited, Pre-Basketmaker III occupation occurred in the White Mesa area.
4	The relative amounts of cultigens, weedy plants and wild foods varied through time, and correlated with environmental change and technology.
5	The population curve varied as environment (carrying capacity) varied and as economic technology was adapted to varying climatic conditions.
6	Periods of higher population density show either a diversity in site types and settlement patterns as more niches were exploited, or a more specialized adaptation as greater reliance was placed on one resource.
7	Some sites were seasonally or intermittently inhabited.
8	Sites were located near important economic resources.
9	Sites of different types were inhabited at the same time.
10	Much of the activity took place in "use areas" outside of the structures; such activities might include cooking and roasting, eating, food preparation (grinding and butchering), stone tool fabrication and sharpening, and pottery making.
11	Dates of pottery styles and architectural styles do not agree exactly with Mesa Verde dates for these styles.
12	Changes in architecture (room types) and site layout reflect changes in community organization.
13	Local quarries or sources supply most necessary materials for tools and pottery.
14	While the inhabitants were largely self-sufficient, they were part of a much larger trading sphere in which exotic materials were distributed.
15	The White Mesa inhabitants had trading and possibly other (ideological) relationships with large sites nearby.
	Firor, Greubel, and Reed (1998)[3]
1	Cultural affiliation and chronology—suggests the possibility of formulating a phase-based system for White Mesa.
2	Site structure—primarily concerned with the identification of how different areas were used within a given site.
3	Site function—determines the primary function of a site, presumably a determination that could be of use at the wider landscape level.
4	Subsistence—seems to simply propose to examine the subsistence data gleaned from the site.
5	Settlement patterns—seems primarily concerned with issues of "mobility and scheduling," and implicitly tackles the issue of "site typology" (which gets back to "site function" above.
6	Social organization—appears to be mostly concerned with "residential organization" or the "composition of groups occupying any unit of space" (i.e. activity area, household, community, etc.).

7	Technology—takes an inductive approach (i.e. generate data, then look for informative patterns); also chooses to focus on lithic technology and correlate it with site type and time period. For the latter, Alpine actually generates a few hypotheses: 1) lithic artifact assemblage signatures will vary between field houses and residences and 2) BM assemblages will differ considerably from Pueblo.
8	Extra-regional relationships—Alpine poses this basic hypothesis: evidence for long-distance trade will tend to have been with other Anasazi groups, not Fremont.
9	Seasonality—inductive, instrumental research (i.e. important for settlement/subsistence research domains, so will look for data in architecture, floral, and faunal data).

[1]The research design in Davis (1985:29-33) presented as a "list of research problems." These are reproduced here, verbatim. These problems are essentially hypotheses, and are presented with expectations if they are true.

[2]Casjens (1980:44-64) produced a set of hypotheses that are repeated verbatim above. These statements are followed by "tests" that outline how the hypotheses should be addressed.

[3]Firor and others (1998:14-22) list a set of "problem domains," the headings of which are reproduced here in italics. The commentary following the heading is my understanding of how the particular problem domain was to be approached by Alpine's research. For the most part, few hypotheses were actually presented.

settlement strategies—the decisions of agriculturalists to settle in, or move beyond, the Four Corners region. A strong paleoenvironmental model could then be used to provide expectations for agricultural yield in particular subregions across the northern Southwest. Generally, many data points are required for any reasonable reconstruction of the area's paleoenvironment. We suggest that excavation data from sites on the White Mesa mill property may contribute substantially to the development of such a data set. To that end, we propose to collect what data we can that might be of use in the development of such a model. In the meantime, we pose questions that require more modest answers, such as:

- Given chronological data from the Cell 4B sites, and paleoclimate data from southwestern Colorado (Van West 1994; Varien and others 2007) and from Dean and others (1985), what were the climatological regimes for the Puebloan sites under consideration here?

- Do the pit structures at 42Sa6393, 42Sa6397, 42Sa6757, and 42Sa28129 contain materials, such as architectural wood, that might improve our understanding of paleoclimate?

- Are archaebotanical and faunal data present that could describe the various paleoenvironmental regimes represented by the Cell 4B sites?

The kinds of data needed to address these questions include tree-ring data, pollen data, flotation data, and faunal data. To accommodate these needs, we propose that tree-ring data be retrieved whenever possible, regardless of the context. For pollen and flotation data, we recommend the systematic sampling of floor and midden contexts when encountered, and the sampling of features when warranted, particularly pit features. Faunal bone will be collected when encountered.

In anticipation of the White Mesa Mill's long-term operation and future mitigation efforts, we suggest the establishment of a small temperature monitor, the data from which could be periodically downloaded to track specifically temperature variation. Such efforts are currently underway in other nearby localities (e.g. Mesa Verde National Park, Crow Canyon Archaeological Center, McElmo Canyon, and Bluff, Utah). The establishment of such a "weather station" at the Mill property would be discrete (the devices are the size of a ping-pong ball) and would come at little or no cost to the Mill. Further, it would contribute to a larger, region-wide effort to document environmental variability in the region.

Historic data may also be very informative when considering such a research domain. We suggest that a review of historic settlement on White Mesa, as it relates to environment and agriculture, could contribute significantly to this research domain.

Yet another kind of question that is pertinent to this domain has to do with the availability of resources to the occupants of White Mesa. Following the excavation of sites within the Cell 4B project area, we will consider the distribution of resources such as water, lithic materials, and clay materials as they relate to this locus of White Mea.

Chronology

Of all the research domains considered here, we will probably concentrate on chronology with the greatest intensity. Absolute dating techniques such as dendrochronology may yield ideal and precise measures of time. However, relative dating techniques such as pottery assemblage dating may also provide very useful information. To this end, we suggest that some of our concerns may be "instrumental" in nature: the improvement of our capacity to use such relative means as pottery typologies may be one of the goals of research associated with the project. In addition to "when" a site was occupied, a question under the chronology research domain may ask "how long" a site was occupied.

Some of the sites clearly have no long-term habitation features associated with them (e.g. 42Sa28128, 42Sa28130, and 42Sa28134). While tree-ring dates may not be available for these sites, coarser-grained methods might be. Furthermore, pollen data from certain of these features may permit some insight regarding the particular season of use for these places. We propose that smaller sites such as these might have been associated with the tending of agricultural fields, an hypothesis that might be tested with pollen data.

The data needs for this research domain include sources for absolute dating methods (e.g. tree-ring samples, radiocarbon samples from annual plants or annual plant remains, and archaeomagnetic samples) as well as sources for relative dating methods (the pottery assemblage, other diagnostic artifacts, and architecture). The length of structure occupation can be based upon accumulations data (Lightfoot 1994; Varien and Mills 1997). We are fortunate to have at least one site, 42Sa6393, with reasonably intact midden deposits. Testing at this site has shown these deposits to be fairly discrete as well as relatively shallow. Understanding this, we propose to excavate both midden areas at this site (Nonstructures 1 and 2), particularly given that the removal of these deposits will be cost-effective.

Subsistence

This research domain addresses questions pertinent to the subsistence economies for households at particular sites within the Cell 4B area, especially 42Sa6393 and 42Sa6757, places that seem to have been occupied year-round for multiple years. In addition to direct evidence for the use of particular plants and animals at these sites, our research would also consider indirect measures of subsistence such as particular lithic tool types, food-processing facilities, and pottery artifacts.

- Were the occupants of 42Sa6393 and 42Sa6757 engaged in a primarily agricultural subsistence economy, a mixed subsistence economy, or a predominantly wild foods subsistence economy?

- What role did the sites play in the subsistence economy of the Pueblo societies associated with the Basketmaker III period and the Pueblo II and III periods? Do plant and animal profiles suggest that individual sites served primarily as habitation, loci of ritual importance (i.e. feasting), or as special-function loci such as seasonally occupied field houses?

The subsistence domain articulates with the other domains considered in this document. With regard to environment, we have already pondered the question of whether there were particular periods through history that might have been better for agriculture on White Mesa. One of the important problems recognized by past researchers on White Mesa has to do with a changing subsistence and settlement strategies through time. Is there a correlation between agricultural practices and environmental regimes? As an example, is a more "extensive" approach to land use and corn-growing associated with periods of greater environmental variability (i.e. increase the number of fields across a broader landscape in the hope that one of the fields will be more productive)? Clearly, this question leads to the research domain of "settlement."

Settlement

"Settlement" issues may address site-specific questions, local site distribution problems, and region-wide issues that address large-scale abandonment and resettlement. We suggest that all scales of such a research domain can be addressed by the Cell 4B project, though not for each individual site.

At the individual site level, the settlement domain grapples primarily with functional issues. One of the most salient questions apparent from past research on or near the White Mesa Mill property has to do with the great variability apparent in pit structure architecture during the Pueblo II period (Casjens 1980; Davis 1985; Firor and others 1998). Specific questions that we could address include:

- Do the pit structures at 42Sa6393 contain the architectural elements commonly described for "kivas" or for "pithouses"?

- What primary function(s) did the pit structures serve? Is there a functional difference between kivas and pithouses?

The documentation and analysis of architectural and artifactual data from the pit structures will suffice to answer most or all of the above questions. Likewise, these data could also inform us about the roles that smaller sites played in the larger settlement systems during the Basketmaker III and Pueblo II/III periods.

- Do the smaller sites represent field house loci? Or do these places represent loci of other activities such as food processing?

At present, it appears that ridgeline locations may have been the preferred locations for inhabitations, while the lower alluvial valleys with deeper soils may have been preferred for agricultural fields.

- Does this hypothesis work in the context of our present project? How does it fare in consideration of other research that has been conducted on White Mesa? Is this a settlement pattern that might be applied at a larger regional level?

Obviously, the settlement domain broadens to include problems beyond the sites in the Cell 4B project area. The domain delves into the relationships that site occupants had with others within the region as well as outside the region. Site abandonment issues become a point of contact for questions regarding extralocal relationships.

- What abandonment modes are indicated by the contents of the pit structures? Were architectural elements recycled and artifacts removed for use elsewhere, suggesting that the occupants moved only a short distance away? Or were the structures burned and their contents left behind, indicating a long-distance move?

- If a long-distance move is indicated, is there evidence for the destination?

Pottery ware data and lithic material type data may assist in the recognition of extralocal relationships with other parts of the Southwest. Intensive analyses of these materials may help address these questions. While we do not focus on laboratory processes in this document, it is important to acknowledge these issues and data needs here. Trace element analyses in both pottery clays and lithic materials may help resolve sourcing issues for both material types, and greatly assist in our understanding of the dynamic sets of relationships between different groups of people within the Mesa Verde region and beyond. As an immediate example, it has been proposed that the azurite spheres recovered from 42Sa6757 may derive from Lisbon Valley to the north. Could trace element analysis of these items from 42Sa6757 support this hypothesis?

Social Organization

Questions pertinent to social organization overlap considerably with all the above research domains. For example, the determination of a pithouse's or kiva's function is fundamental to both settlement and social organization questions. Similarly, evidence of feasting ritual is also pertinent to the subsistence domain. This domain also operates to cover issues that are site-specific as well as trends that are regional.

At the site-specific level, a basic question that we have for the habitations at 42Sa6393 and 42Sa6757 has to do with household size. How many people lived in these places? Architecture and artifact data will help address this question. For 42Sa6393, this underscores the importance of excavating the middens here in their entirety. Demographic data will also be supplemented by information from burials. Out of respect to American Indian concerns, we do not propose destructive or in-depth analyses of human remains. We propose to gather simple data through in-field analysis such as age, sex, cause of death (if possible), and observations of pathologies as they are apparent.

Settlement issues, such as site distribution, will also figure in our attempt at some reconstruction of community organization. This kind of problem exceeds our abilities in the present project; however, we can consider our final results in light of what excavation and survey data already exist for White Mesa. Ultimately, perhaps when most of the projected expansion activities on the White Mesa property are nigh completion, a summative volume on the archaeology of White Mesa would be appropriate to best tackle this particular problem.

The social organization research domain may also address the esoteric concerns of problems that delve into ideology. Again, architecture and artifact analyses will help address things ideological. One of the questions we have for Basketmaker III period sites has to do with azurite spheres. Are these objects truly associated with only the Basketmaker III period? With regard to 42Sa6393, which seems to be solely associated with the early to middle Pueblo II period, are there trappings of the so-called Chaco Phenomenon present? Till (2007) has proposed a strong correlation with the lithic material, Brushy Basin chert, in Pueblo II period site assemblages in southwestern Colorado, and Hurst (personal communication with Jonathan Till, 2009) has made the same observation for southeastern Utah. Does the lithic assemblage at 42Sa6393 also reflect this lithic material preference, particularly in comparison with other sites on the property that are associated with different time periods?

Technology

"Technological" concerns will address detailed examinations and analyses of features and artifacts that heretofore have been understudied or perhaps not studied at all. These problems will not be addressed simply for the sake that they are there; rather, such studies will only be proposed if they are pertinent to addressing other domains in the proposed research design. These studies will be proposed at a later date in a technical proposal/research design specific to laboratory analyses. However, we feel it appropriate to raise the idea that pottery clay and temper sourcing analyses could greatly improve our recognition of extralocal pottery types should such be recovered. Furthermore, such studies would also be invaluable to our understanding of local pottery types, particularly red ware pottery. We anticipate that very modest samples, about 10 samples for clay sourcing and 10 to 20 for temper sourcing, would achieve our goals for this project.

Methodological Madness

This section presents the methods and techniques that will be used to excavate and document archaeological features and their contents. We include here our general excavation approach, as well as site-specific methods. This section also describes the laboratory methods used to catalog and analyze the artifact assemblage collections and samples. We also describe our curation and reporting processes.

Provenience System

Context is everything. Almost, anyway. Understanding this, we propose the implementation of a robust provenience system that is used widely by other archaeological organizations throughout the Four Corners region. This system, the "PD/FS" system, developed from the Dolores Archaeological Project (Ward 1999). In this provenience system, each identified horizontal and vertical context within a site is assigned a unique "provenience designation" number (PD). The numbers are assigned sequentially, starting with "2." The numbers "0" and "1" will be assigned to "general site, unknown" and "general site, modern ground surface" contexts, respectively. Ideally, these numbers will never have to be used, but will be maintained should artifacts become separated from their more specific contexts. The

testing program for this project commenced the use of the PD system on the Cell 4B sites (Till 2009a); the data recovery project will continue its use. For example, if testing activities documented 51 PDs at a site, the data recovery project would start with PD 52 at that same site.

After the site itself, which is designated with a Smithsonian site number (e.g. 42Sa6391), our provenience system will distinguish three types of study unit: structure, nonstructure, and arbitrary (Crow Canyon Archaeological Center 2001; Fuller and others 2002:85-6). A "structure" study unit generally indicates a formal architectural feature, such as a pithouse or a masonry roomblock, but may be used to describe less formal features such as ramadas. A "nonstructure" study unit designation is used to describe nonarchitectural features such as middens and plaza areas, or nonconstructed extramural prehistoric ground surfaces. An "arbitrary" study unit refers to a unit that has no apparent cultural associations.

Table 22 refers to the types of horizontal and vertical subdivisions that will be used during the surface and subsurface investigations of the Cell 4B sites. The horizontal subdivisions include whole study unit (WSU), half, quadrant, grid unit, segment, backhoe trench, probes, and wall. Study units that are not subdivided horizontally are designated by WSU. Many structures, however, will be excavated by half or quadrant. In the case of "halves," the feature being investigated will be roughly divided into two equal portions, usually along a cardinal axis (north to south, or east to west). Some structures may be excavated in "quadrants," with the feature being divided into four, approximately equal portions, often according to cardinal direction. "Grid units" refer to square or rectangular units that are oriented to a site's grid. Each grid unit is identified by the coordinates of the unit's southwest corner. The largest grid unit will measure no more than 4- by 4-m. "Segments" are hand-excavated units that will not be on the grid, nor will they be halves or quadrants of study units. These units are generally not oriented to a cardinal direction. "Backhoe trenches" are machine-excavated units, many of which will have been previously excavated by the Antiquities Section. The designation "probe" refers to auger and/or shovel probes. Finally, "wall" will probably see little use, but will be used when documenting artifacts or samples recovered from a formal, architectural wall.

Table 22. Horizontal and Vertical Subdivisions

Horizontal Subdivisions	**Vertical Subdivisions**
Halves	Stratum
Quadrants	Level
Test Unit	Surface
Whole Study Unit	Full Cut

Vertical subdivisions consist of full cut, stratum, level, and surface. "Full cut" simply refers to those cases where no vertical subdivision is used within a unit. "Stratum" may designate natural or cultural strata that are apparent by color, texture, inclusions, and stratigraphic breaks. In contrast, "level" is an arbitrary vertical subdivision. Levels may be used when a stratum exceeds 20 cm in depth, thus providing excavators with more vertical control. In this scenario, levels will be vertical subdivisions of a particular stratum, and will start with "1" at the top of the stratum. The distinction "surface" refers to cultural surfaces, which will vary in their degree of formality. Some surfaces have been clearly constructed, while others are evident by virtue of use-compaction, while others are simply inferred and virtually undetectable except by the presence of features and flat-lying artifacts.

"Field Specimen" numbers will be assigned, in the field, to "bulk artifact" categories, such as pottery sherds or lithic debitage, "samples," such as pollen samples or tree-ring samples, and individual artifacts, such as projectile points or manos. These numbers will be assigned sequentially, starting with "1," within each PD. Artifact cataloging techniques are further described in the Crow Canyon Archaeological Center laboratory manual (Ortman and others 2005: Chapter 3).

Field Excavation Methods

Data recovery techniques will involve a variety of intensive excavation measures, each used according to the context being investigated. In most cases the entirety of a site, at least as much of it that remains, will be excavated.

In those cases where well-preserved midden areas are relatively intact, the middens will be excavated according to 2- by 2-m grids. As these are relatively shallow features, not seeming to exceed 20 cm in depth. These areas will be excavated full cut unless meaningful stratigraphy (e.g. different depositional events) is observed. All fill will be screened through ¼-inch mesh, and the resulting artifact assemblage collected for further analysis. Each midden unit will be sampled for macrobotanical remains, each sample being 2 liters of fill. These samples will be processed in-house. The heavy fractions of these samples will be fine-screened for microrefuse. A sample of the light fraction materials will be analyzed at a later date by a paleobotanical specialist.

All of the sites in consideration here have relatively small, extramural features (e.g. hearths, postholes, etc.). These features will first be scraped to define their perimeter. After a feature's surface of origin has been drawn and photographed, one-half of the feature will be excavated full cut (without vertical subdivision). When this half is completed, the profile will be drawn and photographed. The remaining fill will be excavated, segregating strata if such are observed in the profile. At least one liter of fill will be collected from a feature for flotation. The remainder of the fill will be screened through ¼-inch mesh. Upon the feature's complete excavation a plan view map will be drawn of that feature and a final set of photographs taken.

At least eight pit structures, and perhaps nine, are known to exist on the Cell 4B property. All structures will first be trenched, either by hand or machine (see below for specific site details). Trenches will be excavated on a north to south orientation, unless the structure's orientation is clearly different (most pithouses and kivas in the Mesa Verde region have a north-to-south orientation). The specific feature will be have one or more profiles drawn, and the profile photographed. Once the feature's stratigraphy has been documented, existing overburden will be removed. Pueblo II period pithouses may be excavated by half. Basketmaker III pithouses, however, may be excavated in fifths at the discretion of the supervising archaeologist. Also at the discretion of the supervising archaeologist (and in consultation with the project director), overburden material may removed by hand or machine, and may or may not be screened through ¼-inch mesh. At the point that structural collapse deposits are observed (i.e. wall and/or roof fall), the structure will be excavated by hand according to stratum. Artifacts found in association with the structure's floor(s) will be point-provenienced. Should roof fall be

observed, point location of artifacts may also occur in this context. Features found in association with the floor or other interior surfaces will be excavated individually according to the procedures described above for small pit features. Any burned structural members encountered will be documented and removed as tree-ring samples should the materials have enough integrity to warrant sampling. Discretionary pollen and flotation samples will be collected from each structure, but will at least include samples from each quadrant of a structure's floor.

Site 42Sa6393

Of the ten sites in the Cell 4B project area, this site will be the most intensively excavated. This site appears to a represent an early to middle Pueblo II period occupation. At least four pithouses are anticipated for this site (Discovery Features 6, 8, 9, and 10). One of these features appears to have burned (Discovery Feature 10). The site also harbors two sheet middens (Nonstructures 1 and 2) as well as several known extramural features (Discovery Features 1-3).

At least two of the pit structures (Discovery Features 6 and 9) may require the use of a backhoe to remove overburden sediments. Hand-excavation techniques may suffice to expose Discovery Features 8 and 10. In addition to the excavation of the pit structures themselves, the areas immediately surrounding these features will be excavated to expose the immediate extramural spaces around these rooms. Otherwise, excavation of the pit structures will observed the methods discussed above.

The midden areas (Nonstructures 1 and 2) will also be the subjects of intensive excavation. These features will be excavated as 4- by 4-m units. Systematic shovel-and-trowel excavations will accomplish the task of sampling the midden as well as exposing any subsurface features associated with the prehistoric ground surface. The methods and techniques for excavating the midden areas have been discussed in the general excavation methods for the project.

Several other small features (e.g. Discovery Features 1-3) have been documented for the site. These will be excavated according to the general excavation methods discussed earlier.

Site 42Sa6397

This site appears to be associated with an early Pueblo period occupation. At least one pithouse is likely on the site (Discovery Feature 11); the remains of two possible surface structures are also present (the jacal concentration in the southeast corner of the site and Discovery Feature 12). The site also includes eight other small discovery features and two small pit features in previous Antiquities Section backhoe trenches.

The excavation of Discovery Feature 11, a likely pithouse, will require the use of a backhoe to remove what seems to be a homogenous, relatively clean overburden sediment. The area immediately surrounding the structure will be excavated in an attempt to discern the prehistoric ground surface associated with the feature, as well as any extramural features

associated with the pithouse. Otherwise, this feature will be excavated according to the general methods described for excavating pit structures.

The two possible surface structures will be investigated by systematically excavating the grid units associated with these areas. In the area of the jacal concentration, this might be relatively easy as the prehistoric ground surface appears to be very shallow. However, the area around Discovery Feature 12, with its difficult stratigraphy, is more problematic.

Antiquities Section backhoe trenches yielded evidence for two small pit features. These areas of the trenches will be re-excavated with a backhoe. Once located the features will be excavated by hand.

Finally, eight other relatively small features have been documented on the site. Discovery Features 1 through 10 will be excavated according to the methods outlined earlier.

Site 42Sa6757

This site has been the subject of earlier intensive excavations by Abajo Archaeology (Davis 1985). Two likely pithouses have been located on the site (Discovery Features 1 and 2), as has a small pit structure (Discovery Feature 3). In addition to these features, blading activities have revealed 19 other smaller features. Finally, we propose to sample a portion of the site's midden area.

Of the two pithouses, one appears to have burned (Discovery Feature 1); the other is unburned (Discovery Feature 2). Discovery Feature 3 also appears to have burned. As this portion of the site has been bladed, no prehistoric ground surface is present for investigation. Consequently, work will focus on the structures themselves, which will be excavated entirely by hand. The structures will be excavated according to the general excavation procedures outlined earlier for pit structures.

The 19 smaller features are mostly concentrated in an area to the southeast of Feature 1, a pithouse that had been previously excavated by Abajo Archaeology. All 19 features will be excavated according to the procedures outlined above for small features.

The site's midden area was not investigated in any intensive way in the past. We propose to sample a few locations in this area to better characterize the material culture from 42Sa6757. We suggest that a minimum of three 4- by 4-m grid units be excavated to sample this sediment. These areas will be selected at the discretion of the supervisory archaeologist working on the site.

Site 42Sa8014

This site had been investigated earlier by Abajo Archaeology (Davis 1985). However, surface scraping revealed the presence of ten subsurface features (Discovery Features 1 through 10). These relatively small features will be excavated according to the methods outlined earlier for small features.

Site 42Sa28128

Testing activities revealed the presence of seven relatively small subsurface features. These features will be excavated according to the methods outlined earlier for small features.

Site 42Sa28129

One pit structure and nine other, smaller features were documented during testing activities. Since the prehistoric ground surface surrounding the pit structure (Discovery Feature 10) has been entirely stripped, data recovery will focus entirely on the interior of the pit structure. The interior sediments of the feature will be excavated by hand. Otherwise, the feature will be excavated by way of the procedures described earlier for pit structures. The nine other smaller features will be also be excavated by the methods outlined earlier for small features.

Site 42Sa28130

Testing activities revealed the presence of three relatively small subsurface features. These features will be excavated according to the methods outlined earlier for small features.

Site 42Sa28131

Only one feature is known to be present on the site. This feature, an historic hearth, will be excavated according to the procedures outlined earlier for small features.

Site 42Sa28132

Testing activities revealed the presence of 12 subsurface features. Seven of the features are relatively small (Discovery Features 2, 5, 6, 8, 9, 10, and 12). These features will be excavated according to the methods outlined earlier for small features. Five of the features are larger, but do not appear to be pit structures. These features (Discovery Features 1, 3, 4, 7, and 11) will be bisected with a small hand-excavated trench, reassessed for its function and size, and then excavated in a manner appropriate to the feature.

Site 42Sa28134

Testing activities revealed the presence of only one small subsurface feature (Discovery Feature 1). This features will be excavated according to the methods outlined earlier for small features.

Laboratory Methods

All artifacts and other specimens recovered from the sites will be brought to the Abajo Archaeology office in Bluff, Utah, at the end of each working day. As noted above, these items will be cataloged in the field. Artifacts will be cleaned and processed for analysis. The catalog will be entered into a relational database (Microsoft Access). The results of these analyses will

be entered into separate Access databases. All databases will share as key fields the site number, the PD number, and the FS number. Artifact analyses are discussed further below.

Lithic Analysis

The analyses of chipped stone and ground stone artifacts will be conducted by Jonathan Till and/or Benjamin Bellorado, both of whom are (usually) employed in the research lab of Crow Canyon Archaeological Center and both of whom are well-experienced with the lithic artifact types and the lithic material types of the immediate project area as well as the broader Four Corners region. These analyses will be conducted according to the methods outlined in Crow Canyon's on-line laboratory manual (Ortman and others 2005). All formal chipped stone tools and ornaments will be photographed and/or illustrated. We anticipate a relatively large assemblage from 42Sa6393, and much smaller assemblages from the remainder of the sites.

Pottery Analysis

Pottery analysis will be conducted by Mark Bond and/or Benjamin Bellorado. Both are well-experienced in the analysis of pottery from the region. These analyses will be conducted according to the methods outlined in Crow Canyon's on-line laboratory manual (Ortman and others 2005). Complete or nearly complete vessels will be photographed. Based on testing activities, we anticipate a relatively large assemblage from 42Sa6393, and much smaller assemblages from the remainder of the sites.

Macrobotanical Specimens

As noted earlier, flotation samples will be taken from all appropriate contexts within pit structures and other architectural features, small extramural features such as hearths, and from middens. These strata include both architectural and nonarchitectural floor features, roof fill, floor fill, and other culturally significant strata. In addition to the macrobotanical specimens, flotation samples may be used to obtain lithic and faunal micro-refuse specimens. These samples will be processed according to methods outlined in Ortman and others (2005). The processed samples will then be submitted to Dr. Karen Adams in Tucson, Arizona for analysis.

Pollen Specimens

Sediment samples from which pollen samples can be extracted will be recovered from in and around architectural and nonarchitectural features. Small features within the larger features (e.g. hearths, mealing bins) will be sampled by taking samples around the outside of the feature as well as from within it. The floor of the pit structures will be sampled in quadrants (i.e. four samples from the floor). Samples will also be taken from any culturally significant stratum encountered. The samples will be submitted to either the Laboratory of Paleoecology at Northern Arizona University, Flagstaff or PaleoResearch Labs in Golden, Colorado.

Faunal Bone Specimens

All faunal remains recovered during data recovery will undergo analysis and will include, when possible, species identification, side, and skeletal element. Modifications such as burning and cut marks will also be documented. All bone tools will be photographed and/or illustrated. Faunal remains will be submitted to Josh Edwards, of Cornerstone Environmental, Flagstaff, Arizona. Based on initial fieldwork at the site (Davis 2008), we anticipate a very small faunal bone assemblage.

Radiocarbon Specimens

If the structure is not burned, charcoal specimens observed associated with roof-fall and floor fill or features will be recovered for radiocarbon dating. Efforts will be made to minimize the effects of "old wood" dating by selecting annual plant remains (e.g. charred maize), twigs, or bark. We estimate collecting at least three samples. Samples will be submitted to Beta Analytic, Inc., Miami, Florida.

Dendrochronological Specimens

We do not currently anticipate the recovery of relatively intact structural remains from Feature 2. However, if such specimens are encountered, then samples will be submitted to the Tree Ring Laboratory in Tucson, Arizona.

Archaeomagnetic Sampling

Archaeomagnetic sampling will be performed by Kay Barnett of Cortez, Colorado. The samples will then be submitted to the Archaeometric Laboratory at Colorado State University. There is a good potential for collecting samples from at least several of the pit structures in the project area.

Human Osteological Remains

Previous research at prehistoric sites on White Mesa have documented a moderate number of human burials (e.g. Casjens 1980; Davis 1985; Firor and others 1998). In the event that human remains are encountered, excavators will treat the remains with sensitivity and respect in the spirit of NAGPRA (Native American Graves Protection and Repatriation Act). If human burials are encountered, Abajo archaeologists will cease excavation in the vicinity of the remains and contact the San Juan County Sheriff and Medical Examiner, as well as the Division of State History. Abajo Archaeology will engage Kay Barnett of Cortez, Colorado to conduct the excavation and analysis of any new human remains data from the proposed project will also be submitted to Ms. Barnett. Human remains will be submitted to the Division of State History for proper treatment and reinterment.

Reporting and Curation

Upon completion of all analyses, a final written report of the data recovery results will be submitted to the Utah Department of Environmental Quality, Division of Radiation Control, the compliance agency responsible for issuing and administering the operation license of the Denison Mines White Mesa Mill. This agency would, in turn, submit the report to the Utah State Historic Preservation Office (SHPO). Additionally, a copy of the report will be submitted to the Edge of the Cedars Museum, Blanding, Utah. A CD with copy of the project's database will also be made available with the report.

In addition to the report, Abajo Archaeology will also submit all artifacts and associated files from the project to the Edge of the Cedars Museum. All artifacts will be housed in archival materials, including artifact bags and boxes as stipulated by the Edge of the Cedars. Consultation with Ms. Deborah Westfall, Curator, will ensure that artifacts and other materials will be treated appropriately for their long-term curation.

Public Outreach

In addition to the reporting process outlined above, we recommend a more public component to the project. Public outreach is critical to the protection and appreciation of southeastern Utah's ancient history. Denison Mines (USA) Corp. maintains a vital relationship with the community of San Juan County, Utah. Their support of any public outreach activities would be openly and gratefully acknowledged, regardless of the forum or media. Naturally, these presentations would reflect well on Denison Mines (USA) Corp.

We propose several types of public outreach. First, we recommend a small series of public presentations by the project director and/or field directors. These presentations could occur on a bi-monthly basis at the Edge of the Cedars Museum in Blanding, Utah. The first presentation could take place soon after data recovery begins, perhaps sometime after the New Year.

Second, we suggest that a small but informative report of the project and its results be made available on-line. This could take place on a web site produced by Abajo Archaeology. Denison Mines (USA) Corp. would be welcome to review this web-based presentation prior to its release to ensure the organization's best interests.

Third, we would like to develop a small exhibit at the Edge of the Cedars Museum that uses artifacts and other materials from the Cell 4B project. The development and presentation of such an exhibit would, in a sense, "give back" the unwritten record of southeastern Utah to its present-day community.

Finally, as archaeologists, the staff of Abajo Archaeology would like to use the data gathered during the Cell 4B project in professional presentations made to the archaeological community. Venues in which these data will be reported include professional publications and professional presentations at regional and national meetings.

Chapter 5: The Players and the Program

Abajo Archaeology and Staff

Abajo Archaeology is a cultural resource management and consulting company organized in 1981 to meet the growing need for cultural resource management services in Utah, Arizona, Colorado, New Mexico and surrounding areas. The company is a general partnership owned and operated by William E. Davis and Deborah A. Westfall in Bluff, San Juan County, Utah.

Abajo Archaeology has been recognized by both state and federal land management agencies for its commitment to high standards of performance. Abajo's key archaeologists all hold Master's degrees in Anthropology and have a combined record that exceeds 80 years of professional expertise. The archaeologists all retain qualifications that meet or exceed the Secretary of the Interior's Standards and Guidelines. Through a network of professionals in other disciplines, Abajo Archaeology incorporates studies from botany, geology, geomorphology, hydrology, paleontology, zoology, and physical and cultural anthropology to produce well-rounded, in-depth reports and articles that contribute to current issues of anthropological method and theory.

Abajo Archaeology has demonstrated its professional competence to federal and state agencies and to private industries. These include the U.S.D.I. Bureau of Land Management, National Park Service, and Bureau of Indian Affairs; the U.S.D.A. Forest Service; the Nuclear Regulatory Commission; the Navajo Nation; the Utah Department of Transportation, the Utah Federal Highway Administration; and the respective state land management offices of Utah, Arizona, Colorado and New Mexico. Our combined expertise and capabilities have pleased project sponsors with efficient, cost-effective, and timely completion of documentary research, field investigations, and report preparation pursuant to meeting requirements for legal compliance in accord with project scheduling.

Abajo Archaeology acts as a central clearinghouse for a group of committed, independent Consulting Archaeologists who have a combined professional experience exceeding 40 years in prehistoric and historic cultural resource management and research. Each Consulting Archaeologist holds a Master's Degree in Anthropology and has experience that exceeds the *Secretary of the Interior's Standards and Guidelines* (48 Federal Register, Part IV).

Principal Investigator: William E. Davis

William E. Davis received his M.A. in Anthropology from Northern Arizona University in 1982. Mr. Davis' professional career spans 35 years for archaeological research and cultural resource management consulting services in Utah, Arizona, New Mexico, Colorado, and Wyoming. He has authored over 100 technical reports and has published numerous research reports on High Plains and Southwest archaeology. As Principal Investigator he is responsible for organizing, implementing, and overseeing all projects. Specific duties include project administration, proposal and research design preparation, fieldwork (survey and excavation), analysis and report preparation, and monitoring of compliance procedures.

Mr. Davis will serve as Principal Investigator for the 42Sa27732 Data Recovery Project. He will be responsible for organization, management, and internal control. His duties will include coordination with the Dension Mines personnel and overall logistics and problem control. During the analysis/report preparation phase, Mr. Davis will provide input for the artifact analysis and will review and edit the project report. He will also be available in the field on an as-needed basis.

Project Director: Jonathan Till

Jonathan D. Till has engaged in archaeological work and research in the northern Southwest for over 20 years, and in the Mesa Verde region for more than 15 years. Past employers include the Coconino and Kaibab National Forests, the State of Arizona, the Navajo Nation Archaeological Department, and Abajo Archaeology. In addition to archaeological survey and excavation, Till is well-experienced in the material culture of prehistoric Puebloan societies. For the past six years he has worked at Crow Canyon Archaeological Center's research lab, managing the analyses of artifacts from numerous sites, teaching analytical techniques to hundreds of children and adults, and reporting on the results of these analyses. Till holds a B.A. in Anthropology from Grinnell College (1989), and an M.A. in Anthropology and a Certificate in Museum Studies from the University of Colorado (2001). He has authored numerous technical reports, has co-authored several book chapters, and has delivered many professional presentations. His research interests include the so-called "Chaco phenomenon" of the Four Corners region.

Field Director: Mark Bond

Mark C. Bond has engaged in archaeological fieldwork in the Four-Corners Southwestern region for over 30 years. He has participated in southeastern and northeastern Utah archaeological projects for 20 years of that time primarily as a Field Project Supervisor. During the 1981 archaeological excavations at the White Mesa Mill he participated as a crew leader and subsequently directed the analysis of all ceramic artifacts recovered by the project. His report on this analysis represents the ceramic chapter in the final project report. More recently, Bond directed the field crews during the Colorado University (Boulder) Summer Archaeological Field School sessions (1996-2004) at the Bluff Great House Site (42Sa22674) in Bluff, Utah. He has consulted on numerous archaeological field projects and authored numerous technical reports. Bond holds a B.A. in Anthropology from New Mexico State University (1974) and an M.A. in Anthropology from Northern Arizona University (1981).

Assistant Field Director: Benjamin Bellorado

Benjamin Bellorado has over 10 years of experience in archaeology, all of which has focused on the archaeology of the Four Corners region. Bellorado is has considerable breadth of experience in survey, excavation, and laboratory analysis. His past employers include SWCA (Animas-La Plata Project), the Comb Ridge Archaeological Project (Bluff, Utah), San Juan College (Farmington, New Mexico), the Crow Canyon Archaeological Center's research lab, Abajo Archaeology, and Fort Lewis College. Bellorado holds a B.A. in Anthropology from Fort Lewis College, and an M.A. in Anthropology from Northern Arizona University. He has

authored technical reports and volume chapters, has delivered many professional presentations, and was the co-organizer of a symposium at the Society for American Archaeology meeting in 2009. Bellorado's research interests include ancient agricultural practices and rock art of the Mesa Verde region.

Archaeologists

Eleven field archaeologists will be responsible for completing the day-to-day tasks involved in the excavation of the site. They will be directly accountable to the field director. Persons retained for this position will be required to have a B.A. in Anthropology, or comparable experience in the field of archaeology.

Laboratory Staff

Two part-time laboratory staff will be employed to process artifacts and samples, as well as perform data entry tasks. Laboratory Manager, Erica Olsen, will supervise the lab's work and organize the collection for curation. She will also assist in public outreach activities discussed earlier in Chapter 4.

Resources

Abajo Archaeology's office facility is situated in Bluff, San Juan County, Utah. The office, with 1000 square feet of floor space and storage area, is geared mainly toward the administration of the company, secretarial and bookkeeping functions, and report and proposal preparation. The office also contains a library of anthropological and archaeological journals, books, papers and cultural resource management academic reports by various colleagues and institutions, as well as an extensive map library. The office is equipped with standard laboratory equipment for performing initial artifact analyses, including cleaning, stabilizing, cataloging, recording of attribute data, microscopic examination and photography. Final bagging and ordering of artifacts for museum curation is done in the office, using specialized supplies and equipment. Lastly, the office is equipped with multiple computers to facilitate rapid production of reports, cultural resource inventory forms, and general mathematical functions.

Proposed Schedule

Table 23 outlines the schedule of work for the proposed project. The fieldwork will start on December 7, 2009 and continue until May 29, 2010. A total of 110 working days or 22 weeks is anticipated to complete the fieldwork. The field work will be performed using two six-person crews and will consist of the project director, field director, assistant field director and nine field archaeologists. Laboratory artifact processing and data entry tasks will be conducted co-currently with the fieldwork. As the artifacts are brought into the laboratory from the field, they will be washed, cleaned and processed into the data base. These tasks will be performed by the Laboratory Manager and an assistant. We calculate that the overall cost to complete the fieldwork will be around $425,000.

Table 23. Estimated Time Requirements	
Field work	**Person Days/Hours**
Principal Investigator	22 Days/176 Hours
Project Director	110 Days/990 Hours
Field Director	110 Days/990 Hours
Assistant Field Director	110 Days/990 Hours
Nine Field Archaeologists	990 Days/7920 Hours
Laboratory Artifact Processing	
Laboratory Manager	58 Days/464 Hours
Laboratory Assistant	55 Days/440 Hours

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