GROUND-PENETRATING RADAR AND CORE SAMPLING AT THE MOUNDVILLE SITE

by
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A THESIS

Submitted in partial fulfillment of the requirements
for the degree of Master of Arts
in the Department of Anthropology
in the Graduate School
of The University of Alabama

TUSCALOOSA, ALABAMA

2000

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ACKNOWLEDGMENTS

This project would not have been possible without the guidance and assistance of numerous individuals. To begin, Carey B. Oakley was the impetus behind the project. His drive, imagination, and general charismatic nature made this work possible. Danny Smith of ENERGEN Corporation directed the establishment of a grant to provide funding. He was also instrumental in contacting Jeff Elliot of ENERGEN who provided the necessary surveying equipment and expertise and Britette (Dette) Lee of Technical Drilling Services who provided the drilling rig and crew. Dette, her husband Curtis, and the crew of Technical Drilling Services contributed the best technical support possible and served as advisors on sample handling and analysis. Paul Jones, the Director of Moundville Archaeological Park, assisted in providing both guidance and equipment. Paul Goldberg of Boston University contributed valuable assistance in the analysis of the core samples. He spent his very valuable and limited time offering support and guidance whenever needed. Gary Hooks was kind enough to provide his knowledge of the geology of the Black Warrior River Valley and explaining the river bank profile just north of Moundville.

This project would not have been possible without the work of V. Stephen Jones. His and my rantings and ravings provided entertainment during the course of the whole project. He also provided information and data vital to every aspect of the ground-penetrating radar discussion presented here.

Myron Estes directed the digital photography of the core samples. He also provided valuable insight as only Myron can do. Jeff Motz and Jason Townsend provided their technical expertise in drafting. Debbie Snow helped me, or should I say I helped her, organize the final report. She kept me sane during the period before the impending due date.

To my committee members, Jim Knight, Ian Brown, Allen Maxwell, and James Bindon, thank you for your guidance, comments, and support throughout the project. Without the support and direction of Jim Knight, this work, the Southeastern Remote Sensing and Core Sampling Seminar, and my course through the University of Alabama, Department of Anthropology would not have been possible. He also provided me with my first job in Southeastern Archaeology and sparked my interest in the archaeology of Moundville.

I would like to thank Jim and Sally Caldwell, supporters of the David and Elizabeth DeJarnette Scholarship. Their efforts in the advocacy of research at Moundville has been an immeasurable asset to the University of Alabama, Department of Anthropology as well as Alabama archaeology as a whole.

My parents, Beverly and David Gage, provided not only unconditional support during the long and drawn out process of writing this work, but also motivation by asking me twice a week, "How's that thesis coming?"

Finally, to my wife Kathryn and my son Henry. You are the two main reasons I have finished this project. I love you both, more than anything.

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ABSTRACT

During the fall and winter of 1997, the University of Alabama Museums, Office of Archaeological Services conducted a ground-penetrating radar (GPR) survey and core sampling of Mound R at the Moundville Site (1Tu500). The project was intended to gather data related to the internal structure of the mound using the least destructive means available. As a consequence of the field investigations, the summit of the mound was imaged with a 300 MHz antenna, anomalies related to subsurface features were plotted, and twelve core samples were removed. The information provided by this survey sheds new light on construction sequences, information which previously was only available through intensive excavation.

CHAPTER 1

Introduction

Mississippian mound complexes dot the landscape of southeastern North America. These sites represent the remains of complex social entities that dominated the area both physically and culturally, prior to European intervention. This project represents an attempt to gain a further understanding of the factors involved in the development of the Mississippian culture.

The Moundville Site Chronology

The Moundville Site (1Tu500) is located on the east bank of the Black Warrior River in West-central Alabama. The site consists of 29 earthen mounds constructed and occupied by Mississippian peoples between approximately A.D. 900 and 1650 (Figure 1). The mounds are considered the result of organized social activities which included various techniques of construction and labor organization. The current understanding of the chronological sequence of occupation at Moundville was developed in the 1970s with more recent refinements (Knight and Steponaitis 1998; Steponaitis 1980, 1983b).

As it stands, the chronological sequence is broken into five ceramic phases and five, not necessarily synchronous, developmental stages (Knight and Steponaitis 1998:6-

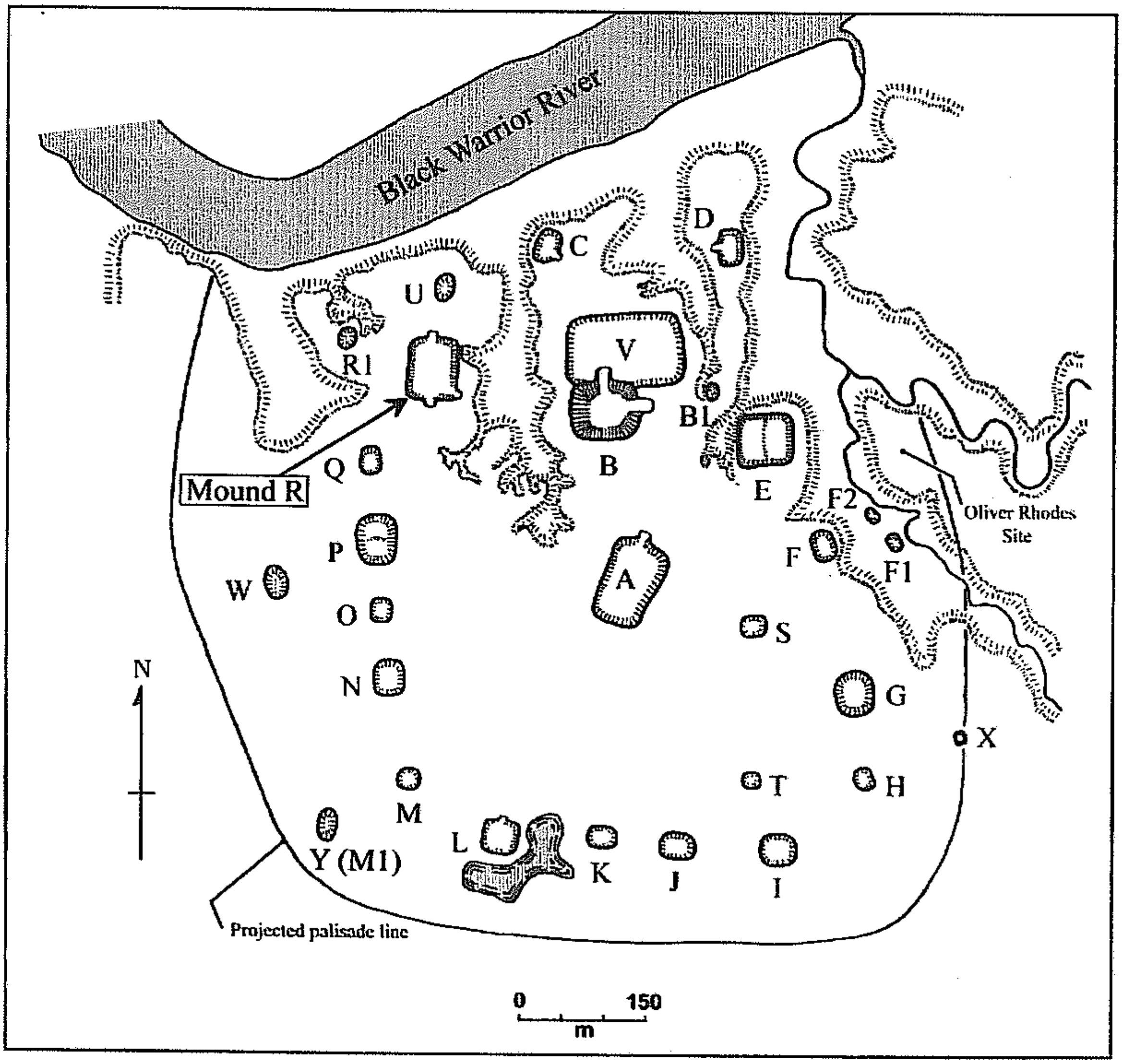

Figure 1. Mound R and the Moundville Site.

25). The first ceramic phase, dating to between A.D. 900 and 1050, is the West Jefferson. It represents a terminal Woodland manifestation defined from sites in the upper Warrior Basin and present throughout the Black Warrior Valley (Jenkins and Neilsen 1974).

Corresponding to the West Jefferson ceramic phase is a developmental stage involving, and thus referred to as, *Intensification of Local Production* (Knight and

Steponaitis 1998:10-12). Its span of existence matches the dates given for the ceramic phase of the terminal Woodland. Survey data provided from the Tombigbee, Tennessee, Black Warrior, Alabama, and Coosa River Valleys suggest the terminal Woodland experienced a period of inter-areal conflict and resource stress which may have led to more permanent community oriented settlement patterns (Knight and Steponaitis 1998; Little 1999; Walthall 1980).

The presence of a Late Woodland occupation at Moundville is only tentatively known by the existence of grog-tempered West Jefferson phase pottery from the site (Astin 1996; Knight 1989a, 1992; Ryba 1997; Scarry 1995). However, in light of current evidence, it is more likely that the grog-tempered pottery commonly attributed to the West Jefferson phase was still being produced during the subsequent early Moundville I phase (Knight and Steponaitis 1998:12). Consequently, Vernon James Knight, Jr. and Vincas P. Steponaitis believe it is unlikely that Moundville was occupied prior to A.D. 1050.

The Mississippian occupation of the Moundville Site began with the Moundville I ceramic phase spanning the two hundred years between A.D. 1050 and 1250. The phase is broken into early and late subphases marked by the changing frequencies of types Bell Plain, Moundville Engraved, Moundville Incised, Warrior Plain, and Carthage Incised.

Early Moundville I roughly corresponds to the *Initial Centralization* developmental stage from about A.D. 1050 to 1200. It is during this time that the diagnostic characteristics of Mississippian culture become apparent. Mounds were built or at least begun, shell-tempered ceramics became dominant, and an increased dependence on maize-based horticulture occurred (Knight and Steponaitis 1998; Scarry 1995, 1998; Schoeninger and Schurr 1998). The presence of grog-tempered ceramics, typical of the West Jefferson phase, points to either incorporation of local tradition (Ned J. Jenkins, personal communication 1999) or contemporaneous occupation and interaction between the two cultures (Richard A. Krause, personal communication 1999).

The *Regional Consolidation* developmental stage spans late Moundville I, from A.D. 1200, to early Moundville II, around A.D. 1300. The stage is dependent upon the idea that Moundville's basic form was a planned pattern. Construction of the majority of the mounds at least began during a time when political power was being consolidated among elite members of the community (Knight and Steponaitis 1998:14-15). It was also during this time that the palisade, surrounding much of the site, was first constructed (Scarry 1995) and maize replaced other resources as the dominant source of nutrients (Schoneinger and Schurr 1998).

The Regional Consolidation stage overlapped the Moundville I phase and extended into the early Moundville II phase at around A.D. 1250. During Moundville II, Carthage Incised and Moundville Engraved were the dominant pottery types. Moundville Incised waned in frequency and eventually disappeared and vessel form and decoration shifted. The Moundville II phase terminated around A.D. 1400.

The developmental stage subsequent to Regional Consolidation is referred to as the *Paramountcy Entrenched.* The stage began in late Moundville II, around A.D. 1300, and ended around A.D.1450 in the following ceramic phase. It was during this time that certain burials appeared with finery attributed to elite status. Copper earspools, gorgets, and hair ornaments, marine shell beads, and other non-local items are but a few of the grave goods attributed to elite burials. Midden deposits at the site became scarce, suggesting a decrease in population. Knight and Steponaitis (1998:18) attribute the decrease in middens and, possibly, populations to the abandonment of the site by commoners and limited occupation by only high status individuals. The number of burials, compared to midden deposits, also suggests that individuals living outside the site boundaries were brought to Moundville specifically for burial. In essence, Moundville had become established as a massive ceremonial center.

The Moundville III ceramic phase is marked by continued shift in forms from about A.D. 1400 to 1550. Moundville Engraved and Carthage Incised continued their predominance during the early Moundville III phase, but by the end, Moundville Engraved became virtually nonexistent.

At approximately A.D. 1450, Moundville again experienced a decline in population. Known as the stage of *Collapse and Reorganization*, only a limited number of mounds at the site appear to show evidence of modification during this time while the remainder were evidently abandoned. In particular, the northern side of the site shows continuation of occupation, while the majority of mounds forming the southern periphery were abandoned (Knight 1989a, 1992, 1998).

The Collapse and Reorganization stage continued through the final ceramic phase at Moundville. The Moundville IV phase is marked by the existence of urn burials and new pottery types including Alabama River Incised and Alabama River Appliqué. Evidence for occupation during the latter portion of the developmental stage includes occupations of Mounds B, P, and E. Maize dependence by the site's occupants was replaced by wild resources. By the end of the sixteenth century, only sparse occupation of Moundville existed. By the seventeenth century, the Black Warrior Valley had become a border zone between warring factions of Creek and Choctaw. The introduction of European settlers into the area was well established by the early 1800s.

The chronological period of occupation that concerns us here is the five hundred year span between A.D. 1050 and 1550. In particular, this includes the initial construction, period of modification and occupation, and final decline of use of Mound R. Between the mound's initial construction during the Moundville I phase, and eventual abandonment sometime near the end of Moundville III, a vast amount of change took place in the morphology of the earthen structure.

Purpose

Culturally modified landscapes both reflect and affect the way Mississippian peoples viewed themselves and their world at large. As such, the investigation of anthropogenically modified landscapes serves to aid in the development of an understanding of cultures and culture change (Dalan 1993). The very nature of mound construction requires sediment to be removed from other areas and redeposited to a secondary mound context. Such activities reveal patterns in the amount of sediment utilized and the necessary labor expenditures employed.

This study is intended to identify the internal matrix of a Mississippian mound structure by examining the stratigraphic zonation present within Mound R, the third largest earthen structure at the Moundville Site. The mound has been investigated previously by two known archaeological excavations. Clarence B. Moore in 1905 and Knight in 1993 both worked on Mound R, but neither specifically focused on the potential information available within the structure's stratigraphy. Mound R represents a series of episodes of artificial and natural modifications to the Moundville landscape. This series is observable in the strata which appear in the 12 core samples removed from Mound R in the late Fall of 1997.

The application of the term "chiefdom" to Moundville's social organization follows the definition provided by Service (1962) and Sahlins and Service (1995). This establishes Mississippian culture within the general categories of sociocultural complexity in the evolution of human society (Blitz 1993). It is also intended as a cross-cultural comparison (Knight 1995; Earle 1989) relying on the recognition of the existence of a hierarchical social order, craft specialization, and differential access to resources. The result is a theoretical understanding of Moundville's occupants as reliant upon a stratified social structure dominated by elite individuals. Evidence of this can be interpreted from the construction of monumental architecture at the site, the establishment of which required technical systems of labor organization and work force implementation.

The impetus behind this project has been to gain a stronger understanding of the factors which led to the existence of what is recognized as the second largest Mississippian community in eastern North America (Peebles 1974,1979; Scarry 1986, 1995; Steponaitis 1983b). Factors involved with the organization of labor, to the extent implied by the monumental architecture present at the Moundville site, have led to the need for investigation of the driving forces behind mound building (Knight 1995; Pauketat 1994). By understanding the amount of effort required for each successive level of mound construction, implications related to social organization at Moundville can be examined.

Interpretations related to the organization of labor and the skills required by elite proponents of these efforts, suggests the existence of political power manipulation at Moundville. In this instance, power can be understood as the capacity to achieve results through the manipulation of others (Smith 1992). Through some force of social cohesion, the elite at Moundville were able to persuade others to assist in the construction of large earthen structures. Understanding the implications of these actions requires examination of each of the resulting developments, in this instance, each of the successive layers from mound building episodes.

Investigation of the rise of the Moundville chiefdom depends on uncovering archaeological data related to specific contributions of individual temporal points within the sequence of occupation as they correspond to the overall development of the site (Knight 1995). As a result of more than a century of archaeological inquiry, many of these points are relatively well understood. Ceramic chronologies for the site have been established (DeJarnette and Wimberly 1941; Steponaitis 1980, 1983b), as have discussions of tribute (Welch 1991, 1996; Pauketat 1994), and resource exploitation (Peebles 1974; Scarry 1986; Blitz 1993; Astin 1996). Nevertheless, gaps exist within the archaeological data which must be addressed. These include what Knight (1995:5-6) has referred to as the lack of detailed history of corporate labor investment in public works and the chronological sequence of mound construction. This not only includes initial construction, but additions and general maintenance. These are vital elements necessary for developing our understanding of elite control over labor and cultural change throughout the period of chiefdom level organization. To examine the social implications of chiefdom level society we must acquire an understanding of the observable results of such societies, namely the modification to the natural or existing landscape.

Understanding of the overall morphology of prehistoric modified landscapes has been promoted by several recent studies of anthropogenically altered areas (e.g., Dalan 1993; Hoffman 1993; Smith 1992;). These studies have followed a trend in the investigation of artificially modified landscapes: the interpretation of built environments (Dalan 1993) and the dynamic aspects of these modified environments' relationship with human beings. Ranita Dalan's work at Cahokia has revealed extensive evidence of soil borrowing and its relative time sequencing for construction activities. In addition, Bruce D. Smith's (1992) work on Cahokia's woodhenges represents a potential interpretation of Mississippian site development as it relates to hierarchical social organization.

Recent works by archaeologists at Moundville (see, e.g., Knight 1995; Ryba 1997) have focused on architectural styles of structures built atop mound summits and the relationship of these structures to social organization. Yet, these investigations have been dependent upon the most commonly employed techniques available, namely excavation. Most of the data currently available have been the result of excavations begun by Knight in 1989 (Knight 1992, 1995; Knight and Steponaitis 1998). These excavations have looked at both the flanks of several of the mounds, as well as summit architecture of Mounds E and Q. They have included stratigraphic discussions for each mound; however, their focus has not included examination of individual building episodes and labor expenditures.

While this study is by no means unprecedented (see, e.g., Hoffman 1993; Price et al. 1964; Reed et al. 1968; Stein 1986, 1991), it is one of the first attempts at combining relatively non-invasive investigative techniques with the intent of recognizing mound construction stages. It is by no means intended as a replacement for the predominant archaeological techniques; rather, it is considered to be a guide for future research. By establishing a model of the internal morphology of the mound, we are, in essence, creating a blueprint for future investigations.

The goal behind the project was to assess the potential for relatively noninvasive investigation of earthen mounds. Since remote sensing has become a relatively common practice in archaeological inquiry, it was a primary factor (Gage and Jones 2000). Because the depths of deposits intended to be examined were greater than 5.0 m, the viability of the majority of remote sensing techniques, namely resistivity, gradiometry, and magnetometry, were considered limited. Given certain conditions, ground-penetrating radar (GPR) has the potential to image much deeper, up to 40.0 m below the surface. Because of these factors, GPR was decided as the technique with the greatest potential for providing the data required. The features intended for imaging included large scale differences within the mound matrix, such as large trenches, pits, fire hearths, prepared clay floors, and different stages of construction.

GPR requires a means of ground-truthing to provide adequate information for interpreting subsurface conditions. As such, it was necessary to perform limited invasive investigation. Core sampling offered an excellent option by providing a continuous profile of the stratified deposits at a given location. It also offered the potential to result in the least amount of impact to the mound while providing the greatest amount of information concerning deeply buried deposits.

If Mound R was built in stages with the use of sediments and soils from the surrounding landscape capped by living surfaces, then strata marking the extinct summits exist within the mound. Consequently, each episode of construction should be definable based on separation by these strata, and estimates as to the amount of material used in each construction episode should be able to be calibrated. Since GPR works by recognizing variations in subsurface materials, the radar data should show the variations in the vertical profiles. Finally, because the GPR survey capabilities are limited and ground-truthing is necessary, core samples taken from selected locations should not only provide continuous profiles of the entire mound evidencing the extinct summits, but also a unit of comparison for the GPR data and means of sampling GPR recognized anomalies. If the variations in the sediment were not enough to manipulate the wave energy propagation, then the GPR data should show none of these features, and instead, reveal a consistent subsurface profile of heterogeneous mound fill.

In the last chapter of this work, a critique of the results of the GPR and core sampling data comparison is presented. It attempts to refine the potential capabilities of each technique and explain some of the successes and problems encountered during the project.

The Moundville Site and Its Environment

The Moundville site occupies approximately 75 hectares of the east bank of the Black Warrior River between mile markers 303 and 304. At this point, the river is a winding twisting channel, cutting through the alluvial valley. Adjacent to Moundville, the river forms a large southerly dip known as Hemphill Bend (Figure 2). Numerous meander scars and oxbow lakes exist to the north, evidence of the changing course of the main channel. Moundville was built on a high Pliocene-Pleistocene terrace at an average elevation of 150 feet AMSL, well above the limits of the 100 year flood level.

The Alluvial-deltaic Plain district of the Black Warrior River forms a large, rich, floodplain cutting through the Fall Line Hills district of Alabama (Sapp and Emplaincourt 1975). The soils of the alluvial valley consist predominantly of silty loams laid down during thousands of flooding episodes. In contrast, the soils of the level terrace on which Moundville is located and the surrounding sloping to steep topography are formed of alluvial sediments deposited as stratified sands, silts, and clays (Johnson 1981) overlain by gravelly, sandy clay, terrace deposits of the Black Warrior River. According to the Tuscaloosa County soil survey (Johnson 1981), Moundville's soils are charcaterized by Choccolocco silt loam, a deep well-drained soil found on high stream terraces above escarpment banks of the Black Warrior River. Included in the map unit are convex areas

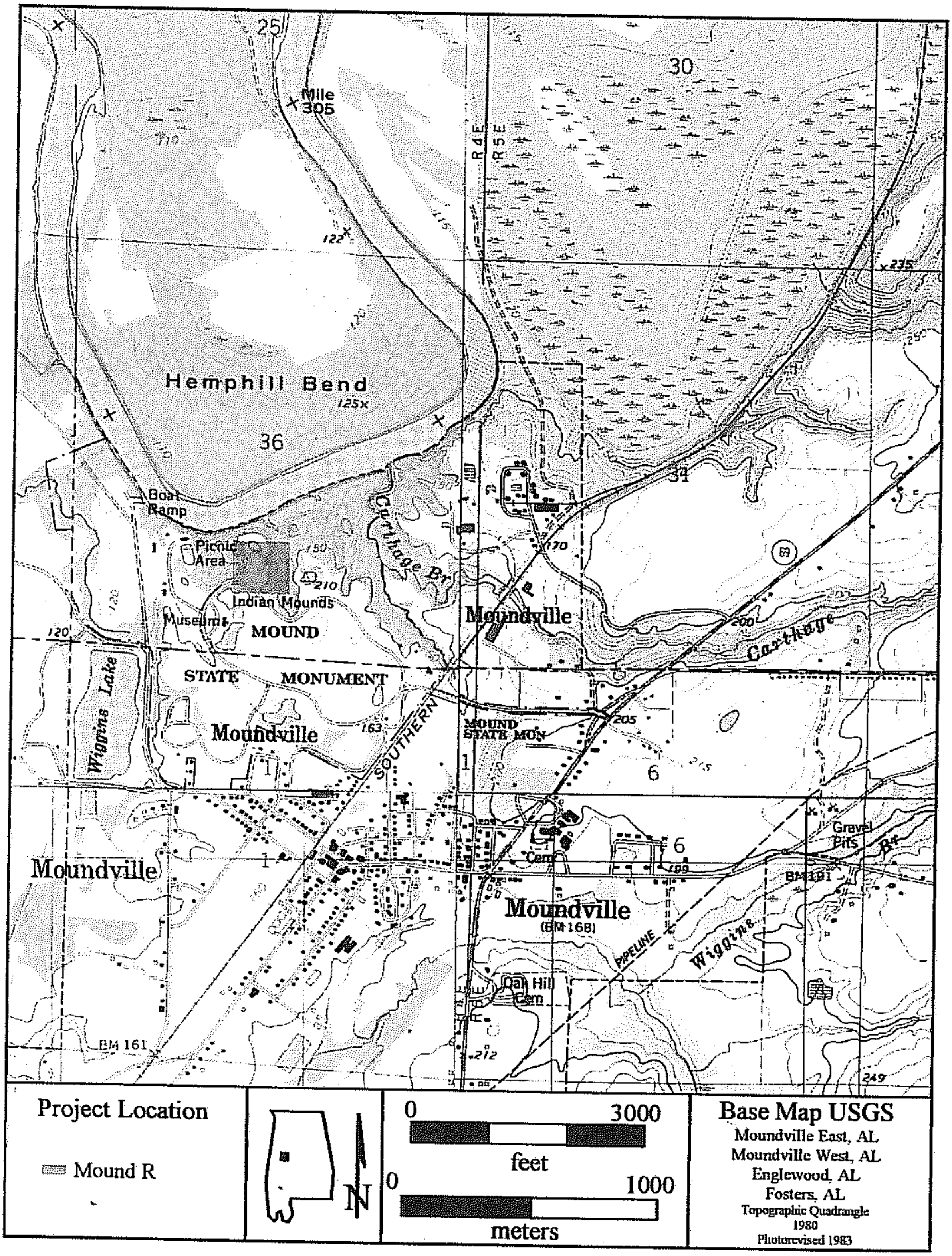

Figure 2. The Moundville Site at Hemphill Bend.

with a sandy surface layer and soils that have a yellowish-brown subsoil (Johnson 1981:17).

Mound R is located in the northwest corner of the generally rectangular layout of the 29 mound complex (Figure 1). It overlooks the plaza to the south and a restored "lake" to the north. North of the lake is a small rise dubbed either Mound U or "ridge north of Mound R" depending on the author and text (Knight 1995; Knight and Steponaitis 1998; Moore 1905). Mound R is a relatively large structure, the third largest at the site, measuring approximately 85 m by 75 m at the base and standing more than 6 m above the plaza (Figure 3).

Mound R is situated at the western edge of a large, deep, erosional ravine which today extends south of the southernmost portion of the mound. Directly east of the mound, this ravine cuts more than 12.2 m (40 ft) into the terrace exposing portions of the underlying Coker and/or Gordo formations (Gary Hooks, 1999). The eastern flank of Mound R, when viewed from the base of the ravine, provides a formidable slope which rises more than 18.5 m (60.9 ft) to the mound's summit. On portions of the eastern flank of the mound, remnants of the original terrace are still visible, vertically dividing the base of Mound R from the edge of the ravine.

Within the ravine itself, areas of erosion provide evidence for the source of much of the bright clays found within fill of Mound R. Stratified deposits in the ravine are dominated by clay and overlain by gravelly sand forming the foundation of the terrace. The intermittent channel which has formed the ravine is densely littered with quartzite pebbles, a sample of which averages 15.2 mm in diameter (n=34). At the upper reaches

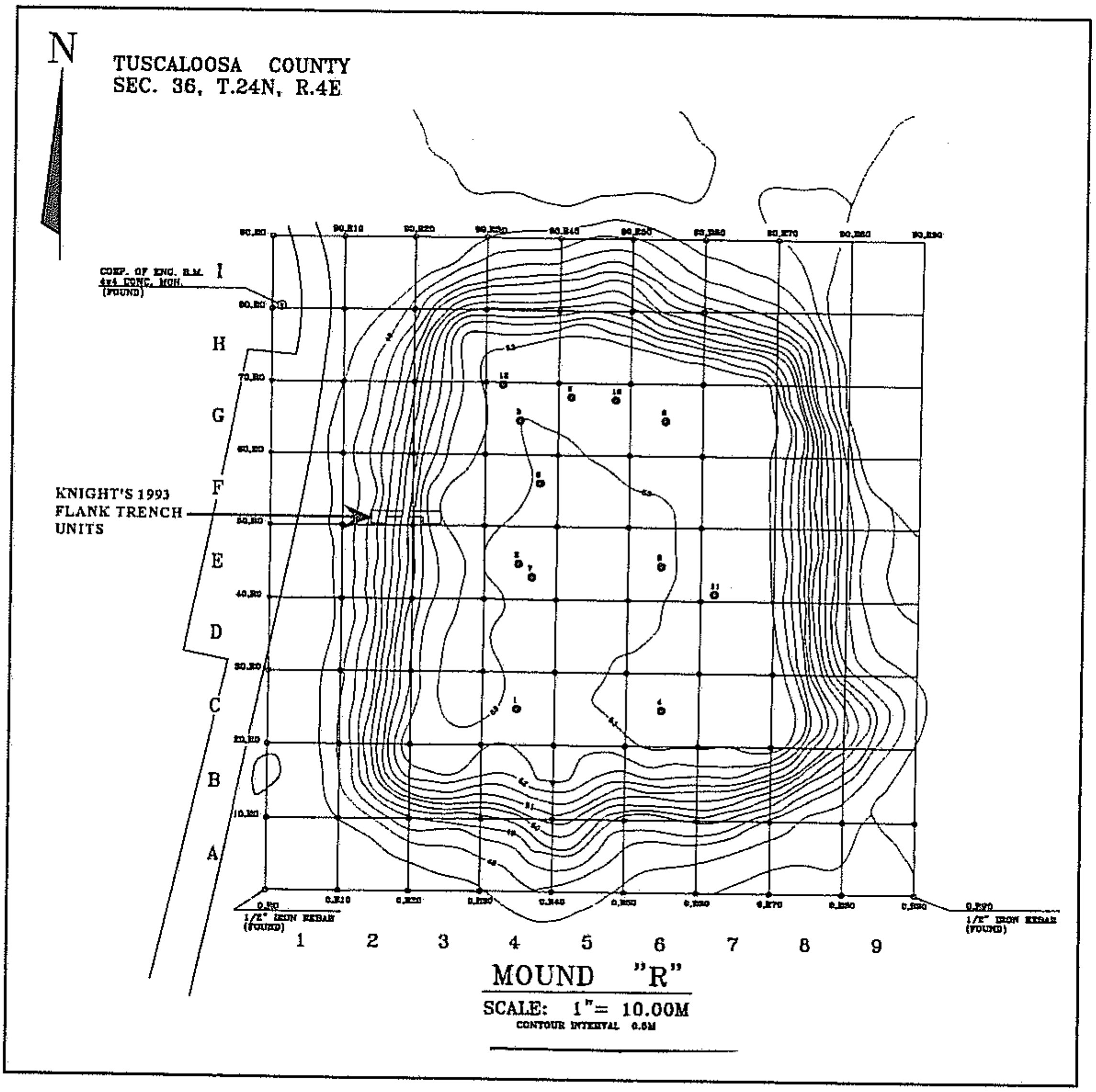

Figure 3. Grid and Contour Map of Mound R.

of the ravine, where these pebbles erode directly from the overlying Pliocene-Pleistocene deposits, the pebbles lack discoloration. As the ravine is followed north to the river and etches deeper into the terrace deposits, the underlying red, brownish-yellow, and gray clay, sandy clay, and very sandy clay strata begin to appear in the eroded stream bank.

Debate exists about the nature of the underlying materials within the area (Conant 1967; Copeland 1968; Gary Hooks, personal communication 1999). Hemphill Bend of the Black Warrior River lies just north of the Tuscaloosa and Hale County border. The contact between the Gordo and Coker Formations of the Upper Cretaceous age Tuscaloosa Group lies slightly to the south. The Coker Formation is the earliest part of the Tuscaloosa Group overlain by the Gordo Formation. The Eoline member of the Coker formation is marine in origin, consisting predominantly of stratified and cross-stratified, fine-grained sand, interbedded with carbonaceous and lignitic clays (Conant 1967). The unnamed upper member is highly variable with light colored micaceous sand as the dominant material and red-mottled gray clay common in the upper portion (Conant 1967:7). The Gordo Formation consists of lenticular beds of massively bedded mottled clay, sand, and gravel (Copeland 1968:19). The Gordo formation is the main gravel-bearing part of the Tuscaloosa Group. However, the upper portion consists predominantly of lenticular beds of red or purple mottled gray clay, carbonaceous clay, and crossbedded sand (Conant 1967:8). Conant (1967:8) notes that the contact between the Gordo and Coker is the easiest of the sequence to recognize and map because of an ironstone layer commonly present at the base of the Gordo, and the fact that, in general, the clays of the Coker tend to be stained red while the Gordo tend to be purple stained. The Geologic maps presented by both Jones (1967:53) and Copeland (1968: Plate 2) outline the generalized contact of the Coker and Gordo Formations throughout west–central Alabama. The maps place Moundville well within the confines of the Coker Formation. However, examination of the exposed east bank of the Black Warrior at

Hemphill Bend reveals the dark purple mottled gray clay attributed to the Gordo formation at or near the average water level. Above these clays are crossbedded sands similar to those of the Coker formation, but also attributed to the upper portion of the Gordo Formation. Thus, the strata attributed to the Coker Formation may, in fact, belong to the Gordo.

Within the ravine, downstream from where the clay deposits begin to appear, quartzite pebbles become discolored. The discoloration attests to the heavy mineral content in the clay, namely the oxide hematite (Fe_2O_3). The pebbles acquire a red to dark red coloration from the iron oxide staining. Even pottery sherds visible in portions of the drainage, downstream from the clay outcrop, display the discoloration caused by submersion in water containing high concentrations of iron oxides. Recovered within this portion of the ravine, a Bell Plain restricted bowl sherd with a beaded rim, a vessel type attributed to late Moundville II and Moundville III (Steponaitis 1983b), showed extensive discoloration, as did a thick Bell Plain basal sherd.

Within the mound fill, the deposits found in the upper portions of the terrace are dominant. Sand, clay, and sandy clay were excavated, transported, and deposited to form the massive earthen structure. Within the predominantly sandy fill, clays are also present. Some exhibit bright coloration, such as the red, gray, and purple clays found in the Coker and Gordo Formations. These were likely taken from locations within the ravines and along the adjacent river bank.

CHAPTER 2

Previous Investigations at Moundville

Moundville is not only one of the largest Mississippian mound complexes in the Southeast, it is also one of the most extensively studied sites (Knight 1998; Steponaitis 1980). Beginning in the mid-nineteenth century, antiquarians became interested in "the mounds at Carthage," as the site was then known (Maxwell 1876).

Excavations of the Nineteenth Century

In 1876 Thomas Maxwell published *Tuskaloosa: The Origin of Its Name, Its History, Etc.* Within the paper, originally presented to the Alabama Historical Society, Maxwell included a discussion of the Carthage Mounds[1] (1876:69).

> It may be permitted, as being cognate to our subject, to give some account of the monuments left here by the race which preceded us. These are scattered all over the face of the country, in the shape of mounds, and some of them are in our immediate vicinity. Some are at Carthage, 17 miles south of us. These I visited for the first time 36 years ago. They were then about 15 in number. Since then some have been plowed down, so as to be scarcely visible. The larger ones are still there, and objects of great interest. The largest one is about 80 feet high on the side next to the Warrior river[2], and on its summit are some of the largest trees of the forest.

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[1] For the majority of the nineteenth century, the location had been known as Carthage. It was not until 1891, that A. H. Griffin acquired land from O. T. Prince and laid out a grid plan of streets south of the mound complex. He named the community Moundville.

[2] C.B. Moore noted in his 1905 publication that the river running from Demopolis to Tuscaloosa, Alabama was referred to as the Warrior, while from Tuscaloosa upstream it was known as the Black Warrior. The name Black Warrior was ascribed to the entire river sometime near the turn of the century.

> In 1840 I measured some of the oaks upon it that were over 9 feet in circumference. At that time I spent several days digging into this mound, until the neighbors thought I was demented. I found a large mass of broken pottery, arrow-heads of flint, hatchets of flint, and burned clay mixed with pebbles and charcoal.

Maxwell's work in 1840 marks the first documented excavations into the site. The largest mound at the site, and the one believed to have been excavated by Maxwell, is Mound B. Measuring 17.37 m (57 feet), the mound covers more than an acre at the base and is separated from Mound R by a deep ravine.

Although this investigation was the first documented, it is not the first to have occurred, for in the discussion of his 1840 excavation, the author mentions that as he was working at the mounds, a young woman presented him with a "beautiful vase" (1876: 70). Maxwell's work was followed by that of Nathaniel T. Lupton, a professor of chemistry from the Southern University in Greensboro, Alabama (Steponaitis 1983a; Weiss 1998) and his student Edward Parish. The investigations were intended to help provide answers as to the "race" of people responsible for the construction of the Carthage Mounds (Lupton 1869).

Excavations of Clarence B. Moore

The next major investigations of the site, and some of the most extensive, were conducted by Clarence Bloomfield Moore (1852-1936), a wealthy philanthropist from Philadelphia. Moore arrived at Prince's Landing in the Spring of 1905 in the flat-bottomed, stern wheel, steamer the *Gopher of Philadelphia*. The steamer carried all of his supplies, thirteen trained excavators, and five supervisors, along with the captain J. S. Raybon, Dr. Milo G. Miller, and himself (Knight 1996; Moore 1905; Stoltman 1973; Wardle 1906). Moore's expeditions were conducted with the sponsorship of the Academy of Natural Sciences of Philadelphia. His finds were displayed in the Academy's archaeological hall and published in the *Journal of the Academy of Natural Sciences of Philadelphia* at his own expense.

By 1905, Moore was working on his fifteenth field season and had already published several of these reports. It was during the off-season of 1904 that Raybon had traveled to Tuscaloosa and worked his way down the Black Warrior River stopping at each landing and investigating potential sites and the names of property owners. Permission to dig at Moundville was acquired prior to departure from Mobile Bay, on December 29, 1904. It was not until February 6, 1905 that the *Gopher* entered the lower Tombigbee River and began working its way north to Tuscaloosa, at the time the northernmost navigable port on the Black Warrior River.

On March 17, Moore and the crew of the *Gopher* arrived at Prince's Landing. They steamed slightly past the landing and tied up at Hemphill Bend, directly across the river from the site.

The following day after the *Gopher*'s arrival at Moundville, Moore and his crew began work excavating and mapping the site. The job of surveying the mounds and surrounding features fell to Miller whose normal role consisted of being the project's anatomist. Miller recorded twenty-two of the site's currently known, twenty-nine mounds. He mapped the site in great detail including several of the gullies and erosional washes that dissect the northern end of the site and the bluff overlooking the Black Warrior River. He also documented the location of trenches visible in several mounds which had been dug prior to the arrival of the *Gopher*.

At the time of Miller's survey, the height of each mound was taken. Mound R was recorded as having a height of 6.36 m (20 feet 10.5 inches) (Moore 1905:120).

As Miller mapped the site, Moore's crew began the task of excavating trial-holes, "averaging four feet square and four feet deep" (Moore 1905:139). The normal crew housed on the *Gopher* was supplemented with ten men from the surrounding community. Excavations into mounds and surrounding areas were back-filled following completion, a novel act compared to the excavations undertaken by prior investigators[3].

Moore's 1905 field season at Moundville consisted of the excavation of at least 378 trial-holes, numerous references to "extensively dug through" mounds, large-scale trenching, and numerous excavations of ground level areas surrounding the mounds. Thirty-five days of excavations by a crew of 23 men, five supervisors, Moore, and Miller resulted in the uncovering of hundreds of human burials and thousands of artifacts, the mapping of 22 of the 29 mounds at the site, and the promotion of Moundville as one of the preeminent archaeological sites in the Southeast.

Mound R, Moore noted, "has a summit plateau 165 feet by 180 feet, approximately" (1905:220). The summit of the mound, nearing 0.75 hectares in size, had been cultivated for an unknown number of years. To this and the subsequent effects of

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[3] Several of these un-filled excavations that predate Moore's work are believed to be those visible in Miller's map as trenches or gullies (Moore 1905:129).

erosion, Moore attributes what he believed to be a loss of elevation of approximately 91 cm (3 feet). He noted that the edges of Mound R, where trees held the soil, were "several feet above that of the rest of the plateau" (Moore 1905:220). He goes on to suggest that another reason for the elevated edges of the mound might be the result of a wall or palisade which crowned the mound. In any event, after excavating twenty-seven trial-holes into the summit of Mound R, it was determined that the mound was not intended as a place of burial. As such, it was not considered to hold the riches Moore was seeking.

As a result of the extensive material remains and burials uncovered by the 1905 season at Moundville, Moore made plans to return in November of the following year. With a crew of between 10 and 16 men, Moore spent slightly less than a month excavating both areas previously found to be of dense artifact and burial concentrations and new areas which had been cultivated and off-limits during the 1905 visit (Moore 1907). Mound R was not one of these areas. Having failed to find burials and their associated grave goods, Moore looked elsewhere. Returning to several of the areas previously investigated, he and his crew uncovered hundreds more burials and artifacts and left with the opinion that they had certainly exhausted the archaeological materials to be found at the site (Moore 1907).

As always, Moore's findings were published the subsequent year in the *Journal of the Academy of Natural Sciences of Philadelphia* (Moore 1905, 1907). For several more years he would continue his tradition of investigation in the Southeast, but this was to be his last visit to Moundville.

The Work of the Alabama Museum of Natural History

While Moore's efforts produced some of the most extravagant artifacts ever found at Moundville, one of the lasting impacts of his investigation was the interest concentrated on the site itself. Recognizing that many Southeastern archaeological sites were being investigated and artifacts removed by individuals and institutions from outside the region, Thomas M. Owen, Eugene A. Smith, Walter B. Jones, and numerous other individuals involved in Alabama archaeology, promoted the protection of the state's archaeological sites. In 1915, the State Antiquities Act (Alabama Statute No. 669 of the 1915 laws) was passed (Waselkov 1994). In December, 1929, as a consequence of the efforts of Clara Powers, Eugene A. Smith, Walter B. Jones and others, 131 acres of property were purchased by the Alabama Museum of Natural History (AMNH) from R. J. and Robert Griffin at the price of $75.00 per acre (Jones 1929). By 1931, another 40 acres were purchased bringing the Museum's holdings at Moundville to more than 171 acres (Moody 1931). So began the next major phase of archaeological inquiry into the Moundville site.

The first field season of the AMNH began in 1930 with excavations conducted throughout the site including the "field west of Mound R" (Jones 1930). Following in the footsteps of Moore, W. B. Jones and his crew focused on recovering burials and their associated artifacts (Peebles 1973). To the great satisfaction of Jones, the AMNH excavated more burials in the first field season (800 burials and 300 earthenware vessels [Jones 1931]) than either of Moore's. The Depression era excavations of the AMNH were, and still are, considered the most prolific period of archaeological investigation of the Moundville site, yet Mound R itself was apparently never the focus of an AMNH excavation. Instead, the next work to be conducted on Mound R involved the "restoration" of the mound to its "basic shape" and size (Jones 1941). Since 1933, Jones and his staff had been attempting to acquire assistance from the Emergency Conservation Works of the National Recovery Program (Jones 1935a). Side camps from both the United States Forest Service and the National Parks Service were temporarily assigned to Moundville, but were considered insufficient for the restoration. In September of 1935, the project was granted a full Civilian Conservation Corps (CCC) company. The company never arrived until Spring, 1938 (Jones 1935b). Nevertheless, with the limited assistance provided by the side camps and partial CCC companies, work began on Mound R in 1937 (Knight 1995).

From the general appearance, maps and drawings by those who had previously investigated the site, as well as the general form of similar mounds throughout the Southeast, it was determined that the mounds were originally flat-topped truncated structures. Cultivation, Moore's extensive digging, unrecorded excavations, and severe erosion had taken their toll on the mounds' form. A cross-section of Mound R, drawn during the restoration project, shows an eroded area on the southern ramp of the mound as well as the concave form of the mound's summit (Figure 4). Sketch maps drawn during the planning of the project show eroded trenches on the northwest corner, the northern end of the eastern flank, and areas to either side of the southern ramp.

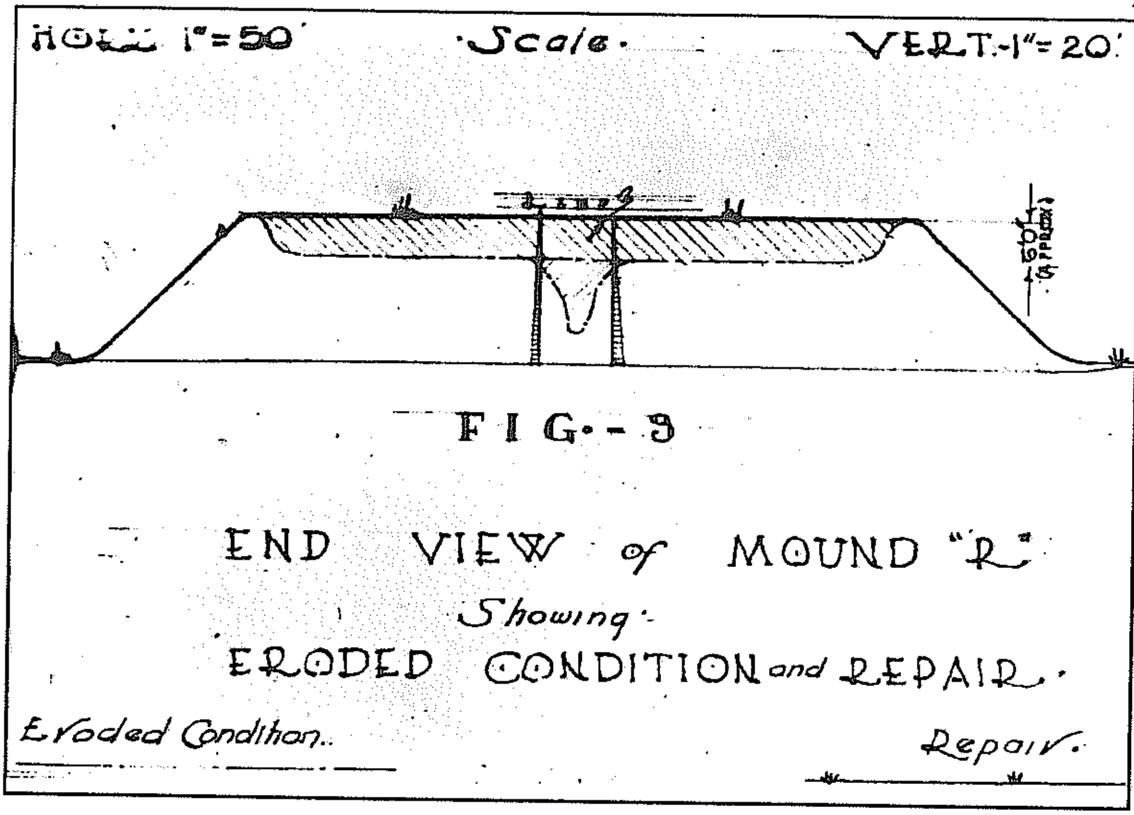

Figure 4. 1941 Plans for Restoration to Offset Erosion of Summit of Mound R.

In addition to the eroded areas at various points on Mound R, the entire summit was also a focus of restoration. As Moore reported from his 1905 visit, Mound R had apparently lost approximately 91 cm (3 feet) of material as a consequence of plowing and erosion. The resulting appearance was that of rimmed and rounded rectangle with a depressed central area. In an effort to reverse the effects of centuries of damage, fill was added to the depression to recreate a flat summit. Portions of the sides were modified to recreate relatively consistent sloping flanks. Finally, the southern ramp was covered and then sodded.

The efforts of the restoration project resulted in a protective layer overlying the summit and portions of the flanks and southern ramp of the mound. The extent of modification to underlying deposits by the restoration project appear to have been relatively minimal. A collection of artifacts labeled Mound R does exist from this general time, but it is believed to be the result of surface collections made by the crews during restoration rather than from excavations into the mound (Knight 1992).

Unfortunately, a portion of the artifacts from this collection are apparently missing. The Mound R sherd collection is designated with the prefix "M-Rp". Sherds labeled M-Rp1 through M-Rp499 are missing from the series (Knight 1992). These are the materials listed as decorated pottery. Yet, Knight (1992) was able to determine, from the remainder of sherds[4], that various types and modes attributed to Moundville I and Moundville III are present in the collection. In addition to the sherds within the collection, Knight (1992:9) also noted several greenstone celt fragments, grooved abraders, pottery objects, and an engraved sandstone palette fragment with a human head in profile view.

Although no recorded archaeological excavations occurred on Mound R during the period from 1905 to 1993, the restoration of Mound R is extremely important to this study. The fill placed atop the mound has acted as a marker, delineating the boundary of

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[4] Knight has noted that several pieces within the collection mistakenly labeled as plainware, were in fact decorated. Sherds of Moundville Incised *var. Moundville* and Carthage Incised *var. Moon Lake* are present suggesting a Moundville I phase component. Sherds with modes attributed to Moundville III include beaded rims and broad and noded strap handles on jars with tall, gently flaring collars (Knight 1992).

the sediment matrix between historic fill and aboriginal deposits. In essence, the fill has encapsulated the mound, protecting the summit and shielding the underlying materials.

The 1993 Excavations of the Department of Anthropology

In 1989, the Department of Anthropology of the University of Alabama, in cooperation with the Alabama Museum of Natural History, began a long-term project at Moundville. Directed by Vernon James Knight, Jr., the project received additional support from the National Science Foundation in 1992. Knight's project was designed to answer several questions about the site. In particular, the project had three goals: (1) Knight wished to develop a mound chronology; (2) he wanted to investigate the particular aspects of mound utilization; and (3) he wanted to develop an ethnohistorically-informed interpretation of the spatial arrangement of the earthen structures at the site (Knight 1995:1, 1998).

Between 1993 and 1994, four mounds (R, E, F, and G) were the subject of excavations. Investigations consisted of post-hole tests placed at 10 m intervals along the toe. These were dug with the intention of finding the areas with the densest artifact concentrations. Twenty-three post-holes excavated around the base of Mound R revealed an absence of any dense refuse deposits (Knight 1995:14). Nevertheless, Mound R was opened in August of 1993, with a test trench excavated into the northern portion of the western flank (Figure 3). The initial trench, referred to as the reference trench, consisted of a one-meter-wide stepped trench excavated in arbitrary levels to a depth believed sufficient. The trench was then expanded laterally at determined points and excavated by observed stratigraphic levels (Knight 1995:14). The excavations of Mound R consisted of two such reference trenches, one near the summit and one near the toe. The two reference trenches each measured four meters in length and one meter in width. The control trenches were then expanded to the south. The control trenches consisted of two, 1 m by 2 m units. One was placed at the eastern end of the summit reference trench and the other at the western end of the toe reference trench.

The 1993 excavation revealed several interesting aspects of the mound. To begin with, the flank, at least within the area investigated, was in surprisingly good condition. Little eroded overburden had been deposited downslope. Second, the summit had been severely impacted by cultivation and subsequent erosion. Third, several underlying layers which were, in reality, extinct summits buried by later additions to the mound, existed in good condition. Knight (1992:17-18) notes that at least five and possibly six building episodes became apparent in the excavated units. Stages, designated I through V, occur in succession from the lowest deposit encountered to the uppermost.

Stage I was encountered only at the base of the summit excavation units. It consisted of uniform sediments labeled as reddish-brown sandy clay (Knight 1992:18). Its thickness was undetermined and it was overlain by an irregular burned surface.

Stage II was similar to Stage I in matrix as well as having a cap of charred material. Its thickness was approximately 15 cm on the summit. Downslope, Stage II was the earliest material identified. At the toe, it was overlain by a lens of sand and silt resulting from water born materials depositing at the base of the mound. This material funneled into a depression recorded as Feature 14. The feature is believed to be an erosional gully, cut into the sub-mound deposits.

Stage III consisted of a minor episode of construction, but did contain evidence of a structure which once occupied the summit. A wall trench intruded into the light colored sandy clay of the Stage III mound fill. In addition, a row of post holes was exposed. The relationship between the posts and the wall trench is unknown. Within one of the post holes, a restorable, undecorated bowl of the type Bell Plain was recovered.

Stage IV offered a point of confusion in determining building episodes.

Stage V was absent within the summit unit, the result of the aforementioned cultivation and erosion, yet it was present in portions of the units placed into the flank.

The chronology for the stages were determined through analysis of pottery and several C-14 dates. The radiocarbon dates place the occupation of Mound R between A.D. 1350-1450 (Knight 1995:24). Knight's Stage I construction took place between A.D. 1290 and 1398. Stages II and III were added sometime after the completion of Stage I and before the addition of Stage IV between A.D. 1400 and 1446. Finally, Stage V was added between A.D. 1405 and 1446. The date ranges fall between the late Moundville II and early Moundville III phases. Diagnostic artifacts from both the CCC collections (Knight 1992) and the 1993 flank trench excavations (Knight 1995) span the period from the early Moundville I phase to possibly the Moundville III phase.

CHAPTER 3

Background of the Mound R Project

The lack of available data related to stage volumes, labor expenditures, and internal mound structure is understandable under the current circumstances. Most of the investigations have relied upon common techniques of archaeological inquiry, namely excavation. Following these techniques, it would require an exorbitant expenditure of money, time, and labor to examine portions of the mound matrix located in deeply buried deposits. As is unavoidable with archaeological excavations, the matrices examined are inevitably destroyed. This might not be seen as a problem unless we consider the potential for future developments of more efficient and conclusive investigative methods.

Various options that avoid this extensive destruction do exist. Relatively non-invasive techniques of investigation have been a part of archaeological inquiry for many years. The majority of studies involving core sampling of modified landscapes have either been focused on establishing source location for site materials (Dalan 1993), in establishing the location of submound deposits for pre-excavation tests (Dalan 1993; Knight 1995), or for predicting overall site layouts (Hoffman 1993). This research project is intended to avoid many of the destructive results of conventional techniques while obtaining stratigraphic information related to cultural activities occurring during the existence of the Moundville chiefdom.

Ground-Penetrating Radar

Ground-penetrating radar, also referred to as electromagnetic subsurface profiling or subsurface interface radar, involves the direction of a pulse or wave of electromagnetic energy into the ground. The return time of reflected energy is recorded in a similar manner to that employed in aircraft radar (Weymouth 1986; Conyers and Goodman 1997). As an investigative tool, GPR allows the archaeologist to cover a relatively large area while providing information about the location of buried features. Unfortunately, GPR is not a simple process applicable to every site. The ground in which the site exists must be conducive to radar survey. Its potential relies on soil and sediment type, ground moisture, vegetation, and topography (Bevan 1998; Conyers and Goodman 1997).

GPR is a non-invasive geophysical technique that creates a continuous profile of the subsurface. Unlike magnetic susceptibility, resistivity, or conductivity instruments, GPR is an interface detector specifically designed to recognize abrupt changes in soils or sediments (Bevan 1998). It is especially useful in detecting soil and sediment stratigraphy and large subsurface features which consist of material unlike the surrounding soil or sediment matrix.

A radar image is achieved by transmitting a low frequency electromagnetic energy pulse, usually in the 80 to 1000 Megahertz (MHz, millions of Hertz) range, into the ground with a transmit/receive antenna (Heimmer 1992; Vaughan 1986). The velocity of radiation in the ground is usually around 5-15 cm/nanosecond, or 37,500-150,000 km/second (Weymouth 1986). As the signal passes through the ground and encounters various soil horizons, sediment zones, or buried features, a reflection is produced. This reflection is detected by the antenna, converted from an electromagnetic signal to a digital or analog signal, and directed to the control unit. A typical radar reflection might include geologic formations, soil and/or sediment interfaces, natural disturbances such as animal burrows and stumps, as well as artificially developed features such as pipes, building foundations, water lines, burial shafts, abandoned wells, and so forth. The depth to which objects can be detected varies from site to site and is dependent upon the properties of the soils and/or sediments present.

The University of Alabama Museums, Office of Archaeological Services currently utilizes a SIR System-8, manufactured by Geophysical Survey Systems, Inc. The system consists of a control unit (mainframe and control module), a monitor with instantaneous display, a graphic recorder, an analog recorder, a power distribution unit, and various transducers (antennae ranging from 120 MHz to 500 MHz) mounted on sleds. The antenna is connected to the control unit by means of a 61 m long control cable. The system is powered through a distribution unit connected to a 12 volt automobile battery for field investigations. The Office of Archaeological Services' system can be operated by a single individual; however, another person makes the survey much easier. While one person pulls the antenna along set transects, a second person monitors the equipment and notes anomalies as they present themselves. GPR models now available include built-in battery packs and consist of a backpack unit, antennae, and a connected laptop computer with digital recording capabilities.

As with any type of archaeological inquiry, collecting the data is only a small fraction of the process. Radar images, recorded digitally or in an analog format, must be downloaded to a computer with software designed to filter, enhance, and display information. Various software packages exist with differing capabilities and user-friendliness. The Office of Archaeological Services utilizes a RADAN software package, also designed by Geophysical Survey Systems, Inc., specifically for use with their radar systems. The software allows for data download, storage, filtration, compression, varying display parameters, and manipulation. Although the software is not particularly user-friendly, it is excellent for enhancing and interpreting GPR data.

Ground-penetrating radar was originally designed to assist in locating buried utilities, cavities, fractures, and voids (Vickers et al. 1976:81). Always quick to take advantage of new technology, archaeologists recognized a potential for locating subsurface archaeological features. As early as 1974, GPR was utilized to locate and delineate buried features at Hungo Pavi, located within Chaco Canyon National Monument, New Mexico (Vickers et al. 1976). Interpretation of radar data and, later, excavation revealed that some of the anomalous reflections in the transect profiles had revealed the presence of buried masonry walls associated with a pithouse (Conyers and Cameron 1998; Conyers and Goodman 1997; Vickers et al. 1976).

Following the success at Chaco Canyon, a number of GPR surveys were applied to historical archaeology. These surveys were successful in locating a variety of subsurface features, such as foundations, cellars, and stone walls (Bevan 1998; Conyers and

Cameron 1998; Conyers and Goodman 1997; Kenyon 1977). The archaeological applications of GPR rapidly became more widespread. At the Ceren site in El Salvador, GPR was utilized to investigate structures buried by volcanic ash (Sheets 1992). In Japan, sunken clay floors and buried soil horizons covered by up to two meters of volcanic pumice and loam were identified (Conyers and Goodman 1997).

Today, advances in technology have improved the capabilities and results of radar surveys. Computer technology now allows for the construction of subsurface maps in three dimensions. These maps outline areas which exhibit similar reflections and display areas of particularly high amplitudes. Whereas previous GPR surveys were limited to the production of radar profiles, these programs allow large areas and massive amounts of data to be compiled into site and individual feature maps (Conyers and Cameron 1998).

Core Sampling

Core sampling of archaeological sites has a long and varied history. Early coring, not unlike these investigations, involved attempts to determine the nature of archaeological sites and their geomorphological settings. At the Cahokia site, Monks Mound, the largest Mississippian mound, has been subject to numerous such investigations (Fowler 1989; Skele 1988). In 1916, A.R. Crook augered a 25 ft. sample from the fourth terrace in an effort to determine whether the earthen structure was a natural feature of the landscape or an artificial mound (Reed et al. 1968). Even after his work, Crook was not convinced that the deposits were "man-made." As a result, Morris

M. Leighton followed suit by augering five holes in the fourth terrace. He determined that the stratified deposits were like those he had noted in other mounds and that at least the upper portion of the mound was artificial (Reed et al. 1968; Stein 1986). In 1939, under the direction of James A. Ford, Louisiana State University used coring to examine the extent of midden deposits at the Little Woods Area sites (Ford and Quimby 1945). Ford was trying to determine why shell middens were located away from the shore of Lake Pontchartrain. He directed Preston Holder to conduct investigations to ascertain where the actual shore of the lake had been during the midden's development.

Ford's familiarity with core sampling arose from his ties to Louisiana State University's, Department of Geography and Anthropology. At the same time that Ford was doing his research on archaeological sites in the Mississippi Delta, Richard J. Russell was using core sampling to determine the extent of delta progradation and submergence. Ford, meanwhile, was working out the pottery sequence in the area. Fred B. Kniffen combined their data to check the methods used to date the delta. He collected pottery from the sites and used the assemblages to date changes in the Mississippi River's morphology (Stein 1986:506).

After testing the Little Woods Area sites, the same techniques were employed at the Big Oak Island Site in 1939 and the Tchefuncte Site in 1941 (Ford and Quimby 1945, Stein 1986). The technique Ford was using did not produce continuous solid cores, but rather allowed materials from great depths to be brought to the surface by means of an Archimedes screw auger (Rapp and Hill 1998).

By 1964, a different system was being used by archaeologists to core sites. The West Virginia Geological Survey was using an Acker "Hillbilly" Core Drill rig. The rig was employed to determine the nature of deeply buried archaeological deposits along the Kanawha River (Price et al. 1964). The rig was fitted with a sampling system that produced solid sediment cores by hammering 3 inch steel pipe casing and a split-tube sampler into the ground with a 300 lb. weight. The samples produced included intact profiles of the stratigraphy of the archaeological sites. The coring succeeded in determining the area of concentration, establishing the potential for intact deposits at the site, revealing the depth of deposits, and provided information about why the site was occupied (Price et al. 1964:221).

Inspired by Price, Hunter, and McMichael's success at coring stratified deposits, Nelson A. Reed, John W. Bennett, and James W. Porter returned to Monks Mound in 1967 with a truck mounted drilling rig (Fowler 1989; Reed et al.1968; Skele 1988; Stein 1986). The continuous sampling system employed had several bugs, and five of the 340 cores they drilled were lost (Reed et al. 1968:139-140). Nevertheless, they recovered a relatively intact series of profiles within the core samples. Prior to the completion of coring, it was decided that a 2 m by 7 m test trench would be excavated by standard methods to compare with the conclusions of the core sampling. The trench was carried to 6.03 m below the surface. The comparison of the cores to the trench excavation revealed several discrepancies including bands of sand and black clay interpreted in the core samples as possible laid floors. The excavation showed them to be basketloads within mound fill rather than buried summits (Reed et al. 1968:141). Nevertheless, the majority of their recognized stage contacts were present in the excavations as well. As a result of their efforts, fourteen individual "soil features" or stages of construction were recognized. Estimates of volume and labor expenditures were generated, carbon samples were recovered and dated, and the hypothesis that Monks Mound was an incomplete work was suggested (Reed et al. 1968:142-147).

Again, building upon their success, Richard W. Casteel conducted core sampling of a midden deposit to determine the feasibility of producing samples for microanalysis (Casteel 1970). Casteel found that a single person could auger, bag, and process by flotation a single core sample to 100 cm below the surface in less than one hour and 30 minutes. The same size sample, taken through standard techniques, would require the excavation of an entire test unit to the same depth (Casteel 1970:466).

In 1977, Julie Stein augered the Carlston Annis Mound, a shell midden, on the Green River in Kentucky. Using a one inch split spoon auger, she produced several 24 cm samples to depths between 1.5 m and 2 m (Stein 1978, 1982). She then produced a 0.25 m contour paleotopographic map of the deposits within the 4,000 year old mound, as well as estimates of the volume contained between bonded units, and an isopach map showing contour lines drawn according to deposits of like thickness (Stein 1978:15-17).

In a 1978 article, Bryan C. Gordon demonstrated the use of coring combined with chemical and pedological analysis of deeply buried archaeological sites under freezing conditions (Gordon 1978; Stein 1986). Klo-kut, a well startified Vunta Kutchin Indian site on the Porcupine River in northern Yukon, Alaska, was sampled using a 1 5/8 inch diameter portable core drill. Gordon determined that the potential for recognizing the vertical and horizontal extent of archaeological sites was possible and that, although ultra-violet sensor tests were unsuccessful, chemical analysis of phosphorous was useful in determining areas of human occupation (Gordon 1978:337-338).

Probably one of the best summaries of the use of augering and core sampling was presented by Stein (1986; see also, Stein 1991; Canti and Meddens 1998; Hoffman 1993). In her article, she divides the use of augering and coring into two periods. Period I covers the methods and techniques used from 1935-1955. Period II covers those from 1964 to the present. She claims that the invention of radiocarbon dating in 1955 halted the need for relative dating of archaeological sites through core sampling (Stein 1986:509). Instead, she notes that the second period was more oriented towards site delineation, the development of stratigraphic data, and the viability of augering and coring in the reduction of investigative costs.

The use of coring and augering in archaeological investigation has continued as the usefulness of the techniques is obvious for site delineation, stratigraphic determination, and sediment, floral and faunal, pollen, and carbon sample recovery. More recent articles outline the use of portable mechanical coring devices (Canti and Meddens 1998) and the need for close-interval sampling to determine internal site structure (Hoffman 1993).

Stein, in particular has been a major proponent of coring and augering, even going so far as to say, "…a corer is potentially the most useful piece of equipment an archaeologist can have" (Stein 1991:138). It must be noted here that the majority of the coring Stein is referring to uses a relatively small diameter, 1 inch split spoon auger, 1.5 inch to 1.625 inch soil sampler, or a 4 inch bucket auger. The samples produced by the smaller diameter samplers, obviously, limit the width of the available profile produced, while the bucket auger often mixes the sediments as the cutting teeth penetrate the deposits. Nevertheless, many of the investigations which utilize these techniques are done with similar intentions to those outlined here.

Methodology and Field Investigations

Field work began in November, 1997 with the re-establishment of a grid system for Mound R. Previously, Knight had assigned a grid to the structure for his 1993 excavation. The grid was tied to a USGS bench mark situated to the northwest and established with a southern baseline south of the base of Mound R. The baseline, originally marked with rebar, was located using a metal detector and stakes were set along the southern baseline and western edge of the grid at 10 m intervals. The grid was divided into ten meter by ten meter blocks and set with stakes.

On November 5, 1997, the ground-penetrating radar survey was begun with the establishment of the GPR grid. This grid enlarged the existing ten meter block grid into 20 m blocks to facilitate the GPR surveying and analysis procedures. Each block was then divided into transects spaced at one meter north to south intervals along which the GPR antenna was to be moved.

The first attempt to image the mound employed the 500 MHz antenna. It is one of the most commonly used antennae for locating relatively shallow features, such as grave shafts or buried utility lines. Transects were further spaced to every 2 m and the antenna dragged from north to south. The actuator was pressed every meter marking the output sheets and providing location information.

It became obvious after the first several blocks of the GPR grid were surveyed, that the signal penetration was too limited for the data to be of much use in recognizing deeply buried deposits. The antenna was imaging buried features, but only within the shallow deposits. This was determined at first by noting the poor data recovery, and then by conducting an experiment. The antenna was dragged over the backfilled 1993 flank trench units. The data showed the presence of only a slight anomaly.

Instead, data recovery was changed to include the 300 MHz antenna. The results were better, although the depth of penetration was still limited. Assuming a dielectric constant of 5, based on Mound R's matrix of sandy clay, it was originally believed that the signals were penetrating between 4 m and 5 m below the surface. During initial comparisons with the core sample data, it became clear that the images were only consistent with the deposits to a depth of approximately 2.5 m below the surface.

The grid was subsequently modified to cover a 50 m, north to south, by 30 m, east to west, area encompassing the majority of the mound summit. Only those areas in the southwest corner of the mound, the sloping area near the northern edge, and the tree-covered eastern side of the mound were not imaged. Transects were spaced at 2 m intervals and the antenna was dragged from south to north. As anomalies were displayed on the black-and-white printout sheets, they were marked with pin flags on the surface of the mound. Large distinct anomalies were marked with green flags while less evident or smaller anomalies were marked with orange.

The GPR data were then returned to the David L. DeJarnette Archaeological Laboratory where they were processed with a RADAN software package translate the analogue data recorded in the field to a digital format.

Color printouts were generated of each transect showing the varying colors assigned to amplitude signatures based on a 512 scan image. The profiles were then re-examined and the data plotted by hand on topographic maps of the mound with grid overlays. Anomalies were drawn on the maps in accordance with their transect locations.

Six clusters of these anomalies were selected, based on their image clarity and size, for coring. Their locations, previously marked by pin flags, were marked with blue flagging as locations to be sampled.

The twelve coring locations (Table 1) were selected based on two guiding principles: first, a good representative sample of the entire mound was necessary to be able to examine the internal construction sequences at the largest and most general level. This involved six samples intended to provide broad areal stratigraphic evidence of the mound. In addition, the anomalies located by the GPR provided locations for the

Table 1. Well Locations on Mound R Grid.

WELL	COORDINATES North R East	GRID
1	25.0210 R 34.8785	C-4
2	45.0807 R 34.8077	E-4
3	64.8157 R 34.8261	G-4
4	25.0764 R 54.8130	C-6
5	44.9640 R 54.4723	E-6
6	65.0027 R 54.7807	G-6
7	43.2681 R 36.6697	E-4
8	56.1441 R 37.6137	F-4
9	68.1942 R 41.8077	G-5
10	67.8555 R 47.9295	G-5
11	47.1738 R 61.8459	E-7
12	69.8415 R 32.3367	G-4

remaining six core samples, the underlying idea was that core sampling might provide insight into the nature of anomalies that appeared on the GPR generated grid and that might offer information about modifications to the internal matrix of the mound.

Each of the twelve coring locations was divided into one 122 cm by 10 cm and four 152.4 cm by 10 cm sections as was required by the auger mechanism of the drilling rig used for the core sampling. This potential overall depth of 731.6 cm assured the core samples would penetrate deep enough to establish pre-mound soils for later comparative analysis. The final result was the extraction of 60 individual core sample sections taken from 12 coring locations systematically placed around the summit of Mound R. Coring was accomplished with the use of a large mobile drilling rig and crew provided by Technical Drilling Services, Inc. of Knoxville, Alabama. Preliminary examination of Mound R by Britette Lee, President of Technical Drilling Services, Inc., and Curtis Lee, Vice President and head of drilling operations, suggested that the use of the rig would not adversely affect the mound.

The rig consists of a Central Mining Equipment (CME) 75 High Torque drilling unit mounted on a GMC Top Kick chasis with a tandem axle. The complete rig weighs approximately 43,000 lbs. A tractor was used to anchor a tow cable for the rig's winch to reduce the likelihood of slipping and damaging the southern ramp.

Once on the mound's summit, the rig was positioned over the predetermined well locations and the auger was prepared (Figure 5). The auger consists of multiple parts: The lucite sampling tube, the sampler itself, and the actual auger sections. The five foot lucite sheaths, or sampling tubes, are placed within the hardened steel sampler, the threaded ends screwed on, and placed inside the auger. Then the entire contraption is attached to the drilling unit shaft (Figures 6 and 7).

The rig is fitted with a clutch control system, similar to a standard transmission in an automobile. This offers the drilling crew variable boring speeds depending on the type of soils/sediments encountered. The drilling went deep enough to ensure that we would achieve sterile sub-mound soils and have examples of the mound's base in each sample.

When the cores were removed from the sampler, they were immediately capped and taped, then labeled for provenience. The by-product of the sampling were the cuttings. These are roughly analogous to shavings produced when drilling into wood. The cuttings were separated for each sample interval and placed into plastic bags for water screening. All sediments recovered in the cuttings were water screened through

Figure 5. Drilling Rig at Core Sample 1.

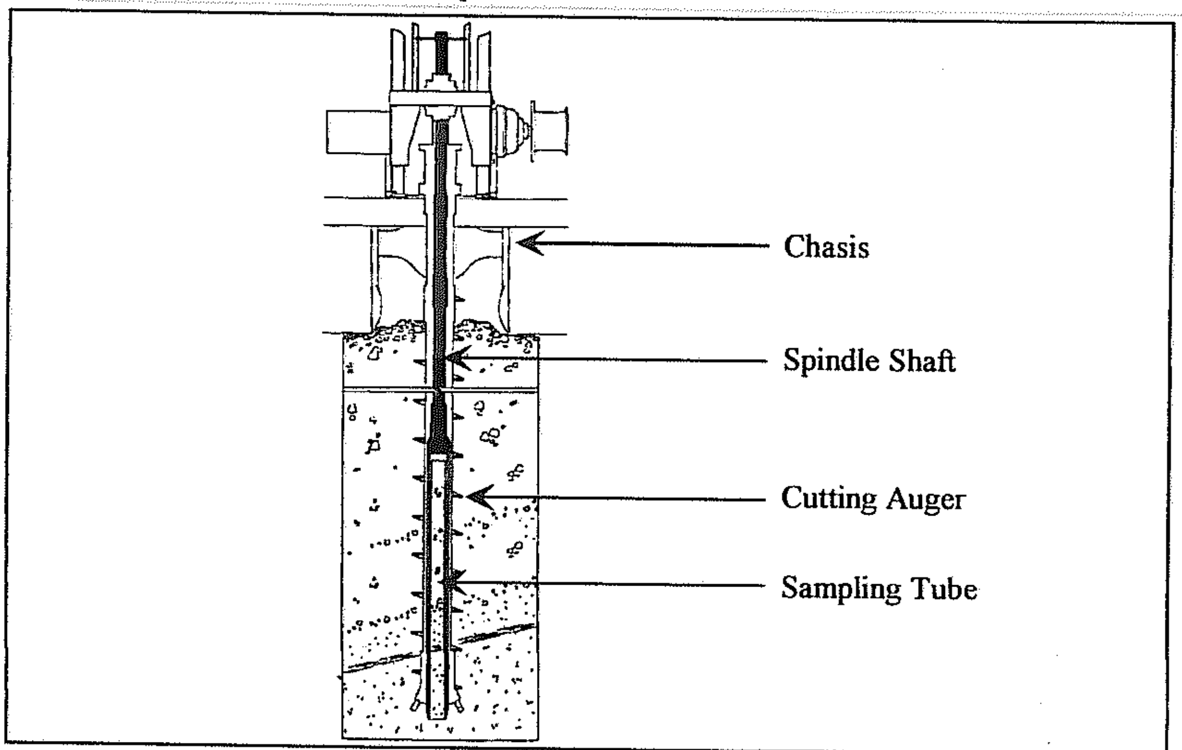

Figure 6. Schematics of the Continuous Sampling System.

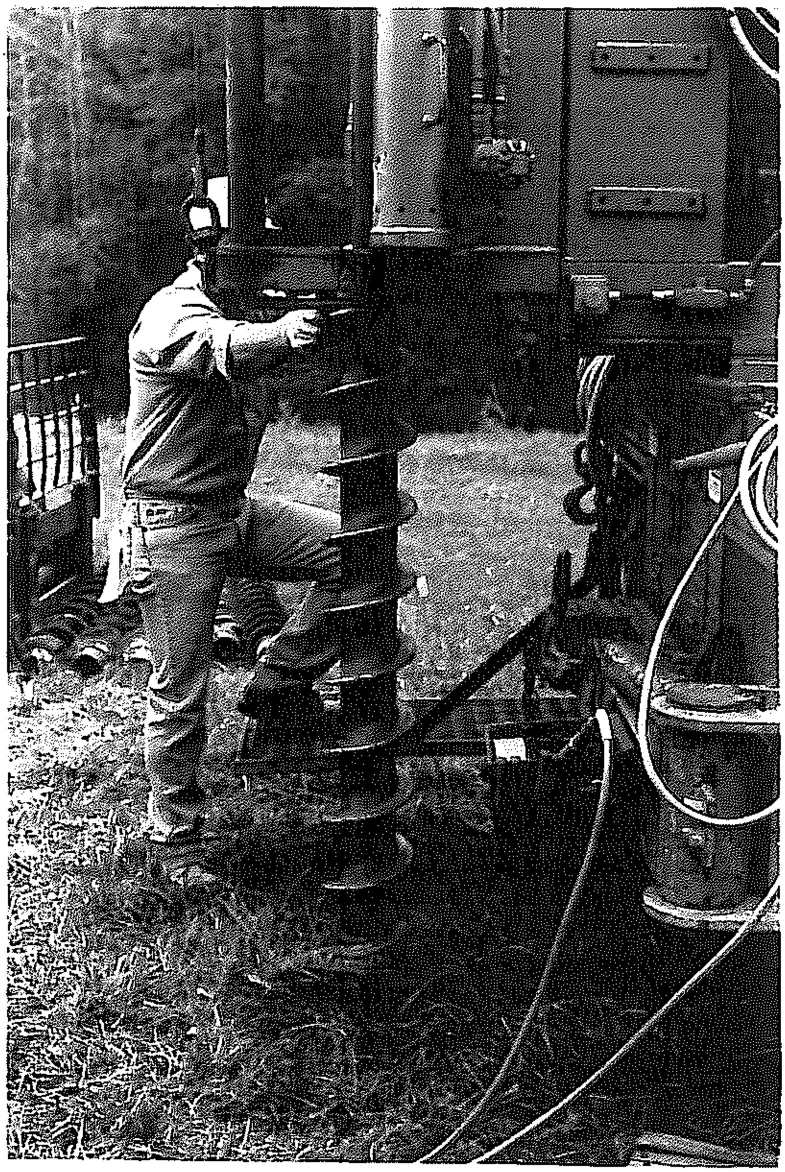

Figure 7. The Auger Bit and Drilling Rig.

6 mm wire hardware cloth to attain cultural materials. These materials were analyzed and are presented here in an appendix.

Initially, it was hoped that artifacts from the cuttings of each section would be separate from those of the underlying deposits. Following the analysis, it became clear that this was not the case. Instead, the action of the auger and, undoubtedly, the mixing of chronologically discrete artifacts within the mound fill itself, resulted in limited information regarding Mound R's stages of construction. They simply supported the idea that artifacts from as early as the Moundville I phase and as late as the Moundville III phase exist within Mound R's fill.

Once the coring was completed and the wells were abandoned they were filled to within 1.5 m of the surface with a filtration media or white sand, to ensure recognition as historic modification by future investigations. The sand was then covered with bentonite pellets. The pellets swell when hydrated and act to seal the well. Finally, grout was poured in to fill the remainder and to ensure against direct water damage.

Following field investigations, the samples were returned to the David L. DeJarnette Archaeological Laboratory at Moundville for storage in preparation for analysis. Each core sample section was bisected along its long axis by first scoring the lucite sheath on a table saw, then cutting the sheath open with a knife, and finally splitting the sample into two halves with a knife. The sections of the bisected core samples and the GPR data comprised the materials analyzed for the purpose of this project. Each section was labeled with hyphenated numbers. The first number in the sequence denotes the core sample while the second is for the section. The sections are numbered from top (mound summit) to bottom (submound soil). For example, the section containing the uppermost deposits of Mound R in Core Sample 1 is listed as CS 1-1.

The profiles evident in each of the bisected samples appear as strata revealing separate instances of modification to the morphology of Mound R. These apparent modifications are the result of both human and natural processes acting upon the various mound summits and fill deposits which previously existed. Through macro- and microscopic examination of the matrix of the soils/sediments and comparisons of the strata of the core samples, the differences between sediments of natural and artificial modification were observed and recorded. The granular matrix of the sediments, modified within the context of the mound by exposure to surface processes (such as living floor activities or summit exposure to natural elements) and various other human activities (including such factors as midden formation or house construction activities), were examined in an effort to differentiate them from those of the non-summit matrices. These non-summit variations are the result of the techniques employed in the construction of Mound R, namely basketloads of fill. These variations were differentiated and recorded to establish strata which represent previous mound summits now buried below the current summit surface.

Recorded data of the stratigraphy from Mound R were then compared utilizing sediment variations to establish related summit features. These features were anticipated to appear in various forms, including house floors, middens, and zones of incipient soil formation. Measurements recorded from the depth of the cores and depths taken from the coring locations across the mound summit acted as control factors for determining locations within the original context of the mound. Similar stratigraphic zones related in both variety of sediments and depths were then linked to develop a picture of the internal matrix of the mound structure. This composite image was compared to unit profiles recorded during Knight's excavations of the western flank of the mound in 1993 (Knight 1995). The flank testing profiles represent the only other recorded stratigraphic evidence from Mound R and act as an additional control factor for establishing related depositional strata.

For the purpose of this project, it has been held that the larger the single-episode, depositional zone, representing an individual episode of construction, the greater the effort expended by Mound R's builders. In turn, it is suggested that the greater the effort expended, the greater the organization factors, in terms of either time or effort, necessary for those episodes. These then may potentially be interpreted as periods of greater power manipulation by the elite members of the Mississippian chiefdom.

Undoubtedly, the nature of mound fill has offered obstacles during analysis as evident mixing and mottling of sediments from various episodes of mound building, basketloads of fill, house construction, day-to-day activities, and natural processes appear. Nevertheless, inspection of the core samples has revealed that distinct stratification does indeed exist and provides substantial evidence for separating individual episodes of construction separated by periods of summit occupation.

The nature of the evidence for mound dimensions present within the core samples limits any discussion of the actual size of the various stages of construction. If it is acceptable to incorporate Knight's stratigraphy of his flank trench and project the position of the remaining buried flanks of the mound, at least those not recognized in the core samples, as outside the boundary established by the placement of the wells, some estimates of the dimensions and volume of fill can be made.

Once completed, the data recorded were tabulated to determine stage volumes and to estimate labor costs. The information regarding labor expenditures for each stage was then compared to determine which episodes of mound construction required the largest amount of human effort and which appear as minimal additions to the mound's morphology.

Mound building as an endeavor of physical labor has been the focus of studies to determine the amount of sediment an individual can excavate, move, and deposit in a single day. Incorporating the experiments of Charles Erasmus (1965) and information recorded by contractors to determine labor costs, John Muller (1986, 1997) estimates the amount of volume an individual can move in a day at around 1.25 m^3. Erasmus experimented with Mexican laborers using digging sticks and found that 2.6 m^3 of fill could be excavated and deposited within a five hour period. Muller (1986:100, 1997:273-274) compares this with modern contractor estimates of 1.2 m^3 for workers with shovels in heavy soils. He suggests that the "costs of construction" can be estimated at around one person-day for every 1.25 m^3 of fill added to a mound (1986:100, 1997:274). While this may be a relatively minimal estimate, it seems appropriate considering the nature of the sediments used in the construction of Mound R and the likelihood that some, such as the brightly colored clays, may have been transported from the river bank, a distance of more than 100 m.

CHAPTER 4

Terminology, Experimentation, and Methodological Explanation

This chapter explains many of the ideas behind the analysis of the GPR data and core samples and attempts to qualify the analysis process. The examination of the core samples reveals the presence of well stratified deposits. The stratigraphy is the result of sediment additions used to create the large earthen structures. Several terms will be used which must first be defined. They are commonly used words which may have more than one meaning and are here employed to discuss the various features seen within the core samples.

To begin, the deposits utilized to construct Mound R are made up of sediment. *Sediments* are the inorganic and organic particles accumulated by natural or human processes (Waters 1996). We are here concerned with sediments resulting from both, but especially those accumulated as a consequence of human activities. These are also known as archaeosediments (Waters 1996), anthropogenic sediments (Hassan 1978), and anthropic sediments or deposits (Gasche and Tunca 1983). *Anthropogenic* will be used in much of the following text. *Soils* are the weathering profiles developed by the physical and chemical alteration of preexisting sediments (Waters 1996). They are the result of *in situ* development, while sediment requires accumulation in a secondary context. Soils are present within the core samples, but predominantly only within the last sample sections recovered where submound deposits were encountered.

The sediment texture referred to within the text was determined based on samples taken during the bisection process. They were visually examined and manually tested for texture following guidelines established by the Alabama Soil Survey. In addition, a hand lens with 10x magnification and a stereoscopic microscope were used in conjunction with a grain size analysis card developed by American/Canadian Straigraphic and designed to follow the Wentworth size classification scheme (see Boggs 1995:81). A Munsell color chart was used to provide color designations.

Anomalies are the basic units recognized in the GPR data. They consist of variations in amplitude signatures between the subject feature and surrounding matrix. These variations are caused by changes in the sediment within the mound. As radar energy passes through different sediments, the signal changes in accordance with the sediment's propensity to conduct it. These changes are recorded by the GPR unit as variations in amplitude frequency.

Each *core sample* represents a portion of the vertical profile of Mound R's deposits. The core samples are broken into 152 cm long by 10 cm diameter sections. The size of the sections is the result of the length of the core drilling *sampler,* a hollow cylinder with a narrowed tip which fits inside the drilling auger. The core samples are removed from *well locations* which are the positions on the mound chosen for drilling.

The wells consist of 30 cm diameter holes produced by the drilling auger boring into the mound. The center 10 cm diameter core sample is recovered from each well.

Chronostratigraphy refers to the stratigraphic classification used to differentiate between surfaces buried at varying depths within the mound. Steno's principle of superposition simply states that the oldest deposits are at the bottom and the youngest at the top (Boggs 1995). Consequently, we can refer to the relative age of sediment deposits based on their position within the core samples. Within the samples, the basic chronostratigraphic units are *layers* or *strata*. These strata are the result of complete episodes of construction and occupation of the mound's sequence of summits as well as individual basket loads of sediment utilized to build the mound. They also include historic alterations to the mound's upper one meter. Layers and strata will be utilized synonymously to discuss the varying bands of sediment within the samples. The layer closest to the existing summit surface of the mound will be referred to in the text as the *modern humus* layer. This layer represents an O horizon or surface horizon consisting predominantly of organic material.

A *break* is used to explain a distinct vertical change in sediment appearance within the core samples. They are the contacts between different layers or strata. Breaks do not necessarily refer to the contact of separate episodes of construction. They are simply the places within the samples where sediments of different color, texture, or sorting contact one another.

A *stage* refers to an individual full episode of construction that either began by building upon sub-mound deposits or by adding to an existing summit. A stage is a planned initial construction or enlargement of the mound. It is composed of one or more layers and a buried summit. A *summit* refers to the horizontal uppermost surface of the mound which acted as a living surface or a break between episodes of construction. Buried summits are those which have experienced additional modification in the form of overlying sediment additions to the mound. Because the current summit of Mound R is the result of historic modification, the sediments involved in this last addition to Mound R are not considered a stage.

An *episode* of construction refers to both the labor required to build each stage of the mound as well as the material utilized, such that Stage *a* is the end result of Episode *b* where *c* person-days were expended and *d* cubic meters of fill were deposited.

The *flank* of the mound refers to the slopes that exist between the summit or surface of any stage of construction and the natural ground surface surrounding the base of the mound or another underlying flank. These slopes have been altered both naturally and artificially as a result of mound building, weathering, and historic reconstruction activities. They are sometimes represented in the samples by sorted deposits where water activity has resulted in down slope sediment migration.

The recognition of each summit is based on a process of elimination. The contact of layers represents the differences of deposited material. Those contacts with dynamic breaks and no intermixing of upper and lower deposits appear different from those where a potential stable surface (summit) was not developed.

The most obvious markers between stages come from those areas where organic material was burned. The charcoal left behind forms a lens, usually less than 2 cm thick and underlain by material that includes fired clay. The heating of the summit sediment by the fire alters its appearance and structure. Conglomerations of sand, mud, and clay particles in gravel size fragments, similar to un-tempered pottery sherds, are formed and become evident in the underlying sediment. Included with this material is daub from structures which also becomes fired. The latter is difficult to distinguish from the fired clay of the summit in the core sample profile, except that it is often found intermixed within a lens of charcoal. Thanks to the effects of gravity and the sequence of building collapse on burned material, the daub of the upper portion of the structure falls atop the charcoal from the lower portion of the structure and, in turn, is covered by more charcoal.

In instances where organic material was not present in enough quantity to leave behind a lens of charcoal following burning, other means for determining buried summits is necessary. The stable summit of a mound would necessarily have had to have undergone some form of leveling process to develop a relatively flat surface. Whether this comes in the form of dumping basketlaods strategically between other loads or spreading and leveling basketloads, the result is a relatively flat surface. Compaction of this surface then begins, first by the builders and then by its occupants as they walk over the summit. Since episodes of construction consists of sediment from various sources, rather than a single location, the summit should appear as a relatively compact and somewhat mottled layer with the preceding layers being a series of homogeneous strata designating basketloads. In addition, the intermixing of the summit with overlying deposits should be relatively limited. Although the effects of pedoturbation are an undeniable factor, the contacts should remain relatively intact because of the summit's compact nature.

All of these factors were considered as potential indicators of buried summits. Their recognition was, and still is, considered relatively speculative and cannot be shown as fact without actual excavation or other, as yet undetermined, means.

Experimental Mound

In an effort to see to just what extent the various factors would have on sediments and how they would appear in a core sample, a simple experiment was designed to recreate mound deposits. A 68 L (18 gal) plastic tub was filled with 40 cm of various sediments and features, then a core sample was taken from the center and bisected. During the filling, each stage was measured and recorded. A lucite sheath was driven into the deposits and the sample was bisected, photographed, and profiled.

The first stage consisted of 2 cm of 10 YR 4/3 brown sandy clay. The surface was dampened and compacted.

The second 15 cm thick stage consisted of: a layer of uncompacted, dry, 10 YR 5/4 yellowish-brown, sandy clay; a second layer of uncompacted, damp, 7.5 YR 4/4 brown, very fine sandy clay; a third layer of uncompacted, dry, 10 YR 5/4 yellowish-brown, sandy clay; and finally, a fourth layer of damp, 7.5 YR 4/4 brown, very fine sandy clay. The surface of this final layer was compacted.

The third stage consisted of 7 cm of dry 10 YR 6/3 pale brown sand. The sand was not compacted.

The fourth stage consisted of 10 YR 4/4 dark yellowish brown sandy clay. The sediment was dampened, leveled, and only slightly compacted.

The fifth stage consisted of 10 YR 6/6 brownish yellow-mottled clay. The clay was mixed with water to form a thick solution, poured atop the fourth stage, and compacted. The surface was allowed to dry before a fire was built to simulate a burned structure. The fire burned for 30 minutes and the coals allowed to cool before the next layer was added.

The sixth stage consisted of slightly damp, 10 YR 5/4 yellowish-brown, sandy clay. The surface was compacted forming a 4 cm layer.

The seventh, and final layer, consisted of 4 cm of more 10 YR 5/4 yellowish-brown sandy clay mottled with 10 YR 4/2 dark, grayish-brown, sandy clay. The surface was then saturated with water and allowed to sit for two days.

A clear lucite core sampling tube was then hammered into the deposits. The difference in the penetration technique in comparison to the core drilling rig is obvious, but it still only resulted in 2 cm of compaction or about five percent.

The core sample was removed by bisecting the entire plastic tub. The profile of the tub was examined and the core sample extracted. The lucite sheath was then cut open and the sediment sample bisected (Figure 8).

The results are as follows:

The first stage was easily discernable from the first layer of the second stage by both feel and color. The compaction of the first layer was evident both during the bisection process and by taking a trowel and scraping along the long axis of the sample.

The colors of the layers within the second stage were obvious and the fact that none were compacted caused some intermixing of the breaks between layers, less than 0.3 cm of downward movement.

The sand and pale color of the third layer were also obvious. Because of the texture difference and the compaction of the underlying deposits, intermixing was virtually nonexistent at the lower contact. However, the overlying, dark, yellowish-brown sandy clay did migrate into the upper contact of the sand deposit. Again, the difference in grain size was a factor.

The fifth stage, the simulated burned structure, was the only layer that changed in appearance. The color changed from a mottled 10 YR 6/6 brownish yellow to 2.5 YR 4/6 red. The layer, especially at the surface, became very hard and remnant charcoal flecks provided evidence of the fire. No intermixing of the overlying deposits occurred.

The sixth and seventh stages were virtually identical in color. The major difference was the compaction of the surface of the sixth layer. Again, the difference

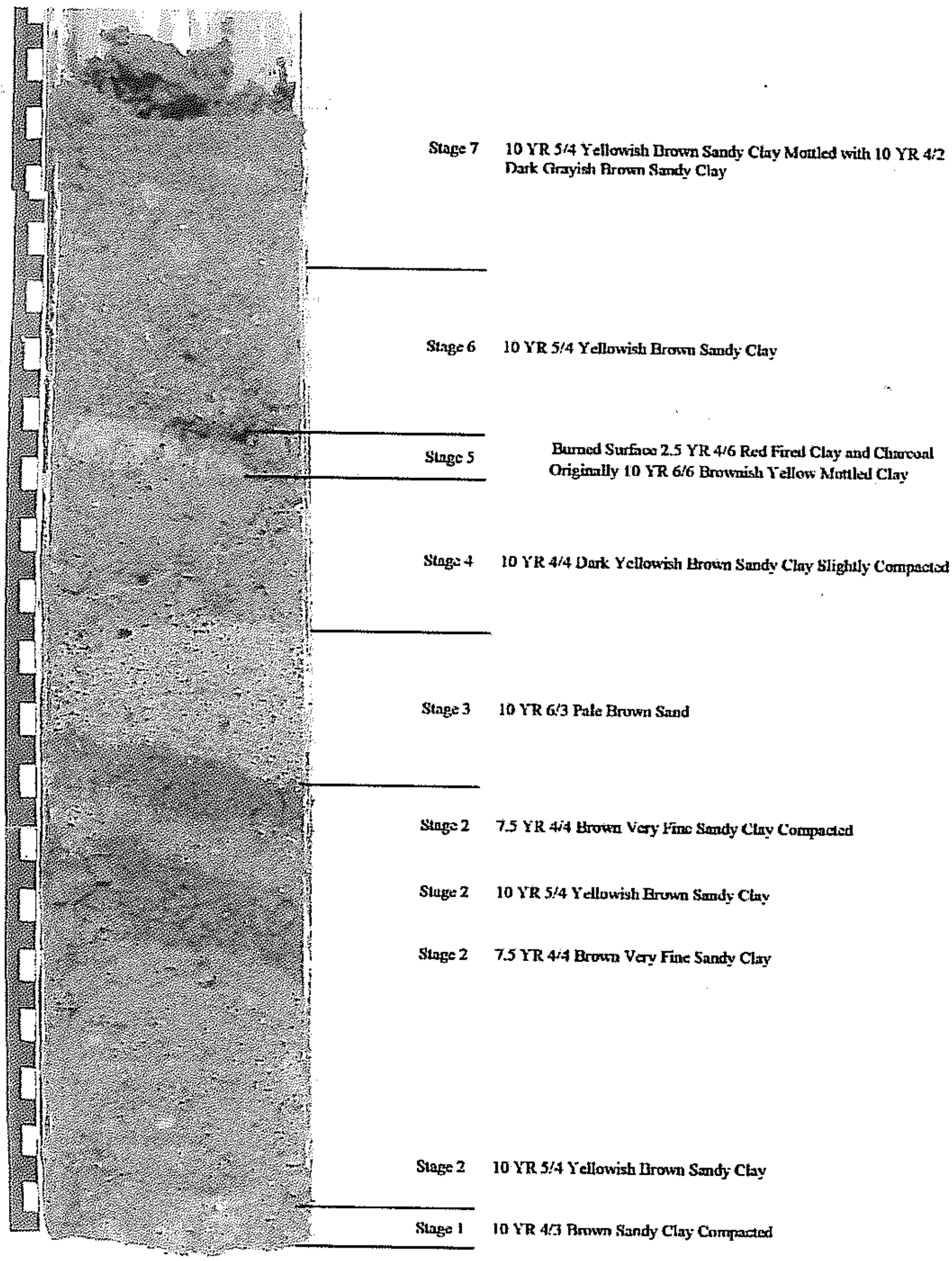

Figure 8. Experimental Mound Core Sample Profile.

could be felt during the bisection process and by running a trowel over the surface, but little indication could be seen simply by examining the location of the known break. The major tell-tale marker was a crack which formed at the break during transport of the sample.

The experiment helped to allay several fears. First, those breaks which included similar color sediment could be differentiated based on compaction. This is, of course, assuming that the turbation of the deposits is limited and that they are virtually unchanged from their original deposition, a common factor in all of the core sample analysis. Second, those surfaces between deposits which were not compacted resulted in more intermixing of sediments than the compacted surfaces. Third, the heating of a mound summit results in color and texture change which is apparent in the core samples.

CHAPTER 5

Stages within Core Samples

Each of the core samples was analyzed and recorded according to the layers and breaks that appeared. Based on the nature of the strata and breaks, they were separated into those representing layers within stages and then combined into stages of construction divided by buried summits. The locations of the core samples were then compared to determine similarities and differences within the same stage (Figure 3). Each stage is presented below as it appears within the designated core sample. Digital images were taken of each of the core sample sections. They are included on a CD in the jacket of this work. An index for the samples is provided in Appendix C.

Core Sample 1 (CS 1)

CS 1 includes 17 recognized breaks in sediment stratigraphy within the 672 cm sample. Strata range in thickness from 1 cm to 115 cm and include slope and summit deposits. Submound deposits consist of yellowish-brown sandy clay overlain by 19 cm of grayish-brown buried humus.

Stage I consists of 18 cm of mound fill capped by two sloping layers of grayish-brown and brown sandy silt (Figure 9).

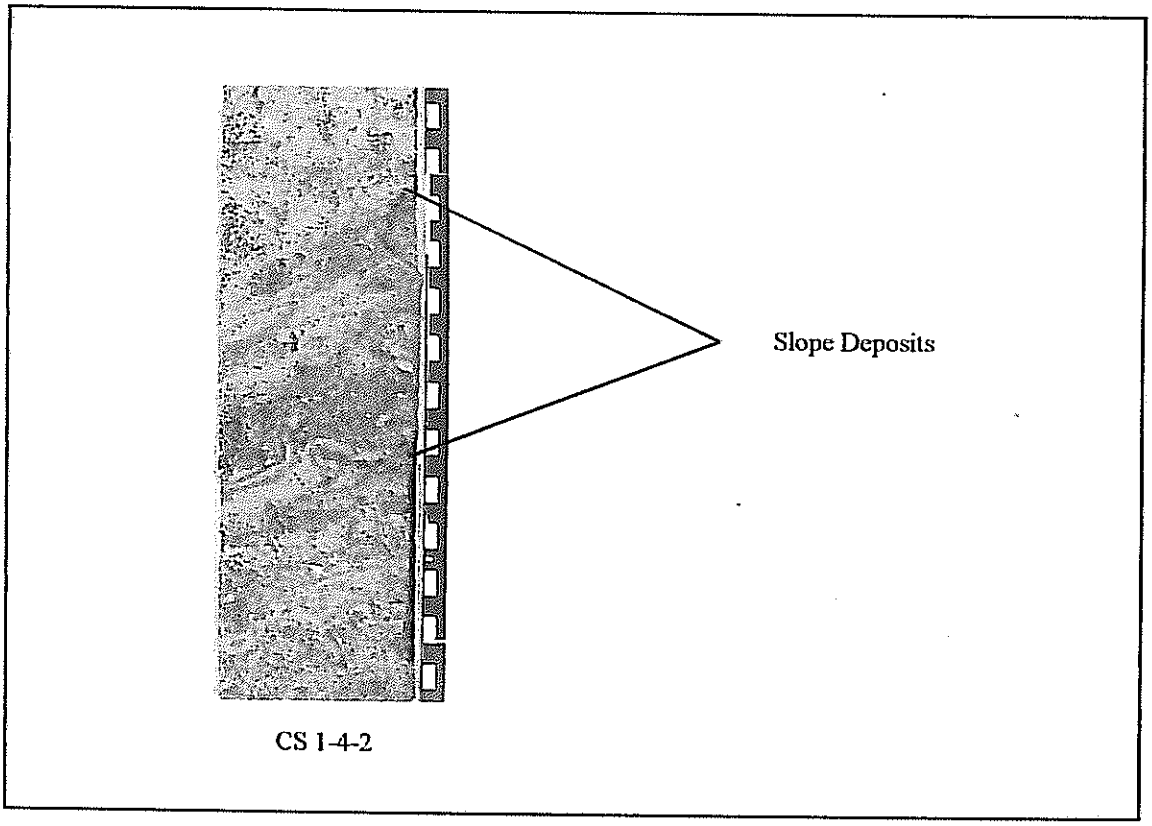

Figure 9. Slope Deposits of Stage I in Core Sample 1.

Stage II consists of a 216 cm addition to the mound raising the structure to 2.34 m above the submound ground surface. Sediments include yellowish-brown, brown, and grayish-brown sandy clay capped by gray sandy clay and ash and a 1 cm layer of heated yellowish-red sandy clay with charcoal flecks.

Stage III includes 115 cm of heavily mottled yellowish-brown sandy clay overlain by 34 cm of gray sandy clay with charcoal flecks, fired clay inclusions and potsherds. The overlying sediments consist of midden deposits. Mound R was raised to 3.83 m above ground surface.

Stage III is intruded upon by a feature which extends from approximately 35 cm below the surface (cmbs) to 128 cmbs. Within the 93 cm stage, the mottled grayish-brown sandy clay is extensively mixed. At the upper contact of the feature, Mound R stood 4.76 m above ground surface.

The remaining 35 cm deposits consist of historic plow zone, a thin layer of restoration fill, and a modern humus layer.

Core Sample 2 (CS 2)

CS 2 includes a series of 21 strata within the 683 cm sample. The strata range in size from 1 cm to 116 cm and include a series of buried summits. Submound deposits consist of yellowish-brown sandy clay overlain by a 16 cm grayish-brown humus zone.

Stage I includes the lowest 1.34 m of Mound R. The deposits include 105 cm of directionally uniform sloping sediment with varying distinct layers of reddish-yellow, brownish-yellow, pale brown, and gray sandy clay. The upper layer of Stage I includes charcoal flecks.

Stage II consists of 96 cm of mottled, brown sandy clay capped by a distinct brown sandy clay layer raising Mound R to 2.3 m.

Stage III includes approximately 78 cm of mound fill with a pale grayish-brown sandy clay cap. Atop this is a 3 cm layer of mottled, brown sandy clay and a 3 cm layer of red fired clay. Charcoal was not noted within this 3 cm strata of fired clay. Stage III raised Mound R to 3.14 m above the ground surface.

Stage IV is an approximately 113 cm addition to Mound R. It includes 95 cm of mound fill capped by 18 cm of dark grayish-brown sandy clay midden. Again, fired clay is present near the upper contact. Mound R was 4.27 m tall at the completion of Stage IV.

Stage V consists of 43 cm of grayish-brown and mottled, grayish-brown sandy clay mound fill intruded upon by historic plow zone. The upper 58 cm of the core sample consists of historic plow zone, 12 cm of yellowish-brown restoration fill, and modern humus.

Core Sample 3 (CS 3)

CS 3 includes a series of 67 recognized strata. The sample consists of 683 cm of fill and submound soils. Submound material consists of yellowish-red sandy clay overlain by grayish-brown premound humus.

Stage I consists of 291 cm of fill and summit materials. The stage begins at 555 cmbs and is capped by yellowish-brown sandy clay at 264 cmbs or 2.91 m above the base of Mound R. Stage I includes 32 recognized layers and represents an unusually varied episode of building. Sorted sand deposits overlie a 5 cm layer of fired clay and charcoal and its red sandy clay cap.

Stage II is an approximately 136 cm addition to the mound. Again, deposits are extremely varied with 23 individual bands of varying sediment. The stage is capped by a lens of charcoal and fired clay at 128 cmbs to 130 cmbs (Figure 10). Mound R was raised to 4.27 m by the completion of Stage II.

Stage III is relatively small in comparison. It consists of approximately 21 cm of mottled grayish-brown and brown sandy clay raising the mound to 4.48 m above ground surface. The upper contact of the stage includes charcoal and fired clay.

Stage IV consists of another relatively small addition to Mound R. Deposits include approximately 22 cm of light, olive-brown and brown mottled sandy clay. The stage is intruded upon by the historic plow zone, 43 cm of mound restoration fill, and a modern humus layer.

Core Sample 4 (CS 4)

CS 4 measures 682 cm and includes 23 strata. Submound materials consist of mottled, yellowish-brown sandy clay capped by grayish-brown submound humus.

Stage I consists of 52 cm of mound fill. The lowest contact consists of banded, water sorted, very pale brown, gray, and white sand overlain by a brown sandy clay lens and light, brownish-gray sandy clay. Above this layer is another white sand lens. The stage ends with a sloping, midden-like, brown, very fine sandy clay with charcoal flecks and sherds of type Bell Plain. This layer is capped by a brown clay lens. These deposits exhibit a consistent slope.

Stage II consists of 66 cm of sloping deposits (Figure 11). The lowest contact consists of light, yellowish-brown, silty clay with a relatively level upper interface. This

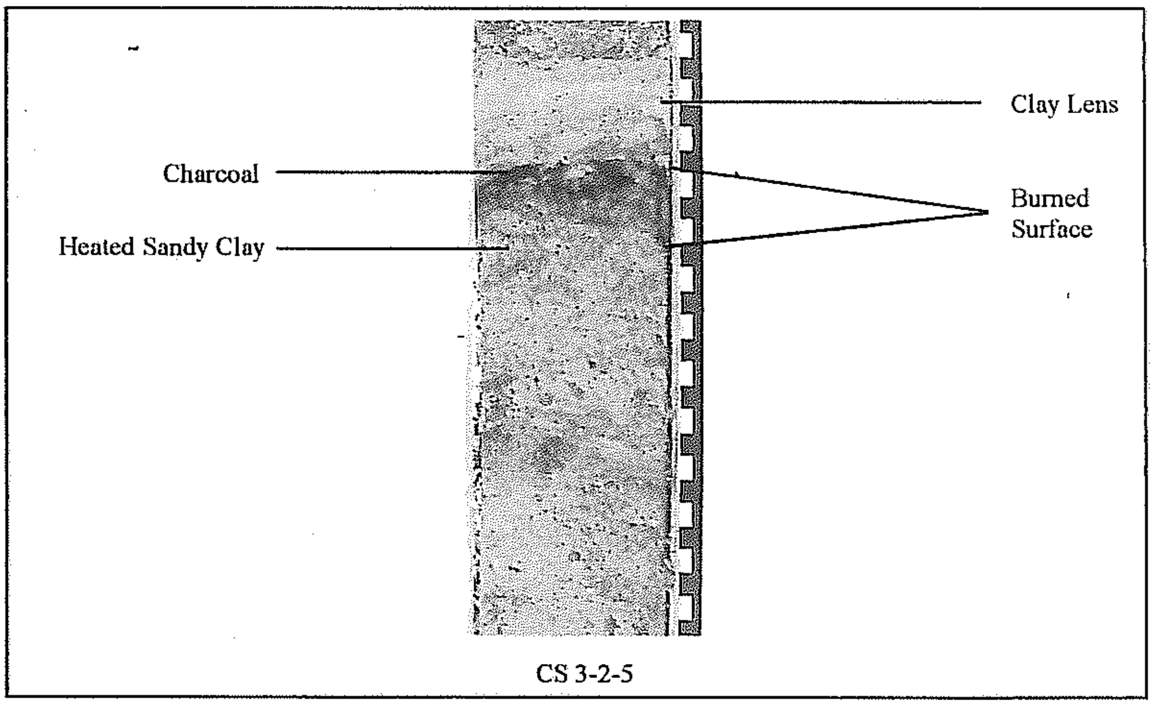

Figure 10. Charcoal and Fired Clay at the Summit Contact of Stage II in Core Sample 3.

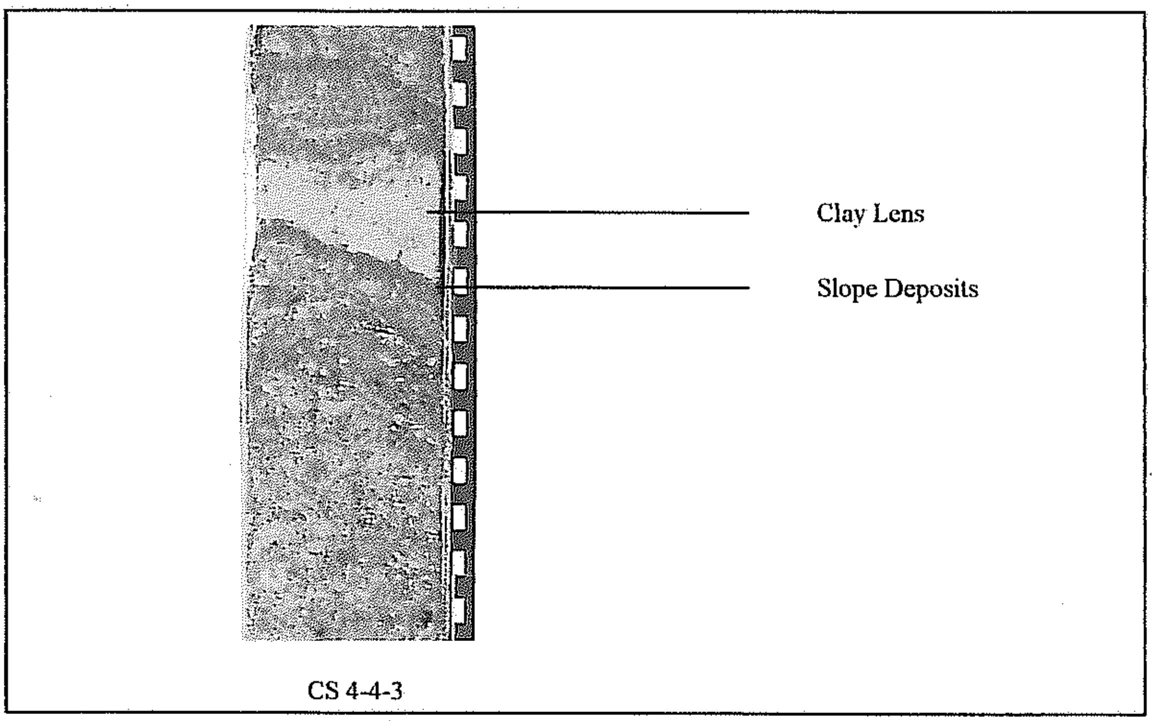

Figure 11. Southern Slope of Stage II in Core Sample 4.

is overlain by more level deposits of grayish-brown mottled sandy clay. Above this, the deposits again slope in a consistent direction and are made up of very pale brown sand mottled with gray sandy clay with relatively heavy charcoal content. This layer is overlain by gray sandy clay banded with white and very pale brown sand with charcoal at the lower contact. The addition of Stage II raised Mound R to 1.18 m above ground surface.

Stage III is a much larger episode of construction, including 211 cm of mound fill. The deposits include midden-like fill of mottled, grayish-brown sandy clay with fired clay, charcoal flecks, and clay inclusions. The uppermost layer consists of gray sandy clay and ash and raised Mound R to 3.29 m above the ground surface.

Stage IV consists of 19 cm of water-sorted, brown sandy clay banded with dark brown sand. Stage IV is intruded upon by overlying grayish-brown, sandy clay, midden-like deposits replete with charcoal flecks and brown sandy clay inclusions. The intrusive feature is, in turn, truncated by historic plow zone at 93 cm below the surface. The plow zone is capped by approximately 10 cm of restoration fill and modern brownish-gray humus.

Core Sample 5 (CS 5)

CS 5 also measures 682 cm. Submound materials consist of reddish-yellow sandy clay overlain by grayish-brown submound humus. CS 5 consists of 30 recognized strata.

Stage I consists of a relatively large episode of construction. It includes approximately 218 cm of gray, brown, reddish-brown, and yellow sandy clay, clay, and silty clay. The upper layer consists of mottled, yellow sandy clay with charcoal fleck inclusions.

Stage II consists of 114 cm of yellowish-brown and mottled, brownish-yellow mound fill. The uppermost layer consists of brown sandy clay with large fragments of fired clay with sloping, water-sorted deposits near its basal contact. The addition of Stage II raised Mound R to 3.32 m above ground surface.

Stage III includes 110 cm of mound fill and summit material. It consists of 87 cm of mottled, yellowish-brown sandy clay capped by 23 cm of yellow and dark brown clay bands capped by brown sandy clay with fired clay and charcoal inclusions. Mound R was 4.42 m tall at its completion.

Stage IV consists of grayish brown sandy clay midden deposits. The stage is truncated at approximately 80 cmbs by the historic plow zone. The historic plow zone is overlain by 25 cm of restoration fill overlain by dark brown modern humus.

Core Sample 6 (CS 6)

CS 6 measures 689 cm in length and includes 28 recognized strata. Of the 689 cm sample, 576 cm represent mound deposits. Submound materials include yellowish-red sandy clay overlain by grayish-brown sandy loam premound humus.

Stage I consists of 291 cm of brown, yellowish-brown, grayish-brown, yellow, reddish-brown, and white banded sandy clays. The uppermost contact includes heated strong brown very sandy clay.

Stage II includes a mixture of materials within 24 cm of deposits. Stage II contains a high amount of ash and charcoal throughout. Again, the uppermost layer includes heated deposits at its upper contact with sorted sand and silt near its basal interface. Stage II raised Mound R to 3.15 m above ground surface.

Stage III represents a 49 cm addition to Mound R. The majority of the fill within the stage consists of light, yellowish-brown to grayish-brown mottled, sandy clay overlain by a 1 cm layer of brownish-gray sandy clay with fired clay near the upper contact and sorted sand and silt at its base. The addition brought Mound R to 3.64 m above ground surface.

Stage IV consists of 141 cm of mound fill and summit deposits. Within the stage, 102 cm consists of heavily mottled, brown sandy clay with fired clay and charcoal inclusions. These deposits are overlain by approximately 39 cm of banded sediments. Each of the bands includes charcoal and/or fired clay. The uppermost layer is a red clay lens bringing Mound R to 5.05 m above ground surface.

Stage V consists of 11 cm of brown sandy clay mound fill truncated by the historic plow zone. The remaining 60 cm of the mound consists of this historic plow zone, approximately 10 cm of yellowish-brown, sandy clay restoration fill, and modern humus.

Core Sample 7 (CS 7)

CS 7 measures 699 cm and includes 28 recognized strata. Submound materials consist of reddish-brown sandy clay overlain by grayish-brown, sandy clay loam humus.

Stage I consists of approximately 216 cm of mound fill. Deposits include banded, brown, yellowish-brown, light reddish-brown, and light yellowish-brown sandy clay and fine sandy clay. The uppermost 22 cm of the stage includes sorted sand and sandy clay deposits overlain by a cap of brown clay with charcoal and fired clay inclusions.

Stage II includes 54 cm of brown, mottled sandy clay underlain by pale yellowish-brown clay and overlain by four separate layers of sediment with relatively high charcoal content in the lowest and highest deposits. With the addition of Stage II, Mound R was raised to 2.7 m above the ground surface.

Stage III begins with a series of alternating bands of brown, yellowish-brown, and pale brown sandy clay mound fill. Approximately 88 cm of mound fill was used in the construction of Stage III. The uppermost deposit consists of light yellowish-brown sandy clay with white sandy clay root stains. Mound R was 3.58 m tall at the completion of Stage III.

Stage IV consists of brown sandy clay with red and white clay inclusions overlain by midden and mound fill of gray sandy clay with charcoal flecks and fired clay inclusions and ash near the upper interface. The stage includes 105 cm of mound fill raising the structure to 4.63 m above the ground surface.

Stage V includes 30 cm of mottled, yellowish-brown sandy clay mound fill truncated by the historic plow zone. Above the plow zone is 42 cm of yellowish-brown, sandy clay, restoration fill and 13 cm of modern humus.

Core Sample 8 (CS 8)

CS 8 includes 711 cm of material and 33 recognized strata. Submound materials consist of yellowish-red sandy clay overlain by 22 cm of grayish-brown, sandy clay loam humus.

Stage I includes 229 cm of banded sediments. Ranging from light yellowish-brown to gray sandy clay, the deposits vary from 62 cm to 2 cm in thickness. The uppermost portion of Stage I is overlain by disturbed deposits of Stage II.

Stage II consists of 63 cm of deposits relatively rich in charcoal and ash content. Between 304 cmbs and 310 cmbs, an intrusive feature is present with parallel sloping sides and a rounded base. This is overlain by sorted sand deposits and a pale yellow clay raising Mound R to 2.92 m above ground surface..

Stage III consists of 64 cm of mottled brown and light, yellowish-brown sandy clay overlain by brown clay and summit deposits of mottled, grayish-brown sandy clay and a 1 cm layer of red sandy clay. At the completion of Stage III, Mound R stood 3.57 m tall.

Stage IV includes mottled, yellowish-brown sandy clay overlain by midden deposits of mottled, brown sandy clay with charcoal and fired clay inclusions. The

160 cm of mound fill are truncated by the historic plow zone at 65 cmbs. The plow zone is overlain by 20 cm of restoration fill and 14 cm of modern humus.

Core Sample 9 (CS 9)

CS 9 measures 702 cm in length and includes 56 recognized strata. Submound deposits consist of mottled, yellowish-red, brown, and reddish-brown sandy clay overlain by brown sandy clay humus (Figure 12).

Stage I consists of 273 cm of mound fill and summit deposits. A series of 19 layers are recognized within Stage I alone. These include brown, reddish-brown, yellowish-brown, and gray sandy clay deposits. The uppermost layer consists of white sandy clay mottled with gray sandy clay.

Stage II consists of 10 relatively narrow strata measuring a total of 26 cm. These layers include strong brown to yellowish-red, grayish-brown, and white sandy clay sediments. The uppermost contact of the stage appears to be overlain by intrusive material. The overlying deposits include a series of banded, water-sorted, sandy clay sediments. At the base of the intrusion, Mound R is 2.99 m above the ground surface.

Stage III includes 139 cm of sediment. The deposits truncate those of Stage II and include sorted sandy clay. The uppermost layers of the stage includes bands of sand and ash, as well as fired clay inclusions. Stage III raised Mound R to 4.38 m above the ground surface.

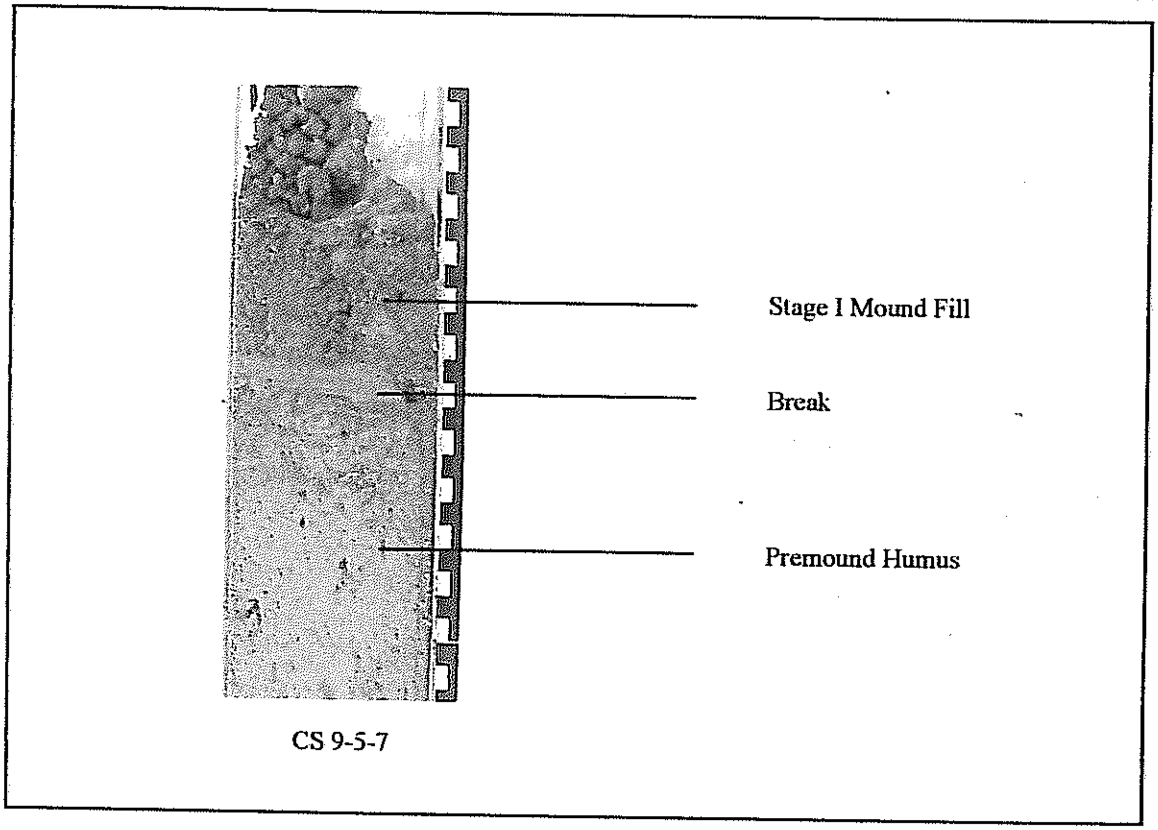

Figure 12. Contact Between Mound and Submound Deposits in Core Sample 9.

Stage IV also begins with a layer of water sorted deposits. Pale brown sand of the lower stratum is overlain by dark, grayish-brown sandy clay and brown, yellowish-brown, and grayish-brown sandy clay deposits. Stage IV's 22 cm of mound fill also appears to be intruded upon by the overlying deposits of Stage V. At the contact of Stage IV and the intrusive feature, Mound R stood 4.6 m above the ground surface.

Stage V consists of 30 cm of grayish-brown clayey sand truncated by the historic plow zone deposits, 19 cm of restoration fill, and modern humus layer.

Core Sample 10 (CS 10)

CS 10 includes 53 recognized strata within the 711 cm sample. Submound material consists of strong brown sandy clay overlain by grayish-brown, sandy clay humus.

Stage I consists of 37 recognized strata forming 257 cm of mound fill and summit deposits. The layers range in thickness from 1 cm to 24 cm. The lowest deposit includes a relatively high amount of ash in a gray, sandy clay matrix. The layers which make up the stage include very pale brown, pale yellow, gray, and brown sandy clay overlain by a 1 cm thick red fired clay lens.

Stage II begins with a layer of water-sorted sediment overlain by mottled, yellowish-brown, brown, and pale yellowish-brown sandy clay deposits measuring a total of 185 cm. The uppermost layer consists of brownish yellow sandy clay with a relatively high concentration of manganese nodules. At the completion of Stage II, Mound R stood 4.42 m above the ground surface.

Stage III, the last stage recognized in the sample, consists of 70 cm of midden truncated by historic plow zone. The midden deposits include grayish-brown, very pale brown, and brown sandy clay, as well as brown clay mottled with yellowish-brown clay. The plow zone measures to 77 cmbs and is overlain by 20 cm of restoration fill and 12 cm of modern humus.

Core Sample 11 (CS 11)

CS 11 includes 35 recognized strata and measures 670 cm. Submound materials consist of reddish-yellow sandy clay and yellowish-brown sandy clay overlain by grayish-brown sandy clay humus.

Stage I consists of approximately 202 cm of brown, gray, light brownish-gray, and light gray mottled sediments. The uppermost layer consists of pale brown sandy clay with a relatively high concentration of manganese nodules.

Stage II consists of 120 cm of mound fill overlain by 11 cm of brown sandy clay with charcoal flecks and fired clay inclusions and heated, reddish-brown sandy clay. Stage II's completion raised Mound R to 3.33 m above the ground surface.

Stage III includes 103 cm of sediment. Deposits include pale brown very sandy clay, mottled, reddish-brown and yellowish-brown sandy clay, and brown very sandy clay. The uppermost deposit consists of pale brown sandy clay and raised Mound R to 4.36 m above the ground surface.

Stage IV consists of 14 cm of grayish-brown sandy clay midden deposits truncated by the historic plow zone. Here, the plow zone includes a relatively high quantity of charcoal inclusions, as well as potsherds. The plow zone is overlain by 42 cm of yellowish-brown, sandy clay restoration fill overlain by 12 cm of modern humus.

Core Sample 12 (CS 12)

CS 12 consists of 705 cm of material divided among 42 recognized strata. Submound materials include reddish-yellow sandy clay overlain by grayish-brown sandy clay humus.

Stage I consists of 245 cm of mound fill overlain by light, brownish-gray sandy clay with a relatively high mica content. The stage fill consists of 23 layers of sediments including mottled very pale brown sandy clay, reddish-yellow sandy clay, yellowish-brown sandy clay, and mottled yellow very sandy clay.

Stage II consists of only 11 cm of pale yellow very sandy clay mottled with yellowish-brown sandy clay with charcoal inclusions overlain by strong brown sandy clay with some charcoal fleck inclusions. The stage is intruded upon by the overlying sediments of Stage III. At the contact of Stage II and the Stage III intrusion, Mound R stood 2.56 m above the ground surface.

Stage III consists of 151 cm of brown and yellowish-brown, mottled sandy clay overlain by 12 cm of brown sandy clay, reddish-brown, heated sandy clay with fired clay inclusions, yellowish-brown heated clay, and dark brown clay with charcoal inclusions. Eight recognized strata exist within the 163 cm stage. At Stage III's completion, Mound R stood 4.19 m above the ground surface.

Stage IV consists of 73 cm of heavily mottled midden fill overlain by grayish-brown sandy clay with charcoal and fired clay inclusions. Stage IV is intruded upon by the overlying historic plow zone. Restoration fill consists of 23 cm of yellowish-brown sandy clay overlain by 15 cm of modern humus.

CHAPTER 6

Ground-Penetrating Radar Data

The data analyzed following the completion of the GPR survey revealed a number of anomalies within each transect. These were transposed to a map of Mound R with the summit grid overlain (Figure 13). Each transect was drawn and anomalies occurring within each transect were designated by general size. Depth of penetration was determined to be approximately 2.5 m below the surface limiting the viability of anomaly recognition to within the upper half of the Mound R.

Several clusters of anomalies were noted within the GPR grid (Table 2). These clusters dictated the remaining six locations cored in accordance with the second sampling strategy. In several instances, overlap occurred where cores of the first sampling strategy were located and drilled within the recognized anomalies. The GPR data were then compared to the core samples that penetrated each anomaly cluster.

Anomaly Clusters

The first cluster (1) recognized was situated in the west-central portion of the mound. It extended from the edge of the GPR grid along Transect 0, from 28R30 north to

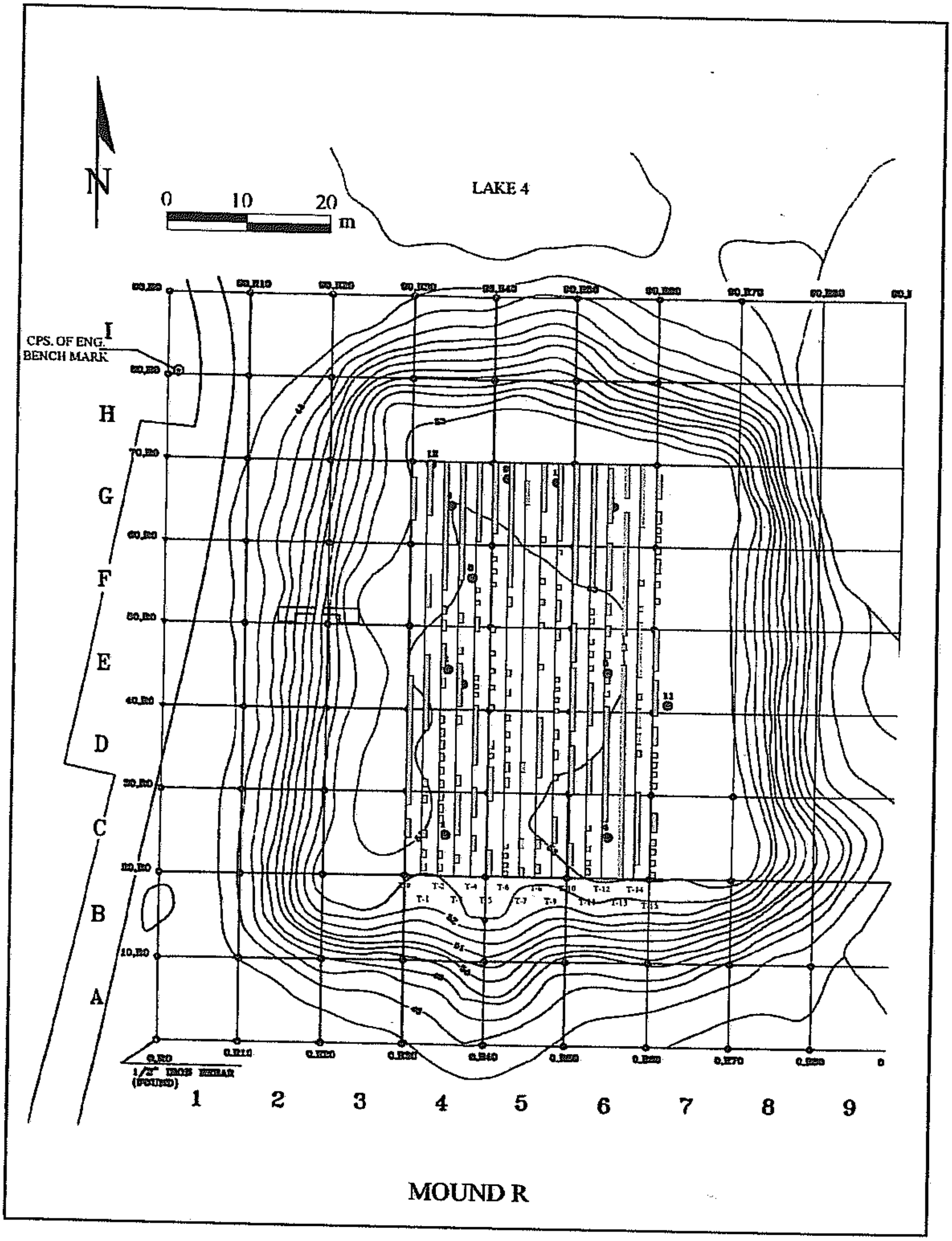

Figure 13. Anomaly Clusters Plotted on GPR Transects.

Table 2. Ground-penetrating Radar Transect and Cluster Coordinates.

GPR TRANSECT	BEGIN COORDINATES (North R East)	END COORDINATES (North R East)	ANOMALY CLUSTER
0	20R30	70R30	1 AND 2
1	20R32	70R32	1 AND 2
2	20R34	70R34	1 AND 2
3	20R36	70R36	1 AND 2
4	20R38	70R38	1 AND 2
5	20R40	70R40	2
6	20R42	70R42	2
7	20R44	70R44	
8	20R46	70R46	3
9	20R48	70R48	3
10	20R50	70R50	3
11	20R52	70R52	3
12	20R54	70R54	3 AND 4
13	20R56	70R56	3 AND 4
14	20R58	70R58	3 AND 4
15	20R60	70R60	4

44R30, east to Transect 5 at 37R40 and south to 30R40[5]. The cluster was intended to be penetrated by two core samples, CS 2 and CS 7.

The location of the anomaly cluster in the central portion of the mound suggested the possibility for the presence of buried architectural remnants, namely burned house floors. The relatively small size of the cluster, approximately 16 m by 7 m, strongly influenced this possibility.

The second cluster (2) occupied much of the northwestern quarter of Mound R. The high amplitude signature was consistent across a relatively large area, extending from

[5] The grid reference points are labeled in a manner consistent with that established for the 1993 excavation. The first number in the sequence refers to the distance in meters north of the southern baseline, the "R" refers to right of the west baseline, and the second number refers to the distance in meters east of the west baseline.

70R30 south to 60R30 east to 55R42 and again north to 70R42 (Figure 14). Four core samples (CS 3, CS 8, CS 9, and CS 12) were designated to penetrate the cluster.

The printouts of Transects 0-6 showed the presence of the anomaly cluster within only the northwest corner of the mound. The profile displayed layers of stratigraphy overlapping one another. The image was suggested to possibly represent a small isolated secondary mound built atop an earlier stage (Figure 15).

The third cluster was also noted in the northern portion of the mound. The northeast corner revealed several varying signatures, all within a 24 m by 21 m area. Extending south from 70R46 along Transect 9 to 65R46, southeast to 49R56, and north to beyond the edge of the grid at 70R56, the anomalies were clustered based on their close proximity. They appeared in Transects 8-15. Two cores (CS 6 and CS 10) were intended to penetrate this group (Figure 16).

The varying nature of the anomalies within this cluster caused no end of consternation. It was put forth that the variations could be the result of a clustering of C.B. Moore trial holes, or possibly midden deposits extending towards the northern flank.

The fourth, and final, cluster of anomalies existed in the southeast corner of the mound near the eastern edge of the grid. They extended from 40R54 south to 27R54, southeast to 22R58, and northeast to slightly east of the edge of the grid at 50R60. Transects 12-15 contained anomalies of this cluster. CS 11 was established to penetrate the eastern edge of this area. The presence of the treeline blocking much of the eastern portion of Mound R was considered as a possible source for the slightly varying high

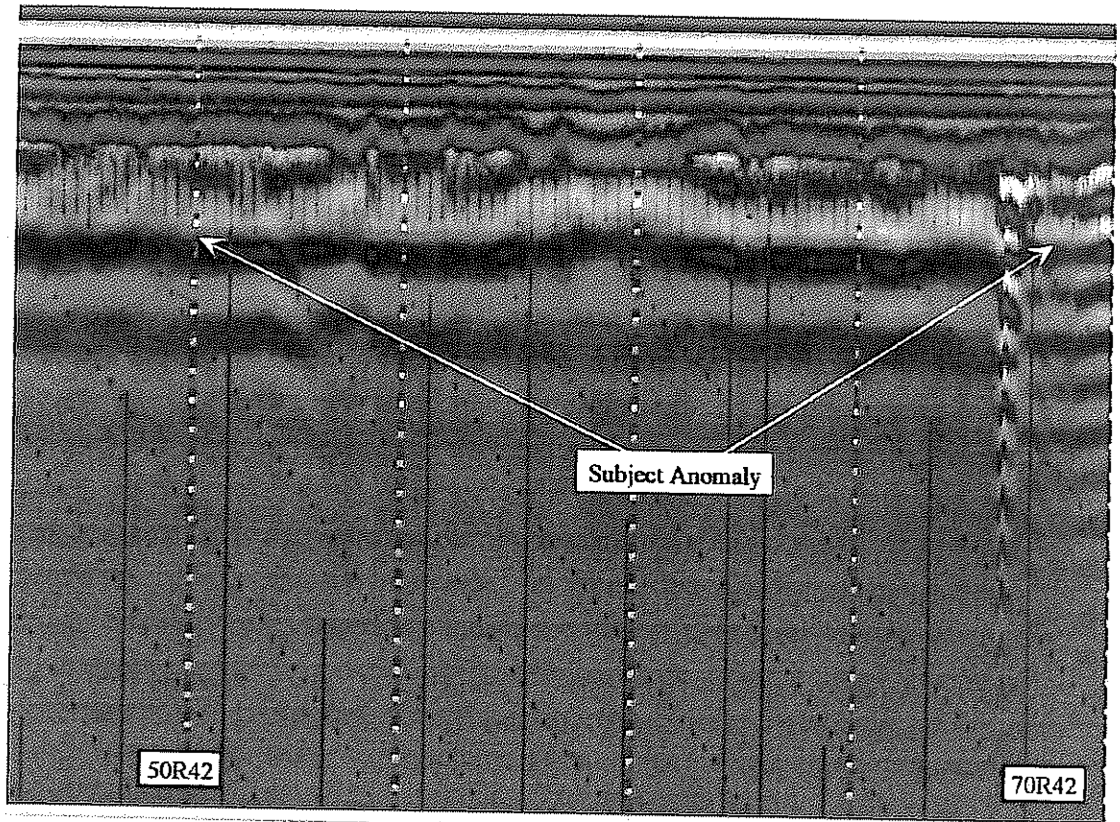

Figure 14. High Amplitude Anomaly Cluster 1 (Transect 6).

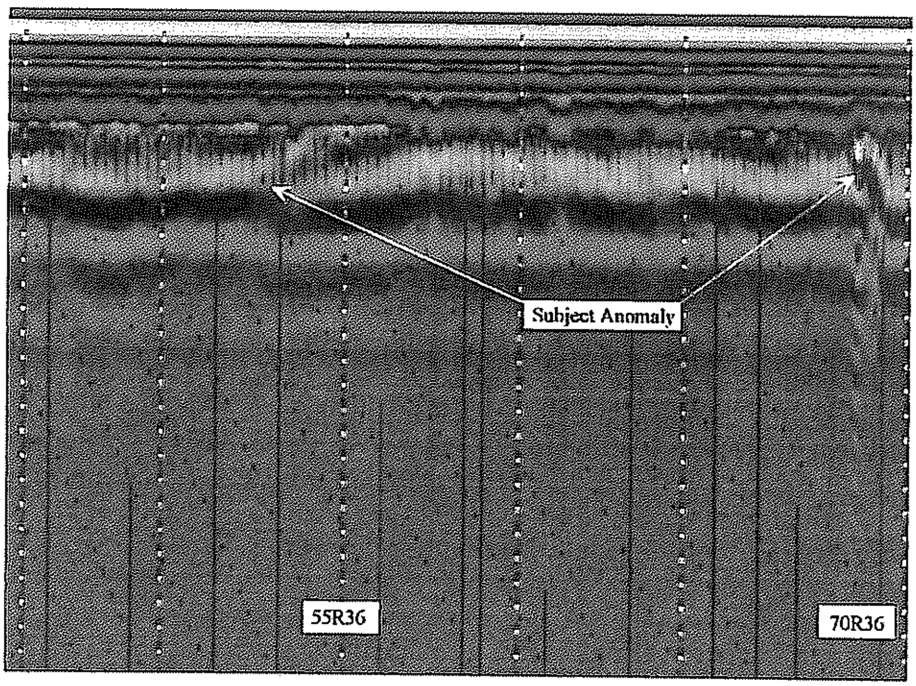

Figure 15. High Amplitude Anomaly Cluster 1 (Transect 3).

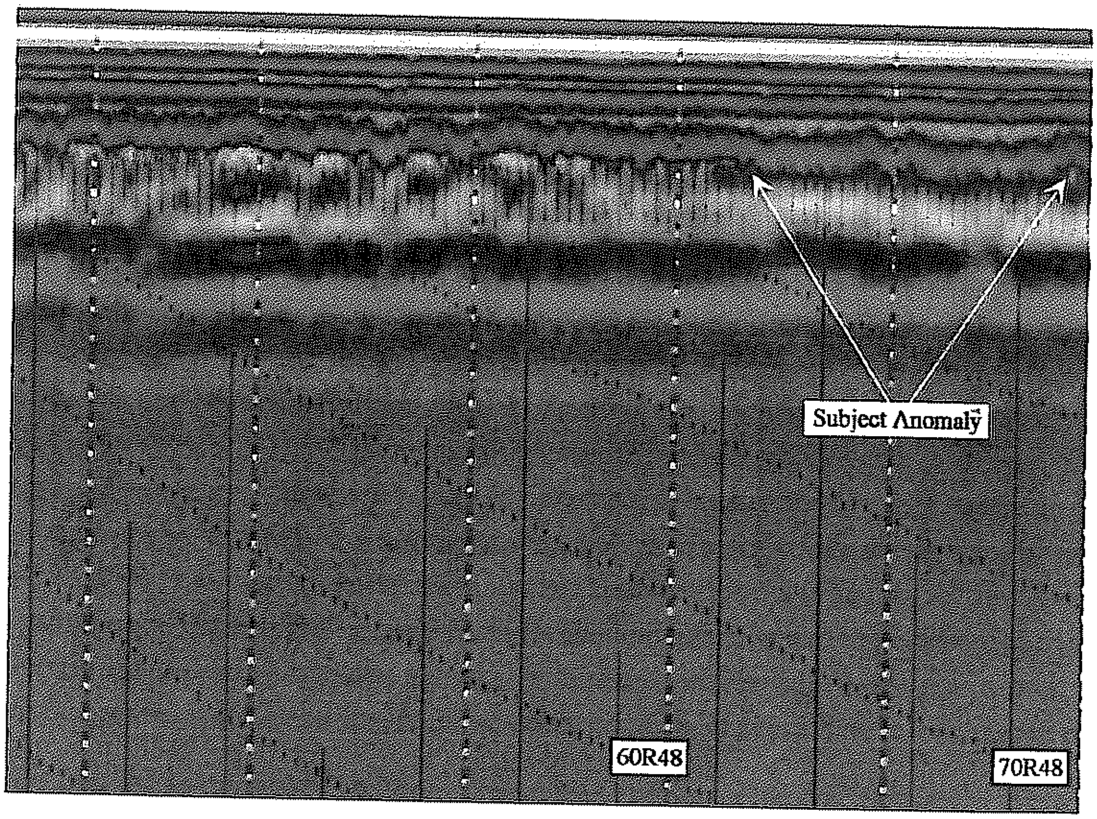

Figure 16. Anomaly Cluster 3 (Transect 9).

amplitude signatures of the anomalies here. However, the relatively large size of each anomaly suggested a different cause than root disturbance (Figure 17). It was also considered feasible that the anomaly was linked to the proximity of the mound to the ravine to its east.

GPR and Core Sample Data Comparison

The first cluster of anomalies was penetrated by CS 2 and CS 7. In comparing the core data, the uppermost intact deposits of CS 2 consist of Stage V mound fill while in CS 7 the deposits appear as Stage V midden-like, yellowish-brown sandy clay mottled

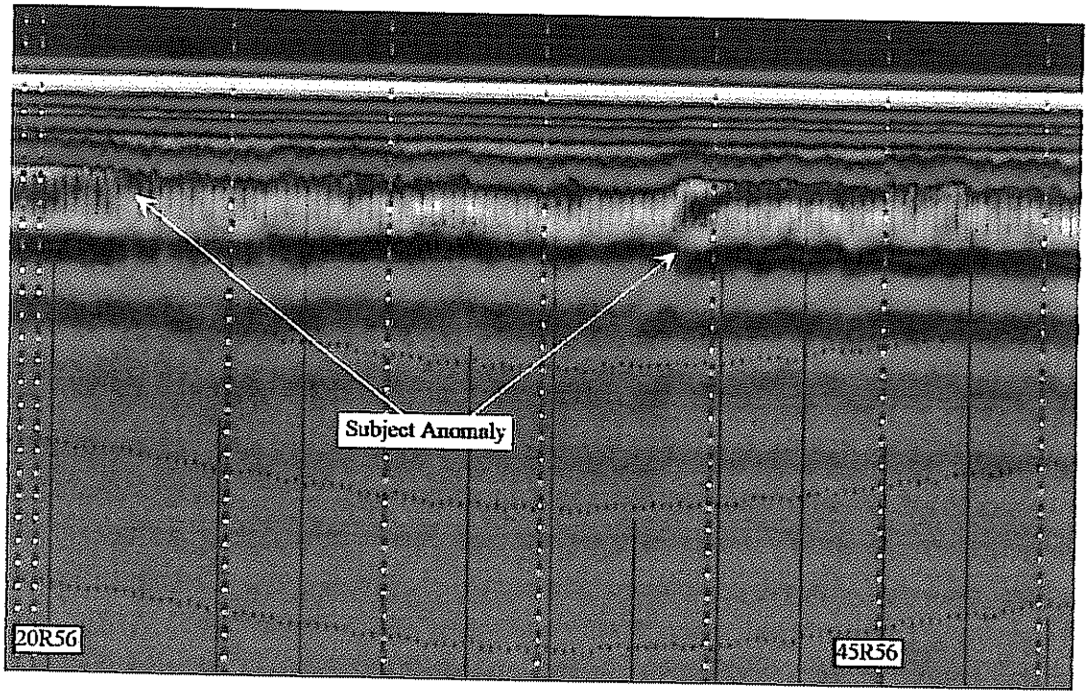

Figure 17. Anomaly Cluster 4 (Transect 13).

with grayish-brown sandy clay. Below each of these deposits was a distinct layer. The buried summit of Stage IV included a heated surface complete with charcoal and fired clay. Each of the cores revealed a layer of dark gray to gray sandy clay with a fired clay surface and charcoal inclusions.

The second anomaly cluster, within the northeast corner of the mound, was penetrated by CS 3, CS 8, CS 9, and CS 12. CS 3, CS 9, and CS 12 show a similar heated surface between 122 cmbs and 139 cmbs. Each of these is the uppermost deposit of Stage III overlain by mound fill of Stage IV. In the case of CS 9, the Stage V mound fill also overlies the buried summit. However, In CS 8, a similar heated surface is noted at 225 cmbs. The depth of the deposit does not correspond well with that of the other samples. The location of the core sample, 56.1R37.6, is only 8.7 m south of CS 3. If the two surfaces are, indeed, contemporaneous Stage III deposits, the burned surfaces noted in CS 3, CS 9, and CS 12 are situated on an elevated surface above that recognized in CS 8.

The third anomaly cluster (3) was penetrated by CS 6 and CS 10. Within the first 2.5 m of CS 6, two distinct features exist. The first consists of a layer of summit deposits between 71 cmbs and 89 cmbs. Included within this layer is a heated surface, a red clay lens, and a black lens of charcoal and ash. Below this is the second feature consisting of a 123 cm thick layer of midden-like deposits overlying the Stage III summit.

Within CS 10, deposits between 80 cmbs and 147 cmbs consist of similar midden sediments. Grayish brown and brown sandy clay is intermixed with bands of very pale brown sandy clay. Ash and charcoal exist throughout these deposits.

The fourth anomaly cluster (4), in the southeast corner of the mound, was penetrated by CS 11. Interestingly, during the drilling of the core sample, the auger encountered very compact, dry, sandy clay deposits. The compact and dry nature of these sediments caused the auger bit to heat up and partially melt the exterior of the lucite sheath. As a result, the sheath was slightly disfigured, but the deposits contained within showed no signs of modification from the heat.

Within the core sample, the Stage IV deposits consist of grayish brown very sandy clay midden-like sediments. The underlying summit, at 98 cmbs to 112 cmbs does not show the signs of heating recognized in many of the other cores. However, the Stage II summit, at 201 cmbs does show signs of heating and includes fired clay and charcoal.

In terms of revealing summits where deposits of different episodes of construction intercept one another, the GPR data were of limited use. The stratification noted within the GPR profiles is not consistent with the information displayed in the core samples. However, the recognition of burned surfaces and relatively extreme changes in deposits does bode well for the recognition of stages by the GPR. Each of the four designated anomaly clusters was related to factors which occur on mound summits. The burning of the surfaces of summits dramatically alters the nature of the sediments within close proximity of the surface. These changes are recognized by changes in energy propagation where the sediment variation modifies the signal return time. This also holds for midden deposits. The high organic content of these sediments, including ash and other carbon based materials, also produce an easily recognizable change in energy propagation.

CHAPTER 7

Stages, Fill Volumes, and Labor Expenditures

To discuss Mound R in terms of the various stages of mound fill, it is necessary to establish a few points above and beyond nomenclature and to be willing to accept several conditions of the analysis. The core samples recovered from Mound R provide only a limited (10 cm wide) profile of the deposits present within the mound. Because of the design of the core drilling sampler, 5 cm of material was lost from the tip of each core sample. As the cap of each section was unscrewed, the deposits contained within were discarded. This material was lost and any potential breaks within this 5 cm portion were lost along with the sediment. However, the likelihood that the lost deposits resulted in a miscalculation of the number of stages is considered unlikely given the relative consistency of the number of noted stages within given areas. That certain portions of Mound R are built in more or fewer stages than other portions is well within the realm of possibility. A review of several mound excavations reveals the variations within mounds in terms of the number of stages present within given areas (see DeJarnette and Wimberly 1941; Lewis and Kneberg 1993:57; Knight 1995; Schnell et al. 1981).

While the core sample data suggests between four and five stages of construction (Table 3 and Figure 18), the actually number of stages is likely between six and eight. The location of the core samples, none of which was closer than 3 m to any edges of the

Table 3. Average Thickness of Stage Deposits.

	STAGE				
	I	II	III	IV	V
AVERAGE THICKNESS in cm	236	100	104	72	43
AVERAGE HEIGHT ABOVE GROUND SURFACE in meters	2.36	3.36	4.4	5.12	5.55

current summit of the mound, play a distinct role in explaining this discrepancy (Figure 3).

In the nineteenth and early twentieth centuries, the majority of the Moundville site was being cultivated in either corn or cotton. This included the summits of the larger mounds, such as A, L, and R. By 1905, when Moore made his first visit to the site, he noted that Mound R had a raised edge with a depressed area in its central portion. As mentioned earlier, Moore remarked that the edges of Mound R, where trees held the soil, were "several feet above that of the rest of the plateau" (Moore 1905:220). Again, he attributed this to either a wall surrounding the summit of the mound or the result of cultivation and subsequent erosion. Given the extent of the plow zone deposits present on the current summit of Mound R, the latter seems the more likely cause.

Since none of our samples were taken close to the edges of the mound, it is likely that they were all taken from a portion of the area that Moore believed had been impacted

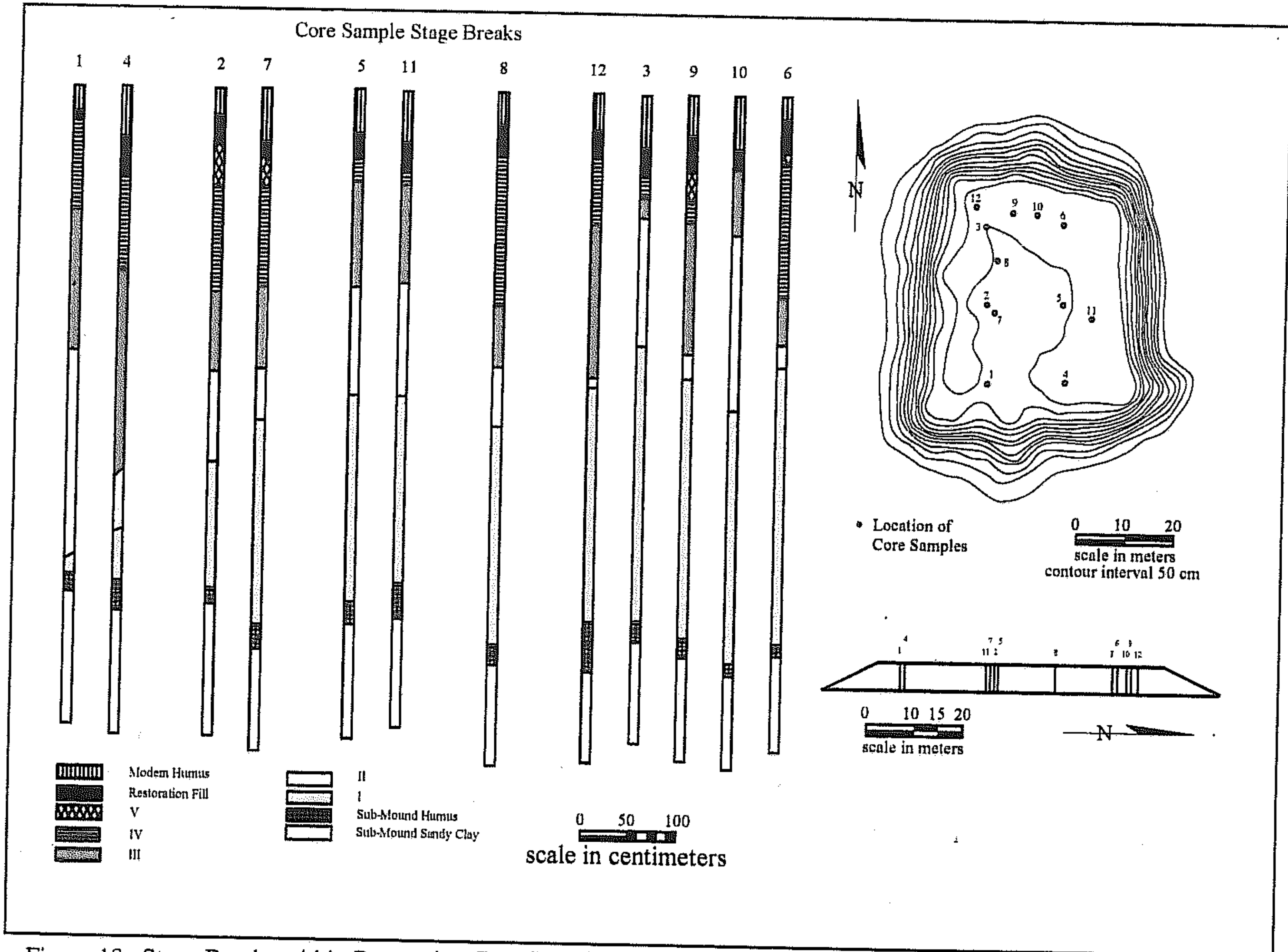

Figure 18. Stage Breaks within Respective Core Samples.

by agriculture and erosion. On the other hand, Knight's excavations into the west flank of Mound R were limited to only a small portion of the mound summit within the area recognized by Moore as the raised edges (Knight 1995). Consequently, we have likely missed the remnants of the most recent episodes of construction while the 1993 excavations missed the oldest. The greater extent of erosion and subsequent removal of summit material from the central portion of the mound has impacted several of the more recent episodes. So, the core samples include earlier episodes of construction not reached by Knight's flank trench excavation and likely miss at least one or two of the latter stages recorded in the flank trench profiles (Gage 1999; Knight 1995). Mound R probably contains between six and eight individual episodes of mound building. The later episodes appear to be the least in added volume.

The individual stages involved in the construction of Mound R varied in the amount of fill used and the labor needed. In an effort to determine the necessary amount of labor, the fill volumes were calculated according to the formula presented by Schnell, Knight, and Schnell (1981:29). This formula is stated as:

$$V_t = (a \text{ x } e \text{ x } b) + (a \text{ x } b \text{ x } d) + (e \text{ x } b \text{ x } c) + .667\ (b \text{ x } c \text{ x } d)$$

Where a is the summit length, b is the summit height, c is the width of the long axis flank, d is the width of the short axis flank, e is the summit width, and V_t is the total volume expressed in cubic meters. The total volume for each stage was then calculated into approximate labor expenditures based on Muller's (1986, 1997:273-274) estimate of

1.25 m^3 per person-day. Again, a person-day refers to the amount of sediment an individual can lift and spread within a five-hour period.

Stages of Construction

Mound R was built directly upon the Plio-Pleistocene terrace deposits of the Black Warrior Valley (Figure 19). Unlike mounds built upon foundations of stone (see DeJarnette and Wimberly 1941), atop extensive village deposits or middens (see Knight 1995), on prepared surfaces (see Schnell et al. 1981), or on substructures (see Lewis and Kneberg 1993), Mound R appears to be set directly on the premound humus layer of grayish-brown sandy loam. Subsoil is a relatively consistent yellowish-brown to yellowish-red sandy clay. The iron oxides geothite and hematite are present throughout the deposits under the mound. None of the twelve core samples encountered any evidence of submound features. Given the extent of village deposits north and west of Mound R, the lack of premound cultural deposits is relatively surprising (see Moore 1905, 1907; Scarry 1986, 1995). It is also surprising considering the evidence generated by the 1993 excavations of the west flank. Here, a premound feature was recognized beneath the toe of the slope and interpreted as evidence of pre-Mound R domestic activity (Knight 1995:18 and 25).

The possibility that the occupation was limited to the area under and beyond the western flank of the mound seems unlikely, particularly given the relatively flat topography beneath Mound R and the limit of similar terrain within such close proximity

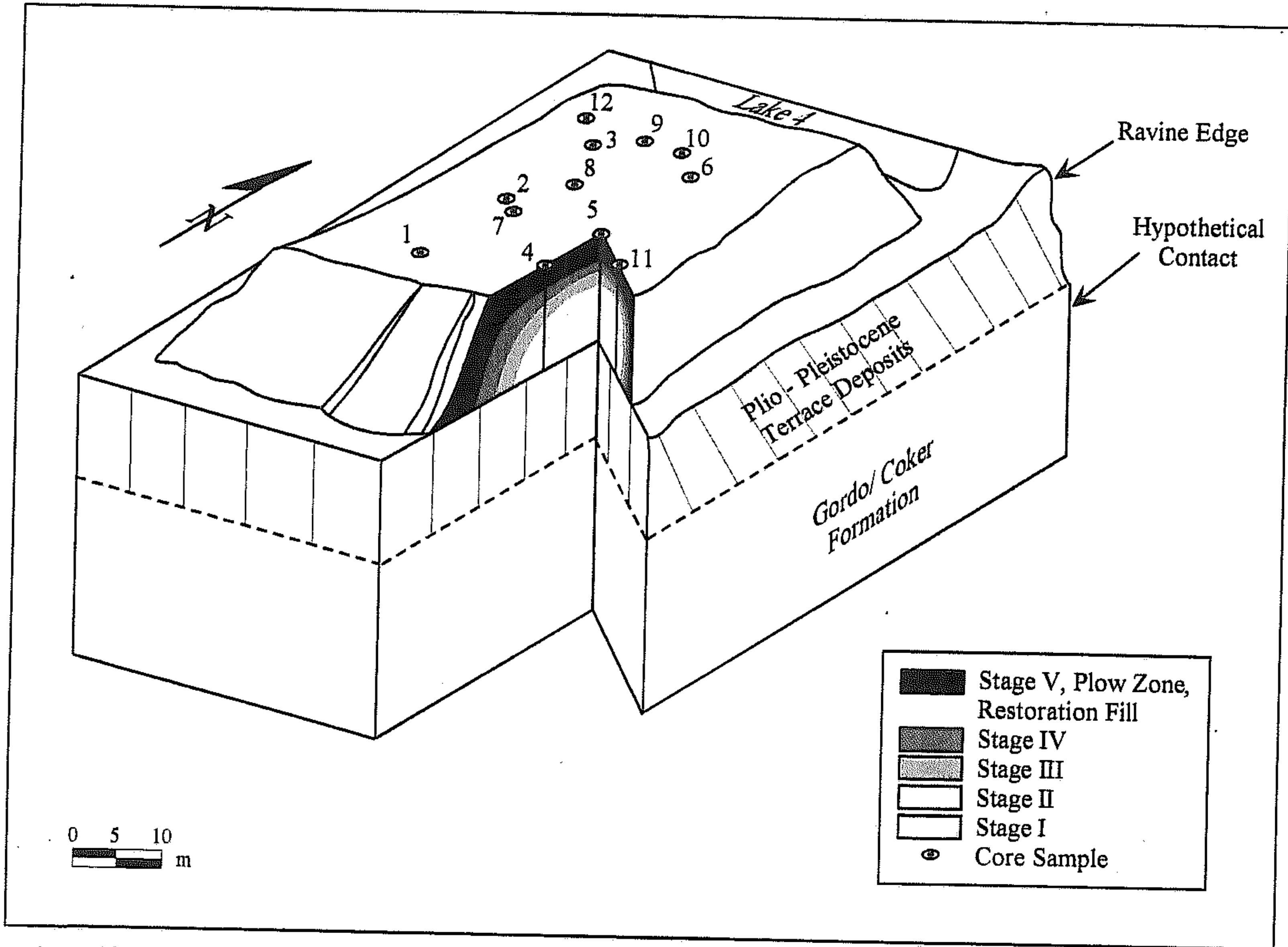

Figure 19. Cross-Section of Mound R.

to the river. Possibly, any such submound anthropogenic deposits were limited and the core samples missed all remnants of premound occupation. Given the extent of deposits north and west of the mound, this appears improbable as well. It seems likely that the premound location was occupied to some extent by the early inhabitants of the site. Nevertheless, no evidence is recognized in any of the 12 core sample locations of such an occupation.

Stage I

Mound R's size changed considerably throughout its occupation. This not only refers to the height of the mound but also its horizontal distribution. Within the two core samples taken from the southernmost locations, uniformly sloping sediments exist as the deepest deposits. Within CS 1, three layers of sloping deposits are noted between the premound ground surface (514 cmbs) and 20 cm (494 cmbs). Each exhibits a relatively consistent 37 degree angle. A similar scenario is documented for CS 4. Between the premound surface (519 cmbs) and 30 cm (489 cmbs), four horizontally deposited layers make up the deepest deposits of the mound. These are overlain by sloping brown and gray sandy clay strata capped by a brown clay lens between 30 cm (489 cmbs) and 53 cm (466 cmbs) above the premound surface. The overlying sloping brown and gray sandy clay sediments are midden deposits established on what was likely the first southern flank of Mound R. The current flank of the mound, at similar depths, lies more than 18 m to the south suggesting the first episodes of construction were centered closer to the northern end of the mound.

Elsewhere within the mound, Stage I deposits are much thicker, averaging approximately 2.36 m. As Knight has noted from recent excavations, the earliest stage of construction of the site's mounds appears to have often been the most significant (Vernon James Knight Jr., personal communication 1998). This is apparently the case for Mound R as its first episode of construction is by far the largest. The core sample data portray a large initial phase of mound building with all subsequent episodes significantly smaller. If CS 1 and CS 4 indicate the southern flank of the Stage I mound, its volume was approximately 9,900 m^3. The current volume of Mound R is documented at about 30,700 m^3 (Gage 1999).

Given the new understanding of Moundville's occupation (Knight and Steponaitis 1998; Steponaitis 1998), the earlier, late Moundville I phase, population of the site would likely have been larger than the subsequent phases. Greater population indicates at least a greater labor pool if not a greater labor force. At the adopted rates of construction, Stage I of Mound R would have required 7,920 person-days to complete.

Steponaitis (1998:43) has suggested that the population of the earlier occupation of Moundville was between 1,000 and 1,700. Assuming the minimum population of 1,000 and assuming that two persons from a family of five (see Scarry 1998:92-93) would provide the necessary labor, Stage I could have been completed in 20 days. The maximum population of 1,700 could have completed the same work in about 12 days.

Stage II

During the next episode of mound construction, the southern flank was extended to the south. Only in the lowest portions of the Stage II deposits, visible in CS 1, do sloping layers exist. Above this, deposits become horizontally distributed showing the southern extension of the mound's flank. However, in CS 4, the sloping deposits continue to appear within the Stage II deposits from 51 cm (468 cmbs) to 1.17 m (402 cmbs). At a similar depth, the flank of Mound R is currently 14 m to the south. Again, suggesting that the initial construction of Mound R was situated closer to the northern portion of the mound locale.

With the completion of Stage II, Mound R's total volume grew to approximately 14,000 m^3. The addition was less than half of the mound's initial construction episode with an added volume of approximately 4,100 m^3. The addition would have required 3,280 person-days to complete. Assuming a similar population and labor force for Stage II's construction, this addition to Mound R could have been completed in five to eight days.

Stage III

The third episode of construction also included the extension of the southern flank. Evidence for sloped deposits exist only in the lowest layers of Stage II in CS 4 and not at all to the west in CS 1. At this point the Stage III summit edge was at approximately 3.56 m above the premound ground surface and was within 8 m of the current southern summit edge.

Approximately 7,200 m^3 of fill was added to the mound during the third episode of construction. Larger than the previous episode, Stage III consists of slightly more than two-thirds of the amount of fill used in Stage I.

Mound R's occupation is suggested by Knight (1992, 1995) as spanning at least the latter portions of Moundville I, Moundville II, and Moundville III. He attributes the deposits encountered within the western flank excavations to post A.D. 1350 occupations of late Moundville II (Knight 1995:24). This falls within the period of time that it is believed the non-elite vacated Moundville for other river valley sites and the remnant occupants were solely elite members of society (Knight and Steponaitis 1998:17-21). If, as suggested earlier, the western flank excavations missed the earliest episodes of construction and the core samples missed the most recent, then Stage III is believed to be one of the deepest stages encountered by Knight's excavation. As such, the population of Moundville would have been less during the Stage III construction than during the preceding phases. The implications for the available labor force are obvious. However, whether the elite residents of Moundville held enough power to acquire the same number of individuals, whether their newly established prominence and distance from non-elites afforded them greater opportunities for labor, or whether they were forced to do more with less is unknown.

At any rate, the necessary expenditure of labor to add Stage III was approximately 5,760 person-days. If the population was reduced to 700 with the same available labor force ratio, the work could have been completed in under 21 days. If the available labor force remained about the same as the minimum population of the earlier phase, the work could have been completed in under 15 days. At the greater population of 1,700, Stage III could have been completed in less than eight and one-half days.

It should be noted that CS 10, near the northern ramp of the mound, is unique in that it contained evidence of only three stages of construction. Here, Stage III was truncated by the historic plow zone. A possible explanation can be seen in the underlying Stage II deposits. An intrusive Stage III feature extends into the underlying Stage II deposits. The sediments include sand layers, clay inclusions and concentrations of fired clay. Although attributed to Stage III, the intrusion may have actually been of Stage IV origin. If so, the intrusion has erased any evidence of the existence of Stage III within the limits of the core sample profile.

Stage IV

The fourth stage of mound building is much more varied in appearance. As noted above, CS 10 contained only three stages of construction with the possibility that a feature originating from one of the later, possibly the third or fourth episode, intrudes into and erases from the profile any evidence of an additional stage. All but four of the core samples contain only four stages of construction with the overlying deposits consisting of the historic plow zone. Nevertheless, given the presence of the overlying mound fill in the remaining four, estimations of labor and fill are possible.

The addition of the fourth stage of mound building raised the summit of Mound R by roughly 72 cm to approximately 5.12 m above the premound ground surface and included approximately 4,600 m^3 of fill. This translates to 3,680 person-days. Again, the question of availability of labor arises. By the late Moundville II or early Moundville III phase, Mound R's fourth stage was under construction and the general population of the site had likely declined (Knight and Steponaitis 1998). Using the same population variables, a community of 700 could have completed the work in a little over 13 days. A community of 1,000 could have completed the work in just over 9 days, and with a population of 1,700, the work could have been completed in five and one-half days.

Stage V

The fifth stage of construction exists in only four of the twelve core samples (CS-2, CS-6, CS-7, and CS-9). In all cases, the historic plow zone has truncated the Stage V deposits. The remaining amount of sediment averages only 28.5 cm thick bringing the summit of Mound R to roughly 5.55 m above the premound surface.

Speculation regarding the amount of fill used in the fifth episode is relatively futile considering the extent of truncation by the plow zone. However, if it is plausible to consider the thickest remaining portion of Stage V to be a possible indicator of its original fill volume, at least a minimum guess can be offered.

Approximately 2,200 m^3 of fill would have been required to equal the minimum amount of sediment in Stage V. This amount would have equaled 1,760 person-days and could have been completed in two and one-half to six days with the same possible labor forces.

The truncation of Mound R by plow zone and subsequent erosion is nothing new to mounds or archaeological sites in general. The issue was addressed at Moundville during the Depression Era restoration at which time several of the mounds received dramatic facelifts. Photographs of the site from before the restoration work show several of the mounds as low humps in an agricultural setting of fields and pasture. While these include the smaller mounds, such as S, T, and Y (M1), the impacts of the same factors on the larger mounds was no less extensive. Within the collection of Moundville-related documents, one set of notes by Carl T. Jones, dated December 11-12, 1934 is listed as "Estimate of Restoration Work Needed at Mound Park." It suggests the need for 620 cubic yards of material to be used on Mound R to fill "holes dug in the sides and a portion of the top that has been dug away." In 1937 the CCC restored much of the summit and southern ramp (Knight 1995). Other plans for restoration work on the mound is indicated by rough hand drawn maps which show several eroded areas on the edges of the summit and western flank. The maps indicate between 30 and 35 cubic yards was used in these repairs. They also indicate the existence of Lake 4. The lake, situated north of Mound R, was excavated and restored by September of 1938, after the completion of the 1937 CCC restoration work. As such, it suggests that the restoration of

Mound R was an ongoing project begun around 1934 and continued until at least 1941 (Jones 1941). Even in the past decade, eroded areas near the southern ramp and on the western flank have required filling. Gravel, sand, and concrete blocks have all been used to repair these holes. The combination of deposits contained within the plow zone and the restoration fill equal approximately 2,700 m^3.

No definitive estimate can be made of the amount of lost fill, unless the edges of the mound are close in height to their original form. If so, it is likely that between one and three stages completed the prehistoric mound building of Mound R. The combined volume of these deposits would have required 2,160 person-days. Without a decrease in population, these stages could have been completed in three to seven days. If the stages were relatively equal in volume, these estimates are reduced to one and one-half to three and one-half days.

CHAPTER 8

Heated Surfaces, Middens, and Buried Summits

Each of the stages of construction was marked by a break between sediment deposits. Several of strata related to these breaks took the form of unheated, unmixed contacts where the compacted sediments of an earlier stage were overlain by different sediments of a succeeding stage. These breaks often displayed an underlying layer which included the presence of manganese nodules, such as that seen in the uppermost portion of the Stage II fill in CS 2, the uppermost portion of Stage I in CS 3, and the uppermost portion of Stage II in CS 10. This is not always the case, as noted in the 120 cm of Stage II fill in CS 11. Here, manganese nodules were present throughout the deposits. However, the predominant appearance of manganese nodules is in the older stages near their uppermost contacts.

In other instances, the presence of midden deposits or burned summits provided easily discernable breaks between stages. Breaks where the summit strata had been subjected to heating usually exhibited compact contacts with charcoal and fired clay inclusions, such as the Stage II summit in CS 1, the Stage III summits in CS 2, CS 3, CS 5, CS 8, CS 9, and CS 12. Midden deposits were most commonly mottled, yellowish-brown, brown, and/or grayish-brown, sandy clay matrices with charcoal fleck and ash inclusions. Often, small fragments of fired clay or pottery sherds were also present.

Midden-like deposits, such as those overlying the Stage III summits in CS 6 and CS 10, and the Stage IV deposits of CS 5 and CS 11, were most common in areas located nearer the current edges of Mound R.

Heated Surfaces

The various heated surfaces of recognized stage breaks within the core samples are the result of burning on the various mound summits. In several instances this is interpreted as likely indication of burned summit architecture. The presence of fired clay and charcoal can obviously be attributed to other sources, such as fire hearths, discarded material cleaned from fires, or any number of other activities involving the use of fire. However, in most of these instances, the extent of the fire would have modified the underlying sediments much more extensively than they have. The deposits in many of these instances are thin, less than 3 cm, such as the Stage II summit in CS 1, the Stage III summit in CS 2, and the Stage I summit in CS 10.

These surfaces are sometimes underlain or covered by a lens of clay, as in the Stage III summit in CS 12, the Stage III summit in CS 2, and below the Stage I summit of CS 3. These clay or sandy clay deposits are suggestive of clay caps or "blanket mantles" recognized in several excavations of mounds at Moundville and other mound centers (see, e.g., Allsbrook et al. 1997; Brown and Fuller 1993; Knight 1992, 1995; Schnell et al. 1981).

The preparation of surfaces for the purpose of establishing living floors is well known from excavations in many of these mounds. Clay, with its strong ionic bounds, hardens and compacts well to form a stable surface. Compacted clay surfaces repel water, resist erosion, and resist pedoturbation more readily than do sediments of larger grain size.

The presence of charcoal is evident in almost all of the breaks which exhibit signs of heating. However, a few, such as the summit of Stage III in CS 2, Stage II in CS 5, and the Stage II summit is CS 6, exhibit surfaces showing signs of heating, but lacking charcoal inclusions. Whether the surfaces were intentionally cleaned following heating or were subject to natural weathering processes that removed evidence of remnant carbon, the color, sorting, and texture suggest they were burned.

The heated summit strata that do exhibit charcoal are interpreted more readily as evidence of burned summit architecture. The use of Mound R as a domiciliary platform mound is alluded to by Moore (1905:220) and more directly addressed by Knight (1995:18-19). Knight has noted evidence within the flank trench units for the presence of burned structural materials. The presence of wall trenches, lensed clay, and charred material is recognized in several of the stages seen in the flank excavations.

In the southern portion of the mound, evidence for heated surfaces and burned structures is less common than in the northern. This cannot be stated without noting the sampling bias of core sample locations. The cluster of core samples in the northern and central portions of the mound outnumber those in the southern portion ten to two. In the two samples from the southern portion, only CS 1 includes a single summit break with signs of surface heating. The Stage II summit in CS 1 consists of mottled, yellowish-brown, and reddish-brown, sandy clay with charcoal inclusions. Below this is a 7 cm layer of gray sandy clay with high ash content. The Stage II summit break in CS 4 is bounded by sloping deposits with some charcoal, but no evidence of heated sediments.

Core samples located in the central and northern portions of the mound contain more evidence for heated surfaces and burned structures. CS 2, CS 3, CS 5, CS 6, CS 7, CS 8, CS 9, CS 10, CS 11, and CS 12 all show signs of at least one heated summit and in most instances two or three. With full knowledge of the sampling bias, the greater number of surfaces exhibiting signs of heating in the central and northern portions of the mound are interpreted as a demonstration of the preference by occupants for locating structures on the northern side. If we take the burned material in Stage III of CS 3, CS 9, and CS 12 and compare it to anomaly cluster 2 of the GPR data, the burned surface in the northwest corner of the mound likely represents a structure which covered roughly 250 m^2 (Figure 20). The northern side of Mound R is closer to the bluff overlooking the Black Warrior River and further back from Moundville's plaza. Although intended only as a possible understanding of occupation preference, the lack of large anomalies recognized in the southern portion of the mound during analysis of the GPR data, and the prevalence of these features in the northern and central portions, provides some support for this interpretation. This may only be limited to the later occupations of the mound and not representative of its entire use-life.

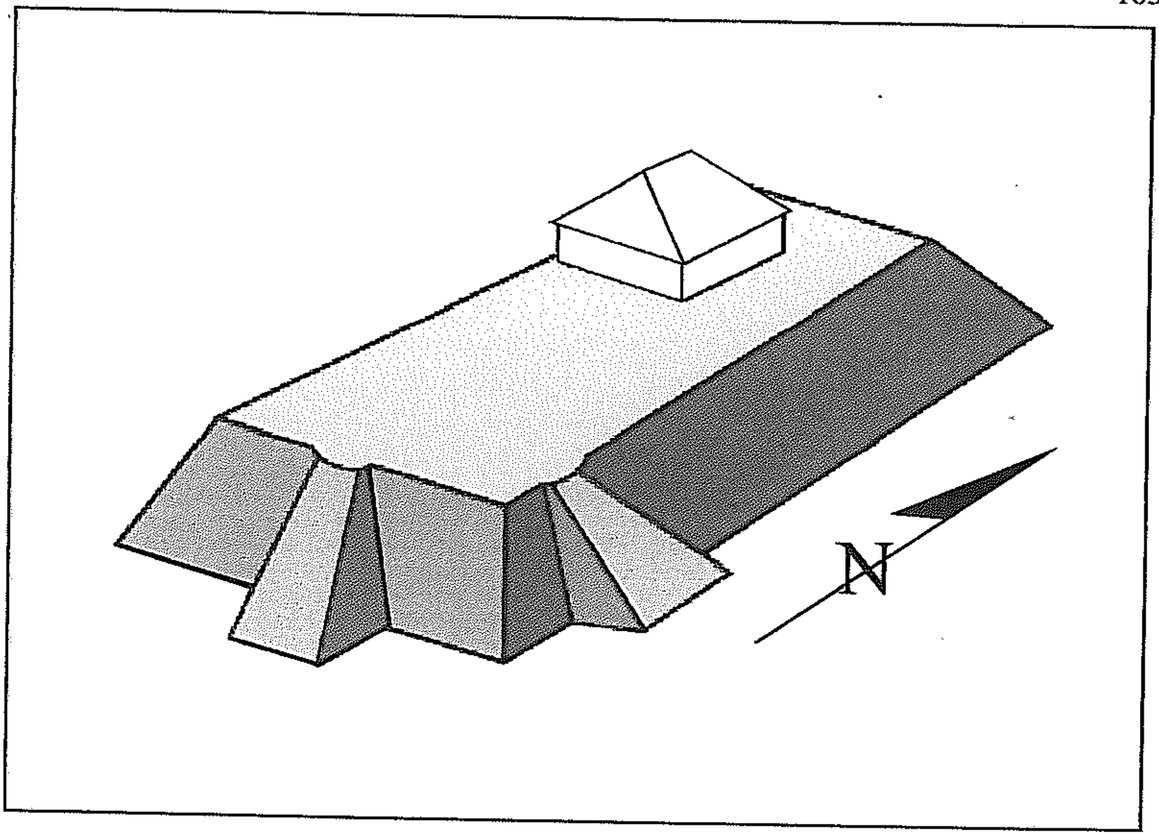

Figure 20. Approximate Location and Dimensions of the Stage III Burned Floor and Associated Structure in the Northwest Corner of Mound R.

Slopes

The recognition of the southern slope during the Stage I and Stage II development of Mound R, is interpreted from both CS 1 and CS 4 (Figures 9 and 11). In both of these locations, the southern slope of the mound was more than 10 m north of its current location. The Stage I slope recognized in CS 1 near the base of the mound also appears in CS 4. However, the Stage II slope is only noted in CS 4. Here, sorted silty clay suggests weathering of the southern flank.

Sometime following the initial construction of Mound R, the southern end was extended beyond the limits of CS 1, but not beyond CS 4. Only after the completion of Stage II does a subsequent episode of construction appear to incorporate the area penetrated by CS 4. The deposits evident for Stage III in CS 4 are more than three times the size of either of the preceding stages. It would appear that the Stage III construction sequence involved a large addition extending this southern edge towards Moundville's plaza.

Middens

Midden deposits associated with Stages IV and III are particularly evident in the northeastern portion of the mound in CS 6 and CS 10, respectively. Their size and shape can be roughly estimated by comparison with the GPR data as covering an area of at least 12 m by 15 m. In CS 10, the midden deposits are greater than 70 cm thick. The intrusion of the historic plow zone has truncated the remainder of these deposits. However, in CS 6, the Stage IV deposits overlying the midden delimit its boundaries to between 89 cmbs and 212 cmbs. Its total thickness is 123 cm. This suggests a minimum volume of at least 173 m^3.

Midden or midden-like deposits are also noted in the southeast portion of the mound within CS 4 overlying the Stage IV deposits and in Stage IV of CS 11 . They are also evident in Stage IV and V of CS 7, Stage IV of CS 8, and Stage IV of CS 12. Interestingly, in all of these core samples, the midden deposits are within the later stages.

No midden deposits are noted for the Stage I or Stage II summits. The deepest midden deposits are those overlying the Stage III deposits in CS 6 near the northern side of the mound and nearer the ravine edge.

One possible interpretation is that the disposal of refuse changed from the earlier Stage I and Stage II occupations to the later post-Stage III occupations. Whatever the cause, disposal became more sporadic and less concentrated. Rather than using that portion of the mound nearest the ravine where weathering processes might help to flush midden deposits down into the drainage and out to the river, they were established around the summit edges in random distribution.

The proposed change in occupation that Moundville experienced during late Moundville II (Knight and Steponaitis 1998) appears to have impacted the occupation of Mound R as well. The changes in the structure' morphology, architectural distribution, and midden deposits reflect the dynamic social conditions of the time. Volumes of fill added during episodes of construction gradually diminished as the available labor force of non-elite residents moved out of Moundville. Middens began to appear in random distribution around the mound's edges, and summit architecture is concentrated in the central and northern end of the mound.

CHAPTER 9

Concluding Remarks

Interpretations

What follows is a summary of interpretations drawn from the GPR and core sampling data. They are considered best guess conclusions and are, as always, subject to drastic revision given further investigations.

Mound R experienced a series of at least six, and possibly as many as eight, episodes of construction. The exact number is in question because of the extent of historic modifications to all but the mound's edges. It is believed that the five or possibly six episodes of construction recognized by Knight (1993:18-19) correspond to the three later stages (III, IV, and V) of construction recognized in the core samples. In addition, the 1993 excavations likely encountered two or three additional episodes on the edge of the mound removed from the central portion by cultivation and subsequent erosion.

The initial episode of construction, likely occurring during late Moundville I or early Moundville II phase, was the largest with each succeeding episode being much smaller in volume. The estimates of labor required for each episode of construction, although dictated by the population and available labor force, was likely limited to less than 21 days for any individual stage.

The distribution of features, including house floors, slopes, and midden deposits reveals a shift in the primacy of occupation areas and refuse disposal. While the earliest stages of the mound experienced construction efforts concentrated in the central and northern portion of the Mound R locale, the later post-Stage II episodes of construction involved a massive addition to the southern end of the mound. This, in turn, was followed by a shift in refuse disposal from concentration in the northeast portion of the mound during the first two stages (I and II), to random distribution around the mound's edges in subsequent stages (III-V).

Throughout Mound R's occupation, the northern end of the mound appears to have been preferred for summit architecture. Interestingly, this preference appears after the first stage of construction. Only during Stage I does a burned surface, suggestive of burned summit architecture, appear in the southern portion of the mound.

Mound R's patterns of occupation mirror the changes in social organization proposed for the site. With the changing population, successive episodes of decreased volumes of construction become apparent until probably the end of Moundville III or early Moundville IV when Mound R is abandoned.

Earthen mounds, specifically Mississippian platform mounds built throughout the Southeast are constructed in a common way. Sediment is piled to form a surface raised above the surrounding ground level. The uppermost surface of this structure may represent the first and only summit, or it may be one in a series of mound building episodes. Additions to mounds are not only common, but the norm (DeJarnette and

Wimberly 1941; Knight 1995; Lewis and Kneberg 1993; Schnell et al. 1981). David J. Hally (1996:110-112) has made a study of the likely duration between Mississippian mound-construction stages. His findings come from both ethnographic and ethnohistoric evidence derived from the Natchez as well as possibly from the Taensa and Timucua which suggest that the frequency with which mounds were provided additional stages requires an event of similar frequency. The phenomenon Hally identifies as the only "event having sufficient community interest and occurring with sufficient frequency and regularity to have served as the stimulus for most rebuilding" was the succession of a chief (Hally 1996:95). As such, he believes that the duration of a stage's use-life was between fifteen and twenty-five years (Hally 1996:110).

Knight (1986, 1989b) supports a slightly different, although relatively compatible, cosmological foundation for monumental architecture and its "burial." Falling within his "triad of iconic families" Mississippian platform mounds were symbolic objects of sacred display (Knight 1986:678). The mound is an icon representative of earth, modified by periodic burial as a means of its purification and renewal (Knight 1986:678, 1989b:282). It is a sacred element representative of ceremonial and religious beliefs, such as a metaphor for the "earth island," as a means of appeasing or honoring ancestral spirits, or associated with mountains or other elevated surfaces (Knight 1989b). The addition of stages symbolizes renewal, purification, and possibly fertility, not unlike the Muskogee "green corn dance."

For whatever reason, successive episodes of construction over years, decades, or centuries was undertaken by groups of laborers in an effort to modify the existing communal landscape. The commonality of building techniques and methods leads to a similarity, notable in almost all such earthen structures. Basketload upon basketload was excavated from secondary locations, transported to a common locale, and deposited to form mounded earthen structures. As a result, profiles of these structures reveal individual piles of sediment as well as summit surfaces buried by subsequent additions of mound fill.

Anthropogenic modifications to the landscape require labor above and beyond the basic needs for human survival. The impetus behind the coordinated efforts of several individuals required for the development of a mound can only be speculated upon. Moundville's political organization as a stratified, chiefdom level society provides some semblance, if again speculative, of reason behind mound construction. Justification by elite individuals for corporate labor expenditure might be found in what Earle has called "… an ideology that strengthens the legitimate position of leaders…"(1991:6). He outlines a series of ten political strategies designed to potentially answer the question of elite control. These include:

(1) *giving (inflicting debt), feasting, and prestations*;

(2) *improving infrastructure of subsistence production*;

(3) *encouraging circumscription*;

(4) *outright force applied internally*;

(5) *forging external ties*;

(6) *expanding the size of the dependent population*;

(7) *seizing control of existing principles of legitimacy (the past, supernatural, and natural)*;

(8) *creating or appropriating new principles of legitimacy*;

(9) *seizing control of internal wealth production and distribution*;

(10) *seizing control of external wealth procurement* (Earle 1991:5).

By comparing these strategies to Moundville's archaeological record, it is possible to at least suggest exclusion of those that may not apply. Strategies (1) and (2) require leaders to harness the economic power resulting from controlling the means of production. This is certainly a viable option given the resources available for craft production within the influence sphere of the civic ceremonial center (Welch 1991, 1996). The clays which outcrop along the Black Warrior River near or below current artificial pool levels provide an excellent source for pottery production. In fact, much of the pottery found at the site and attributed to non-local sources, has instead been found to have been made from Moundville-area clays (Welch 1996:84). Resources within the Fall Line Hills and subject to Moundville's political control may have also included sandstone (Sherard 1999), Tuscaloosa gravel, and any number of perishable and non-perishable materials (Scarry 1995; Welch 1991, 1996). Although any assertion that Moundville was the controlling center for craft specialization during Mississippian times is tentative at best, some evidence does exist for craft production at the Moundville site and not at other adjacent sites within its sphere of influence (Muller 1997; Scarry 1995; Steponaitis 1991; Welch 1991, 1996).

Strategies (3) through (6) are tied directly to forced conscription and/or warfare. While we know that the preceding Late Woodland witnessed large scale areal conflict (Steponaitis 1983, 1991), the Moundville I phase and the subsequent Moundville II and III phases saw a decrease in conflict. The number of traumatic injuries noted in burials from the site are few and far between (Powell 1988, 1991, 1992, 1998). This lack of evidence for traumatic injuries or death caused by combat does not support the idea that the occupants of Moundville were involved with extensive warfare. However, the presence of the palisade wall surrounding Moundville from the Moundville I phase to possibly the middle of the Moundville II phase implies the desire for some type of protection (Scarry 1998; Vogel and Allan 1985).

The remaining strategies, (7) through (10), emphasize the need for leaders to portray themselves as necessary to maintaining the order of the world (Earle 1991:6-7). This may come in the form of controlling non-domestic goods and their exchange. The artifact assemblage from Moundville shows a differentiation between elite and non-elite burials in regard to the presence or absence of trade goods and/or exotic materials (Peebles 1971, 1974). This differentiation may, as suggested elsewhere (see, e.g., Scarry 1995; Steponaitis 1991; Welch 1991, 1996) represent a situation in which foreign exchange was dominated by the Moundville elite. None of the exotic looking pottery, originally believed to have been non-local and only recently attributed to production at

Moundville, appears at the known outlying sites. Other non-local materials include obsidian projectile points, elk antlers, Mill Creek and Dover chert hoes, and an Amethyst bead (Peebles 1979; Welch 1996). Their access to these goods might then afford them privilege in the form of subservient behavior by non-elite individuals, namely labor expenditure. The connection between the presence of these items, in potentially elite burials, and the construction of monumental architecture by Mississippian peoples is undoubtedly conjectural. But, whatever the cause, the building of 29 earthen mounds within a confined area the size of Moundville required both communal planning (Knight 1998) and extensive labor organization.

The use-life of Mound R spans more than two hundred years. Its initial building within the northern section of the 29 mound complex coincides with the massive episode of construction undertaken by the occupants of Moundville. Perhaps two centuries after the end of Mound R's occupation, its abandonment is followed by that of the remainder of the Black Warrior Valley. The mound, the site, and eventually the entire river valley, once home to the second largest civic-ceremonial center, gradually became relegated to a borderland between cultures.

Considerations for Future Investigations

The data recovery techniques employed during the course of field investigations as well as many of the analytical techniques utilized during laboratory work were based on trial and error experimentation. This was a necessary evil because of the nature of these investigations. While both GPR and core sampling are relatively common in archaeological inquiry, their combination and adaptation to Mound R's investigation was unprecedented.

To critique these investigations in their sequence of occurrence seems the most logical course. First, the establishment of the grid system worked well, namely because of the existing grid already in place. Its existence made the orientation, placement, and survey of GPR transects readily comparable to the core sampling data.

Second, collection of GPR data provided information for the shallower mound deposits. The nature of the sediments within Mound R, namely sandy clay, and the difficulties these deposits presented for radar energy propagation were well understood by the end of the core sample analysis. However, they were virtually unrecognizable early on and reeked havoc on interpretation. The need for at least a limited ground-truth, here present in the form of the 1993 flank trench unit on the western edge of Mound R's summit, is a necessity. Even with the comparable data in the core samples, the presence of the ground-truth is helpful in establishing the necessary settings for the GPR system.

Third, the use of the GPR in recognizing stage breaks is dependent upon the existence of certain factors not always present in all portions of the mound. The stages must obviously be within the area of potential imaging by the selected antenna. Deeply buried deposits require lower frequency antennae while shallower deposits are more readily seen with higher frequency antennae. Variations in sediment must be distinct enough for the unit to pick up the changes in energy propagation and signal return time.

Within Mound R this required the presence of burned surfaces where the sandy clay summit had been altered by heating or midden deposits with higher organic content and distinct sediments.

Fourth, any deposits that exist beneath the shallowest recognized anomaly will likely be distorted and completely missed. This is the result of "echo" or signal attenuation caused by changes in the energy wave as it passes through the sediment matrix of the anomaly.

Fifth, close interval data collection, although far more time-consuming in terms of both field and laboratory time, results in more accurate boundary delineation for anomalies. Anomalies with similar amplitude signatures can be more accurately plotted if they are known to exist within closer proximity.

Sixth, the analysis of GPR data should be conducted with the assistance of software designed to facilitate the recognition of specified factors, such as areas of similar amplitude signatures. The plotting of these areas by hand proved not only time consuming, but confusing, subjective, and was liable to receive drastic revision during the reanalysis.

The collection of core sample data should be based on a sampling strategy that limits the distance between cores to an acceptable level. This means closer intervals and more evenly distributed locations.

While none of the archaeological field crew had ever experienced core drilling before, the obvious factors involved with sample collection were not completely understood. Familiarity with the techniques employed by the drilling crew should have been established prior to drilling the mound. The irreplaceable loss of the material contained within the sampler caps is considered regrettable.

The analysis of the core samples was postponed during the development of a vacuum chamber for experimental core sample impregnation (Gage 1999), storage racks, and various other factors unrelated to the project. This allowed the samples to experience a period of drying which made their bisection more difficult than when the samples were damp.

Seventh, the effort expended in screening and analyzing the artifacts from the core sample cuttings was of little use, other than to support the chronological position of the occupation of the entire Moundville site. The materials used in the construction of the mound are secondary deposits gathered from points around Mound R. This material included artifacts from previous occupation mixed with the sediments used as fill. Their inclusion within the mound fill taints any suggestion that the separated cuttings provided evidence for chronological dating. Without the ability to see the artifacts in their context, such as lying atop a buried summit or within a midden deposit, they provide relatively little information. At best, the latest artifacts from the uppermost, core sample section cuttings provide evidence for the latest occupation. Because of the action of the auger, the cuttings from deeper deposits include those of the specified section, as well as all overlying deposits.

Finally, analysis of the GPR data and core samples should be conducted separately to limit the effects of subjective bias. When an anomaly was known to exist in a specific location, the core samples for that area were inspected for any semblance of variation that it could be blamed on. This became evident early on in the analysis process, and in an effort to correct it, the GPR and core sample data were reexamined at a later time and under separate conditions.

The recognition of areas with anomaly clusters also suggests disturbance to those areas. As such their stratigraphy may be impacted by these disturbances. If investigation of anomalous areas had not been considered a priority and, instead, stratigraphic evidence for construction episodes had been the only goal, these areas should have been used to redirect the core samples to other locations.

The use of combinations of relatively non-invasive investigative techniques in archaeological inquiry is undoubtedly going to become a more common occurrence. This is partially the result of ever improving technology, but predominantly because of a shift in the interest of preserving archaeological sites and their deposits. More and more often, opposition to excavation and, ultimately, at least partial destruction of archaeological deposits, is voiced by both the public and governing bodies which control aspects of access to archaeological sites. These take the form of state, federal, and special interest groups who either hold legal jurisdiction or personal interest in the site. Legislation such as the Native American Graves Protection and Repatriation Act, the new regulations dictating the need for Tribal Historic Preservation Officer and State Historic Preservation

Officer notification, as well as Native American groups who have legitimate ties to certain sites, are all influencing the future of archaeological investigation. Consequently, it is rapidly becoming more expensive and more difficult to acquire permission and the capabilities to excavate archaeological sites. If other means of data recovery are available, possibly at least a portion of the available information can be collected and investigated without the loss of the entire body.

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APPENDIX A: MOUND R CORE SAMPLE CUTTINGS ARTIFACT CATALOG

Site 1Tu500, Mound R Core Samples.

	Core Sample 1-1 15-137 cmbs		Core Sample 1-2 137-274 cmbs		Core Sample 1-3 274-426 cmbs		Core Sample 1-4		Core Sample 1-5 578-732 cmbs	
	Count	*Weight (g)*	Count	*Weight (g)*	Count	*Weight (g)*	Count	*Weight (g)*	Count	*Weight (g)*
Lithics:										
Debitage										
Flake, quartzite	-	-	-	-	-	-	-	-	-	-
Flake, greenstone	-	-	-	-	-	-	-	-	-	-
Unmodified Rock										
Siltstone/Quartzite/Sandstone/Petrified Wood	29	*29.4*	41	*43.7*	35	*14.1*	108	*95.6*	22	*25.2*
Hematite	-	-	1	*6.0*	-	-	1	*3.2*	1	*2.2*
Ceramics:										
Baytown Plain sherd	-	-	-	-	-	-	-	-	-	-
Carthage Incised Grog and Shell Tempered sherd	-	-	-	-	-	-	-	-	-	-
Carthage Incised sherd	-	-	-	-	-	-	-	-	-	-
Mississippian Plain Shell and Grog Tempered Eroded sherd	-	-	-	-	-	-	-	-	-	-
Mississippian Plain Shell Tempered Eroded sherd	-	-	2	*0.3*	-	-	6	*1.4*	1	*0.3*
Mississippian Plain Shell Tempered sherd	-	-	-	-	-	-	-	-	-	-
Mississippian Plain Shell Tempered sherdlets	-	-	-	-	-	-	-	-	-	-
Mississippian Plain Shell Tempered, rim sherd	-	-	-	-	-	-	-	-	-	-
Mississippian Plain sherd	-	-	-	-	-	-	-	-	-	-
Shell and Grog Temperd Eroded sherdlet - unidentified	-	-	-	-	-	-	-	-	-	-
Shell Tempered eroded sherdlets - unidentified	-	-	-	-	-	-	-	-	-	-
Shell Tempered Plain sherd	-	-	-	-	-	-	-	-	-	-
Shell Tempered sherd - unidentified	-	-	-	-	-	-	-	-	-	-
Shell Tempered sherdlets - unidentified	-	-	-	-	-	-	-	-	-	-
Unidentified sherd	-	-	-	-	-	-	-	-	-	-
Miscellaneous:										
Fired Clay / Daub	-	-	2	*0.6*	-	-	1	*0.3*	1	*0.7*
Shell Fragment - Gastropod	-	-	-	-	-	-	-	-	-	-
Historics:										
Window Glass	-	-	-	-	-	-	-	-	-	-
TOTAL COUNT	29	*29.4*	46	*50.6*	35	*14.1*	116	*100.5*	25	*28.4*

Site 1Tu500, Mound R Core Samples.

	Core Sample 2-2 122-274 cmbs		Core Sample 2-3 274-426 cmbs		Core Sample 2-4 426-578 cmbs		Core Sample 2-5 578-731 cmbs		Core Sample 3-2 122-274 cmbs	
	Count	*Weight (g)*	Count	*Weight (g)*	Count	*Weight (g)*	Count	*Weight (g)*	Count	*Weight (g)*
Lithics:										
Debitage										
Flake, quartzite	-	-	-	-	-	-	-	-	-	-
Flake, greenstone	-	-	-	-	-	-	-	-	-	-
Unmodified Rock										
Siltstone/Quartzite/Sandstone/Petrified Wood	48	*75.6*	59	*78.1*	38	*34.7*	315	*517.5*	1	*2.6*
Hematite	-	-	-	-	-	-	-	-	-	-
Ceramics:										
Baytown Plain sherd	-	-	-	-	-	-	-	-	-	-
Carthage Incised Grog and Shell Tempered sherd	-	-	-	-	-	-	-	-	-	-
Carthage Incised sherd	-	-	-	-	-	-	-	-	-	-
Mississippian Plain Shell and Grog Tempered Eroded sherd	-	-	1	*3.5*	-	-	-	-	-	-
Mississippian Plain Shell Tempered Eroded sherd	2	*1.5*	-	-	-	-	-	-	2	*5.2*
Mississippian Plain Shell Tempered sherd	-	-	-	-	2	*1.9*	-	-	-	-
Mississippian Plain Shell Tempered sherdlets	-	-	-	-	-	-	-	-	-	-
Mississippian Plain Shell Tempered, rim sherd	-	-	-	-	-	-	-	-	-	-
Mississippian Plain sherd	-	-	-	-	-	-	3	*2.2*	-	-
Shell and Grog Temperd Eroded sherdlet - unidentified	-	-	-	-	-	-	-	-	-	-
Shell Tempered eroded sherdlets - unidentified	-	-	-	-	-	-	-	-	-	-
Shell Tempered Plain sherd	-	-	-	-	-	-	-	-	-	-
Shell Tempered sherd - unidentified	-	-	-	-	-	-	1	*0.1*	-	-
Shell Tempered sherdlets - unidentified	-	-	-	-	-	-	-	-	-	-
Unidentified sherd	-	-	-	-	-	-	-	-	-	-
Miscellaneous:										
Fired Clay / Daub	5	*3.3*	6	*7.7*	2	*0.5*	5	*3.4*	3	*7.9*
Shell Fragment - Gastropod	-	-	-	-	1	*0.1*	-	-	-	-
Historics:										
Window Glass	-	-	-	-	-	-	-	-	-	-
TOTAL COUNT	55	*80.4*	66	*89.3*	43	*37.2*	324	*523.2*	6	*15.7*

Site 1Tu500, Mound R Core Samples.

	Core Sample 3-3 274-426 cmbs		Core Sample 3-4 426-578 cmbs		Core Sample 3-5 578-732 cmbs		Core Sample 4-2 122-274 cmbs		Core Sample 4-3 274-426 cmbs	
	Count	*Weight (g)*	Count	*Weight (g)*	Count	*Weight (g)*	Count	*Weight (g)*	Count	*Weight (g)*
Lithics:										
Debitage										
Flake, quartzite	-	-	-	-	1	*0.6*	-	-	-	-
Flake, greenstone	-	-	-	-	-	-	-	-	-	-
Unmodified Rock										
Siltstone/Quartzite/Sandstone/Petrified Wood	82	*131.6*	367	*312.0*	84	*81.6*	2	*13.7*	36	*42.3*
Hematite	-	-	1	*0.2*	-	-	-	-	-	-
Ceramics:										
Baytown Plain sherd	-	-	-	-	-	-	-	-	-	-
Carthage Incised Grog and Shell Tempered sherd	-	-	-	-	-	-	-	-	-	-
Carthage Incised sherd	-	-	-	-	-	-	1	*1.4*	-	-
Mississippian Plain Shell and Grog Tempered Eroded sherd	-	-	-	-	-	-	-	-	-	-
Mississippian Plain Shell Tempered Eroded sherd	-	-	1	*0.2*	-	-	-	-	-	-
Mississippian Plain Shell Tempered sherd	-	-	-	-	-	-	-	-	-	-
Mississippian Plain Shell Tempered sherdlets	-	-	-	-	-	-	-	-	-	-
Mississippian Plain Shell Tempered, rim sherd	-	-	-	-	-	-	-	-	-	-
Mississippian Plain sherd	-	-	-	-	-	-	-	-	-	-
Shell and Grog Temperd Eroded sherdlet - unidentified	-	-	-	-	-	-	-	-	-	-
Shell Tempered eroded sherdlets - unidentified	-	-	-	-	-	-	-	-	-	-
Shell Tempered Plain sherd	-	-	-	-	-	-	1	*3.5*	-	-
Shell Tempered sherd - unidentified	-	-	-	-	-	-	-	-	-	-
Shell Tempered sherdlets - unidentified	-	-	-	-	-	-	-	-	-	-
Unidentified sherd	-	-	-	-	-	-	-	-	-	-
Miscellaneous:										
Fired Clay / Daub	2	*1.6*	9	*3.8*	3	*0.8*	-	-	-	-
Shell Fragment - Gastropod	-	-	-	-	-	-	-	-	-	-
Historics:										
Window Glass	-	-	-	-	-	-	-	-	-	-
TOTAL COUNT	84	*133.2*	378	*316.2*	88	*83.0*	4	*18.6*	36	*42.3*

Site 1Tu500, Mound R Core Samples.

	Core Sample 4-4 426-578 cmbs		Core Sample 4-5 578-732 cmbs		Core Sample 5-1 0-122 cmbs		Core Sample 5-2 122-274 cmbs		Core Sample 5-3 274-426 cmbs	
	Count	*Weight (g)*	Count	*Weight (g)*	Count	*Weight (g)*	Count	*Weight (g)*	Count	*Weight (g)*
Lithics:										
Debitage										
Flake, quartzite	-	-	-	-	-	-	-	-	-	-
Flake, greenstone	-	-	-	-	-	-	-	-	-	-
Unmodified Rock										
Siltstone/Quartzite/Sandstone/Petrified Wood	6	*14.9*	251	*189.9*	29	*40.3*	82	*150.5*	26	*27.6*
Hematite	1	*5.8*	-	-	-	-	-	-	-	-
Ceramics:										
Baytown Plain sherd	-	-	1	*0.4*	-	-	-	-	-	-
Carthage Incised Grog and Shell Tempered sherd	-	-	-	-	-	-	-	-	-	-
Carthage Incised sherd	-	-	-	-	-	-	-	-	-	-
Mississippian Plain Shell and Grog Tempered Eroded sherd	-	-	-	-	-	-	-	-	-	-
Mississippian Plain Shell Tempered Eroded sherd	2	*3.4*	-	-	2	*1.0*	-	-	-	-
Mississippian Plain Shell Tempered sherd	-	-	-	-	-	-	-	-	1	*0.7*
Mississippian Plain Shell Tempered sherdlets	-	-	-	-	-	-	5	*6.8*	-	-
Mississippian Plain Shell Tempered, rim sherd	-	-	-	-	-	-	-	-	-	-
Mississippian Plain sherd	-	-	1	*0.8*	-	-	-	-	-	-
Shell and Grog Temperd Eroded sherdlet - unidentified	-	-	-	-	-	-	-	-	-	-
Shell Tempered eroded sherdlets - unidentified	-	-	-	-	-	-	-	-	-	-
Shell Tempered Plain sherd	-	-	-	-	-	-	-	-	-	-
Shell Tempered sherd - unidentified	-	-	-	-	-	-	-	-	-	-
Shell Tempered sherdlets - unidentified	-	-	-	-	-	-	-	-	-	-
Unidentified sherd	-	-	-	-	-	-	-	-	-	-
Miscellaneous:										
Fired Clay / Daub	1	*11.7*	9	*5.9*	3	*2.2*	9	*13.3*	3	*3.4*
Shell Fragment - Gastropod	-	-	-	-	-	-	-	-	-	-
Historics:										
Window Glass	-	-	-	-	-	-	-	-	-	-
TOTAL COUNT	10	*35.8*	262	*197.0*	34	*43.5*	96	*170.6*	30	*31.7*

Site 1Tu500, Mound R Core Samples.

	Core Sample 5-4 426-578 cmbs		Core Sample 5-5 578-732 cmbs		Core Sample 6-1 0-122 cmbs		Core Sample 6-2 122-274 cmbs		Core Sample 6-3 274-426 cmbs	
	Count	*Weight (g)*	Count	*Weight (g)*	Count	*Weight (g)*	Count	*Weight (g)*	Count	*Weight (g)*
Lithics:										
Debitage										
Flake, quartzite	-	-	-	-	-	-	-	-	-	-
Flake, greenstone	-	-	-	-	-	-	-	-	-	-
Unmodified Rock										
Siltstone/Quartzite/Sandstone/Petrified Wood	15	*8.7*	77	*26.8*	109	*92.1*	2	*3.8*	25	*25.4*
Hematite	-	-	-	-	6	*2.4*	1	*0.8*	-	-
Ceramics:										
Baytown Plain sherd	-	-	-	-	-	-	-	-	-	-
Carthage Incised Grog and Shell Tempered sherd	-	-	-	-	-	-	-	-	-	-
Carthage Incised sherd	-	-	-	-	-	-	-	-	-	-
Mississippian Plain Shell and Grog Tempered Eroded sherd	-	-	-	-	-	-	-	-	-	-
Mississippian Plain Shell Tempered Eroded sherd	-	-	-	-	3	*1.0*	-	-	-	-
Mississippian Plain Shell Tempered sherd	-	-	-	-	-	-	-	-	-	-
Mississippian Plain Shell Tempered sherdlets	-	-	-	-	-	-	-	-	-	-
Mississippian Plain Shell Tempered, rim sherd	-	-	-	-	-	-	-	-	-	-
Mississippian Plain sherd	-	-	-	-	-	-	-	-	-	-
Shell and Grog Temperd Eroded sherdlet - unidentified	-	-	-	-	-	-	-	-	-	-
Shell Tempered eroded sherdlets - unidentified	-	-	5	*1.2*	-	-	-	-	-	-
Shell Tempered Plain sherd	-	-	-	-	-	-	-	-	-	-
Shell Tempered sherd - unidentified	-	-	-	-	-	-	-	-	-	-
Shell Tempered sherdlets - unidentified	-	-	-	-	-	-	-	-	-	-
Unidentified sherd	-	-	-	-	-	-	-	-	-	-
Miscellaneous:										
Fired Clay / Daub	-	-	7	*1.8*	11	*6.5*	2	*2.2*	-	-
Shell Fragment - Gastropod	-	-	-	-	-	-	-	-	-	-
Historics:										
Window Glass	-	-	-	-	-	-	-	-	-	-
TOTAL COUNT	15	*8.7*	89	*29.8*	129	*102.0*	5	*6.8*	25	*25.4*

Site 1Tu500, Mound R Core Samples.

	Core Sample 6-4 426-578 cmbs		Core Sample 6-5 578-732 cmbs		Core Sample 7-1 0-122 cmbs		Core Sample 7-2 122-274 cmbs		Core Sample 7-3 274-426 cmbs	
	Count	*Weight (g)*	Count	*Weight (g)*	Count	*Weight (g)*	Count	*Weight (g)*	Count	*Weight (g)*
Lithics:										
Debitage										
Flake, quartzite	-	-	-	-	-	-	-	-	-	-
Flake, greenstone	-	-	-	-	-	-	-	-	-	-
Unmodified Rock										
Siltstone/Quartzite/Sandstone/Petrified Wood	18	*71.1*	29	*58.5*	52	*46.1*	5	*10.6*	67	*56.0*
Hematite	-	-	-	-	-	-	-	-	-	-
Ceramics:										
Baytown Plain sherd	-	-	-	-	-	-	-	-	-	-
Carthage Incised Grog and Shell Tempered sherd	-	-	-	-	-	-	-	-	-	-
Carthage Incised sherd	-	-	-	-	-	-	-	-	-	-
Mississippian Plain Shell and Grog Tempered Eroded sherd	-	-	-	-	-	-	-	-	-	-
Mississippian Plain Shell Tempered Eroded sherd	-	-	-	-	-	-	-	-	-	-
Mississippian Plain Shell Tempered sherd	-	-	-	-	8	*6.8*	-	-	-	-
Mississippian Plain Shell Tempered sherdlets	4	*6.3*	-	-	-	-	-	-	-	-
Mississippian Plain Shell Tempered, rim sherd	-	-	-	-	-	-	-	-	-	-
Mississippian Plain sherd	-	-	-	-	-	-	1	*1.7*	-	-
Shell and Grog Temperd Eroded sherdlet - unidentified	-	-	-	-	-	-	-	-	-	-
Shell Tempered eroded sherdlets - unidentified	-	-	-	-	-	-	-	-	-	-
Shell Tempered Plain sherd	-	-	-	-	-	-	-	-	-	-
Shell Tempered sherd - unidentified	-	-	-	-	-	-	-	-	-	-
Shell Tempered sherdlets - unidentified	-	-	-	-	-	-	-	-	9	*2.4*
Unidentified sherd	-	-	-	-	-	-	2	*0.6*	-	-
Miscellaneous:										
Fired Clay / Daub	-	-	-	-	1	*0.2*	7	*19.7*	16	*16.2*
Shell Fragment - Gastropod	-	-	-	-	-	-	-	-	-	-
Historics:										
Window Glass	-	-	-	-	-	-	-	-	-	-
TOTAL COUNT	22	*77.4*	29	*58.5*	61	*53.1*	15	*32.6*	92	*74.6*

Site 1Tu500, Mound R Core Samples.

	Core Sample 7-4 426-578 cmbs		Core Sample 7-5 578-732 cmbs		Core Sample 8-1 0-122 cmbs		Core Sample 8-2 122-274 cmbs		Core Sample 8-3 274-426 cmbs	
	Count	*Weight (g)*	Count	*Weight (g)*	Count	*Weight (g)*	Count	*Weight (g)*	Count	*Weight (g)*
Lithics:										
Debitage										
Flake, quartzite	-	-	-	-	-	-	-	-	-	-
Flake, greenstone	-	-	-	-	-	-	1	*1.1*	-	-
Unmodified Rock										
Siltstone/Quartzite/Sandstone/Petrified Wood	21	*25.2*	1	*2.8*	10	*10.8*	41	*25.7*	4	*23.7*
Hematite	-	-	-	-	-	-	-	-	-	-
Ceramics:										
Baytown Plain sherd	-	-	-	-	-	-	-	-	-	-
Carthage Incised Grog and Shell Tempered sherd	-	-	-	-	-	-	1	*2.5*	-	-
Carthage Incised sherd	-	-	-	-	-	-	-	-	-	-
Mississippian Plain Shell and Grog Tempered Eroded sherd	-	-	-	-	-	-	-	-	-	-
Mississippian Plain Shell Tempered Eroded sherd	-	-	-	-	-	-	11	*8.2*	-	-
Mississippian Plain Shell Tempered sherd	-	-	-	-	4	*6.6*	-	-	-	-
Mississippian Plain Shell Tempered sherdlets	-	-	4	*5.0*	-	-	-	-	-	-
Mississippian Plain Shell Tempered, rim sherd	-	-	-	-	-	-	-	-	-	-
Mississippian Plain sherd	1	*0.6*	-	-	-	-	-	-	1	*4.9*
Shell and Grog Temperd Eroded sherdlet - unidentified	-	-	-	-	-	-	-	-	-	-
Shell Tempered eroded sherdlets - unidentified	-	-	-	-	-	-	-	-	-	-
Shell Tempered Plain sherd	-	-	-	-	-	-	-	-	-	-
Shell Tempered sherd - unidentified	1	*0.1*	-	-	-	-	-	-	1	*0.3*
Shell Tempered sherdlets - unidentified	-	-	-	-	-	-	-	-	-	-
Unidentified sherd	-	-	-	-	-	-	-	-	-	-
Miscellaneous:										
Fired Clay / Daub	5	*2.4*	3	*5.1*	17	*10.9*	16	*9.7*	-	-
Shell Fragment - Gastropod	-	-	-	-	-	-	-	-	-	-
Historics:										
Window Glass	-	-	-	-	-	-	-	-	-	-
TOTAL COUNT	28	*28.3*	8	*12.9*	31	*28.3*	70	*47.2*	6	*28.9*

Site 1Tu500, Mound R Core Samples.

	Core Sample 8-4 426-578 cmbs		Core Sample 8-5 578-732 cmbs		Core Sample 9-3 274-426 cmbs		Core Sample 9-4 426-578 cmbs		Core Sample 10-1 0-122 cmbs	
	Count	*Weight (g)*	Count	*Weight (g)*	Count	*Weight (g)*	Count	*Weight (g)*	Count	*Weight (g)*
Lithics:										
Debitage										
Flake, quartzite	-	-	-	-	-	-	-	-	-	-
Flake, greenstone	-	-	-	-	-	-	-	-	-	-
Unmodified Rock										
Siltstone/Quartzite/Sandstone/Petrified Wood	60	*40.2*	43	*87.3*	1	*1.3*	37	*47.5*	10	*4.8*
Hematite	3	*1.2*	-	-	-	-	-	-	1	*1.4*
Ceramics:										
Baytown Plain sherd	-	-	-	-	-	-	-	-	-	-
Carthage Incised Grog and Shell Tempered sherd	-	-	-	-	-	-	-	-	-	-
Carthage Incised sherd	-	-	-	-	-	-	-	-	-	-
Mississippian Plain Shell and Grog Tempered Eroded sherd	-	-	-	-	-	-	-	-	-	-
Mississippian Plain Shell Tempered Eroded sherd	-	-	-	-	2	*3.2*	-	-	-	-
Mississippian Plain Shell Tempered sherd	-	-	-	-	-	-	1	*0.8*	-	-
Mississippian Plain Shell Tempered sherdlets	-	-	-	-	-	-	-	-	-	-
Mississippian Plain Shell Tempered, rim sherd	-	-	-	-	-	-	-	-	-	-
Mississippian Plain sherd	9	*7.9*	-	-	-	-	-	-	1	*0.5*
Shell and Grog Temperd Eroded sherdlet - unidentified	-	-	-	-	-	-	-	-	-	-
Shell Tempered eroded sherdlets - unidentified	-	-	-	-	-	-	-	-	-	-
Shell Tempered Plain sherd	-	-	-	-	-	-	-	-	-	-
Shell Tempered sherd - unidentified	5	*1.2*	-	-	-	-	-	-	2	*0.2*
Shell Tempered sherdlets - unidentified	-	-	-	-	-	-	-	-	-	-
Unidentified sherd	-	-	-	-	-	-	-	-	-	-
Miscellaneous:										
Fired Clay / Daub	25	*17.8*	11	*11.7*	-	-	-	-	3	*1.9*
Shell Fragment - Gastropod	-	-	-	-	-	-	-	-	-	-
Historics:										
Window Glass	-	-	-	-	-	-	-	-	-	-
TOTAL COUNT	102	*68.3*	54	*99.0*	3	*4.5*	38	*48.3*	17	*8.8*

Site 1Tu500, Mound R Core Samples.

	Core Sample 10-2 122-274 cmbs		Core Sample 10-3 274-426 cmbs		Core Sample 10-4 426-578 cmbs		Core Sample 11-2 122-274 cmbs		Core Sample 11-3 274-426 cmbs	
	Count	*Weight (g)*	Count	*Weight (g)*	Count	*Weight (g)*	Count	*Weight (g)*	Count	*Weight (g)*
Lithics:										
Debitage										
Flake, quartzite	-	-	-	-	-	-	-	-	-	-
Flake, greenstone	-	-	-	-	-	-	-	-	-	-
Unmodified Rock										
Siltstone/Quartzite/Sandstone/Petrified Wood	13	*43.5*	-	-	3	*3.3*	43	*67.0*	-	-
Hematite	-	-	-	-	1	*3.5*	-	-	-	-
Ceramics:										
Baytown Plain sherd	-	-	-	-	-	-	-	-	-	-
Carthage Incised Grog and Shell Tempered sherd	-	-	-	-	-	-	-	-	-	-
Carthage Incised sherd	-	-	-	-	-	-	-	-	-	-
Mississippian Plain Shell and Grog Tempered Eroded sherd	-	-	-	-	-	-	-	-	-	-
Mississippian Plain Shell Tempered Eroded sherd	-	-	2	*3.8*	-	-	-	-	-	-
Mississippian Plain Shell Tempered sherd	-	-	-	-	2	*5.9*	2	*2.8*	-	-
Mississippian Plain Shell Tempered sherdlets	-	-	-	-	-	-	-	-	-	-
Mississippian Plain Shell Tempered, rim sherd	-	-	-	-	-	-	1	*2.2*	-	-
Mississippian Plain sherd	-	-	-	-	-	-	-	-	-	-
Shell and Grog Temperd Eroded sherdlet - unidentified	2	*0.6*	-	-	-	-	-	-	-	-
Shell Tempered eroded sherdlets - unidentified	1	*1.1*	-	-	-	-	-	-	-	-
Shell Tempered Plain sherd	-	-	-	-	-	-	-	-	-	-
Shell Tempered sherd - unidentified	-	-	-	-	-	-	-	-	-	-
Shell Tempered sherdlets - unidentified	-	-	-	-	-	-	-	-	-	-
Unidentified sherd	-	-	-	-	-	-	-	-	-	-
Miscellaneous:										
Fired Clay / Daub	-	-	-	-	4	*1.5*	3	*1.8*	-	-
Shell Fragment - Gastropod	-	-	-	-	-	-	-	-	-	-
Historics:										
Window Glass	-	-	1	*0.3*	1	*0.9*	-	-	-	-
TOTAL COUNT	16	*45.2*	3	*4.1*	11	*15.1*	49	*73.8*	0	*0.0*

Site 1Tu500, Mound R Core Samples.

	Core Sample 11-5 578-732 cmbs		Core Sample 12-2 122-274 cmbs		TOTAL				Average Weight (g)
	Count	*Weight (g)*	Count	*Weight (g)*	COUNT	%	*WEIGHT (g)*	%	
Lithics:									
Debitage									
Flake, quartzite	-	-	-	-	1	0.037%	*0.6*	*0.020%*	
Flake, greenstone	-	-	-	-	1	0.037%	*1.1*	*0.036%*	
Unmodified Rock									
Siltstone/Quartzite/Sandstone/Petrified Wood	27	*42.7*	3	*1.8*	2377	87.454%	*2747.6*	*89.568%*	
Hematite	-	-	-	-	17	0.625%	*26.7*	*0.870%*	
Ceramics:									
Baytown Plain sherd	-	-	-	-	1	0.037%	*0.4*	*0.013%*	0.40
Carthage Incised Grog and Shell Tempered sherd	-	-	-	-	1	0.037%	*2.5*	*0.081%*	2.50
Carthage Incised sherd	-	-	-	-	1	0.037%	*1.4*	*0.046%*	1.40
Mississippian Plain Shell and Grog Tempered Eroded sherd	-	-	-	-	1	0.037%	*3.5*	*0.114%*	3.50
Mississippian Plain Shell Tempered Eroded sherd	-	-	-	-	36	1.325%	*29.5*	*0.962%*	0.82
Mississippian Plain Shell Tempered sherd	-	-	-	-	20	0.736%	*25.5*	*0.831%*	1.28
Mississippian Plain Shell Tempered sherdlets	-	-	-	-	13	0.478%	*18.1*	*0.590%*	1.39
Mississippian Plain Shell Tempered, rim sherd	-	-	-	-	1	0.037%	*2.2*	*0.072%*	2.20
Mississippian Plain sherd	-	-	-	-	17	0.625%	*18.6*	*0.606%*	1.09
Shell and Grog Temperd Eroded sherdlet - unidentified	-	-	-	-	2	0.074%	*0.6*	*0.020%*	0.30
Shell Tempered eroded sherdlets - unidentified	-	-	-	-	6	0.221%	*2.3*	*0.075%*	0.38
Shell Tempered Plain sherd	-	-	-	-	1	0.037%	*3.5*	*0.114%*	3.50
Shell Tempered sherd - unidentified	-	-	-	-	10	0.368%	*1.9*	*0.062%*	0.19
Shell Tempered sherdlets - unidentified	-	-	-	-	9	0.331%	*2.4*	*0.078%*	0.27
Unidentified sherd	-	-	-	-	2	0.074%	*0.6*	*0.020%*	0.30
Miscellaneous:									
Fired Clay / Daub	-	-	3	*0.8*	198	7.285%	*177.3*	*5.780%*	
Shell Fragment - Gastropod	-	-	-	-	1	0.037%	*0.1*	*0.003%*	
Historics:									
Window Glass	-	-	-	-	2	0.074%	*1.2*	*0.039%*	
TOTAL COUNT	27	*42.7*	6	*2.6*	2718	100.000%	3067.6	*100.000%*	

APPENDIX B: MOUND R CORE SAMPLE STRATA DESCRIPTIONS

CORE SAMPLE 1	STRATA and COMMENTS	STAGE
0-19 cmbs	dark brown sandy loam (modern humus)	Humus
19-26 cmbs	reddish brown sandy clay (restoration fill)	Restoration Fill
26-35 cmbs	grayish brown sandy clay with clay inclusions (historic plow zone)	Historic Plow Zone
35-118 cmbs	grayish brown sandy clay mottled with gray, brown, reddish brown, and yellowish brown sandy clay, homogenized sediments (feature, possible CB Moore pit)	Feature
118-128 cmbs	gray sandy clay mottled with brown and pale brown sandy clay (base of above feature)	
128-162 cmbs	gray sandy clay with charcoal, sherds, and fired clay inclusions (midden, mound fill)	Stage III
162-277 cmbs	yellowish brown sandy clay heavily mottled with reddish brown and yellowish brown sandy clay and small amounts of charcoal flecks, sherds, and fired clay inclusions (mound fill)	
277-278 cmbs	yellowish red sandy clay, heated appearance, with charcoal fleck inclusions (summit)	Stage II
278-282-285 cmbs	gray ashy sandy clay (summit)	
282-324 cmbs	grayish brown compact sandy clay mottled with reddish brown and yellowish sandy clay-more predominant near base (mound fill)	
324-409 cmbs	brown sandy clay mottled with reddish brown and yellowish brown sandy clay, charcoal fleck and fired clay inclusions (mound fill)	
409-494-496 cmbs	yellowish brown sandy clay heavily mottled with white, gray, and yellow sandy clay. charcoal fleck inclusions throughout (mound fill-slope)	
494-496-499 cmbs	brown silty clay with dark grayish brown silty clay basal interface, charcoal inclusions (summit-slope)	Stage I
496-506-508 cmbs	yellowish brown sandy clay mottled with white, and gray sandy clay. charcoal fleck inclusions and root stains throughout (mound fill-slope)	
506-514 cmbs	compact light brownish gray sandy clay with charcoal flecks and root stains throughout (mound fill-slope)	
514-533 cmbs	grayish brown sandy clay mottled with brownish yellow sandy clay and root stains and manganese nodules (submound humus zone)	Sterile
533-672 cmbs	yellowish brown sandy clay mottled with white sandy clay and having root stains in upper 30 cm (submound soil)	

CORE SAMPLE 2	STRATA and COMMENTS	STAGE
0-15 cmbs	dark brown sandy loam (modern humus)	Humus
15-27 cmbs	yellowish brown sandy clay (restoration fill)	Restoration Fill
27-57 cmns	grayish brown, heavily mottled sediments, banded with distinct gray zone (historic plow zone)	Historic Plow Zone
57-58 cmbs	yellowish brown clay lens (base of historic plow zone)	
58-87 cmbs	grayish brown, mottled with yellowish brown sandy clay and banded with distinct gray zone CS2-1 (mound fill)	Stage V
87-101 cmbs	grayish brown sandy clay (mound fill)	
101-119 cmbs	dark grayish brown sandy clay with fired clay near top-heated appearance (midden/summit)	Stage IV
119-169 cmbs	pale grayish brown sandy clay mottled near bottom with brown sandy clay (feature 125-157 cmbs, root stain)	
169-214 cmbs	brown sandy clay mottled with yellowish brown sandy clay, white clay inclusions and manganese nodules (mound fill)	
214-216 cmbs	red clay-fired and heated clay (burned summit)	Stage III
216-219 cmbs	brown sandy clay mottled with reddish brown sandy clay and brown clay(lower portion of summit)	
219-222 cmbs	pale grayish brown sandy clay (clay cap)	
222-225 cmbs	grayish brown sandy clay mottled with reddish brown and yellowish brown sandy clay with small flecks of charcoal (mound fill)	
225-297 cmbs	very pale grayish brown sandy clay mottled with pale yellowish brown sandy clay (mound fill)	
297-298 cmbs	brown sandy clay (summit)	Stage II
298-393 cmbs	brown sandy clay mottled with yellowish brown and reddish brown sandy clay, white clay inclusions and manganese nodules (mound fill)	
393-404 cmbs	light yellowish brown very fine sandy clay with charcoal flecks (mound fill)	Stage I
404-509 cmbs	directionally uniform sloping bands of reddish yellow, brownish yellow, pale brown, and gray sandy clay (mound fill)	
509-527 cmbs	banded light reddish yellow and brownish yellow sandy clay (mound fill)	
527-543 cmbs	grayish brown sandy loam with minimal root stains (submound humus zone)	Sterile
543-683 cmbs	yellowish brown sandy clay with root stains (submound soil)	

CORE SAMPLE 3	STRATA and COMMENTS	STAGE
0-12 cmbs	dark brown sandy loam (modern humus)	Humus
12-55 cmbs	yellowish brown sandy clay mottled in the lower portion with grayish brown and pale brown sandy clay (restoration fill)	Restoration Fill
55-? cmbs	grayish brown sandy clay mottled with brown and reddish brown sandy clay, charcoal inclusions (historic plow zone, core sample break)	Historic Plow Zone
?-85 cmbs	pale brown sandy clay (historic plow zone, core sample break)	
85-101 cmbs	light olive brown sandy clay (mound fill)	Stage IV
101-102 cmbs	brown sandy clay (mound fill)	
102-107 cmbs	light olive brown sandy clay mottled with brown and yellowish sandy clay and fading to reddish brown sandy clay at base (mound fill)	
107-122 cmbs	grayish brown mottled mound fill with charcoal and fired clay (burned summit)	Stage III
122-126 cmbs	grayish brown sand banded with pale brown and brown sand, sorted material (base of above mound fill)	
126-128 cmbs	brown sandy clay (mound fill)	
128-130 cmbs	brown sandy clay with charcoal with fire clay inclusions (burned summit)	Stage II
130-134 cmbs	grayish brown clay with fired clay inclusions (mound fill/summit mixed material)	
134-137 cmbs	reddish brown sandy clay mottled with pale brown and brown sandy clay (mound fill)	
137-140 cmbs	brown mottled sandy clay (mound fill)	
140-149 cmbs	pale brown sandy clay mottled with reddish brown sandy clay (mound fill)	
149-156 cmbs	brown sandy clay (mound fill)	
156-167 cmbs	brown to reddish brown sandy clay with charcoal inclusions surrounding white clay (feature)	
167-168 cmbs	reddish brown clay (feature)	
168-171 cmbs	brown sandy clay (feature)	
171-181 cmbs	banded brown clayey sand with a pale red sandy clay intrusion at 177-178 cmbs, sorted material (feature)	
181-183 cmbs	pale brown sandy clay (mound fill)	
183-193 cmbs	grayish brown sandy clay mottled with pale brown and yellowish brown sandy clay with small charcoal fleck inclusions and manganese nodule near base(mound fill)	
193-195 cmbs	brown sandy clay (mound fill)	
195-198 cmbs	pale brown sandy clay (mound fill)	
198-199 cmbs	brown sandy clay (mound fill)	
199-203 cmbs	grayish brown sandy clay with charcoal and fired clay heated surface (summit)	
203-254 cmbs	brown sandy clay mottled with yellowish brown and grayish brown sandy clay (mound fill)	
254-256 cmbs	red sandy clay (mound fill)	
256-257 cmbs	brown sandy clay (mound fill)	
257-259 cmbs	red clay (mound fill)	
259-260 cmbs	brown sandy clay (mound fill)	
260-262 cmbs	brown sandy clay (mound fill)	
262-264 cmbs	light gray to white sand with sorted material lens at base interface (mound fill)	
264-269 cmbs	yellowish brown sandy clay with root activity and small (< 5 mm) manganese nodules near base (summit)	Stage I
269-270 cmbs	brownish yellow sandy clay sorted material (summit)	
270-272 cmbs	red sandy clay (summit, possible cap)	
272-275-277 cmbs	brown sandy clay with charcoal inclusions at upper interface (possible burned summit)	
275-296 cmbs	gray sandy clay heavily mottled with brown and brownish yellow sandy clay (mound fill)	
296-299 cmbs	brown sandy clay (mound fill)	
299-305 cmbs	gray sandy clay mottled with brownish yellow sandy clay, sorted material at lower interface (mound fill)	
305-315 cmbs	yellowish brown sandy clay mottled with grayish brown and brownish yellow sandy clay (mound fill)	
315-317 cmbs	gray sandy clay (mound fill)	

317-321 cmbs	reddish yellow sand with well sorted red sandy clay inclusions (mound fill)	
321-322 cmbs	brown sandy clay (mound fill)	
322-324 cmbs	reddish yellow sandy clay mottled with red sandy clay (mound fill)	
324-325 cmbs	gray sand (mound fill)	
325-326 cmbs	reddish yellow sandy clay (mound fill)	
326-330 cmbs	gray sandy clay (mound fill)	
330-344 cmbs	light brownish gray sandy clay mottled with brown sandy clay and numerous pebble inclusions (mound fill)	
344-347 cmbs	red sandy clay (mound fill)	
347-356 cmbs	light brownish gray sandy clay mottled with yellowish brown sandy clay (mound fill)	
356-359 cmbs	brown sandy clay with charcoal fleck inclusions,band of the above light brownish gray sandy clay at basal interface (mound fill)	
359-361 cmbs	red sandy clay (mound fill)	
361-363 cmbs	white and brown sandy clay (mound fill)	
363-365 cmbs	dark brown sandy clay (mound fill)	
365-370 cmbs	light gray sandy clay mottled with light yellowish brown sandy clay (mound fill)	
370-373 cmbs	light gray sandy clay (mound fill)	
373-375 cmbs	gray sandy clay (mound fill)	
375-449 cmbs	banded brown, grayish brown, and pale brown very sandy clay with claystone pebbles (mound fill)	
449-453 cmbs	brown sandy clay (mound fill)	
453-455-457 cmbs	gray sand (mound fill)	
455-460-462 cmbs	reddish yellow, yellowish red, brown, and gray sandy clay with charcoal flecks throughout (mound fill)	
460-528 cmbs	brown, brownish yellow, white, gray, and yellowish red sloping, banded sandy clay -sorted appearance (mound fill)	
528-540? cmbs	grayish brown sandy clay (mound fill)	
540-555 cmbs	brown mottled sandy clay (mound fill)	
555-576 cmbs	grayish brown sandy clay loam with root stains (submound humus)	Sterile
576-683 cmbs	yellowish red sandy clay with root stains (submound soil)	

CORE SAMPLE 4	STRATA and COMMENTS	STAGE
0-20 cmbs	brownish gray sandy loam (modern humus)	Humus
20-40 cmbs	grayish brown and brown sandy clay (restoration fill)	Restoration Fill
40-50 cmbs	reddish brown very sandy clay banded with brown and pale brown very sandy clay (restoration fill)	
50-93 cmbs	brown and gray mottled sandy clay (historic plow zone)	Historic Plow Zone
93-183 cmbs	grayish brown sandy clay with small charcoal flecks, brown sandy clay disturbances in lower half (feature/midden fill)	Feature
183-191 cmbs	brown sand banded with dark brown sand, sorted material (mound fill)	IV
191-194 cmbs	gray ashy sandy clay sorted wash(summit)	III
194-281 cmbs	light grayish brown sandy clay heavily mottled with yellowish brown sandy clay, white and red clay, small charcoal fleck inclusions and fired clay near top (mound fill and summit/slope material mixed)	
281-309 cmbs	grayish brown sandy clay heavily mottled with reddish brown, yellowish brown, and brown sandy clay, charcoal fleck inclusions and sherds (feature)	
309-355 cmbs	light grayish brown sandy clay heavily mottled with white sand, red clay (bubble gum), and brown sandy clay (feature)	
355-402 cmbs	grayish brown sandy clay heavily mottled with white, brown, and reddish brown sandy clay (mound fill)	
402-412-413 cmbs	gray sandy clay banded with white and very pale brown sand with charcoal at basal interface (summit-slope)	II
412-431-435 cmbs	very pale brown sand mottled with gray sandy clay with heavy charcoal content, possible root burn (summit-slope)	
431-463 cmbs	grayish brown sandy clay mottled with gray sandy clay (mound fill-level upper and lower interfaces)	
463-466-468 cmbs	light yellowish brown silty clay (mound fill- level upper, sloping lower interfaces)	
466-467-469 cmbs	brown clay lens (summit-slope)	I
467-489 cmbs	brown very fine sandy clay mottled with gray sandy clay, Bell Plain sherds (summit-possible slope midden)	
489-490 cmbs	white sand lens-sorted wash appearance (mound fill)	
490-509 cmbs	light brownish gray sandy clay with charcoal flecks and fired clay inclusions and root activity (mound fill)	
509-510 cmbs	brown sandy clay lens-sorted and settled sediment (mound fill)	
511-519 cmbs	very pale brown sand banded with gray and white sand-sorted wash appearance (mound fill)	
519-550 cmbs	grayish brown sandy clay loam with root stains (submound humus)	Sterile
550-682 cmbs	yellowish brown sandy clay mottled with white sandy clay and root stains (submound soil)	

CORE SAMPLE 5	STRATA and COMMENTS	STAGE
0-20 cmbs	dark brown sandy loam (modern humus)	Humus
20-45 cmbs	yellowish brown sandy clay (restoration fill)	Restoration Fill
45-71 cmbs	grayish brown sandy clay with fired clay inclusions (historic plow zone)	Historic Plow Zone
71-? cmbs	brown sandy clay (midden/mound fill)	IV
?-98 cmbs	grayish brown sandy clay (midden/mound fill, core sample break)	
98-106 cmbs	brown sandy clay with fired clay and charcoal inclusions (burned summit)	III
106-107 cmbs	dark brown clay band (prepared surface/summit associated with above materials)	
107-109 cmbs	yellow sandy clay (summit associated with above)	
109-110 cmbs	dark brown clay band (summit associated with above)	
110-121 cmbs	grayish brown sandy clay with charcoal and fired clay inclusions (summit)	
121-208 cmbs	yellowish brown sandy clay heavily mottled with brown sandy clay, and white, brown, and red clay (mound fill)	
208-231-233 cmbs	brown sandy clay with large fragments of fired clay, sorted material sloping and banded at base (summit)	II
231-308 cmbs	brownish yellow sandy clay banded at the upper interface and heavily mottled throughout with brown sandy clay, manganese nodules (mound fill)	
308-322 cmbs	yellowish brown sandy clay mottled with white and pale yellow clay and charcoal fleck inclusions (mound fill)	
322-328 cmbs	yellow sandy clay heavily mottled with white clay and yellowish brown sandy clay, charcoal fleck inclusions (summit)	I
328-416-418 cmbs	yellow sandy clay heavily mottled and banded with gray sandy clay and minimal charcoal fleck inclusions (mound fill)	
416-420-423 cmbs	brown sandy clay (mound fill)	
423-457 cmbs	gray sandy clay with charcoal inclusions and bands of brownish yellow sandy clay (mound fill)	
457-471 cmbs	yellow sandy clay heavily mottled with gray, white, and reddish yellow silty clay (mound fill)	
471-472 cmbs	gray very fine sandy clay -sorted appearance, strat is curved down in center (mound fill)	
472-473 cmbs	yellow very fine sandy clay -strat is curved down in center (mound fill)	
473-484 cmbs	brownish yellow silty clay mottle with, gray, white, and reddish yellow sandy clay (mound fill)	
484-487 cmbs	gray sandy clay with charcoal inclusions at lower interface (mound fill-distinct break)	
487-492 cmbs	reddish brown very sandy clay with fired clay and charcoal inclusions near upper interface (mound fill- distinct break)	
492-500 cmbs	yellow silty clay mottled with gray and white clay (mound fill)	
500-522 cmbs	gray very fine sandy clay mottled with yellow clay (mound fill)	
522-524 cmbs	gray sandy clay lens (mound fill- distinct break)	
524-? cmbs (~540)	yellowish brown sandy clay with gray clay inclusions (mound fill, core sample break)	
?-564 cmbs	grayish brown sandy loam minimal root stains (pre-mound humus, core sample break)	Sterile
564-682 cmbs	reddish yellow sandy clay subsoil with root stains (submound soil)	

CORE SAMPLE 6	STRATA and COMMENTS	STAGE
0-15 cmbs	dark brown sandy loam (modern humus)	Humus
15-25 cmbs	yellowish brown sandy clay (restoration fill)	Restoration Fill
25-60 cmbs	yellowish brown sandy clay mottled with grayish brown sandy clay and reddish brown fired clay (historic plow zone)	Historic Plow Zone
60-71 cmbs	brown sandy clay (mound fill)	V
71-76 cmbs	red clay lens (summit)	IV
76-? cmbs	reddish brown sandy clay (showing signs of heating) with charcoal and fired clay inclusions (burned summit, core sample break)	
?-88 cmbs	grayish brown sandy clay with fired clay inclusions, sorted material (burned summit)	
88-89 cmbs	black lens of ash and charcoal, sorted appearance (burned summit)	
89-92 cmbs	strong brown and brown sandy clay mottled with reddish brown sandy clay and charcoal inclusions, heated appearance (feature or midden mound fill)	
92-110 cmbs	grayish brown sandy clay with charcoal and fired clay inclusions (feature or midden mound fill)	
110-212 cmbs	brown sandy clay heavily mottled with red, white, and gray clay, charcoal and fired clay inclusions (feature or midden mound fill)	
212-213 cmbs	brownish gray sandy clay with fired clay inclusions near upper interface, sorted material (base of feature)	III
213-261 cmbs	light yellowish brown to grayish brown sandy clay becoming mottled and paler in lower portions with dark brown, pale brown, and gray sandy clay (mound fill)	
261-269 cmbs	yellowish red sandy clay with evidence of heating, sorted material at base (summit/feature)	II
269-272 cmbs	reddish yellow sandy clay with dark gray zone lens at upper interface (summit/feature)	
272-274 cmbs	yellowish red sandy clay with evidence of heating (summit/feature)	
274-275 cmbs	brownish yellow fine sandy clay lens with gray very fine sandy clay lens at lower interface, sorted material (summit/feature)	
275-281 cmbs	brown fine sandy clay, sorted material (summit/feature)	
281-282 cmbs	very dark gray sandy clay (possible heated organic material [not charcoal] summit/feature)	
282-285 cmbs	gray ashy sandy clay (summit/feature)	
285-291 cmbs	strong brown very sandy clay, consistency suggests heating (burned summit)	I
291-298 cmbs	brown sandy clay (mound fill)	
298-302 cmbs	light yellowish brown sandy clay mottled with reddish brown and white sandy clay (mound fill)	
302-436cmbs	alternating bands of yellow, brown, light brownish gray, yellowish brown, and gray sandy clay with charcoal inclusions (mound fill)	
436-444 cmbs	gray very sandy clay (mound fill)	
444-576 cmbs	alternating bands of brown, very pale brown, grayish brown, yellowish brown, and gray with charcoal inclusions, sandy clays (mound fill)	
576-589 cmbs	grayish brown sandy loam with charcoal flecks and root stain inclusions (submound humus)	Sterile
589-689 cmbs	yellowish red sandy clay with root stains (submound soil)	

CORE SAMPLE 7	STRATA and COMMENTS	STAGE
0-13 cmbs	dark brown sandy loam (modern humus)	Humus
13-55 cmbs	yellowish brown sandy clay (restoration fill)	Restoration Fill
55-72 cmbs	grayish brown sandy clay with fired clay and charcoal inclusions (historic plow zone)	Historic Plow Zone
72-102 cmbs	yellowish brown sandy clay mottled with grayish brown sandy clay (midden/mound fill)	V
102-138-149 cmbs	gray sandy clay with charcoal flecks and fired clay inclusions-ashy near upper interface (burned summit/midden), disturbance in one half	IV
138-149-197 cmbs	brown sandy clay with red and white clay, siltstone pebbles, manganese nodules, and charcoal inclusions (slope/mound fill), disturbance in one half	
189-202-204 cmbs	red and white clay, large inclusion (mound fill)	
202-207 cmbs	brown sandy clay with manganese nodules (mound fill)	
207-209 cmbs	light yellowish brown sandy clay with white root stains and manganese nodules at interface with above (summit, no distinct break)	III
209-212 cmbs	brown slightly sandy clay mottled with pale brown sandy clay (mound fill)	
212-218 cmbs	pale brown sandy clay heavily mottled with gray and brown sandy clay (mound fill)	
218-? cmbs	alternating bands of brown, yellowish brown, and pale brown sandy clay with charcoal fleck inclusions in brown sandy clay (mound fill, core sample break)	
?-297 cmbs	brownish yellow sandy clay with large charcoal inclusion (summit/feature, core sample break)	II
297-299 cmbs	red sandy clay (summit/feature)	
299-303 cmbs	brown sandy clay with minimal inclusions of charcoal at lower interface (summit/feature)	
303-306 cmbs	brown sandy clay with large quantity of charcoal mixed in (summit/feature)	
306-310-315 cmbs	very pale yellow and pale brown sand with large charcoal inclusion at lower sloping interface, sorted material [summit/feature(possible burned post)]	
310-315-346 cmbs	brown sandy clay mottled with yellowish brown sandy clay, red clay, and minimal charcoal inclusions, red sand area 319-327 cmbs does not extend across sample(intrusive feature) (mound fill)	
346-349 cmbs	pale yellowish brown clay (mound fill)	
349-350 cmbs	brown clay with charcoal and red fired clay inclusions (burned summit)	I
350-359 cmbs	yellowish brown sandy clay (mound fill)	
359-371 cmbs	banded very pale brown sand and brown sandy clay, sorted material with red fired clay and charcoal inclusions (feature)	
371-? cmbs (~295)	banded yellowish brown very sandy clay and brown sandy clay with large amounts of charcoal inclusions (feature)	
?-449 cmbs	very pale brown sandy clay mottled with gray sandy clay with manganese nodules (mound fill)	
449-540 cmbs	banded brown, light reddish brown, yellowish red sandy clay, light yellowish brown very fine sandy clay with manganese nodules throughout (mound fill)	
540-? cmbs (~565)	reddish yellow sandy clay mottled with gray and brownish yellow sandy clay with charcoal flecks- water sorted appearance (mound fill)	
?-590 cmbs	grayish brown sandy clay loam with root stains (submound humus, core sample break)	Sterile
590-699 cmbs	reddish brown sandy clay with root stains (submound clay)	

CORE SAMPLE 8	STRATA and COMMENTS	STAGE
0-14 cmbs	dark brown sandy loam (modern humus)	Humus
14-34 cmbs	yellowish brown sandy clay (restoration fill)	Restoration Fill
34-65 cmbs	heavily mottled grayish brown sandy clay with charcoal, fired clay, and sherds (historic plow zone)	Historic Plow Zone
65-193 cmbs	brown sandy clay mottled with pale and grayish brown sandy clay, charcoal, fired clay and root stains (feature/midden)	IV
193-219 cmbs	brown sandy clay mottled with pale brown sandy clay with fired clay and root stain inclusions (feature/midden)	
219-225 cmbs	yellowish brown sandy clay mottled with reddish brown and white sandy clay (mound fill)	
225-226 cmbs	red sandy clay (summit)	III
226-232 cmbs	grayish brown sandy clay mottled with brown sandy clay and charcoal fleck inclusions (summit)	
232-233 cmbs	yellowish red sand, sorted wash material (summit)	
233-238 cmbs	brown clay (mound fill)	
238-283 cmbs	brown sandy clay mottled with pale brown and yellowish brown sandy clay, Bell Plain sherd (mound fill)	
283-289 cmbs	light yellowish brown very sandy clay (mound fill)	
289-291 cmbs	pale yellow clay mottled with brown root stains (summit/feature)	II
291-297-299 cmbs	brownish yellow sandy clay banded with pale yellow clay and brown sandy clay, sorted material (feature)	
299-304 cmbs	light yellowish brown sandy clay with reddish brown sandy clay inclusions, charcoal, and fired clay at 300-304 cmbs (feature/possible root or rodent disturbance)	
304-342 cmbs	brown sandy clay heavily mottled with reddish brown, gray, and white clay and charcoal inclusions (intrusive feature/post mold-like in appearance 304-310 cmbs)	
342-352 cmbs	brown sandy clay mottled with gray ashy sandy clay (feature)	
352-370 cmbs	grayish brown sandy clay with reddish brown and brown sandy clay inclusions (mound fill)	I
370-376 cmbs	gray sooty sandy clay with brownish yellow sandy clay and charcoal fleck inclusions (mound fill)	
376-438 cmbs	brown sandy clay with reddish brown and grayish brown sandy clay bands (mound fill)	
438-445 cmbs	pale yellow sandy clay with root stains and manganese nodules (mound fill)	
445-446 cmbs	yellowish red sandy clay (mound fill)	
446-453 cmbs	pale yellow sandy clay with root stains (mound fill)	
453-458 cmbs	yellow red sandy clay with charcoal flecks (mound fill)	
458-462 cmbs	gray very sandy clay (mound fill)	
462-472 cmbs	grayish brown sandy clay with root stains (mound fill)	
472-475 cmbs	yellowish red sandy clay (mound fill)	
475-481 cmbs	gray very sandy clay (mound fill)	
481-502 cmbs	reddish yellow sandy clay mottled with brown and gray sandy clay (mound fill)	
502-537 cmbs	yellowish red sandy clay mottled with gray and brownish yellow sandy clay (mound fill)	
537-581 cmbs	light yellowish brown sandy clay heavily mottled brown, gray, and yellow sandy clay (mound fill)	
581-603 cmbs	grayish brown sandy loam with root stains(submound humus)	Sterile
603-711 cmbs	yellowish red sandy clay with minimal root stains (submound soil)	

CORE SAMPLE 9	STRATA and COMMENTS	STAGE
0-21 cmbs	dark brown sandy loam (modern humus)	Humus
21-40 cmbs	brown sandy clay mottled with yellow sandy clay (restoration fill)	Restoration Fill
40-71 cmbs	brown sandy clay mottled with grayish brown sandy clay with fired clay and sherd inclusions (historic plow zone)	Historic Plow Zone
71-81 cmbs	yellowish brown and pale brown sand, sorted material (historic plow zone)	
81-111 cmbs	grayish brown clayey sand (mound fill)	
111-112 cmbs	yellowish brown sandy clay intruded by above (summit)	V
112-122 cmbs	brown sandy clay mottled with dark brown sandy clay, charcoal flecks and manganese nodules (mound fill)	IV
122-123 cmbs	yellowish brown sandy clay intruded from above by root stain (mound fill)	
123-125 cmbs	grayish brown sandy clay mottled with light yellowish brown sandy clay, red clay inclusions (mound fill)	
125-128 cmbs	brown sandy clay, sorted material (mound fill)	
128-132 cmbs	dark grayish brown sandy clay with charcoal flecks and fired clay inclusions (mound fill)	
132-133 cmbs	pale brown sand, sorted material (mound fill)	
133-136 cmbs	dark grayish brown root stained clay with fired clay inclusions (summit)	III
136-140 cmbs	brown sandy clay with ashy sand lens at base, sorted material (summit)	
140-142 cmbs	pale grayish brown (ashy) sandy clay (summit)	
142-211 cmbs	strong brown to yellowish red (possibly heated) sandy clay fades into brown sandy clay which fades at 145 cmbs into brown sandy clay heavily mottled with yellowish brown, pale brown, gray, and red clay with charcoal flecks (mound fill and possible feature)	
211-228 cmbs	yellowish brown sandy clay heavily mottled with brown sandy clay (mound fill/feature)	
228-236 cmbs	brown sandy clay, very sandy near upper interface mottled with yellowish brown and gray sandy clay (mound fill)	
236-240 cmbs	brown slightly sandy clay mottled with yellowish brown sandy clay (mound fill)	
240-? cmbs	yellowish brown clay (mound fill, core sample break)	
?-255 cmbs	light yellowish brown sandy clay with gray sandy clay sorted material at basal interface (mound fill/feature, core sample break)	
255-257 cmbs	reddish yellow sandy clay (mound fill/feature)	
257-272 cmbs	light yellowish brown sandy clay heavily banded with pale brown very sandy clay and gray sandy clay sorted materials (mound fill/feature)	
272-274 cmbs	yellowish red sandy clay mottled near upper interface with yellow sandy clay inclusions (summit)	II
274-276 cmbs	white very sandy clay (mound fill)	
276-278 cmbs	brownish yellow sandy clay (mound fill)	
278-279 cmbs	grayish brown sandy clay heavily mottled with reddish yellow and gray sandy clay and minimal charcoal fleck inclusions (mound fill)	
279-280 cmbs	white very sandy clay mottled with pale gray sandy clay (mound fill)	
280-282 cmbs	yellowish red sandy clay with minimal charcoal fleck inclusions (mound fill)	
282-292 cmbs	white sandy clay mottled with yellowish brown sandy clay and a gray clay with charcoal flecks inclusion (mound fill)	
292-295 cmbs	strong brown sandy clay with minimal charcoal fleck inclusions (mound fill)	
295-296 cmbs	yellowish brown sandy clay mottled with white sandy clay, minimal charcoal fleck inclusions (mound fill)	
296-298 cmbs	strong brown sandy clay with minimal charcoal fleck inclusions (mound fill)	
298-300 cmbs	white sandy clay mottled with gray sandy clay (summit)	I
300-304 cmbs	pale yellow sandy clay mottled with gray sandy clay (mound fill)	
304-316 cmbs	gray sandy clay mottled with yellowish red and brownish yellow sandy clay, sorted material at basal interface (mound fill)	
316-327 cmbs	brownish yellow sandy clay mottled with gray sandy clay (mound fill)	
327-339 cmbs	brownish yellow sandy clay with gray and red clay inclusions (mound fill)	
339-340 cmbs	brown clay with small root stains (mound fill)	
340-346 cmbs	brownish yellow sandy clay mottled with yellow and gray sandy clay (mound fill)	
346-357 cmbs	yellowish brown sandy clay mottled with gray sandy clay (mound fill)	
357-362 cmbs	light gray very sandy clay (mound fill)	

362-370 cmbs	yellowish brown sandy clay mottled with gray sandy clay (mound fill)	
370-378 cmbs	light gray very sandy clay (mound fill)	
378-474 cmbs	yellowish brown sandy clay mottled with gray sandy clay (mound fill)	
474-481 cmbs	brown very fine sandy clay (mound fill)	
481-513 cmbs	brownish yellow sandy clay mottled with gray and brown sandy clay (mound fill)	
513-516 cmbs	gray fine sandy clay, brownish yellow sandy clay, and brown very fine sandy clay bands with a sorted appearance (mound fill)	
516-537 cmbs	brownish yellow sandy clay mottled with light gray sandy clay (mound fill)	
537-542 cmbs	brown very fine sandy clay (mound fill)	
542-? cmbs	brownish yellow sandy clay mottled with light gray sandy clay (mound fill, core sample break)	
?-571 cmbs	reddish brown sandy clay (mound fill, core sample break)	
571-592 cmbs	brown sandy clay with root stains (submound humus)	Sterile
592-660 cmbs	reddish brown sandy clay fading to yellowish brown near base (submound soil)	
660-671 cmbs	brown sandy clay loam with root stains (submound soil)	
671-702 cmbs	yellowish red sandy clay mottled with white sandy clay and root stains in upper portion (submound soil)	

CORE SAMPLE 10	STRATA and COMMENTS	STAGE
0-12 cmbs	dark brown sandy loam (modern humus)	Humus
12-57 cmbs	yellowish brown sandy clay mottled with grayish brown sandy clay (restoration fill)	Restoration Fill
57-77 cmbs	grayish brown very sandy clay mottled with brown sandy clay and charcoal inclusions (historic plow zone)	Historic Plow Zone
77-80 cmbs	brown sandy clay mottled with yellowish brown sandy clay, sorted material (mound fill?)	III
80-90 cmbs	very pale brown sandy clay (midden/mound fill)	
90-92 cmbs	brown clay mottled with yellowish brown clay (midden/mound fill)	
92-123 cmbs	very pale brown sandy clay (midden/mound fill)	
123-147 cmbs	grayish brown very sandy clay lightly mottled with brown and yellowish brown sandy clay (midden/mound fill)	
147-152cmbs	brownish yellow sandy clay with manganese nodules (summit/mound fill)	II
152-192 cmbs	yellowish brown sandy clay with red, gray, white and brown clay (feature)	
192-194-197 cmbs	pale brown sand, sorted material (feature/mound fill)	
194-197-221 cmbs	yellowish brown sandy clay mottled with gray, white and brown clay and red fired clay inclusions (feature/mound fill)	
221-224 cmbs	pale yellowish brown fine sand (feature/mound fill)	
224-289 cmbs	yellowish brown sandy clay mottled with gray, white, and brown clay and red fired clay, minimal charcoal fleck, and root stain inclusions (feature/mound fill)	
289-295 cmbs	brown sandy clay with red fired clay and root stain inclusions (feature\mound fill)	
295-332 cmbs	yellowish brown sandy clay heavily mottled with brown, light brown, reddish yellow, and gray sandy clay, sorted material at basal interface (mound fill/base of feature)	
332-333 cmbs	red fired clay lens (summit)	I
333-344 cmbs	pale yellow sandy clay mottled with gray, brownish yellow, and yellowish brown sandy clay. bands of brown and dark grayish brown sandy clay at 338 cmbs and 340 cmbs. light brownish gray sand sorted material at basal interface (mound fill)	
344-346 cmbs	yellowish brown sandy clay (mound fill)	
346-351 cmbs	brownish yellow sandy clay (mound fill)	
351-354 cmbs	yellowish brown sandy clay (mound fill)	
354-356 cmbs	brownish yellow sand mottled with gray sandy clay (mound fill)	
356-361 cmbs	brown clay with small root stains (summit)	
361-367 cmbs	brownish yellow sandy clay mottled with yellow and gray sandy clay (mound fill)	
367-371 cmbs	light gray sandy clay (mound fill)	
371-377 cmbs	yellowish brown sandy clay mottled with very pale brown very sandy clay (mound fill)	
377-401 cmbs	yellow sandy clay mottled with gray, brownish yellow, and yellowish red sandy clay (mound fill)	
401-405 cmbs	slightly angled gray ash lens with charcoal inclusions (mound fill)	
405-? cmbs	yellow sandy clay mottled with gray, brownish yellow, and yellowish red sandy clay (mound fill, core sample break)	
?-431 cmbs	brown sandy clay (mound fill, core sample break)	
431-436 cmbs	pale yellow sandy clay (mound fill)	
436-447 cmbs	yellowish brown sandy clay mottled with grayish brown and pale yellow sandy clay, dark brown clay area at 436-440 cmbs (mound fill)	
447-452 cmbs	brown sandy clay (mound fill)	
452-460 cmbs	yellowish brown sandy clay mottled with gray and brown sandy clay (mound fill)	
460-467 cmbs	pale yellow sandy clay (mound fill)	
467-470 cmbs	very pale brown sandy clay (mound fill)	
470-476 cmbs	grayish brown sandy clay mottled with brown and yellow sandy clay(mound fill)	
476-480 cmbs	very pale brown sandy clay (mound fill)	
480-485 cmbs	brown sandy clay (mound fill)	
485-491 cmbs	pale yellow sandy clay mottled with gray sandy clay (mound fill)	
491-492 cmbs	gray sandy clay lens (mound fill)	

492-494 cmbs	brown sandy clay (mound fill)	
494-501 cmbs	pale yellow sandy clay mottled with gray sandy clay (mound fill)	
501-512 cmbs	pale yellow sandy clay mottled with brown and gray sandy clay (mound fill)	
512-515 cmbs	grayish brown sandy clay mottled with brown sandy clay (mound fill)	
515-532 cmbs	pale yellow sandy clay mottled with brown and gray sandy clay (mound fill)	
532-535 cmbs	gray very sandy clay, sorted appearance (mound fill)	
535-538 cmbs	dark brown silty clay (mound fill)	
538-539 cmbs	very pale brown sandy clay (mound fill)	
539-543 cmbs	grayish brown and sandy clay (mound fill)	
543-? cmbs	pale yellow sandy clay mottled with gray sandy clay (mound fill, core sample break)	
?-583 cmbs	dark brown clay (mound fill, core sample break)	
583-589 cmbs	gray ashy sandy clay (mound fill)	
589-611 cmbs	grayish brown sandy clay with root stains (submound humus)	Sterile
611-711 cmbs	strong brown sandy clay with root stains (submound soil)	

CORE SAMPLE 11	STRATA and COMMENTS	STAGE
0-12 cmbs	dark brown sandy loam (modern humus)	Humus
12-54 cmbs	yellowish brown sandy clay (restoration fill)	Restoration Fill
54-84 cmbs	brown sandy clay mottled with gray sandy clay and inclusions of charcoals and sherds (historic plow zone)	Historic Plow Zone
84-98 cmbs	grayish brown very sandy clay (midden/mound fill)	IV
98-112 cmbs	pale brown sandy clay (summit)	III
112-171 cmbs	yellowish brown sandy clay with white clay inclusions in upper portion (mound fill)	
171-177 cmbs	brown very sandy clay, sorted material(mound fill)	
177-181 cmbs	reddish brown sandy clay mottled with brown and yellowish brown sandy clay (mound fill)	
181-183 cmbs	yellowish brown sandy clay mottled with brown and grayish brown sandy clay, sorted material (mound fill/feature)	
183-185 cmbs	reddish brown sandy clay mottled with brown and yellowish brown sandy clay (mound fill)	
185-201 cmbs	pale brown very sandy clay (mound fill)	
201-202 cmbs	reddish brown sandy clay (summit)	II
202-212 cmbs	brown sandy clay with charcoal fleck and fired clay inclusions (summit)	
212-? cmbs	yellowish brown sandy clay (mound fill, core sample break)	
?-229 cmbs	brown sandy clay (mound fill, core sample break)	
229-235 cmbs	red sandy clay (mound fill?)	
235-243 cmbs	pale brown fine sandy clay, sorted material (mound fill)	
243-251 cmbs	light yellowish brown sandy clay with manganese nodules (mound fill)	
251-262 cmbs	pale brown sandy clay mottled with yellowish brown sandy clay (mound fill)	
262-268 cmbs	yellowish brown sandy clay (mound fill)	
268-271 cmbs	pale brown very sandy clay (mound fill)	
271-282 cmbs	brown sandy clay with minimal charcoal inclusions (mound fill)	
282-294 cmbs	pale brown sandy clay mottled with yellowish brown sandy clay with manganese nodules (mound fill)	
294-297 cmbs	brown sandy clay with manganese nodules (mound fill)	
297-305 cmbs	very pale brown fine sandy clay (mound fill)	
305-317 cmbs	grayish brown sandy clay with manganese nodules(mound fill)	
317-321 cmbs	brownish yellow sandy clay with manganese nodules (mound fill)	
321-341 cmbs	pale brown sandy clay with manganese nodules (summit)	I
341-390 cmbs	brown sandy clay mottled with pale brown and light yellowish brown sandy clay and minimal charcoal inclusions (mound fill)	
390-393 cmbs	gray sandy clay (mound fill)	
393-438 cmbs	light brownish gray sandy clay mottled with pale brown and yellowish brown sandy clay (mound fill)	
438-479 cmbs	brown sandy clay mottled with reddish yellow sandy clay (mound fill)	
479-? cmbs ~523	light gray very fine sandy clay mottled with brown and light yellowish brown sandy clay (mound fill, core sample break)	
?-556 cmbs	grayish brown sandy clay with root stains (submound humus, core sample break)	Sterile
556-670 cmbs	reddish yellow sandy clay fading to yellowish brown sandy clay (submound soil, core sample break)	

CORE SAMPLE 12	STRATA and COMMENTS	
0-15 cmbs	dark brown sandy loam (modern humus)	Humus
15-38 cmbs	yellowish brown sandy clay (restoration fill)	Restoration Fill
38-64 cmbs	dark brown sandy clay with charcoal, fired clay, and clay inclusions (historic plow zone)	Historic Plow Zone
64-90 cmbs	grayish brown sandy clay with charcoal and fired clay inclusions (disturbed mound fill)	IV
90-? cmbs	yellowish brown clay (midden/mound fill, core sample break)	
?-137 cmbs	yellowish brown sandy clay heavily mottled with brown sandy clay, charcoal, fired clay, red and white clay inclusions (midden/mound fill)	
137-139 cmbs	dark brown clay with charcoal at base (midden/summit)	III
139-141 cmbs	yellowish brown, possibly heated, clay (summit)	
141-145 cmbs	reddish brown, possibly heated clay, with fired clay inclusions (summit)	
145-149 cmbs	brown sandy clay (summit)	
149-152 cmbs	banded brown sand, sorted material (feature/mound fill)	
152-167 cmbs	brown sandy clay mottled with reddish brown clay and charcoal fleck and fired clay inclusions (feature/mound fill)	
167-281 cmbs	heavily mottled yellowish brown sandy clay with brown, white, and reddish brown sandy clay (feature/mound fill)	
281-300 cmbs	pale yellow very sandy clay mottled with yellowish brown sandy clay (feature/mound fill)	
300-303 cmbs	strong brown sandy clay with some charcoal flecks (mound fill intruded by above feature)	II
303-311 cmbs	pale yellow very sandy clay mottled with yellowish brown sandy clay with some charcoal inclusions, possibly some sorting at base (mound fill)	
311-313 cmbs	light brownish gray sandy clay, mica present as very fine sand size grains (summit)	I
313-328 cmbs	yellow very sandy clay mottled with light gray very sandy clay (mound fill)	
328-334 cmbs	reddish yellow sandy clay mottled with very pale brown sandy clay with charcoal flecks (mound fill)	
334-352 cmbs	light gray sandy clay mottled with yellow sandy clay (mound fill)	
352-356 cmbs	reddish brown sandy clay (mound fill)	
356-417 cmbs	yellow very sandy clay mottled with gray, very pale brown, and reddish yellow with charcoal flecks, sandy clay (mound fill)	
417-421 cmbs	pale yellow sandy clay (mound fill)	
421-435 cmbs	yellowish brown sandy clay mottled with light gray sandy clay (mound fill)	
435-436 cmbs	light grayish brown sandy clay with root stains and charcoal flecks (mound fill)	
436-440 cmbs	yellowish brown sandy clay mottled with light gray sandy clay (mound fill)	
440-443 cmbs	brownish yellow sandy clay (mound fill)	
443-449 cmbs	yellowish brown sandy clay mottled with light gray sandy clay (mound fill)	
449-454 cmbs	light brownish gray very fine sandy clay with root stains and charcoal flecks (mound fill)	
454-465 cmbs	brownish yellow sandy clay mottled with gray sandy clay (mound fill)	
465-467 cmbs	gray sandy clay (mound fill)	
467-470 cmbs	brown sandy clay (mound fill)	
470-476 cmbs	pink sandy clay mottled with yellowish brown sandy clay (mound fill)	
476-481 cmbs	brown sandy clay with root stains (mound fill)	
481-487 cmbs	very pale brown sandy clay mottled with brownish yellow sandy clay (mound fill)	
487-495 cmbs	brown sandy clay mottled with reddish brown sandy clay (mound fill)	
495-526-529 cmbs	yellowish brown sandy clay mottled with gray and brown sandy clay (mound fill)	
526-540 cmbs	brown sandy clay with reddish brown clay inclusions (mound fill)	
540-542 cmbs	reddish brown clay lens (mound fill)	
542-? cmbs ~556	brown sandy clay (mound fill, core sample break)	
?-583 cmbs	grayish brown sandy clay with root stains (submound humus, core sample break)	Sterile
583-705 cmbs	reddish yellow sandy clay with minimal root stains (submound soil)	

APPENDIX C: MOUND R PHOTO LOG INDEX

Name	Size	Type	Last Modified
cs1-1-1 5-27-98 2_30 PM	900KB	TIF Image Document	5/28/98 14:33
cs1-1-2 5-27-98 2_31 PM	900KB	TIF Image Document	5/28/98 14:34
cs1-1-3 5-27-98 2_31 PM	900KB	TIF Image Document	5/28/98 14:34
cs1-1-4 5-27-98 2_32 PM	900KB	TIF Image Document	5/28/98 14:35
cs1-2-1 5-27-98 1_50 PM	900KB	TIF Image Document	5/28/98 13:53
cs1-2-2 5-27-98 1_50 PM	900KB	TIF Image Document	5/28/98 13:54
cs1-2-3 5-27-98 1_51 PM	900KB	TIF Image Document	5/28/98 13:54
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cs1-2-6 5-27-98 1_55 PM	900KB	TIF Image Document	5/28/98 13:58
cs1-2-7 5-27-98 1_55 PM	900KB	TIF Image Document	5/28/98 13:59
cs1-2-8 5-27-98 1_56 PM	900KB	TIF Image Document	5/28/98 13:59
cs1-3-1 5-27-98 1_21 PM	900KB	TIF Image Document	5/28/98 13:24
cs1-3-2 5-27-98 1_21 PM	900KB	TIF Image Document	5/28/98 13:24
cs1-3-3 5-27-98 1_22 PM	900KB	TIF Image Document	5/28/98 13:25
cs1-3-4 5-27-98 1_22 PM	900KB	TIF Image Document	5/28/98 13:25
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