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National Register of Historic Places Eligibility Testing of Site 41SM404 Within TxDOT's Tyler District Smith County, Texas

Texas Antiquities Permit No. 5367
CSJ 3487-01-004, Toll 49 West, Section A

Prepared for:

North East Texas Regional Mobility Authority
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Abstract

Atkins North America, Inc. (Atkins) was contracted by the North East Texas Regional Mobility Authority to conduct National Register of Historic Places eligibility (NRHP) testing of site 41SM404, a prehistoric Caddo occupation site on a hilltop overlooking the floodplain of Indian Creek in western Smith County, Texas. The Texas Department of Transportation acted as the lead agency for the project. Testing investigations were conducted during September 2009 and January 2010. The site was subjected to a systematic program of shovel testing, mechanical trenching, hand excavation, and machine scraping in an effort to identify cultural features or living surfaces; optimize recovery of diagnostic faunal, floral, and artifactual materials; and ensure that no significant elements of the site would be impacted by project construction activities

The recovered cultural materials indicate that site 41SM404 represents a prehistoric occupation dating primary to the Middle Caddo period, based on analysis of and radiocarbon dating of ceramic sherds and matrix from intact cultural features. More-ephemeral occupations dating to the Middle to Late Archaic, Late Woodland, and the Formative and Early Caddo periods are suggested based on radiocarbon dating of feature matrix, the dating of bulk sherd organics, and temporally diagnostic dart points.

Intact charred floral materials were also recovered from matrix samples of three cultural features. Identified charred plant materials include corncob parts, cane fragments, ragweed and grape family seeds, hickory and black walnut nutshells, hickory nut hulls, and charcoal from red and white oaks, hickory, sycamore, maple, elm, and sweet gum trees.

The testing program located four cultural features but failed to locate cultural deposits suggestive of intact living surfaces. Because of the excellent preservation of organic materials in features and the large ceramic assemblage representing occupations primarily associated with the Middle Caddo period, site 41SM404 is thought to warrant NRHP listing. It has been designated as a State Archeological Landmark.

Although the site is situated entirely within the project right of way, no project impacts will occur except along the hillslope in the extreme eastern part of the site in an area that is not thought to contain contributing elements to the site's NRHP eligibility. No further investigation is recommended.

I. INTRODUCTION

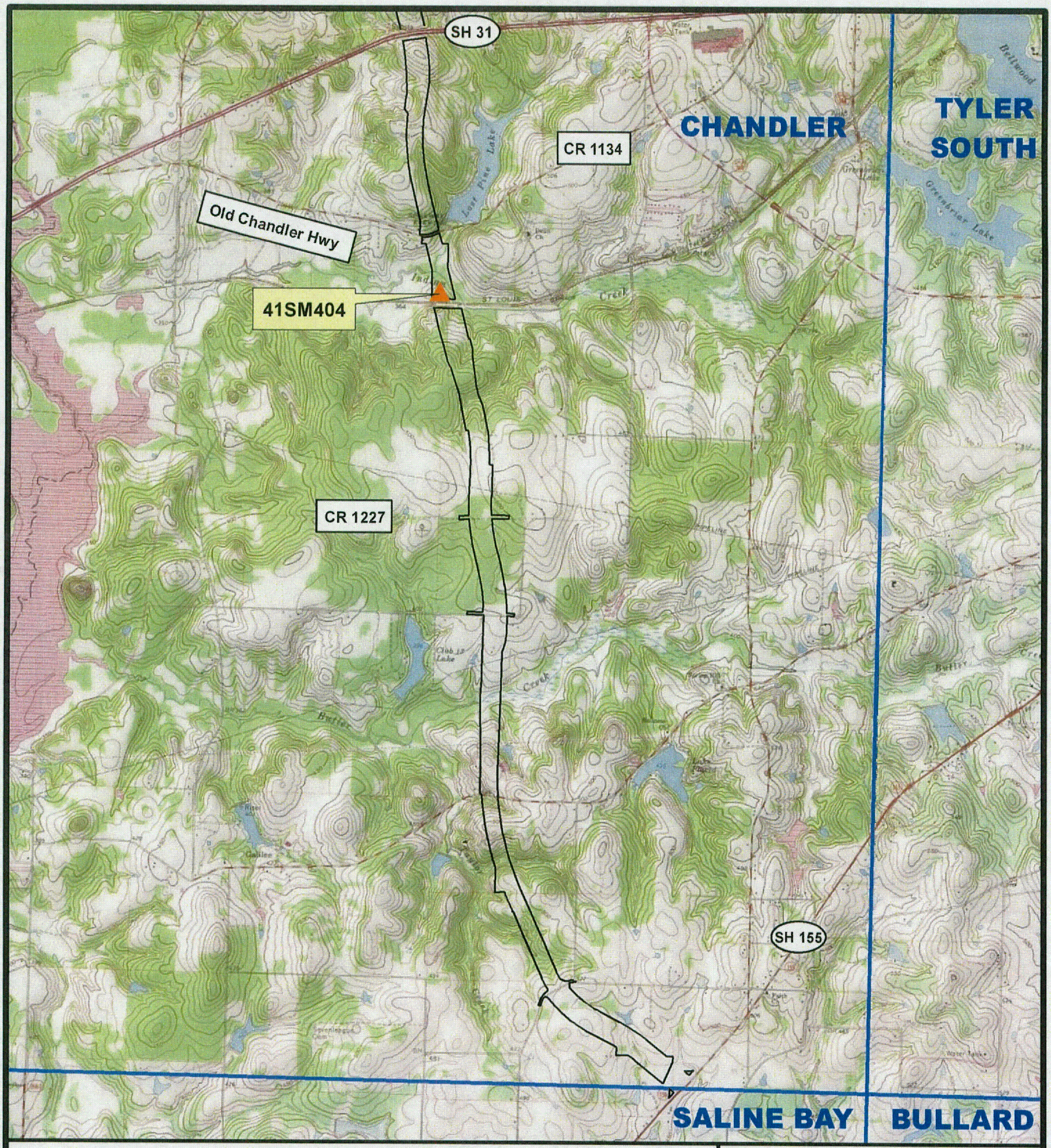
Atkins North America, Inc. (Atkins) was contracted by the North East Texas Regional Mobility Authority (NET RMA) to undertake archeological investigations for proposed Toll 49, Segment 3A, between State Highway (SH) 31 on the north, at about 6 miles (9.7 kilometers [km]) west of Loop 323, and SH 155 on the south, at about 5.25 miles (8.5 km) southwest of Loop 323 in Smith County, Texas. The project involves the construction of two lanes of an ultimate four-lane facility and includes the construction of a two-lane, rural typical section (two 12-foot [ft] [3.6-meter (m)]) lanes and 10-ft [3.0-m] shoulders on each side). From north to south, bridge work will include the construction of bridges at SH 31, County Road (CR) 1134/waterway structure (Indian Creek)/UPRR, waterway structure at station 725+00, CR 1227, CR 1130, Butler Creek, CR 1113/waterway structure, waterway structure at station 850+50, CR 196, and SH 155.

At the request of the NET RMA, PBS&J (now Atkins) conducted National Register of Historic Places (NRHP) eligibility testing of prehistoric site 41SM404 during September 2009 and January 2010. The site is situated on a relatively level hill summit and upper slopes overlooking the floodplain of Indian Creek, in western Smith County (Figure 1). The site is about 140 m (460 ft) north-south by 100 m east-west and occupies the northernmost three-fourths of the summit (Figure 2).

The site is located mostly within the 300-ft (90-m) right of way (ROW) for the proposed highway bypass project near its western edge. The main lanes will pass through the eastern periphery of the site along the eastern hillslope in an area about 85 ft (26 m) in width (see Figure 2). The vertical impact to the site is anticipated to be 20 ft (6 m) or less, based on typical highway design for this type of project.

In order to determine the NRHP eligibility of 41SM404, the site was subjected to a systematic program of shovel testing, mechanical trenching, and hand excavation in an effort to locate intact cultural features with datable subsistence or spent fuel materials. This work demonstrates that these remains have been preserved to some degree on the site, and the potential exists for further intact cultural features. For this reason, it is the opinion of PBS&J that the site warrants NRHP inclusion and designation as a State Archeological Landmark (SAL). Further work is recommended at the site.

These investigations were performed in compliance with the Texas Antiquities Code of 1977, as revised through 1995 (Texas Natural Resources Code: Title 9, Chapter 191), and the National Historic Preservation Act of 1966, as amended through 1992 (PL 89–665 through PL 102–575; 80 Stat. 915; 16 USC §470 et seq.). Finally, the work was conducted in accordance with the guidelines set forth by the Council of Texas Archeologists (1995), under the supervision of the Texas Department of Transportation (TxDOT).



N
W E
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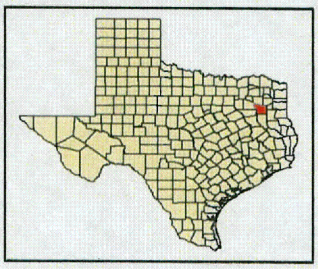
Site Location
APE
USGS Topo Boundary

600 0 600 1,200 Meters

2,000 0 2,000 4,000 Feet



NOT FOR PUBLIC DISCLOSURE

BASE MAP: USGS 7.5' TOPOGRAPHIC MAP, BULLARD, CHANDLER, SALINE BAY & TYLER SOUTH, TEXAS

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FIGURE 1
LOCATION OF 41SM404

LOOP 49 SEGMENT 3A
FROM SH 31 TO SH 155
SMITH COUNTY, TEXAS

Job No.: 480013.03	Scale: 1:46,592 @ 8.5"x11"
Prepared by: PBS&J (19658)	Date: 05/27/09

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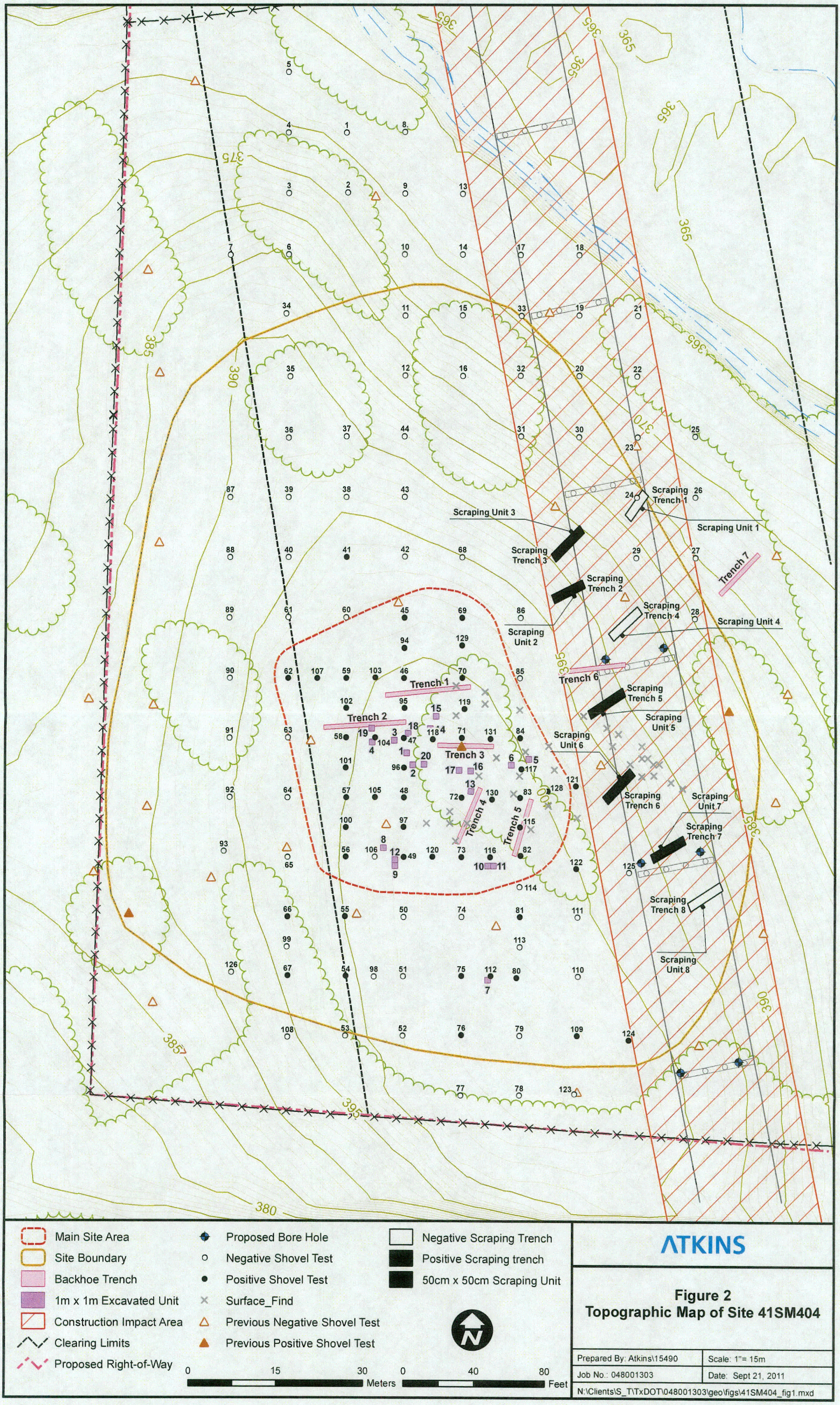

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Figure 2
Topographic Map of Site 41SM404

Prepared By: Atkins\15490	Scale: 1"= 15m
Job No.: 048001303	Date: Sept 21, 2011

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Approximately 90 person-days of labor were expended during the fieldwork. The project was conducted under the direction of Principal Investigator Maynard Cliff and the direct supervision of Project Archeologist Michael Nash. The field crew included David Jackson, Lynne O'Kelly, Ty Golgoun, Sara Laurence, Philip Washington, Erin Watkins, Randy Norris, Tony Chapa, and Karen Belvin. Analysis of artifacts was done by Timothy Perttula, Michael Nash, Linda Ellis, and Candace Wallace. TxDOT personnel who participated in the project include Archeology Project Manager Waldo Troell, Geo-Archeologist James Abbott, and Tyler District Environmental Coordinator Jay Tullos.

This report is divided into seven sections. Following the introduction, sections II and III discuss the general environmental setting and the cultural background of site 41SM404. Section IV presents the research design and methods for the fieldwork, and Section V presents results of the investigation. Section VI provides a summary of the cultural resource management recommendations. A list of references cited follows the text. A specimen inventory of collected material is presented in Appendix A. The radiocarbon dating analysis is presented in Appendix B. Appendix C presents tabular data on the lithic artifact analysis. Appendix D provides data on the analysis of the ceramic sherds. Appendix E reports on the petrographic analysis of selected ceramic sherds.

II. NATURAL ENVIRONMENT

TOPOGRAPHY

Site 41SM404 is located on a hill summit overlooking Indian Creek (see Figure 2). The site is approximately 80 m (260 ft) southwest of the present creek channel at its closest point. It is at an approximate elevation of 400 ft above mean sea level (msl). The site is vegetated with a variety of short grasses and nettles, with scattered mature hardwoods located within and around the site (Figure 3).

PHYSIOGRAPHY AND GEOLOGY

Site 41SM404 is physiographically in a transitional area between the Pineywoods and the Post Oak Savannah natural regions of Texas. Geologically, the site is situated within a small strip of the Queen City Sand, a late Eocene-aged formation between geologically recent sandy alluvium along Indian Creek to the north and the Eocene-aged Weches Formation to the south. The Queen City Sand consists of a fine-grained quartz sand locally overlying clay with ironstone concretions common. The Weches Formation consists of a grayish green to grayish olive-green, thin-bedded glauconite and quartz sand with clay (Bureau of Economic Geology 1965).

SOIL

The surface soil for the main site area (see Figure 2) of 41SM404 on the hill summit is mapped as Wolfpen loamy fine sand, 1 to 6 percent slopes. This soil is a deep and very well-drained Alfisol, typically occurring on broad, gently sloping upland interstream divides. The stratigraphic profile typically consists of a very friable, slightly acid, dark brown to yellowish brown loamy fine sand to a depth of 27 inches (68 centimeters [cm]) overlying a friable, yellowish brown sandy clay (U.S. Department of Agriculture, Soil Conservation Service [USDA, SCS] 1993:45–46, 94).

Portions of the site outside of the main site area are mapped as Redsprings very gravelly sandy loam, 8 to 25 percent slopes. This soil is a moderately deep and well-drained Alfisol, typically occurring on strongly sloping to steep hillslopes above drainageways in the uplands. The stratigraphic profile typically consists of a friable, medium acid, dark reddish brown, very gravelly sandy loam to a depth of 5 inches (12 cm) overlying a firm, very strongly acid, red clay (USDA, SCS 1993:41–42, 91).

CLIMATE

The climate of Smith County is humid and subtropical with long hot summers, cool fairly short winters, and fairly heavy precipitation throughout the year (USDA, SCS 1993). During the spring, summer, and fall seasons, air masses off the Gulf of Mexico dominate, while during the winter, the

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Figure 3

GENERAL VIEW OF SITE 41SM404
VIEWED TO NORTHEAST

L:\Projects\Hel\CLIENTS\NET RMA\Testing at 41SM404\cad\Figure 3_General View of Site

Drawn by: C. Wallace

climate is significantly affected by cold arctic air masses. Monthly temperatures for Smith County, recorded in Tyler for the period from 1954 to 1981, range from an average of 7.7 degrees Celsius (°C) (46 degrees Fahrenheit [°F]) during the winter, to an average of 26.6 °C (80 °F) during the summer, with a typical growing season of about 228 days (USDA, SCS 1993:110–111).

The average annual precipitation of Smith County is about 44 inches (112 cm), about half of which usually falls between April and September. July and August are the two driest months of the year. The average rainfall during these two months drops to 2.64 inches (6.7 cm), while April has the highest average rainfall, 5.04 inches (12.8 cm). Thunderstorms are most common in the spring, occurring on about 44 days of each year. Snowfall averages about 2 inches (5.0 cm) a year (USDA, SCS 1993:110–111).

FLORA

The site is located within a transitional area between the Piney Woods and Post Oak Savannah ecoregions (Texas Parks and Wildlife Department [TPWD] 2004). The vegetation, as indicated by TPWD's *Vegetation Types of Texas* (TPWD 1984), consists largely of Pine-Hardwood Forest and pasture consisting of Other Native and/or Introduced Grasses in the uplands and upper floodplains, and Willow-Water Oak-Blackgum Forest in the lower floodplains (McMahan et al. 1984), most of which has been cleared in proximity to site 41SM404. The Pine-Hardwood Forest in Smith County is classified as Subtype 2: Shortleaf Pine-Post Oak-Southern Red Oak Forest (McMahan et al. 1984). Commonly associated plants include loblolly pine (*Pinus taeda*), black hickory (*Carya texana*), sandjack oak (*Quercus incana*), flowering dogwood (*Cornus florida*), common persimmon (*Diospyros virginiana*), sweet gum (*Liquidambar styraciflua*), sassafras (*Sassafras albidum*), greenbriar (*Smilax* spp.), yaupon (*Ilex vomitoria*), wax myrtle (*Myrica* spp.), American beautyberry (*Callicarpa americana*), hawthorn (*Crataegus* spp.), supplejack (*Berchemia scandens*), winged elm (*Ulmus alata*), beaked panicum (*Panicum anceps*), spranglegrass (*Leptochloa* spp.), indiangrass (*Sorghastrum nutans*), switchgrass (*Panicum virgatum*), three-awn (*Aristida* spp.), bushclover (*Cuscuta* spp.), and tickclover (*Desmodium* spp.) (McMahan et al. 1984:25).

The Willow-Water Oak-Blackgum Forest commonly includes beech (*Fagus grandifolia*), overcup oak (*Quercus lyrata*), chestnut oak (*Quercus muehlenbergii*), cherrybark oak (*Quercus pagoda*), elm (*Ulmus* sp.), sweetgum, sycamore (*Plantanus occidentalis*), southern magnolia (*Magnolia grandiflora*), white oak (*Quercus alba*), black willow (*Salix nigra*), bald cypress (*Taxodium distichum*), swamp laurel oak (*Quercus laurifolia*), hawthorn, bush palmetto (*Sabal minor*), common elderberry (*Sambucus canadensis*), southern arrowwood (*Viburnum dentatum*), poison oak (*Toxicodendron pubescens*), supplejack, trumpet creeper (*Campsis radicans*), crossvine (*Bignonia capreolata*), greenbriar, blackberry (*Rubus fruticosus*), rhomboid copperleaf (*Acalypha rhomboidea*), and St. Andrew's Cross (*Ascyrum hypericoides*).

FAUNA

The site is located within the Austroriparian biotic province, as defined by Blair (1950), and is bordered on the west by the Texan biotic province. Davis and Schmidly (1994) divide Texas into four faunal regions based on the ecological distribution of mammals within the state. Smith County falls within the East Texas region. This region includes the Pineywoods, the Central Texas Woodlands, the Blackland Prairies, and the Coastal Prairies and Marshes.

Animal species that may have been important for food, shelter, and clothing to prehistoric and early historic inhabitants of this area include bison (*Bos bison*), rabbit (*Sylvilagus* spp.), fox squirrel (*Sciurus niger*), raccoon (*Procyon lotor*), Virginia opossum (*Didelphis virginiana*), white-tailed deer (*Odocoileus virginianus*), beaver (*Castor canadensis*), black bear (*Ursus americanus*), and diverse rodent fauna (Davis and Schmidly 1994). Important birds that occur in the area include turkey (*Meleagris gallopavo*), quail (*Colinus virginianus*), and the prairie chicken (*Tympanuchus cupido*) (Skokan et al. 1997). In addition to birds and mammals, fish, such as gar (*Lepisosteus* sp.), bowfin (*Amia calva*), pickerel (*Esox* sp.), catfish (Ictaluridae), and bass (Centrarchidae), and reptiles and amphibians, including turtles (Testudinata), particularly the snapping turtle (*Chelydra serpentina*), lizards (Iguanidae), snakes (Colubridae), and frogs (Ranidae), were also exploited (Perttula and Bruseth 1983; Swanton 1942).

III. CULTURAL BACKGROUND

CULTURAL HISTORY

Site 41SM404 lies within the Northeast Texas Archeological Region, as defined by the Texas Historical Commission (THC) (Kenmotsu and Perttula 1993). The general cultural history of this area, based on previous research, can be divided into five primary chronological and developmental periods—Paleoindian, Archaic, Woodland, Caddo, and Historic (Table 1). These divisions are believed to reflect changes in subsistence and cultural development as reflected by cultural materials and settlement patterns. Because site 41SM404 is associated predominantly with the Caddo period and, to a lesser degree, the Late Archaic period of occupation, only these periods are discussed in this section. The following discussion of these periods draws on previous summaries by Perttula (1988, 1995), Story (1981, 1985, 1990), and Thurmond (1985, 1988, 1990).

Table 1: Cultural Sequence for Northeast Texas
(after Perttula and Kenmotsu 1993; Story 1990)

Period	Approximate Dates
Paleoindian	9500–7000 B.C.
Archaic	7000–200 B.C.
Woodland	200 B.C.–A.D. 800
Caddo	
Formative	A.D. 800–1000
Early	A.D. 1000–1200
Middle	A.D. 1200–1400
Late	A.D. 1400–1680
Historic	post–A.D. 1680

Archaic Period (ca. 7000–200 B.C.)

In northeast Texas, the Archaic period is represented by three divisions, the Early, Middle, and Late Archaic. The Early Archaic (ca. 7000–4000 B.C.) is seen as a transition from late Paleoindian to fully Archaic lifeways (Duffield 1963). Story (1990) has identified selected characteristic dart points for each of the Archaic divisions in northeast Texas. She identifies Keithville, Palmer, Kirk, and Cossatot points as indicators of the Early Archaic; Big Sandy, Calf Creek, Johnson, Carrollton, and Morrill points as characteristic of the Middle Archaic (ca. 4000–2000 B.C.); and Lange, Castroville, Palmillas, Ellis, Edgewood, and Yarbrough dart points as chronological indicators for the Late Archaic (ca. 2000–200 B.C.) (Story 1990:Figure 32).

Thurmond (1990:214–218) suggests that there is an increase in the frequency of Early Archaic sites in comparison to the Paleoindian period, and that this increase in site frequency or density continues at least until the later Woodland period. Along Big Sandy Creek in Upshur County, Early

Archaic sites appear to be distributed on terraces and upland projections within major drainage basins (Perttula et al. 1986:50). Similar patterns have been found elsewhere (Bruseth and Perttula 1981; Jones 1957; Perttula and Skiles 1988).

In terms of excavated components, Middle Archaic sites are better represented in the archeological record than are components of the Early Archaic (Bruseth and Perttula 1980, 1981; Johnson 1962; Voellinger 1984). Settlement patterns appear to have changed little, although site density appears to be greater (Perttula et al. 1986:51; Thurmond 1990:216).

During the Late Archaic, there appears to have been a continued increase in site density, especially along tributaries of major drainages (Perttula et al. 1986:52; Thurmond 1990:215–219). Perttula et al. (1986:52) suggest that the more widely dispersed settlement pattern in the region is indicative of an economy based upon the hunting and gathering of local food resources. Numerous sites with Late Archaic components have been excavated in the region (Bruseth and Perttula 1980, 1981; Bruseth et al. 1977; Duffield 1961; Johnson 1962; Jones 1957; Voellinger 1984).

Caddo Period (A.D. 800–1680)

The Caddo period in east Texas in general has been subdivided into Formative (A.D. 800–1000), Early (A.D. 1000–1200), Middle (A.D. 1200–1400), and Late (A.D. 1400–1680) subperiods. The chronology used here is based on the work of Perttula (1995) and Thurmond (1990) in the Sabine River and Cypress Creek basins, north of the present project area. Both the Formative and Early Caddo periods include components related to the more traditional Alto and Sanders foci in eastern Texas. The ceramic types characteristic of the Formative Caddo are Holly Fine Engraved, Hickory Fine Engraved, Spiro Engraved, Kiam Incised, Weches Fingernail Impressed, and Coles Creek Incised, with Williams Plain also being present (Thurmond 1990). Ceramic types characteristic of the Early Caddo period include Sanders Engraved, Hickory Fine Engraved, Sanders Plain, and Canton Incised, with Williams Plain making up a smaller part of the assemblage than previously (Thurmond 1990:226–227).

Arrow points for the Formative to Early Caddo periods include Alba, Bonham, Catahoula, and Scallorn types (Thurmond 1990:226–227). The Formative Caddo period is suggested to be the earliest true Caddo cultural configuration (Story 1972). The George C. Davis site (41CE19) on the Neches River is probably the most important site for this period. Small Formative Caddo sites are generally located on terraces adjacent to water resources. Major Formative Caddo mound centers are located in major river valleys such as the South Sulphur River.

Sites of the Early Caddo period are more widespread and are typically found on terraces and on knolls near water resources. Subsistence during both the Formative and Early Caddo periods was probably based primarily on the hunting of deer and small mammals, supplemented by horticulture. Maize has been recovered from Early Caddo occupations, and settlement patterns are

thought to reflect wide population dispersal into sedentary hamlets and farmsteads (Perttula et al. 1986:54–55).

Judging from radiocarbon dates, Middle Caddo period occupations are more common throughout much of northeast Texas in comparison to Formative and Early Caddo occupations. Middle Caddo period sites continue to be located on elevated landforms adjacent to major streams, as well as along minor tributaries and spring-fed drainages (Perttula 2004b:378–379). Ceramic types identified for the Middle Caddo period include Ripley Engraved, Avery Engraved, Canton Incised, Maydelle Incised, Bullard Brushed, Pease Brushed-Incised, and La Rue Neck Banded (Thurmond 1990:227–228). In the Sabine River and Cypress Creek basins, the brushing of utility ware vessels became common after A.D. 1300 (Perttula 1995:338). Projectile points identified as being characteristic of the period include Bonham, Catahoula, Alba, Perdiz, and Cliffton (Thurmond 1990:227–228). In the Sabine River basin, the Middle Caddo component at the Oak Hill Village site (41RK214) is estimated to date between about A.D. 1200/1300 and 1450 (Rogers and Perttula 2004). Middle Caddo sites in Smith County include the Bryan Hardy site (41SM55), the Redwine site (41SM193), and the Langford site (41SM197) (Middlebrook and Perttula 1997; Walters 1997; Walters and Haskins 2000).

Smith County falls within what Shafer has recently termed the Northern Prairie Caddo geographic area (Shafer 2006:Figure 1). Shafer (2006) proposes a model for identifying what he calls Prairie Caddo using material culture occurring in east central Texas from approximately A.D. 1000 to 1300. In this model, he argues that some Caddo groups, while associated with neighboring Caddo in the woodlands to the east, adapted to life in the prairies of central Texas using a distinctive technological style. His list of cultural materials that might be used to identify Prairie Caddo sites includes ceramics and human remains identified as Caddo, Gahagan biface knives, Bonham-Alba arrow points, bone needles, and deer metapodial beamers (Shafer 2006).

Thurmond (1990) observes that ca. A.D 1400, the elements of Caddo material culture, manifested archeologically in ceramic and projectile point assemblages, differentiate along a line drawn roughly north to south somewhat west of Caddo Lake in Harrison County, Texas. The observed differences west to east are hypothesized by Thurmond (1990) to represent probable social groups.

The Late Caddo period appears to be notable for an increase in regional variants (see Perttula 2004b:Figure 13.26). The western portion of the Cypress Creek basin and the middle Sabine basin, north of site 41SM404, were characterized by the Whelan and Titus phases. The Whelan phase (ca. A.D. 1350–1450) is the earlier of these two and is largely confined to the Cypress Creek drainage basin (Thurmond 1985:Figure 4). Ceramics from Whelan phase sites include Ripley Engraved, Taylor Engraved, Wilder Engraved, Bullard Brushed, Pease Brushed-Incised, Maydelle Incised, and La Rue Neck Banded. Perdiz and Scallorn arrow points are generally associated with the Whelan phase (Thurmond 1990:228).

The succeeding Titus phase (ca. A.D. 1450–1650) represents the final prehistoric occupation of the upper Cypress Creek basin. Perttula (1995:338) describes the Titus phase as representing "the archeological remains of a number of Caddo groups who lived between the Sabine and Sulphur rivers." Ceramics characteristic of the Titus phase include Ripley Engraved, Taylor Engraved, Wilder Engraved, Bailey Engraved, Johns Engraved, Bullard Brushed, Harleton Appliqué, Maydelle Incised, La Rue Neck Banded, McKinney Plain, and Killough Pinched. Arrow points are primarily Bassett, Maud, Reed, and Talco (Thurmond 1990:228–229).

Another Late Caddo grouping, identified as the Frankston phase (ca. A.D. 1400–1650), is located in the Neches and Angelina river basins in Smith, Henderson, Cherokee, and Van Zandt counties (Perttula 2004b:395). Frankston phase sites include farmsteads, hamlets, and small villages. One Frankston phase mound is known, at the A.C. Saunders site (41AN19) in Anderson County (Jackson 1936; Kleinschmidt 1982). Small scattered hamlets with one to three houses have been identified in the upper Neches River basin (Anderson et al. 1974:178–180). The ceramic inventory of the Frankston phase includes Poynor Engraved, Bullard Brushed, Maydelle Incised, and La Rue Neck Banded. Elbow pipes and Perdiz arrow points are also present.

A third Late Caddo group, identified as the Angelina phase (ca. A.D. 1450–1650), is centered between the Angelina and Sabine rivers, in the vicinity of Lake Sam Rayburn (Perttula 2004b:395). The Walter Bell site (41SB50) is an Angelina phase site that contained small midden deposits, circular structures, and a small cemetery with extended and flexed burials (Perttula and Black 2003). Artifacts at the site included Perdiz arrow points, conch shell beads, bone tools, mussel shells, and incised bird bone flutes (Perttula and Black 2003). Ceramics associated with Angelina phase sites largely consist of Pineland Punctated-Incised and Broaddus Brushed (Jelks 1965:214; Wyckoff 1974:206).

PREVIOUS INVESTIGATIONS

Smith County attracted little interest from early archeologists until the 1930s, when J.E. Pearce, the founder of the Department of Anthropology at the University of Texas, arranged for expanded archeological work in Texas, much of which was centered in east Texas. In 1935, Walter Goldschmidt prepared a synthesis of archeological sites in Titus County and their relationship to other sites in east Texas (Goldschmidt 1935). The importance of this early work is that it was one of the first attempts at defining a chronological framework for the region. In Smith County, Jack Hughes recorded 45 sites from 1938 to 1943 (Kleinschmidt 1982).

In the decades after the Second World War, archeological research in the region was, for the most part, related to investigations along waterways for reservoir development. Cedar Creek Reservoir, on the western side of Henderson County in the middle Trinity River basin, was surveyed in 1961, 1963, and 1964 by the Texas Archeological Salvage Project. Three sites were excavated in 1964 by Dee Ann Story (Story 1965). In 1957, E.B. Jelks conducted a survey of Blackburn Crossing Reservoir

(present-day Lake Palestine) in Anderson, Cherokee, Henderson, and Smith counties, in the Upper Neches River basin. He recorded one site (41SM73) in Smith County. The Joe Meyer site was a Late Caddo cemetery that at one time contained over 20 burials (Jelks 1958; Johnson 1958, 1961). A later survey conducted by Southern Methodist University in 1969 and 1970 for the enlargement of Lake Palestine located 98 sites, including 41 in Henderson County, 28 in Smith County, 10 in Anderson County, and 15 in Cherokee County (Anderson 1971; Anderson et al. 1974). These sites ranged in age from the Middle Archaic to Late Caddo, with Caddo sites exhibiting ceramics from both the Alto and Frankston phases (Anderson et al. 1974). Other reservoir studies conducted within the Neches-Angelina River basin include Lake Athens (Duffield 1960) and the proposed Ponca Reservoir (Skinner 1971a). Investigations associated with reservoir projects within the Sabine River basin include Lake Tawakoni (formerly Iron Bridge Reservoir) (Duffield 1961; Duffield and Jelks 1961; Johnson 1957), Lake Mineola (Carl Estes Reservoir) (Malone 1972), Lake Fork Reservoir (Bruseth 1975; Bruseth et al. 1977; Skiles 1978; Skinner 1971b, 1975), proposed Big Sandy Reservoir (Gibson 1982; Perttula et al. 1986), and proposed Water's Bluff Reservoir (Perttula 1986).

Nonreservoir cultural resource management work pertinent to the current project has been conducted in association with power generation projects, water pipeline projects, park expansions, well pads, and power transmission projects. The State Department of Highways and Public Transportation conducted numerous surveys in the county from 1973 to 1979, but no cultural resource sites were recorded. Alan Skinner recorded 8 Civil War commercial salt-manufacturing furnace locations and 10 furnaces along the Neches-Saline (Skinner 1971c).

In 1977, W.H. Whitsett recorded three prehistoric sites (41SM94, 41SM95, and 41SM96) during a survey for the Texas Water Quality Board and the City of Tyler (Whitsett 1977). Of the three, only 41SM94, a multicomponent site, was found to contain Caddo pottery. Nash et al. (1993) recorded three sites (41SM174, 41SM175, and 41SM180) during a cultural resources survey for a proposed transmission line. Site 41SM174 was recorded as an unknown prehistoric campsite, while sites 41SM175 and 41SM180 were historic period house sites. Schmidt (1996) recorded three sites (41SM200, 41SM201, and 41SM202) during a cultural resources survey for the East Texas Electric Cooperative. Site 41SM201 was found to be multicomponent with both historic and prehistoric artifacts, while 41SM200 and 41SM202 were both historic period sites.

An archeological survey of Tyler State Park, conducted by TPWD (Howard et al. 1995), resulted in the recording of six sites (41SM184, 41SM185, 41SM186, 41SM187, 41SM188, and 41SM189), of which two (41SM184 and 41SM189) were designated SALs. Site 41SM184 was determined to be a Late Caddo campsite, while 41SM189 was found to be the remnant of a Civilian Conservation Corps camp from the 1930s. The remaining four sites consisted of late-nineteenth- to early-twentieth-century wells, dumps, and habitations.

In 1999, Alan Skinner recorded three historic period sites during archeological investigations at Faulkner Park and Pounds Field Airport (Skinner 1999a, 1999b). Two of these (41SM235 and 41SM236) were recorded at Faulkner Park, and included a mid- to late 1800s house site and an early 1900s foundation for the Harris Chapel School. The third site (41SM242) consisted of the remains of a World War II-period barracks from Tyler Army Airfield. That same year, Perttula and Nelson (1999) conducted an archeological survey for the proposed Starrville Water Supply waterline and recorded three prehistoric lithic scatters of indeterminate date (41SM227, 41SM228, and 41SM229). In 2003, archeological investigations were conducted at the Lindsey Park site (41SM300) by Archeological & Environmental Consultants (Perttula et al. 2003). Site 41SM300 was found to be a multicomponent site that was occupied from the Late Archaic to Woodland periods, with an apparent reoccupation during the Late Caddo period. The excavations resulted in the recovery of a burial, two chert dart points, a mano/pitted stone, lithic debris, wood charcoal, and nutshells (Perttula et al. 2003). Radiocarbon dates suggested that the burial was affiliated with the Frankston phase (ca. A.D. 1400–1615). Archeological surveys of several well pads at Lake Tyler East, conducted by Archeological & Environmental Consultants (Perttula and Nelson 2004a, 2005), recorded four prehistoric sites in the Angelina drainage basin (41SM209, 41SM213, 41SM332, and 41SM333). Sites 41SM209 and 41SM213 were judged to be Caddo sites, while the other two were of indeterminate age.

Perttula and Nelson also conducted several archeological investigations for the City of Tyler-Lake Palestine Water Treatment Pipeline project (Perttula and Nelson 2000, 2001a, 2001b, 2004b). Eight cultural resource sites were recorded (41SM203, 41SM271, 41SM272, 41SM273, 41SM274, 41SM275, 41SM281, and 41SM291), two of which had Caddo components. Test excavations were later conducted at the Prestonwood site (41SM272) and the Broadway site (41SM273) (Perttula and Nelson 2001a, 2004b). Site 41SM272 was found to be a multicomponent prehistoric site with Paleoindian, Archaic, and Caddo cultural materials, while 41SM273 yielded Late Caddo pottery.

Other projects in the county include assessment work on mound sites in the Sabine River basin and various other archeological testing projects. In the 1980s, Tim Perttula conducted a survey for Caddo mound sites within the Sabine River basin in east Texas and adjacent portions of northwestern Louisiana (Perttula 1989). Three mound sites (41SM54, 41SM55, and 41SM62) were identified in Smith County—41SM54 (the Jamestown site), 41SM55 (the Bryan Hardy site), and 41SM62. The Jamestown site appears to be a multimound site dating to the Middle Caddo period and is presently listed as a SAL. The Bryan Hardy site is another Middle Caddo mound site, while 41SM62 was recorded as a possible mound site by Robert Mallouf and Dee Ann Story in 1978.

In 1997, test excavations were conducted by Nancy Kenmotsu at 41SM203 for TxDOT. Site 41SM203 was found to be a Late Archaic to Late Prehistoric campsite with only a small amount of Caddo pottery (Goode 1997). In 2001, TxDOT conducted archeological testing at site 41SM231 for the South Tyler Greenbelt project. The site was determined to be an Early to Middle Caddo campsite and yielded 98 shell-and-grog-tempered plain ware sherds (Ahr 2001).

In 1997 and 1998, archeological investigations were conducted for the Federal Highway Administration/TxDOT at Camp Ford (41SM181), a Confederate prisoner of war (POW) camp, presently listed as a SAL. Archeological fieldwork for the Camp Ford Archaeological and Historical project included test excavations and remote sensing (Thoms 2004). Site 41SM181 was found to contain over 80 subsurface features, including slave-dug footing trenches for the stockade walls, POW-built houses, refuse pits, drainage ditches, and latrine features. Artifacts recovered from the excavations included military buttons, insignia fragments, bullets, and pieces of ceramics and glass (Thoms 2004).

In 2007, an archeological survey with geoarcheological investigations was conducted by PBS&J for Proposed Loop 49, Segment 3A (Pemberton et al. 2009). The investigation included pedestrian survey of the proposed ROW between SH 155 on the south and SH 31 on the north, and geoarcheological investigation within the floodplain of Indian Creek. Four new archeological sites were recorded (41SM372, 41SM373, 41SM374, and 41SM385). These included two prehistoric sites (41SM372 and 41SM385) and two historic sites (41SM373 and 41SM374). Only one site was recommended for further archeological assessment (41SM385). NRHP testing was conducted at nearby site 41SM385 in 2009. Site 41SM385 is primarily a Woodland period occupation, but sparse Caddo-aged materials at this site represent a series of ephemeral usage of the location, possibly as a resource procurement locus ancillary to site 41SM404.

On May 7, 2009, site 41SM404 was discovered by TxDOT personnel while inspecting ground disturbance associated with geotechnic boring investigations. On May 12–15, 2009, survey-level investigations including surface inspection and shovel testing were conducted by archeologists Lynne O'Kelly and Matt Basham of PBS&J. These investigations resulted in 37 shovel tests excavated in the vicinity of the site, of which 4 were positive, yielding 17 artifacts. Additionally 53 artifacts were recovered during surface collection. Recovered artifacts included ceramic sherds, lithic debitage, burned rocks, charcoal, and charred nutshell. Ceramic artifacts suggested a Caddo period component was present at the site. NRHP eligibility testing was recommended (Cliff 2009).

IV. RESEARCH DESIGN AND METHODS

The testing strategy was designed to determine whether the site harbors significant data resources that meet the criteria warranting inclusion in the NRHP. Such resources may include intact cultural features or deposits that maintain integrity of design and materials and are likely to yield information important to prehistory. This work complies with applicable standards as defined or referenced in 13 TAC 26.20 and THC policy.

The field investigations were conducted in three stages: systematic shovel testing, judgmentally placed mechanical excavations, and hand excavation. Horizontal control was maintained with a total station established over a site datum. All shovel tests, trenches, and hand-excavation units were tied to the site datum with the total station. The total station was also used to map the site's topography.

HORIZONTAL CONTROL

A control grid with 10-m grid intercepts oriented parallel to the proposed ROW edge was established on the site. The control grid encompassed the site boundaries as defined during the initial survey and recordation and allowed for possible site boundary expansion. All shovel tests, backhoe trenches, and hand-excavation units were tied to the grid with a total station.

SHOVEL TESTING

During the first stage of the investigations, site 41SM404 was subjected to a systematic program of shovel testing in order to evaluate the horizontal and vertical distribution of artifacts across the site and determine whether behaviorally meaningful patterns of discard, such as activity areas, were preserved at the site. This effort was designed to horizontally identify and define individual site components and activity areas as well as areas having a high probability for cultural features. During two phases of shovel testing, 117 shovel tests measuring approximately 30 cm in diameter and ranging in depth from 20 to 105 centimeters below surface (cmbs) in depth, and averaging 60 cmbs were excavated (Table 2). During the first phase, shovel tests were excavated at 10-m grid intercepts across the site to broadly define artifact density clines. During the second phase, shovel tests were primarily excavated at 5-m grid intercepts between previously excavated shovel tests within high artifact density and diversity areas defined during the first stage. All shovel tests were excavated in arbitrary 10-cm levels and screened with ¼-inch-mesh hardware cloth. Shovel tests were excavated until a clayey subsoil was encountered and were terminated approximately 5 cm into the subsoil. In the absence of a subsoil, they were excavated until they had reached a depth of at least 80 cmbs and two culturally sterile 10-cm levels had been excavated.

Table 2: Termination Depth of Shovel Tests, Test Units, and Backhoe Trenches

Unit No.	Termination Depth in cmbs	Unit No.	Termination Depth in cmbs	Unit No.	Termination Depth in cmbs	Unit No.	Termination Depth in cmbs
Shovel Test (ST) 1	65	ST 51	80	ST 90	30	Test Unit (TU) 1	50
ST 2	20	ST 52	20	ST 91	40	TU 2	60
ST 3	31	ST 53	30	ST 92	30	TU 3	50
ST 4	30	ST 54	40	ST 94	75	TU 4	40
ST 5	40	ST 55	80	ST 95	60	TU 5	70
ST 6	35	ST 56	90	ST 96	70	TU 6	90
ST 7	30	ST 57	60	ST 97	70	TU 7	50
ST 8	50	ST 58	60	ST 99	20	TU 8	40
ST 9	67	ST 59	80	ST 10	40	TU 9	45
ST 10	70	ST 60	100	ST 101	80	TU 10	80
ST 11	43	ST 61	50	ST 102	60	TU 11	100
ST 12	55	ST 62	50	ST 103	60	TU 12	40
ST 13	100	ST 63	65	ST 104	42	TU 13	85
ST 14	71	ST 64	50	ST 105	60	TU 14	70
ST 15	100	ST 65	50	ST 106	60	TU 15	68
ST 16	70	ST 66	40	ST 107	60	TU 16	105
ST 28	30	ST 67	25	ST 108	10	TU 17	100
ST 29	27	ST 68	60	ST 109	66	TU 18	63
ST 30	27	ST 69	80	ST 110	65	TU 19	100
ST 31	50	ST 70	80	ST 111	60	TU 20	65
ST 32	90	ST 71	80	ST 112	80		
ST 33	30	ST 72	100	ST 113	80		
ST 34	20	ST 73	80	ST 114	80	Trench 1	80
ST 35	40	ST 74	80	ST 115	80	Trench 2	70
ST 36	50	ST 75	80	ST 116	80	Trench 3	80
ST 37	100	ST 76	70	ST 117	80	Trench 4	106
ST 38	60	ST 77	30	ST 118	55	Trench 5	90
ST 39	40	ST 78	60	ST 119	60	Trench 6	110
ST 40	80	ST 79	80	ST 120	70	Trench 7	120
ST 41	70	ST 80	80	ST 121	75		
ST 42	80	ST 81	70	ST 122	60		

Table 2 (Cont'd)

Unit No.	Termination Depth in cmbs	Unit No.	Termination Depth in cmbs	Unit No.	Termination Depth in cmbs	Unit No.	Termination Depth in cmbs
ST 43	70	ST 82	70	ST 123	70	Scrape Trench 1	150
ST 44	40	ST 83	80	ST 124	80	Scrape Trench 2	50
ST 45	105	ST 84	80	ST 125	30	Scrape Trench 3	170
ST 46	70	ST 85	55	ST 126	25	Scrape Trench 4	130
ST 47	60	ST 86	80	ST 127	60	Scrape Trench 5	35
ST 48	65	ST 87	30	ST 129	55	Scrape Trench 6	65
ST 49	50	ST 88	20	ST 130	80	Scrape Trench 7	40
ST 50	60	ST 89	30	ST 131	80	Scrape Trench 8	30

MECHANICAL EXCAVATION

Initially, seven backhoe trenches were used to sample areas of high artifact density and to expose a representative cross section of the site. Trenches ranged from 70 to 120 cm in depth, averaging 94 cm in depth excavated (see Table 2). Trench walls were cleaned with hand tools and closely examined to determine whether cultural features were present. A representative profile was drawn of each trench, and a portion of the corresponding trench wall was photographed. The goal of this effort was to search for intact cultural features and deposits and to expose an intermittent stratigraphic profile of the site.

HAND EXCAVATION

Twenty 1-x-1-m test units excavated in arbitrary 10-cm levels with a total volume of 13.2 m^3 were excavated at site 41SM404. Test units ranged in depth from 40 to 105 cm, averaging 69 cm in depth excavated (see Table 2). These units were used to sample high artifact density and diversity areas and to search for intact cultural features. They were placed according to the field director's judgment, based on the results of shovel testing and trench excavation, to optimize location of intact cultural features and recovery of artifacts and faunal and macrobotanical remains.

ADDITIONAL MECHANICAL EXCAVATION

After completion of the initial testing activities described above, it was determined that project impacts would be limited to the eastern edge of the site along the hillslope. To ensure that no NRHP-contributing elements of the site were present within this area of potential effect, eight trenches were excavated by machine scraping in thin layers. Each scraping trench was approximately 1.5 m (5 ft) wide and 6 m (20 ft) long. The locations of the scraping trenches were selected to avoid the steepest and most obviously disturbed areas. Each scraping trench was excavated by following the surface slope in very thin levels of approximately 5 cm (ca. 2 inches) in thickness until clay subsoil was reached. Following each scraped layer, the base of the scraping trench was shovel scraped with flat-bottomed shovels and inspected for prehistoric features, while the excavated dirt was examined. Questionable anomalies were more closely examined by trowel scraping, and, if necessary, water spraying and/or trowel probing. Trenches ranged from 30 to 170 cm in maximum depth, averaging 84 cm in maximum depth excavated (see Table 2). A representative profile was drawn and photographed of each trench, and a 50-x-50-cm test unit was excavated along each trench wall.

SPECIAL STUDIES

During the field investigation, soil samples were collected for possible radiocarbon dating or special studies. Special studies that were considered during the analysis phase of the project include particle-size analysis and magnetic susceptibility. However, given the absence of defined living surfaces identified during field investigations, no special studies were conducted. Radiocarbon dating was on intact cultural features and selected ceramic sherds.

LABORATORY ANALYSIS AND CURATION

All recovered artifacts were brought back to the PBS&J laboratory in Austin, Texas, where all artifacts were washed, cataloged, and labeled prior to analysis. All recovered artifacts, field notes, and records will be organized for curation according to Texas Archeological Research Laboratory (TARL) curation policies and procedures and will then be submitted to TARL for permanent housing.

The ceramic analysis quantified the variability in the physical characteristics of the ceramic assemblage. Important attributes that were analyzed include temper and paste characteristics, oxidation patterns, surface treatments, wall thickness, attributes of form, and decoration. When possible, sherds were classified according to established types. Following the ceramic analysis, 10 sherds were subjected to petrographic thin sectioning and analysis (see Appendix E).

Lithic debitage was classified in categories reflecting state of reduction, i.e., primary, secondary, and tertiary. Bifaces were classified into categories reflecting stage of reduction/completion following Andrefsky's (1998) typology. In his typology, flake blanks are stage 1, edge-modified bifaces are

stage 2, thinned bifaces are stage 3, preforms are stage 4, and finished tools are stage 5. The assemblage of lithic tools was examined under low-power microscopy in order to identify patterns of use wear. Morphological characteristics of projectile points were used to identify cultural affiliation and assess manufacturing techniques when possible. The entire lithic assemblage, including tools and debitage, was classified into raw material categories and evaluated for thermo-alteration.

All soil samples from intact features were floated and divided into heavy and light fraction categories. Artifacts found with the flotation material were removed and added to their individual artifact categories. Light fraction samples were submitted for identification and analyzed by a macrobotanist. After macrobotanical analysis, charred plant remains from intact features were subjected to radiocarbon dating analysis.

V. RESULTS OF THE INVESTIGATION

SHOVEL TESTING

The site was systematically sampled with 117 shovel tests at 10- and 5-m grid intercepts covering the site area (see Figure 2). Of these, 51 shovel tests were culturally positive, yielding a total of 37 lithic debitage fragments, 237 ceramic sherds, 1 piece of burned rock, and 2 small charcoal fragments. Cultural materials occurred between the ground surface and 105 cmbs, with 71 percent of the cultural materials in the upper 30 cmbs and 93 percent of the cultural materials in the upper 50 cmbs. The highest artifact density shovel test was Shovel Test 47, which yielded 18 ceramic sherds and 5 lithic artifacts, all within the upper 30 cmbs (see Appendix A). The soil encountered in shovel tests generally consisted of a loose to slightly firm, very fine sandy loam. Depths of shovel tests ranged from 20 to 105 cmbs (see Table 2).

MECHANICAL EXCAVATION

Seven backhoe trenches were excavated to prospect for cultural features and to help evaluate the site's formation history. Trenches 1–5 were excavated on the site's east-west axis in order to prospect for features in areas of high artifact density and to reveal a general profile of the site. Trenches 6 and 7 were excavated on the eastern slope of the landform that the site occupies and within the Indian Creek floodplain below the site in order to locate features and better understand the site's formation process. Each trench was examined by the Project Geoarcheologist. All profiles were described using standard soil description nomenclature.

In general, the trench profile descriptions conformed to those of the Wolfpen series. Wolfpen soils are nonaggrading upland soils. Taxonomically they are classified as Arenic Paleudalfs, which are reddish Alfisols that occur on relatively stable surfaces, and have a loamy fine sand or coarser texture (Soil Survey Staff 1975:135). In a typical profile, Wolfpen soils have a horizon sequence of A-E-Bt-Bt2-B/E3 (USDA, SCS 1993:94).

The soil horizons observed in trenches 1, 2, 3, and 5 were a typical sequence for Wolfpen series. Trench 4 differed in having what appeared to be a poorly developed Bt horizon underlying the Ap horizon (Figure 4a). The horizon was characterized by coalescing lamella of yellowish red clay. This may represent past cultural disturbances. Long believed to take thousands of years to form (Birkeland 1985:113), recent work by Alston Thoms in the Tyler area has demonstrated these pedogenic features require much less time to form, possibly less than 150 years (Thoms 2008). However, Trench 4 was the only trench profile in which this horizon was distinguishable, and natural processes such as the uprooting of a large tree could perhaps have resulted in displacement and eventual redeposition of B horizon materials.

a) Trench 4, south wall profile

b) Trench 6, facing east

Figure 4. Trenches 4 and 6

Trench 6 was excavated on a relatively steeply sloping part of the site as evidenced by an E horizon that varied considerably in thickness, from 20 to 100 cm (Figure 4b). The trench was placed in an area that may have been artificially terraced. Finally, the horizon sequence observed in Trench 7, excavated on a toeslope or lower backslope near the base of the ridge harboring 41SM404, differed slightly, appearing as Ap-Bw-Bt. Presumably, the slight difference in the sequence is a factor of the trench's position on the landscape.

A carbonized stain was observed in the south wall of Trench 2 at a depth of about 35 cmbs. Subsequent hand excavation suggested the stain was cultural, interpreted as possibly being a posthole (see discussion of Feature 4, below).

The following strata were identified in the seven backhoe trenches at 41SM404.

Stratum	Thickness	Description
Trench 1 South Wall Profile		
I	20 cm	Medium bedded; clear, wavy boundary; dark grayish brown (10YR 4/4) very fine sandy loam; weak fine, subangular blocky structure; loose consistency; grass rootlets in upper 10 cm. Ap horizon.
II	30 cm	Thick bedded; clear, smooth boundary; brown (10YR 5/3) very fine sandy loam; weak, fine, subangular blocky structure; loose consistency. E horizon.
III	20+ cm	Lower boundary not encountered; yellowish red (5YR 4/6) clayey sand; moderate, medium, blocky structure; friable consistency. Bt horizon.
Trench 2 South Wall Profile		
I	20 cm	Medium bedded; clear, wavy boundary; dark grayish brown (10YR 4/4) very fine sandy loam; weak fine, subangular blocky structure; loose consistency; grass rootlets in upper 10 cm. Ap horizon.
II	40 cm	Thick bedded; clear, smooth boundary; brown (10YR 5/3) very fine sandy loam; weak, fine, subangular blocky structure; loose consistency. Carbon stain about 15–20 cm at approximately 35 cmbs. E horizon.
III	20+ cm	Lower boundary not encountered; yellowish red (5YR 4/6) clayey sand; moderate, medium, blocky structure; friable consistency. Bt horizon.
Trench 3 South Wall Profile		
I	20 cm	Medium bedded; clear, wavy boundary; dark grayish brown (10YR 4/4) very fine sandy loam; weak fine, subangular blocky structure; loose consistency; grass rootlets in upper 10 cm. Ap horizon.
II	40 cm	Thick bedded; clear, smooth boundary; brown (10YR 5/3) very fine sandy loam; weak, fine, subangular blocky structure; loose consistency. E horizon.
III	20+ cm	Lower boundary not encountered; yellowish red (5YR 4/6) clayey sand; moderate, medium, blocky structure; friable consistency. Bt horizon.
Trench 4 West Wall Profile		
I	20 cm	Medium bedded; clear, wavy boundary; dark grayish brown (10YR 4/4) very fine sandy loam; weak fine, subangular blocky structure; loose consistency; grass rootlets in upper 10 cm. Ap horizon.

Stratum	Thickness	Description
II	30 cm	Medium to thick bedded; clear, wavy boundary; yellowish red (5YR 4/6) clayey sand; moderate, medium, blocky structure; friable consistency. Carbonized root at 40–45 cmbs. Incipient Bt horizon.
III	50 cm	Thick bedded; clear, smooth boundary; yellowish brown (10YR 5/6) fine sandy loam; weak, fine, subangular blocky structure; loose consistency. Bt/E horizon.
IV	20+ cm	Lower boundary not encountered; yellowish red (5YR 4/6) clayey sand; moderate, medium, blocky structure; friable consistency. Bt horizon.
Trench 5 West Wall Profile		
I	20 cm	Medium bedded; clear, wavy boundary; dark grayish brown (10YR 4/4) very fine sandy loam; weak fine, subangular blocky structure; loose consistency; grass rootlets in upper 10 cm. Ap horizon.
II	40 cm	Thick bedded; clear, smooth boundary; brown (10YR 5/3) very fine sandy loam; weak, fine, subangular blocky structure; loose consistency. E horizon.
III	20+ cm	Lower boundary not encountered; yellowish red (5YR 4/6) clayey sand; moderate, medium, blocky structure; friable consistency. Bt horizon.
Trench 6 South Wall Profile		
I	20 cm	Medium bedded; clear, wavy boundary; dark grayish brown (10YR 4/4) very fine sandy loam; weak fine, subangular blocky structure; loose consistency; grass rootlets in upper 10 cm. Ap horizon.
II	20–100 cm	Thick bedded; clear, smooth boundary; brown (10YR 5/3) very fine sandy loam; weak, fine, subangular blocky structure; loose consistency. E horizon.
III	20+ cm	Lower boundary not encountered; yellowish red (5YR 4/6) clayey sand; moderate, medium, blocky structure; friable consistency. Bt horizon.
Trench 7 South Wall Profile		
I	30 cm	Medium bedded; clear, wavy boundary; dark grayish brown (10YR 4/6) loamy fine sand; weak fine, subangular blocky structure; loose consistency; grass rootlets in upper 10 cm. Ap horizon.
II	60 cm	Thick bedded; clear, smooth boundary; brown (7.5YR 5/4) very fine sandy loam; weak, fine, subangular blocky structure; loose consistency. Bw horizon.
III	20+ cm	Lower boundary not encountered; yellowish red (5YR 4/6) clayey sand; moderate, medium, blocky structure; friable consistency. Bt horizon.

HAND-EXCAVATED UNITS

Twenty 1-x-1-m test units were excavated by hand (see Figure 2) to sample high artifact density areas identified during shovel testing. The cultural assemblage recovered from these units included ceramic sherds, lithic debitage and tools, ground stone fragments, daub, thermally altered rocks, and small amounts of faunal material and charcoal (Table 3).

Table 3: Cultural Material from Test Units

Unit No.	Feature No.	Level	Ceramics	Diagnostic Points	Nondiagnostic chipped stone tools	Ground Stone	Lithic Manufacturing Debris	Thermally Altered Rock	Faunal Remains by weight	Charred Floral Remains by Weight	Daub	Burned Clay
	Central Site Group											
1		1	9									
		2	103				8		0.56			
		3	39		1		8			0.18		
	1	4	6				2	1	0.27	2.24		
		4	13				2		0.15	1.81		
	1	4-5	9				10		1.82			8
	1	5	3						1.75	0.43		
		5	3				1		1.36	0.05		
		6	1									
	1	6	4				4					
	Subtotal		190	0	1	0	35	1	5.91	4.71	0	8
2		1	94				6					
		2	61			1	5	1		0.11		
		3	45			1	11			0.24		
		4	25			2	6	2		0.10		
		5	5				1					
		6	2				1					
	Subtotal		232	0	0	4	30	3	0	0.45	0	0
3		1	84			1	8	3				
		2	46				2	1				
		3	29				5			0.16		
		4	16				2					
		5	2				2					
	Subtotal		177	0	0	1	19	4	0	0.16	0	0
4		1	30				8	1				
		2	18				8	1				
		3	16				5					
		4	1				3			0.23		
	Subtotal		65	0	0	0	24	2	0	0.23	0	0
14		1	19				2		0.18			
		2	41				4	2				
		3	38				4		1.40	0.25	1	
		4	17	1		1	4		9.94		1	
		5	16			1	2	1	0.78		2	
		6	5								3	
	Subtotal		136	1	0	2	16	3	12.3	0.25	7	0
15		1	24						0.52			
		2	118		2		3		0.18	0.80		
		3	45		1		4		1.72			
	5	3-5						5				
		4	57				1		6.26			
		5	30				2			0.15		
		6	12				2	1		0.11		
		7	7				1					
	Subtotal		293	0	3	0	13	6	8.68	1.06	0	0
18		1	5									
		2	75			1	4					
		3	42	1		1	3		2.67			
		4	42				5					
		5	44				1					
		6					2					
	Subtotal		208	1	0	2	15	0	2.67	0	0	0
19		1	29				2					
		2	32				6			0.08		
		3	5				5			0.12		
	6	4										
		4	8			1	8			0.53		
	Subtotal		74	0	0	1	21	0	0	0.73	0	0
20		1	89				5					
		2	66				5		0.55			
		3	31				3			0.06		
		4	10				2			0.52		
		5	6				1					
		6	8				1					
	Subtotal		210	0	0	0	17	0	0.55	0.58	0	0
Central Site Group Subtotal			1585	2	4	10	190	19	30.11	8.17	7	8

Table 3 (Cont'd)

Unit No.	Feature No.	Level	Ceramics	Diagnostic Points	Nondiagnostic chipped stone tools	Ground Stone	Lithic Manufacturing Debris	Thermally Altered Rock	Faunal Remains by weight	Charred Floral Remains by Weight	Daub	Burned Clay
	Eastern Site Group											
5		1	61				6	1	0.62			
		2	56				1	1				
		3	48		1		3					
		4	8				1			0.37		
		5	10				1			0.26		
		6					1					
	Subtotal		183	0	1	0	13	2	0.62	0.63	0	0
6		1	52				3	1				
		2	53				2		0.61			
		3	32				3					
		4	18		1		5					
		5	11									
		6	5				3					
		7	4					1				
		8	6				2	1				
	Subtotal		181	0	1	0	18	3	0.61	0	0	0
13		1	56				2					
		2	66				4			0.32		
		3	62			1	6			0.05		
		4	17				4	1		0.20		
		5	9				8					
		6	2				5					
		7	2				2					
		8	3				2		1.30	0.39		
	Subtotal		217	0	0	1	33	1	1.3	0.96	0	0
16		1	28				2					
		2	77				9		0.35			1
		3	16				5		0.66			
		4	9				6			1.14		
		5	7				4			0.05		
		6	4		1		5			0.91	1	
		7	3				4					
		8	4									
		10	1				3					
	Subtotal		149	0	1	0	38	0	1.01	2.1	1	1
17		1	32	1			7					
		2	34				2		0.30		1	
		3	18				5		0.30			
		3	13				3					
		5	7				3					
		6	5			1	4					
		7	2				2					
		8	4				1					
		9					1					
	Subtotal		115	1	0	1	28	0	0.6	0	1	0
Eastern Site Group Subtotal			845	1	3	2	130	6	4.14	3.69	2	1

Table 3 (Cont'd)

Unit No.	Feature No.	Level	Ceramics	Diagnostic Points	Nondiagnostic chipped stone tools	Ground Stone	Lithic Manufacturing Debris	Thermally Altered Rock	Faunal Remains by weight	Charred Floral Remains by Weight	Daub	Burned Clay
Northern Site Group												
7		1	2									
		2	3				2	4		0.01		
		3	1			1	6	1		0.08		
		4	1				7					
Subtotal			7	0	0	1	15	5	0	0.09	0	0
8		1	28				7		0.25			
		2	22				4	1				
		3	10				2					
		4	4									
	2	2-3						3				
Subtotal			64	0	0	0	13	4	0.25	0	0	0
9		1	22				2					
		2	26				4					
		3	12		1		6					
	3	3-4					1	1				1
		4	9		2		3	1				
		5	2				4	1		0.41		
Subtotal			71	0	3	0	20	3	0	0.41	0	1
10		1	27				1					
		2	19				1					
		3	20				3		0.47	0.26		
		4	24	1			5			0.05		
		5	4	2	1		1					
		6	9	1			2			0.36		
		7	2				3	1				
		8	2							0.47		
Subtotal			107	4	1	0	16	1	0.47	1.14	0	0
11		1	10				2					2
		2	19				4					
		3	24				5					
		4	5			1	4			0.63		
		5	7				1	1		0.06		
		6	9				4					
		7	2									
		8					3					
		9					2					
Subtotal			76	0	0	1	25	1	0	0.69	0	2
12		1	22				7					
		2	19				4					
		3	9									
		4	10				2			1.13		
Subtotal			60	0	0	0	13	0	0	1.13	0	0
Northern Site Group Subtotal			385	4	4	2	102	14	0.72	3.46	0	3
Site Total			2815	7	11	14	422	39	34.97	15.32	9	12

During controlled hand excavation, 2,815 ceramic sherds, 440 lithic artifacts, 14 ground stone artifacts, 39 burned rock fragments, 9 pieces of daub, and 12 pieces of burned clay were recovered from the ground surface to a depth of 105 cm. The heaviest density of material was from between 0 and 30 cm in depth where about 76 percent of the artifacts were recovered. The upper 60 cm yielded 98 percent of the recovered artifacts. The unit with the heaviest artifact density was Unit 15 with a total of 315 artifacts, followed closely by units 2 and 13 with 269 and 252 artifacts, respectively. The lowest density was 28 artifacts from Unit 7 excavated near the northern periphery of the site. No discrete areas of artifact concentrations suggesting intact living surfaces were apparent in any of the test units.

FEATURE DESCRIPTIONS

Four prehistoric cultural features and one noncultural feature were identified at 41SM404. The prehistoric cultural features or stratigraphically discrete concentrations are suggestive of intact cultural deposits.

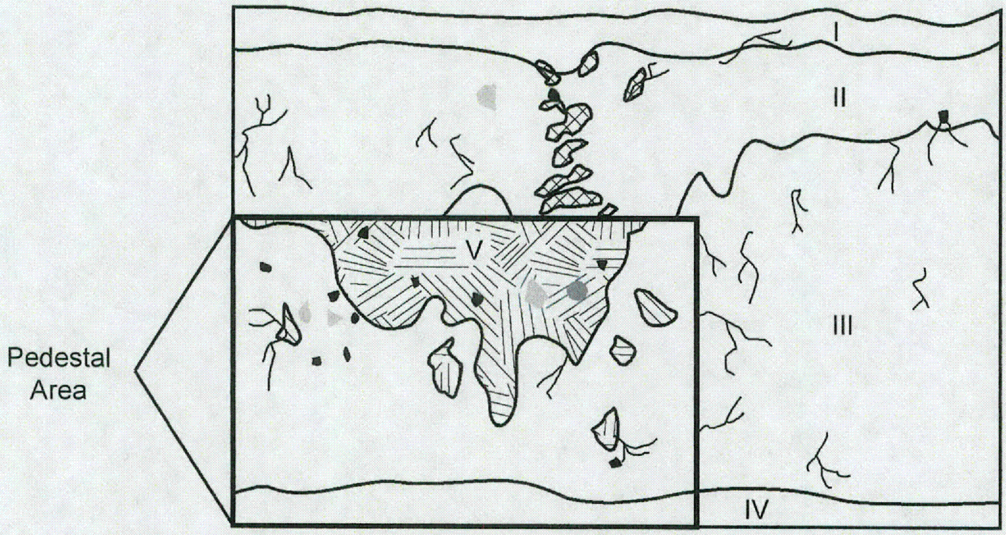
Feature 1 was encountered in Unit 1 at the bottom of Level 3 at a depth of about 30 cmbs (Figure 5). Feature 1 was identified as a compact dark yellowish brown silty sand stain with chunks and flecks of charcoal. Lithics, ceramics, and charred faunal remains were also identified within the stain (Table 4). The feature extended 60 cm north to south by 57 cm east to west. Feature 1 most likely represents a prehistoric hearth.

Matrix samples were collected for radiocarbon dating and macrofloral analysis. Radiocarbon dating analysis resulted in a measured radiocarbon age of 430 ± 40 B.P. with a 2-sigma calibration of A.D. 1270 TO 1320 (Cal B.P. 680 TO 630) and A.D. 1350 TO 1390 (CAL B.P. 600 TO 560), suggesting an occupational episode during the Middle Caddo period (Appendix B).

Table 4: Feature 1 Artifacts

Level	Depth	Lithic	Ceramic	Faunal (g)	Carbon (g)	Burned Rock (g)
4	40–50	4	19	0.42	4.05	1
5	50–60		3	3.11	0.43	
6	60–70	4	2			
Totals		8	24	3.53	4.47	1

Feature 2 was encountered in Unit 8 in Level 3 at about 24 cmbs in the west and south wall. The feature consisted of two pieces of burned rock in the south wall of the unit and one piece of burned rock in the west wall. A barely discernible basin-shaped layer of sparse carbon flecks, approximately 5 cm thick, was present in the west wall below the burned rock fragment (Figure 6). The feature extended approximately 40 cm north to south by 40 cm east to west. No artifacts were



I. 10YR 6/3 Pale Brown Humus/Silty Sandy Loam
II. 10YR 5/4 Yellowish Brown Silty Sand
III. 10YR 7/3 Very Pale Brown Silty Sand
IV. 7.5YR 5/8 Strong Brown, 7.5YR 6/8 Reddish Yellow, and 10YR 7/4 Very Pale Brown Sandy Clay
V. FEATURE 1, 10YR 5/6 Yellowish Brown and 10YR 4/4 Dark Yellowish Brown Silty Sand

Roots
Rocks
Burned Bone
Feature 1/Soil Stain
Fe-Mn Concretions

N

0 30
centimeters

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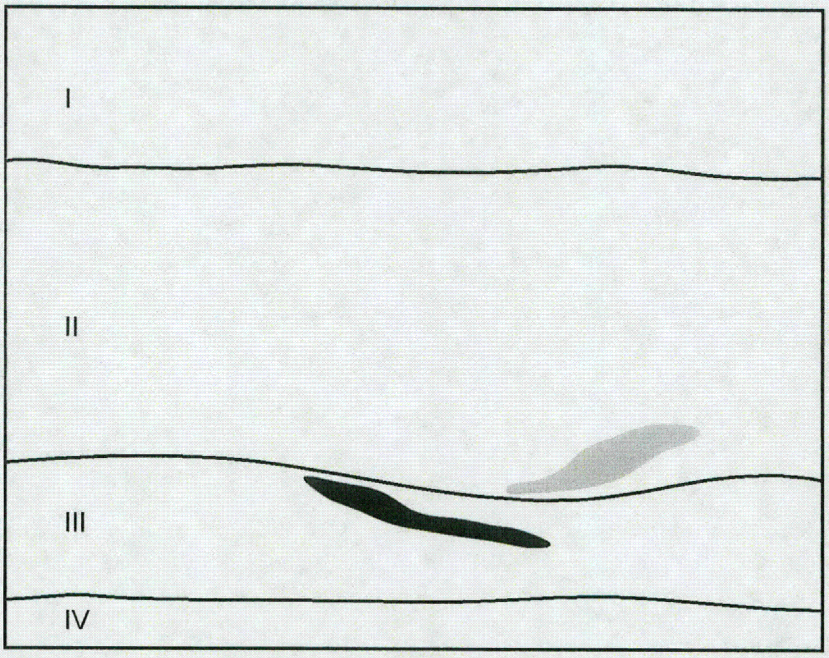
Figure 5

FEATURE 1 PROFILE
UNIT 1, NORTH WALL

L:\Projects\Hel\CLIENTS\NET RMA\Testing at 41SM404\cad\Figure 5 Feature 1 Profile

Drawn by: C. Wallace

FEATURE 2, PLAN VIEW



FEATURE 2, WEST WALL PROFILE

I. 10YR 5/6 Yellowish Brown Sandy Loam
II. 10YR 5/6 Yellowish Brown Fine Sandy Loam
III. 10YR 6/6 Brownish Yellow Mixed with 10YR 5/6 Yellowish Brown Fine Sandy Loam
IV. 7.5YR 4/6 Strong Brown Sandy Clay

Charcoal Flecks
Fire-cracked Rock

0 10
centimeters

ATKINS

Figure 6

FEATURE 2 PLAN VIEW AND PROFILE

L:\Projects\Hel\CLIENTS\NET RMA\Testing at 41SM404\cad\Figure 6 Feature 2 Profile

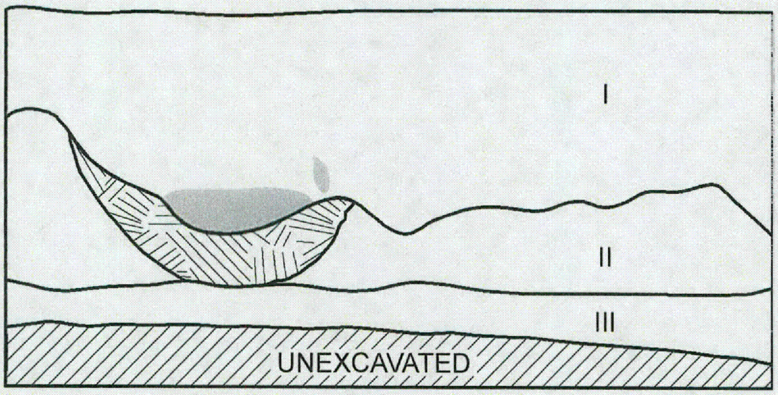
Drawn by: C. Wallace

identified within the stain or the feature matrix. A matrix sample was collected for radiocarbon dating and macrofloral analysis. Feature 2 most likely represents a disarticulated prehistoric hearth. Because of poor apparent integrity of the feature, the absence of associated artifacts, and the extreme paucity of charred floral remains, this feature was not subjected to radiocarbon dating.

Feature 3 was encountered in Unit 9 within Level 4 (30 to 40 cmbs) and extended through the middle of Level 5 (40 to 50 cmbs). Feature 3 was identified as a single piece of burned rock visible in the north wall of the unit with a small basin-shaped stain of carbon flecks, approximately 8 cm thick and 20 cm wide, below the burned rock (Figure 7). No artifacts were identified within the stain or the feature matrix. Feature 3 most likely represents a disarticulated prehistoric hearth. A matrix sample was collected for radiocarbon dating and macrofloral analysis. Radiocarbon dating analysis resulted in a measured radiocarbon age of 1200 ± 40 B.P. with a 2-sigma calibration of A.D. 690 to 900 (Cal B.P. 1260 to 1050), suggesting an occupational episode occurring sometime between the latter half of the Woodland period and the early part of the Formative Caddo period (see Appendix B).

Feature 4 consists of a dark stain initially encountered in the south wall of Trench 2 at grid coordinate S008 E104.5. The stain appeared to be about 18 cm east-west and about 15 cm vertically, beginning at about 34 cmbs. It appeared to have vertical sides and a flat to slightly convex base (Figure 8). Unit 19 was placed adjacent to Trench 2 to investigate the feature. The south approximate half of the feature was intact, appearing as a semicircle in plan view, suggesting a circular feature about 18 cm in diameter. No artifacts were recovered from the feature matrix. Feature 4 likely represents the remnants of a posthole. A matrix sample was collected for radiocarbon dating and macrofloral analysis. Radiocarbon dating analysis resulted in a measured radiocarbon age of 350 ± 40 B.P. with a 2-sigma calibration of A.D. 1290 to 1420 (Cal B.P. 660 to 530), suggesting an occupational episode during the Middle or early Late Caddo periods (see Appendix B).

Feature 5 was encountered in Unit 15 at the base of Level 3 (20 to 30 cmbs) extending to the base of Level 5 (40 to 50 cmbs). When first encountered, the feature appeared to be a cluster of burned rocks in the western portion of the unit. However, after excavation, the feature was found to be a large, crumbly piece of hematite approximately 30 cm north to south by 30 cm east to west. No staining or carbon was found associated with the feature. Feature 5 appears to be a naturally degrading piece of hematitic sandstone and is not cultural.



I. 7.5YR 5/4 Brown Very Dry, Hard Silty Sandy Loam
II. 10YR 5/8 Yellowish Brown Dry, Hard Silty Sandy Loam
III. 5YR 5/6 Yellowish Red Clay

N

0 20
centimeters

Feature 4/Faint Charcoal Flecking

Fire-cracked Rock

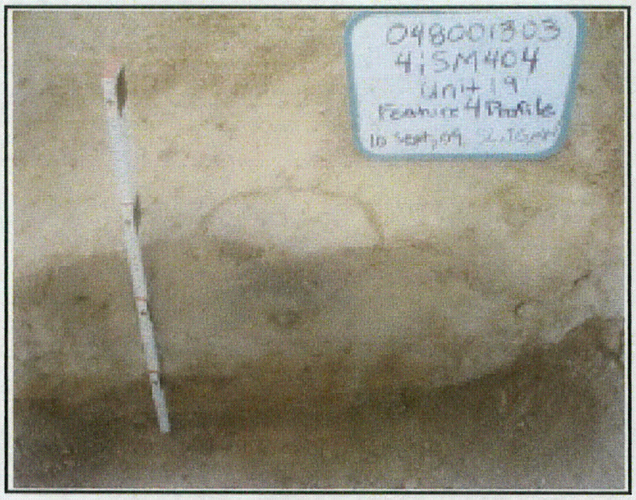
ATKINS

Figure 7

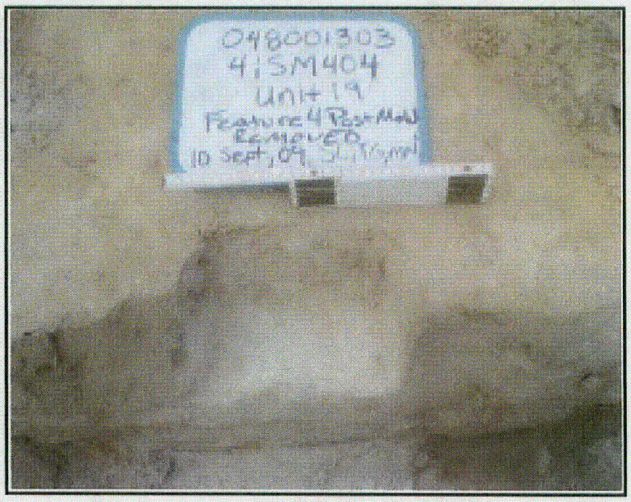
FEATURE 3 PROFILE, NORTH WALL

L:\Projects\Hel\CLIENTS\NET RMA\Testing at 41SM404\cad\Figure 7 Feature 3 Profile

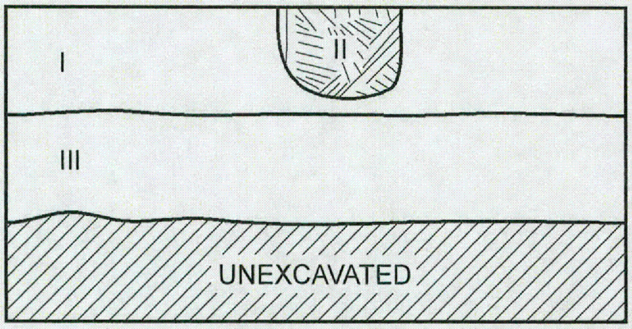
Drawn by: C. Wallace



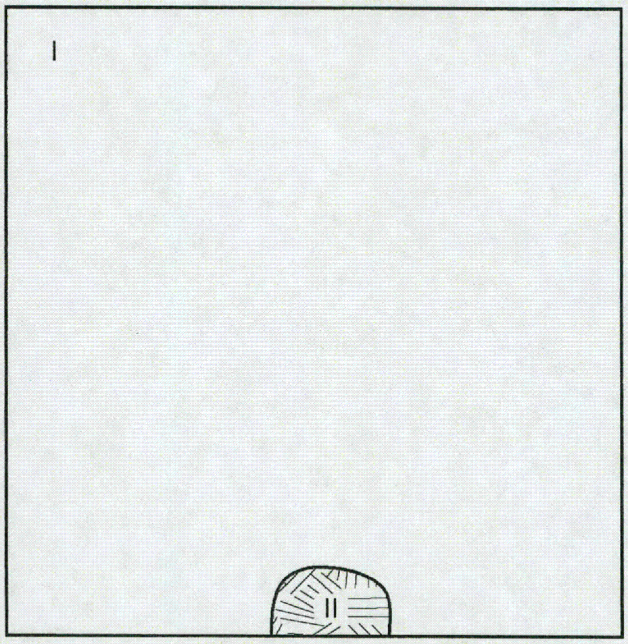
FEATURE 4, PROFILE



FEATURE 4, PLAN VIEW

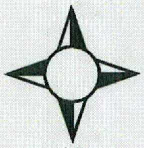


FEATURE 4, PROFILE



FEATURE 4, PLAN VIEW

I. 10YR 6/4 Light Yellowish Brown Silty Loam
II. 10YR 2/1 Black and 10YR 7/2 Light Gray Silty Loam
III. 7.5YR 5/6 Strong Brown Clay



N

Feature 4/Soil Stain

0 25
centimeters

ATKINS

Figure 8

FEATURE 4 PLAN VIEW AND PROFILE, FACING SOUTH

L:\Projects\Hel\CLIENTS\NET RMA\Testing at 41SM404\cad\Figure 8 Feature 4 Plan View and Profile

Drawn by: C. Wallace

ADDITIONAL MECHANICAL EXCAVATION

After it was determined that project impacts would be limited to the eastern edge of the site along the hillslope, eight machine-excavated scraping trenches were excavated in this area to ensure that no NRHP-contributing elements of the site were present there. Each scraping trench was approximately 1.5 m (5 ft) wide and 6 m (20 ft) long and excavated in approximate 5-cm levels.

Subsoil was encountered at depths ranging from about 5 to 140 cmbs (ca. 2 to 55 inches), and the depth to subsoil often varied widely within a single scraping trench. The surface soil was typically a brown (7.5YR 5/4) to yellowish brown (10YR 5/4) sandy loam. The subsoil was typically a yellowish red (5YR 5/8) to strong brown (7/5YR 5/6) sandy clay, sometimes with irregular lenses of gravel or coarse sand, suggesting soil elements from the hilltop had slumped downslope or modern cultural activity.

Scraping Trench 1, located on the lower hillslope, appeared to be relatively intact with a soil profile consistent with colluvial erosion episodes of undetermined age. Scraping trenches 3 and 4 were located near the front of a terrace or bench that was the most prominent topographic feature apparent on the upper hillslope. These two trenches showed extensive modern disturbance, suggesting that this bench may be of recent cultural origin. Scraping trenches 2 and 5 through 8 appeared to be relatively undisturbed by modern or historic activities, exhibiting simple profiles with a relatively thin sandy loam surface soil overlying the sandy clay subsoil, although Scraping Trench 2 exhibited a gravelly sandy loam B horizon below the surface soil. The most marked differences in these five scraping trenches was the wide variation in thickness of the surface soil, even within a single scraping trench, sometimes increasing in thickness downslope as in Scraping Trench 8, sometimes decreasing in thickness downslope as in Scraping Trench 7, and sometimes maintaining uniform thickness throughout the scraping trench as in scraping trenches 2, 5, and 6. The lack of uniformity in the thickness of the surface soil may be indicative of past terracing.

Trenching activities were continuously monitored by at least two archeologists at all times. Artifacts were observed in five of the eight scraping trenches, including scraping trenches 2, 3, 5, 6, and 7 (see Figure 2). Artifacts observed include four undecorated ceramic sherds, a nutting stone, and a lithic flake, all recovered within the upper 20 cmbs. A 50-x-50-cm (1.6-x-1.6-ft) test unit was excavated adjacent to each scraping trench. Four of the eight scraping trench units (3, 4, 5, and 6) yielded prehistoric artifacts, including three decorated and seven undecorated ceramic sherds, all within the upper 15 cmbs.

The scraping trenches and adjacent 50-x-50-cm (1.6-x-1.6-ft) test units generally exhibited extremely poor integrity and sparse cultural materials compared with the main part of the site on the summit of the hill. The low density of observed material recovered during monitoring of trench scraping and associated test unit excavations indicate that the prehistoric activities that occurred on this portion of the hillslope were unlikely to significantly contribute to the site's eligibility.

RADIOCARBON DATING ANALYSIS

Seven samples consisting of four prehistoric ceramic sherds (B-289203, B-289206, B-289202, and B-289207) and three charred organic fragments (B-289208, B-289204, and B-289205) recovered during the NRHP testing investigations at site 41SM404 were selected for radiocarbon dating analysis and submitted to Beta Analytic Inc. of Miami, Florida, for AMS dating (Table 5).

Radiocarbon analysis of sample Beta-289203 (Lot 73), a Caddo ceramic bottle sherd with a cross-hatched engraved zone (Figure 9a) recovered from Shovel Test 72, Level 2 (10 to 20 cmbs), resulted in a conventional radiocarbon age of 80 ± 40 B.P. with a 2-sigma calibration of A.D. 1680 to 1740 (Cal B.P. 270 to 210) and A.D. 1800 to 1940 (Cal B.P. 150 to 20) A.D. 1950 to 1960 (Cal B.P. 0 to 0) (see Appendix B).

Radiocarbon analysis of sample Beta-289202 (Lot 69), an opposed incised Caddo utility ware rim sherd (Figure 9c) recovered from Shovel Test 103, Level 3 (20 to 30 cmbs), resulted in a conventional radiocarbon age of 730 ± 40 B.P. with a 2-sigma calibration of A.D. 1230 to 1300 (Cal B.P. 720 to 650) (see Appendix B).

Radiocarbon analysis of sample Beta-289206 (Lot 184), a ceramic Caddo rim sherd, cf. Poyner Engraved, early variety (Figure 9b) recovered from Test Unit 11, Level 2 (10–20 cmbs), resulted in a conventional radiocarbon age of 470 ± 40 B.P. with a 2-sigma calibration of A.D. 1410 to 1460 (Cal B.P. 540 to 490) (see Appendix B).

Radiocarbon analysis of sample Beta-289207 (Lot 235), a Caddo jar utility ware, brushed body sherd (Figure 9d) recovered from Test Unit 17, Level 3 (20 to 30 cmbs), resulted in a conventional radiocarbon age of 840 ± 40 B.P. with a 2-sigma calibration of A.D. 1060 to 1080 (Cal B.P. 900 to 870) and A.D. 1150 to 1270 (Cal B.P. 800 to 680) (see Appendix B).

The radiocarbon dates indicate occupational episodes in the post-Caddo period (Beta-289209), the early part of the Middle Caddo period (Beta-289202), the early part of the Late Caddo period (Beta-289206), and the Early Caddo or early Middle Caddo (Beta-289207). However, ceramic analysis and correlation with ceramic assemblages from other sites indicate that the ceramic remains from 41SM404 primarily represent a chronologically homogeneous assemblage dating to the latter part of the Middle Caddo period. All of the ceramic sherds had sufficient decorative characteristics to place them firmly within this group. The ceramic analysis section of this report provides a more-detailed assessment of the radiocarbon age ranges and the time period of occupation as reflected in the ceramic assemblage.

Radiocarbon analysis of sample Beta-289208 (Lot 253), a *Zea mays* fragment recovered from Feature 4 (posthole), Test Unit 20, Level 3 (20 to 30 cmbs), resulted in a conventional radiocarbon age of 600 ± 40 B.P. with a 2-sigma calibration of A.D. 1290 to 1420 (Cal B.P. 660 to 530), suggesting an occupational episode during the late Middle or early Late Caddo periods (see Appendix B).

Table 5: Radiocarbon Dates with Provenience

Sample No. & Beta Lab No.	Dated Material	Context	Provenience	Level	Depth	Conventional Radiocarbon Age	2-Sigma Calibrated Age
SM404-69-1 Beta-289202	Bulk sherd organics	Unit Level	Shovel Test 103	Level 3	20–30 cmbs	730 ± 40 B.P.	A.D. 1230 to 1300 (Cal B.P. 720 to 650)
SM404-73-2 Beta-289203	Bulk sherd organics	Unit Level	Shovel Test 72	Level 2	10–20 cmbs	80 ± 40 B.P.	A.D. 1680 to 1740 (Cal B.P. 270 to 210) and A.D. 1800 to 1940 (Cal B.P. 150 to 20) and A.D. 1950 to 1960 (Cal B.P. 0 to 0)
SM404-173-5 Beta-289204	*Zea mays* fragment	Feature 1 Matrix	Test Unit 1	Levels 4-5	30–50 cmbs	680 ± 40 B.P.	A.D. 1270 to 1320 (Cal B.P. 680 to 630) and A.D. 1350 to 1390 (Cal B.P. 600 to 560)
SM404-177-6 Beta-289205	black walnut hull	Feature 3 Matrix	Test Unit 9	Level 5	40–50 cmbs	1210 ± 40 B.P.	A.D. 690 to 900 (Cal BP 1260 to 1050)
SM404-184-3 Beta-289206	Bulk sherd organics	Unit Level	Test Unit 11	Level 2	10–20 cmbs	470 ± 40 B.P.	A.D. 1410 to 1460 (Cal B.P. 540 to 490)
SM404-235.4 Beta-289207	Bulk sherd organics	Unit Level	Test Unit 17	Level 3	20–30 cmbs	840 ± 40 B.P.	A.D. 1060 to 1080 (Cal B.P. 900 to 870) and A.D. 1150 to 1270 (Cal B.P. 800 to 680)
SM404-253.7 Beta-289208	*Zea mays* fragment	Feature 4 Matrix	Test Unit 20	Level 3	20–30 cmbs	600 ± 40 B.P.	A.D. 1290 to 1420 (Cal B.P. 660 to 530)

a) Lot 73
Crosshatched Engraved Bottle Body Sherd

b) Lot 184
Engraved Rim Sherd
cf. Poynor Engraved

c) Lot 69
Opposed Incised Rim Sherd

d) Lot 235
Brushed Body Sherd

CENTIMETER
0 1 2 3 4 5

ATKINS

Figure 9

SITE 41SM404
SHERDS SENT FOR DATING

L:\Projects\He1\CLIENTS\NET RMA\Testing at 41SM404\cad\Figure 9_Sherds Sent for Dating

Drawn by: C. Wallace

Radiocarbon analysis of sample Beta-289204 (Lot 173), a *Zea mays* fragment recovered from Feature 1 (hearth), Test Unit 1, levels 4–5 (40–60 cmbs), resulted in a conventional radiocarbon age of 680 ± 40 B.P. with a 2-sigma calibration of A.D. 1270 to 1320 (Cal B.P. 680 to 630) and A.D. 1350 to 1390 (CAL B.P. 600 to 560) suggesting an occupational episode during the Middle Caddo period (see Appendix B).

Radiocarbon analysis of sample Beta-289205 (Lot 177), a black walnut hull fragment recovered from Feature 3 (hearth), Test Unit 9, Level 5 (40 to 50 cmbs), resulted in a conventional radiocarbon age of 1210 ± 40 B.P. with a 2-sigma calibration of A.D. 690 to 900 (Cal B.P. 1260 to 1050), suggesting an occupational episode during the late Woodland or Formative Caddo period (see Appendix B).

ANALYSIS OF THE CHIPPED STONES

The chipped stone assemblage recovered during testing investigations at site 41SM404 includes approximately 470 artifacts, consisting of 21 tools and 449 debitage fragments. The most common raw material type is chert, accounting for 39.8 percent of the assemblage (n = 187), followed closely by metaquartzite, accounting for 30.4 percent of the assemblage (n = 143). Quartz arenite is the third most common material, accounting for 18.5 percent of the total (n = 87). Silicified wood accounts for 9.8 percent of the assemblage (n = 46), and hematitic sandstone accounts for 1.5 percent of the assemblage (n = 7).

The debitage includes 13 primary flakes, accounting for 2.9 percent of the debitage assemblage, 86 secondary flakes (19.2 percent), 233 tertiary flakes (51.9 percent), 45 corticated chips (10.0 percent), 70 decorticated chips (15.6 percent), and 2 decorticated cores (0.4 percent), indicating 32.1 percent of the assemblage exhibited some degree of cortex. The percentage of cortical debitage ranged from 17 percent for chert to 57 percent for silicified wood, with quartz arenite and metaquartzite exhibiting 30 and 44 percent, respectively.

Chipped stone tools recovered from the investigation consist of seven projectile points or fragments, seven bifaces or fragments, one uniface, one unifacially modified flake, and five utilized flakes (Table 6).

Projectile Points

Recovered projectile points or fragments include a Perdiz arrow point, an arrow point preform, a Neches River-like dart point, a Trinity-like dart point, a Yarbrough dart point, and two unidentified dart point fragments (see Table 6).

Lot 181.1. This Perdiz arrow point is manufactured from a medium-grained gray chert. It has a very small triangular-shaped body, contracting stem, small barbed shoulders, and relatively straight lateral margins (Figure 10a). The stem tip appears to have been truncated, possibly during

Table 6: Chipped Lithic Tools Recovered in NRHP Testing of Site 41SM404

Lot No.	Unit	Level	Depth in cmbs	Depth in cmbd	Artifact Material	Description	Artifact Sub-description	Artifact Form/Condition	Surface Treatment	Length in mm	Width in mm	Thickness in mm	Comments
181.1	10	6		60–70	Chert	Arrow Point	Perdiz	Proximal Fragment	na	15.7	11.3	2.8	na
117.1	1	3		30–40	Metaquartzite	Biface	na	Medial Fragment	na	14.4	21.1	7.0	No stage or shape given due to fragmentary nature; decorticated, slightly convex lateral edge, broken at material flaw, utilized along slightly convex lateral edge (9.26 mm) for planing medium-hard materials
148.1	5	3		40–50	Quartz Arenite	Biface	Stage 3	Complete	Thermally Altered	36.0	23.5	10.0	Stage 3 biface; ovate-shaped body, decorticated, convex distal and proximal edges, slightly convex lateral edges, no evidence of utilization
154.1	6	4		35–45	Metaquartzite	Biface	na	Proximal Fragment	Thermally Altered	15.7	19.1	8.3	No stage or shape given due to fragmentary nature; corticated, convex proximal edge, slightly convex lateral edges, fractured at material flaw, no evidence of utilization, suggesting abandonment upon breaking
168.1	9	3		20–30	Silicified Wood	Biface	na	Distal Fragment	na	21.4	12.1	5.2	No stage or shape given due to fragmentary nature; decorticated, pointed distal tip, narrow body, straight lateral edges, snap fracture, no evidence of utilization, suggesting abandonment upon breaking
170.1	9	4		30–40	Silicified Wood	Biface	na	Proximal Fragment	na	26.7	29.8	9.8	No stage or shape given due to fragmentary nature; corticated, convex distal edge, single convex lateral edge, straight proximal edge, broken at material flaw at single lateral edge, convex distal edge (23.18 mm) utilized for chopping medium-hard materials
220.1	15	3		20–30	Chert	Biface	na	Decorticated	na	8.8	15.5	4.5	Medial fragment from near distal tip; no utilization wear
19	SST57	6	50–55		Metaquartzite	Biface	na	Medial Fragment	Thermally Altered	22.6	23.3	7.6	No stage or shape given due to fragmentary nature; decorticated, straight lateral edges, no evidence of utilization suggesting abandonment upon breaking
179.1	10	4		35–45	Metaquartzite	Dart Point	Neches River-like	Complete	na	29.3	21.1	6.1	Dart point compares favorably to Neches River type; short triangular-shaped body, straight lateral edges, beveling on left side, prominent shoulders, slightly expanding stem, slightly convex basal edge, no evidence of utilization
180.1	10	5		45–65	Chert	Dart Point	Reworked Trinity	Lateral Fragment	na	37.6	23.3	8.1	Reworked Trinity-like dart point; short triangular-shaped body, portion of base and one shoulder and lateral edge missing, straight lateral edges, distinct shoulder, expanding stem, slightly convex basal edge, ground stem edges and basal corner, no evidence of utilization
180.2	10	5		45–65	Chert	Dart Point	Untyped	Distal Fragment	na	39.7	25.9	5.2	Untyped dart point; pointed distal tip, thin triangular shaped body, indistinct shoulders, broken at material flaw at bottom of base, no evidence of utilization
232.1	17	1		0–10	Metaquartzite	Dart Point	Basal fragment	Distal Fragment	Thermally Altered	18.1	18.0	6.2	Short, square base about 10.5 mm long & 13.5 mm wide, similar to Yarborough
238.1	18	3		20–30	Quartz Arenite	Dart Point	Yarbrough Dart Point	Decorticated	na	52.6	24.2	10.0	Yarbrough dart point, 1 shoulder fractured, thick biconvex cross section. Lateral blade margins appear rounded with only slight crushing, suggesting possible usage against a soft, gritty material
209.1	14	4		30–40	Chert	Preform	Arrow point preform	Complete	na	18.4	10.0	3.8	Manufactured on flake
245	17	8		70–80	Quartz Arenite	Uniface	Gouge	Complete	na	22.6	25.3	9.5	Gouge/end scraper, spine-plane angle=67
180.3	10	5		45–65	Chert	Unifacially Modified Flake	Tertiary Flake	Medial Fragment	na	37.6	40.9	2.7	Unifacially modified along 8.94 mm of the slightly concave lateral edge, modified edge utilized for planing medium-soft to medium-hard materials
170.2	9	4		30–40	Chert	Utilized Flake	Secondary Flake	Medial Fragment		11.6	16.1	6.7	Utilized along 7.42 mm of the slightly concave lateral edge for scraping soft materials
217.1	15	2		10–20	Chert	Utilized Flake	Secondary Flake	Proximal Fragment	na	19.7	17.0	4.4	Utilization wear on both lateral margins suggesting scraping against medium material
217.2	15	2		10–20	Chert	Utilized Flake	Secondary Flake	Proximal Fragment	na	15.4	15.6	2.9	Utilization wear on left lateral margin suggesting short-term usage against soft material
223.1	16	6		50–60	Chert	Utilized Flake	Tertiary Flake	Complete	na	51.8	43.7	4.5	Minor utilization wear to both lateral margins suggest short-term usage against soft material
6	SST45	8	70–80		Chert	Utilized Flake	Tertiary Flake	Medial Fragment	na	20.3	26.8	3.3	Utilized along 2.41 mm of the straight distal edge and 2.93 mm of the straight lateral edge for cutting soft to medium-soft materials

a) Lot 181.1
Perdiz Arrow Point

b) Lot 209.1
Arrow Point Preform

c) Lot 179.1
Neches River-like Dart Point

d) Lot 180.1
Reworked Trinity Dart Point

e) Lot 238.1
Yarbrough Dart Point

f) Lot 180.2
Untyped Dart Point Fragment

g) Lot 232.1
Untyped Dart Point Fragment

CENTIMETER
0 1 2 3 4 5

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Figure 10

SITE 41SM404
PROJECTILE POINTS

L:\Projects\Hel\CLIENTS\NET RMA\Testing at 41SM404\cad\Figure 10_Chipped Stone Formal Tools

Drawn by: C. Wallace

manufacture. Minor utilization damage is present to the lateral margins, suggesting cutting usage against a soft to medium material. The artifact is currently 15.7 millimeters (mm) in length, 11.3 mm in width, and 2.8 mm in thickness.

Lot 209.1. This arrow point preform is manufactured from a medium-grained light brown chert. The artifact is generally lanceolate-shaped with a plano-convex cross section, a small contracting stem, and a right barbed shoulder (Figure 10b). It appears that the left lateral margin had become very difficult to thin during the manufacture, which probably led to the discard of the preform. No evidence of utilization is apparent. The artifact is currently 18.4 mm in length, 10.0 mm in width, and 3.8 mm in thickness.

Lot 179.1. This point is similar to the Neches River dart point type. It is manufactured from a fine-grained grayish brown metaquartzite. It is generally triangular in shape with straight lateral margins that are slightly beveled on the left margin of each surface. It has barbed shoulders and a broad, slightly expanding stem (Figure 10c). No evidence of utilization is apparent. The artifact is 29.3 mm in length, 21.1 mm in width, and 6.1 mm in thickness.

Lot 180.1. This point is similar to the Trinity dart point type. It is manufactured from a dark gray, medium-grained chert and has been damaged and heavily reworked. At present, the artifact has a plano-convex cross section, a slightly convex left lateral margin, a recurved right margin, deep side notches, and a broad, expanding stem with a convex base (Figure 10d). It is currently 37.6 mm in length, 23.3 mm in width, and 8.1 mm in thickness. No evidence of utilization is apparent.

Lot 238.1. This is an example of the Yarbrough dart point type. It is manufactured from a light brown medium-grained quartz arenite. The artifact has a roughly lancelate-shaped body with prominent medial ridges, convex lateral margins, modest shoulders, and a broad, parallel stem with a flat base., short contracting stem, convex basal edge, weak shoulders, and slightly convex lateral margins (Figure 10e). One of the shoulders has been significantly damaged and not repaired. Both lateral margins have been heavily rounded along their lengths, possibly to make a groove in a hard abrasive surface or as a prelude to reworking edges. The artifact is currently 52.6 mm in length, 24.2 mm in width, and 10.0 mm in thickness.

Lot 180.2. This artifact is a dart point fragment of an unidentified type, missing only the stem. It is manufactured from a medium-grained light brownish gray chert with many small inclusions. The artifact has well-thinned, slightly convex lateral margins that have been beveled slighted on the right margin of each side. The shoulders are distinct and slightly barbed (Figure 10f). The artifact is currently 39.6 mm in length, 25.9 mm in width, and 5.2 mm in thickness. The general morphology is consistent with small to medium-sized Late to Terminal Archaic triangular point types such as Edgewood, Ellis, and Ensor, but in the absence of the stem, identification is speculative. Little if any edge wear is present.

Lot 232.1. This artifact is a dart point fragment of an unidentified type, including only the stem and part of one shoulder. The stem is parallel-sided with a flat base, missing only the stem (Figure 10g). It is manufactured from a medium-grained, reddish brown, thermally altered metaquartzite. The artifact is currently 18.1 mm in length, 18.0 mm in width, and 6.2 mm in thickness. The morphology of the artifact is not particularly identifiable with any point type common to the region. The artifact has not been ground but displays minimal edge rounding, suggestive of haft wear.

The Perdiz arrow point and the arrow point preform are both consistent with a Middle Caddo occupation. The Yarbrough, Neches River-like, and Trinity-like dart points suggest a Late to Terminal Archaic occupation of the site.

Bifaces

Of the seven bifacial tools recovered from site 41SM404 (lots 19, 117.1, 148.1, 154.1, 168.1, 170.1, and 220.1), five appear to be expedient tools without extensive modification (lots 19, 117.1, 154.1, 168.1 and 170.1). Of these, all appear to be fragments except lot 170.1 which appears to be complete. Two (lots 117.1 and 170.1) exhibit edge damage consistent with usage for planing and chopping, respectively, against medium-hard material such as fresh wood. The two remaining bifacial tools, a complete Stage 3 biface and a small medial fragment, are described below.

Lot 148.1. This artifact appears to be a complete Stage 3 biface manufactured of coarse-grained, thermally altered quartz arenite. The artifact is 36.0 mm in length, 23.5 mm in width, and 10.0 mm in thickness. It is decorticated with an ovate-shaped body and prominent central ridge on both faces. The distal and proximal margins are convex and exhibit slight crushing damage. The lateral edges are convex, one markedly so. Both exhibit serrated flaking. No apparent evidence of utilization is present.

Lot 220.1. This artifact appears to be a small medial fragment of a much larger, relatively thin preform or knife manufactured from a light gray thermally altered chert. The artifact is biconvex in cross section, and the width changes significantly over the current length, suggesting that it is from near the proximal or distal tip of a tool. The artifact is currently 8.8 mm in length, 15.5 mm in width, and 4.5 mm in thickness. No clear evidence of utilization is present, although the lateral margins exhibit very slight edge rounding.

Unifaces

Lot 245. This artifact is manufactured from a thick flake of quartz arenite that was truncated distally and the distal end tooled into a small gouge. The artifact is 22.6 mm in length, 25.3 mm in width, and 9.5 mm in maximum thickness. Generally, this type of tool would have been hafted and used as an adze to chop woody material. However, the observed edge wear consists of numerous crushing and step fractures to the dorsal surface of the distal bit, suggesting scraping against a medium or hard material with the ventral side leading.

Unifacially Modified and Utilized Flakes

Six artifacts are flakes or fragments that exhibit minimal cultural modification and/or utilization (lots 6, 170.2, 180.3, 217.1, 217.2, and 223.1). All are chert debitage flakes or fragments. Evidence of utilization is generally light and suggestive of short-term usage by scraping or planing against soft or medium material.

ANALYSIS OF THE GROUND STONE TOOLS

Sixteen ground and battered stone artifacts were recovered at 41SM404. Although many are weathered and/or heat-fractured, evidence of their modified surfaces was still visible. Detailed analyses of the assemblage identified a variety of tool types indicative of a diverse range of activities and included five abraders, one mano, three pitted manos, four paint pallets, one pigment stone, one paint pallet/grinding basin, and one pitted anvil stone (Table 7).

For purposes of this study, analytical categories were based on two primary morphological distinctions. First, a distinction was made between the upper hand stone and the lower anvil stone. The upper hand stone is the tool most easily manipulated. It is hand-held and supplies the pressure used for pounding and/or rubbing. The lower anvil stone serves as a stationary platform that absorbs the pressure of pounding and/or rubbing and often serves as a receptacle for holding any residue produced during processing. The largest number of ground stone tools recovered at the site were upper hand-held stones (n = 10).

The second distinction concerns the manner in which the upper and lower stones are used. Since a variety of processes can produce distinctive wear, tools were assigned to specific analytical categories on the basis of several key variables: the mechanical processes, the outcome of those processes, and the material being processed. Microscopic examination of each tool aided in the identification of the key mechanical processes and the subsequent wear patterns still visible on the tool. Because any specific tool can be used in a range of activities, multifunctional tools were categorized on the basis of the predominant type of wear still visible on the tool. Microscopic analyses of the tools identified eight types of wear patterns: grinding, polishing, pecking, battering, pitting, grooves, notching, and striations.

Upper Hand-held Stones

The assemblage includes 10 upper hand-held stones. On the basis of microscopic examination, the stones were assigned to four morphological categories: mano, pitted mano, pigment stone, and abrader.

Table 7: 41SM404 Ground and Battered Stone Attributes

Lot No.	Trench	Feature	Unit	Level	Depth (cmbd)	Weight (g)	Length (mm)	Width (mm)	Thickness (mm)	Raw Material	Classification	Grinding	Polish	Pecking	Battering	Pitting	Grooves	Notching	Striations
126			2	2	20–30	174.4	49.8	62.3	30.4	Hematitic Sandstone	Abrader	X	X	X			X		
127			2	3	30–40	61.4	53.4	48.3	12.9	Hematitic Sandstone	Paint Pallet	X	X						X
128			2	4	50–60	186.7	102.6	54.7	24.1	Hematitic Sandstone	Paint Pallet	X							X
132			3	1	0–20	33.2	62.6	29.2	10.9	Hematitic Sandstone	Abrader	X				X	X		
161			7	3	20–30	140.9	76.9	50.0	16.7	Hematite/ Hematitic Sandstone	Paint Pallet	X	X						X
172		2	8	2–3	29–40	402.1	127.0	105.1	27.8	Hematite/ Hematitic Sandstone	Paint Pallet/ Grinding Basin	X	X			X			X
186	2				Backdirt	378.3	94.1	75.7	54.7	Hematitic Sandstone	Pitted Anvil Stone	X				X			
191			11	4	38–48	9.9	36.8	24.7	11.1	Silicified Wood	Abrader	X	X				X	X	
204			13	3	20–30	91.4	49.4	52.4	28.2	Hematitic Sandstone	Pitted Mano	X	X			X			
209			14	4	30–40	3.9	25.1	16.1	9.5	Hematite/Red Ochre	Pigment Stone	X	X						X
211			14	5	40–50	228.5	65.8	63.6	44.6	Hematitic Sandstone	Abrader	X					X		
236			18	2	10–20	113.5	62.0	43.7	22.1	Hematitic Sandstone	Abrader	X	X				X		
238			18	3	20–30	28.0	30.2	29.4	16.3	Hematitic Sandstone	Paint Pallet	X	X				X		
241			17	6	50–60	338.8	78.2	73.5	40.1	Quartz Arenite	Mano	X	X	X					
256			19	4	34–44	326.8	71.6	63.4	38.3	Hematitic Sandstone	Pitted mano	X			X	X			
258	6				15	538.6	82.8	81.2	45.3	Hematitic Sandstone	Pitted mano	X			X	X			

Manos/Pitted Manos

Two categories of mano were recovered at the site, those primarily used for grinding (n = 1) and those that exhibit wear associated with both grinding and pitting (n = 3). Stones used primarily for grinding generally have relatively flat, smooth surfaces. The interstices between the grains are full of debris, and micro-fracturing has created truncated and opaque grains that are concentrated on the high-relief areas. Their surfaces often have a frosted appearance due to the scratches and cracks created by surface fatigue and abrasive wear. Once the surface has worn down to the point that the grains are leveled and the interstices are obliterated, the surface would need to be pecked in order to roughen it and maintain grinding efficiency (Adams 1988, 1996).

At 41SM404, one quartz arenite mano (Figure 11a) was recovered from Level 6 of Test Unit (TU) 17. This oval-shaped stone appears to have been used for generalized grinding. Heavy grinding has rounded the edges and obliterated the interstices between the grains, leaving highly polished areas on all surfaces. This type of wear suggests that the substance(s) being ground was relatively hard, and repeated grinding produced a heavy build-up of debris. The random peck marks dotting the surface indicate refurbishing of the tool's surface in order to maintain grinding efficiency (see Adams 1988).

In addition to evidence for generalized grinding, three stones also have one or more pitted areas on at least one surface. All three tools are made of hematitic sandstone; however, their pitted areas vary in overall appearance, indicating specific types of grinding and/or pounding activities.

One pitted mano (Figure 11b) was recovered from TU 19, Level 4. This relatively small, square stone has wear on multiple surfaces. Several well-worn flake scars are strategically place in various locations around the sides to provide comfortable finger holds. The stone is battered around the edges. Both plane surfaces have small, shallow pitted areas whose edges are relatively smooth, suggesting that they served as a cup to hold whatever substance was being ground. Although the stone is eroded, its surfaces still show patches of grinding in the high-relief areas.

The second pitted mano (Figure 11c) was recovered from Trench 6. The stone is weathered; however, remnant patches of grinding are still visible on both plane surfaces. One plane surface has a shallow, relatively smooth depression. Microscopic examination of the ground patches on this side of the tool shows the high-relief grains to be flattened and opaque, with the interstices between the grains obliterated. The shallow depression with its relatively smooth edges suggests that it probably served as a cup to hold whatever was being ground. The opposite side is more convex, and there are a number of relatively jagged pitted areas randomly distributed across the face. Battering occurs on the ends and along the sides. The wear on this tool suggest that this side of the tool was used primarily for pounding and grinding hard substances.

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Figure 11

SITE 41SM404
GROUND STONE EXAMPLES

L:\Projects\Hel\CLIENTS\NET RMA\Testing at 41SM404\cad\Figure 11_Ground Stone Examples

Drawn by: C. Wallace

The third stone appears to be a fragment of an oval-shaped mano (Figure 11d). It was recovered from TU 13, Level 3. The stone is broken in half and heavily weathered; however, remnant patches of grinding are still visible on one plane surface. On the opposite face, the stone is heavily dimpled with multiple small pits that are heavily stained with ochre (5YR 5/6). Along one broken edge, remnants of an ochre-stained and highly polished surface are still visible. Given the wear patterns still visible on the stone, it may be that one face of the tool was used to pound ochre fragments, while the opposite face was used to grind them into a fine powder.

Abraders

The tools assigned to this category exhibit a variety of wear patterns, but all have at least one or more grooves cut into at least one surface. These types of tools result from the abrasive use of the stone to grind, smooth, shape, or sharpen a variety of implements such as grinding the base of a projectile point, straightening and polishing an arrow shaft, and/or sharpening the tip of a bone awl. From a technological standpoint, abraders often serve as the lower anvil stone that absorbs the pressure of rubbing an object across its surface; however, all of the tools recovered at 41SM404 are small enough to be held in the hand. In addition, three of the tools also have at least one plane surface that had been used for generalized grinding. As such, the abraders in the assemblage were classified as upper hand stones.

Fragments of five abraders were recovered. Four were made from hematitic sandstone and one was a fragment of silicified wood. The fragment of silicified wood (Lot 191) appears to be the tapered end of what was once a tabular abrader. The stone exhibits wear in a number of areas. Both plane surfaces have ground and polished areas interspersed with numerous shallow, lengthwise-running grooves. Ground and polished areas also occur along one edge, as well as the blunt-tipped end. A broad, polished notch occurs along the opposite edge. In general, wear occurs around and between the raised portions of the grains, giving the surface a smooth undulating appearance. This wear pattern, when coupled with its shiny lustrous quality, suggests that this tool was likely used to work softer material such as wood.

Fragments of three tabular abraders were recovered from TU 2 Level 2 (Lot 126), TU 3 Level 1 (Lot 132), and TU 18 Level 2 (Lot 236). The three tools are similar in that all have one surface primarily used for grinding and one surface that displays one or more wide grooves. The tool recovered from TU 3 (Lot 132) is an edge fragment exhibiting remnants of several broad, shallow grooves on one plane surface. Ground and polished patches are still visible on the opposite face.

Wear on two of the abraders suggests that each was a multipurpose tool used for both generalized grinding and abrasive activities. The specimen recovered from TU 2 is the end portion of an oval-shaped tool. A series of diagonally running grooves cover one plane surface (Figure 11e). The grooves are relatively narrow, and there is evidence of polish along the high ridges of the grooves.

Its opposite surface is ground, and there is a distinct polish on the high-relief grains along the peak of the ridges.

The specimen recovered from TU 18 (Lot 236) is the medial section of a tabular abrader. This tool is heavily eroded, but the remnant of at least one deep groove is still visible on one plane surface. On its opposite surface, traces of its ground and polished surface are still visible on the intact high-relief grains. The distinct areas of polish present on both tools suggest that they were probably used to work softer material such as wood.

The tool recovered from TU 14, Level 5 (Figure 11f) is an irregularly shaped fragment. The tool is heavily eroded, but wear is still visible on multiple surfaces. Patches of grinding are still visible along one edge, and several wide grooves occur on both plane surfaces. Ochre staining (5YR 5/6) is visible along the edges of the grooves on one surface and extends over the sides in several areas.

Pigment Stone

A small, highly polished piece of hematite (Lot 209; Figure 11g) was recovered from Level 4 of TU 14. Rather than a tool used to prepare and grind pigments, this small stone would have been the source of the pigment. The specimen has been thermally altered and exhibits a deep rich, reddish brown (5YR 3/3) coloration. Heavy grinding has reduced the stone to a distinctive wedge shape. Portions of one end and one side are missing, but the remaining surfaces are highly polished and covered by numerous unidirectional striations.

Lower Anvil Stones

The assemblage includes six stationary anvil stones. On the basis of microscopic examination, the six stones or stone fragments could be assigned to three morphological categories: paint pallet, paint pallet/grinding basin, and pitted anvil stone.

Paint Pallets

Four small stones (lots 127 and 128 from TU 2, and lots 161 and 238 from TU 3; see Table 7) were tentatively identified as paint pallets. All are fragments made from hematitic sandstone. Their wear patterns and ochre-stained surfaces suggest they were used as pallets for grinding and mixing pigments. For example, the specimen recovered from TU 7, Level 3 (Lot 161) appears to be the remaining half of what was once an oval-shaped stone (Figure 11h). Flake scars along its edges suggest that the stone was deliberately shaped. Repeated crushing, grinding, and mixing of nodules has rounded the grains in the high-relief areas. The heavy build-up of red and yellow ochre ranges in coloration from a yellowish red (5YR 5/8) to a dark reddish brown (5YR 3/4), coats both surfaces of the stone, and fills the interstices between the high-relief areas. Pigment stains on the other three stones have a similar coloration range.

Paint Pallet/Grinding Basin

A large fragment of what appears to have been a paint pallet/grinding basin was recovered from Feature 2 in TU 8 (Lot 172; Figure 11i). The tool exhibits basin-shaped grinding depressions on both surfaces. On one face, the basin appears to have been relatively wide and shallow. Portions of its highly polished face are stained with a thick coating of dark reddish brown pigment (5YR 3/3). A series of shallow curved striations points to a grinding action involving a circular rather than a back-and-forth motion. On the opposite face there are remnants of two shallow smooth depressions.

Pitted Anvil Stone

A corner fragment from a larger tool was recovered from Trench 2 (Figure 11j). This section of hematitic sandstone has wear on two faces. On one face, portions of a basin-shaped grinding surface are still visible. On the opposite face, there are several jagged and irregular pitted areas, suggesting forceful areas of impact. When coupled with the coarse-grained nature of the stone, it is likely that whatever was being ground required heavy crushing.

Summary

The ground stone assemblage found at 41SM404 included both stationary platform stones and hand-held stones, and their associated wear patterns indicate they were used in a broad range of activities. Many of them appear to be multipurpose tools and their general morphology and associated wear patterns point to their use in a diverse range of activities such as food processing, tool manufacturing and maintenance, and the pounding and grinding of nonfood substances such as ochre for use as pigment.

CERAMIC ANALYSIS

By Timothy K. Perttula

Introduction

The section concerns the analysis of the recovered prehistoric ceramic artifacts from 41SM404, a habitation site in the Indian Creek valley. Indian Creek is a small westward-flowing tributary to the Neches River in eastern Texas. The analysis emphasizes the acquisition of information on the technological and stylistic character of the ceramic sherds from the site, as dictated in the scope of work for the project (PBS&J 2009). Of particular interest is the manufacture and production of ceramic vessels as determined from the study of temper use and paste, firing, and surface treatment, as well as the stylistic character of the decorated sherds, with the goal of assessing the place and cultural affiliation of the pottery made and used at this site within the context of eastern Texas prehistoric Caddo ceramic traditions and practices.

During the excavation of shovel tests, twenty 1-x-1-m units, several backhoe trenches, as well as a small surface collection (see Nash and Watkins 2009), 14 fragments of burned clay, 10 pieces of daub, and 3,076 prehistoric ceramic sherds were recovered.

The bulk of the burned clay fragments are extremely small nodules recovered from the Feature 1 (n = 8) and Feature 3 (n = 4) flotation samples (Table 8). Given the low frequency of burned clay fragments at the site and their association with features, these burned clay pieces likely represent the incidental burning of clay from ovens and cooking pits.

Table 8: Daub and Burned Clay

Lot No.	Unit	Feature	Level	Depth (cmbd)	Datum	Elevation	Daub	Burned Clay	Comments
173	1	1	4-5	40–60	A	110.36–109.16		8	Recovered from flotation
177	9	3	3-4	30–40		110.73–110.53		4	Recovered from flotation
182	11		1	7-18		110.40–110.29		2	
207	14		3	20-30		109.41	1		
209	14		4	30-40		109.31	1		
211	14		5	40-50		109.21	2		
213	14		6	50-60		109.11	3		
218	16		2	10-20		109.54	1		
223	16		6	50-60		109.14	1		
233	17		2	10-20		109.61	1		

The 10 pieces of daub have characteristic grass and circular twig impressions. All are relatively small fragments, with the largest pieces measuring between 15 mm and 22 mm at their widest point. The occurrence of daub at the site is confined to TUs 14, 16, and 17 located in the central portion of the site (see Table 8). Daub marks the burning of the clay plastering on a thatched Caddo structure; however, the low frequency of the daub suggests that whatever burning occurred was minimal and probably not related to the burning of a structure(s).

Ceramic Sherd Assemblage

Analysis of the 3,076 prehistoric ceramic sherds recovered at the site involved several levels of examination. The first phase included an initial sorting of the ceramics. During the initial sort, 276 sherds could be conjoined or fitted with other sherds. Once these pairings were made, all undecorated body sherds with a maximum dimension of less than 2 cm were counted then culled from further analysis. Sorting resulted in the removal of 1,609 sherds, leaving a total of 1,200 plain (n = 752; 62.7 percent) and decorated (n = 448; 37.3 percent) sherds in the sample (Table 9). The plain to decorated sherd ratio (P/DR)—a useful temporal measure (see below) in the upper Neches River basin—is 1.68.

Table 9: Provenience of Plain and Decorated Sherds from 41SM404

Provenience	Lot No.	Plain Rim	Plain Body	Plain Base	Decorated Rim	Decorated Body	Total
Surface	115	-	2	-	-	-	2
ST 45, Level 3	2	-	1	-	-	-	1
ST 45, Level 4	163	-	-	-	-	1	1
ST 45, Level 10	7	-	-	-	-	1	1
ST 46, Level 2	11	-	1	-	-	-	1
ST 46, Level 5	12	-	1	-	-	1	2
ST 47, Level 1	20	1	-	1	1	3	
ST 47, Level 2	21/22	-	3	1	-	2	6
ST 49, Level 1	3	-	1	-	-	1	2
ST 49, Level 2	4	-	1	-	-	-	1
ST 49, Level 3	5	-	-	-	-	1	1
ST 54, Level 2	27	-	-	-	-	1	1
ST 55, Level 1	23	-	1	-	-	-	1
ST 56, Level 2	24	-	1	-	-	-	1
ST 56, Level 7	26	-	1	-	-	-	1
ST 57, Level 3	17	-	1	-	-	-	1
ST 58, Level 2	13	-	-	1	-	-	1
ST 58, Level 5	14	-	1	-	-	-	1
ST 59, Level 2	8	-	1	-	-	-	1
ST 62, Level 2	10	-	1	-	-	-	1
ST 66, Level 1	28	-	1	-	-	-	1
ST 67, Level 1	32	-	-	1	-	-	1
ST 69, Level 3	53	-	1	-	-	-	1
ST 70, Level 1	55	-	2	-	-	-	2
ST 70, Level 2	56	-	1	-	-	-	1
ST 71, Level 4	41	-	2	-	-	2	
ST 71, Level 5	42	-	2	-	-	2	
ST 71, Level 6	43	-	-	-	-	1	1
ST 72, Level 1	72	-	1	-	-	-	1
ST 72, Level 2	73	-	3	-	-	1	4
ST 72, Level 3	74	-	3	-	-	-	3
ST 72, Level 4	75	1	-	-	-	-	1

Table 9 (Cont'd)

Provenience	Lot No.	Plain Rim	Plain Body	Plain Base	Decorated Rim	Decorated Body	Total
ST 72, Level 5	76	-	2	-	-	1	3
ST 72, Level 6	77	-	1	-	-	-	1
ST 73, Level 3	59	-	-	-	1	-	1
ST 73, Level 5	67	-	1	-	-	-	1
ST 81, Level 4	34	-	1	-	-	-	1
ST 82, Level 2	36	-	1	-	-	-	1
ST 83, Level 3	38	-	1	-	-	-	1
ST 83, Level 4	39	-	-	-	-	1	1
ST 84, Level 3	44	-	3	-	-	-	3
ST 84, Level 4	45	-	2	-	-	1	3
ST 94, Level 3	89	-	-	-	-	1	1
ST 95, Level 2	60	-	1	-	-	-	1
ST 95, Level 4	61	-	1	-	-	-	1
ST 96, Level 1	85	-	1	-	-	-	1
ST 97, Level 3	47	-	2	-	-	-	2
ST 97, Level 4	48	-	1	-	-	-	1
ST 100, Level 3	50	-	1	-	-	-	1
ST 103, Level 3	69	-	-	-	1	1	2
ST 104, Level 1	65	-	1	-	-	2	3
ST 104, Level 2	66	-	2	-	-	-	2
ST 115, Level 1	79	-	-	-	-	1	1
ST 115, Level 2	80	-	1	-	-	-	1
ST 115, Level 3	81	-	1	-	-	-	1
ST 116, Level 2	99	-	2	-	-	-	2
ST 116, Level 4	101	-	2	-	-	-	2
ST 117, Level 1	92	-	-	-	-	1	1
ST 117, Level 2	93	-	2	-	-	-	2
ST 117, Level 3	94	-	-	-	-	2	2
ST 117, Level 4	95	-	-	-	-	1	1
ST 117, Level 5	96	-	1	-	-	-	1
ST 117, Level 7	97	-	2	-	-	-	2
ST 118, Level 1	106	-	1	-	-	-	1
ST 118, Level 2	107	-	3	-	-	-	3

Table 9 (Cont'd)

Provenience	Lot No.	Plain Rim	Plain Body	Plain Base	Decorated Rim	Decorated Body	Total
ST 118, Level 4	108	-	2	1	-	-	3
ST 118, Level 5	109	-	2	-	-	-	2
ST 119, Level 1	103	-	-	-	-	3	3
ST 119, Level 3	104	-	2	-	-	-	2
ST 119, Level 5	105	-	-	-	-	1	1
ST 120, Level 2	110	-	1	-	-	-	1
ST 120, Level 3	111	-	-	-	1	-	1
ST 120, Level 4	112	-	1	-	-	-	1
ST 121, Level 2	71	-	1	-	-	-	1
ST 122, Level 3	78	-	1	-	1	2	
ST 124, Level 1	102	-	1	-	-	-	1
ST 130, Level 2	121	-	1	-	-	1	2
ST 130, Level 4	123	-	5	-	-	-	5
ST 131, Level 1	120	-	2	-	-	-	2
ST 131, Level 6	124	-	-	-	-	1	1
Unit 1, Level 1	114	-	-	-	-	3	3
Unit 1, Level 2	116	6	24	-	2	12	44
Unit 1, Level 3	117	12	-	4	4	20	
Unit 1, Level 5	138	1	2	-	-	-	3
Unit 1, Level 6	145	-	2	-	-	-	2
Unit 1, Feature 1, 40–50	118	-	2	-	-	-	2
Unit 1, Feature 1, Level 4	130	-	4	1	-	3	8
Unit 1, Feature 1, Level 5	137	-	1	-	-	-	1
Subtotal	7	47	1	6	22	83	
Unit 2, Level 1	125	3	14	2	2	10	31
Unit 2, Level 2	126	1	15	-	-	16	32
Unit 2, Level 3	127	1	13	-	-	8	22
Unit 2, Level 4	128	1	11	-	1	3	16
Unit 2, Level 5	129	-	1	-	-	-	1
Unit 2, Level 6	131	-	1	-	-	-	1
Subtotal	6	55	2	3	37	103	

Table 9 (Cont'd)

Provenience	Lot No.	Plain Rim	Plain Body	Plain Base	Decorated Rim	Decorated Body	Total
Unit 3, Level 1	132	1	15	1	1	13	31
Unit 3, Level 2	133	1	12	1	1	9	24
Unit 3, Level 3	134	-	8	-	-	4	12
Unit 3, Level 4	135	-	3	-	1	3	7
Subtotal	2	38	2	3	29	74	
Unit 4, Level 1	139	1	4	1	-	4	10
Unit 4, Level 2	140	-	6	1	-	2	9
Unit 4, Level 3	141	1	3	-	-	2	6
Subtotal	2	13	2	-	8	25	
Unit 5, Level 1	143	-	12	-	-	9	21
Unit 5, Level 2	146	2	11	1	-	7	21
Unit 5, Level 3	148	2	14	-	1	6	23
Unit 5, Level 4	149	-	1	-	-	1	2
Unit 5, Level 5	151	-	3	-	-	1	4
Subtotal	4	41	1	1	24	71	
Unit 6, Level 1	147	1	6	1	-	6	14
Unit 6, Level 2	150	1	4	1	3	5	14
Unit 6, Level 3	152	1	7	-	2	2	12
Unit 6, Level 4	154	-	1	-	-	2	3
Unit 6, Level 5	155	-	3	-	-	3	6
Unit 6, Level 6	156	1	2	-	-	1	4
Unit 6, Level 7	158	-	2	-	-	2	
Unit 6, Level 8	159	-	2	-	-	-	2
Subtotal	4	27	2	5	19	57	
Unit 7, Level 1	157	-	1	-	-	-	1
Unit 7, Level 2	160	-	2	-	-	-	2
Unit 7, Level 4	162	-	1	-	-	-	1
Subtotal	-	4	-	-	-	4	
Unit 8, Level 1	165	-	6	-	-	3	9
Unit 8, Level 2	166	-	8	1	1	2	12
Unit 8, Level 3	169	-	4	-	-	1	5
Unit 8, Level 4	171	-	1	-	-	-	1
Subtotal	-	19	1	1	6	27	

Table 9 (Cont'd)

Provenience	Lot No.	Plain Rim	Plain Body	Plain Base	Decorated Rim	Decorated Body	Total
Unit 9, Level 1	164	-	3	-	-	3	6
Unit 9, Level 2	167	1	7	-	-	3	11
Unit 9, Level 3	168	-	3	1	-	1	5
Unit 9, Level 4	170	-	1	-	-	2	3
Unit 9, Level 5	176	-	-	1	-	-	1
Subtotal	1	14	2	-	9	26	
Unit 10, Level 1	174	1	7	1	-	3	12
Unit 10, Level 2	175	-	2	1	-	2	5
Unit 10, Level 3	178	-	5	-	2	3	10
Unit 10, Level 4	179	-	6	2	1	5	14
Unit 10, Level 5	180	-	1	-	-	-	1
Unit 10, Level 6	181	-	1	2	-	3	6
Unit 10, Level 7	183	-	1	-	-	-	1
Unit 10, Level 8	185	-	2	-	-	-	2
Subtotal	1	25	6	3	16	51	
Unit 11, Level 1	182	-	2	-	-	1	3
Unit 11, Level 2	184	-	4	-	1	-	5
Unit 11, Level 3	190	-	4	-	1	3	8
Unit 11, Level 4	191	-	1	-	1	-	2
Unit 11, Level 5	192	-	-	1	1	-	2
Unit 11, Level 6	193	-	1	2	-	2	5
Unit 11, Level 7	195	-	1	-	-	-	1
Subtotal	-	13	3	4	6	26	
Unit 12, Level 1	194	-	1	-	-	4	5
Unit 12, Level 2	196	-	3	1	2	1	7
Unit 12, Level 3	198	-	3	-	-	-	3
Unit 12, Level 4	200	-	2	-	-	-	2
Subtotal	-	9	1	2	5	17	
Unit 13, Level 1	201	2	7	1	2	5	17
Unit 13, Level 2	202	2	7	1	1	7	18
Unit 13, Level 3	204	2	10	2	2	11	27
Unit 13, Level 4	206	1	8	-	-	2	11
Unit 13, Level 5	208	-	1	-	-	1	2

Table 9 (Cont'd)

Provenience	Lot No.	Plain Rim	Plain Body	Plain Base	Decorated Rim	Decorated Body	Total
Unit 13, Level 6	210	-	2	-	-	-	2
Unit 13, Level 7	212	-	1	-	1	-	2
Unit 13, Level 8	214	-	2	-	-	-	2
Subtotal	7	38	4	6	26	81	
Unit 14, Level 1	203	1	3	-	-	1	5
Unit 14, Level 2	205	-	6	-	-	9	15
Unit 14, Level 3	207	3	6	-	1	3	13
Unit 14, Level 4	209	-	5	1	1	3	10
Unit 14, Level 5	211	-	2	-	-	6	8
Unit 14, Level 6	213	-	3	-	-	-	3
Subtotal	4	25	1	2	22	54	
Unit 15, Level 1	215	-	4	-	-	4	8
Unit 15, Level 2	217	-	20	-	3	15	38
Unit 15, Level 3	220	2	12	-	2	5	21
Unit 15, Level 4	225	-	11	1	1	9	22
Unit 15, Level 5	226	2	9	-	-	1	12
Unit 15, Level 6	230	-	6	-	-	-	6
Unit 15, Level 7	231	-	2	-	1	2	5
Subtotal	4	64	1	7	36	112	
Unit 16, Level 1	216	-	7	-	1	1	9
Unit 16, Level 2	218	1	12	1	2	10	26
Unit 16, Level 3	219	-	4	-	1	3	8
Unit 16, Level 4	221	-	3	-	-	1	4
Unit 16, Level 5	222	-	2	-	1	1	4
Unit 16, Level 6	223	-	1	-	-	-	1
Unit 16, Level 7	224	-	1	-	-	1	2
Unit 16, Level 8	227	-	4	-	-	-	4
Subtotal	1	34	1	5	17	58	
Unit 17, Level 1	232	-	4	-	-	3	7
Unit 17, Level 2	233	1	3	1	2	2	9
Unit 17, Level 3	235	1	3	1	-	1	6
Unit 17, Level 4	237	-	4	-	-	2	6
Unit 17, Level 5	239	-	1	-	-	2	3

Table 9 (Cont'd)

Provenience	Lot No.	Plain Rim	Plain Body	Plain Base	Decorated Rim	Decorated Body	Total
Unit 17, Level 6	241	-	2	-	-	-	2
Unit 17, Level 7	243	-	-	-	-	1	1
Unit 17, Level 8	245	-	2	-	-	-	2
Subtotal	2	19	2	2	11	36	
Unit 18, Level 1	234	-	-	1	-	1	2
Unit 18, Level 2	236	2	10	-	-	10	22
Unit 18, Level 3	238	1	7	1	1	8	18
Unit 18, Level 4	240	-	8	1	2	3	14
Unit 18, Level 5	242	-	4	1	1	6	12
Subtotal	3	29	4	4	28	68	
Unit 19, Level 1	249	1	2	-	-	3	6
Unit 19, Level 2	248	1	8	-	-	4	13
Unit 19, Level 3	251	-	1	-	-	-	1
Unit 19, Level 4	256	-	2	1	1	3	7
Subtotal	2	13	1	1	10	27	
Unit 20, Level 1	247	-	7	-	1	4	12
Unit 20, Level 2	250	2	10	1	-	8	21
Unit 20, Level 3	252	-	6	-	2	4	12
Unit 20, Level 4	254	-	3	-	-	1	4
Unit 20, Level 5	255	1	1	-	-	1	3
Unit 20, Level 6	257	-	2	-	-	3	5
Subtotal	3	29	1	3	21	57	
Trench 2	186	-	1	-	-	-	1
Trench 3, SE wall	262	-	-	-	-	1	1
Trench 3 back dirt	188	-	2	-	-	1	3
Trench 4	187	1	1	-	-	-	2
Trench 5, SE wall	260	-	4	-	-	1	5
Trench 6, Level 2	259	-	1	-	-	1	2
Totals	55	654	43	62	386		1,200

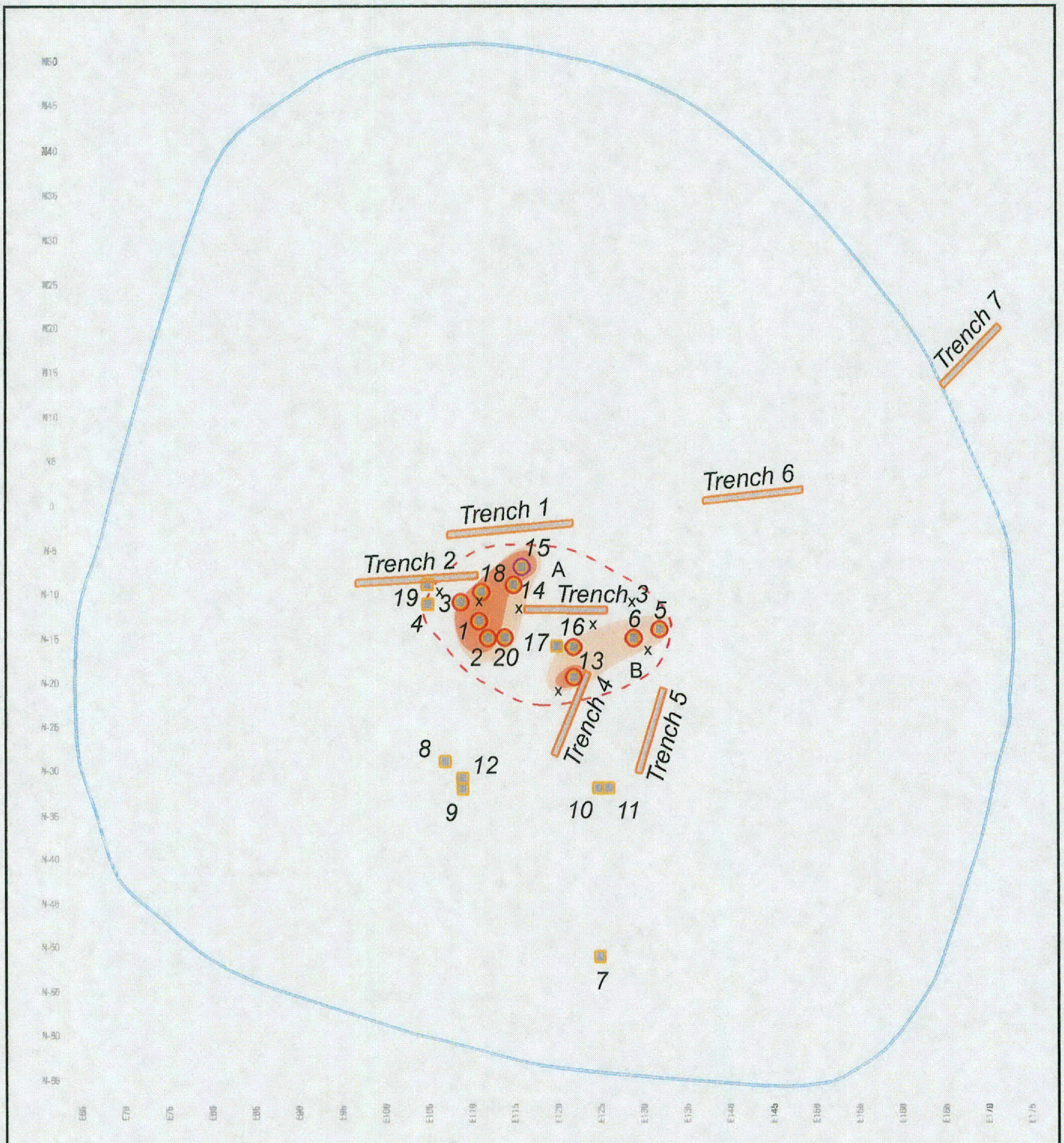
Plotting the varying densities of sherds from shovel testing and the 1-x-1-m units at the site, there appears to be a ca. 30-x-19-m area (ca. 570 m^2) in the north central part of 41SM404 that has the highest densities of Caddo ceramic sherds (Figure 12). These densities likely represent the accumulation of broken ceramic vessels in and around structures and outdoor work areas, as well as the deliberate disposal of some ceramic vessel fragments in discrete trash areas. Units and shovel tests with the highest densities of sherds concentrate in two areas about 5 to 10 m apart (see Figure 12), with an apparent area of lower density between them, suggesting the site may have had two areas of domestic structures (A and B on Figure 12) with a small open courtyard between them (cf. Perttula 2010a:Figure 5-48). Unfortunately, insufficient archeological investigations took place in the area of the postulated courtyard (see Figure 2) to confirm that lower sherd densities occur in this part of the site, or if such an intrasite spatial feature is present within the domestic spatial area at 41SM404.

Plain to Decorated Sherd Ratios

Plain to decorated sherd ratios (P/DR) from numerous Caddo sites in East Texas appear to hold considerable promise as an independent means of establishing the age of Caddo ceramic-bearing components (provided samples of plain and decorated sherds are larger than about 200–300 sherds per site; 41SM404 meets this data threshold). When P/DRs from a number of different ceramic assemblages from the various ceramic traditions/regions in East Texas are linked with absolute ages as established by radiocarbon dating from those assemblages, it is expected that further refinements in how P/DRs change through time in East Texas Caddo sites will be established. At the moment, looking at Early Caddo to Historic Caddo ceramic assemblages in the region through time, the trend is that ceramic assemblages have lower proportions of undecorated sherds through time and thus a lower P/DR (Perttula, ed. 2008:9, 315–317). Analyzed pre-A.D. 1200 sites in east Texas have P/DRs that range between 2.97 and 4.80. Middle Caddo sites (ca. A.D. 1200–1450) have ratios that range between 1.30 and 2.65. In known Late Caddo sites (ca. A.D. 1450–1680) in the Neches, Angelina, and Sabine river basins, by contrast, the P/DR ranges from only 1.30 to 0.47. Finally, post–A.D. 1680 Caddo occupations in the Neches-Angelina river basin have P/DRs that range from 0.20 to 0.30. As previously mentioned, the P/DR at 41SM404 is 1.68, suggesting the ceramic assemblage dates to the Middle Caddo period (see below for further P/DR comparisons in Lake Palestine area Caddo sites). We can better evaluate this temporal estimate for the age of the Caddo ceramic-bearing component at 41SM404 after discussing the character of the decorated utility ware and fine ware vessel sherds from the site.

Methods of Analysis

The detailed analysis of the ceramic sherds from 41SM404 (Appendix D is based on ascertaining differences in temper, type of sherd (i.e., rim, body, or base), rim and lip form (cf. Brown 1996:Figure 2-12), decoration (if present), surface treatment (smoothing, burnishing, or polishing;



x Shovel Tests with High Sherd Densities
Total Plain and Decorated Sherds, 54-115 Per Square Meter
43+ Per Square Meter
27-39 Per Square Meter
22-24 Per Square Meter
Main Component Area
Site Boundary
1m x 1m Excavated Unit
Backhoe Trench

N

0 15 30
Meters
0 20 40 60 80
Feet

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Figure 12

SITE 41SM404
DENSITIES OF
PLAIN AND DECORATED SHERDS
FROM SHOVEL TESTS AND UNITS

L:\Projects\Hel\CLIENTS\NET RMA\Testing at 41SM404\cad\Figure 12

see Rice 1987), and firing conditions (cf. Teltser 1993). Sherd cross sections were inspected macroscopically and with a 10X hand lens to determine the character of the paste and its inclusions. Determining the firing conditions is based on the identification of the firing core in the sherd cross sections and the identification of oxidation patterns as defined in Teltser (1993:535–536 and Figure 2a–h) and Perttula (2005:Figure 5-30i–l).

In conducting the detailed sherd analysis of the 41SM404 ceramic assemblage, all the sherds in the assemblage were examined at a basic level of detail (sherd type and decoration) to determine via the tabulation of rim sherds the number of different vessels in the assemblages, as well as to obtain comprehensive information on the decorative motifs and elements that are present at the site, and also establish a P/DR for the assemblage as a whole. At 41SM404, 29 percent of the plain and decorated sherds in the collection (n = 343) were selected for more-detailed analysis, thus allowing sufficient information to be obtained from the assemblage as a whole to characterize its stylistic and technological diversity and ensure that a representative sample has been subjected to such detailed analysis. At 41SM404, within an analyzed sample of 1,200 sherds, the detailed analysis of a 29 percent sample (n = 211) of the plain body and base sherds, 26 percent of the decorated utility ware rim and body sherds (n = 89), and 41 percent of the fine ware rim and body sherds (n = 43) provides a reasonable sample for detailed analysis of the three wares in this assemblage, and permits comparisons with other prehistoric Caddo assemblages in the upper Neches and upper Sabine River basins. The purpose of this more-detailed analysis has been to obtain sufficient information from the assemblage to characterize its stylistic and technological diversity and ensure that a representative and analytically useful sample of plain and decorated rim and body sherds are subjected to study.

More specifically, the following attributes were employed in the detailed analysis of the ceramic vessel sherds from 41SM404, following the Council on Texas Archeologists Ceramics Protocol Committee's recommended approach to the study of prehistoric Caddo ceramics as detailed by Perttula (2010b:29–30): (a) temper, the deliberate and indeterminate materials found in the paste (Rice 1987:411), including a variety of tempers (such as grog or crushed sherds, grit or crushed quartz pebbles, and burned mussel shell) and "particulate matters of some size"; and (b) although most of the sherds are small and thus from indeterminate vessel forms, where sherds were large enough, vessel form categories include open containers (bowls) and restricted containers, including jars and bottles. Other form attributes include rim profile (direct or vertical, and inverted) and lip profile (rounded, flat, or folded to the exterior). The orifice diameter of sufficiently large rim sherds will also be established, as the orifice diameters of vessels used for cooking, food service, and the storage of foodstuffs and liquids provide some indication of the scale of food preparation and food serving in a Caddo vessel assemblage, and whether vessels were intended for individual or communal use. In a few cases, base shape could also be recorded. Observations on ceramic sherd cross sections permit consideration of oxidation patterns (Teltser 1993:Figure 2), namely the conditions under which a vessel was fired and then cooled after firing. Finally, wall thickness was recorded in millimeters, using a vernier caliper, along the midsection of the sherd.

With respect to interior and exterior surface treatment on the sherds, the primary methods of finishing the surface of the vessels include smoothing and burnishing, and polishing. Brushing, a popular method of roughening the surface of Middle, Late, and Historic Caddo cooking jars in upper Neches River basin sites with stiff bundles of grasses, is considered a decorative treatment here rather than solely a functional surface treatment (cf. Rice 1987:138). A roughened and brushed pot would certainly have been easier to pick up and carry than would an unroughened or smoothed vessel, but because the brushing was applied to be an integral part of the decoration of both rim and body vessel surface, I de-emphasize it as a surface treatment. Smoothing creates "a finer and more regular surface... [and] has a matte rather than a lustrous surface" (Rice 1987:138). Burnishing creates an irregular lustrous finish marked by parallel facets left by the burnishing tool (perhaps a smoothed pebble or bone). A polished surface treatment is marked by a uniform and highly lustrous surface finish, done when the vessel is dry, but without "the pronounced parallel facets produced by burnishing leather-hard clay" (Rice 1987:138).

The ceramic analysis began first with the consideration of the rim sherds, which total 117, 47 percent plain and 53 percent with either utility ware or fine ware decorations (see below). The sorting of rims by ware helps establish the number and proportion of different kinds of fine wares, utility wares, and plain wares in the 41SM404 assemblage—namely the composition of day-to-day household ceramics. This approach of identifying the minimum number of vessels (ca. 117, based solely on the rims, perhaps a minimum of 150+ vessels represented among the decorated rim and body sherds) is more representative of household use than a strict focus on sherds sorted at random by surface treatment.

The stylistic analysis of Caddo ceramics from 41SM404 focused on the definition of recognizable decorative elements in the fine wares (i.e., the engraved and red-slipped vessels, including carinated bowls and bottles) and utility wares, usually cooking or storage jars and simple bowls. These wares are known to have been made and used differently, based on functional, technological, and stylistic analyses on numerous Caddo sherd assemblages in the broader East Texas region, with uses ranging from food service, cooking of foodstuffs, as containers for liquids, and for plant food/seed crop storage. Sherd analysis continued with the documentation of the methods of decoration, including the identification of motifs and elements, see above.

The decorated sherds from the site (see Table 9) can be readily separated into fine wares (n = 105, 23.4 percent of all the decorated sherds) or utility wares (n = 343, 76.6 percent of all the decorated sherds), as is discussed below, following the distinctions discussed by Schambach and Miller (1984) at the Cedar Grove site in the Great Bend area in southwestern Arkansas. These distinctions include apparent differences in temper, surface treatment, vessel forms, and decorative methods. Utility wares generally are jars and simple bowls used for the cooking and storage of foods, have a coarse temper, and lack burnishing, polishing, or slipping on interior and exterior vessel sherd surfaces. Such vessel sherds are decorated with brushing, incising, punctations (tool, cane, or fingernail), and appliquéd elements, either by themselves or in combination with one or more of these decorative

methods (see Perttula et al. 1995; Schambach and Miller 1984; Suhm and Jelks 1962). Fine wares at the sites, on the other hand, consist principally of engraved vessel sherds from carinated bowls, some simple bowls, and bottles; none of the engraved sherds have a slip. The fine ware vessel sherds more frequently are smoothed or burnished on the exterior vessel surface, and as discussed in more detail below, the fine ware vessels from the Caddo sites seem to have been made, fired, and used in different ways than were the utility ware vessels.

Decorative techniques present in the 41SM404 ceramic sherd collection include engraving in the fine wares, along with engraved-punctated, red-slipped, and red-slipped appliquéd sherds, as opposed to incising, incising-punctated, punctated (both fingernail and tool), brushing, brushed-incised, brushed-punctated, and pinched, in the utility wares. Engraving and engraved-punctating were done with a sharp tool when the vessel was either leather hard or after it was fired; the red iron-rich clay slip was applied to one or both surfaces of a vessel immediately before firing; and one unique sherd was both slipped and appliquéd, the latter being a ridge of clay added to the vessel when it was wet or still plastic. The application of a hematite-rich clay slip, black after firing in a reducing environment, is another form of surface treatment noted in this assemblage, although it is very rare. The clay slip was typically applied to the vessel exterior or both surfaces, and then was burnished or polished after it was leather hard or dry; when the vessel was fired, it created a thin red slip. In other instances, a kaolin-rich clay (i.e., white pigment) or a hematite-rich clay (i.e., red pigment) was applied as a pigment to engraved ceramic vessels.

The other decorative techniques—all in the utility wares—were executed with tools (incising and punctation with wood or bone sticks or dowels and brushing with frayed sticks or grass bundles), with finger impressions (fingernail punctated), or with the fingers pinching the clay into ridges (pinching) when the vessel was wet or still plastic.

Utility Ware Sherds

Utility wares comprise 76.6 percent of all the decorated sherds from 41SM404, as well as 40.7 percent of the plain and decorated rim sherds. Vessels decorated with incised elements are by far the most important and best represented of the utility wares (Table 10), followed by sherds from vessels with tool punctated, brushed, and incised-punctated decorations. Three of these four utility wares are well represented in both the rim and body sherds, indicating that utility ware jars were likely decorated on the rim as well as on the vessel body. Brushed rims are not common, on the other hand, suggesting utility ware jars were likely brushed primarily on the vessel body, and the rims of the vessels had other nonbrushed decorations. Notable by their absence in the 41SM404 ceramic assemblage are neck-banded Late Caddo period LaRue Neck Banded jars and Hood Engraved effigy vessels (Perttula 2008:53).

Table 10: Utility Ware Decorative Methods in the 41SM404 Ceramic Assemblage

Decorative Method	Rim	Body	N	Percent of Utility Ware Sample
Incised	30	143	173	50.7
Tool Punctated	9	55	64	18.8
Brushed	1	47	48	14.1
Incised-Punctated	8	14	22	6.5
Brushed-Incised	-	14	14	4.1
Fingernail Punctated	-	10	10	2.9
Brushed-Punctated	-	9	9	2.6
Pinched	-	1	1	0.3
Totals	48	293	341	100.0

Incised

More than 50 percent of the decorated utility ware sherds from the assemblage have incised decorations (see Table 10). With respect to utility ware rim sherds in the 41SM404 ceramic assemblage, 62.5 percent have incised decorations. Incised rims account for 17.3 percent of all the incised sherds, suggesting vessels were probably decorated in a similar fashion on both the rim and body.

The vast majority of the incised sherds from 41SM404 have straight line and/or geometric decorative elements. The most common incised decorative element at 41SM404 is crosshatched incised lines (Table 11; Figure 13a and 13b), typically on the rim (the body sherds likely represent the lower part of the rim, with the rim and lip itself missing). Given the direct rims and rounded lips on these vessels, they can most readily be classified as Canton Incised jars (Suhm and Jelks 1962:23 and Plate 12). Other than single straight or parallel incised lines, the most frequent incised decorative elements include sets of opposed incised lines, where the incised lines are pitched in different directions (Figure 13d), sets of diagonal or horizontal and diagonal lines (see Figure 13b), sets of horizontal lines, and a few sherds with curvilinear incised lines (2.3 percent).

One of the more notable incised pottery sherds from 41SM404 is a rim sherd that has a Poynor Engraved oval element with surrounding arcs of lines (see Figure 12e) executed with incised lines. Between 1.2 and 3.1 percent of the incised sherds from the Lang Pasture site have Poynor Engraved hatched-triangle decorative elements that were executed with incised lines (see Perttula 2010c:Figures 6-7f and 6-8g).

a) Lot 191
Crosshatched Incised

b) Lot 76
Crosshatched Incised

c) Lot 179
Horizontal and Diagonal Incised

d) Lot 69
Opposed Incised

e) Lot 201
Incised Ovals and Arcing Lines
cf. Poynor Engraved
Executed with Incised Lines

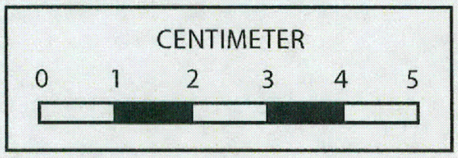

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Figure 13

SITE 41SM404
INCISED SHERDS

L:\Projects\Hel\CLIENTS\NET RMA\Testing at 41SM404\cad\Figure 13_Incised Sherds

Drawn by: C. Wallace

Table 11: Incised Sherd Decorative Elements in the 41SM404 Ceramic Assemblage

Decorative Element	Rim Sherd	Body Sherd	N
Crosshatched lines	13	37	50
Parallel lines	-	34	34
Opposed lines	3	18	21
Diagonal lines	9	4	13
Horizontal and crosshatched lines	-	4	4
Horizontal and diagonal lines	3	1	4
Opposed and crosshatched lines	-	1	1
Interior curvilinear line	-	1	1
Opposed curvilinear lines	-	1	1
Curvilinear and straight line	-	1	1
Curvilinear lines	-	1	1
Oval and arcing lines, cf. Poynor engraved, but incised	1	-	1
Zoned and opposed lines	-	1	1
Parallel and opposed lines	-	1	1
Vertical lines	1	-	1
Single straight line	-	38	38
Totals	30	143	173

Incised-Punctated

Sherds from a number of utility ware vessels from 41SM404 have incised-punctated decorative elements (Table 12), comprising 6.5 percent of the decorated utility ware sherds and 16.7 percent of the utility ware rims (see Table 10). The majority of the incised-punctated decorative elements have straight or geometric incised lines or panels framing punctated zones or rows of punctates, particularly notable being the creation of sets of incised triangles filled with tool, fingernail, or cane punctations (Figure 14a–c, e).

Tool-punctated elements were primarily used in the incised-punctated designs in the utility wares, accounting for 86.4 percent of the incised-punctated sherds in the assemblage (see Table 12). Fingernail-punctated elements (9.1 percent) and cane-punctated elements (4.5 percent) were decidedly secondary among the incised-punctated sherds from 41SM404.

a) Lot 69
Horizontal and Vertical Incised Panel
Filled with Teardrop-shaped Tool Punctates

b) Lot 207
Vertical Incised Line
Adjacent to a Tool-punctated Zone

c) Lot 240
Diagonal Incised and
Triangular Tool-punctated Zone

d) Lot 152
Curvilinear Incised Zone
Filled with Tool Punctates

e) Lot 220
Incised Panel Filled with
Hatched Incised Triangles or
Triangles Filled with Tool and Fingernail Punctates

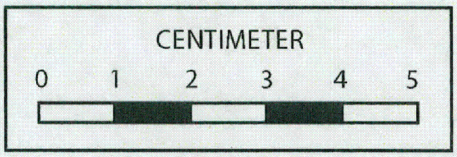

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Figure 14

SITE 41SM404
INCISED-PUNCTATED SHERDS

L:\Projects\Hel\CLIENTS\NET RMA\Testing at 41SM404\cad\Figure14_Incised-punctated Sherds

Drawn by: C. Wallace

Table 12: Incised-Punctated Decorative Elements in the 41SM404 Ceramic Assemblage

Decorative Element	Rim Sherd	Body Sherd	N
Straight incised line adjacent to tool-punctated rows	-	6	6
Diagonal incised line adjacent to triangular zone filled with tool punctates	4	-	4
Triangular incised zone filled with tool punctates	1	2	3
Straight incised line adjacent to fingernail-punctated zone	-	2	2
Vertical incised line and tool-punctated zone	1	-	1
Vertical and horizontal incised panel and teardrop-shaped tool punctate-filled zone	-	1	1
Straight incised line adjacent to teardrop tool punctates	-	1	1
Diagonal line adjacent to tool-punctated zone	1	-	1
Curvilinear incised zone that is tool punctated-filled	-	1	1
Panels filled with incised or punctated triangles	-	1	1
Horizontal lines above cane-punctated zone	1	-	1
Totals	8	14	22

Among the incised-punctated rims, one has a horizontal incised line above a zone of cane punctates, six, likely from Canton Incised jars (see Suhm and Jelks 1962: Plate 12d, h), have diagonal incised lines that apparently formed triangles filled with tool punctates (see Table 12), and one has a vertical incised panel filled with tool punctates. None of the rims have curvilinear incised zones filled with punctations, although there is one body sherd with a curvilinear incised zone filled with tool punctations (see Figure 14d).

Punctated

Punctations, either tool or fingernail, are a common utility ware decorative treatment, accounting for approximately 22 percent of all the decorated utility wares from 41SM404 (see Table 10). Tool punctations were regularly employed as part of several different decorative elements in the 41SM404 utility wares (Table 13). Most of these consist of rows of tool punctations of various sizes and shapes, either placed in a single row under the lip, at various places in several rows on the rim, in horizontal and vertical rows, as well as apparently sometimes freely covering much of the vessel body (Figure 15a–b). Suhm and Jelks (1962:157 and Plate 79) note the considerable diversity in the decoration of utility wares in East Texas Caddo sites, although punctated utility ware in the upper Neches River basin has only the most basic decorative elements (Suhm and Jelks 1962:Plate 79a–b).

a) Lot 259
Tool-punctated Rows

b) Lot 212
Horizontal and Vertical
Tool-punctated Rows

c) Lot 168
Fingernail-punctated, Free

CENTIMETER
0 1 2 3 4 5

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Figure 15

SITE 41SM404
PUNCTATED SHERDS

L:\Projects\Hel\CLIENTS\NET RMA\Testing at 41SM404\cad\Figure 15_Punctated Sherds

Drawn by: C. Wallace

Table 13: Punctated Decorative Elements in the 41SM404 Ceramic Assemblage

Decorative Element	Rim	Body	N
Fingernail-punctated rows	-	5	5
Fingernail punctates in zones	-	1	1
Fingernail punctates, free	-	2	2
Single fingernail punctate	-	2	2
Tool-punctated rows	5	30	35
Tool punctates, free	-	8	8
Single tool punctate	1	17	18
Tool-punctated row under lip	1	-	1
Horizontal and vertical tool-punctated rows	1	-	1
Diagonal and opposed tool-punctated rows	1	-	1
Totals	9	65	74

Tool-punctated sherds represent 100 percent of the punctated rim sherds in the assemblage, as well as 85 percent of the body sherds (see Table 13). The absence of rims with fingernail punctations (see Table 13) suggests that fingernail-punctated decorative elements were most often placed on the body of utility ware vessels, rather than on the rim and body as with tool-punctated decorative elements. In most cases from 41SM404, fingernail punctates were placed in straight rows across the exterior surface of utility ware vessels (see Figure 15b). There is one example where the decorative element is fingernail punctates placed in a zone (see Table 13). Randomly or freely placed fingernail-punctated decorative elements are found on several sherds of punctated utility wares (Figure 15c).

Pinched

There is a single body sherd in the 41SM404 assemblage that has vertical rows of pinching: closely spaced ridges of clay formed by the use of fingers or fingernails to push up clay to form a shallow raised ridge. This sherd is likely from a Killough Pinched jar (Suhm and Jelks 1962:91 and Plate 27f, h), which is a utility ware seen in post-A.D. 1300 Caddo sites in the Neches and Angelina river basins in East Texas (Perttula 2010c).

Brushed

The brushed sherds from 41SM404 are dominated by body sherds with parallel brushing marks (Table 14 and Figure 16a); although the orientation of these sherds is unknown, it is likely that the brushing was oriented vertically on the body of cooking and storage jars. The one rim has horizontal brushed marks. These brushed sherds are probably from Bullard Brushed jars (see

a) Lot 235
Parallel Brushed

b) Lot 179
Opposed and Overlapping Brushed

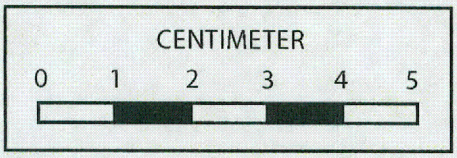

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Figure 16

SITE 41SM404
BRUSHED SHERDS

L:\Projects\Hel\CLIENTS\NET RMA\Testing at 41SM404\cad\Figure 16_Brushed Sherds

Drawn by: C. Wallace

Table 14: Brushed Decorative Elements in the 41SM404 Ceramic Assemblage

Decorative Element	Rim Sherd	Body Sherd	N
Parallel brushed	-	38	38
Overlapping brushed	-	5	5
Horizontal brushed	1	1	2
Opposed brushed	-	2	2
Opposed and overlapping brushed	-	1	1
Totals	1	47	48

Suhm and Jelks 1962:Plate 11), but the rarity of brushed rims leaves open the possibility that another, but as yet untyped, brushed utility ware is present at 41SM404.

Occasionally, the bodies of brushed jars have opposed, overlapping, or both opposed and overlapping brushed marks (Figure 16b) instead of vertical/parallel brushing. These together comprise 20.8 percent of the brushed sherds at 41SM404 (see Table 14).

Overall, brushed vessels in both areas of the Lang Pasture site were decorated in similar manners on the vessel body. Analysis of the absolute proportions of brushed sherds in the utility wares at the Lang Pasture site in the upper Neches River basin suggest that it was in the period after ca. A.D. 1320–1400, and then again in much of the fifteenth century A.D., when Caddo potters in the upper Neches River basin began to manufacture considerable numbers of brushed jars and jars with brushed vessel bodies (see Perttula 2010c). The relatively low proportion of brushed sherds at 41SM404—14.1 percent of the utility wares and 10.7 percent of all the decorated sherds—suggests the main occupation at the site precedes the mid- to late fifteenth century A.D.

The units with the highest proportion of brushed sherds, among all the decorated sherds from the units, is concentrated in a ca. 16-x-12-m area within the main Caddo component area (Figure 17, see also Figure 12). This concentration of brushed sherds is mainly in Area A on Figure 12, the westernmost sherd cluster.

Brushed-Incised

Brushed-incised sherds represent a rare form of decoration on the 41SM404 utility wares (Table 15). These sherds account for only 4.1 percent of the utility wares (see Table 10). Both Maydelle Incised and Bullard Brushed vessels have brushed and/or incised bodies, particularly Maydelle Incised jars (see Suhm and Jelks 1962:103 and Plate 52a, f-g).

The parallel brushed-parallel incised decorative element on vessel bodies is most common at 41SM404 (see Table 15). Opposed, overlapping, and diagonal brushed-incised decorative elements

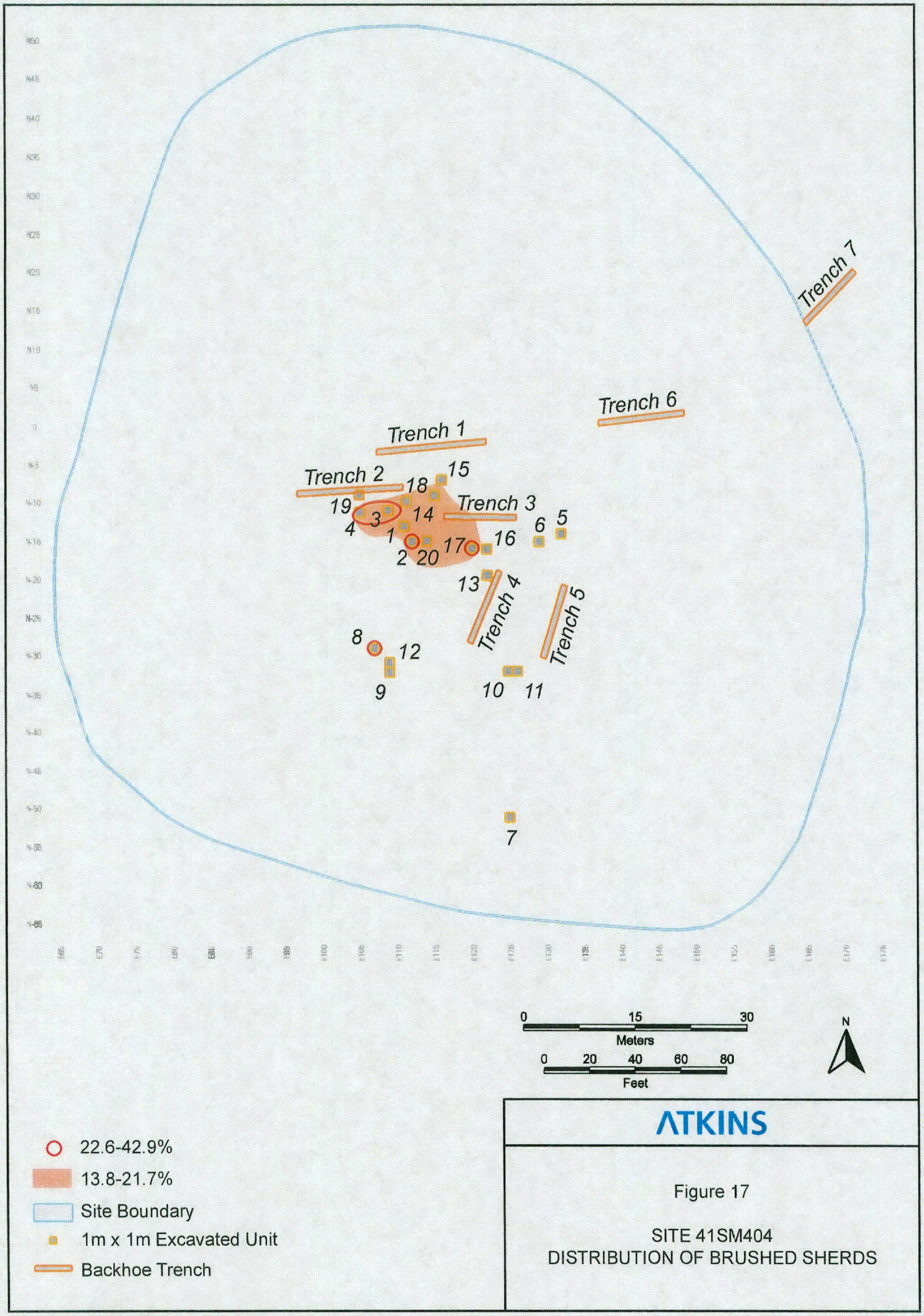

Figure 17

SITE 41SM404
DISTRIBUTION OF BRUSHED SHERDS

L:\Projects\Hel\CLIENTS\NET RMA\Testing at 41SM404\cad\Figure 17_Brushed Element Distribution

Table 15: Brushed-Incised and Brushed-Punctated
Decorative Elements in the 41SM404 Ceramic Assemblage

Decorative Element	Rim Sherd	Body Sherd	N
Brushed-Incised			
Parallel brushed-incised lines	-	5	5
Opposed brushed-incised lines	-	2	2
Parallel brushed with opposed incised lines over brushing	-	2	2
Parallel brushed-adjacent diagonal incised line	-	2	2
Parallel brushed-opposed incised line	-	1	1
Parallel brushed-overlapping incised lines	-	1	1
Overlapping brushed-single straight incised line	-	1	1
Subtotal	-	14	14
Brushed-Punctated			
Parallel brushed with tool punctates through brushing	-	4	4
Parallel brushed with fingernail punctates through brushing	-	4	4
Parallel brushed-tool punctuated row adjacent to brushing	-	1	1
Subtotal	-	9	9
Totals	-	23	23

on body sherds, sometimes with the incised lines drawn through the brushing and other times with the incised lines placed adjacent to the brushing marks, account for the remainder of the site's brushed-incised decorations on utility ware vessel bodies. One brushed sherd has a row of tool punctates (possibly at the rim-body juncture) adjacent to an area with parallel brushing, probably on a jar body.

Brushed-Punctated

Brushed-punctated decorations on utility ware body or rim sherds are not common at 41SM404 (see Table 15), accounting for only 2.6 percent of the utility wares (see Table 10). These are likely from Bullard Brushed jars (see Suhm and Jelks 1962:21 and Plate 11a–c, e–f). The most common decorative elements are body sherds with parallel brushing marks and at least one row of tool or fingernail punctates pushed through the brushing marks.

Fine Ware Sherds

There are a total of 105 fine ware sherds in the 41SM404 ceramic assemblage, which represents 23.5 percent of all the decorated sherds from the site. Approximately 72 percent have engraved elements and partial motifs, and the other 28 percent are red-slipped on either one or both vessel

surfaces (Table 16). Each of the rim sherds is from a different vessel, indicating that there are at least 13 fine ware engraved vessels in the assemblage.

Table 16: Fine Ware Sherds in the 41SM404 Ceramic Assemblage

Decorative Method	Rim	Body	N	Percent of Fine Ware Sample
Engraved	13	61	74	70.2
Red-slipped	-	28	28	26.9
Engraved-punctated	-	2	2	1.9
Red slipped-appliquéd	-	1	1	1.0
Totals	13	92	105	100.0

Engraved

The engraved rim sherds from 41SM404 are primarily from carinated bowls and bowls that are decorated almost exclusively along a distinct rim panel; bodies tended to be plain. More than 21 percent of the engraved sherds in the assemblage are from bottles, which were decorated exclusively on the vessel body. That bottle sherds are relatively common in this assemblage indicates their importance for use and discard in domestic contexts (see below).

The fine wares have the most diverse range of decorative elements in the 41SM404 decorated sherd assemblage, with geometric designs common, along with the use of panels and zones, hatched triangular and circular elements, opposed lines, curvilinear lines, and ovals—as well as combinations of various elements (Table 17)—found primarily on the rim panel of bowls and carinated bowls; in this case, body sherds simply represent the lowermost part of a rim panel, with the lip missing (figures 18 and 19). Nevertheless, the range of decorative elements and motifs in the 41SM404 engraved wares is much less stylistically exuberant than other contemporaneous Middle Caddo period assemblages in the middle reaches of the Sabine River and the Angelina River basins in East Texas (see Hart and Perttula 2010; Perttula et al. 2008, 2009; Walters and Haskins 1998) and in Middle Caddo Haley phase contexts along the Red River (see Moore 1912). Only a few of the decorative elements in the 41SM404 ceramic assemblage feature the use of red clay pigments (see discussion below) that had been rubbed in the engraved lines, or have a red-slipped exterior surface into which an engraved design had been carved. The red clay was made with a mixture of crushed ochre, clay, and an organic binder, probably deer fat or blood.

The engraved decorative elements on carinated bowls and bowls can be divided into four groups: (1) simple geometric elements (n = 32, including seven rims), including straight lines (10 percent with a red slip), parallel lines (25 percent with a red slip), usually closely spaced (but whose orientation on the vessel is uncertain), opposed lines; horizontal lines (including one on the interior

Table 17: Engraved, Engraved Bottle, and Engraved-Punctated Decorative Elements in the 41SM404 Ceramic Assemblage

Decorative Element	Rim Sherd	Body Sherd	N
Engraved			
cf. Poynor Engraved elements/motifs	5	14	19
Horizontal lines	4	5	9
Hatched zones	-	4	4
Diagonal lines	-	3	3
Parallel lines, closely spaced	-	3	3
Opposed engraved lines	1	1	2
Horizontal hatched zone	-	1	1
Opposed lines and pendant hatched elements (cf. Holly Fine Engraved?)*	1	-	1
Crosshatched lines	1	-	1
Vertical and diagonal lines	-	1	1
Horizontal and diagonal lines	1	-	1
Horizontal and curvilinear arcing lines	-	1	1
Int. horizontal line	-	1	1
Parallel lines and red slipped	-	1	1
Single straight line	-	9	9
Single straight line, int./ext. red slipped	-	1	1
Subtotal	13	45	58
Engraved-punctated			
Engraved triangle with small circular punctates	-	1	1
Curvilinear zones with punctates within the zones	-	1	1
Subtotal	0	2	2
Engraved bottle sherds			
Curvilinear lines	-	3	3
Hatched zone*	-	3	3
Opposed curvilinear lines	-	2	2
Horizontal engraved line	-	2	2
Opposed lines and hatched triangle	-	1	1
Hatched triangle	-	1	1
Curvilinear hatched zone	-	1	1
Curvilinear and horizontal lines	-	1	1
Curvilinear and cross-hatched pendant triangle	-	1	1
Cross-hatched zone and open engraved triangle	-	1	1
Subtotal	0	16	16
Totals	13	63	76

*Red pigment rubbed in engraved lines

a) Lot 116
Horizontal and Opposed
Enrgaved Triangles and Arcing Lines
cf. Poynor Engraved, Rim Peak

b) Lot 111
cf. Poynor Engraved, *var. Cook*
with Arcing LInes

c) Lot 5
Horizontal Hatched Zone

d) Lot 190
Opposed Engraved Lines and
Hatched Pendant Elements
cf. Holly Fine Engraved

e) Lot 133
Curvilinear Engraved Zones with
Punctates within Them

f) Lot 184
Opposed Triangles and Arcing Lines
cf. Poynor Engraved

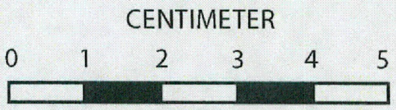

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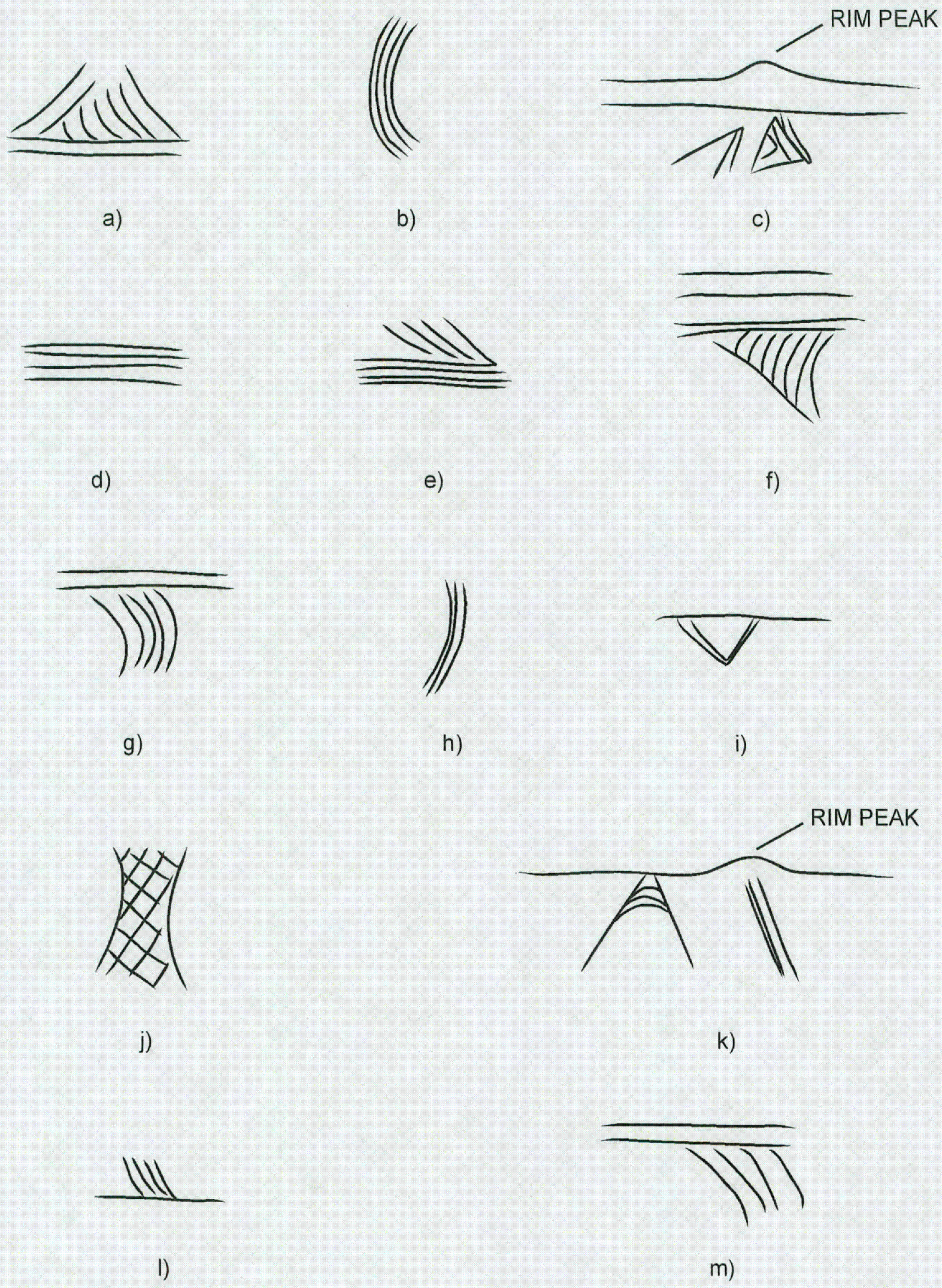
Figure 18

SITE 41SM404
ENGRAVED AND ENGRAVED-PUNCTATED
SHERDS AND CARINATED BOWLS

L:\Projects\Hel\CLIENTS\NET RMA\Testing at 41SM404\cad\Figure 18_Engraved/Engraved-punctated Sherds

Drawn by: C. Wallace



a) curvilinear hatched triangle element
b) curvilinear arc of engraved lines
c) opposed triangles and rim peak
d) closely spaced parallel lines
e) closely spaced horizontal and diagonal lines
f) horizontal lines and hatched triangle element (*var. Cook*?)
g) horizontal and curvilinear arc of lines
h) closely spaced horizontal curvilinear arc of lines
i) triangle element composed of closely spaced lines
j) crosshatched bracket or divider (*var. Hood*?)
k) opposed triangles and closely spaced arcing lines, rim peak
l) horizontal and closely spaced diagonal engraved lines
m) horizontal and closely spaced curvilinear arc of lines (*var. Cook*?)

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Figure 19

SITE 41SM404
POYNOR ENGRAVED ELEMENTS

L:\Projects\Hel\CLIENTS\NET RMA\Testing at 41SM404\cad\Figure 19_Poynor Engraved Elements

Drawn by: C. Wallace

rim of a vessel), diagonal lines, horizontal and diagonal lines, crosshatched lines, vertical and diagonal lines; (2) sherds with narrow zones or panels filled with hatched or crosshatched lines (n = 5); (3) rim and body sherds that have motifs that compare favorably to early (i.e., ca. A.D. 1320–1400+) styles of Poynor Engraved ceramics (n = 20, including five rims) in the upper Neches River basin (see figures 18a–b, f and 19c, k, m); and (4) one distinctive carinated bowl rim sherd with sets of opposed engraved lines and a triangular area between that has several hatched pendant ovals and triangles. If the triangular area on this sherd had been excised, it would be readily classified as Holly Fine Engraved (Suhm and Jelks 1962:77 and Plate 39). Here, I refer to it as cf. Holly Fine Engraved (see Figure 18d), and consider it a late style (dating after ca. A.D. 1200) because of the use of hatched pendant elements, a stylistic attribute so prevalent in parts of East Texas in Middle Caddo period times.

The sherds from fine ware vessels that have elements and motifs that compare favorably with Poynor Engraved (see Figure 18a–b, f, and Figure 19c, k, m) as defined by Suhm and Jelks 1962:Plate 62a–j), and more recently subdivided into varieties of local and regional scope (Perttula 2008:Figure 1a–e, 2010c:389–390) have hatched triangles of various sizes appended to larger motifs on rim panels. Other examples simply have alternating hatched triangles (see figures 18a, f, and 19c, k) on the rim, which I have identified as local variety 1 of Poynor Engraved at the Lang Pasture site (Perttula 2010c:Figure 6-29a). In many cases, the engraved lines are relatively fine and narrow, but "poorly executed, with little contrast between surface colors and the cores exposed by engraving" (Suhm and Jelks 1962:123). The decorations on sherds from these engraved vessels feature—either in a singular fashion or in combination—triangular, oval, or circular motifs on rim panels filled in with closely to widely spaced hatching or crosshatched lines, usually with appended hatched triangles. The engraved sherds with oval elements on the rim are most likely from Poynor Engraved, *var. Cook* vessels (see Figure 19a, b, f–g, m; see also Perttula 2010c:Figure 6-15), and those with geometric lines and geometric lines with appended hatched triangles are from Poynor Engraved, *var. Blackburn* vessels (see Figure 19d, e, l), or any number of unspecified varieties of Poynor Engraved. Twenty-two unspecified varieties have been identified from the study of whole vessels in the region, as well as a further five local varieties at the Lang Pasture site (41AN38) (Perttula 2010c:figures 6-29 and 6-65). The main Caddo occupation at the Lang Pasture dates from ca. A.D. 1320–1400 (Perttula 2010b:152), providing a working temporal boundary.

The distribution of rim and body sherds at 41SM404 that have engraved elements and motifs that compare favorably to early styles of Poynor Engraved in the ca. A.D. 1320–1400 occupation at the Lang Pasture site (see Perttula 2010c:figures 6-29, 6-64a–d, and 6-65:var. A and F) occur over a large area (ca. 19 x 30 m) of the site (Figure 20). This area of cf. Poynor Engraved sherds falls within both plain and decorated sherd clusters A and B (see Figure 12) as well as an area to the south and outside of the main sherd concentration, as well as outside the concentrations of red-slipped (see Figure 23, below) and brushed sherds (see Figure 17).

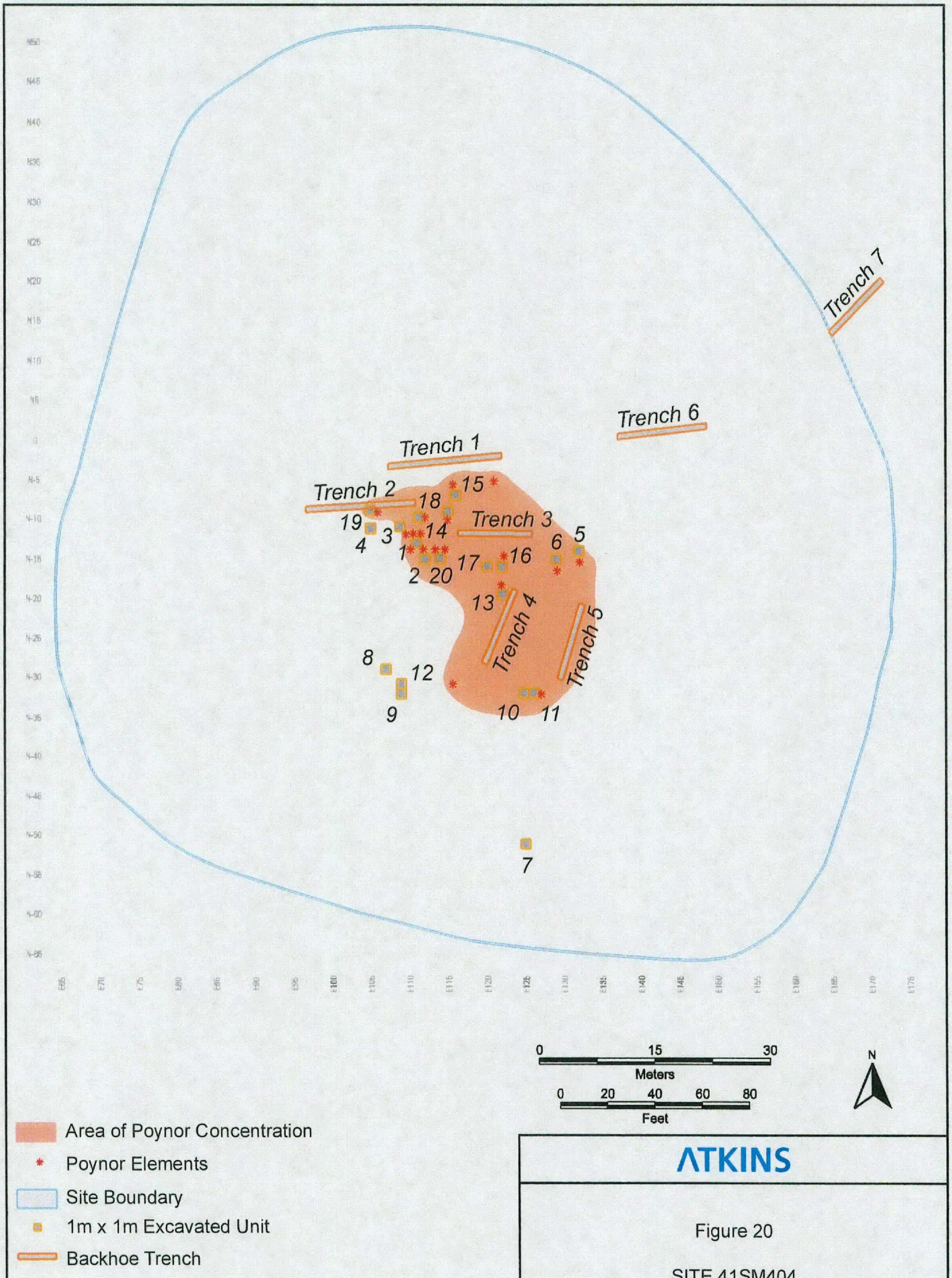

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Figure 20

SITE 41SM404
DISTRIBUTION OF SHERDS WITH
CF. POYNOR ENGRAVED ELEMENTS

L:\Projects\Hel\CLIENTS\NET RMA\Testing at 41SM404\cad\Figure 20_Poynor Elements

The engraved bottle sherds at 41SM404 appear to be from globular bottles where the designs are oriented horizontally to fit the broader bottle body—and the designs are in consequence unconstrained because they did not need to be confined to a rim panel as is seen on the engraved carinated bowls and other bowls in the assemblage. On post–ca. A.D. 1350 to fifteenth-century or later bottles in the upper Neches River basin (see Perttula 2010c), the decorative elements and motifs are commonly oriented vertically to follow the shape of the bottle, but this is not the case here. Common engraved elements on the bottles from 41SM404 include sets of curvilinear lines, hatched and crosshatched triangles (in one case, pendant from a curvilinear engraved line), ovals, hatched circles, hatched zones, circles and semicircles, and opposed curvilinear lines (Figure 21). These are also relatively common and popular decorative elements on the carinated bowls and bowls (see Table 17).

The distribution of several distinctive kinds of ceramic sherds from 41SM404 is depicted on Figure 22. This includes mostly fine wares with distinctive rim and lip forms, bottle sherds with hatched or crosshatched engraved zones, engraved-punctated, red-slipped-appliquéd, a cf. Holly Fine Engraved carinated owl rim sherd, and Red River long-stemmed pipe sherds. These distinctive sherds are concentrated in the area of the main ceramic component (see Figure 12), being distributed in both A and B density clusters (structure locations and associated work areas?), and in the same clusters as the high density of brushed, red-slipped, and cf. early Poynor Engraved sherds. The only exceptions are four of these distinctive sherds in the southern part of the site (in units 8, 10, and 11), including a bottle sherd with a hatched engraved zone; one rim with a scalloped lip; another with a rim peak; and a possible cf. Holly Fine Engraved carinated bowl rim sherd (see figures 18d and 22).

Engraved-Punctated

There are only two engraved-punctated body sherds in the 41SM404 fine wares, both apparently from carinated bowls. The first of these has only a single engraved triangle that has small circular carved punctations within it (i.e., not decorated until after the vessel had been fired), while the second has curvilinear engraved zones with one or two carved punctations within several of the zones (see Figure 18e). Similar engraved-punctated sherds have been identified from the Lang Pasture site, primarily from the earlier, ca. A.D. 1320–1400 component (Perttula 2010c: Figure 6-14). Although several varieties of Poynor Engraved (see Suhm and Jelks 1962:Plate 62g, i) have punctated zones, including *var. Blackburn* and *var. Lang* (Perttula, ed. 2008:Figure 1b', g), the sherds from 41SM404 do not appear to be from Poynor Engraved vessels because they appear to be part of repeated elements on the vessel rim, not central punctate-filled circles.

Red-slipped

Red-slipped sherds are relatively common in the fine wares from 41SM404, as they account for almost 28 percent of the fine wares in the assemblage (see Table 16). The red clay slip was made

a) Lot 148
Curvilinear Hatched Zone

b) Lot 237
Hatched Curvilinear Zone

c) Lot 73
Crosshatched Engraved Zone and
Open Triangle Engraved Element

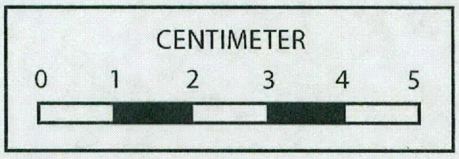

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Figure 21

SITE 41SM404
ENGRAVED BOTTLE SHERDS

L:\Projects\Hel\CLIENTS\NET RMA\Testing at 41SM404\cad\Figure 21_Engraved Bottle Sherds

Drawn by: C. Wallace

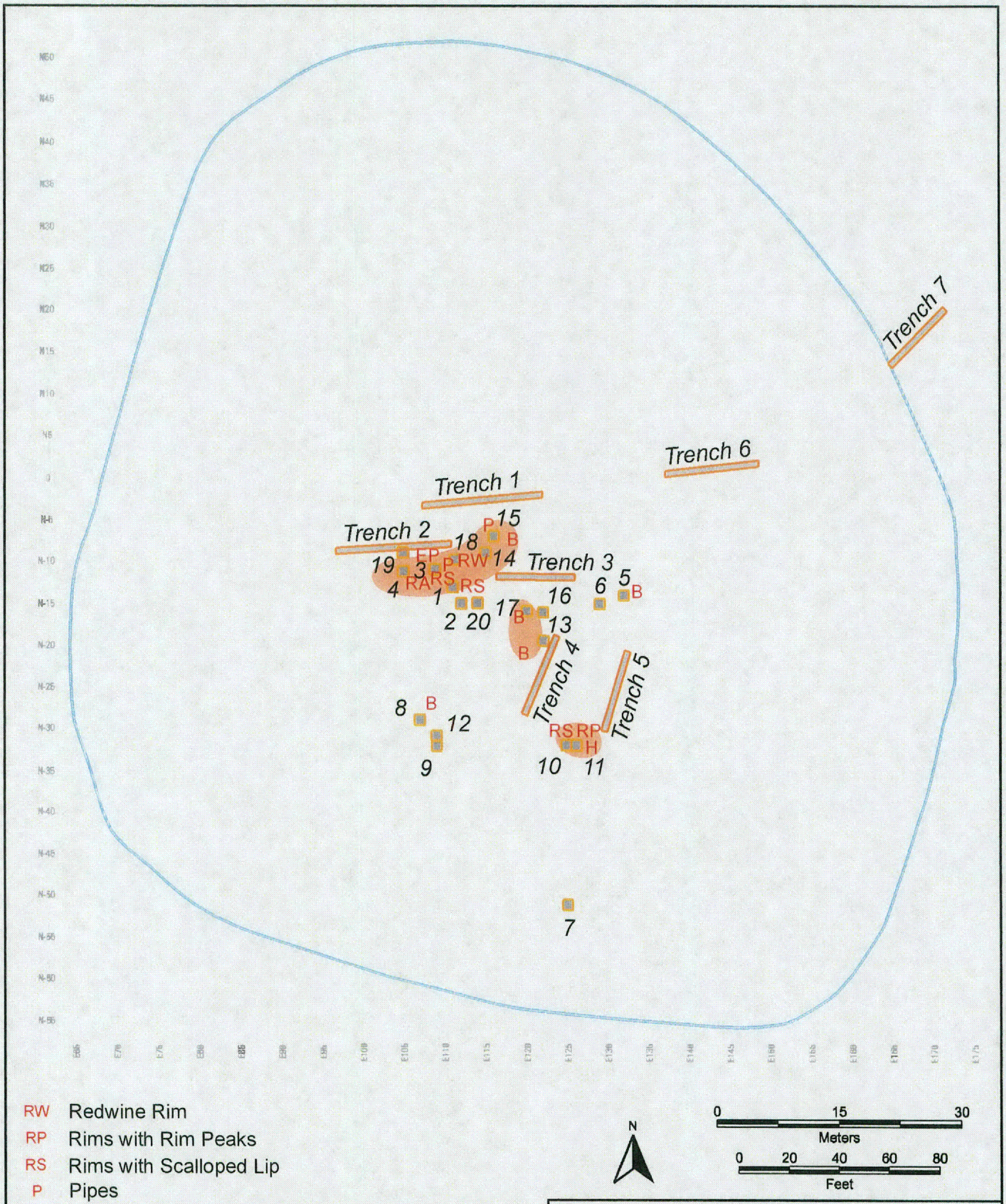

Figure 22

SITE 41SM404
DISTRIBUTION OF OTHER
FINE WARE RIM AND BODY SHERD
ATTRIBUTES AND PIPES

L:\Projects\Hel\CLIENTS\NET RMA\Testing at 41SM404\cad\Figure 22_Fine Ware and Pipe Distribution

with water, clay, and crushed ochre or hematite to add the color to the mixture. Among all the decorated sherds from the site—both utility and fine wares—6.5 percent are red-slipped. The relatively high percentage of red-slipping in the fine wares is consistent with ceramic assemblage data from several Middle Caddo period sites in the upper Neches and upper Sabine River basin (see discussion in Perttula 2011), while conversely red-slipped vessels are rare in fifteenth-century and later Frankston phase sites in the upper Neches (Anderson et al. 1974; Kleinschmidt 1982; Perttula 2010c; Shafer 1981).

At 41SM404, there are 28 red-slipped body sherds and 1 red-slipped-appliquéd body sherd (Table 18). Differences in temper and firing conditions among these red-slipped sherds indicate they are from a minimum of 13 different vessels. The majority of these are slipped only on the exterior vessel surface, and they are from bowls or carinated bowls. The absence of red-slipped rims suggests that the red-slipping was employed primarily on vessels that had other decorations (i.e., engraved elements), rather than that there were vessels that only had a slip as the decoration.

Table 18: Red-slipped and Red-slipped-Appliquéd Sherds
in the 41SM404 Ceramic Assemblage

Decorative Element	Rim Sherd	Body Sherd	N
Int. red-slipped	-	5	5
Ext. red-slipped	-	14	14
Int. and Ext. red-slipped	-	9	9
Ext. red-slipped and appliquéd ridge	-	1	1
Totals	0	29	29

The highest densities of red-slipped sherds at 41SM404 are in an 11-x-20-m area in the main component (Figure 23). This distribution overlaps with the two main clusters (A and B) of ceramic sherds at the site (see Figure 12).

In East Texas, the manufacture and use of red-slipped pottery unembellished with engraved decorations is most commonly seen in Middle Caddo ceramic traditions, whether it be in Caddo sites on the Red River or in parts of the upper Sulphur, Big Cypress, Neches, and Sabine River basins. The apparent popularity of red-slipped pottery at 41SM404 is consistent with a Caddo occupation during the thirteenth and fourteenth centuries A.D., which was when a tradition of manufacturing red-slipped carinated bowls and bottles was established across much of the western part of East Texas. At the Middle Caddo period Jamestown Mound site (41SM54), for example, more than 26 percent of the decorated sherds (n = 84) are from red-slipped vessels, including one Maxey Noded Redware bottle sherd (Perttula and Walker 2008:7), and 10.9 percent of the decorated sherds from the Pace McDonald site (41AN51) are red-slipped (Perttula 2011). Furthermore,

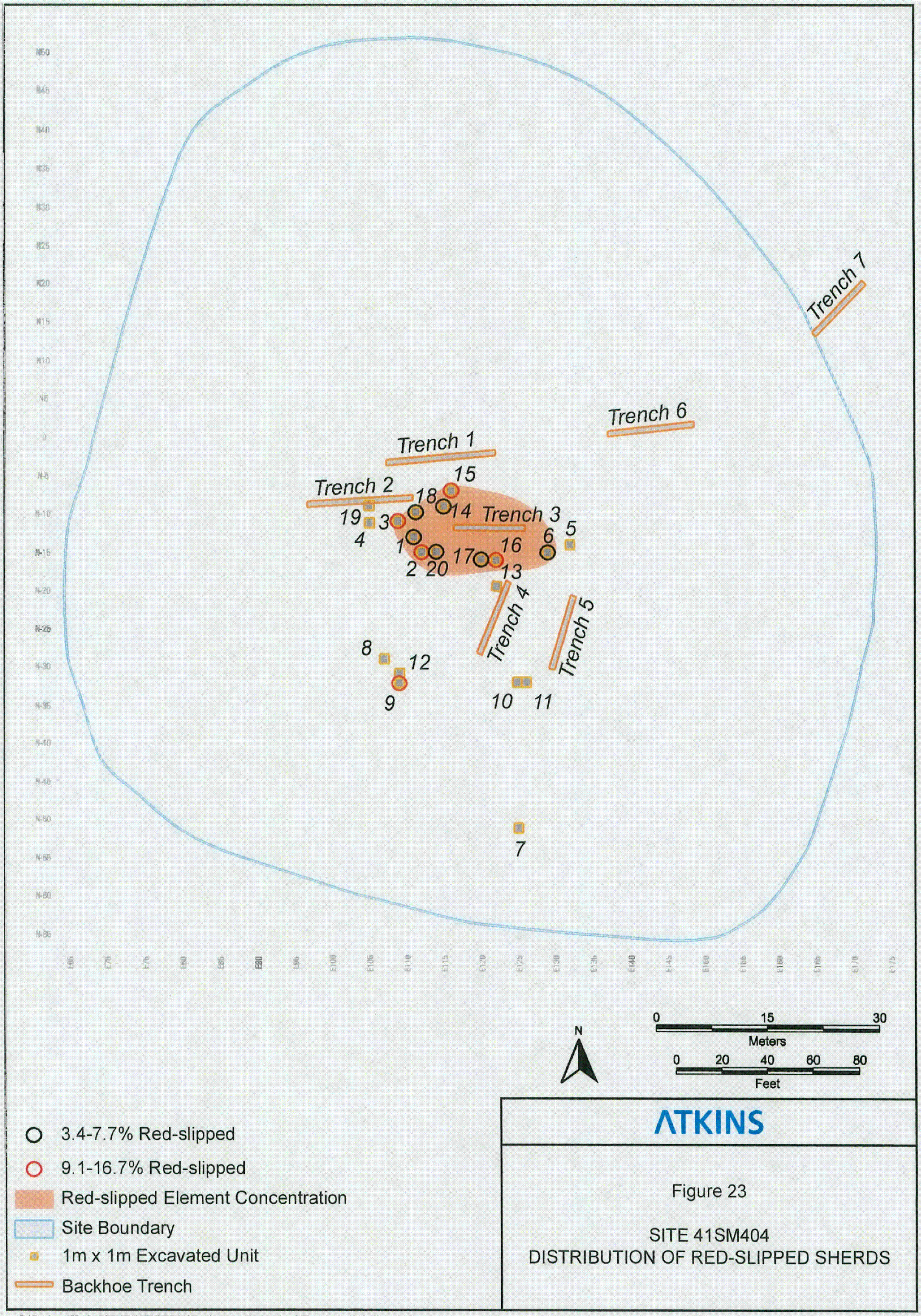

Figure 23

SITE 41SM404
DISTRIBUTION OF RED-SLIPPED SHERDS

L:\Projects\Hel\CLIENTS\NET RMA\Testing at 41SM404\cad\Figure 23_Red-slipped elements

Johnson (1961:Figure 3e–f) identifies red-slipped Maxey Noded Redware and a red-slipped vessel with a scalloped lip at two sites at Lake Palestine (41SM87 and 41SM88).

It is possible that the red-slipping on these vessels may have served a functional role rather than strictly a stylistic one, that being to reduce the permeability of the vessels (see Dunnell 2008: 66–67) in instances where there were major changes in use of temper and firing conditions, or to help with the making of salt in one of the saline's along the upper Neches. There is no evidence of a major technological change (i.e., from grog to shell tempering) in upper Neches River basin Caddo ceramics, and it is doubtful that the well-made grog-tempered pottery made by the Caddo in Middle Caddo times had permeability problems.

Red-slipped and Appliquéd

The single slipped and appliquéd sherd (Figure 24) was slipped on the exterior surface only and had a broad appliquéd ridge across it. The roughened interior of this sherd suggests it came from a bottle, perhaps of the Maxey Noded Redware type, since there are Caddo bottles in this type (as currently defined) with a series of continuous appliquéd ridges placed vertically or diagonally across the bottle body (Suhm and Jelks 1962:Plate 51f).

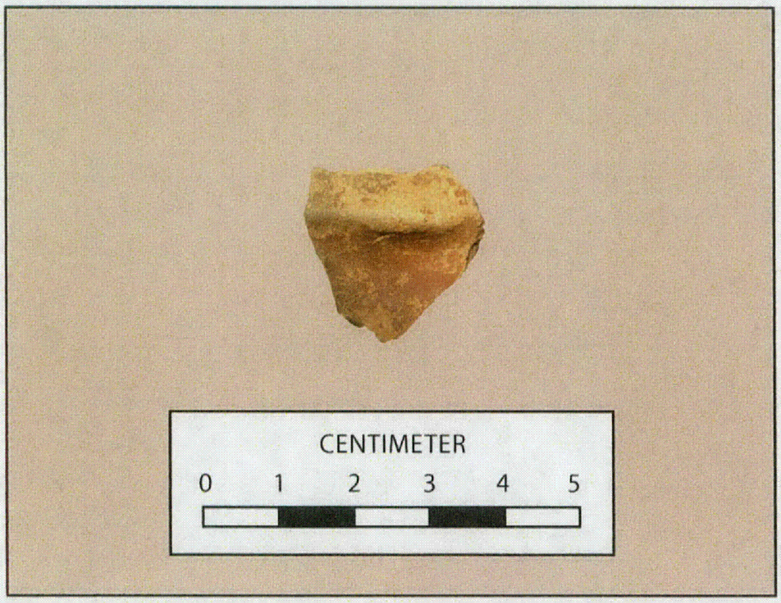

Figure 24. Red-slipped appliquéd sherd from 41SM404.
Provenience: Unit 3, Level 2/Lot 133.

Pigments

Only two fine ware sherds from 41SM404 (1.9 percent) had red pigments rubbed into the engraved decorations of two different fine ware vessels after firing. This includes a bottle sherd from Unit 17 (Level 4) with a hatched engraved zone (see Figure 21b) and a possible late style of Holly Fine

Engraved carinated bowl (Unit 11, Level 3) with opposed engraved lines around a triangular area filled with hatched elements (see Figure 18d).

The use of pigments is a longstanding northeastern Texas Caddo ceramic practice (Campbell 1936:Table 7), applied to 14–16 percent of the fine ware vessels in Campbell's study of burial vessels, and clay pigments were also used as stand-alone offerings. For instance, elite burials in shaft tombs in Mound C (dating from ca. the mid-late ninth century A.D. to the late thirteenth–early fourteenth century A.D.) at the George C. Davis site (41CE19) had clay pigment offerings, including gray, green, red, purple, brown, yellow, and blue-gray colors (Story 1997:7–65).

In East Texas Caddo ceramics, there appear to be alternating preferences for either red or white clay pigments, and this may have a resonance that extends beyond simple differences in pigment choice. Lankford (1992) discusses the importance of the use of these two colors in social, political, and cosmological dualisms or divisions in Southeastern societies, and it is likely that similar dualisms characterized prehistoric Caddo groups living in East Texas. In the context of the use of different colors of pigments in mortuary rituals, Lankford (1992:76–77) has suggested that the two colors symbolize the Lower world of change (red) and the Upper world of order (white). It is probable as a means by which to explain the symbolic meaning and use of different pigments on mortuary vessels that cosmological and world views of the Caddo peoples living in northeastern Texas began to change after ca. A.D. 1480, with different trends in pigment use (Hart and Perttula 2010; Perttula 2010c). These new cosmological and world views came to dominate beliefs and mortuary ritual usage after ca. A.D. 1560 and then continued into Historic Caddo (post-A.D. 1650) Allen phase times, when fine ware engraved vessels always have white pigments rubbed in the design. Before that time, the use of red pigments appears to have been the predominant practice.

Ethnographic accounts of the Caddo in the seventeenth and eighteenth centuries occasionally mention their use of red and white colors, paints, pigments, and feathers, but not in mortuary ceremonies. Red and white colors sometimes were used in opposition when applied as paints or pigments on material items in ceremonies, such as the calumet, where the pipe was placed upon a structure of three sticks painted red, and with a white deerskin placed across the sticks (Foster 1998). Red ochre was apparently a valuable commodity, and the Caddo mined it and carried it long distances between settlements (Hatcher 1927:209). Caddo men painted their faces with ochre to make themselves look redder (Hatcher 1927:176), but there are other instances where Caddo men painted their faces red and white (Foster 1998:206). White feathers—a sign of peace—were attached to calumets by the Caddo (Hatcher 1927:151). George Sabo (2009) indicates that such examples of color use by the Caddo peoples "suggest an association of red and white with an ongoing cycle of life in which birth and death are subsumed."

Plain Rim, Body, and Base Sherds

The 752 plain sherds from 41SM404 include 55 rims, 654 body sherds, and 43 base sherds. The fact that 47 percent of all the rim sherds (n = 117) recovered at 41SM404 are plain—even disregarding the 10–20 rim sherds that are so small that it is virtually impossible to discern whether they are from a plain or decorated vessel—indicates that plain vessels are abundant in the ceramic assemblage. These plain vessels include bowls, jars, carinated bowls, and bottles.

Selected plain ware rims from 41SM404 are illustrated in Figure 25. The majority of the plain ware vessels are from jars, simple bowls, or carinated bowls with direct (or vertical) profiles and rounded lips, although a few have rim peaks or scalloped lips.

Each of the different categories of ceramics (i.e., plain ware, utility ware, and fine ware) in the 41SM404 ceramic assemblage has a distinctive array of vessel rim and lip forms (Table 19). This in turn suggests that each category of ceramic ware represents sherds from vessels of different forms (and decoration) that are category-specific.

The plain rims primarily have direct or vertical rims and rounded lips, and are principally from bowls (as are the inverted rim vessels) and possibly a few plain jars and one bottle neck; the everted rims may be from plain jars. The principal rim form for the utility wares has a rounded profile: these are from direct or vertical rim jars (see Table 19). In most cases, the rims to these vessels have rounded lips, but there are also utility ware jars with exterior folded and/or flat lips. These vessels are moderately sized, with estimated orifice diameters that range from 13 to 18 cm.

The fine ware vessel rims are from vessels with direct or vertical rim carinated bowls and bowls. Although most of these rims have rounded or flat lips, a significant number of them are scalloped or have rim peaks (see Table 19). Approximately 23.1 percent of the fine wares have these lip attributes, compared to 7.3 percent of the plain ware rims; none of the utility ware rims have peaks or scalloped lips. The few fine ware rims with a measurable orifice diameter range from 14 to 28 cm in size.

The range in sizes of the plain wares and fine wares—based on estimated orifice diameter—suggests that vessels were made for use for individual servings (at the smaller orifice diameter ranges) as well as multiple servings (at the 28-cm orifice diameter range). Much of the food service was designed for individual or small group servings, and thus likely carried out within small social groups, presumably households. Such servings could have included such separate dishes as corn and *atole* tamales; beans, corn, and *pinole*; as well as meat stews and hickory nut oils (Chapa 1997:149–150).

a) Lot 138
Plain Rim
with Scalloped Lip

b) Lot 133
Plain Rim
with Scalloped Lip

c) Lot 187
Plain Rim
Direct Rim and Rounded Lip

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Figure 25

SITE 41SM404
PLAIN RIM SHERDS

L:\Projects\Hel\CLIENTS\NET RMA\Testing at 41SM404\cad\Figure 25_Plain Rim Sherds

Drawn by: C. Wallace

Table 19: Rim and Lip Forms in the 41SM404 Ceramic Assemblage

Rim and Lip Form	Plain Ware (%)	Utility Ware (%)	Fine Ware (%)
Direct rim-rounded lip	32.7	50.0	30.8
Direct rim-rounded lip, exterior folded	1.8	6.8	-
Direct rim-rounded lip, rim peak	1.8	-	15.4
Direct rim-rounded lip, scalloped	5.5	-	7.7
Direct rim-flat lip	9.1	20.5	30.8
Direct rim-flat lip, exterior folded	1.8	4.5	7.7*
Direct rim-flat lip, internal beveled	1.8	-	-
Everted rim-rounded lip	1.8	4.5	-
Inverted rim-rounded lip	1.8	-	-
? rim/rounded lip	41.8	9.1	7.7
? rim/rounded lip, exterior folded	-	4.5	-
Summary of Rim and Lip Forms			
Direct rim	93.8	94.7	100.0
Everted rim	3.1	5.3	-
Inverted rim	3.1	-	-
Rounded lip	78.2	63.6	38.5
Rounded lip, exterior folded	1.8	11.4	-
Rounded lip, scalloped	5.5	-	7.7
Rounded lip, rim peak	1.8	-	15.4
Flat lip	9.1	20.5	30.8
Flat lip, exterior folded	1.8	4.5	7.7*
Flat lip, interior beveled	1.8	-	-

*Redwine mode lip (Walters 2010)

One engraved rim from Unit 18 (Level 4/Lot 240) has a distinctive Redwine Mode pie crust rim (see Walters 2010:78 and Figure 2). This is a rim that has an acute angle (usually at or near a right angle) or change in orientation from the sides of a particular Caddo vessel. The Redwine Mode rim has been documented from two clusters of Middle Caddo period sites in East Texas (Walters 2010: Figure 4). Site 41SM404 falls within the boundaries of Cluster 1, with eight sites in the "upper reaches of the Sabine River drainage, one site (41AN38) on the Neches River, and one site (41UR315) in the Cypress Basin" (Walters 2010:81).

Technological Comparisons among Wares

Certain technological attributes of the ceramic vessel sherds from 41SM404 can be compared to determine if there are differences in how the vessels were made, fired, and used across the site. The

ceramic attribute data reviewed below are based on detailed decorated (n = 132 sherds) and plain sherd (n = 211) analyses (Appendix D). The detailed macroscopic analyses are further supplemented by petrographic thin section analyses of 10 sherds from this sample (see Appendix E).

The vessel sherds from 41SM404 are from vessels that are tempered almost exclusively with grog (fired clay and/or crushed sherds). Between 97.7 and 100 percent of the sampled sherds by ware have grog temper inclusions (Table 20). Other tempers, such as bone and hematite, were occasionally added to the grog-tempered paste, especially among the plain wares. The few sherds that do not have a grog temper either have crushed and burned bone (1.0–2.3 percent by ware) or crushed hematite (0.5 percent, in association with bone temper in the plain wares). Other temper inclusions found in the paste of the vessel sherds include charred organic materials (i.e., visible pieces of charcoal), but these occur exclusively in association with grog temper.

Table 20: Temper Classes in the Plain, Utility, and Fine Wares in the 41SM404 Ceramic Assemblage

Temper class	Plain Ware (%)	Utility Ware (%)	Fine Ware (%)
Grog	56.6	77.1	69.8
Grog/sandy paste	15.2	4.6	11.6
Grog-bone	4.8	5.7	2.3
Grog-bone/sandy paste	0.5	-	-
Grog-hematite	14.3	10.3	11.6
Grog-hematite/sandy paste	2.9	-	-
Grog-organics	1.0	-	2.3
Grog-organics/sandy paste	0.5	-	-
Grog-bone-hematite	2.0	2.3	-
Grog-bone-hematite/sandy paste	0.5	-	-
Bone	0.5	-	2.3
Bone/sandy paste	0.5	-	-
Bone-hematite/sandy paste	0.5	-	-
Bone-grog-hematite-organics	0.5	-	-
Summary Percent:			
Sherds with grog temper	98.5	100.0	97.7
Sherds with bone temper	9.5	8.0	4.7
Sherds with hematite temper	20.5	12.6	11.6
Sherds with organics	2.0	-	2.3
Sherds with sandy paste	20.5	4.6	11.6

There is only moderate variability in temper-paste use among the different wares in the 41SM404 ceramics, as there are only 14 temper-paste combinations here (see Table 20), but not as low as the temper-paste combinations in early Historic Caddo sites in the upper Neches River basin (see Perttula 2007, 2008; Perttula, ed. 2008), or as diverse as the 31 temper-paste combinations at a ca. A.D. 1150–1430 site reported by Perttula and Nelson (2003), for example, in the nearby Angelina River basin in East Texas. This suggests that the 41SM404 ceramics are a product of a ceramic-vessel-making tradition that was standardized in manufacturing and vessel engineering, and "pretty much had all the bugs worked out of it" (Johnson 1992:18). The heavy use of grog temper in this ceramic assemblage is completely consistent with other upper Neches River basin Caddo sites, where grog-tempered sherds make up more than 90 percent of all the sherds from Caddo occupations dating after ca. A.D. 1250.

The very high frequency of grog-tempered pottery at the site is believed to represent a specific attempt on the part of the Caddo potters to slow the oxidation process of the ceramic vessels during firing. This would have created darker-colored vessels in the reducing environment (or lighter tan, orange, and brown colors in oxidizing environments), while allowing them to be fired longer, and producing a harder ceramic vessel (Rice 1987:354; Teltser 1993:532, 540). Since grog has expansion coefficients comparable to the coefficients of the clay paste—especially with the finely crushed grog pieces as seen in the fine wares—this would have further contributed to the ability of fired vessels to withstand heat-related stresses, as well as increasing their flexural strength (Rice 1987:362).

Between 4.7 and 9.5 percent of the plain ware, utility ware, and fine ware sherds are from vessels that had burned bone added to the clay paste. Bone-tempered ceramics are most common in the plain wares, and least preferred for the manufacture of fine ware vessels, although the differences in proportion are slight (see Table 20).

The use of hematite as a temper may have served the same purpose as feldspars, which are often found together in the paste of Caddo vessels. The occurrence of fine grains of these minerals in the paste would have enhanced a vessel's ability to melt and fuse the paste constituents during firing, resulting in a dense, hard body, and reduced vessel porosity (Rice 1987:96). Its coarse texture and large grain size when added to the clay recipe may have also helped in holding the clay paste together.

Sherds with preserved organic materials in the paste are found only in the plain wares and fine wares (2–2.3 percent) (see Table 20). The sherds from these particular vessels indicate that a certain small proportion of vessels were not fired at high temperatures and/or not fired for a long duration. Apparently, the organic materials naturally present in the worked clay did not have a chance to be completely burned off during firing.

The majority of the vessel sherds from 41SM404 have a clayey to silty paste. Clays used for vessel manufacture were probably gathered from nearby alluvial settings, perhaps along Indian Creek or even the Neches River, but certainly within a short (1–7 km away, at most) distance from the settlement (Arnold 2000:343; Arthur 2006:52). This ensured that an inordinate amount of time and energy was not expended by potters in hauling clay back to a site. Arthur (2006:52) points out that potters are likely to select lower quality clays for vessel manufacture than high quality clays if the latter are farther away.

The pottery found at 41SM404 in domestic contexts was very likely to have been made on-site by potters who lived there. Chemical analyses of vessel pastes and local clay sources will likely indicate that the vessels were made from local upper Neches River basin clays (see Ferguson et al. 2008).

Between 4.6 and 20.5 percent of the sherds from 41SM404 have a sandy paste (see Table 20). This suggests the regular use of naturally sandy clay for the manufacture of particular kinds of vessels. The highest proportions of sandy paste sherds are in the plain wares (20.5 percent), with lesser amounts between the utility wares (4.6 percent) and the fine wares (11.6 percent). The plain wares also have the highest proportions of crushed hematite and bone-tempered sherds in the assemblage (see Table 20). It is probable that the Caddo potters recognized that sandy clays held up better to heat-related stresses and helped with vessel porosity and thermal conductivity, which would have had practical value given the repeated use of some of the plain ware vessels for the serving of hot foods and liquids in simple bowls (see Rice 1987, 1996). The relatively high amount of quartz sand in the paste of certain utility ware, plain ware, and fine ware vessels may be related to decisions made by Caddo potters at 41SM404 to be able to better control the making and firing of harder and more-durable vessels.

The ceramic wares at 41SM404 were fired in several different ways, typically in a regular or well-controlled fashion in a bed of coals from a wood fire. This is indicated by the small proportions of the sherds that are from vessels that were incompletely oxidized during firing, possibly reheated/sooted/smudged, or that have multiple reducing/oxidizing bands in the sherd cross sections (Table 21). These three categories of less-controlled or sustained firing account for 24 percent of the plain sherds, 17.3 percent of the utility wares, and 20.9 percent of the fine wares.

The plain sherds and fine ware sherds are from vessels that overall are quite similar in the manner in which they were fired, with comparable proportions of oxidized firing (11.6–15.8 percent), incompletely oxidized firing (16.3–17.2 percent), reduced firing (6.2–9.3 percent), and reduced firing, with subsequent cooling of the vessel in the open air (53.6–58.2 percent) (see Table 21). The utility ware sherds, on the other hand, are much more likely to have come from vessels that were fired and cooled in a high oxygen environment (25.3 percent) than the utility wares—producing some vessels that are uniformly a light red, reddish brown, and yellowish brown color, or vessels that were fired in a reducing environment (10.3 percent), producing a durable vessel. Most of the sherds that were fired in a reducing environment are from vessels that were cooled in the open air,

leaving one or both surfaces of the vessel with a lighter color than the vessel core. Only 6.2–9.3 percent of the plain ware and fine ware sherds are from vessels with a gray, dark gray, or black interior and exterior surface color (see Table 21).

Fine wares and plain wares were apparently better made and better fired (at least in terms of regulating the firing temperature), and they were probably fired longer in a low oxygen environment than the utility wares. The Caddo potters exerted more control over the end product of fine ware and plain ware vessel manufacture than they did with the utility wares, primarily to produce a harder ceramic. Firing conditions tend to be more heterogeneous among the utility wares (including the incompletely oxidized vessel sherds), likely the product of the multipurpose nature of these vessel forms, as they were used for cooking pots and storage containers. As long as the porosity of the utility wares was not excessive, and there was a good balance between clay plasticity and temper constituents, they did not need to be fired for as long a time as the harder fine wares to be quite serviceable vessels without being subject to diminished strength from cumulative thermal fatigue as well as cracks and fractures.

Table 21: Firing Conditions in the Plain, Utility, and Fine Wares

Firing Condition*	Plain Ware (%)	Utility Ware (%)	Fine Ware (%)
A (oxidizing)	15.8**	25.3	11.6
B (reducing)	6.2	10.3	9.3
C	6.2	5.7	14.0
D (incompletely oxidized)	1.0	-	-
E	10.0	8.0	2.3
F	28.2	24.1	25.6
G (reducing, but cooled in open air)	22.0	19.5	23.3
H	3.4	3.4	9.3
I	-	1.2	2.3
J (sooted, smudged, reheated)	-	-	-
K	5.8	1.2	-
L	0.5	1.2	-
X (multiple oxidizing and reducing zones)	0.5	-	2.3

*After Teltser (1993:Figure 2) and Perttula (2005:Figure 5-30)
**Percentage

Many of the vessel sherds from 41SM404 retain evidence of the smoothing or burnishing of interior and/or exterior surfaces (Table 22). These surface treatments were done to thin and even out the vessel surfaces, strengthen them by melding coil joins, and even to create a surface appearance that enhanced the vessel decoration.

Table 22: Surface Treatment in the Plain, Utility, and Fine Wares

Surface Treatment	Plain Ware (%)	Utility Ware (%)	Fine Ware (%)
Interior smoothed	35.2	43.7	39.6
Exterior smoothed	51.0	4.6	41.9
Interior burnished	1.9	-	7.0
Exterior burnished	10.5	-	51.2

Among the utility ware sherds, most of them (43.7 percent) have been smoothed on the interior surface, while less than 5 percent have been smoothed on exterior surfaces. This smoothing was most likely consistently done to lower the permeability and increase the heating effectiveness of particular vessels (cf. Rice 1996:148) that being the utility ware vessels used for cooking.

The decorated fine ware sherds are more frequently smoothed on the exterior surface than the utility wares (41.9 percent compared to only 4.6 percent) as well as more commonly burnished on either interior (7 percent) or exterior (51.2 percent) vessel surfaces. None of the utility ware vessels are burnished on either interior or exterior vessel surfaces.

The comparable smoothing and burnishing of interior and exterior vessel surfaces of the 41SM404 fine wares (not including the bottles, which have a roughened interior vessel body) indicates that the fine wares were not used for cooking purposes, but probably to serve and hold foods and liquids. The smoothed and burnished surfaces of such vessels would have been advantageous in the repeated use of such serving vessels. The exterior smoothing and burnishing, beyond its purpose in melding coil joins, was probably designed to have stylistic and display purposes, creating a flat and lustrous surface well suited to highlight the engraved and/or slipped exterior surfaces of the fine ware vessels.

The plain ware sherds from 41SM404 are more like the fine wares than the utility wares with respect to vessel wall surface treatments (see Table 22). Smoothing of vessel surfaces is similar on both the interior (35.2 percent) and exterior (51 percent) walls of vessels—as it is with the fine wares—and burnished vessel surfaces are considerably more common in the plain wares (both interior and exterior surfaces) than they are in the utility wares. This surface treatment information suggests that most of the plain wares (likely bowls, carinated bowls, and some bottles) were used more like fine wares than utility wares, being well smoothed and burnished, and probably were made to also be used in the serving of foods and liquids.

Each of the Caddo ceramic wares from 41SM404 are, on average, rather thin-walled, with rims ranging from 4.70 to 7.37 mm (at 1 standard deviation) and body sherds ranging from 5.65 to 7.55 mm (1 standard deviation) (Table 23). The flat disk-shaped base sherds range (at 1 standard deviation) from 9.25 to 11.13 mm (see Table 16). The relatively thick bases, constructed to be flat

Table 23: Thickness of Rim, Body, and Base Sherds in the Plain, Utility, and Fine Wares

Ware	Rim (mm)	Body (mm)	Base (mm)
Plain Ware	6.40 ± 0.66 (n = 7)	6.54 ± 0.82 (n = 195)	10.19 ± 0.94 (n = 18)
Utility Ware	6.56 ± 0.81 (n = 13)	6.79 ± 0.76 (n = 74)	-
Fine Ware	5.57 ± 0.87 (n = 6)	6.24 ± 0.6 (n = 37)	-

and disk-shaped for stability, would have been advantageous when manufacturing and using sturdy and durable vessels for cooking, storage, and food serving needs (Figure 26).

The only significant difference between the wares in vessel wall thickness is with the fine ware rim sherds, which are, on average, ca. 15–18 percent thinner (some engraved sherds are less than 4 mm thick) than the rim sherds from plain wares and utility wares (see Table 23). The thicker rims on the utility ware vessels and plain ware vessels would have been well suited to repeated handling and lifting, and in their resistance to breakage and fracturing from serving and stirring utensils. Body sherds generally have the same mean wall thickness regardless of the ware, and body wall thickness (again, except for the fine wares) differs little from rim wall thickness. It is suspected that the height and volume of vessels made by the Middle Caddo potters at the site, regardless of their intended function for the cooking and serving of cooked foods, was comparable, thus dictating in part the necessary vessel wall thicknesses for the rim and body.

In general, there is a trend in Caddo vessels for vessel body walls (irrespective of the rims) to increase in thickness from the upper body to the lower body (which is probably the case here), and then the base (which is the thickest part of the vessel). This suggests that the Caddo vessels made and used at 41SM404 may have been constructed from the bottom up, with the lower portion of each vessel thicker, although not considerably, than the upper part (e.g., Krause 2007:35). Smoothing and burnishing of vessel walls before and after firing may have decreased the relative differences in wall thickness from the rim and the body in this particular assemblage; the vessel base was likely constructed separately and then joined to the constructed vessel body.

Ceramic Pipe Sherds

There are two sherds from Red River long-stemmed ceramic pipes (see Hoffman 1967) in the assemblage from 41SM404. The absence of elbow pipe sherds is noteworthy, because they are a style of ceramic pipe manufacture that began to be popular after ca. A.D. 1350 in East Texas and elsewhere in the Caddo area (see Hoffman 1967; Perttula 2010c; Rogers and Perttula 2004), but are virtually the exclusive form of clay pipe made by the Caddo from the fifteenth century A.D. on. An examination of the clay elbow pipes from mortuary contexts in the upper Neches River basin (see Perttula 2010c), from cemeteries of known age, indicates that the earliest elbow pipes (Var. A) are

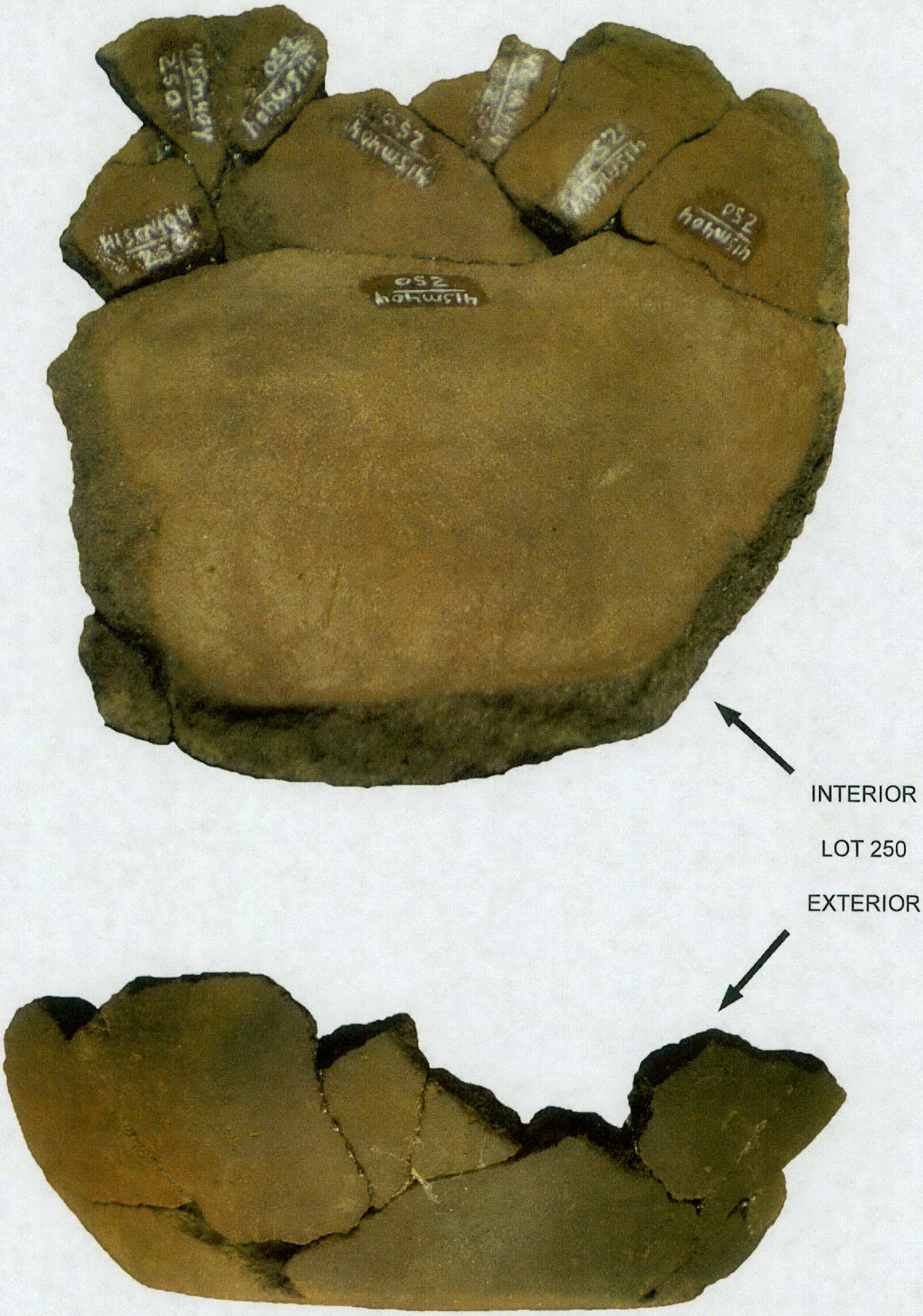

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Figure 26

SITE 41SM404
CERAMIC BASE

L:\Projects\Hel\CLIENTS\NET RMA\Testing at 41SM404\cad\Figure 26_Lot 250 Ceramic Base

Drawn by: C. Wallace

plain L-shaped forms. Radiocarbon and thermoluminescence dates on sherds indicate that L-shaped pipes at the Lang Pasture site (41AN38) date in the fourteenth century A.D., from ca. A.D. 1320 to 1400. In other upper Neches River basin sites of known age, Var. A pipes are restricted to pre-A.D. 1480 Frankston phase components.

The first of the long-stemmed pipe sherds is the flat distal stem sherd of a likely var. Haley pipe (see Hoffman 1967:10 and Figure 5), based on its 11.9-mm stem diameter (Figure 27). The pipe is bone tempered, and the exterior surface has been well smoothed.

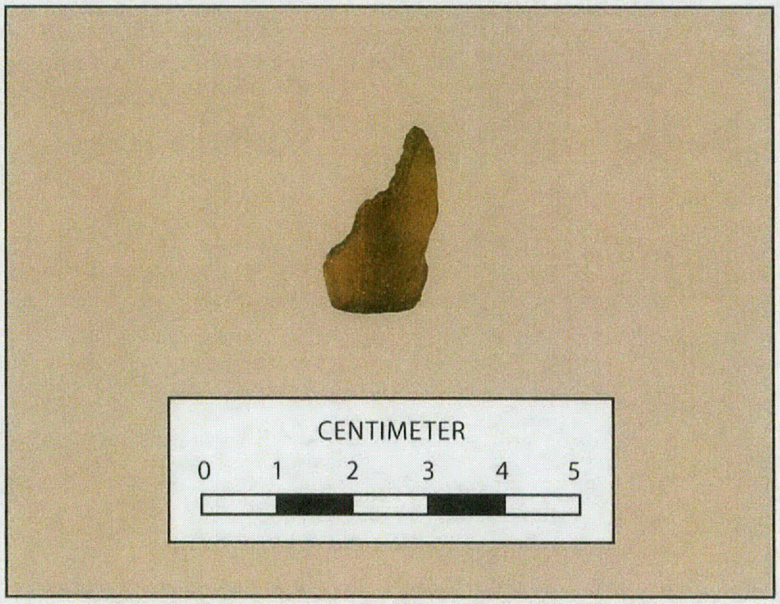

Figure 27. One of the ceramic pipe sherds from 41SM404.
Provenience: Unit 15, Level 4/Lot 225.

The second long-stemmed pipe sherd is from Unit 3 (Level 2/Lot 133). It is a fragment of the stem, but no stem hole diameter could be determined; the stem wall is 2.8 mm thick. This sherd came from a pipe that was grog tempered and fired in a reducing environment

Discussion and Assemblage Comparisons

Cultural Affiliation

Hart and Perttula (2010) have posited that there is a distinctive Middle Caddo ceramic stylistic tradition in East Texas, embodied in its engraved fine ware vessels found in burial mound mortuary contexts here and at other nonmound cemeteries, as well as in its utility wares (mainly seen in the popularity of brushed vessels) and fine wares from domestic contexts, that comprise a regional style zone. By style zone, Hart and Perttula (2010) mean a single, coherent, community of technological and stylistic practice specific to the peoples of a given region. The East Texas style zone is consistent with a broad unity in culture and material culture production, as well as a shared

native history, one developed through centuries of intermarriage, trade, transmission of learning, and other kinds of reciprocal relationships.. This same broad area of East Texas was occupied in historic times by numerous Caddo groups that were affiliated with the Hasinai Caddo (Bolton 1987; cf. Swanton 1942), including the Nasoni, Nadaco, Hainai, and Nacogdoche.

The prehistoric Caddo settlers at 41SM404 shared a common ceramic heritage with other prehistoric and historic Caddo groups living in East Texas, particularly with other Caddo living in the upper part of the Sabine and Neches River basins (Figure 28), but also in a broader sense with Caddo sites in the Angelina (Hart and Perttula 2010; Perttula 2009a), Attoyac Bayou (Perttula, ed. 2008), Lake Sam Rayburn (Jelks 1965), Toledo Bend Reservoir (Woodall 1969), and a wide range of sites in the Sabine and Big Cypress stream basins (Perttula and Rogers 2007:Figure 1). In each of these areas, brushing is an important decorative component in the utility wares only after ca. A.D. 1250, and the proportion of brushed pottery appears to increase through time all the way through the Historic Caddo period after ca. A.D. 1680. Ceramics at many of these sites, especially in the Angelina, Attoyac, and middle Sabine River basin, have high proportions of burned bone temper. However, north of the Sabine River, in the upper Sabine River basin, and west in the upper Neches River basin, by contrast, grog was always the preferred temper in prehistoric and early historic Caddo ceramic assemblages (Perttula 2010c:Figure 6-70). This area (see Figure 28) appears to be the most likely geographic extent of Caddo groups with a ceramic tradition much like that identified at 41SM404: moderate amounts of brushed pottery; utility wares comprised more commonly of incised, punctated, and incised-punctated elements and motifs; heavy use of grog temper in vessel manufacture; a distinctive set of fine wares, including red slipping, geometric and hatched engraved elements and motifs, and early varieties of engraved vessels that compare favorably to Poynor Engraved in the upper Neches River basin.

In these areas where different tempering materials were preferred by contemporaneous Caddo groups, there is nevertheless a broad similarity in decorative styles, in both the fine and utility wares, attesting to a wide area of cultural interaction and transmission. Among the fine wares, these include hatched or crosshatched curvilinear and vertical ladders or narrow panels (see Gadus et al. 2006; Hart 1982; Haskins and Walters 2001; Middlebrook 1994, 1997; Nelson and Turner 1997; Perttula 2004a, 2008; Walters 1997, 2006; Walters and Haskins 1998), as well as hatched and crosshatched triangles, pendant triangles, or rectangular panels with engraved triangles (Gadus et al. 2006; Hart 1982; Nelson and Turner 1997; Perttula 2004a, 2008; Turner 1997; Walters 2006; Walters and Haskins 1998, 2000). In some instances, there are engraved vessels with vertical and triangular panels filled with concentric circles (Turner 1997). A number of the engraved fine ware vessels have horizontal interlocking, slanting, and vertical scrolls (Gadus et al. 2006; Hart 1982; Middlebrook 1994, 1997; Nelson and Turner 1997; Perttula, ed. 2008; Turner 1997)—including negative S-shaped scrolls (Gadus et al. 2006; Middlebrook 1994, 1997; Perttula 2004a; Perttula, ed. 2008)—as their principal motif, although these are not common at 41SM404. There are also rayed circles/sun elements (Gadus et al. 2006; Hart 1982; Haskins and Walters 2001; Middlebrook 1994,

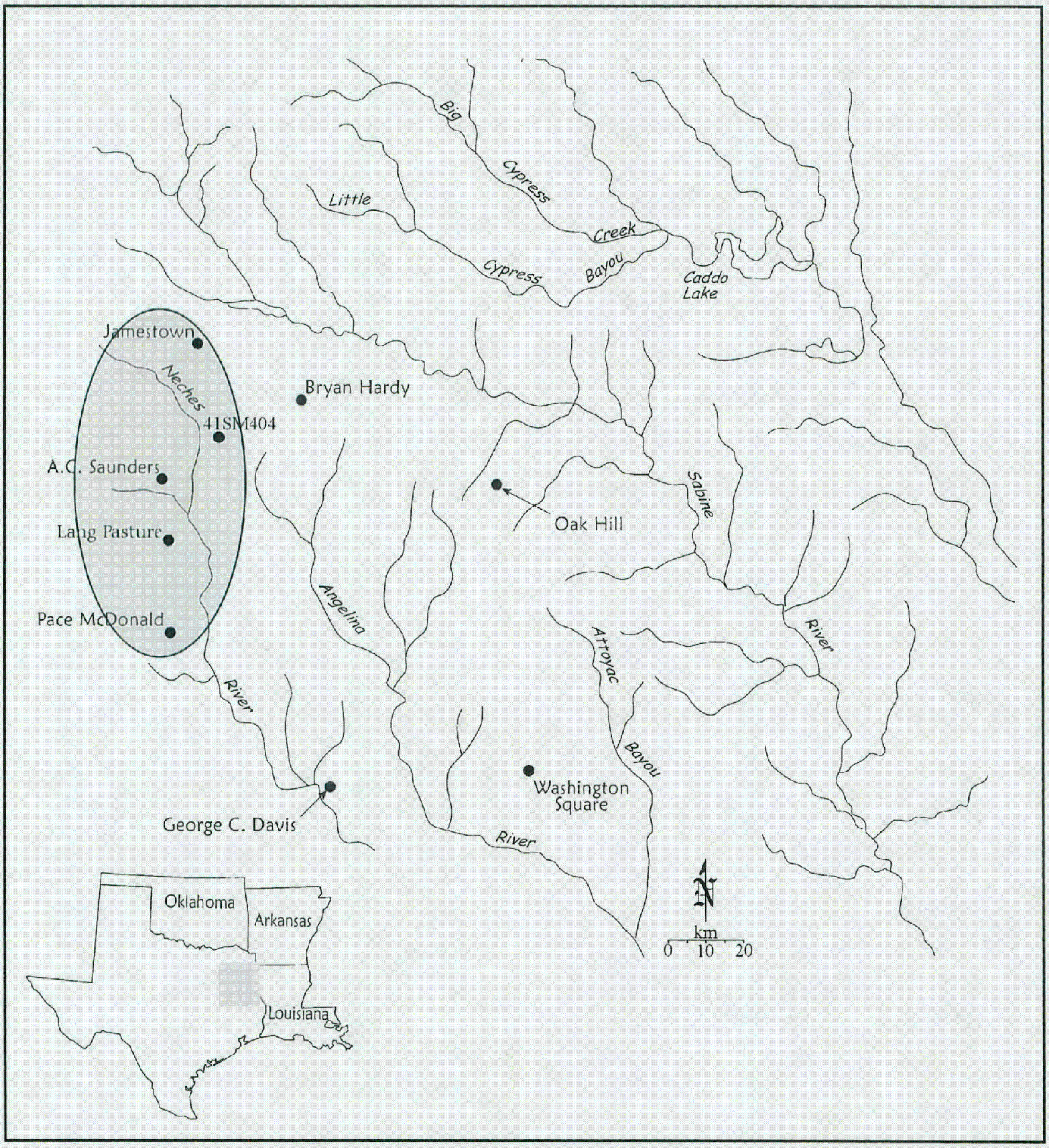

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Figure 28

GENERAL AREA OF CERAMIC SYTLISTIC AFFILIATION OF THE 41SM404 ASSEMBLAGE

L:\Projects\He1\CLIENTS\NET RMA\Testing at 41SM404\cad\Figure 28

Drawn by: Lance Trask

1997; Nelson and Turner 1997; Turner 1997; Walters 1997, 2006) and the swastika cross-in-circle (Gadus et al. 2006; Hart 1982; Middlebrook 1994, 1997; Perttula, ed. 2008; Perttula et al. 2009; Turner 1997; Walters 2006).

Some of these engraved fine wares have motifs and decorative elements that have been recognized as having iconographic significance (Lankford 2007; Philips and Brown 1978:146–156; Reilly 2004). In recent years, figural representations of rattlesnakes on engraved Caddo vessels mostly dating to ca. A.D. 1200–1400 have been documented from at least 16 different Caddo sites, almost all of them in two clusters in northeastern Texas (Walters 2006:Figure 16). Site 41SM404 lies near the Sabine River cluster of sites with engraved rattlesnake vessels, although it does not have engraved rattlesnake motifs and elements in the fine ware sherds.

Age of the Caddo Occupation

Various lines of evidence were called upon in an effort to establish the chronological age of the 41SM404 occupation with its associated ceramic assemblage. First, various stylistic and technological attributes and indices from this site's ceramic assemblages were compared to other domestic Caddo sites in the upper Neches River basin. These attributes and indices include such things as the styles of ceramic pipes present in the assemblage, as well as the range and character of the fine ware and utility ware decorative elements in the 41SM404 assemblage, the percentage of brushed sherds found in the decorated sherd sample, the percentage of bone temper in the assemblages, the percentage of wet-paste decorations other than brushing (i.e., incised, punctated, appliquéd, neck-banded, etc.), the plain/decorated sherd ratio (P/DR), and the brushed sherd/wet paste decorated sherd ratio.

The ceramic pipe data from 41SM404 indicate that long-stemmed pipes were still in use, rather than elbow pipe forms. The latter became popular after ca. A.D. 1350 (Rogers and Perttula 2004), suggesting that 41SM404 was likely abandoned before the mid-fourteenth century. Long-stemmed Red River style pipes had a long history of use in the Caddo area, being first made ca. A.D. 800. The particular variety of long-stemmed pipe found at 41SM404 is var. Haley, a Middle Caddo (ca. A.D. 1200–1400) Red River long-stemmed pipe.

From the comparisons of ceramic attribute data, six different groups of upper Neches River ceramic assemblages can be seriated (see O'Brien and Lyman 1999) from oldest (Group VI) to youngest (Group I). These groups seem to reflect temporal changes due to the high frequency of Late Caddo Frankston phase decorated types, such as Poynor Engraved, Maydelle Incised, Bullard Brushed, Hume Engraved, and engraved effigy vessels, that are found in the Group II-IV sites (corresponding to the early, middle, and late parts of the Frankston phase)—as well as Patton Engraved sherds from sites in Group I—and the occurrence of Early and Middle Caddo types such as Canton Incised, Dunkin Incised, Holly Fine Engraved, and Pennington Punctated-Incised in the Group V and VI

upper Neches River sites (Table 24), as well as cf. Poynor Engraved sherds in components in Group , including Lang Pasture (Perttula 2010b) and 41SM404.

This particular seriation, with three different temporal groupings of Frankston phase sites and one group of Allen phase sites, is also supported by differences in (a) the proportions of Poynor Engraved varieties, Patton Engraved, engraved effigy vessels, Maydelle Incised, La Rue Neck Banded, and Bullard Brushed in upper Neches River Caddo burials (Perttula 2010b), (b) differences in the relative frequencies of common vessel forms in Poynor and Patton Engraved vessels (Kleinschmidt 1982:Figure 24), as well as (c) the occurrence of European trade goods. Corbin (2007) considers the Group I-IV Caddo sites part of an upper Neches River cluster that represents a conglomeration of constituent groups that share a broadly similar sociopolitical organization through time and space (see Story and Creel 1982:30–34).

The George C. Davis site, one of the premier Caddo civic-ceremonial centers in East Texas, but situated farther downstream from 41SM404 on the Neches River (see Figure 16), may also have a component that dates to some part (ca. A.D. 1200–1300) of the Middle Caddo period, and has a ceramic assemblage that may be part of this East Texas ceramic tradition, although red-slipped sherds are not at all common in the ceramic assemblage (Stokes and Woodring 1981:222–223). Story (2000:13–14) suggests there are "late Alto phase" ceramics (i.e., dating after ca. A.D. 1200) in certain areas of the site that include "brushed utility wares, a hallmark of the Frankston phase, as well as Maddox Engraved, Pease Brushed-Incised, and other pottery usually associated with the Middle Caddoan Bossier phase." Stokes and Woodring (1981:206) indicate that this collection of ceramics also includes those with incised or punctated panels as well as appliquéd strips. At the George C. Davis site, interestingly, the Maddox Engraved sherds from "late Alto phase" contexts are described as having narrow bands (either straight or curvilinear) filled with cross-hatched lines (Stokes and Woodring 1981:190—191), very similar to several of the decorative elements in the 41SM404 fine wares.

It has been shown repeatedly in Caddo ceramic studies in East Texas that the proportion of brushed sherds in decorated sherd assemblages steadily increases through time, beginning after ca. A.D. 1250, during the occupation of the Group V Caddo sites (including 41SM404, and after the principal Early Caddo occupation ended at the George C. Davis site, i.e. after ca. A.D. 1250—1300). In the well-dated A.D. 1320—1400 Middle Caddo component (the northern area) at the Lang Pasture site (41AN38), brushed sherds comprise 26 percent of the utility wares (see Table 24). Brushed sherds comprise between 10.9 and 26.1 percent of the decorated sherds in Group V sites, and wet-paste sherds (i.e., incised, punctated, etc.) account for between 50.3 and 72.7 percent of the decorated sherds in these assemblages; 41SM404 falls comfortably in Group V of the Upper Neches River basin ceramic seriation. P/DR values range from 1.73 to 3.97 (see Table 24). By the early fifteenth century A.D., however, Caddo potters in the upper Neches River basin began to manufacture considerable numbers of jars with brushed vessel bodies and rims (Perttula 2010b).

Table 24: Comparative Sherd Assemblage Data from Selected Upper Neches River Basin Caddo Sites

Site	No. of Decorated Sherds	% Brushed*	% Bone Temper	% Wet-paste Decorations	P/DR	Brushed/ Wet Paste Ratio
GROUP I (Allen phase, Historic Caddo, with Patton Engraved), ca. post-A.D. 1650						
41CE421	1805	88.1	?	8.6	0.30	9.10
Pine Snake	305	85.2	5.7	8.8	0.51	9.63
Blue Branch	49	84.0	?	6.1	0.57	13.67
41CE354	474	82.7	3.1	8.9	0.20	8.14
GROUP II (late Frankston phase), ca. A.D. 1560–1650						
41HE22	228	85.5	?	7.5	0.62	11.5
Henry Lake	188	81.9	3.2	7.3	0.48	11.0
Attaway	814	84.4	?	10.6	1.71	8.0
Debro	311	80.0	?	10.3	0.14	7.75
41SM91	179	82.7	?	13.4	0.55	6.17
A. C. Saunders	5750	75.2	15.5**	14.2	0.21	5.30
William Sherman	525	75.8	?	16.2	0.44	4.68
GROUP III (middle Frankston phase), ca. A.D. 1480–1560						
Forest Drive	1693	68.6	?	21.9	0.56	3.12
Halbert	1757	65.8	2.6	26.3	0.70	2.51
Woldert	1730	62.7	0.0	28.8	0.72	2.19
Ferguson	4116	60.8	<1.0	27.9	0.61	2.17
GROUP IV (early Frankston phase), ca. A.D. 1400–1480						
41AN38+	1216	57.7	?	26.1	1.28	2.21
Tomato Patch	912	49.2	?	41.7	1.50	1.21
41SM88	95	37.9	?	49.5	1.53	1.31
Mitchell, Area D	54	32.1	0.0	33.3	1.37	1.50
41HE337	149	35.6	5.6	45.6	2.25	0.78
GROUP V (Middle Caddo period), ca. A.D. 1200–1400						
41AN38++	1356	22.3	?	50.3	1.99	0.44

Table 24 (Cont'd)

Site	No. of Decorated Sherds	% Brushed*	% Bone Temper	% Wet-paste Decorations	P/DR	Brushed/ Wet Paste Ratio
41SM404	448	16.0	8.5	60.7	1.73	0.26
41SM73	165	26.1	?	72.7	2.61	0.37
White Mule	1404	18.5	1.5	63.7	2.61	0.29
41HE139	40	17.5	8.1	65.0	2.51	0.33
Broadway, Z1/2	256	10.9	28.8	70.0	3.97	0.16
GROUP VI (likely Early Caddo period), ca. pre-A.D. 1200						
Broadway, Z3	155	9.7	32.3	73.5	3.80	0.13
Mitchell, Areas A–C	56	1.3	12.0	65.7	1.71	0.03
41SM87	36	0.0	?	69.4	4.44	0.00

Sources: Anderson et al. 1974; Cliff et al. 2004; Johnson 1961; Kleinschmidt 1982; Perttula 2009b, 2010c; Perttula and Middlebrook 2009; Perttula and Nelson 2004b, 2008a, 2008b; Shafer 1981; Walters 2010

P/DR = plain/decorated sherd ratio; % brushed* represents the percentage of brushed sherds among all the decorated sherds; + southern area; ++northern area; **based on the analysis of vessel batches, not a detailed analysis of all the sherds from the site (see Kleinschmidt 1982)

The Lake Palestine ceramic assemblages, and those from nearby sites that have been recently analyzed in the upper Neches River basin (41CE324, see Perttula and Middlebrook 2009; and 41HE337 in the upper Caddo Creek basin, see Perttula 2009b), especially those that date to Frankston phase times (Groups II–IV), share several characteristics that make clear the character of an upper Neches River basin Caddo ceramic tradition that dates from ca. A.D. 1400 to the late seventeenth century, a tradition that follows from the Group V ceramics from the same region. The decorated and plain sherd assemblages are (1) almost exclusively grog-tempered; bone-tempered pottery comprises less than 6 percent of the sherds, where that information is available; (2) rushed utility ware pottery dominates the decorated sherd assemblages, accounting for between 32 and 85 percent of all the decorated pottery (Perttula 2010b:Figure 6-68 and Table 6-38); (3) fine ware vessel sherds generally account for less than 10 percent of the decorated sherds, and their frequency decreases through time; (4) wet paste decorations on sherds are also more abundant than fine wares, accounting for between 7.5 and 49.5 percent of the decorated sherds, by site, and again decreasing in frequency through time; (5) at the Lake Palestine sites, fingernail punctated sherds are rare (less than 3 percent) at each site (Anderson et al. 1974); and (6) P/DR values range from only 0.14 to 2.25, with most of the sites having P/DR values less than 1.53 for the ca. A.D. 1400–1480 Caddo sites and less than 0.72 for the ca. A.D. 1480–1650 Caddo sites. This indicates that Lake Palestine Caddo sites did not have many plain ware vessels. Generally speaking, the lower the P/DR value, the higher the proportion of brushed sherds in the Lake Palestine ceramic

assemblages, and the younger the age of the ceramic assemblage. The engraved fine wares are Poynor Engraved and Hood Engraved. By the late seventeenth century, Caddo sites in the upper Neches River basins have ceramic assemblages where brushed sherds account for more than 82 percent of the decorated sherds (see Table 24).

To attempt to establish the chronological age of the 41SM404 occupation with its associated ceramic assemblage, stylistic and technological comparisons were made with (1) other Caddo ceramic assemblages in the upper Neches River basin; (2) the range and character of the fine ware and utility ware decorative elements observed in the 41SM404 assemblage; (3) the occurrence of red-slipped ceramics, a distinctive feature of a number of Middle Caddo period sites in the upper Neches and upper Sabine River basins in East Texas; and (4) temporal evidence for the use of either long-stemmed pipes or elbow pipes in the region.

Drawing these disparate pieces of ceramic pipe and ceramic vessel decorative data evidence together, it appears likely that 41SM404 was primarily occupied in the fourteenth century A.D., probably somewhere in the span from ca. A.D. 1300 to 1350, during the middle to latter part of the Middle Caddo period. This temporal interval is supported by (a) the continued use of long-stemmed Red River style pipes and the absence of the earliest form of elbow pipe, which dates from ca. A.D. 1350, (b) a moderate proportion of brushed utility wares, (c) more incised, incised-punctated, and punctated utility wares in the assemblage that are likely from Canton Incised and Dunkin Incised types, or local variations of these types, (d) the regular use of red-slipped fine wares, red-slipping being a consistent feature of upper Neches and upper Sabine River Caddo assemblages dating to the Middle Caddo period, and (e) the range of engraved fine ware sherds, some of which are from vessels with elements and motifs that compare favorably with early varieties of Poynor Engraved. At the Lang Pasture site, these varieties are particularly common in a component there that dates from ca. A.D. 1320 to 1400, overlapping with the estimated age of the 41SM404 ceramic assemblage.

How does the ca. A.D. 1300—1350 temporal estimate compare with the radiocarbon results from 41SM404 (Table 25)? First, some parsing of the radiocarbon age ranges is warranted. The Beta-289203 assay obtained calibrated 2-sigma age ranges (A.D. 1680–1740, 1800–1940, and 1950–1960) from the bulk organics in a stylistically clear Middle Caddo period engraved bottle sherd, and is anomalous in the extreme. The date is anomalous for several reasons, including the fact that the age ranges (especially those from A.D. 1800 to 1940 and A.D. 1950 to 1960) pertain to periods when Caddo Indians were not even living in this part of East Texas, or in fact any part of Texas; the Caddo were removed in 1859. The A.D. 1680–1740 age range could be considered plausible as it does fall within a period of time where Caddo groups were still living in the upper Neches River basin. However, all those groups were manufacturing Patton Engraved pottery—and had other distinct functional and stylistic characteristics (Perttula 2010: Table 23)—and no Patton Engraved pottery sherds were identified in the large assemblage of decorated sherds. Thus, the A.D. 1680–1740 age range is not archeologically plausible given the preponderance of available archeological

Table 25: Radiocarbon Dates, from Youngest to Oldest in Age

Lab No.	1-sigma cal (A.D.)	2-sigma cal (A.D.)	cal Intercept (A.D.)	Material
B-289203	1700–1720, 1820–1920, 1950–1960	1680–1740, 1800–1940, 1950–1960	1960	Ceramic sherd, bulk organics; Caddo bottle sherd; crosshatched engraved zone
B-289206	1420–1450	1410–1460	1440	Ceramic sherd, bulk organics; Caddo rim sherd, cf. Poynor Engraved, early variety
B-289208	1300–1370, 1380–1400	1290–1420	1320, 1350, 1390	Charred maize cob fragment
B-289204	1280–1300, 1370–1380	1270–1320, 1350–1390	1290	Charred maize cob fragment
B-289202	1260–1290	1230–1300	1280	Ceramic sherd, bulk organics; opposed incised Caddo utility ware rim sherd
B-289207	1170–1240	1060–1080, 1150–1270	1210	Ceramic sherd, bulk organics; Caddo jar utility ware, brushed body sherd
B-289205	770–880	690–900	780	Charred black walnut hull fragment

information from 41SM404. I suggest that this date is not chronologically relevant in establishing the absolute age of 41SM404. Since there are so many factors, according to Darden Hood of Beta Analytic Inc. (Hood 2010), that are at play when attempting to date organics in the clay paste, it is impossible to hazard what might account for the anomalous date.

Then, there is the matter of Beta-289205, with a 2-sigma calibrated age range of A.D. 690–900, and a calibrated intercept of A.D. 780. If this date is archeologically accurate, given the context and the contents of the dated sample, this calibrated date suggests that 41SM404 was used by aboriginal peoples at or near the end of the Woodland period. The Woodland period appears to have ended between ca. A.D. 800 and 850 in East Texas.

During the excavations at 41SM404, two dart points were recovered that suggest the site may have been occupied as late as the latter part of the Woodland period (ca. A.D. 500–700, based on Turner and Hester [1999:113, 136]): single examples of Kent and Ellis-like points. However, no obvious or possible diagnostic Woodland period ceramic sherds were detected in the 41SM404 ceramic assemblage, and in fact, ceramic sherds on Woodland period sites in the upper Neches River occur only in very low densities, even on multicomponent Woodland period sites (Perttula and Nelson 2004: Shafer and Walters 2010; Walters 2009).

On the basis of the two dart points from 41SM404, then, the A.D. 690–900 radiocarbon age range may be from a late Woodland feature at the site, or at least may be from a concentration of charred plant remains buried and preserved sometime at the latter end of the Woodland period. It is not associated with the later prehistoric Caddo occupation at the site.

The remaining five radiocarbon age ranges and calibrated intercepts from 41SM404 (see Table 25) represent the best cases for establishing the absolute age of the Caddo occupation at the site, an occupation I previously estimated took place between ca. A.D. 1300–1350 (Perttula 2010). Two of the radiocarbon assays are on charred maize from Caddo features, while the other three of the radiocarbon assays are on bulk organics from decorated Caddo sherds characteristic of the 41SM404 decorated sherd assemblage as a whole.

The charred maize age ranges from this Caddo component are very consistent and tightly spaced, with calibrated intercepts that range from A.D. 1290, 1320, 1350, to 1390. The 1-sigma calibrated age ranges are as early as A.D.1280–1300 to as late as A.D. 1380–1400, while the 2-sigma age ranges are from as early as A.D. 1270–1320 to as late as A.D. 1290–1420. The 1-sigma calibrated age ranges overlap between A.D. 1300 and 1370, and the 2-sigma calibrated age ranges overlap between A.D. 1270 and 1390. These dating results on the charred maize indicate that there is a 95 percent chance that the primary occupation at 41SM404 took place throughout the fourteenth century A.D., during the latter half of the Middle Caddo period. Although two charred maize samples hardly make for a robust statistical sampling of the site, the age estimate offered on the basis of the analysis of the ceramic plain and decorated sherds and the ceramic pipes does fall comfortably within the 1- and 2-sigma calibrated age ranges on these samples of charred maize.

The calibrated age ranges on bulk organics from the paste of three decorated Caddo sherds have a much wider temporal range than do the calibrated charred maize dates. First, the calibrated intercepts range from A.D. 1210, 1280, to 1440, a span of 230 years; the maize calibrated intercepts have a span of only 100 years. Second, the 1-sigma calibrated age range of the directly dated sherds range as early as A.D. 1170–1240 to as late as A.D. 1420–1450, a period of 280 years, while the 2-sigma age ranges are from as early as A.D. 1060–1080 to as late as A.D. 1410–1460, a maximum 400-year age range. None of the three dated sherds have 1-sigma calibrated age ranges that overlap with each other, and only two of the three sherds have 2-sigma calibrated age ranges that overlap at all, and that is only between A.D. 1230–1270 and A.D. 1410–1420 (see Table 25). It is particularly anomalous that the oldest age range of the three sherds is on a brushed sherd (2-sigma age ranges of A.D. 1060–1080 and A.D. 1150–1270). Brushing makes its appearance as a common utility ware on Caddo sites in East Texas after ca. A.D. 1250, but seriation of sites in the area indicate that brushed utility ware became more important (percentage-wise) after A.D. 1400. Perhaps one of the oldest examples of brushed pottery on 41SM404 happened to have been selected for dating, but this seems unlikely; of course, it would take 10–20 more radiocarbon dates on brushed pottery from the site to be able to establish with confidence the temporal range of this utility ware in the Caddo component.

These dating results on the ceramic sherds, which are directly contradicted by the calibrated maize age ranges discussed above, if viewed as accurate in an archeological sense, would indicate that the Caddo occupation at 41SM404 took place at two different times in the past, once in the thirteenth century and again in the early fifteenth century. The age estimate offered on the basis of the analysis of the ceramic plain and decorated sherds and the ceramic pipes by Perttula (2010) does not fall within the 1- and 2-sigma calibrated age ranges of the directly dated ceramic sherds.

How do we evaluate these contradictory calibrated age range results based on the analysis of two different materials (maize or bulk organics)? In terms of precision, one would have to favor the charred maize dates simply because their context is known, and it is clear what the source of the organic materials were that were being dated, the charred corn remains themselves. This is not the case for the dating of the bulk organics from the paste of three sherds from 41SM404. This lessens their reliability, as there is no means by which we can evaluate or account for the factors behind the differences in their calibrated age ranges. This may not matter if one is of the opinion that the prehistoric Caddo component at 41SM404 represents the product of two or three chronologically distinct Caddo occupations. However, there is no evidence in the 41SM404 ceramics that there are two or three distinct ceramic assemblages that could be correlated with two or three hypothetical Caddo occupations.

Another negative finding concerning the acceptability of the ceramic sherd calibrated age ranges versus those of the maize calibrated age ranges is that of the 230-year spread of calibrated date intercepts represented by the three sherds believed to be from the same culturally and temporally distinct assemblage. This is an unacceptably large range if one accepts that the preponderance of the ceramic sherd assemblage evidence is indicative of a Caddo occupation that represents a single (and likely short-term, 1–2 generations) component within the Middle Caddo period, and not an occupation that lasted the entire Middle Caddo period, and then a few years beyond that.

The inconsistencies encountered in the calibrated age ranges of the bulk dated ceramics from 41SM404 speak directly to the problems associated with clay source variability (Hood 2010). In particular, it brings up some interesting questions about manufacturing behavior. Were Caddo people at this site randomly pulling clay from a number of different sources (i.e., no favored spot or specific clays for specific vessels) or is there just a lot of variability within any particular clay source? It also may be that certain tempering agents affect firing temperatures enough to account for slight shifts in the calibrated age ranges. However, addressing these questions calls for more detailed studies of clay sources in the region and points out the importance of pairing petrographic analyses with the bulk ceramic dating of sherds from Caddo components well dated by independent methods, such as thermoluminescence or the AMS dating of plant remains from contexts where sherds can be selected for bulk ceramic dating. That being said, the direct dating of ceramic sherds does have the potential for adding to our array of systematic dating programs; however, it may be that targeting the dating of residues and fire clouds near the vessel surface may be more productive than the dating of bulk sherd organics (Personal Communication, Jim Abbott 2012). Taking into

account these various lines of reasoning, as well as the likelihood that seven radiocarbon dates from a single site may not be sufficient to establish the age of the occupations at 41SM404 with any reasonable confidence, the most likely age range of the primary Caddo occupation at 41SM404, based on ascertaining chronological age from the analysis of ceramic vessels, vessel sherds, and pipe sherds from this site and many others in East Texas, is ca. A.D. 1300–1390. This is during the latter years of the Middle Caddo period, and this age range is congruent with the notion that the prehistoric Caddo occupation was not lengthy, and that the ceramic assemblage has many characteristics of the latter years of the Middle Caddo period in the upper Neches River basin. One other calibrated age range suggests that 41SM404 was used during the late Woodland period.

Conclusions

Recent archeological investigations at 41SM404 in the upper Neches River basin in East Texas recovered from domestic occupational debris a substantial Caddo ceramic vessel sherd assemblage as well as a few sherds from Red River style long-stemmed ceramic pipes. The spatial distribution of the ceramic sherds at the site suggests the main component had one or two houses and outdoor activity areas in proximity, with a possible small courtyard between the houses. This arrangement of features, the use of space, and the density of ceramic sherds further suggests that 41SM404 may have been occupied for no more than one or two generations by one or two nuclear to extended families.

This ceramic assemblage at 41SM404 is dominated by sherds from plain ware and utility ware vessels (89 percent of the rim sherds are from these two wares) used in the cooking, storing, and serving of foods and liquids, with the remainder of the sherds from engraved and red-slipped fine wares used, but not on the same basis as the plain wares, for the serving of foods and liquids. Vessels are moderate to large in size, suggesting that vessels for the cooking and serving of foods by the Caddo were designed primarily for individual and family use, although occasionally cooking and serving vessels were meant to be used by multiple families, perhaps during times of feasting and ceremonies in the local community.

The decorative style of the Caddo ceramics from 41SM404 indicates that the Caddo potters at the site, or Caddo potters in this immediate locale, were part of an East Texas tradition of ceramic practice, in that the styles apparent in the fine wares and utility wares are part of a distinctive East Texas style zone (see Hart and Perttula 2010). This style zone encompassed Caddo communities and potters that lived primarily in the Neches and Angelina River basins as well as parts of the upper and middle reaches of the Sabine River basin. Detailed comparisons of the decorations on the utility wares and fine wares at 41SM404 with other Caddo sites in this part of East Texas point more specifically to this site sharing decorative styles (particularly engraved fine ware motifs and elements, and the use of red-slipping) with Caddo peoples living in the upper Neches and upper Sabine River basins (see Figure 28). Within this area, there was apparently considerable cultural transmission and interaction between local groups and local groups of potters.

In addition to the sharing of decorative styles for utility and fine ware vessels designed for domestic use, these upper Neches River basin Caddo potters had a shared technology of vessel manufacture. Vessel forms—including jars, bowls, bottles, and carinated bowls—were made by coiling the rim and body walls and placing that part of a vessel atop a separately made flat disk base. The vessels were almost exclusively tempered with grog, added to a clay, silty, or sandy paste, although coarse pieces of burned bone and hematite were added to the clay paste, particularly among the plain ware vessels. Most of the vessels at 41SM404 were smoothed and/or burnished on one or both vessel surfaces (including the base itself), depending upon what type of vessel was being made and how it was to be used; vessel walls were relatively thin and well joined. Low oxygen or reduced firing methods were preferred by the upper Neches Caddo potters for their vessels—as indeed it appears to have been the case among all East Texas Caddo pottery makers—and firing was generally well controlled.

The unique juxtaposition of several different ceramic attributes and artifacts in the ceramic assemblage at 41SM404 were important in attempting to establish the likely period of time when a Caddo group occupied the site. These attributes and artifacts include the presence of only long-stemmed Red River pipe sherds; moderate amounts of brushed utility wares, a plain to decorated sherd ratio of 1.73, and an abundance of wet-paste utility wares (as viewed through an upper Neches River seriation of 29 ceramic assemblages); the occurrence of red-slipped and red-slipped appliquéd fine ware vessel sherds; and the various decorative elements in the fine wares, among them basic geometric designs, hatched and crosshatched zones as a principal element on some carinated bowls and bottles, and a number of sherds with engraved designs that compare favorably to early varieties of Poynor Engraved in the upper Neches River basin that are known from ca. A.D. 1320 to 1400 at another site in this locale (see Figure 28). Taken together, it is thought likely that the principal Caddo occupation of 41SM404 took place in the first half of the fourteenth century A.D., during the Middle Caddo period.

FAUNAL MATERIAL

Faunal material recovered from NRHP testing at site 41SM404 included 50 specimens recovered in 24 level proveniences of units 1, 6, 8, 10, 13, 14, 15, 16, 17, and 18, most commonly in units 1, 14, and 15 (Table 26). Of the recovered specimens, 28 percent (n = 14) could not be identified to any taxonomic category because of their small size, fragmentary nature, and poor condition of preservation. Of the remaining 36 identifiable specimens, 34 were attributable to mammals and 2 were attributable to reptiles.

Of the 34 mammal bones, 24 were attributable to medium-sized mammals (20–120 kilograms [kg] in live weight), numerically accounting for 71 percent of the mammalian total. Only one medium-sized mammal specimen could be identified more specifically. This was a proximal fragment of a radius attributable to white-tailed deer recovered from Unit 14, Level 4. The remaining 23 medium-sized mammal bones could not be further identified taxonomically. The white-tailed deer is

Table 26: Vertebrate Faunal Remains Recovered from NRHP Testing at Site 41SM404

FS No.	Lot No.	Unit	Feature	Northing	Easting	Level	Depth cmbd	Count	Animal	Taxon	Element	Side	Burned	Comments
116		1		-13	110	2	20–30	1	small-medium mammal	Mammalia	unknown	unknown	yes	
118		1	1	-13	110	4	40–50	1	unidentified vertebrate	Vertebrata	unknown	unknown	yes	
130		1		-13	110	4	40–50	1	unidentified vertebrate	Vertebrata	unknown	unknown	yes	
137		1	1	-13	110	5	50–60	3	medium mammal	Mammalia	longbone diaphyseal fragment	unknown	yes	
163		1		50	60	5	50–60	4	unidentified vertebrate	Vertebrata	unknown	unknown	yes	
	173	1	1	-13	110	4-5	40–60	6	small-medium mammal	Mammalia	cranial fragment	unknown	yes	
150		6		-15	128	2	15–25	1	small-medium mammal	Mammalia	longbone diaphyseal fragment	unknown	yes	
165		8		-29	106	1	6–20	2	unidentified vertebrate	Vertebrata	unknown	unknown	yes	
179		10		-32	124	3	25–35	1	medium mammal	Mammalia	longbone diaphyseal fragment	unknown	yes	
215		13		-19	121	8	70–80	1	medium mammal	Mammalia	longbone diaphyseal fragment	unknown	no	
204		14		-9	114	1	0–10	1	unidentified vertebrate	Vertebrata	unknown	unknown	yes	
208		14		-9	114	3	20–30	3	medium mammal	Mammalia	longbone diaphyseal fragment	unknown	yes	
208		14		-9	114	3	20–30	2	unidentified vertebrate	Vertebrata	unknown	unknown	yes	
210		14		-9	114	4	30–40	1	white-tailed deer	*Odocoileus virginianus*	radius proximal fragment	right	no	
212		14		-9	114	5	40–50	1	medium mammal	Mammalia	longbone diaphyseal fragment	unknown	no	
216		15		-19	121	8	70–80	1	unidentified vertebrate	Vertebrata	unknown	unknown	yes	

Table 26 (Cont'd)

FS No.	Lot No.	Unit	Feature	Northing	Easting	Level	Depth cmbd	Count	Animal	Taxon	Element	Side	Burned	Comments
218		15		-14	115	2	10–20	1	unidentified vertebrate	Vertebrata	unknown	unknown	yes	
221		15		-14	115	3	20–30	1	medium mammal	Mammalia	longbone diaphyseal fragment	unknown	no	
226		15		-14	115	4	30–40	1	medium mammal	Mammalia	metapodial diaphyseal fragment	unknown	no	rodent gnawing
226		15		-14	115	4	30–40	3	medium mammal	Mammalia	longbone diaphyseal fragment	unknown	yes	
226		15		-14	115	4	30–40	6	medium mammal	Mammalia	longbone diaphyseal fragment	unknown	no	1 spiral fracture
219		16		-16	121	2	10–20	1	unidentified vertebrate	Vertebrata	unknown	unknown	no	
220		16		-16	121	3	20–30	1	medium mammal	Mammalia	longbone diaphyseal fragment	unknown	yes	
234		17		-16	119	2	10–20	1	medium mammal	Mammalia	rib fragment	unknown	yes	
236		17		-16	119	3	20–30	1	small-medium mammal	Mammalia	longbone diaphyseal fragment	unknown	yes	
239		18		10	112	3	20–30	1	medium mammal	Mammalia	longbone diaphyseal fragment	unknown	no	
239		18		10	112	3	20–30	1	unidentified turtle	Cryptodira	carapace or plastern fragment	unknown	no	
251		20		-15	113	2	10–20	1	small-medium mammal	Mammalia	longbone diaphyseal fragment	unknown	yes	
251		20		-15	113	2	10–20	1	unidentified turtle	Cryptodira	carapace or plastern fragment	unknown	no	
							Total	50						

typically the most common medium-sized mammal species identified in prehistoric assemblages in this region so it is likely that most or all of the remaining medium-sized mammal bones are also deer bones. Other possible candidates in this size range that were present during prehistoric times include wolf, red wolf, or larger examples of dog or beaver. Due to the sandy soil and relatively shallow depth of cultural-bearing strata, intrusive specimens of historic domestic species such as swine are also possible.

The 10 remaining faunal specimens were categorized as representing small to medium-sized mammals, generally within the 5–20-kg live-weight range, Common animals in this size range that occurred in the region prehistorically include beaver, dog, raccoon, coyote, and bobcat.

The only other faunal materials recovered from site 41SM404 were two reptile remains, both carapace or plastern fragments from unidentified turtles.

Cultural Modification

The primary evidence of cultural modification present in the faunal assemblage was burning. Thirty-five bone fragments, or 70 percent of the faunal assemblage, exhibited evidence of burning. All of these bones were burned completely to a light gray, suggesting intentional discard in a fire rather than fortuitous blacking of exposed bone surfaces during cooking for consumption. This method of disposal was probably intended to inhibit flies and insects as well as larger scavenger species. The only other cultural modification observed in the assemblage was spiral fracturing, present on a single medium-sized mammal longbone diaphyseal fragment. Spiral fracturing results from trauma to bones shortly after or shortly before death and is commonly attributable to intentional extraction of bone marrow.

MACROFLORAL ANALYSIS

By Leslie L. Bush, Ph.D., R.P.A.

Thirty-five carbon samples and 5 flotation samples were submitted for identification and analysis from site 41SM404. The site is located west of modern Tyler, Texas, on a toeslope above the Indian Creek floodplain. Indian Creek flows into the Neches River via Lake Palestine.

Site 41SM404 is located in the Post Oak Savannah region of Texas. This vegetative region has affinities to both deciduous forests and grasslands (Thomas 1962:9). Understory vegetation in this region is typically tall grass, and there may have been fewer trees in the past than today. Climax grasses include little bluestem (*Schizachyrium scoparium*), indiangrass (*Sorghastrum nutans*), and switchgrass (*Panicum virgatum*) (Diggs et al. 2006:118). Soils in the site area are sands and sandy loams where the primary trees would have been post oak (*Quercus stellata*, a white group oak), blackjack oak (*Q. marilandica*, a red group oak), and black hickory (*Carya texana*). The floodplain forest near Indian Creek would have included tree species that thrive under wetter conditions such as sycamore (*Platanus occidentalis*), elms (*Ulmus* spp.), green ash (*Fraxinus pennsylvanica*), and

water oak (*Quercus nigra*). Riparian understory plants include vines such as grapes (*Vitis* spp.) and poison ivy (*Toxicodendron radicans*), river cane (*Arundinaria gigantea*), and various grasses and sedges (Diggs et al. 2006:122)

Methods

Flotation samples from 41SM404 were processed by personnel from Macrobotanical Analysis in a bucket-to-bucket flotation system. The 15.5-liter sample was split into thirds for more-effective processing, and the three subsamples were recombined in laboratory analysis. Light fractions were caught in a triangular mesh with maximal openings of 0.5 mm, and heavy fractions were caught in 1.0-mm mesh. Heavy fractions were examined under the microscope for carbonized plant material, which was then added to the light fractions. Chert flakes and ceramic sherds were extracted and placed in smaller bags within the heavy fraction bag.

Flotation light fractions (along with any additional material culled from the heavy fraction) were sorted according to standard procedures at the Macrobotanical Analysis laboratory in Manchaca, Texas (Pearsall 2000). Each sample was weighed on an Ohaus Scout II 200 x 0.01 gram (g) electronic balance before being size-sorted through a stack of graduated geologic mesh. Material that did not pass through the No. 10 mesh (2-mm square openings) was completely sorted, and all carbonized botanical remains were counted, weighed, recorded, and labeled. Uncarbonized botanical material that did not fall through the 2-mm mesh was weighed, recorded, and labeled as "contamination." Material that fell through the 2-mm mesh ("residue") was examined under a stereoscopic microscope at 7-45X magnification for carbonized botanical remains. The presence of identifiable plant material that had not been previously identified in the material larger than 2 mm was noted on laboratory forms. Uncarbonized macrobotanical remains were recorded on a presence/absence basis on laboratory forms.

Carbon samples were handled using latex gloves and freshly washed glassware. Contact with paper and other plant products was avoided. Soil without visible charcoal flecks was discarded in the laboratory so that weights would better reflect the carbon content of the sample (e.g., soil scraped from the interior of hickory nutshells). When carbon flecks were visible, the sample was placed on a No. 10 mesh (2 mm). All material that did not fall through the mesh was sorted and identified. Material that did fall through the mesh was examined under the microscope for botanical remains not represented at sizes larger than 2 mm and retained as "residue." Identification of carbonized material proceeded as for flotation samples.

Identification was attempted for all wood charcoal fragments larger than 2 mm from carbon samples and flotation samples. For identification, wood charcoal fragments were snapped to reveal a clean transverse section and examined under a stereoscopic microscope at 28–180X magnification. When necessary, tangential or radial sections were examined for ray seriation,

presence of spiral thickenings, types and sizes of intervessel pitting, and other minute characteristics that can only be seen at the higher magnifications of this range.

Botanical materials were identified to the lowest possible taxonomic level by comparison to materials in the Macrobotanical Analysis comparative collection and through the use of standard reference works (Core et al. 1979; Davis 1993; Hoadley 1990; Martin and Barkley 2000; Musil 1963; Panshin and de Zeeuw 1980). Botanical nomenclature follows that of the PLANTS Database (U.S. Department of Agriculture, Natural Resources Conservation Service [USDA, NRCS] 2010).

Results

Carbon Samples

Botanical remains from carbon samples consisted of wood charcoal, bark, nut hull, nutshell, corn cob parts, and cane (Table 27). The most common woods were oaks, with both the red and white groups represented. Other woods identified were hickory, sycamore, maple, elm, and sweetgum.

Flotation Samples

Uncarbonized (modern) plants. Uncarbonized plant parts were present in the flotation samples and consisted of roots, rootlets, rhizomes, and seeds. The roots, rootlets, and rhizomes are easily interpreted as parts of modern plants currently or very recently growing on the site. Uncarbonized seeds from flotation samples are shown in Table 28. They are a common occurrence on most archeological sites, and they usually represent seeds of modern plants that have made their way into the soil either through their own dispersal mechanisms or by faunalturbation, floralturbation, or argilliturbation (Bryant 1985; Miksicek 1987). Two lines of evidence support this interpretation. First, 16 of the 17 identified taxa are those of weedy annuals common in disturbed areas. (The seventeenth taxon, oak, is also common in the area.) Second, seeds recovered in uncarbonized form were not recovered in carbonized form, as would be expected if fresh seeds and carbonized plant remains both represented ancient human use of plants.

Although the uncarbonized seeds are not of archeological significance, they are noteworthy for methodological reasons. Several of the taxa, including the carpetweed that was present in every sample, have very small seeds, Their presence in the flotation samples indicates that recovery techniques were adequate to recover small archeological seeds even though none were found in these samples.

Carbonized (ancient) plants. In addition to plant taxa already represented in the carbon samples, flotation processing produced four new plant types: corn kernel fragments were recovered in two of the five samples (lots 173 and 253), and black walnut nutshell, a ragweed seed fragment, and a grape seed fragment were recovered in one sample (Lot 173). Plants recovered in flotation samples are shown in Table 29 by count and Table 30 by weight.

Table 27: Plant Remains from Carbon Samples from Site 41SM404

Lot #	State	Plant Part	Botanical Name	Common Name	Count	Weight (g)	Comments
54	Semicarbonized	Bark			2	0.09	not archeological
117	Carbonized	Nutshell	*Carya* sp.*	Hickory	1	0.03	
117	Carbonized	Wood	*Liquidambar styraciflua*	Sweetgum	1	0.07	
118	Carbonized	Rachis	*Zea mays*	Corn	21	0.17	18 cupules, 3 glumes
118	Carbonized	Nutshell	*Carya* sp.	Hickory	22	1.56	
118	Carbonized	Nutshell	Juglandaceae	Hickory/walnut family	6	0.05	
118	Carbonized	Wood	*Carya* sp.	Hickory	1	0.01	
118	Carbonized	Bark			1	0.02	
118	Carbonized	Residue**				0.26	
127	Carbonized	Rachis	*Zea mays*	Corn	11	0.20	11 cupules, 2 glumes
128	Carbonized	Nutshell	*Carya* sp.	Hickory	1	0.09	
130	Carbonized	Nutshell	*Carya* sp.	Hickory	15	1.14	
130	Carbonized	Bark	*Carya* sp.		3	0.07	
134	Carbonized	Nutshell	*Carya* sp.	Hickory	1	0.16	
137	Carbonized	Nutshell	*Carya* sp.	Hickory	3	0.22	
137	Carbonized	Wood	*Quercus* subg. *Lobatae*	Red group oak	2	0.14	
138	Uncarbonized	Indeterminable			2	0.05	not archeological
142	Carbonized	Nutshell	*Carya* sp.	Hickory	2	0.21	
149	Carbonized	Nutshell	*Carya* sp.	Hickory	1	0.11	
149	Carbonized	Wood	*Ulmus americana*	American elm	3	0.13	
151	Carbonized	Nutshell	*Carya* sp.	Hickory	1	0.26	
161	Semicarbonized	Stem	*Arundinaria gigantea*	Cane	5	0.08	carbonized with brown edges; accepted as archeological
176	Carbonized	Wood	Ring-porous hardwood	Ring-porous hardwood	4	0.04	
176	Carbonized	Unknown			7	0.15	
176	Carbonized	Residue				0.16	
178	Carbonized	Bark			1	0.26	

Table 27 (Cont'd)

Lot #	State	Plant Part	Botanical Name	Common Name	Count	Weight (g)	Comments
179	Carbonized	Wood	*Quercus* subg. *Quercus*	White group oak	1	0.05	
180	Carbonized	Wood	*Quercus* subg. *Lobatae*	Red group oak	1	0.11	
181	Carbonized	Nutshell	*Carya* sp.	Hickory	5	0.08	
181	Carbonized	Wood	Hardwood	Hardwood	1	0.22	
185	Carbonized	Nutshell	*Carya* sp.	Hickory	1	0.30	
191	Carbonized	Wood	*Quercus* sp.	Oak	2	0.58	
192	Carbonized	Wood	*Quercus* sp.	Oak	1	0.06	
200	Carbonized	Wood	Diffuse-porous hardwood	Diffuse-porous hardwood	3	0.33	
200	Carbonized	Wood	*Carya* sp.	Hickory	5	0.32	
200	Carbonized	Wood	*Quercus* sp.	Oak	4	0.11	
200	Carbonized	Residue				0.16	
204	Carbonized	Bark			1	0.06	
206	Carbonized	Wood	*Quercus* subg. *Lobatae*	Red group oak	1	0.09	
206	Carbonized	Wood	*Acer* sp.	Maple	5	0.05	
207	Carbonized	Wood	*Carya* sp.	Hickory	1	0.11	
207	Carbonized	Bark			1	0.08	
214	Carbonized	Wood	*Platanus occidentalis*	Sycamore	5	0.26	
221	Carbonized	Wood	*Quercus/Castanea* spp.	Oak/Chestnut	4	0.90	
222	Carbonized	Nutshell	*Carya* sp.	Hickory	1	0.06	
223	Carbonized	Indeterminable			1	0.89	contains sand inclusions
226	Carbonized	Nutshell	*Carya* sp.	Hickory	1	0.10	
226	Carbonized	Wood	*Quercus* subg. *Quercus*	White group oak	4	0.04	
230	Carbonized	Nut hull	*Carya* sp.	Hickory	1	0.11	
251	Carbonized	Nutshell	*Carya* sp.	Hickory	2	0.12	
252	Carbonized	Wood	*Ulmus* sp.	Elm	1	0.06	
254	Carbonized	Wood	*Quercus* subg. *Quercus*	White group oak	1	0.44	
256	Carbonized	Nutshell	*Carya* sp.	Hickory	9	0.47	

*All *Carya* sp. nutshell is thick and *Carya* sp. wood is true hickory; i.e., they are not pecan (*Carya illinoinensis*)

**Soil without visible carbon was discarded in the laboratory so that weights better reflect carbon content. Any soil with visible carbon flecks smaller than 2 mm was examined under the microscope for botanical remains not represented at sizes greater than 2 mm and retained as "residue."

Table 28: Uncarbonized Seeds from Flotation Samples from Site 41SM404

Lot #		172	172	173	177	253	
Feature		2, S wall	2, W wall	1	3	6	
Level		2–3	2–3	4–5	3–4	4	Total
Liters		0.5	0.25	15.5	2.25	3	Occurrences
Mollugo verticillata	Carpetweed	X	X	X	X	X	5
Croton spp.	Croton		X	X		X	3
Cyperus sp.	Flatsedge	X		X	X		3
Lamiaceae	Mint family				X	X	2
Poaceae	Grass family		X	X			2
Asteraceae	Daisy family			X			1
Chamaesyce prostrata	Prostrate sandmat					X	1
Oxalis sp.	Woodsorrel			X			1
Panicodae	Panicoid grass			X			1
Phytolacca americana	Pokeweed			X			1
Portulaca oleracea	Purslane			X			1
Prunella sp.	Selfheal			X			1
Quercus sp.	Acorn			X			1
Rudbeckia hirta	Black-eyed Susan			X			1
Stellaria media	Chickweed			X			1
Strophostyles sp.	Fuzzybean					X	1
Trifolium sp.	Clover			X			1

Table 29: Carbonized Plants Recovered by Flotation from Site 41SM404 (Raw Counts)

Lot #		172	172	173	177	253	
Feature		2, S wall	2, W wall	1	3	6	
Level		2–3	2–3	4–5	3–4	4	Site
Liters		0.5	0.25	15.5	2.25	3	Total
Wood charcoal		*					
Acer sp.	Maple			2			2
Carya sp.	Hickory			2		1	3
Quercus sp.	Oak		1	17	4	7	29
Quercus subg. *Lobatae*	Red group oak			1			1
Quercus subg. *Quercus*	White group oak					8	8
Corn (*Zea mays*)							
Rachis fragments	Cupules and glumes			169		68	237
Seed fragments	Kernels			1		3	4
Nutshell							
Carya sp.	Hickory	1		83		14	98
Juglandaceae	Hickory/walnut family			13	1	4	18
Juglans nigra	Black walnut			7			7
Wild plant seeds							
Ambrosia sp.	Ragweed			1			1
Vitaceae	Grape family			1			1
Indeterminable fragments				11			2
Bark						2	

*present < 2 mm

Table 30: Carbonized Plants Recovered by Flotation at Site 41SM404 (weight in grams)

	Lot #	172	172	173	177	253	
	Feature	2, S wall	2, W wall	1	3	6	
	Level	2–3	2–3	4–5	3–4	4	Site
	Liters	0.5	0.25	15.5	2.25	3	Total
Wood charcoal		*					
Acer sp.	Maple			0.01			0.01
Carya sp.	Hickory			0.01		0.01	0.02
Quercus sp.	Oak		0.01	0.25	0.04	0.03	0.33
Quercus subg. *Lobatae*	Red group oak			0.01			0.01
Quercus subg. *Quercus*	White group oak					0.07	0.07
Corn (*Zea mays*)							
Rachis fragments	Cupules and glumes			1.56		0.43	1.99
Seed fragments	Kernels			0.02		0.03	0.05
Nutshell							
Carya sp.	Hickory	0.03		2.22		0.19	2.44
Juglandaceae	Hickory/walnut family			0.13	0.01	0.04	0.18
Juglans nigra	Black walnut			0.22			0.22
Wild plant seeds							
Ambrosia sp.	Ragweed			0.01			0.01
Vitaceae	Grape family			0.01			0.01
Indeterminable fragments					0.08		0.08
Bark						0.01	0.01

*present <2 mm

Discussion

Wood Charcoal

A total of 4.56 g of wood charcoal was recovered. The wood indicates exploitation of two topographical zones near the site: the uplands, from which oak and hickory woods were collected, and the riparian zone near Indian Creek, which is the likely source of the sycamore, sweetgum, maple, elm, and perhaps some oaks.

Nutshell and Nut Hull

Nutshell was the most common plant part represented on the site, with 7.80 g recovered in total. The vast majority of nutshell consisted of thick-shelled hickory, although black walnut was also present. Hickory nut hull was recovered in a carbon sample (Lot 230). It is probably associated with nut consumption rather than the use of hickory wood as fuel. Unlike pecan hulls, hickory hulls frequently fall with the nut rather than remain on the branch.

Cane

Fragments of river cane were identified in one carbon sample (Lot 161). Cane (*Arundinaria gigantea*) is the only North American member of the bamboo tribe, a woody group of the grass family (Diggs et al. 2006: 836). A facultative wetlands plant, it grows in moist woods and low areas generally. Although river cane is rare today, it was once far more abundant, often occurring in dense, monocultural stands referred to as canebrakes. One Texas canebrake is reported to have been 75 miles long and 1 to 3 miles wide (Diggs et al. 2006:836). Native people used cane in many items, including mats, baskets, and screens to divide rooms, spear shafts, arrow shafts, pipe stems, blow guns, flutes, and blow tubes used in healing (Moerman 1998:104).

Corn

Corn cob parts (cupules and glumes) were recovered in two flotation samples and two carbon samples. As noted above, the two carbon samples also produced the more delicate corn kernels in addition to cob fragments.

Although most corn cob parts were present only as single cupules with or without attached glumes, the flotation sample from Feature 1 yielded three examples of joined cupules. Measurements for these rachis segments are given in Table 31. Of the three rachis segments, Segment 3 is narrower than the other two, indicating a smaller cob and/or larger row number. Comparative measurements from other sites are given in Table 32. The corn from site 41SM404 is typical of the region in that widths are in the 4–8 mm range, and lengths are less than widths (Goldborer 2002). All cupule widths fall below the 8.5-mm cupule width used by many authors to separate larger and smaller varieties of Eastern Complex Corn, the corn type generally recognized for East Texas (Bird and Dobbs 1989; Goldborer 2002).

Table 31: Attached Cupules from Feature 1 (Lot 173), 41SM404

Rachis Segment	Cupule Width (mm)	Total rachis Segment Length (mm)	Average Cupule Length (mm)	Cupule Depth (mm)
1	7.7	9.9	3.3	0.5
	7.9			0.5
	8.2			0.8
2	7.8	7.4	3.7	0.7
	7.8			0.6
3	5.4	9.7	3.2	-
	5.7			0.4
	5.9			0.5

Table 32: Corn *(Zea mays)* Cupule Measurements from Sites in Northeast Texas

Site	Average Cupule Width (mm)	Average Cupule Length (mm)	Reference
Stallings Ranch	5.38	3.06	Bush 2008
Pine Tree Mound	5.26	2.3	Bush 2009
Sha'chahdínnih Lot 52A	9.2	3.3	Goldborer 2002
Sha'chahdínnih Lot 175	5.9	2.4	Goldborer 2002
Sha'chahdínnih Lot 51	8.08	3.8	Goldborer 2002
Sha'chahdínnih Lot 52B	7.3	2.9	Goldborer 2002
Oak Hill Village Feature 86	4.84	3.08	Elson et al. 2004
Oak Hill Village Feature 85	4.7	2.18	Elson et al. 2004
Henry M. Lot 160a	6.9	1.95	Bush 2010
Henry M. Lot 160b	5.37	1.5	Bush 2010
Henry M. Lot 292	6.14	2.3	Bush 2010

Wild Seeds

A ragweed seed was recovered in the Lot 173 flotation sample. As its name suggests, ragweed is a weedy plant that thrives near human habitations. Its presence in the site flora may be the result of accidental carbonization, but the plant also has several medicinal uses (Moerman 1998). A nonmedicinal use is known from Kiowa ethnography where ragweed is reported as a fuel plant, along with sage, in sweat lodges (Moerman 1998).

One fragment of a grape family seed was also recovered from the Lot 173 flotation sample. It is probably grape (*Vitis* sp.) but may be Virginia creeper (*Parthenocissus* sp.). Its presence indicates exploitation of the riparian zone near the site for wild food plants.

Summary

Macrobotanical remains recovered from site 41SM404 consist of wood charcoal, nuts, corn, cane, bark, and seeds of two wild fruits. The data indicate a diet consisting of both wild and agricultural products. Woods from two local ecological zones were exploited for fuel.

DISCUSSION OF SITE

Site 41SM404 appears to be an occupation site dating primarily to the Middle Caddo period, somewhere between about A.D. 1200 and 1400. Although the entire site area measures about 115 m by 107 m (375 x 350 ft), the main area of the site where the highest density of cultural material is located and 19 of the 20 hand-excavated test units were placed is about 40 x 50 m (130 x 165 ft) and occupies the central portion of the site area (see Figure 2). Outside of this area, shovel tests were negative or yielded very small numbers of artifacts. Artifacts found outside of the main area during surface inspection were typically on slopes in eroded areas or artificial cuts and are likely the result of colluvial transport and secondary deposition or deflation. The size of the site and the intensity of occupation probably indicate a hamlet type site.

Although artifacts were recovered from as deep as 105 cmbs, the bulk of the material was recovered between the surface and 30 cmbs with a gradual and consistent diminishment of artifact density below this depth, suggesting that the 0–30-cmbs zone is the origin of the majority of recovered remains and their present position is largely the result of vertical migration in the sandy soil. The shallow depth of the cultural zone is not conducive to integrity of cultural deposits due to impacts associated with historic land clearance and cultivation. The intact elements that were recovered appear to be the lower portions of features that originated in the cultural zone where intact macrofloral remains were recovered. Three of the features were first identified at a depth slightly below 30 cmbs. Feature 2 was the shallowest feature, encountered at a depth of 24 cmbs. Thus the potential for intact living surfaces is very limited, but the potential for partially intact buried features and human burials is much greater. The location of an intact posthole (Feature 4)

indicates the survival of some architectural elements and suggests that more-intense investigation may yield additional data on structure size and configuration within the site.

Although the overwhelming majority of the artifacts are indicative of Middle Caddo period occupation, minor Archaic and Formative Caddo components also appear to be present, represented by three temporally diagnostic dart points and a radiocarbon-dated feature. The southern and northwestern parts of the site exhibited the highest density of lithic artifacts and a lower ratio of ceramic to lithic artifacts and may represent earlier period occupation or activity areas at the periphery of the main area more conducive to discard of lithic manufacturing debris.

The ratio of ceramic to lithic artifacts at site 41SM404 was about 6.3 to 1. Caddo-aged sites exhibit a wide range in the ratio of ceramic to lithic artifacts, from about 15 ceramics per lithic at one extreme to about 4 lithics per ceramic artifact at the other extreme. However, much of this range can probably be attributed to sampling error or the presence of unidentified or underestimated preceramic components represented in the artifact assemblage. In general, the majority of investigations at Caddo-aged sites exhibit ratios between about 1 and 6 ceramics per lithic artifact. So the ratio of 6.3 ceramics per lithic at site 41SM404 appears to be at the upper end of, or slightly above, the general range.

VI. CONCLUSIONS AND RECOMMENDATIONS

Site 41SM404 was subjected to a systematic program of shovel testing, mechanical trenching, and hand excavation to determine its eligibility for listing in the NRHP or designation as a SAL. During the investigations, partially intact cultural features were located at the site that can yield information regarding the site's age and the subsistence practices of its inhabitants. Therefore, the potential exists that additional investigations could add to our understanding of the prehistory of the region. For this reason, site 41SM404 is thought to be eligible for listing in the NRHP (36 CFR 800.16[i] and 36 CFR 800.4(c)) and has been designated as a SAL (13 TAC §26.8(1)(2)).

Site 41SM404 is located near the western edge of the proposed ROW. The bulk of the site is located to the west of the proposed Toll 49 bridge, while most of the main site area falls within the clearing limits (see Figure 2). The main site area will be adversely affected by vegetation clearing, while the eastern periphery of the site will be adversely directly affected by construction of the Toll 49 bridge, involving construction of abutments to support the raised roadway (Figure 2 shows the location of the proposed bridge, with a 6.1-m [20-ft] construction buffer to either side). At the present time, planned vegetation clearing will apparently be done using heavy machinery to first remove the trees and roots close to the bridge, and then level any holes that are left by their removal. It is also probable that the construction crew will want to work from the west side (i.e., the site area) of the bridge, since the east side would be too steep when actually building the bridge.

The portion of the site to be directly impacted by construction is outside of the primary area of the site as defined by the present testing, and appears to have been disturbed by artificial terracing at some time in the past. It is believed that the eastern periphery of the site has little potential to add any significant data to our understanding of the site as a whole, or to contain elements that could support the site's eligibility status. Thus, it is believed that the site will not be adversely affected by direct construction impacts.

In the event that unanticipated archeological deposits are encountered during construction in this area, work would cease in the immediate vicinity of the discovery and the responsible Project Development Agency (either TxDOT or NET RMA) and their archeological staff or representative would be notified to initiate accidental discovery and emergency procedures under the provisions of the First Amended Programmatic Agreement among the Federal Highway Administration, the Texas State Historic Preservation Officer, the Advisory Council on Historic Preservation, and TxDOT; the Memorandum of Understanding between the THC and TxDOT; and the Project Development Agreement between TxDOT and the NET RMA.

As noted above, clearing of vegetation and construction of the bridge does have the potential to adversely impact the main area of the site, as does indirect activity associated with the construction, unless steps are taken to prevent it. In order to protect the site for the short term, it is recommended that:

1) clearing of the vegetation on the site be done entirely by hand with no ground disturbance and no holes to level, using only hand tools to cut down the trees and brush and removing all brush by hand;

2) construction on the bridge must be done from the eastern side of the bridge, not from the western side; and

3) all heavy machinery must be kept completely off of the site and no ancillary activity associated with the construction, such as placement of a construction trailer or a parking area, can take place or be done on the site.

If these procedures cannot be followed in the short term, then the site will have to be mitigated through excavation prior to construction. However, even if these procedures are followed in the short term, the site will either have to be mitigated in the future, or some form of permanent preservation must be devised. One form of permanent preservation, previously used by TxDOT in the area, which may be appropriate for 41SM404, is to cover the site with chain-link fencing, then to bury under a layer of sterile soil, and finally to seed the area with pine trees.

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Appendix A

Specimen Inventory
(on CD)

Appendix B

Radiocarbon Dating Analysis

BETA ANALYTIC INC.
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MIAMI, FLORIDA, USA 33155
PH: 305-667-5167 FAX:305-663-0964
beta@radiocarbon.com

REPORT OF RADIOCARBON DATING ANALYSES

Ms. Linda W. Ellis — Report Date: 1/5/2011

PBS&J — Material Received: 12/3/2010

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 289202	740 +/- 40 BP	-25.9 o/oo	730 +/- 40 BP

SAMPLE : SM404-69-1
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (bulk sherd organics): acid washes
2 SIGMA CALIBRATION : Cal AD 1230 to 1300 (Cal BP 720 to 650)

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 289203	60 +/- 40 BP	-23.8 o/oo	80 +/- 40 BP

SAMPLE : SM404-73-2
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (bulk sherd organics): acid washes
2 SIGMA CALIBRATION : Cal AD 1680 to 1740 (Cal BP 270 to 210) AND Cal AD 1800 to 1940 (Cal BP 150 to 20)
Cal AD 1950 to 1960 (Cal BP 0 to 0)

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 289204	430 +/- 40 BP	-9.5 o/oo	680 +/- 40 BP

SAMPLE : SM404-173-5
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid
2 SIGMA CALIBRATION : Cal AD 1270 to 1320 (Cal BP 680 to 630) AND Cal AD 1350 to 1390 (Cal BP 600 to 560)

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 289205	1200 +/- 40 BP	-24.4 o/oo	1210 +/- 40 BP

SAMPLE : SM404-177-6
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid
2 SIGMA CALIBRATION : Cal AD 690 to 900 (Cal BP 1260 to 1050)

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

BETA

BETA ANALYTIC INC.

DR. M.A. TAMERS and MR. D.G. HOOD

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beta@radiocarbon.com

REPORT OF RADIOCARBON DATING ANALYSES

Ms. Linda W. Ellis

Report Date: 1/5/2011

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 289206	490 +/- 40 BP	-26.3 o/oo	470 +/- 40 BP

SAMPLE : SM404-184-3
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (bulk sherd organics): acid washes
2 SIGMA CALIBRATION : Cal AD 1410 to 1460 (Cal BP 540 to 490)

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 289207	840 +/- 40 BP	-25.2 o/oo	840 +/- 40 BP

SAMPLE : SM404-235-4
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (bulk sherd organics): acid washes
2 SIGMA CALIBRATION : Cal AD 1060 to 1080 (Cal BP 900 to 870) AND Cal AD 1150 to 1270 (Cal BP 800 to 680)

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 289208	350 +/- 40 BP	-9.9 o/oo	600 +/- 40 BP

SAMPLE : SM404-253-7
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid
2 SIGMA CALIBRATION : Cal AD 1290 to 1420 (Cal BP 660 to 530)

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-25.9:lab. mult=1)

Laboratory number: **Beta-289202**

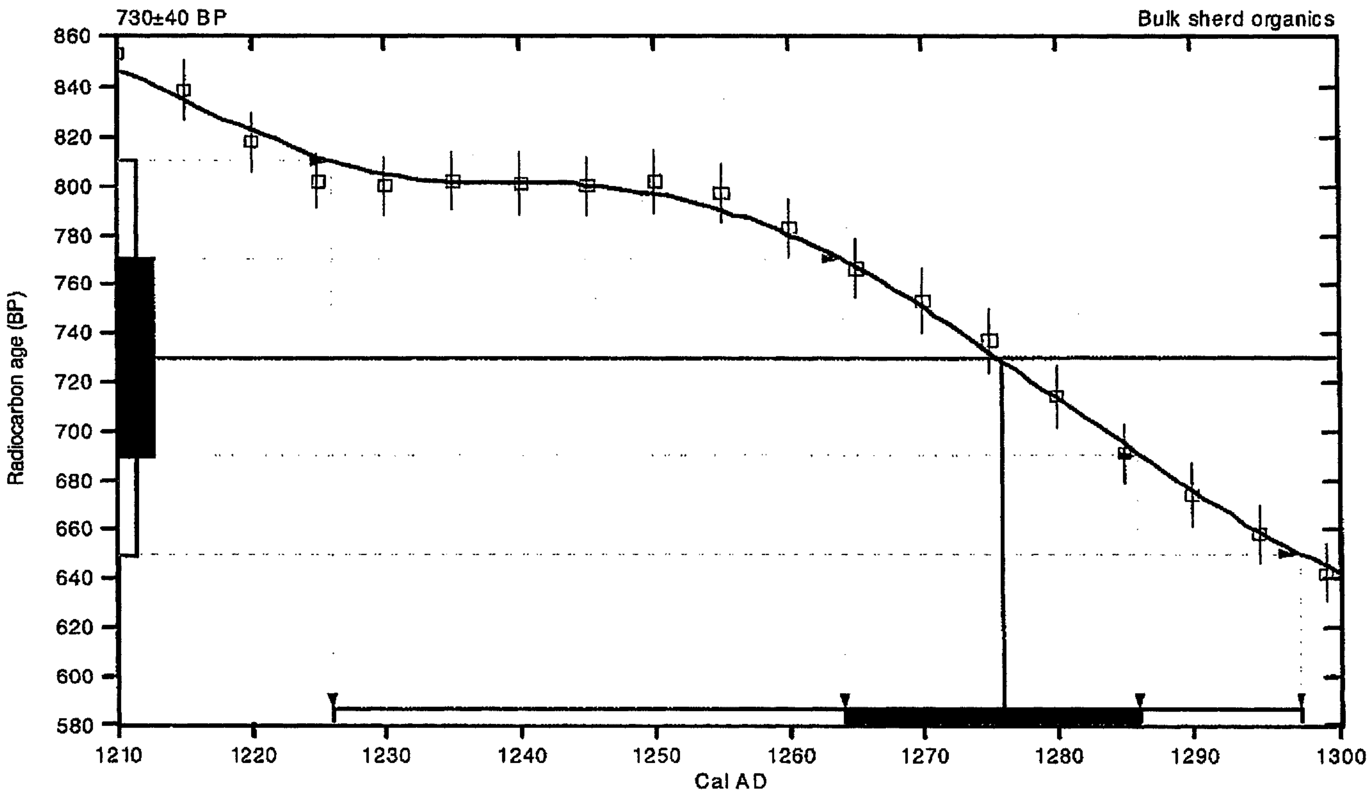
Conventional radiocarbon age: **730±40 BP**

2 Sigma calibrated result: (95% probability) **Cal AD 1230 to 1300 (Cal BP 720 to 650)**

Intercept data

Intercept of radiocarbon age with calibration curve: Cal AD 1280 (Cal BP 670)

1 Sigma calibrated result: (68% probability) Cal AD 1260 to 1290 (Cal BP 690 to 660)



References:

Database used

INTCAL04

Calibration Database

INTCAL04 Radiocarbon Age Calibration

IntCal04: Calibration Issue of Radiocarbon (Volume 46, nr 3, 2004).

Mathematics

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

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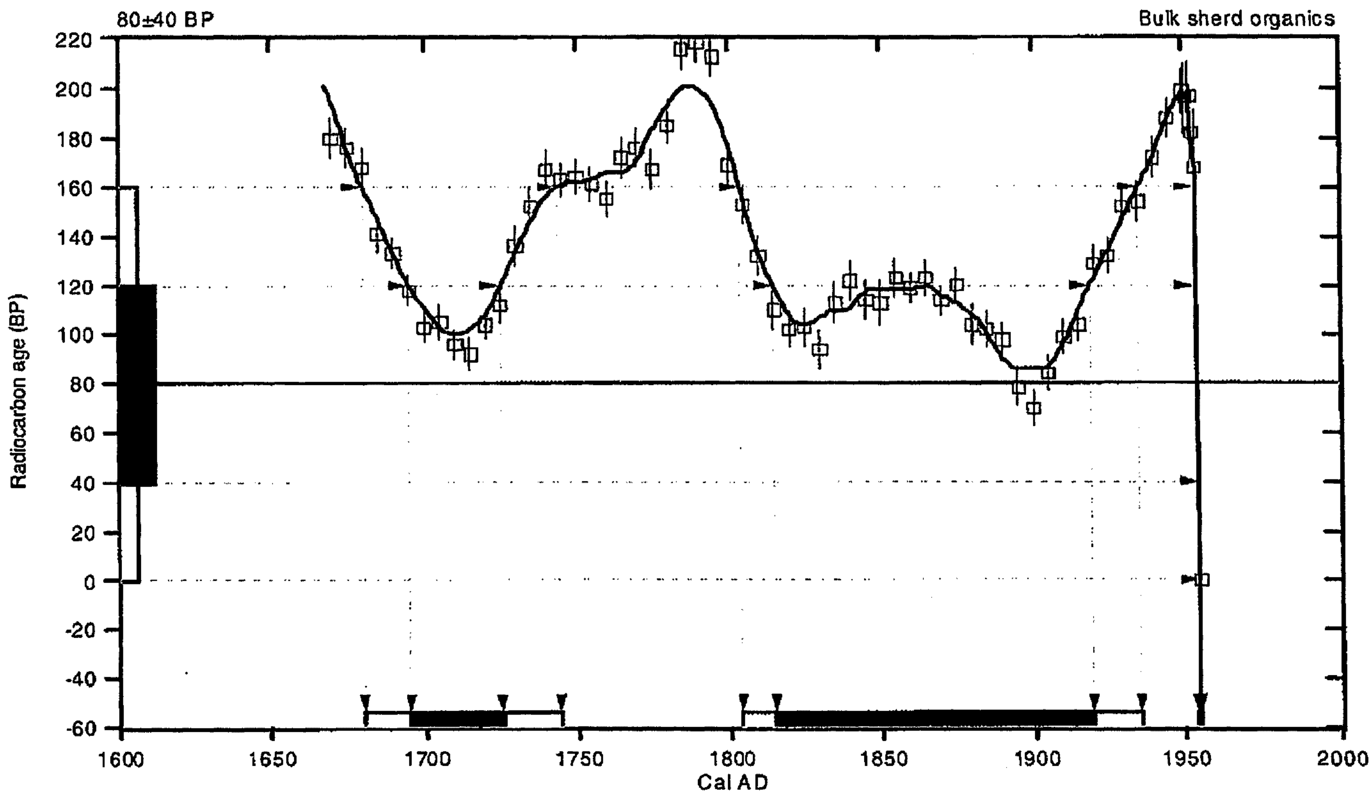
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-23.8:lab. mult=1)

Laboratory number:	**Beta-289203**
Conventional radiocarbon age:	**80±40 BP**
2 Sigma calibrated results: (95% probability)	**Cal AD 1680 to 1740 (Cal BP 270 to 210) and Cal AD 1800 to 1940 (Cal BP 150 to 20) and Cal AD 1950 to 1960 (Cal BP 0 to 0)**

Intercept data

Intercept of radiocarbon age with calibration curve:	Cal AD 1960 (Cal BP 0)
1 Sigma calibrated results: (68% probability)	Cal AD 1700 to 1720 (Cal BP 260 to 220) and Cal AD 1820 to 1920 (Cal BP 140 to 30) and Cal AD 1950 to 1960 (Cal BP 0 to 0)



References:

Database used
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Mathematics
A Simplified Approach to Calibrating C14 Dates
Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-9.5:lab. mult=1)

Laboratory number: **Beta-289204**

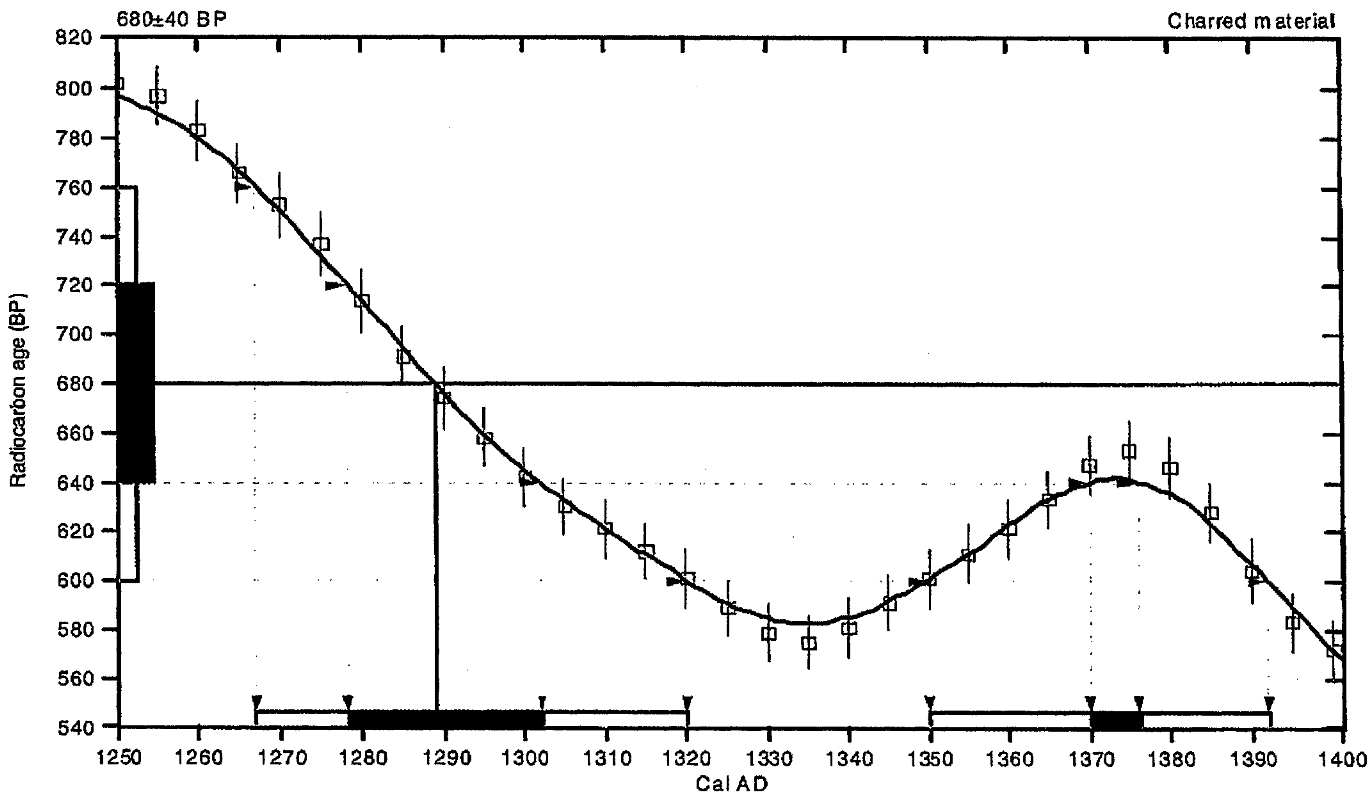
Conventional radiocarbon age: **680±40 BP**

2 Sigma calibrated results: (95% probability) **Cal AD 1270 to 1320 (Cal BP 680 to 630) and Cal AD 1350 to 1390 (Cal BP 600 to 560)**

Intercept data

Intercept of radiocarbon age with calibration curve: Cal AD 1290 (Cal BP 660)

1 Sigma calibrated results: (68% probability) Cal AD 1280 to 1300 (Cal BP 670 to 650) and Cal AD 1370 to 1380 (Cal BP 580 to 570)



References:

Database used

INTCAL04

Calibration Database

INTCAL04 Radiocarbon Age Calibration

IntCal04: Calibration Issue of Radiocarbon (Volume 46, nr 3, 2004).

Mathematics

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-24.4:lab. mult=1)

Laboratory number: **Beta-289205**

Conventional radiocarbon age: **1210±40 BP**

2 Sigma calibrated result: (95% probability) **Cal AD 690 to 900 (Cal BP 1260 to 1050)**

Intercept data

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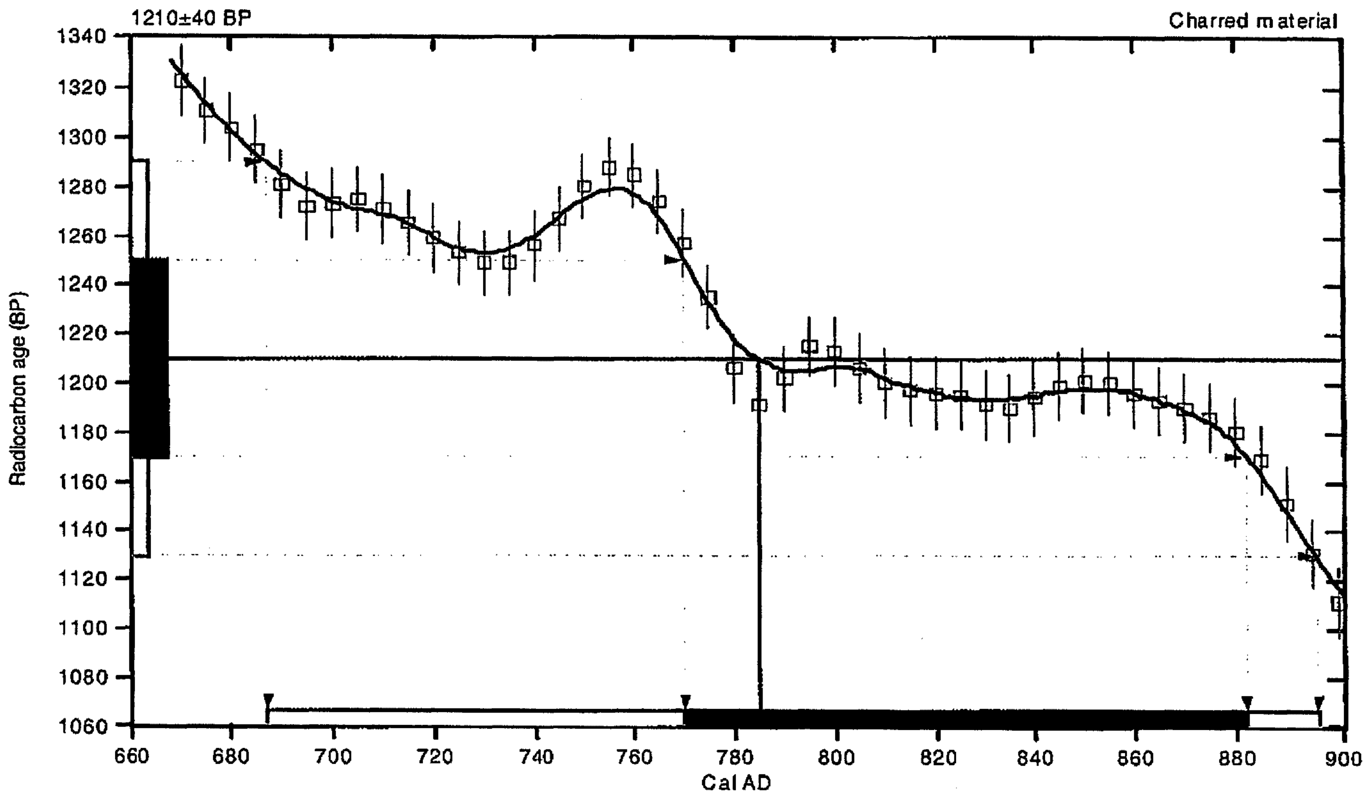
1 Sigma calibrated result: (68% probability) Cal AD 770 to 880 (Cal BP 1180 to 1070)



References:
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Mathematics
A Simplified Approach to Calibrating C14 Dates
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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-26.3:lab. mult=1)

Laboratory number: **Beta-289206**

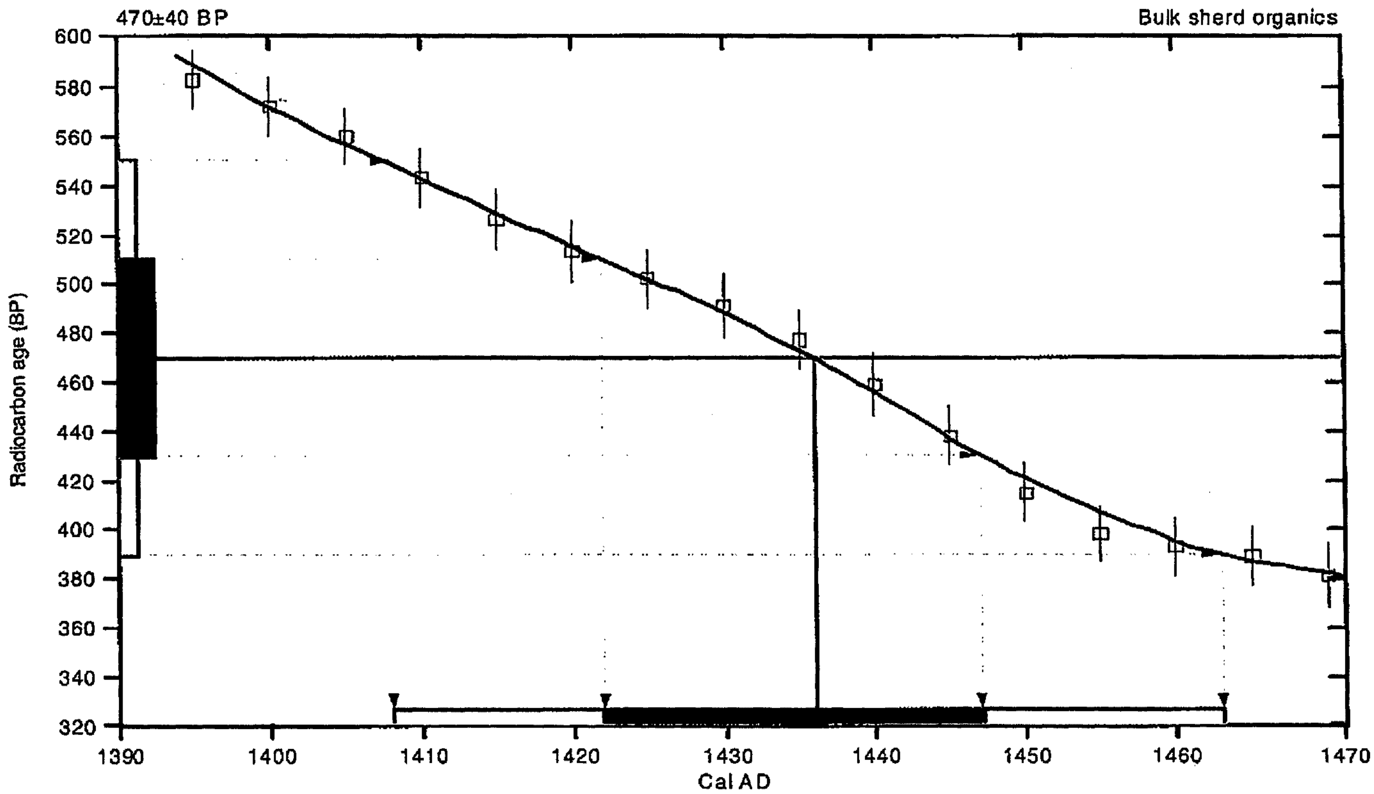
Conventional radiocarbon age: **470±40 BP**

2 Sigma calibrated result: **Cal AD 1410 to 1460 (Cal BP 540 to 490)**
(95% probability)

Intercept data

Intercept of radiocarbon age with calibration curve: Cal AD 1440 (Cal BP 510)

1 Sigma calibrated result: Cal AD 1420 to 1450 (Cal BP 530 to 500)
(68% probability)



References:
Database used
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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-25.2:lab. mult=1)

Laboratory number: **Beta-289207**

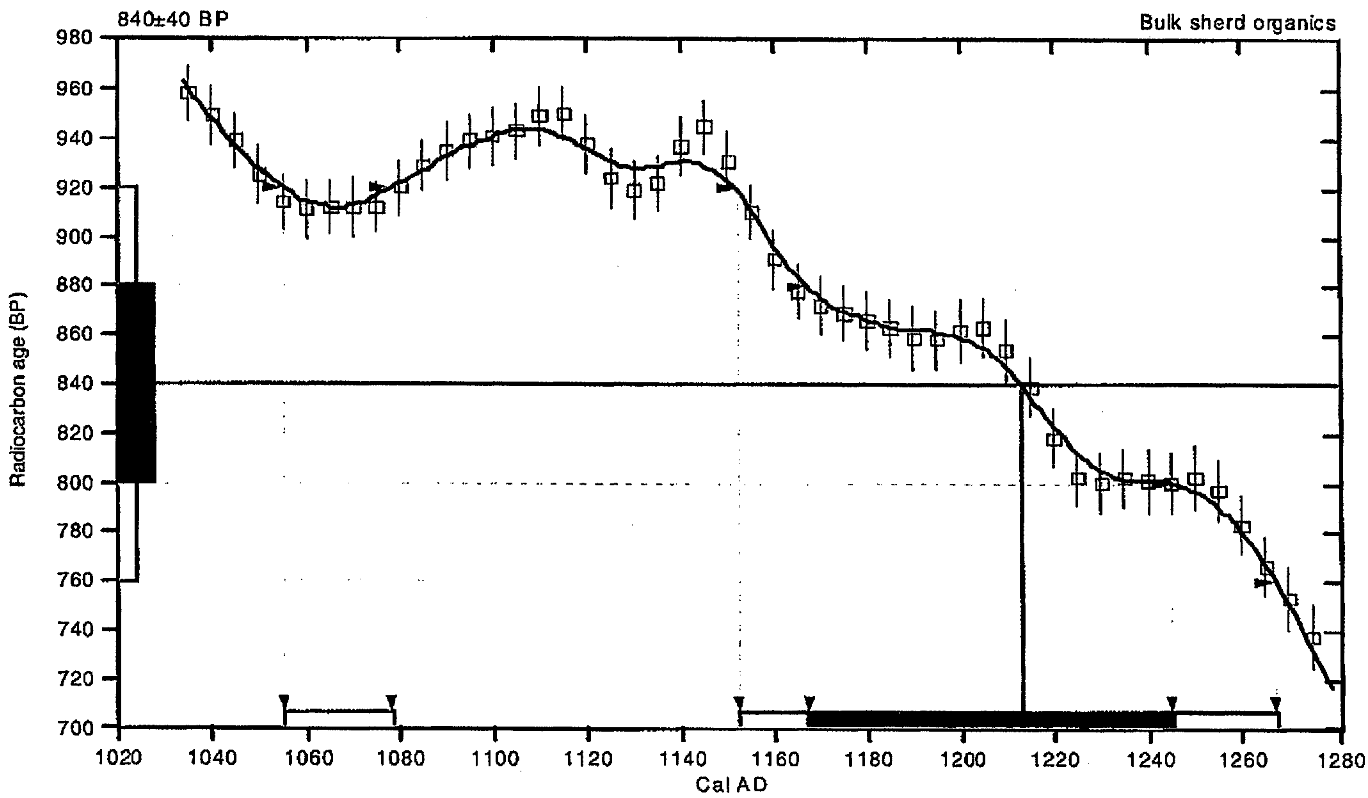
Conventional radiocarbon age: **840±40 BP**

2 Sigma calibrated results: (95% probability) **Cal AD 1060 to 1080 (Cal BP 900 to 870) and Cal AD 1150 to 1270 (Cal BP 800 to 680)**

Intercept data

Intercept of radiocarbon age with calibration curve: Cal AD 1210 (Cal BP 740)

1 Sigma calibrated result: (68% probability) Cal AD 1170 to 1240 (Cal BP 780 to 700)



References:

Database used

INTCAL04

Calibration Database

INTCAL04 Radiocarbon Age Calibration

IntCal04: Calibration Issue of Radiocarbon (Volume 46, nr 3, 2004).

Mathematics

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-9.9:lab. mult=1)

Laboratory number: **Beta-289208**

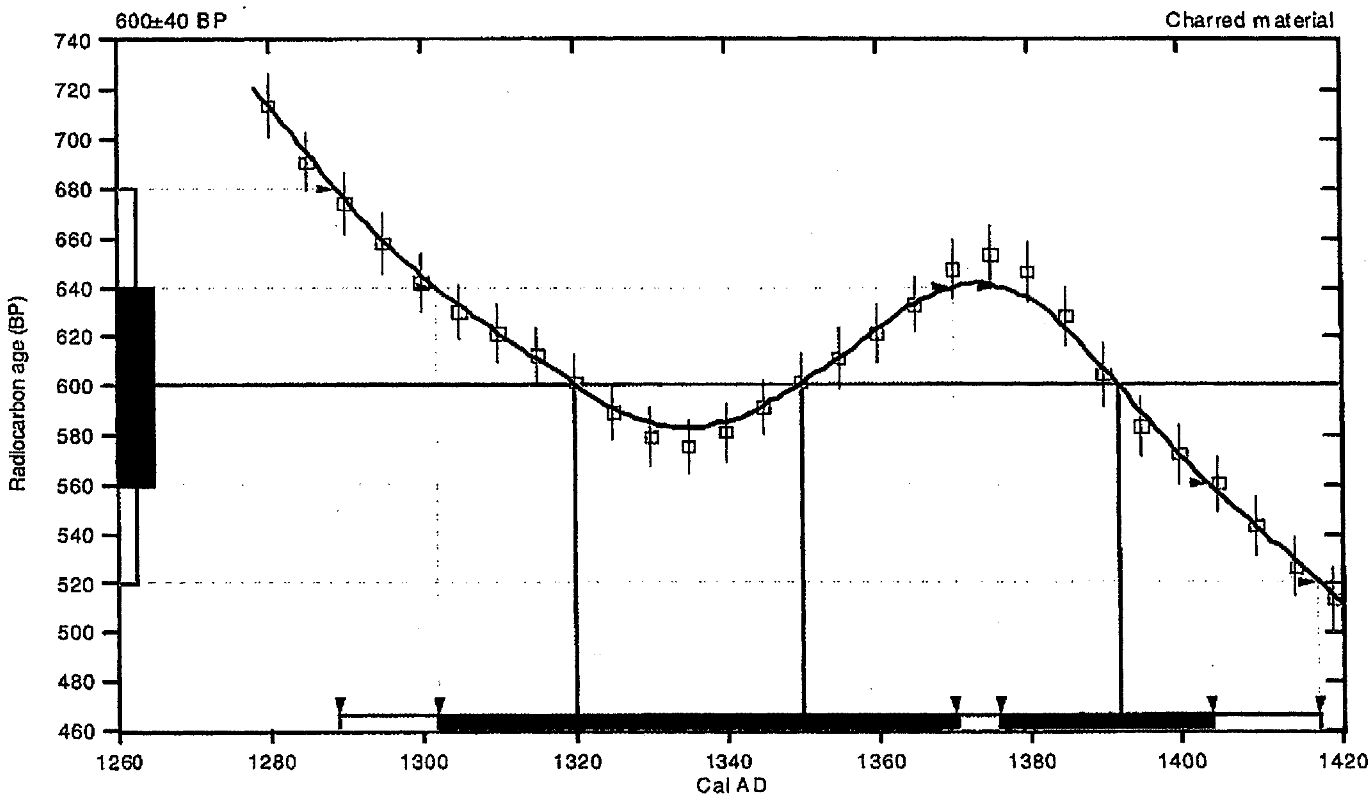
Conventional radiocarbon age: **600±40 BP**

2 Sigma calibrated result: (95% probability) **Cal AD 1290 to 1420 (Cal BP 660 to 530)**

Intercept data

Intercepts of radiocarbon age with calibration curve: Cal AD 1320 (Cal BP 630) and Cal AD 1350 (Cal BP 600) and Cal AD 1390 (Cal BP 560)

1 Sigma calibrated results: (68% probability) Cal AD 1300 to 1370 (Cal BP 650 to 580) and Cal AD 1380 to 1400 (Cal BP 570 to 550)



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INTCAL04
Calibration Database
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IntCal04: Calibration Issue of Radiocarbon (Volume 46, nr 3, 2004).
Mathematics
A Simplified Approach to Calibrating C14 Dates
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Appendix C

Lithic Analysis
(on CD)

Appendix D

Detailed Analysis of Ceramic Sherds from 41SM404
(on CD)

Appendix E

Petrographic Analysis of Ceramic Sherds from 41SM404

Appendix E: Ceramic Petrography, Site 41SM404

INTRODUCTION

The petrographic analysis of ceramics from 41SM404 was performed to identify the constituents of the ceramic material. The purpose of this work was to make a variety of comparisons with other known ceramics and gain insights on the samples' technology and manufacturing techniques. Information on source localities of clays and other constituents might also be gained. The 10 sherds selected for the analysis also had material removed as samples for instrumental neutron activation analysis (INAA). Five of the sherds were removed for bulk radiocarbon dating as well. Table E-1 gives provenience and typological information on the sample.

Table E-1. Ceramic Petrographic Samples

Lot No.	Petrographic Sample No.	Beta Analytic No.	Unit No.	SST No.	Trench	Form	Decorative Motif	Figure # in Main Report
69	SM404-69	289202	–	103	–	Rim	Opposed incised	14a
73	SM404-73	289203	–	72	–	Body	Engraved bottle	21c
184	SM404-184	289206	11	–	–	Rim	Engraved	18f
235	SM404-235	289207	17	–	–	Body	Brushed	9d
133	SM404-133	–	3	–	–	Body	Engraved	18e
138	SM404-138	–	1	–	–	Rim	Plain	25a
201	SM404-201	–	13	–	–	Body	Incised ovals and arching lines	13E
220	SM404-220	–	15	–	–	Body	Incised-punctated	14e
237	SM404-237	–	17	–	–	Body	Engraved bottle	21b
259	SM404-259	–	–	–	6	Body	Punctated	15a

METHODS

The methods employed here adhere to those developed by PBS&J analysts in the past to evaluate ceramics at other Caddo sites in northeast Texas (Reese-Taylor 1993, 1995, 1997; Rogers 2011; Skokan and Perttula 1998). This adherence was intended to enhance comparability with prior analyses and produce descriptions of the ceramic thin sections that are detailed, quantified, and replicable.

The principal method of the analysis was identification and point counting of minerals and ceramic structures following the method of Chayes (1949) and the approach to petrographic analysis pioneered in archeology by Shepard (1942, 1976) and elaborated by Rice (1987). Point counting consists in counting a set number (200) of ceramic attributes observed in the viewing field during systematic microscopic traverses of each thin section. Counting the same number of ceramic

attributes in each thin section allows reliable statistical comparisons. Additional information such as grain size and shape was recorded on the counting sheet for potential future reference. The color and isotropy of the ceramic matrix was determined and recorded. Any mineral species that was observed in the initial survey of the section but which did not fall into the count was recorded on the counting sheet as "tr" for trace, so as not to lose information on rare but potentially significant bodies. During the point count, the thin section was advanced 0.5 to 1 millimeter (mm), and the points along the line were counted, until the 200-count total was achieved.

The analysis was conducted on an Olympus BH 2 stereographic polarizing microscope with a rotating stage. The ceramic thin sections were prepared by Wagner Petrographics, Inc. of Midvale, Utah. Each thin section consisted of a prepared slide containing a single ceramic sherd oriented perpendicular to the vessel wall. The samples were impregnated with epoxy stained with cobalt nitrite and ground to a standard thickness of 0.03 mm.

OBSERVATIONAL CONVENTIONS

As a general practice, bodies varying from anything observed earlier in the count were listed separately on the counting page, described in notes, and counted. This procedure was intended to capture potentially significant patterns of a less obvious nature. Hematite was recorded as ferrous or ferric opaques but entered on the spreadsheet as hematite, again to offer the widest possible breakdown of observations. Organic opaques entered the counted lists in recognition of their optical properties. They were rare in the sample and likely charcoal pieces worked into the matrix incidentally. All measurements are in millimeters and grain size names are from the Wentworth scale (1922, 1933). The roundness scale of Powers (1953) offers a consistent scale for determining the qualities of shape. Grog is ground up ceramic sherds and usually is identified by pronounced angularity and an interior ceramic matrix with inclusions. Grog was categorized and given letters to designate its variants, A, B, C, etc. Clay balls received similar designation, although they may have multiple sources, including grog. The generally rounded nature of the bodies, unlike grog particles, prevented an exclusive interpretation of them during the scopework, and so they were counted separately. Paste groups, grog and clay ball types, and general observations on the samples in thin section are presented after the descriptions of the sections.

THIN SECTION DESCRIPTIONS

The quantification of the ceramic component was designed to determine whether paste groups could be defined generally and correlated with technological attributes noted in the overall analysis of ceramics from 41SM404. The determinations were based on the frequency and proportions of clay matrix, porosity, and aplastic inclusions. Grain size was also considered. The proportions of each of the ceramic components are provided in Table E-2. Percentages reported in the descriptions are proportions of the 200-grain count.

Table E-2. Ceramic Component Percentages and Grain-size Classification, 41SM404

Components	SM404-73	SM404-138	SM404-235	SM404-237	SM404-184	SM404-201	SM404-220	SM404-259	SM404-69	SM404-133
Monocrystalline quartz	7	8	9	12.5	18.5	12.0	8	9.5	11	17
Polycrystalline quartz	1.5	–	–	1	0.5	2.5	–	–	–	4.5
Quartz, resident	26.5	6	15	7.5	10.5	11.5	10.5	17.5	13	11.5
Quartz, undulating extinction	0.5	–	1	3	–	–	–	0.5	–	–
Chert	–	6.5	3	3.5	2.0	5	4.5	6	3.5	3.0
Hematite	15	19	8.5	18	12.5	7	11	6.5	12	7.5
Organic opaques	–	–	–	–	0.5	–	–	–	–	–
Plagioclase feldspar	–	–	1	–	–	–	–	–	–	–
Muscovite	7	Tr	1	1.5	1	–	3	1.5	2	2.5
Biotite	–	–	0.5	–	–	–	–	–	–	1
Clinopyroxene	0.5	–	1.0	–	0.5	–	–	–	–	1.5
Grog A	–	–	5	2	4.5	–	4.5	1	–	5
Grog B	–	0.5	2.5	–	–	–	–	2	–	Tr
Grog C	–	–	–	–	–	3.5	–	–	–	–
Grog D	–	–	–	–	–	–	13.5	–	–	–
Clay Ball A	4	1.5	–	–	–	5.5	–	–	7.5	–
Clay Ball B	–	–	Tr	9	–	–	–	5.5	–	–
Clay Ball C	1	3.5	3	–	3.5	–	–	–	–	–
Bone	Tr	Tr	–	–	–	–	–	–	8	4.5
Bioclasts	–	–	–	–	–	–	–	–	1	–
Unknown A	0.5	–	–	–	–	–	–	–	–	–
Matrix	26.5	34.5	35	30	28	34	35	35	23.5	26.5
Voids	10	20.5	14.5	12	18	19	10	15	18.5	15
Percent total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Average (mean) mm	0.349	0.396	0.609	0.416	0.359	0.278	0.664	0.335	0.352	0.326
Wentworth size class	Medium sand	Medium sand	Coarse sand	Medium sand	Medium sand	Medium sand	Coarse sand	Medium sand	Medium sand	Medium sand

SM404-73

The section belongs to Paste Group A, having a greenish tan and gray appearance in the section and small golden masses under crossed-Nichols polarization (xpl). The section is tempered with Clay Ball A (see following section for descriptions of all paste group types, grog types, and clay ball types) and monocrystalline quartz. A small amount of polycrystalline quartz was also observed in the section as a possible tempering agent. Medium silt and fine sand-sized quartz resident in the clay was abundant, forming 26.5 percent of the count, as was hematite, at 15 percent. The section also had a significant amount of muscovite mica (7 percent), a common accessory or alteration product of volcanic rocks; it is usually poorly transportable. A single grain each of pyroxene and quartz with undulating extinction may also point to a partial igneous contribution to the paste. A single particle of bone is a likely incidental inclusion. Voids are jagged, curving strips contributing to a flowing, striplike look of the paste. They occasionally outline the solid particles of the section. An unknown fibrous material was observed along one edge and worked partially under it. This may have been an organic or other material picked up from the ceramic atelier floor during manufacture and worked incidentally into the surface before firing.

SM404-138

Another member of Paste Group A, the paste is light greenish brown, and it appears greenish gold and dark green in xpl. Long, jagged voids give the entire section a striplike, fibrous look. The section is tempered with monocrystalline quartz (8 percent), and it contains one very coarse sand-sized particle of Grog B. The single grain renders problematic its status as a tempering agent, and it may be an incidental inclusion. The section also contains small amounts of Clay Ball A (1.5 percent) and Clay Ball C (3.5 percent). A large amount of hematite (19 percent) distinguishes the section; chert and a trace of muscovite were also observed. A single small grain of bone was identified in the section. A dense iron-rich strip along one edge may be the remains of a slip layer.

SM404-235

A member of Paste Group A, the section has light greenish brown color and bright golden and green strips in xpl. The matrix is moderately dense (35 percent) and voids are in irregular shapes. Only a few voids outline solid particles. The paste is tempered with Grog A (5 percent), Grog B (2.5 percent), and possibly Clay Ball C (3 percent) and monocrystalline quartz (9 percent). The section has 15 percent of coarse silt and fine sand-sized quartz and 8.5 percent hematite as resident minerals. It has two grains of quartz with undulating extinction and a small but potentially significant suite of volcanic-derived minerals: muscovite (1 percent), biotite (a mica related to muscovite, 0.5 percent), plagioclase feldspar (1 percent), and clinopyroxene (1 percent).

SM404-237

The section belongs to Paste Group A, having light to medium greenish tan and yellow color, with golden and green clay colors under xpl. Voids are few but long, up to 3 mm in length through the center of the sherd. They are unoriented and occasionally widen to form irregularly shaped gaps in the matrix. The matrix has a light carbon streak on the interior surface and center of the section; the exterior one-third of the section is light and well oxidized. The grog, clay ball, and hematite particles in the darker, more-carbonized portions of the section are darkened as well. This probable carbon darkening of the particles may, among other effects, be the sole difference between grog types A and D. The section is tempered with Grog A (2 percent), but Grog D is absent from the section. Clay Ball B (very coarse sand, 9 percent) is a principal tempering agent, and monocrystalline quartz (12.5 percent) in medium sand sizes may also be a deliberate additive. Resident quartz in coarse silt and fine sand sizes is relatively abundant (7.5 percent). The section contains hematite (18 percent) in extreme abundance, but its particle sizes range only from coarse silt to medium sand. The section yields small amounts of chert (3.5 percent), quartz with undulating extinction (3 percent), polycrystalline quartz (1 percent), and muscovite (1.5 percent).

SM404-184

This section belongs to Paste Group B, with a massive matrix in greenish brown colors, and gold and light brown clay masses in xpl. Voids within the matrix are irregularly shaped and do not commonly outline solid particles. The section is tempered with Grog A (4.5 percent) and possibly Clay Ball C (3.5 percent) and monocrystalline quartz (18.5 percent). Hematite (12.5 percent) is abundant in rounded fine silt to fine sand sizes. Resident quartz (10.5 percent) is found in silt and fine sand sizes. The section also has small amounts of chert (2 percent), polycrystalline quartz (0.5 percent), muscovite (1 percent), clinopyroxene (0.5 percent) and organic opaques (0.5 percent). The organic opaques, one particle, are likely charcoal worked into the clay paste incidentally.

SM404-201

Another Paste Group B member, the section is medium yellowish brown in plane polarized light, but golden brown in xpl. The matrix is moderately dense with masses of slightly varying colors and numerous voids in jagged strips, giving the section a very diverse look. The void strips are aligned in parallel with the edges of the section and only rarely surround the solid particles. Despite the variety of colors and textures in the matrix, the section is very clearly tempered with Grog C (3.5 percent), which is mostly in very coarse sand-sized particles and distinctive, very angular wedge shapes. Clay Ball A (5.5 percent) may also have been deliberately added. Monocrystalline quartz (12 percent) occurs in medium sand size, while resident quartz (11.5 percent) only ranges from medium silt to coarse silt. The section also contains hematite (7 percent) in very fine sand to medium sand sizes, chert (5 percent), and polycrystalline quartz (2.5 percent).

SM404-220

This is one of the most distinctive sections in the sample, comprising the sole member of Paste Group C. The matrix is a bright iron-red in plane polarized light and xpl, with additional hematite (11 percent) in abundance. The matrix is dense, and numerous voids in it are long, jagged strips. The section is tempered with Grog A (4.5 percent) and Grog D (13.5 percent). Monocrystalline quartz (8 percent) is found in medium sand sizes, whereas resident quartz (10.5 percent) is coarse silt to fine sand in size. The section also contains chert (4.5 percent) and muscovite (3 percent) particles in coarse silt–sized spicules and needles.

SM404-259

The section is the sole example of Paste Group D, typified by its reddish golden-brown color in plane polarized light and golden-brown color in xpl. The matrix is also dense, but with numerous unoriented voids in various shapes and sizes. The section is tempered with Grog A (1 percent) and Grog B (2 percent) in coarse sand sizes. Clay Ball B is more abundant at 5.5 percent, but is found only in medium sand size in the section, and so it is unlikely as a tempering agent. Monocrystalline quartz (9.5 percent) is abundant, and resident quartz (17.5 percent) is found in silt and fine sand sizes.

SM404-69

This section defines Paste Group E and is its sole member. The matrix is dense and yellow-brown in plane polarized light, golden-brown in xpl. The matrix has an apparent swirled and curving texture, the shapes defined further and bordered by voids in jagged strips. The section and paste group are distinguished primarily by bone tempering. Bone (8 percent) ranges from fine sand to coarse sand sizes and occurs in subrounded to angular and foliate shapes. Clay Ball B (7.5 percent) is a supplemental temper. Monocrystalline quartz (11 percent) ranges from fine sand to medium sand sizes. Resident quartz (13 percent) ranges from medium silt to fine sand only. Hematite particles (12 percent) are similarly small, also ranging from medium silt to fine sand. These are likely native residents of the clay. The section also contains chert (3.5 percent) and muscovite lathes (2 percent). Bioclasts (1 percent) were observed in the section; the two items were both parts of terrestrial snail shells.

SM404-133

The section is the only member of Paste Group F. The matrix is light greenish brown in plane polarized light and shows gold and green strips in xpl. Numerous voids interrupt the matrix, and the voids have various shapes ranging from short strips to wide coarse sand–sized gaps with irregular outlines. The paste is tempered with Grog A (5 percent) in particles ranging from medium sand to granule, but the section is most distinctive for bone tempering (4.5 percent) in particle sizes ranging from fine sand to coarse sand. Monocrystalline quartz (17 percent) may have been a

deliberate contributor as well, with particle sizes ranging from fine sand to coarse sand. Resident quartz (11.5 percent) is abundant in coarse silt and fine sand sizes. The section also contains rounded hematite (7.5 percent), chert (3 percent), a trace of Grog B, and a small suite of volcanic minerals: muscovite (2.5 percent), biotite (1 percent), and clinopyroxene (1.5 percent).

PASTE GROUPS, GROG, AND CLAY BALLS

Paste Groups

Paste groups were defined on the basis of the observed traits of the ceramic matrix and the closest similarities across the members of the group. The individual particles and bodies within the section contributed to the definition of the paste group, but not all particles are shared across all members of the group. If complete uniformity of particles and traits was required, then the 10 sherds of the ceramic petrography sample would comprise 10 separate paste groups. Groups defined on the basis of similarity but not uniformity therefore express relationships of central tendency of materials use and manufacturing technique. They do not identify a single firing batch if the group contains multiple sherd members. Even so, out of the sample of 10 sherds, six paste groups were defined; one with four members, one with two members and four with a single member each. This breakdown of paste groups speaks to the diversity in this small sample.

Paste Group A

SM404-73, SM404-138, SM404-235, SM404-237

The paste of this group is light greenish brown in plane light. In cross polarized light, the paste is anisotropic, or light disruptive, and the matrix appearance alternates between a bright gold and dark greenish gray. The thin section view at 100X shows a granular and almost swirling texture of the matrix material, the differing colors matching the silt and fine sand-sized clay masses. The group contains grog types A and B and clay ball types A, B, and C. Void shapes are various, with many jagged strips and wide gaps. The voids occasionally, but not commonly, outline solid particles. Angular resident quartz in silt to fine sand sizes ranges from minor to abundant in the matrix. Larger sizes of quartz, which may have been additions to the clay, are fresh or common quartz (monocrystalline quartz), with the exception of small but distinctive proportions of polycrystalline, or composite, quartz and quartz grains with undulating extinction. These materials may reflect resource areas with igneous materials. Undulating extinction (Folk 1980:70–74) is an optical property of some quartz grains, whereby the darkening of a grain as the stage is rotated is not uniform, but sections of the grain darken progressively across its face. The darkening appears to undulate or sweep across the grain. The property stems from stress and pressure on the quartz, termed strain, which the material may suffer in a number of environments of formation, notably volcanic or metamorphic ones.

Paste Group B

SM404-184, SM404-201

The paste is medium yellowish and greenish brown and dense, with variously shaped voids aligned parallel with the edges. The paste has abundant resident hematite particles and silt-sized particles of monocrystalline quartz. The quartz is subrounded and subangular and not apparently a mature sand. The paste is tempered with grog and clay balls in sizes of medium sand, coarse sand, and very coarse sand. The median size is coarse. The grog types are not shared between the two group members; SM404-184 has Grog A and Clay Ball C, and SM404-201 has Grog C and Clay Ball A. Further, SM404-184 has traces of muscovite and clinopyroxene (one grain), suggesting a different clay source and that the two sherds belonged to differing firing batches.

Paste Group C

SM404-220

This paste is the most distinctive in the ceramic petrographic sample. The matrix throughout is bright iron-red in plane, polarized, and cross polarized light, with additional abundant red hematite particles. The single example of the paste contains two grog types as tempering agents, Grog A and Grog D. They are both in very coarse sand sizes, although Grog D yielded one granule-sized particle. Quartz in the section ranges from coarse silt to medium sand sizes. It is all monocrystalline and likely clay-resident. A small amount of muscovite was observed in the section.

Paste Group D

SM404-259

The paste is dense and reddish golden brown. The matrix is interrupted by widely dispersed voids, unoriented and of irregular shape. The anisotropic, or light-disrupting, quality of the paste shows jagged silt and fine sand masses of the clay body alternating between gold and brown as the microscope stage is rotated. The single section contained Grog A and Grog B as tempering agents. Clay Ball B is present but in particle sizes (medium sand) too small to have served as temper. The paste holds abundant quartz as a resident, including some grains with undulating extinction. This type of extinction is rare in the sample and may indicate a specific, perhaps nonlocal source. Hematite was common and a few muscovite spicules were observed.

Paste Group E

SM404-69

The matrix has a texture of many small masses of clay appearing as curved particles that seem to swirl around the aplastic inclusions. Jagged, striplike voids help create this pattern. The paste is tempered copiously with bone from fine sand to very coarse sand sizes and angularity ranging from

subrounded to angular and foliated, or branching. Monocrystalline quartz in the matrix ranges up to fine sand sized and is all likely resident. Another abundant clay resident is hematite, ranging in size from medium silt to fine sand. The matrix also contains Clay Ball B in medium sand sizes. The paste is distinguished also by two bioclasts, small but distinctive curving pieces of snail shell.

Paste Group F

SM404-133

The paste is a light greenish brown, showing gold and green strips in cross polarized light. Due to anisotropy, the strips alternate between gold and green. Numerous voids interrupt the striplike clay pattern with gaps of various sizes and shapes. The paste is tempered both with bone and Grog A. Bone ranges in size from fine sand to coarse sand, while Grog A ranges from medium sand to granule (2.0 mm) in size. Hematite is abundant as a clay resident in medium silt to fine sand sizes. The paste is distinctive in the sample for having a small suite of typically volcanically derived minerals, biotite, muscovite (both micas) and pyroxene. Commonly accessory minerals or alteration products of volcanic rocks, they are clay residents in the paste group. They are all small, lacking grains larger than fine sand. Their presence here in contrast to the other pastes groups may indicate a different, perhaps nonlocal, clay source.

Grog Types

Grog is ground up pottery used as temper in ceramic pastes. In thin section they have the angular, sometimes curved look of larger sherds. The interiors of grog particles also retain the composite, ceramic look of their parent sherd and ware. During the microscopic examination of the ceramic sample, four differing grogs were defined on the basis of interior particles and paste.

Grog Type A

Sections: SM404-184, SM404-235, SM404-220, SM404-259, SM404-237, SM404-130

The matrix is medium greenish brown in plane polarized light and grayish brown in xpl. Anisotropy shows colors alternating between gold and gray-brown and gray. The paste contains monocrystalline quartz in medium silt, coarse silt, and fine sand sizes. Rare or occasional particles are hematite and muscovite rods and lathes. The type occurs in paste groups A, B, C, D, and F.

Grog Type B

Sections: SM404-235, SM404-259, SM404-138

The matrix is red in plane- and cross polarized light. The grog bodies are often lined with a more deeply reddened layer of the same material on a section of the perimeter or completely around it. Grains within the grog body are silt to fine sand-sized monocrystalline quartz and the occasional muscovite spicule. The grog is found in paste groups A and D.

Grog Type C

Section: SM404-201

The matrix is dark reddish black in plane- and cross polarized light, and grains within it are fine sand to medium sand-sized monocrystalline quartz in low density and subrounded, subangular, and angular shapes. The grog bodies are notably angular and wedge shaped. The grog is found in Paste Group B.

Grog Type D

Section: SM404-220

The matrix is light greenish brown in plane polarized light, bright gold and brown in cross polarized light. The bodies contain monocrystalline quartz in angular and subangular shapes ranging from very fine sand to very coarse sand. The bodies also contain rounded hematite particles in low density. The grog is found in Paste Group C.

Clay Balls

Clay balls are clay bodies within the section that have a ceramic composite look and are usually rounded, often distinct in colors from the surrounding matrix, have interior grains, and sometimes blend into the matrix gradually along sections of their perimeters. Their uncertain status as contributors to ceramic pastes is such that they can have ambiguous or multiple explanations for their presence in any section. They can be natural particles resident in a clay material and included in the ceramic paste, or they can be ceramic materials ground into rounded shapes as preparation for grog tempering. Given the uncertainty, they were counted separately and not treated as grog types, although they may be. Their similarities to grog types are noted in the descriptions when such are warranted.

Clay Ball A

Sections: SM404-73, SM404-138, SM404-201

The matrix is light brown in plane polarized light and bright gold and brown in cross polarized light. Interior grains are angular monocrystalline quartz and abundant rounded hematite grains. The clay balls are coarse sand in size and rounded. The bodies are very similar to Grog Type A and Paste Group A. They are found in paste groups A and B.

Clay Ball B

Sections: SM404-235, SM404-237, SM404-259, SM404-69

The matrix is dark reddish black in plane and cross polarized light. The bodies contain monocrystalline quartz in fine-sand sizes and angular, subangular, and subrounded shapes. Their density is relatively high. A few grains of chert are also found in the bodies. The type is similar to Grog Type C. The bodies are found in paste groups A, D, and E.

Clay Ball C

Sections: SM404-73, SM404-138, SM404-184

The matrix is bright red in plane polarized and cross polarized light. It has additional rounded hematite particles in it. It also contains angular and subangular monocrystalline quartz in low density. A few rare grains of subrounded chert in fine-sand sizes also were observed. The balls are usually found in rounded shapes in coarse sand, very coarse sand, and granule sizes. Clay Ball C is very similar to Paste Group C, but it must be cautioned that it may have a source in hematite deposits as larger chunks with mineral impurities and added to ceramic pastes as colorants or temper. It is found in paste groups A and B.

OBSERVATIONS

In discerning and attempting to discern patterns and similarities among the variety of composites and textures in the ceramic sample, one pattern was most apparent: Paste Group A is the predominant paste in the sample, and grog types A and D are formed from Paste Group A. The difference between grog types A and D is largely light value, and this may be accounted for by the original position of their bodies relative to carbon streaks within the sherd. Zones of higher carbon (incomplete oxidation) leave a darker paste and darker particles within it. Grog particles derived from this zone became Grog A; grog derived from more fully oxidized zones (lighter colors) in the sherd became Grog D. Of incidental note is that Grog A tempered some sherds of Paste Group A, meaning that some firing batches of Paste Group A were self-grogged.

A broader interpretation of this pattern is appropriate. Grogs A and D tempered vessels of paste groups A, B, C, D, and F. These are all the paste groups save E. These common grog types may indicate that all these paste groups were contemporary or that Paste Group A was slightly earlier in time of production. It is certainly true that Paste Group A was very common at site 41SM404.

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