SIGNIFICANCE TESTING OF ARCHEOLOGICAL SITE 41SR242, THE CORNELIO ALVAREZ SR. SITE, STARR COUNTY, TEXAS

CSJ: 3632-01-001 PHARR DISTRICT

Prepared for

Texas Department of Transportation
Environmental Affairs Division
118 E. Riverside
Austin, Texas 78704

Prepared by

Stephen M. Carpenter, M.A., Christopher W. Ringstaff, M.A., Mercedes C. Cody, M.A., James T. Abbott, Ph.D., Ken Lawrence, M.A., Chris Shelton, M.A., Charles D. Frederick, Ph.D., and Christina Nielsen, M.A.

SWCA Environmental Consultants
4407 Monterey Oaks Boulevard
Building 1, Suite 110
Austin, Texas 78749
www.swca.com

Principal Investigator

Christopher W. Ringstaff

Texas Antiquities Permit 7912

SWCA Project Number 52105.03
SWCA Cultural Resources Report No. 19-675
Archeological Studies Program Report No. 181

January 2020

ISBN: 978-1-935545-48-4

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Printed by Sir Speedy

published by:

Texas Department of Transportation
Environmental Affairs Division
Archeological Studies Program
Scott Pletka, Ph.D., Supervisor

Archeological Studies Program Report No. 181

and

SWCA Environmental Consultants
Austin, Texas

SWCA Cultural Resources Report 19-675

ISBN 978-1-935545-48-4

ABSTRACT

The Texas Department of Transportation (TxDOT), conducted National Register of Historic Places (NRHP) eligibility testing of the Cornelio Alvarez Sr. site (41SR242) as part of the State Loop (SL) 195 project (Project) (CSJ: 3632-01-001) in Starr County, Texas. Subsequent to the field investigations, SWCA Environmental Consultants (SWCA) conducted artifact analysis, reporting, and curation preparation for the multi-component historic and prehistoric site. Investigations were conducted in compliance with Section 106 of the National Historic Preservation Act (54 United State Code 30601) and the Antiquities Code of Texas (9 Natural Resources Code). The investigations assessed the site's eligibility for listing on the NRHP (36 Code of Federal Regulations 60.4) and for designation as a State Antiquities Landmark (SAL; 13 Texas Administrative Code 26.8, 26.12). Christopher W. Ringstaff served as Principal Investigator under Texas Antiquities Permit Number 7912. TxDOT conducted the field investigations were from February 20–24, 2017, and April 10–14, 2017.

Site 41SR242 is primarily a Middle to Late Archaic site with lesser Late Prehistoric and perhaps earlier components. The open occupational site is located on an upland margin landform in a tributary valley a few miles from the Rio Grande. The investigations revealed material assemblages consisting of diffusely scattered burned rock, debitage, and lithic tools, which were predominantly recovered from a 30- to 50-cm-thick stratum of mixed artifacts. However, a few concentrations of artifacts were identified, and each location yielded isolated intact features. Formation and post-depositional processes are generally not conducive to preservation of intact archeological surfaces, patterns, or site structure. Although the overall site lacks integrity and potential data yield, isolated discrete behavioral loci are present. Therefore, site 41SR242 is recommended as eligible for the NRHP and as an SAL. This recommendation pertains to the portions of the site within the APE. The site extends beyond the APE, and the areas outside of the APE have not been evaluated.

ACKNOWLEDGEMENTS

The National Register and State Antiquities Landmark testing of 41SR242 was a collaborative effort of Texas Department of Transportation's (TxDOT) Environmental Affairs Division (ENV), TxDOT Pharr District, Cox McClain Environmental Consulting, and SWCA Environmental Consultants. Landowner Cornelio Alvarez, Jr. warrants particular recognition for his hospitality, grilled ribs, and chicken. The Pharr District's logistical support was critical and thanks go out to Edward Paradise Jr., Robin Gelston, Eduardo Garcia Jr., Marisa Ramirez, Dagoberto Salinas, Edelmiro Perez, Esteban Martinez, Antonio Moreno, and Claudio McKee. TxDOT ENV Principal Investigator Christopher W. Ringstaff made it all happen, cradle to grave, with the field assistance of Dr. J. Kevin Hanselka, Dr. Jason Barrett, and Dr. James Abbott. Dr. Abbott's geoarcheological assessment is a principal interpretive basis for understanding the site. As part of the geoarcheological assessment, CT imagery was captured at the High-Resolution CT Scan Facility (UTCT) at the Jackson School of Geosciences, University of Texas at Austin. Analysis of the imagery was greatly facilitated by Dr. Matthew Colbert, who performed the scans and patiently walked Abbott through the ins and outs of the various software packages used for analysis. Thanks are due to him, Dr. Jessie Maisano, Dr. Romy Hanna, David Edley, and Gary Zucker at UTCT for their help and their patience. Consulting Geoarcheologist Dr. Charles Frederick conducted the thin section analysis and the analysis of sediment samples, including granulometry, magnetic susceptibility, CCE, and organic matter. Additionally, Dr. Abbott's analysis benefitted from conversations about the site with a number of individuals, including Charles Frederick, Arlo McKee, Eric Oksanen, Kevin Hanselka, Ken Lawrence, Chris Ringstaff, Matt Colbert, Jason Barrett, Corey Crawford, and Waldo Troell. Special thanks are due to Corey for covering the last field session. Thanks, are in order for the experienced professional staff of Cox McLain for assistance with field efforts, contracting, and initial post-field analyses. Dr. Chris Dayton assembled an "A-Team crew" consisting of Mathew Stotts, Corey Crawford, and Cesario Guerra. The post-field artifact analysis was conducted by Stephen Carpenter, Jessica Ulmer, Ben Morton, Michael Golden, and Mercedes Cody. Chris Shelton conducted the faunal analysis. The report was written and compiled as a group effort by Christopher Ringstaff, Dr. James Abbott, Stephen Carpenter, Ken Lawrence, Chris Shelton, and Mercedes Cody with maps and figures produced by Carole Carpenter and Christopher Ringstaff. Lauri Logan and Kendall Duncan edited, organized, and formatted the report. Finally, Mercedes Cody oversaw the curation preparation. Much appreciation to those who contributed to the effort. To these and others, this author owes a debt of gratitude.

Steve Carpenter
SWCA Project Manager

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CHAPTER 1. INTRODUCTION

The Texas Department of Transportation (TxDOT), conducted National Register of Historic Places (NRHP) eligibility testing of the Cornelio Alvarez Sr. site (41SR242) as part of the State Loop (SL) 195 project (Project) (CSJ: 3632-01-001) in Starr County, Texas (Figure 1.1). Subsequent to the field investigations, SWCA Environmental Consultants (SWCA) conducted artifact analysis, reporting, and curation preparation for the multi-component historic and prehistoric site. Investigations were conducted in compliance with Section 106 of the National Historic Preservation Act (NHPA; 54 United State Code [USC] 30601) and the Antiquities Code of Texas (ACT; 9 Natural Resources Code [NRC] 191). The investigations assessed the site's eligibility for listing on the NRHP (36 Code of Federal Regulations [CFR] 60.4) and for designation as a State Antiquities Landmark (SAL; 13 Texas Administrative Code [TAC] 26.8, 26.12). Christopher W. Ringstaff served as Principal Investigator under Texas Antiquities Permit Number 7912. The field investigations were conducted on February 20–24, 2017, and April 10–14, 2017.

To facilitate the Project schedule, an interim report was submitted in 2017 (Ringstaff and Abbott 2017). Recommendations provided therein were used to coordinate NHPA and ACT obligations. The Texas Historical Commission (THC) concurred with the findings and recommendation provided in the interim report. This report provides the final results of the investigations and analyses to meet the requirements of the antiquities permit and Secretary of Interior guidelines. The additional data and interpretations provided in this report support the previous recommendations.

PROJECT DESCRIPTION AND AREA OF POTENTIAL EFFECTS (APE)

The tested portion of the site is located within the larger Project area of potential effects (APE). The proposed SL 195 is a new roadway in southwestern Starr County extending from Farm-to-Market (FM) 755 to the intersection of U.S. Highway 83 and Loma Blanca Road. The total project length is 17.21 miles and varies between 300 and 450 feet in width. The entire SL 195 Project covers a total area of approximately 824.5 acres. Existing right-of-way (ROW) composes approximately 24 acres and the remaining 800.5 acres is new ROW. According to typical design sections, the depth of impacts is estimated to be up to 40 feet below the current ground surface for the bridge supports and up to 6 feet in depth for the rest of the project.

PREVIOUS ARCHEOLOGICAL INVESTIGATIONS

Site 41SR242 was initially recorded in April 1975 as a multi-component historic and prehistoric site. The historic component was described as an artifact scatter associated with an old house foundation disturbed by root plowing. The prehistoric component was simply characterized as cores, flakes, and burned rock. In 2006, Hicks and Company conducted a survey for the initial design of the proposed SL 195 project under Texas Antiquities Permit Number 4199 (King and Feit 2006). The executive summary of the report briefly describes denied right of entry for 41SR242, as well as adjacent site 41SR243. The report further states that site 41SR243 was examined from an adjacent property and bulldozing was observed, but no mention is made of impacts to 41SR242. In May 2016, SWCA conducted additional survey on behalf of TxDOT. Based on shovel test recovery and apparent upland Holocene sedimentation, SWCA recommended additional work in the western portion of the site. The site was re-surveyed in May 2016 by Jim Abbott and Chris Ringstaff of TxDOT to examine the area designated for additional investigation via backhoe trenching. The artifact-bearing Holocene sediments were confirmed and a debitage feature was encountered. The feature was mapped, then covered for systematic excavation later during testing. With confirmation of the upland Holocene soils containing archeological materials, TxDOT recommended NRHP and SAL eligibility testing at 41SR242.

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Figure 1.1. Overview of Project area, showing location of site 41SR242 in Starr County.

GENERAL OVERVIEW OF RESEARCH OBJECTIVES

The Rio Grande delta has long been cited as an archeological region with a rich material record but rife with unresolved issues regarding the prehistoric sequence and adaptive patterns. In part the issues derive from depositional processes that result in mixed assemblages on relatively stable landforms. In alluvial settings, high energy floods often result in lateral scouring of stream terraces. In addition to natural processes, cultural forces have also affected the region's archeological record. Agricultural practices historically relied on gravity flow canal irrigation, which emerged in the early twentieth century. To be effective, the landscape was leveled and the high points removed to fill the low points. Canal irrigation fostered an economic boom, the "Magic Valley," but these agricultural practices significantly disturbed the archeological record.

As a result of these factors, much of the regional archeological record is known from large surface collections and there is a general lack of clarity on cultural and behavioral patterns of the prehistoric sequence extending back to Paleoindian times. Accordingly, in consideration of the regional context, the testing objectives were to assess the site's potential for providing intact and isolable components or activity areas that could redress some of the regional research problems. Site formation processes, both natural and cultural, constituted a central analytical tack in the site assessments. Specifically, the investigations were "feature-focused," directly targeting intact artifact concentrations.

OVERVIEW OF INVESTIGATIONS AND REPORT ORGANIZATION

To gather sufficient data to make clear determinations of eligibility, the investigation used a two-phased approach, including a geoarcheological study and archeological testing, which were done concurrently. Jim Abbott conducted the geoarcheological study, focusing on the depositional contexts and stratigraphy, site formation processes, and assessing the potential for intact buried surfaces. The second phase entailed archeological investigations using backhoe trenching, mechanical scraping, and hand excavations to assess the potential for intact or substantial cultural deposits. The investigations occurred within select portions of the site, areas defined during previous surveys as having the highest potential for intact deposits (Ringstaff 2014).

Upon completion of the field investigations in April 2017, artifacts were washed, tabulated, and analyzed in accordance with TxDOT and other protocols. The interim report and the artifact and sample analyses were completed in August 2019. Special samples included soil analyses and seven radiocarbon assays obtained from one piece of wood charcoal and six *Rabdotus* shells. Analyses of artifacts followed TxDOT protocols (TxDOT 2013).

In compliance with requirements of the ACT, and guidelines issued by the Secretary of the Interior and the Council of Texas Archeologists, this report provides details on the environmental setting (Chapter 2), cultural background and contexts (Chapter 3), objectives and methods (Chapter 4), results of investigations (Chapters 5 and 7), and interpretations and recommendations on eligibility and research potential (Chapter 8). Appendices include backhoe trench (BHT) descriptions (Appendix A), soil micromorphology (Appendix B), radiocarbon data (Appendix C), the results of analyses for lithic studies (Appendix D), the faunal assemblage (Appendix E), and the historic artifact assemblage (Appendix F).

CHAPTER 2. ENVIRONMENTAL SETTING

DESCRIPTION OF SETTING

Site 41SR242 is situated on a gradual rise approximately 300 meter (m) east of Arroyo Quiote and approximately 190 m northeast of a prominent tributary. The site is within the dissected uplands of the Rio Grande Plains physiographic region of Texas. The Rio Grande delta is a region with a distinct set of environmental circumstances that create a unique ecosystem found only in South Texas and Northeastern Mexico (Jahrsdoerfer and Leslie 1988). These environmental conditions, which include suitable soils and climate for agriculture, have attracted human settlement for millennia. The area, referred to by early twentieth land developers as “Magic Valley,” currently supports a population of 1.3 million people according to the 2012 U.S. Census Bureau estimates for the four-county area including Starr, Hidalgo, Willacy, and Cameron Counties. As a result of settlement, there have been many environmental changes since the 1920s, including the loss of approximately 95 percent of the original native brushland (Jahrsdoerfer and Leslie 1988). Modern gravel mines and agricultural fields currently border the project area. The practices of both have affected the archeological record of the area, including 41SR242.

OVERVIEW OF PHYSICAL GEOGRAPHY

A review of the Bureau of Economic Geology and U.S. Geological Survey (USGS) topographic maps reveal the Rio Grande Valley is a wide floodplain delta containing many *resacas*, oxbow lakes formed from abandoned meanders of the Rio Grande. The Project area is near the northwestern margin of the delta, which fans out to become much wider downstream to the east. Although the region has relatively level topography, the Project area falls on the upland margin overlooking the river floodplain and terraces to the south. Downcutting tributaries create a scalloped upland margin, and archeological sites tend to be common on prominent landforms overlooking the terraces.

GEOLOGY AND SOILS

The geology of the project area is mapped within the Tertiary-age Jackson Group sandstone and clay, Catahoula and Frio formation mudstone, claystone, sandstone, and clay with occurrences of Pleistocene Uvalde Gravels and Holocene Alluvium (Fisher 1976) (Figure 2.1). Rio Grande gravels composed of chert, chalcedony, sandstone, and quartzite from the Trans-Pecos, Mexico, and New Mexico provide a wide variety of lithic resources available for exploitation by the prehistoric population. However, the area borders the Rio Grande delta, a region in which knappable lithic material is all but absent from the landscape making the project area a suitable area for prehistoric inhabitants to resupply. The mapped soils for site 41SR242 within the ROW are primarily Copita fine sandy loam (Thompson et al. 1972~~1~~) (Figure 2.2). The Copita series soils are well drained, moderately deep soils overlaying sandstone that are level to gently sloping (Thompson et al. 1972).

HYDROLOGY

The Rio Grande, one of North America’s major rivers, flows 3,090 kilometers (km) from southeastern Colorado, emptying into the Gulf of Mexico approximately 180 km east of the project area. Arroyo Quiote flows directly in the Rio Grande. Prior to modern flood and irrigation systems, surface water was much more prevalent in the area (see discussion on modern developments below).

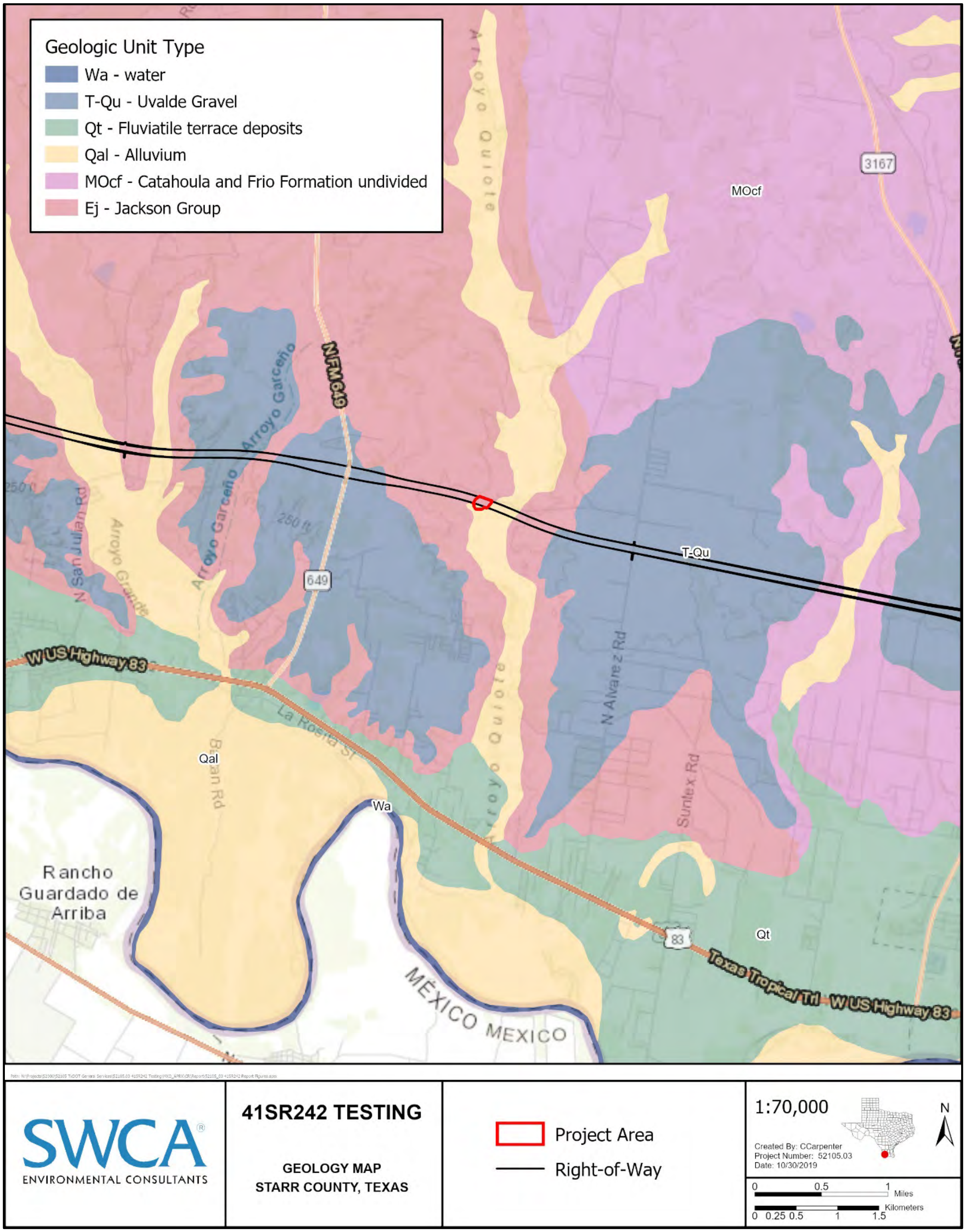

Figure 2.1. Geology of Project area.

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Figure 2.2. Soils in Project area.

There are several inland lakes, Laguna Madre and Laguna Atascosa are among the largest. Along the western and northern sides of many lakes, clay dunes called lomas create fairly substantial formations up to 9 m high. Most of the inland lakes are east of the project area in the lower delta, but several lake beds approximately 50 km to the northeast are notable as historic and prehistoric salt sources. La Sal Vieja and Sal del Rey are shallow salt lakes, dry during parts of the year but seasonally recharged with rainfall, contain millions of tons of 99.0897 percent sodium chloride rock-crystal salt (Campbell 2014).

ECOLOGICAL SETTING - FLORA AND FAUNA

The Project area falls within the Tamaulipan biotic province as defined by Blair (1950), a province that covers the South Texas Plains geographic region, and more specifically the lower Rio Grande delta ecoregion (Figure 2.3). However, Blair (1950:103) suggests the Lower Rio Grande Valley should be considered a separate biotic district distinct from the rest of South Texas within the Tamaulipan province. Diamond et al. (1987:204) place the area in a subdivision of the South Texas Brush Country called the Subtropical Zone. Many of the 61 mammal species, two land turtles, 36 snakes, 19 lizards, and various species of reptiles, frogs, and toads that occupy, or have historically occupied, this biotic province have adapted to its subtropical, “megathermal” climate (Blair 1950:102-105). Species distribution and densities vary considerably and are mainly dependent upon the local vegetational community and available water resources.

The South Texas Plains region’s modern vegetation community has changed quite a bit from prehistoric conditions of the area (Jahrsdoerfer and Leslie 1988). The indigenous flora “would have been composed of riparian lands and bottom lands deciduous forests” (Kibler and Freeman 1993:3). Today, the regional vegetation is brush land dominated by mesquite (*Prosopis glandulosa*) and acacia (*Acacia* sp.). Other scrub and brush species found in the region include prickly pear (*Opuntia lindheimeri*), Barbados cherry or Mexican myrtle (*Malpighia glabra*), and saw greenbrier (*Smilax bona-nox*). Vegetation along the Rio Grande is dominated by giant reed (*Arundo donax*), black willow (*Salix nigra*), hackberry (*Celtis laevigata*), and huisache (*Acacia farnesiana*) trees. The Mexican palm (Sabal Mexicana) is a species the distinguishes the Lower Rio Grande Valley from the rest of south Texas

According to Davis and Schmidly (1994), common small mammals that may occur in the region include the pocket mouse (*Perognathus hispidus*), white-footed mouse (*Peromyscus leucopus*), southern plains woodrat (*Neotoma micropus*), desert cottontail (*Sylvilagus audubonii*), and black-tailed jackrabbit (*Lepus californicus*). Large mammal species that occur or have the potential to occur within the project area include white-tailed deer (*Odocoileus virginianus*), coyote (*Canis latrans*), bobcat (*Lynx rufus*), and javelina (*Tayassu tajacu*).

Bird species present in the area are typical of the brush and scrub vegetational community. Common resident species include the mourning dove (*Zenaida macroura*), northern mockingbird (*Mimus polyglottos*), house sparrow (*Passer domesticus*), olive sparrow (*Arremonops rufivirgatus*), the northern bobwhite (*Colinus virginianus)*, red-tailed hawk (*Buteo jamaicensis*), and long-billed thrasher (*Toxostoma longirostre*). Besides mammals and birds, various snakes and lizards, and occasional toads can also be found.

Restricted Information

Not for Public Disclosure

Figure 2.3. Level IV Ecoregions map.

SETTING PRIOR TO HISTORIC MODIFICATIONS

The current setting of the Rio Grande delta is very different from the landscape occupied by indigenous groups in prehistoric times. The nearly level, treeless coastal plain with little surface water except for irrigation canals is the result of modern development and agricultural practices. Based on a compilation of historical accounts, Salinas (1990:12-13) describes the Rio Grande delta in early historic and prehistoric times as covered with dense woody vegetation, with marshy resacas. Currently, intensive upstream water demand and dams have slowed the Rio Grande flow rate, curtailing deltaic flooding, sapping the recharge of oxbow lakes and marshes. After approximately 1900 to 1920, much of the landscape was cleared and leveled for canal irrigation, removing topographical high points to infill low areas. Based on the accounts, the prehistoric Rio Grande delta likely contained a richer concentration and diversity of biotic resources, both aquatic and terrestrial, prior to historic modifications.

CHAPTER 3. CULTURAL SETTING

The project area is within the larger South Texas archeological region, covering the state's southern coastal plain from the margin of Edwards Plateau southward to the Rio Grande delta and thence up the Texas coast to just beyond the mouth of the Guadalupe and San Antonio Rivers (Hester 2004:128). However, the Rio Grande delta is often considered a fairly unique sub-region, one that has many adaptations and traditions not found elsewhere in South Texas. Long-term strategies were likely adapted to the setting at an ecotonal juncture between the southern Texas prairies, inland Brasada with its scrubby, arid setting, and the coastal plain marked by marine and littoral settings along the coast, bays, estuaries, and streams. To provide a context for the archeological sites, this chapter provides data on previous investigations, cultural resources in the area, and the prehistoric sequence.

CULTURAL RESOURCES BACKGROUND REVIEW

SWCA performed a cultural resources background archival and literature review of the general area surrounding archeological site 41SR242. To conduct this review, an SWCA archeologist reviewed the *Roma Los Saenz East* USGS 7.5-minute quadrangle maps on the THC's Texas Archeological Sites Atlas online database including searching for pertinent records pertaining to the project area. These sources provided information on the nature and location of previously conducted cultural resources surveys, previously recorded historic and/or prehistoric archeological sites, NRHP districts and/or properties, SALs, Official Texas Historical Markers (OTHMs), Registered Texas Historic Landmarks (RTHLs), cemeteries, and local neighborhood surveys in or near the project area. The results of the review are presented in Figure 3.1.

Site 41SR242 was recorded in April 1975 as a multicomponent historic and prehistoric site. The historic component described an artifact scatter associated with an old house foundation disturbed by root plowing. The prehistoric component is simply characterized as cores, flakes, and burned rock. The form is quite brief, providing minimal information. In 2006, Hicks and Company conducted a survey for the initial design of the proposed SL 195 project under Texas Antiquities Permit 4199. The executive summary of the report briefly describes denied right of entry for 41SR242 and 41SR243 and that site 41SR243 was examined from an adjacent property and bulldozing was observed. There was no mention of impacts to 41SR242.

In May 2016, SWCA conducted additional survey on behalf of TxDOT. Based on shovel test recovery and apparent upland Holocene sedimentation, SWCA recommended additional work in the western portion of the site. The site was re-surveyed in May 2016 by Jim Abbott and Chris Ringstaff of TxDOT to examine the area designated for additional investigation via backhoe trenching. The artifact-bearing Holocene sediments were confirmed and a debitage feature was encountered. The feature was mapped and covered to be excavated properly during testing. With confirmation of the upland Holocene soils containing archeological materials, TxDOT recommended NRHP and SAL eligibility testing at 41SR242.

Four previously recorded sites (i.e., 41SR16, 41SR242, 41SR243, and 41SR419) are within a 1-mile radius of 41SR242 (THC 2019). The sites consist of primarily surface scatters of lithic debris and burned rock. The nearest site, 41SR243, is likely an extension of 41SR242 and was previously recommended for combining by SWCA during the survey investigations (see Figure 3.1). No historical markers, cemeteries, NRHP districts or properties are located within the 1-mile background review area (THC 2019).

Restricted Information

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Figure 3.1. Cultural resources background review results map.

CULTURAL CONTEXT AND CHRONOLOGY

Site 41SR242 is a multicomponent historic and prehistoric site with possible Paleoindian to Late Prehistoric components. Most of the radiocarbon dates and diagnostic artifacts indicate Middle to Late Archaic occupations were the predominant occupational periods. The cultural chronology provides a wider geographical extent than solely the lower Rio Grande, including the broader South Texas and Coastal regions.

Paleoindian

The Paleoindian period (11,500 to 8800 B.P.[radiocarbon years]) spans the time of initial settlement to the advent of regional identities that mark the beginnings of the later Archaic period hunter-gatherers. These earliest groups, distinguished in the archaeological record by various lanceolate points, including Clovis, Folsom, Plainview, Golondrina, and Angostura types, are generally inferred to have been small, highly mobile bands relying on large game animals for their basic livelihoods. Although a fairly large number of diagnostic artifacts dating to this period have been recovered from South Texas, no clearly intact sites have been investigated in the region. Consequently, the nature of Paleoindian adaptation to South Texas remains poorly understood, relying largely on inferences from better-studied sites in adjacent areas such as the Southern Plains, Lower Pecos, and Central Texas, but the focus is on the Pharr District in which 41SR242 is located.

Since early Paleoindian sites are rare in far South Texas, the distribution of diagnostic artifacts reveal some important information on settlement patterns. Clovis points mark the earliest identified Paleoindian groups in the region. In a survey of fluted points reported from throughout the state, Meltzer and Bever (1995) identified 49 Clovis points recovered from the counties comprising the South Texas region. Clovis points are rare in the coastal areas, including the Rio Grande Delta. A total of 2 points were reported from the Pharr District counties (see Meltzer and Bever 1995:49–50) and only 4 Clovis points recovered from the counties comprising the Corpus Christi District, further substantiating the rarity of these early sites along the coast and Rio Grande Delta. Interestingly, the vast majority of Clovis points in South Texas have been recovered from the Nueces-Guadalupe Plain, indicating either a focus on the area or uncommonly suitable preservation conditions. Folsom point distributions, both the frequency and spatial patterning, differ from the Clovis patterns, suggesting a shift in settlement patterns (Meltzer and Bever 1995:60, 74). Folsom points appear more frequently in the coastal plain as well as the South Texas plain, most notably the Nueces-Guadalupe Plain. As Folsom points are almost exclusively found in plains settings, the technology perhaps marks a more specialized adaptation, likely to a more intensive reliance on ancient bison.

No intact sites dating to these times have been systematically studied in the vicinity of the Cornelio site. Among the nearest investigated Paleoindian sites is the La Paloma Mammoth site (41KN78) located along the Palo Blanco River in Kenedy County (Suhm 1978, 1980). At this site, a possible fluted lanceolate point and other tools were found in proximity to mammoth and *Bison antiquus* bones. However, the researchers determined the artifacts were found in secondary context and were not in direct association with the Pleistocene faunal remains. The nearest sites with reasonably good integrity are located in the Lower Pecos (e.g. Baker Cave, Hinds Cave, Devil's Mouth, and Eagle Cave), the coastal plain (e.g. Berger Bluff and several sites in Victoria County), and Central Texas (e.g. Pavo Real, Berclair Terrace, otherwise known as Buckner Ranch). The submerged site at McFaddin Beach on the upper Gulf Coast has produced artifacts spanning the entire spectrum of Texas prehistory, with remarkable numbers of Paleoindian and Early Archaic projectile points having been recovered.

The early lithic technology of the Paleoindians consisted mainly of the fluted projectile points and specialized blade core production (Hester 2004). At the later end of this period, projectile point styles change to non-fluted, lanceolate types such as Angostura and Golondrina (Black 1989:49). In addition, the poorly dated Lerma dart point has been tentatively assigned to this period (Epstein 1969; MacNeish 1958; Suhm, Krieger, and Jelks 1954), but the lack of corroborating data makes this style increasingly suspect as a legitimate type (Hester 2004). The important transitional stage between the Paleoindian Period and the subsequent Early Archaic Period is poorly understood in this region. However, it is believed there was a transition from big-game hunting to generalized hunting and gathering strategies at the later part of the Paleoindian Period (Black 1989). An accompanying technological shift from lanceolate points to stemmed dart points appears to have also occurred.

Early Archaic

The Early Archaic from 8800 to 6000 B.P. is distinguished from the earlier Paleoindian period by increasing adaptation to regional environments, more intensive processing of local resources, and diversification of artifact types and technologies. The temporal division between Paleoindian and Archaic patterns is generally around 8800 B.P. (radiocarbon years) based on several chronologies and well-dated sites (e.g., Thoms and Clabaugh 2011:85), although a number of authors place the advent of Archaic ways later in time. Hester (2004:137) defines the advent of the earliest clearly Archaic technologies as beginning around 8000 B.P. In coastal areas of South Texas, Ricklis (2004:161) begins the Early Archaic at approximately 7500 B.P. when sea level was still well below current levels. The terminus of the South Texas Early Archaic is around 6000 to 5500 B.P., but others have it continuing to 4500 to 4200 B.P. (Hester 2004:137; Ricklis 2004:161). Recent dating of bison bone place of the Calf Creek horizon, which falls within Hester’s final horizon of the Early Archaic, from 5955 to 5815 B.P. in calibrated calendrical years or about 5100 to 5200 radiocarbon years (Lohse et al. 2014). Considering the discrepancy between radiocarbon and calendrical years of about 1000 years at this time, the different estimated termini of 5500 and 4500 B.P. may be attributable to conversion factors.

Early Archaic sites are typically located on upland landforms and high terraces, though several components within deep alluvium are known from the Choke Canyon area of Live Oak County. Examples of sites from the coastal bend include 41VT17 (Fox and Hester 1976), the McKenzie site (Ricklis 1988), and the Swan Lake site (Prewitt et al. 1987). Although the Early Archaic components at these sites are ephemeral, they demonstrate early use of the estuarine bayshore environment along coastal areas. During the late part of the Early Archaic, the number of coastal components increased, as did the intensity of the occupations (Ricklis 2004:162, 164). It appears that both shellfish and fish were exploited to the extent that these early components likely functioned as fishing camps (Ricklis 1988:101–102, 2004:161–165).

Few Early Archaic sites have been intensively studied, although there are notable exceptions such as the Richard Beene site (41BX831) (Thoms and Clabaugh 2011; Thoms and Mandel 2007) in Bexar County. It has been suggested that populations and site densities continued to be low on the entire coastal plain during the period (Story 1985:37), but much research is needed to determine whether the lack of sites from the time is a matter of poor preservation or whether the record accurately reflects low population densities.

Early Archaic technology includes projectile points, large bifaces, small informal hearths, Guadalupe tools, and Clear Fork gouges. Projectile points diagnostic of the period include Gower, Wells, Bell, Andice, Martindale, Uvalde, and related forms (Hester 2004:136–137; Weinstein 1992:57). Hester (2004:136–137) has suggested these point styles can be categorized into two sequential horizons, including the early corner-notched, followed by the early basal-notched horizons. The Martindale, Uvalde, Baker, and Bandy points comprise variations on a theme, constituting central diagnostics of the early corner-notched horizon. Some have suggested technological continuity of these forms directly from earlier types such as Hoxie and Early Stemmed Lanceolate (Carpenter and Paquin 2010). If so, the early corner-notched technology could be an in situ technological development. Conversely, the basal-notched horizon, which includes Bell and Andice, has strong technological affinities with Calf Creek and other forms found farther to the north, including Oklahoma, suggesting either the diffusion of point-making ways or migration of peoples. Numerous Calf Creek horizon points have been recovered from far south Texas near the project area and southward into northern Mexico (Hester 2004:138).

Hester (2004:136, 138) associates Guadalupe tools, inferred to be wood-working tools (Brown 1985), with the early corner-notched horizon, and unifacial Clear Fork tools with the basal-notched horizon. While the majority of Early Archaic features are small hearths, several larger burned rock features have been noted at sites such as Richard Beene, indicating technological cooking features more common in later times had their origins in the Early Archaic (Thoms and Clabaugh 2011:105).

Evidence of subsistence, although not common, indicates a generalized foraging strategy of exploiting a wide variety of species, including snails, aquatic resources, and many small animals. The association of basal-notched points with bison remains has commonly been noted (e.g., Bement et al. 2005), and Lohse et al. (2014) have shown a prominent increase of bison in the archeological record at the time of the Calf Creek horizon. The implication is that Early Archaic peoples maintained a broad spectrum subsistence, although clearly targeting highly ranked resources when available. They were able to adapt rather quickly to exploit new circumstances.

Early Archaic society is often construed as consisting of a low population density with small mobile, multifamily bands, but evidence from the Early Archaic cemetery at Buckeye Knoll seem to indicate a more diverse picture, one with greater social complexity and widespread supra-regional interaction (Ricklis 2011). A total of 69 burials dating to between 7500 and 6200 B.P. (calibrated years, or about 6600 to 5600 radiocarbon years) yielded evidence of social ranking and “relatively complex cultural expressions” with affinities with cultures in the Lower Mississippi Valley and Eastern Woodlands (Ricklis 2011:70). Sites such as this are paradigm busters, creating cause for a reconsideration of inferences drawn from small occupational sites that may represent only part of the overall picture.

Middle Archaic

Data from the comparatively brief Middle Archaic are unclear on many aspects, engendering very contradictory interpretations on the nature of cultural adaptations and the climatic setting during this mid- Holocene period. Well-documented sites, such as the Richard Beene site component dating from 4500 to 4,100 years ago, are few and yield sparse remains, often with the inclusion of diagnostic artifacts from other periods. Based on Central Texas data, Johnson and Goode (1994:26) see the period as having mesic but drying conditions, and Thoms and Clabaugh (2011:91) interpret the period as fluctuating between drier conditions but concluding between 4500 and 4100 B.P. with a cooler wetter climate. Data from the adjacent Lower Pecos area show a hot and dry interlude from 5500 to 4100 B.P. (Turpin 2004:270), but whether these patterns are applicable to South Texas remains to be determined. Along the coastal regions, Ricklis identified the period from 5800 to 4200 B.P. as the Middle Holocene stillstand, a period of stable sea levels, before the rapid sea level rise beginning around 4200 B.P. (Ricklis 2004:164). During this stillstand, a period he originally placed within the Early Archaic but would now fall within his Middle Archaic based on his later revised timeframe (e.g., Ricklis 2011:38, see discussion below), Ricklis notes a prominent increase in the number of archeological components. Consequently, in some areas, site frequency appears to increase, and in others the archeological record suggests perhaps a decline, but such a trend is unclear.

Although the Middle Archaic has often been defined as extending from approximately 4,500 to 2,500 years ago (e.g., Hall et al. 1986; Hester 2004; Ricklis 2004), more recent trends in chronological partitioning and better dating techniques have substantially modified not only the timing but also the content of the Middle Archaic (e.g., Lohse et al. 2014; Ricklis 2011:38, 71; Thoms and Clabaugh 2011).

The differential use of calendrical versus radiocarbon years adds to the confusion and accounts for some of this discrepancy, but there are also substantive differences in chronologies. For instance, as commonly defined, the South Texas Middle Archaic would primarily fall within the Late Archaic of South Texas as defined by Hester (2004). Many of the same diagnostic artifacts are considered Middle Archaic in one region and classified as Late Archaic in the immediately adjacent region. The lack of a common definition of the divisions is partly to blame for such discrepancies. Consistent with these recent data, the Middle Archaic is defined here as dating from 5800 to 4000 B.P. The period begins shortly after the Calf Creek horizon dated by Lohse et al. (2014) to approximately 6000 to 5800 B.P.

While the site distribution patterns remain to be clarified, Story (1985:39, 1990:244) has suggested that environmental changes may have enhanced coastal resources enough that populations and site densities increased. Ricklis (2004:164) also inferred an increase in population during the period from 5800 to 4200 B.P. If inland sites of the period continue to show small short-term occupations and coastal areas greater concentrations of sites, the period may reflect increased coastal adaptations. However, one aspect that perhaps counters the interpretation of increased population is the lack of cemeteries, often viewed as indicators of increased territoriality and population. Ricklis' (2011:72) review of coastal cemeteries show no cemeteries dating to the time.

Small burned rock features, stemmed and triangular point types, and formal tools such as gouges and scrapers are hallmarks of the Middle Archaic technology. The cooking feature assemblage in the Middle Archaic components at the Richard Beene site comprises mainly small features that do not include burned rock (Thoms and Clabaugh 2011:104). Using data from Central Texas, Johnson and Goode (1994:24, footnote) observe that diagnostic artifacts from the Middle Archaic are typically found below substantial burned rock accumulations. However, they do suggest burned rock midden technology, indicative of more intensive exploitation of vegetal resources, may have been practiced during the Middle Archaic, but perhaps not to the extent as in later times. In coastal areas, shell middens become prominent as evident at sites such as McKinzie (41NU221), Means (41NU184), and 41SP156 (Ricklis 2004:164). Possible baking pit features with associated concentrations of burned rocks also have been identified at coastal shell midden sites. Diagnostic projectile point styles include Early Triangular, Nolan, and Travis points. Pandale points, more common in the Lower Pecos region, are also found in South Texas. There is a difference of opinion on whether the Calf Creek complex with Bell and Andice points are Early or Middle Archaic. Dart points, unifacial scrapers, and preforms found at Middle Archaic sites suggest hunting and manufacturing activities. Gouges are present in artifact assemblages in increased numbers over the preceding period, possibly suggesting increased wood- or hide-working activities (Hester 2004).

Subsistence data from the period are limited. Shell middens, often containing fish otoliths, indicate exploitation of marine resources from the time. As noted, the advent of burned rock middens suggests a more intensive exploitation of plant resources.

The appearance of projectile point types typical of other regions (e.g., Bell, Andice, and Pandale) and marine shell originating from outside the area suggest an expansion of trade/exchange networks in the region, although as previously discussed the Early Archaic Buckeye Knoll site indicates such networks were already well-established.

Late Archaic

The Late Archaic period from 4000 to 1000 B.P. is far better understood than the preceding periods and is marked by a continuation and intensification of adaptations established in the previous period, but also witnessed the development of new technologies and social identities. There were major environmental fluctuations during the time, but the general trend was towards conditions that roughly equate to the historic setting. The period began with rapid rise in sea level around 4,000 years ago, submerging river valleys and reaching the modern stable sea level by about 3,000 years ago (Ricklis 2004:157). In the course of these events, barrier islands developed creating protected bays and extensive estuarine environments with high densities of diverse species. Many models indicate dry conditions in the beginning that gradually ameliorated to increasing mesic conditions. Faunal data from Halls Cave and Bering Sinkhole on the southern margin of Central Texas indicate relative dry conditions until 2700 to 2500 B.P. before the shift to wetter conditions (Toomey et al. 1993:309). Based on the faunal data, inland environments were short-grass grassland or desert grassland, turning to wetter mixed grasslands after circa 2500 to 2000 B.P. (Toomey et al. 1993:309).

The Late Archaic, as defined here, covers a longer span of time than many authors have it, three millennia, beginning earlier than previous chronologies (e.g., Hall et al. 1986; Hester 2004; Ricklis 2004:165). The temporal span and cultural developments in this revised Late Archaic period are consistent with recent revisions and improvements in radiocarbon dating that place the advent around 4000 B.P. (e.g., Lohse 2014; Ricklis 2011:38). Many cultural and temporal subdivisions have been devised to partition the Late Archaic into finer divisions, but there is still much debate on the validity of various phases, complexes, and foci. One of the more enduring divisions is the Aransas focus defined by Campbell (1947, 1952), and more recently refined by Weinstein (2002) based on excavations at the Guadalupe Bay site (41CL2). Weinstein (2002) defines the Aransas I (2500 to 2100 B.P.), II (2100 to 1900 B.P.), and III (1900 to 1200/1300 B.P.) as covering the final part of the Archaic period. Ricklis (2011:38) breaks the Late Archaic into sub-periods I (4000 to circa 2700 B.P.), II (2700 to 1900 B.P.), and III (1900 to 1200 B.P.). His Late Archaic II roughly corresponds temporally with Weinstein's Aransas I and II, and the Late Archaic III corresponds temporally with Aransas III.

Technological hallmarks of the time include hearths, ovens, burned rock middens, ground stone such as manos and metates, bedrock mortars, projectile points, bifaces, bone and shell tools, and various formal types of gouges, scrapers, and adzes. Projectile points from the Late Archaic include Bulverde, Pedernales, Desmuke, Tortugas, Refugio, Marcos, Shumla, Ensor, Frio, Fairland, Montell, Morhiss, Castroville, and Ellis. There is a gradual decrease in point size from the broad-bladed forms that predominate until approximately 2200 B.P. with the advent of the Ensor-Frio-Fairland series.

Coastal sites such as Mustang Lake (41CL3) on San Antonio Bay and 41SP43 along Ingleside Cove on Corpus Christi Bay have yielded evidence to support "a significant intensification of estuarine resource use" in Late Archaic, with an increase in shellfish gathering around 3000 B.P. and a substantial increase in the reliance on fish by around 2000 B.P. (Ricklis 2004:165). In the Aransas Bay area, Campbell (1947, 1952) designated this period of intensive exploitation of estuarine resources as the Aransas Focus. Inland, the presence of grinding implements and large deposits of burned rocks at the Choke Canyon sites suggest continued, intensive exploitation of plant resources in addition to a broad range of animal species (Hester 2004:140).

Burial of the dead in cemeteries appears to be more common in this period as evidenced by excavations at the Loma Sandia Site in Live Oak County (Taylor and Highley 1995), Ernest Witte (Hall 1981), Crestmont (Hall 2002), and numerous other sites.

Distinctive shell tools such as Busycon whorl scrapers and columella gouges mark Aransas sites. Similar tools have been recovered from shell midden sites as far north along the coast as Lavaca Bay and the lower reach of Caney Creek in Matagorda County (Fritz 1975:129).

Late Prehistoric Period

The technological innovations of ceramics and the bow and arrow are typically regarded as marking the beginning of the Late Prehistoric (1,150–350 B.P.) (Black 1989b:51; Hester 2004). Prehistoric sites from this period are often the best preserved, most distinctive, and visible of all periods in South Texas. Ceramics dating to this period are generally bone tempered (Black 1989b:52). Late Prehistoric settlement patterns suggest increased mobility, perhaps an effect of greater reliance on bison as a subsistence mainstay. Faunal assemblages dating to the Late Prehistoric show an increased consumption of bison, deer, and antelope (Black 1989b; Hester 2004). At the Hinojosa Site in Jim Wells County, the well-preserved faunal remains associated with a Toyah occupation showed dependence on deer and antelope, and to a lesser extent, bison (Black 1986). Adoption and use of the bow and arrow may have facilitated the shift in balance between animal and plant foods. In South Texas, common arrow point types include Perdiz, Scallorn, Fresno, Starr, and Zavala. The social and material culture of the period can be inferred to some degree by the ethnohistorical record, as discussed below.

In South Texas coastal areas, around A.D. 1250 to 1300, a distinct archeological assemblage emerges. The Rockport phase is marked by a series of ceramic types that are spatially limited to the central coast, but also a lithic industry that incorporates much of the Toyah assemblage (Ricklis 2004:172–175). Perdiz points, unifacial end scrapers, a prismatic blade-core technology, and thin bifacial knives (occasionally alternately beveled) show a strong overlap between the technologies of both groups. One of the few distinctions between the Rockport and Toyah lithic assemblages is the forms of perforators (Ricklis 2004:175). The former made relatively narrow proximal ends, whereas Toyah drills tend to have a wide proximal portion where it was held or hafted. Rockport subsistence strategies clearly emphasized maritime resources, though perhaps on a seasonal basis. The relationship between Toyah and Rockport is generally inferred to be one of two distinct peoples, with Rockport adopting the Toyah lithic assemblages about the same time bison became relatively abundant on the coastal plain (Ricklis 2004:175). Marine shell, most notably *Oliva sayana*, are part of the Toyah assemblage, but the extent of mutualistic economic relationships between the inland and coastal groups is not entirely certain.

Brownsville Complex

In the Rio Grande delta of far south Texas, a distinctive but vaguely understood complex designated the Brownsville Complex is commonly surmised to have emerged around A.D. 1250 to 1300, continuing for a couple centuries until A.D. 1500, although a reanalysis of the long-held construct shows it is not so easily defined (Terneny 2005:1). The “complex,” for lack of a better term is primarily defined as a mortuary complex based on several large cemeteries in the region (e.g., Ayala [41HG1] and Floyd Morris [41CF2]) and the extensive use of shell in implements and decorations. The complex is called the Barrill Complex in the coastal areas of Mexico immediately south of Texas, rendering the boundary between the two an arbitrary one (Terneny 2005:212, 214). Additionally, the temporal boundary is arbitrary since there are few dates to clearly define it, and the traits associated with the complex have also been shown to occur in preceding Archaic contexts. Accordingly, Terneny (2005:211) recommends abandoning the construct, but we are still left with an intriguing constellation of archeological traits in need of definition. While the use of cemeteries is often considered evidence of increased social complexity, in this case cemeteries may have evolved as a result of limited territoriality and constrained mobility, not necessarily from increasingly hierarchical society. For example, Hester (1969:163) presents a model of hunter-gatherer fishers in the area maintaining limited mobility as a result of the rich concentration of estuarine, riverine, and coastal resources—the need for long-range movement to exploit dispersed resources was unnecessary in such a setting. Additional work is needed to address the economic basis of society in the area, not only the subsistence basis but also commerce evident by the high quantity of trade goods going into (e.g., jadeite beads) and out of (e.g., marine shell beads and ornaments). These exotic goods suggest a vibrant trade sphere centered as this critical juncture of environmental and economic contexts.

Historic Period

The Historic period in the South Texas Coastal area begins with the first Spanish entradas when the Europeans began to explore and colonize the region. In 1519, Alonso Alvarez de Pineda was the first European to reach the Rio Grande delta, (Scott 1970; Stambaugh and Stambaugh 1954). Álvar Núñez Cabeza de Vaca is cited to have passed through the area in 1528 (Scott 1970), but the evidence that he traveled through the Rio Grande delta is tenuous.

In 1554, a Spanish fleet of four ships laden with treasures from the New World set sail from Veracruz heading home to Spain. The fleet carried over 400 people and a rich cargo. En route to Cuba, its first harbor along the homeward journey, a fierce storm drove three ships aground along the Texas coast off Padre Island a short distance south of Corpus Christi. One captain managed to salvage a crippled ship and tenuously returned to Veracruz, but three hundred passengers were forced ashore, an unknown number drowning in the effort. The survivors began to walk southward along the shoreline hoping to reach the colonial outpost of Tampico thought to be only a short distance away. In, the trek back, however, most survivors were either killed by indigenous groups or drowned while crossing rivers. A few survivors of the "the wreck of the 300" made it to the Rio Grande delta, but only two ultimately made it back to the colonial outpost.

A group under Jacinto García de Sepulveda was sent to explore the area in August 1638. They crossed the Rio Grande near Mier and marched down the north bank of the river as far as the site of present Brownsville (Garza and Long 2015). Also, on February 27, 1747, José de Escandón built a raft to sound the Rio Grande just north of the modern-day Matamoros and Brownsville area. A royal inspection made in 1757 by José Tienda de Cuervo recommended that titles to the land in the area be given to the colonists, and Escandón helped found the colonies of Reynosa (1749), Camargo (1749), Mier (1750), Revilla (1752), and Laredo (1755). Down the Rio Grande to the south of these colonies, San Juan de los Esteros was established in 1765. After 30 years of tenuous existence, San Juan de los Esteros was emboldened by Nuevo León immigrants and renamed Nuestra Señora del Refugio. After Mexico won independence from Spain in 1821, Nuestra Señora del Refugio was renamed Matamoros.

Mexican independence ushered in a prosperous time of settlement for the Rio Grande Delta region and the Lower Coastal region. Most of these early settlers were Mexican ranchers who, in turn, attracted American and European merchants. Matamoros was established as a seaport in 1823, and this significantly increased the economic vitality of the region. This vitality was largely unaffected by the Texas War for Independence, since military campaigns were concentrated further north and west (Webb 1952).

The same cannot be said for the Mexican War, whose formal opening occurred along the Rio Grande at Matamoros. General Zachary Taylor's forces established themselves on the northern side of the Rio Grande opposite Matamoros in March of 1846. Responding to the placement of Mexican artillery, Taylor ordered the construction of a fort, which included defensive works in the form of six-sided, moated earthworks 800 yards in circumference and 9 feet tall (Mahr-Yanez and Perttula 1995). Mexican artillery fired on the fort May 3, 1846, while Taylor and the bulk of his forces had marched downstream to Port Isabel. After several days of heavy fighting, the Mexican troops were turned back. Major Jacob Brown, the interim commander, died during the attack and General Taylor, upon hearing this, ordered the fort to be named Fort Brown (see further discussion below). The Mexican War ended on July 4, 1848, after two years of heavy fighting in Mexico.

Immediately following the war, Starr County was formed from the Nueces Land District and named after James Harper Starr, a Republic of Texas treasurer. Rio Grande City is the county seat.

Business continued to improve up to the beginning of the Civil War. Confederate forces, under the direction of General H. P. Bee, assumed control of Brownsville in 1861 after the peaceful withdrawal of General Twigg's Union forces. Brownsville returned to Union control in November of 1863 after a sizable Union force landed on Brazos Island, which compelled General Bee to abandon and burn Fort Brown (Pierce 1917). The Confederate forces regained Fort Brown in July of 1864 and held it until the end of the war. The last battle of the Civil War occurred on Palmito Ranch near Brownsville south of the Project area. On May 13, 1865, more than a month after Robert E. Lee's surrender, opposing forces met for the final time as the Confederates pushed back federal troops until reinforcements arrived and a truce was negotiated.

The economy of the Rio Grande Delta suffered after the Civil War, and disorder escalated following the collapsed fortunes of many in the area (Rogers 1996). This prompted Union troops, under the command of General Phillip Sheridan, to restore order to the region immediately after the war (Webb 1952).

The regional economy grew slowly but steadily throughout the rest of the nineteenth century until flood control and irrigation projects contributed to the success of regional agriculture. Shipping and railroads turned Brownsville into a major port during the nineteenth century. In 1837, Charles Morgan established the first steamship line between New Orleans and Galveston, which became the basis for further expansion of the lines throughout Texas into the southern coast by the 1840s (Baughman 2015). Roma and Rio Grande City were both ports for steamboat traffic. After interruption during the Civil War, Morgan began integrating railroad and maritime transport, developing railways that connected to ports. These developments led to the founding of Morgan's Louisiana and Texas Railroad and Steamship Company in 1877.

Rail continued to be a major economic force throughout the nineteenth and twentieth centuries. According to railroad records, the area produced 761 freight car shipments of produce in 1907, when the first flood control project was completed. Shipments totaled 6,307 in 1920, and in 1930 annual shipments reached 28,113 (Watson 1931).

The Project area landscape was transformed by the adjacent ship channel and its history of construction and maintenance. In 1928, residents of the area approved funds to establish the Brownsville Navigation District and construct a ship channel from Brazos Santiago Pass to allow deep-water vessels to dock in Brownsville. The voter-approved $2 million provided the initial impetus, but progress was slow. It was not until the Public Works Administration provided additional funds that the 17-mile-long channel, turning basin and Terminal facilities were completed. The port of Brownsville opened on May 15, 1936. The channel connects Brownsville with the Gulf Intracoastal Waterway, and SH 48 runs alongside the channel for most of its length.

The completion of the port made Brownsville the shipping center for the Lower Rio Grande Valley and northeastern Mexico and helped the city to weather the worst effects of the Great Depression.

The Lower Rio Grande Valley, called the Magic Valley for its agricultural productivity, "forms one of the most inviting fields for irrigation on a large scale that can be found in Texas" (Taylor 1902:68). In the delta, the floodplain widens, making it ideal for irrigation agriculture. By 1904 when the St. Louis, Brownsville and Mexico Railway created a suitable mode of export, agriculture become a paramount economic mainstay for the region. Early efforts to irrigate the Lower Rio Grande Valley date back to the 1870s, with the first extensive efforts occurring along the Rio Grande (Knight 2009:13).

George Brulay, "the first irrigator in the Valley and the man who first introduced sugar cane to South Texas" (Knight 2009:13), was a French immigrant who completed a canal system along the Rio Grande south of Brownsville in 1896. Brulay used a large pump with a maximum capacity of 8,000 gallons a minute, and a lift of 22 feet (Taylor 1902:68). The pump ran about 14 hours a day and supported 300 acres of sugar cane.

Many canal systems developed throughout the area during the first half of the twentieth century. Knight (2009:31-32) lists 35 irrigation companies that formed in the area from 1896 to 1951.

A review of aerials and maps of the 41SR242 vicinity shows fallow fields and open range. A 2011 aerial clearly shows plowed fields. Sheep, goat, and cattle ranching have long been an important economic mainstay in Starr County, and the current Project area appears to have been previously used as a pasture.

CHAPTER 4. OBJECTIVES AND METHODS

TESTING OBJECTIVES

The main focus of testing was to identify, if present, isolable features that represent discrete activities such as lithic reduction areas. This feature-focused approach acknowledged common disturbances to many of the surficial components, focusing efforts instead on the comparatively intact areas. With so little known of the site prior to testing, the investigations sought to characterize site content and context, to define components, features, or activity areas that could contribute to an understanding of the region's archeological record and cultures. Two main objectives were set forth to define the data needed to address NRHP and SAL criteria within applicable historic contexts. Eligibility requires two fundamental factors, both of which must be present: significance and integrity (Little et al. 2000). The two main objectives, both designed to address these factors, are briefly discussed, followed by the state and federal significance criteria.

Objective 1: Integrity of the Archeological Deposits

Integrity, according to NRHP guidelines, is the ability of a property to convey its significance. It entails aspects of location, design, setting, materials, workmanship, feeling, and association. Of these aspects, a primary focus of the archeological investigations was on setting and materials, specifically regarding whether the sites retained reasonably intact site assemblages in their original contexts. Accordingly, primary goals of these investigations were:

- To acquire data on depositional context and define any relationships between natural strata and subsurface cultural features/deposits;
- To determine if the integrity of the buried deposits was sufficient to establish relative and/or absolute chronological dates for any subsurface components; and
- To subdivide recovered materials into analytical units relevant to specific research questions.

To address the research issue, excavations were performed with sufficient detail to provide for the identification and documentation of relevant analytical units. The primary means of addressing the issue were the geomorphological assessment and archeological investigations designed to expose broad areas, documenting finds with a survey-grade global positioning system (GPS) unit. Additionally, radiocarbon dating of a cultural feature and paired dates on *Rabdotus* snail shells provided data on the chronostratigraphy and integrity of deposits.

Objective 2: Potential Data Yield

Besides integrity, NRHP guidelines define significance as the other necessary quality for eligibility (Little et al. 2000). Significance is the ability of a property to contribute to a meaningful context. In addition to local, state, and national contexts, considerations of significance include:

- Areas of significance;
- Periods of significance; and
- Cultural affiliation.

Consequently, the archeological work sought to establish components that could be assigned to specific timeframes and cultural phases within the Lower Rio Grande Valley and wider region. In considering data yield, the intent was to recover information that could be used to address specific research questions, placing the sites in specific spatial, temporal, and cultural contexts. The testing project addressed general questions relevant to the testing archeological investigations, including:

- Depositional/formation processes;
- Site structure;
- Function; and
- Chronology.

Preservation potential for macrobotanical or faunal remains was also a criterion used to evaluate potential data yield. To address the issue of potential data yield, an excavation strategy employed a combination of mechanical stripping and hand excavations. The objective was to expose large areas of the site in the search for isolated contexts with greater archeological potential, then use hand excavations to gather data from these specific contexts. The excavators gathered special samples from appropriate contexts to address aspects of data yield.

Evaluating Significance

For the site to be found significant and eligible for NRHP listing and SAL designation, the deposits must demonstrate sufficient integrity and data yield potential to contribute to one or more historic contexts. Specifically, the site must provide information that would allow the formulation of specific, detailed research questions that would contribute to the understanding of the regional prehistory.

Specifically, both state and federal eligibility criteria are applicable to the sites. Under the ACT and in accordance with 13 TAC 26.10, criteria used to evaluate the SAL eligibility for archeological sites include:

(1) the site’s potential to contribute to a better understanding of the prehistory and/or history of Texas by the addition of new and important information;

(2) the site's archeological deposits and the artifacts within the site are preserved and intact;

(3) the site possesses unique or rare attributes concerning Texas prehistory and/or history;

(4) the study of the site offers the opportunity to test theories and methods of preservation; and

(5) there is a high likelihood that vandalism and relic collecting has occurred or could occur.

Under the purview of Section 106 of the NHPA, criteria for determination of NRHP eligibility stipulate the sites possess integrity of location, design, setting, materials, workmanship, feeling, and association and that sites:

(a) are associated with significant events that have contributed to the broad patterns of our history;

(b) are associated with the lives of persons significant;

(c) embody distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

(d) have yielded, or may be likely to yield, information important in prehistory or history.

NRHP Criterion D is the primary consideration for a multicomponent site like 41SR242. As such, there are five basic steps in Criterion D evaluation:

(1) identify the property's data set or categories of archeological, historical, or ecological information;

(2) identify the historic context or framework;

(3) identify important research questions that the site can address;

(4) considering integrity, evaluate the site data with regard to addressing questions; and

(5) identify information that archeological study has yielded or would likely yield.

METHODS

The work involved three primary phases: field investigations, analyses, and curation. Methods for each are detailed below.

Field Investigations

TxDOT conducted the testing from February 20–24, 2017, and April 10–14, 2017. The work entailed two approaches to assess the eligibility of 41SR242: 1) geoarcheological assessments, and 2) archeological investigations using a combination of mechanical and hand excavations. The geoarcheological investigation of the site determined the depositional contexts and stratigraphy, site formation processes, and the potential for intact buried surfaces. The primary method of this approach was to reopen trenches in or near previously excavated areas tested by TxDOT in 2016 (Figure 4.1). Fifteen BHTs were excavated at 41SR242. Dr. Jim Abbott of TxDOT conducted the geoarcheological investigation (Figure 4.2) and all BHT excavation was monitored by TxDOT personnel. The location of each BHT was recorded with a survey-grade GPS unit. Stratigraphic profile drawings with detailed soil descriptions were made for each BHT. Additional details on the methodology and the results of the geoarcheological investigations are presented in Chapter 6 of this report.

The second approach, overlapping the geoarcheological investigation, was the archeological testing of 41SR242. In lieu of random test units (TUs), which would only give limited understanding at the site, mechanical trenching was used to discover isolated buried features. Where potentially intact features were identified, the backhoe was used to remove the upper disturbed Ap zone, which was typically removed and not screened.

One 50 × 50 centimeter (cm) column sample was excavated to quantify artifact density and vertical distribution within the Holocene sediments. The column sample extended from the ground surface to the base of the BHT. The soils from the column sample were excavated in 10-cm levels and screened through ⅛-inch hardware screen mesh to assess the presence of micro-debitage.

Upon identification of subsurface features through mechanical trenching, TUs were placed over the features. TUs were typically 1 × 1-m in size and excavated in 10-cm arbitrary levels. All matrix excavated was screened through ⅛-inch mesh and, where deemed appropriate, water screen samples were collected. Units used standard archeological methods, the TUs were documented using standardized field forms and photographs. All artifacts and pertinent special samples were collected for analysis.

Figure 4.1. Backhoe trenching and scraping investigations at the site.

Figure 4.2. Overview of Corey Crawford conducting geoarcheological investigations at the site.

Site Mapping and Provenience Control

Satellite Based Augmentation System (SBAS) and Real Time Kinematic Global Navigation Satellite System (RTK GNSS) was used for recording spatial data across the site. Surface artifact collection was plotted using SBAS GNSS which provides sub-meter accuracy. Given the history of root plowing at the site, this level of accuracy was deemed appropriate. RTK GNSS, which provides centimeter accuracy, was used for spatial data collection of BHTs, TUs, and datums across the site. The GPS data are collected in meters above mean sea level (amsl) but can be converted to other scales.

Artifact and Sample Collection

The field archeologists recovered all artifacts from each excavation unit (e.g., TU levels and column samples). In addition to the subsurface testing, a controlled surface collection was conducted given the quantity of surface materials across the site. Two phases of collection were conducted, with the first focused on prehistoric diagnostics, tools, and staged bifaces. The second focused on the historic artifacts scattered across the site. All artifacts were point provenienced using the GPS unit, collected, bagged, and labeled accordingly.

A suite of special samples was collected from appropriate contexts for subsequent analyses. Snail samples, faunal remains, and radiocarbon samples were routinely collected if present (see discussion of geoarcheological sampling in Chapter 6). Charcoal or other charred organic materials associated with cultural materials were collected, although this was observed in few areas. However, the investigations recovered and submitted seven charcoal radiocarbon samples and four *Rabdotus* shells were submitted for dating. Radiocarbon and snail samples were submitted to Beta Analytic for analysis. To assist in the geoarcheological analysis, the collection of soil profiles and column samples from the BHT wall profile exposures were the primary field method for determining the depth, extent, and integrity of Holocene sediments with archeological deposits.

Analytical Methods and Techniques For Lithic Materials

Basic analyses followed TxDOT protocols for lithic artifacts, specifically Version 2.4b (dated March 2013) of the TxDOT Debitage Analysis Protocol, and the Chipped Stone Analytical Protocol (TxDOT 2013). The terms and quantified attributes are defined therein. Additionally, to address specific research issues related to the sites and the Rio Grande delta, certain analyses not covered by the protocols were also conducted. The following section briefly addresses the main analytical aspects of the protocols and on additional analyses that are not covered in those protocols.

Projectile Points, Formal Tools, and Bifaces

The analysis of points, formal tools, and bifaces followed the TxDOT protocols, which include all the usual aspects such as weight, length, width, and thickness (TxDOT 2013). The analyses of the dart points focused on the few stylistic aspects that are hypothesized to have sociotechnical information. Stem shape, morphology of lateral margin, and barb shape are all hypothesized to be attributes with isochrestic variation, meaning their variation is stylistic (a way of doing things) without affecting function. Certain asymmetries are perhaps related to handedness of the maker, a form of isochrestic variation.

Debitage

Debitage analysis is designed to identify lithic reduction processes that occur at a particular locale. Such reduction typically includes tool production, maintenance, and core reduction. To address these issues, the analysis of debitage employed a complementary approach using TxDOT lithic protocols (TxDOT 2013) augmented by individual flake analysis methods devised by Root (2004). Although there was substantive overlap in the two methods, the main difference is Root's use of a technological flake typology in addition to elements of the mass analysis and individual flake analysis. Additionally, flake and platform dimensions were measured. To define the terms and methods used, the following is an abbreviated version of TxDOT protocols and Root's technological flake criteria. These protocols were applied to all debitage recovered from Features 1 and 4.

MINIMUM NUMBER OF NODULES (MNN)

An assessment of minimum number of nodules (MNN) is designed to record the minimum number of individual raw material nodules that contributed to a specific analytical assemblage. The sort by raw material was based on visual characteristics of raw material type and properties, augmented with the use of ultraviolet fluorescence. SWCA analysts considered effects of obscuring factors such as calcium carbonate encrustation, patination, and thermal alteration of raw material features when assessing MNN. Analysts should favor lumping over splitting in determining MNN.

SIZE-GRADE ANALYSIS

In the field, lithic reduction features were screened with nested ¼-inch and ⅛-inch mesh. For the analysis, all debitage was further size graded using standard grade sizes, including 1-inch, ¾-inch, ½-inch, and the two smaller screen sizes.

CORTEX PERCENT

The presence of cortex is an indicator of stage of manufacture. Although many analyses use the "triple cortex" breakdown (primary, secondary, and tertiary cortical states), researchers such as Sullivan and Rozen (1985:756–757) have pointed out that there is little standardization in such approach. In particular, the triple cortex criteria are poorly quantified. Accordingly, the debitage analysis relied upon percentage of cortex on the dorsal surface based on percentages, including the following categories 0 percent, 1 to 25 percent, 26 to 50 percent, 51 to 75 percent, and 76 to 100 percent.

PLATFORM TYPE

The platform of a flake is the point where the percussor strikes the parent material, initiating flake detachment. The morphology of the platform yields information on the stage of manufacture and reduction methods. These data in turn, when considered in concert with other data, inform on the overall organization of technology. SWCA recorded these data for all complete and proximal flakes from Features 1 and 4.

THERMAL ALTERATION

Thermal alteration, as defined in the TxDOT protocols, is the use of heat to increase the knappability of lithic materials (TxDOT 2013). The process of heating, recorded in ethnographic cases and experimentally replicated, is thought to homogenize the internal structure of siliceous materials, increase brittleness, and thereby allow better flake propagation. There is a fine line between heat treatment and heat damage. Too much heat or rapid temperature changes create damage that decreases knappability. Thermal alteration was recorded on the debitage from Features 1 and 4.

MEASUREMENTS

Although measurements of individual flakes are typically not part of the TxDOT lithic protocols, to acquire data for specific research objectives, the analysis obtained four measurements on each analyzed flake from Features 1 and 4. The analysts measured the platform width and thickness (Figure 4.3) and the overall flake width and length. While there are multiple ways of measuring flakes, the analysis used axial length and width when the orientation could be discerned (Figure 4.4). Where the orientation could not be discerned, maximum measurements were taken.

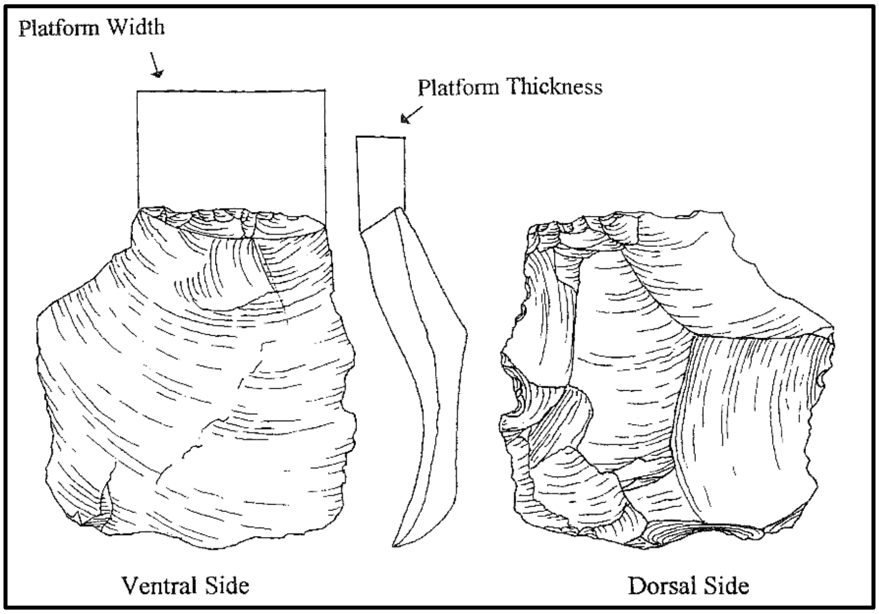

Figure 4.3. Locations on a flake striking platform for measuring platform width and thickness (Andrefsky 2014:95, Figure 5.5).

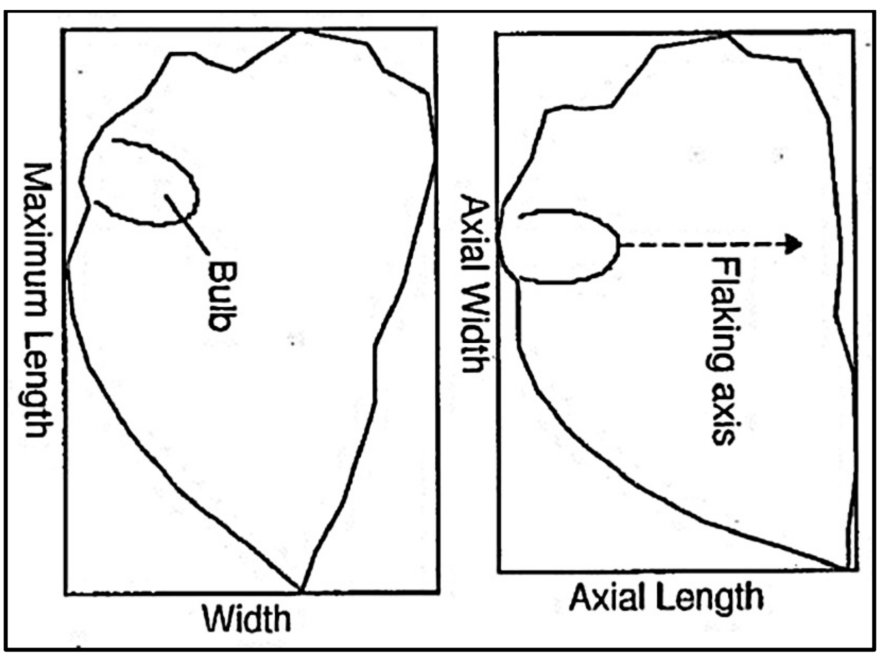

Figure 4.4. Locations on a flake for measuring axial width and thickness.

Root's Technological Attributes

In addition to TxDOT protocols, Root's (2004) approach codes for three extra attributes including technological class, detachment scar, and resharpening. Technological class is perhaps the most useful of his attributes, including 13 types:

1. **primary decortication** – entirely cortical dorsal surfaces.
2. **shatter** – irregularly shaped fragments lacking platforms, bulbs of percussion, or discernible alignment of flake scars.
3. **bifacial thinning flakes** – multifaceted and acortical platforms, diffuse bulb of percussion, minimal body cortex, thin and curved long sections, and expanding shape in planview.
4. **bifacial shaping or pressure flakes** – usually small (less than 5.6 mm), thin, with multifaceted and ground platforms.
5. **notching flakes** – produced by notching points or other tools, these have a circular planview with a concave platform. The appearance looking at the platform is often called "gull-wing" after its semblance to a bird approaching with wings raised.
6. **alternate flakes** – thick relative to length and width, triangular in cross section, and single-faceted platforms, these flakes are produced during early stages of bifacial reducing squared off edges.
7. **wedging or bipolar flakes** – shattered platforms, and evidence of pressure exerted from both ends. Often used in initial stages of pebble reduction.
8. **blades** – specialized flakes with parallel or subparallel dorsal arises, parallel or subparallel lateral margins, length-to-width ration of 2 to 1, and plano-convex, triangular, rectangular, or trapezoidal cross sections.
9. **unifacial retouch** – small, single-faceted flakes, often straight to slightly curved long sections, and a near-90 degree platform angle.
10. **radial-break flakes** – often triangular shaped fragments resulting from transverse fractures radiating outward from a central point of impact.
11. **simple flakes** – flakes larger than 5.66 mm that do not have defining characteristics of those above, have cortex on 0 to 99 percent of dorsal surface, and relatively thick cross sections. These flakes typically derive from early stage core and biface reduction.
12. **complex flakes –** flakes with no cortex and lack attributes that place them in the above-defined categories. These typically are associated with later stages of biface reduction, but can also occur in more formal core reduction.
13. **undiagnostic size grade 4 (2.54-mm) flakes** – flakes that are too small to technologically attribute to one of the other classes.

CURATION

All artifacts and records will be curated at the Center for Archeological Studies at Texas State University in San Marcos. Burned rock and snail shell have been quantified and analyzed, but will not be submitted for permanent curation.

CHAPTER 5. RESULTS OF FIELD INVESTIGATIONS

Over the course of three phases in 2016 and 2017, TxDOT conducted geoarcheological and testing investigations at archeological site 41SR242. Phase 1 investigations consisted of a preliminary geoarcheological and archeological assessment with mechanical trenching excavations to assist in planning for NRHP eligibility testing performed on December 14, 2016. Phases 2 and 3 investigations consisted of NRHP eligibility testing performed on February 20–24 and April 10–14, 2017. Field crew at the site included Dr. Jim Abbott, Dr. Jason Barrett, Dr. J. Kevin Hanselka, Corey Crawford, Mathew Stotts, and Cesario Guerra. Christopher Ringstaff served as Principal Investigator, participating in all field work.

This chapter provides the findings of the field investigations including the results of the excavations of BHTs, a column sample, and TUs. Results of the geoarcheological investigations are provided in Chapter 6. Detailed descriptions of the features, artifacts, and ecofacts follow in Chapter 7. The interpretations of the findings are provided in Chapter 8.

The tested area of the site is in a semi-open, broad, flat area of mesquite and acacia shrub. Most of the mesquite is fairly young, less than 6 inches in trunk diameter. A review of recent aerial photographs indicates the site area was an active agricultural field until sometime around 2011 and appears to have subsequently lain fallow or was used as a pasture.

BACKHOE TRENCHES

TxDOT excavated a total of 15 BHTs across 41SR242 within an approximately 100 m^2 area in the northwestern/western portion of the site (Figure 5.1 and Table 5.1). This portion of the site within the proposed ROW was previously recommended for further investigations by SWCA during survey level investigations in May 2016, as discussed in the earlier background review results section of this report. The 15 TxDOT BHTs included the initial excavation of three BHTs (i.e., BHTs 1–3) during the Phase 1 preliminary geoarcheological and archeological assessment investigations, and the subsequent reopening of these three BHTs during the Phases 2 and 3 eligibility testing investigations. Furthermore, TxDOT newly excavated an additional 12 BHTs (i.e., BHTs 4–15) during the Phases 2 and 3 eligibility testing investigations. The distribution of all the BHTs was designed to provide systematic coverage but also explore the more intact and densest portions of the site.

TxDOT encountered a total of four features (i.e., Features 1–4) during the BHT excavations. The features encountered were identified as clusters of chipped stone flaking debris, burned rock, dense land snails (cf *Rabdotus* sp.), or a combination of the three. The features and cultural materials recovered are further discussed below and in Chapter 7.

BHT 1

BHT 1 was excavated within the northwestern quadrant of the site area recommended for further investigations during survey level investigations. The trench was approximately 4.5 m long and excavated to a depth of approximately 65 cm below surface (cmbs). Intact deposits were encountered at approximately 13 cmbs at the top of Zone 2 (A horizon) and was situated beneath Zone 1 (Ap1 horizon / Ap plow zone). This is followed by Zone 3 (Bk1 horizon), then Zone 4 (Bk2 horizon).

Restricted Information

Not for Public Disclosure

Figure 5.1. Subsurface testing distribution across area of 41SR242 recommended for NRHP testing.

Table 5.1. 41SR242 Backhoe Trenches

Trench	Length (m)	Depth (cmbs)
BHT 1	4.5	65
BHT 2	4.5	120
BHT 3	4.5	95
BHT 4	6.0	160
BHT 5	9.0	68
BHT 6	7.0	70
BHT 7	4.0	50
BHT 8	7.0	80
BHT 9	5.0	90
BHT 10	4.5	100
BHT 11	5.0	82
BHT 12	5.0	100
BHT 13	5.0	120
BHT 14	4.5	125
BHT 15	6.0	125

Based on combined archeological and geoarcheological considerations, the upper 25 to 35 cm of the ground surface was removed (Figure 5.2). The overburden showed little integrity. This layer was likely repeatedly disturbed by agriculture, root plowing, bioturbation, and other processes. This identifiable Ap Horizon (plow zone) was scraped off to the contact with the underlying intact sediments. From there, backhoe scraping was slowed considerably and removed in 3-5 cm increments stopping and hand scraping frequently looking for artifacts and features.

Figure 5.2. Crew removing overburden during backhoe trench testing, facing east.

The BHT excavation revealed Feature 1 within intact Holocene deposits at a depth of 50–60 cmbs within a relatively small area that measured approximately 50 × 50 cm. The feature was encountered during trowel scraping of the trench walls and floor. Feature 1 consisted of a dense concentration of chipped stone flaking debris with considerable quantities of land snail (*Rabdotus*). The BHT excavation yielded 151 pieces of debitage, nine faunal bone fragments, and 71 land snail (*Rabdotus*), all in association with the feature. The cultural feature and materials were observed within Zone 4 (Bk2 horizon).

In addition, TxDOT excavated four TUs (i.e., TU 1, TU 3, TU 4, and TU 5) to expand the BHT 1 excavation area and further investigate Feature 1. An additional feature, designated as Feature 3, that consisted of a small scatter of thermally altered rock was revealed during the excavation of TU 4 and TU 5. The TUs and features are further discussed in their respective sections below.

BHT 2

BHT 2 was placed within the southeastern quadrant of the site area recommended for further investigations during survey level investigations. The trench was approximately 4.5 m long and excavated to a depth of approximately 120 cmbs. Intact deposits were encountered at approximately 22 cmbs at the top of Zone 3 (Bk1 horizon), immediately followed by Zone 4 (Bk2 horizon). Both are situated beneath Zone 1 (Ap1) and Zone 2 (Ap2 horizon / Ap plow zone). Zone 5 (BC horizon), is situated beneath all of the above. No cultural features were observed during the BHT excavations; however, a small area of well-preserved land snail (*Rabdotus*) with some flakes was observed within Zone 3 ranging from 22 to 60 cmbs. No cultural materials were collected from BHT 2.

BHT 3

BHT 3 was located within the northeastern quadrant of the site area recommended for further investigations during survey level investigations. The trench was approximately 4.5 m long and excavated to a depth of approximately 95 cmbs. Intact deposits were encountered at approximately 40 cmbs at the top of Zone 3 (ABk horizon) composed of abundant fine gravels situated beneath Zone 1 (Ap1 horizon) and Zone 2 (Ap2 horizon / Ap plow zone). This is followed by Zone 4 (Bk1 horizon) then Zone 5 (Bk2 horizon). No cultural features or materials were observed during the BHT excavations.

BHT 4

BHT 4 was positioned within the southwestern quadrant of the site area recommended for further investigations during survey level investigations. The trench was approximately 6.0 m long and excavated to a depth of approximately 160 cmbs. Intact deposits were encountered at approximately 40 cmbs at the top of Zone 3 (ABk1 horizon) situated beneath Zone 1 (Ap1 horizon) and Zone 2 (Ap2 horizon / Ap plow zone). This is followed by Zone 4 (Bk1 horizon) then Zone 5 (2BC horizon).

The BHT excavation revealed Feature 2 relatively high in the profile at a depth of 20–50 cmbs, situated at the contact between the Ap and ABk1 horizons. The feature consisted of a small concentration/cluster of thermally altered rock. The BHT excavation yielded 158 pieces of debitage, 44 burned rock fragments, and sparse mussel shell, all in association with the feature. The cultural feature and materials were observed within Zone 2 (Ap2 horizon) and Zone 3 (ABk1 horizon).

In addition, TxDOT excavated one TU (TU 2) over Feature 2 discovered in this BHT to further investigate the feature. The TU and feature are further discussed in the Test Unit 2 section below.

BHT 5

BHT 5 was excavated within the southeastern quadrant of the site area recommended for further investigations during survey level investigations. The trench was approximately 9.0 m long and excavated to a depth of approximately 68 cmbs. A zone of large cobbles was observed at approximately 20 cmbs within Zone 2 (AC horizon). Intact deposits were encountered at approximately 50 cmbs at the top of Zone 3 (Bk horizon) situated beneath Zone 1 (Ap horizon /plow zone) followed by Zone 2 (AC horizon). No cultural features or materials were observed during the BHT excavations.

BHT 6

BHT 6 was placed within the northwestern quadrant of the site area recommended for further investigations during survey level investigations. The trench stratigraphy was similar to BHT 1. The trench was approximately 7.0 m long and excavated to a depth of approximately 70 cmbs. Intact deposits were encountered at approximately 13 cmbs at the top of Zone 2 (A horizon) situated beneath Zone 1 (Ap1 horizon / Ap plow zone). This is followed by Zone 3 (Bk1 horizon) then Zone 4 (Bk2 horizon). No cultural features or materials were observed during the BHT excavations.

BHT 7

BHT 7 was located within the southwestern quadrant of the site area recommended for further investigations during survey level investigations. The trench stratigraphy was similar to BHT 1. The trench was approximately 4.0 m long and excavated to a depth of approximately 50 cmbs. Intact deposits were encountered at approximately 13 cmbs at the top of Zone 2 (A horizon) situated beneath Zone 1 (Ap1 horizon / Ap plow zone). This is followed by Zone 3 (Bk1 horizon) then Zone 4 (Bk2 horizon). No cultural features or materials were observed during the BHT excavations.

BHT 8

BHT 8 was positioned within the northwestern quadrant of the site area recommended for further investigations during survey level investigations. The trench was approximately 7.0 m long and excavated to a depth of approximately 80 cmbs. Intact deposits were encountered at approximately 20 cmbs at the top of Zone 3 (Bk1 horizon) immediately followed by Zone 4 (Bk2 horizon) both situated beneath Zone 1 (Ap1 horizon) and Zone 2 (Ap2 horizon / Ap plow zone).

The BHT did not reveal any cultural features, but cultural materials were observed during the excavations. TxDOT excavated one column sample along BHT 8 to quantify artifact density and vertical distribution within the Holocene sediments. The column sample is further discussed in its respective section below. No further excavation was performed at BHT 8.

BHT 9

BHT 9 was excavated just beyond the northwestern site boundary and site area recommended for further investigations during survey level investigations. The trench was approximately 5.0 m long and excavated to a depth of approximately 90 cmbs. Intact deposits were encountered at approximately 25 cmbs at the top of Zone 2 (Ak horizon) and immediately followed by Zone 3 (Bk horizon) both situated beneath Zone 1 (Ap horizon / plow zone). The BHT contains a possible pit feature within the Ak and Bk horizons; however, no cultural materials were observed during the BHT excavations.

BHT 10

BHT 10 was placed within the northeastern quadrant of the site area recommended for further investigations during survey level investigations. The trench was approximately 4.5 m long and excavated to a depth of approximately 100 cmbs. The BHT excavation encountered Zone 1 (Ap1 horizon) and Zone 2 (Ap2 horizon / Ap plow zone) at the top. This is followed by Zone 3 (C1 horizon) composed of channel gravels then Zone 4 (2Bk horizon) composed of highly weathered bedrock. No cultural features were observed during the BHT excavations. Sparse cultural materials observed included occasional crumbs of burned rock within the Ap plow zone. No cultural materials were collected from BHT 10.

BHT 11

BHT 11 was located within the southeastern quadrant of the site area recommended for further investigations during survey level investigations. The trench was approximately 5.0 m long and excavated to a depth of approximately 82 cmbs. The BHT excavation encountered Zone 1 (Ap1 horizon) and Zone 2 (Ap2 or Apk horizons / Ap plow zone) composed of colluvial alluvium, followed by Zone 3 (BCk horizon) composed of weathered sandstone bedrock. No cultural features or materials were observed during the BHT excavations with the exception of sparse cultural materials at the surface. No cultural materials were collected from BHT 11.

BHT 12

BHT 12 was positioned within the southeastern quadrant of the site area recommended for further investigations during survey level investigations. The trench was approximately 5.0 m long and excavated to a depth of approximately 100 cmbs. Intact deposits were encountered at approximately 40 cmbs at the top of Zone 3 (Bk horizon) situated beneath Zone 1 (Ap1 horizon) and Zone 2 (Ap2 horizon / Ap plow zone). This is followed by Zone 4 (C horizon). No cultural features or materials were observed during the BHT excavations. However, it was notes that lots of crushed land snail (*Rabdotus*) was observed within the Zone 2 (Ap2 horizon) and Zone 3 (Bk horizon) deposits. Very low density gravels were observed within BHT 12.

BHT 13

BHT 13 was excavated within the southwestern quadrant of the site area recommended for further investigations during survey level investigations. The trench was approximately 5.0 m long and excavated to a depth of approximately 120 cmbs. The trench stratigraphy was similar to BHT 1. Intact deposits were encountered at approximately 13 cmbs at the top of Zone 2 (A horizon) situated beneath Zone 1 (Ap1 horizon / Ap plow zone). This is followed by Zone 3 (Bk1 horizon) then Zone 4 (Bk2 horizon). No cultural features or materials were observed during the BHT excavations.

BHT 14

BHT 14 was placed within the northwestern quadrant of the site area recommended for further investigations during survey level investigations. The trench was approximately 4.5 m long and excavated to a depth of approximately 125 cmbs. Intact deposits were encountered at approximately 42 cmbs at the top of Zone 2 (B1 horizon) immediately followed by Zone 3 (B2 horizon), both situated beneath Zone 1 (Ap horizon / Ap plow zone). This is followed by Zone 4 (C horizon) composed of weathered sandstone parent material.

The BHT excavations did not encounter any cultural features; however, cultural materials were observed primarily within Zone 2 (B1 horizon) with some disturbed cultural material observed within Zone 1

(Ap horizon / Ap plow zone). This included two early- to mid-stage bifaces and lightly scattered lithic debitage and burned rock frags. No further excavation was performed at BHT 14.

BHT 15

BHT 15 was located within the northwestern quadrant of the site area recommended for further investigations during survey level investigations. The trench was approximately 6 m long and excavated to a depth of approximately 125 cmbs. Intact deposits were encountered at approximately 43 cmbs at the top of Zone 2 (B horizon) immediately followed by Zone 3 (Bk horizon), both situated beneath Zone 1 (Ap horizon / Ap plow zone). This is followed by Zone 4 (C horizon) composed of weathered sandstone parent material.

The BHT excavation revealed Feature 4 relatively high in the profile at a depth of 20–50 cmbs at the contact between the Ap and B horizons. The feature consisted of a dense concentration of chipped stone flaking debris, burned rock, and land snail (*Rabdotus*). The cultural feature and materials were observed within Zone 2 (B horizon).

In addition, TxDOT excavated two TUs (TU 6 and TU 7) over Feature 4 discovered in this trench to further investigate the feature. The results of the TUs are discussed in their respective sections below.

BHT 8 COLUMN SAMPLE

TxDOT excavated a 50 × 50-cm column sample along BHT 8 to the substrate calcic horizon to quantify artifact density and vertical distribution within the Holocene sediments (Figure 5.3). The column sample recovered high quantities of cultural materials (Table 5.2). This included one Tortugas dart point, four bifaces, 204 pieces of debitage, eight burned rock fragments, three faunal bone fragments, one ochre fragment, one charcoal sample, and one historic-age undecorated whiteware ceramic fragment. The Tortugas dart point was recovered in Level 6 between 50 and 60 cmbs and was the only prehistoric temporally diagnostic artifact encountered.

Figure 5.3. Column sample from BHT 8, facing east-southeast.

Table 5.2. 41SR242 Artifact Recovery in BHT 8 Column Sample

Level	Artifact Description	Artifact Total
1	Size-Graded Debitage	7
	Burned Rock	4
	Artifact Total	**11**
2	Size-Graded Debitage	22
	Bone	2
	Burned Rock	0
	Undecorated Whiteware Ceramic	2
	Artifact Total	**26**
3	Size-Graded Debitage	11
	Charcoal Sample	1
	Burned Rock	4
	Artifact Total	**16**
4	Size-Graded Debitage	35
	Artifact Total	**35**
5	Size-Graded Debitage	28
	Artifact Total	**28**
6	Size-Graded Debitage	38
	Tortugas Dart Point	1
	Early-Stage Biface	1
	Mid-Stage Biface	2
	Late-Stage Biface	1
	Ochre	1
	Artifact Total	**44**
7	Size-Graded Debitage	20
	Bone	1
	Artifact Total	**21**
8	Size-Graded Debitage	43
	Artifact Total	**43**
Grand Artifact Total		**224**

TEST UNITS

TxDOT excavated a total of seven 1 × 1-m TUs placed over Features 1 – 4 encountered during BHT excavations. All TUs were excavated in 10-cm arbitrary levels and the overlying plow zone (Ap) was removed and not screened. All matrix excavated from beneath the plow zone was screened through ⅛- inch mesh and water screen samples were collected from Features 1, 3, and 4. The unit corners were recorded using a sub-centimeter GPS unit. All materials and samples were documented with photographs and drawings; provenience was maintained using the GPS for point plotting. Please refer to Tables 5.3 through 5.10 for a detailed accounting of cultural materials recovered in the TUs by level. The features and cultural materials recovered are further discussed below and in Chapter 7.

Test Unit 1

Although standard 1 × 1-m TUs were used for feature recovery, TU 1 is the only exemption (Figure 5.4). After reopening the previously excavated BHT 1 to recover Feature 1, TU 1 was expanded to better expose the feature and the surrounding occupational surface (see Table 5.3).

Figure 5.4. Representative photograph of TU 1, facing north.

Table 5.3. 41SR242 Artifact Recovery in BHT 1-TU 1

Level	Artifact Description	Artifact Total
1	Analyzed Debitage	65
	Charcoal Sample	1
	Rabdotus Shell	52
	Burned Rock	2
	Artifact Total	**120**
2	Analyzed Debitage	196
	Charcoal Sample	1
	Mussel Shell	1
	Rabdotus Shell	24
	Burned Rock	2
	Undecorated Whiteware Ceramic	2
	Metal Buckle	1
	Artifact Total	**227**
3	Analyzed Debitage	505
	Core	1
	Late-Stage Biface	1
	Edge-Modified Utilized Flake	1
	Bone	25
	Mussel Shell	3
	Rabdotus Shell	596
	Burned Rock	72
	Artifact Total	**1,204**
4	Analyzed Debitage	181
	Mussel Shell	1
	Rabdotus Shell	102
	Burned Rock	19
	Artifact Total	**303**
Grand Artifact Total		**1,854**

Level 1 of TU 1 was excavated between approximately 29 cmbs and 40 cmbs. The level is not associated with Feature 1, which begins with Level 3. Excavations of Level 1 recovered primarily lithic debitage (n=65) and land snail (*Rabdotus*) shells (n=52), as well as one charcoal sample and two burned rocks.

Level 2 of TU 1 was excavated between 40 cmbs and 50 cmbs. The level is located just above Feature 1 and shows an increase in artifacts as compared to Level 1. Artifacts recovered from Level 2 include primarily lithic debitage (n=196), as well as two burned rock fragments and a charcoal sample. In addition to the prehistoric artifacts, historic artifacts were also recovered from Level 2 and consist of a metal buckle and two undecorated whiteware ceramic sherds. Recovered ecofacts include one mussel shell and 24 land snail (*Rabdotus*) shells.

Level 3 of TU 1 was excavated between 50 cmbs and 60 cmbs, and contains Feature 1, which consists of a dense concentration of chipped stone flaking debris with considerable quantities of land snail (*Rabdotus* sp.). The feature is located between approximately 50 cmbs and 62 cmbs, and artifacts appear to have been concentrated towards the northwest of the TU. Adjacent TUs (i.e., TU 3, TU 4, and TU 5) were excavated to the north, northeast, and east, and TU 1 was expanded to the south to test the extent of the artifact concentration.

Artifacts recovered from TU 1 Level 3 include primarily lithic debitage (n=505), as well as 72 burned rock fragments, a core, a late-stage biface, and a utilized flake. Ecofacts recovered from Level 3 include primarily land snail (*Rabdotus*) shell (n=596), as well as mussel shell (n=3) and vertebrate remains (n=25).

Level 4 of TU 1 was excavated between 60 cmbs and 70 cmbs and contains considerably fewer artifacts/ecofacts in relation to Level 3. The Feature 1 concentration terminates at approximately 62 cmbs. Artifacts below this depth are probably due to disturbances, such as bioturbation. Artifacts recovered from Level 4 include lithic debitage (n=181) and burned rock fragments (n=19). Ecofacts recovered from the level include land snail (*Rabdotus*) shells (n=102) and mussel shell (n=1).

Test Unit 2

TU 2 was excavated within BHT 4 after the top of a small concentration of burned rock was encountered relatively high in the profile (approximately 20 cmbs) (see Table 5.4). This concentration was designated as Feature 2, and the floor of BHT 4 was excavated down to the bottom of Feature 2, approximately 40 cmbs. Levels 1 and 2 of TU 2 consist of the north half of the TU alone and were excavated to bring the rest of TU 2 down to the feature.

Table 5.4. 41SR242 Artifact Recovery in BHT 4-TU 2

Level	Artifact Description	Artifact Total
1	Size-Graded Debitage	42
	Burned Rock	12
	Artifact Total	**54**
2	Size-Graded Debitage	63
	Mid-Stage Biface	1
	Late-Stage Biface	1
	Mussel Shell	6
	Burned Rock	9
	Earthenware Slip Glazed-Brown Ceramic	1
	Artifact Total	**81**
3	Prehistoric Ceramic Plain Body Sherd	1
	Size-Graded Debitage	53
	Burned Rock	23
	Miscellaneous Metal Fragments	2
	Artifact Total	**79**
Grand Artifact Total		**214**

Level 1 of TU 2 consists of only the northern half of the TU and was excavated between 18 cmbs and 30 cmbs. Recovered artifacts include 42 pieces of lithic debitage and 12 burned rock fragments.

Level 2 of TU 2 consists of only the north half the TU and was excavated between 30 cmbs and 40 cmbs. The bottom of level two is level with the floor of BHT 4. Recovered artifacts include 63 pieces of lithic debitage, a mid-stage biface, a late-stage biface, a historic ceramic sherd, and nine burned rock fragments.

Level 3 of TU 2 was excavated between 40 cmbs and 50 cmbs and includes the recovery of Feature 2 (Figure 5.5). Artifacts recovered from Level 3 include 53 pieces of lithic debitage, 23 burned rock fragments, two unidentifiable metal fragments, and one prehistoric ceramic sherd.

Figure 5.5. Feature 2 in Test Unit 2 along BHT 4, facing north.

Test Unit 3

TU 3 was excavated to the north of TU 1 and was designed to test the extent of Feature 1. The southern portion of TU 3 (approximately 40 cm north to south by 1 m east to west) was disturbed by previous trenching efforts to a depth of approximately 50 cmbs. Although artifacts were found in each level, the Feature 1 concentration was only present in the southeast corner of Levels 3 and 4 (see Table 5.5).

Table 5.5. 41SR242 Artifact Recovery in BHT 1-TU 3

Level	Artifact Description	Artifact Total
1	Analyzed Debitage	69
	Rabdotus Shell	13
	Artifact Total	**82**

Level	Artifact Description	Artifact Total
2	Analyzed Debitage	205
	Multidirectional Core	1
	Late-Stage Biface	1
	Burned Rock	1
	Artifact Total	**208**
3	Analyzed Debitage	243
	Bone	6
	Mussel Shell	1
	Rabdotus Shell	10
	Artifact Total	**260**
4	Analyzed Debitage	65
	Unidentified Dart Point Base	1
	Bone	2
	Artifact Total	**68**
Grand Artifact Total		**618**

Level 1 of TU 3 was excavated from 30 cmbs to 40 cmbs in the northern approximately two-thirds of the TU. Artifacts recovered are exclusively lithic debitage (n=69), while recovered ecofacts consist of 13 land snail (*Rabdotus*) shells.

Level 2 of TU 3 was excavated between 40 cmbs and 50 cmbs in the northern approximately two-thirds of the TU. Although artifact density notably increases, there were no discernable artifact concentrations. Artifacts recovered from Level 2 include 205 pieces of lithic debitage, a multidirectional core, a late-stage biface, and a single burned rock fragment. No ecofacts were recovered from the level.

Level 3 of TU 3 was excavated between 50 cmbs and 60 cmbs and contained a small continuation of Feature 1 in the southeast corner. Artifacts recovered from the level consist exclusively of lithic debitage (n=243), while recovered ecofacts include 10 land snail (*Rabdotus*) shells, six vertebrate bone fragments, and a mussel shell.

Artifacts continued to be recovered in the first few centimeters of Level 4, which was excavated from 60 cmbs to sterility. Artifacts recovered from the level include 65 pieces of lithic debitage and a single dart point base. Recovered ecofacts include two faunal bone fragments.

Test Unit 4

TU 4 was excavated to the northeast of TU 1 and was designed to test the extent of Feature 1. Feature 3, a burned rock scatter, was identified in TU 4 and TU 5 at approximately the same depth as Feature 1 (50 cmbs to 60 cmbs) (Figure 5.6). Although the artifact content of Feature 3 is not as dense as Feature 1, given the proximity and the similarity of depth, the two features are likely related (see Table 5.6).

Figure 5.6. Level 2 of TU 4, facing west. Note the Feature 4 on the north side of the test unit.

Table 5.6. 41SR242 Artifact Recovery in TU 4

Level	Artifact Description	Artifact Total
South Wall	Bone	1
	Artifact Total	**1**
1	Size-Graded Debitage	108
	Charcoal Sample	1
	Bone	4
	Burned Rock	14
	Earthenware Slip Glazed-Brown Ceramic	1
	Artifact Total	**128**
2	Size-Graded Debitage	61
	Bone	3
	Burned Rock	1
	Colorless Glass	1
	Artifact Total	**66**
3	Size-Graded Debitage	101
	Multidirectional Core	1
	Late-Stage Biface	1
	Mussel Shell	1
	Artifact Total	**104**
4	Size-Graded Debitage	50
	Early-Stage Biface	1
	Burned Rock	21
	Artifact Total	**72**
Grand Artifact Total		**371**

Level 1 of TU 4 was excavated between 30 cmbs and 40 cmbs. Both the southern and western edges of the TU consisted of fill from previous trenching efforts. Artifacts include 108 lithic debitage pieces, 14 burned rock fragments, and one historic ceramic sherd. Ecofacts recovered from the level include four faunal bone fragments and one charcoal sample.

Level 2 of TU 4 was excavated between 40 cmbs and 50 cmbs. Both the southern and western edges of the TU consisted of fill and embedded modern trash from previous backhoe trenching efforts. Artifacts recovered from the level include 61 lithic debitage pieces, one burned rock fragment, and one shard of colorless glass. Recovered ecofacts consist of three faunal bone fragments.

Level 3 of TU 4 was excavated between 50 cmbs and 60 cmbs and contained a scatter of lithic debitage and burned rock fragments throughout the level. Only a small portion in the southwest corner of the unit consisted of fill from previous backhoe trenching efforts. Artifacts recovered from the level include 101 lithic debitage pieces, one multidirectional core, and one late-stage biface. Only one ecofact, a mussel shell, was recovered from Level 3.

Level 4 of TU 4 was excavated between 60 cmbs and 70 cmbs. An increase in presence of large flakes in this level, as compared to the overlying levels, could indicate an association with Feature 1. Artifacts recovered from this level include 50 lithic debitage pieces, 21 burned rock fragments, and one early-stage biface.

Test Unit 5

TU 5 was excavated to the east of TU 1 and was designed to test the extent of Feature 1. As mentioned above, Feature 3, a burned rock scatter, was identified in TU 4 and TU 5 at approximately the same depth as Feature 1 (50 cmbs to 60 cmbs). Although the artifact content of Feature 3 is not as dense as Feature 1, given the proximity and the similarity of depth, the two features are likely related (see Table 5.7).

Table 5.7. 41SR242 Artifact Recovery in TU 5

Level	Artifact Description	Artifact Total
1	Size-Graded Debitage	72
	Late-Stage Biface	1
	Burned Rock	3
	Artifact Total	**76**
2	Size-Graded Debitage	147
	Edge-Modified Utilized Flake	1
	Burned Clay	1
	Charcoal Sample	1
	Burned Rock	116
	Artifact Total	**266**
3	Size-Graded Debitage	159
	Edge-Modified Utilized Flake	2
	Charcoal Sample	1
	Bone	1
	Burned Rock	31
	Artifact Total	**194**
Grand Artifact Total		**536**

Level 1 of TU 5 was excavated between 30 cmbs and 40 cmbs. Although artifacts were found scattered throughout the level, no artifact concentration could be discerned. The artifacts recovered from level 1 include 72 lithic debitage pieces, three burned rock fragments, and one late-stage biface. No ecofacts were recovered from Level 1.

Level 2 of TU 5 was excavated between 40 cmbs and 50 cmbs and includes an increase in artifact presence, as well as a continuation of Feature 3, a burned rock cluster. Artifacts within this level include 147 lithic debitage pieces, 116 burned rock fragments, and a utilized flake. In addition to the artifacts, one charcoal sample was collected, and a piece of burned clay was recorded in Level 2.

Level 3 of TU 5 was excavated between 50 cmbs and 60 cmbs. Although lithic material remains abundant, the burned rocks are fewer and less concentrated than the overlying level. Artifacts within the level include 159 lithic debitage pieces, 31 burned rock fragments, two modified flakes. In addition to the artifacts found in the level, a charcoal sample and a faunal bone fragment were recovered.

Test Unit 6

TU 6 was excavated due to a concentration of lithic debitage, burned rock, and land snail (*Rabdotus*) shell which was uncovered during the excavation of BHT 15 (see Table 5.8). The feature (i.e., Feature 4) was encountered just below the plow zone and begins just below 20 cmbs.

Table 5.8. 41SR242 Artifact Recovery in BHT 15-TU 6

Level	Artifact Description	Artifact Total
1	Analyzed Debitage	152
	Rabdotus Shell	433
	Burned Rock	36
	Mussel Shell	1
	Artifact Total	622
2	Analyzed Debitage	131
	Tortugas Dart Point Preform	1
	Charcoal Sample	1
	Rabdotus Shell	929
	Burned Rock	36
	Artifact Total	1,098
3	Analyzed Debitage	158
	Mid-Stage Biface	2
	Unidentified Dart Point Base	1
	Rabdotus Shell	491
	Burned Rock	26
	Artifact Total	678
Grand Artifact Total		**2,398**

Level 1 of TU 6 was excavated between 29 cmbs and 40 cmbs and is the first level into Feature 4. Both artifacts and ecofacts within the level were heavily concentrated towards the north and west of the TU. Artifacts recovered from the level include 152 lithic debitage pieces and 36 burned rock fragments. Ecofacts recovered from the level include 433 land snail (*Rabdotus*) shells and one mussel shell.

Level 2 of TU 6 was excavated between 40 cmbs and 50 cmbs. As Feature 4 was excavated, the high-density land snail shell concentration was located towards the center of the TU and terminated at approximately 46 cmbs. Artifacts recovered from this level include 131 lithic debitage pieces, 36 burned rock fragments, and a triangular dart point preform. Land snail (*Rabdotus*) shells were the most prevalent in this level, with 929 shells recovered. In addition, one charcoal sample was recovered from Level 2.

Level 3 of TU 6 was excavated between 50 cmbs and 60 cmbs. Although artifacts and ecofacts were not concentrated in this level, they remain prevalent. Artifacts recovered from Level 3 include 158 lithic debitage pieces, 26 burned rock fragments, two mid-stage bifaces, and a dart point base. Ecofacts recovered from the level consist of 491 land snail (*Rabdotus*) shells.

Test Unit 7

TU 7 was excavated to the west of TU 6 and was designed to recover and expose the extent of the Feature 4 (Figure 5.7). Feature 4 was exposed during the excavation of BHT 15 and was uncovered just below 20 cmbs. The feature consists of a concentration of land snail (*Rabdotus*) shells and lithic debitage and is concentrated toward the south wall of the TU (see Table 5.9).

Figure 5.7. Level 2 of TU 6, facing north.

Table 5.9. 41SR242 Artifact Recovery in TU 7

Level	Artifact Description	Artifact Total
1	Analyzed Debitage	68
	Early-Stage Biface	1
	Rabdotus Shell	69
	Burned Rock	16
	Artifact Total	**154**
2	Analyzed Debitage	192
	Rabdotus Shell	532
	Burned Rock	71
	Artifact Total	**795**
3	Analyzed Debitage	137
	Fresno Arrow Point	1
	Early-Stage Biface	2
	Edge-Modified Utilized Flake	1
	Rabdotus Shell	315
	Burned Rock	61
	Artifact Total	**517**
Grand Artifact Total		**1,466**

Level 1 of TU 7 was excavated beginning at the floor of BHT 15, approximately 29 cmbs, to a depth of 40 cmbs. Both artifacts and ecofacts were concentrated toward the south wall of the TU. Recovered artifacts consist of 68 lithic debitage pieces, 16 burned rock fragments, and an early-stage biface. Recovered ecofacts consist of 69 land snail (*Rabdotus*) shells.

Level 2 of TU 7 was excavated between 40 cmbs and 50 cmbs and contained an increase of artifacts compared to the overlying level. Feature 4 continues from the overlying level and terminates just above 50 cmbs. Artifacts from the level include 192 lithic debitage pieces and 71 burned rock fragments. A total of 532 land snail (*Rabdotus*) shells were recovered from the level.

Level 3 of TU 7 was excavated between 50 cmbs and 60 cmbs. Artifacts and ecofacts continue to be present within the level but are fewer in number and are more diffuse as compared to the overlying level. Artifacts recovered from Level 3 include 137 lithic debitage pieces, 61 burned rock fragments, two early-stage bifaces, a Fresno arrow point, and a utilized flake. In addition, 315 land snail (*Rabdotus*) shells were recovered from the level.

A more detailed discussion of the TU recovered cultural materials and feature investigations and findings is provided in Chapter 7.

CONTROLLED SURFACE COLLECTION

As mentioned in the Methods section in Chapter 4, a controlled surface collection was conducted. The collection targeted both prehistoric and historic-age materials across the site. Cornelio Alvarez Jr. (the landowner) provided details on soil disturbance at the property. In particular, root plowing conducted by his family in the 1980s and 1990s. These disturbances are clearly visible in trench profiles and even in aerial imagery. It is probable that once shallowly buried archeological materials in the upper 30 cm of the profile were exposed by these practices and account for the high density of surface chipped stone artifacts across the site (Figure 5.8).

Discussed in more detail in Chapter 7, chipped stone artifacts collected at the site consisted of projectile points, identifiable tools, staged bifaces and cores. The purpose of the collection was, despite compromised context, to gain a better understanding of site chronology, function, and broad temporal technological organization.

In addition to the chipped stone artifacts, a number of twentieth century artifacts were also collected. The historic surface assemblage is dominated by ceramics sherds and glass with various metal artifacts, the majority of which are oxidized. A thorough accounting and analysis of the historic artifact assemblage is presented in Chapter 7.

Table 5.10. 41SR242 Prehistoric Controlled Surface Collection

Designation	Class	Completeness	Type*	Material	Break Type
SD1	Biface	Basal-medial	Dart Point	Chert	Impact
SD2	Biface	Basal-medial	Dart Point	Chert	Compound
SD3	Biface	Basal	Dart Point	Chert	N/A
SD4	Late-Stage Biface	Distal	N/A	Chert	Snap
SD5	Late-Stage Biface	Basal	Preform	Metamorposed Schist	Bending
SD6	Mid-Stage Biface	Complete	Preform	Chert	N/A
SD7	Biface	Basal-medial	Dart Point	Siltstone	Snap
SD8	Late-Stage Biface	Distal	N/A	Chert	Compound
SD9	Biface	Basal-Medial	Dart Point	Slate	Compound
SD10	Biface	Complete	Dart Point	Chert	N/A
SB1	Mid-Stage Biface	Base	N/A	Chert	Oblique Bending
SB2	Biface	Indet	N/A	Chert	Bending
SB3	Mid-Stage Biface	Complete	N/A	Chert	N/A
SB4	Uniface	Complete	Discoid	Chert	N/A
SB5	Late-Stage Biface	Indet	N/A	Chert	Compound
SB6	Mid-Stage Biface	Distal	N/A	Petrified Wood (?)	Oblique Bending
SB7	Mid-Stage Biface	Basal	N/A	Chalcedony	Snap
SB8	Mid-Stage Biface	Medial-Distal	N/A	Chert	Compound
SB9	Early-Stage Biface	Complete	N/A	Chert	N/A
SB10	Early-Stage Biface	Complete	N/A	Chert	N/A
SB11	Uniface	Complete	DBT	Mudstone	N/A
SB12	Biface	Complete	Core	Chert	N/A

Designation	Class	Completeness	Type*	Material	Break Type
SB13	Late-Stage Biface	Lateral	N/A	Chalcedony	Radial
SB14	Mid-Stage Biface	Basal	N/A	Chalcedony	Overshot
SB15	Biface	Basal	Dart Point	Chert	N/A
SB16	Late-Stage Biface	Distal	N/A	Chert	Oblique Snap
SB17	Late-Stage Biface	Basal	N/A	Chert	Oblique Bending
SB18	Late-Stage Biface	Basal	N/A	Chert	Oblique Snap
SB19	Biface	Complete	Chopper	Chalcedony	N/A
SD201	Biface	Complete	Dart Point	Chert	N/A
SD202	Biface	Complete	Dart Point	Chert	N/A
SD203	Biface	Base	Dart Point	Chert	Thermal?
SD204	Biface	Complete	Dart Point	Chert	N/A
SD205	Biface	Complete	Dart Point	Siltstone	N/A
SD206	Biface	Basal-medial	Dart Point	Chert	Impact
SD207	Mid-Stage Biface	Complete	Dart Point	Chert	N/A
SB201	Biface	Basal	Dart Point	Metamorphic	Snap
SB202	Late-Stage Biface	Complete	N/A	Chalcedony	N/A
SB203	Late-Stage Biface	Distal	N/A	Chert	Snap
SB204	Late-Stage Biface	Basal	N/A	Chalcedony	Oblique Snap
SB205	Late-Stage Biface	Basal-medial	N/A	Chert	Oblique Bending
SB206	Mid-Stage Biface	Basal	N/A	Chert	Snap
SB207	Mid-Stage Biface	Distal	N/A	Chert	Bending
SB208	Mid-Stage Biface	Basal	N/A	Chalcedony	Oblique Snap
SB209	Early-Stage Biface	Complete	N/A	Chert	N/A
SB210	Biface	Basal	Dart Point	Chert	Snap
SB211	Early-Stage Biface	Basal	N/A	Chert	Bending
SB212	Mid-Stage Biface	Complete	N/A	Metamorphic	N/A
SB213	Biface	Indet	Utilized Frag	Chert	N/A
SB214	Early-Stage Biface	Distal	N/A	Chert	Snap
SB215	Mid-Stage Biface	Complete	N/A	Chert	N/A
SB216	Late-Stage Biface	Distal	N/A	Chert	Snap
SB217	Mid-Stage Biface	Basal	Dart Point	Chert	Bending
SB218	Mid-Stage Biface	Basal	N/A	cf Petrified Palm	Compound
SB219	Biface	Complete	Olmos Biface	Chert	N/A
SB220	Early-Stage Biface	Complete	N/A	Rhyolite	N/A

**see typological classification in Chapter 7 for more detailed analysis.*

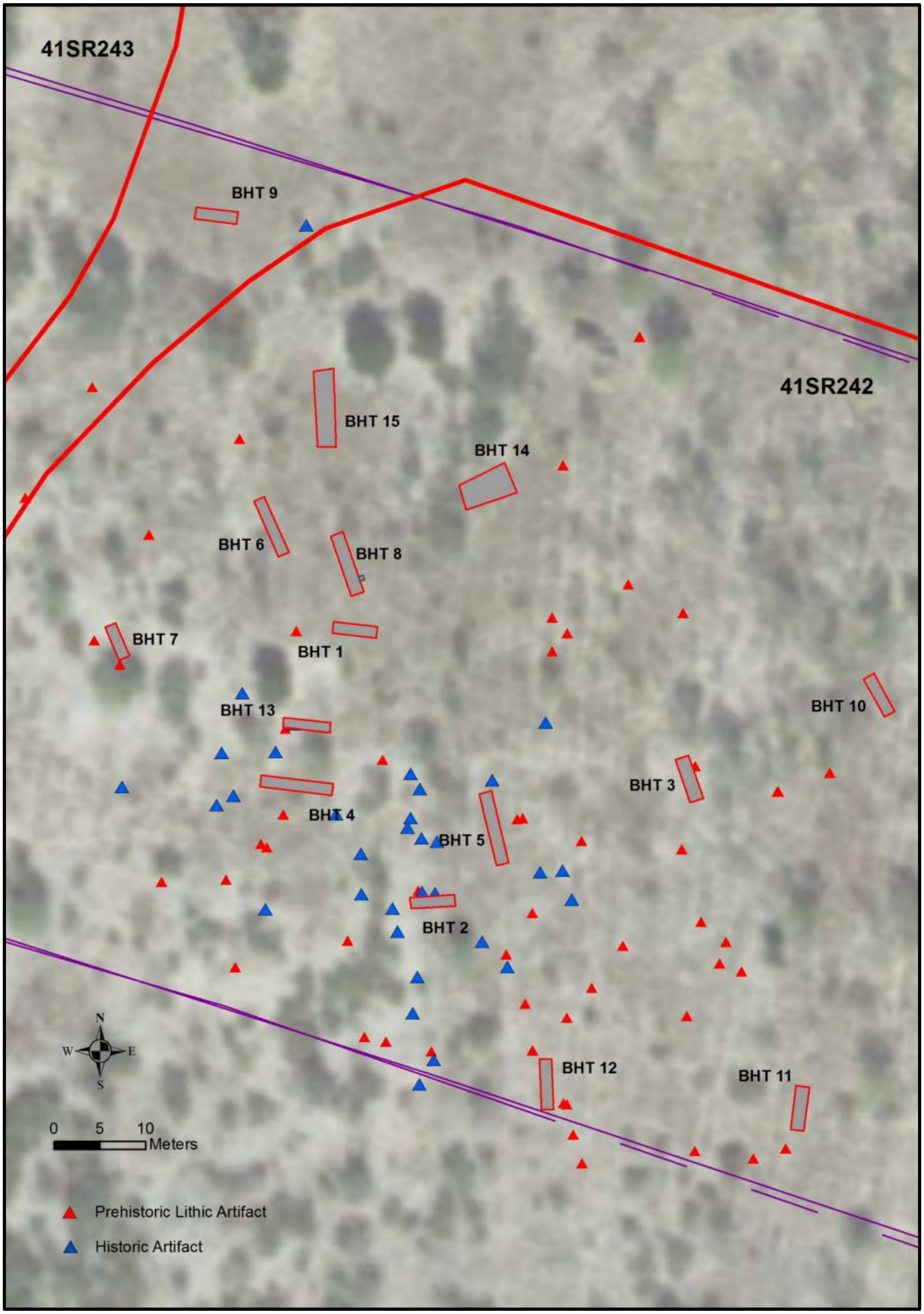

Figure 5.8. Surface artifact distribution across site 41SR242

SUMMARY

41SR242 is a Late Archaic to Late Prehistoric open camp on the upland margins of the Lower Rio Grande Valley. Based on the geoarcheological assessment, the site formed within *in situ* soils (i.e., residuum) that developed in the Goliad formation. At some point, likely in the 1980s and 1990s according to the landowner and a review of aerial photographs, that landform appears to have been root plowed, resulting in an upper Ap zone with minimal integrity. Below the Ap, archeological materials are found within a 30- to 40-cm cultural zone that closely correlates with the A/Bk soil horizon. With very few exceptions, cultural material is absent from the lower Bk horizons.

The spatial distribution of artifacts reveals some trends. The horizontal patterning indicates a sparse, widespread distribution of materials punctuated by locales of higher concentration, such as around Feature 1. The vertical distribution consistently showed all cultural materials within 20 to 60 cm of the original ground surface, although modern activities may have truncated this surface.

A total of 15 BHTs, seven TUs, and a column sample were excavated during the eligibility testing of 41SR242, revealing the presence of four prehistoric cultural features. Each of the four features consisted of distinct concentrations of artifacts and ecofacts and were completely recovered during testing. A thorough discussion of the geologic analysis, artifact analysis, feature analysis, and chronological data are presented in Chapters 6 and 7.

CHAPTER 6. GEOARCHEOLOGY OF 41SR242

by James T. Abbott

INTRODUCTION

This chapter describes geoarcheological observations made as a result of mechanical trenching and subsequent eligibility testing of site 41SR242, a multicomponent site in the planned ROW of SL 195 around Rio Grande City in Starr County. Figure 6.1 illustrates the general location of the site in Texas. TxDOT conducted the initial work on December 14, 2016 (for convenience sake, Phase 1) to gather preliminary data to assist in planning for eligibility testing of the site in advance of construction on SL 195, while the subsequent phases of fieldwork (Phases 2 and 3) represented NRHP eligibility testing. Fieldwork for Phases 2 and 3 occurred on February 20–23, 2017, and April 10–14, 2017. The current author did not participate in the Phase 3 field effort; geoarcheological observations were made by Corey Crawford (Cox-McClain), and samples taken by the field crew were incorporated into the analysis.

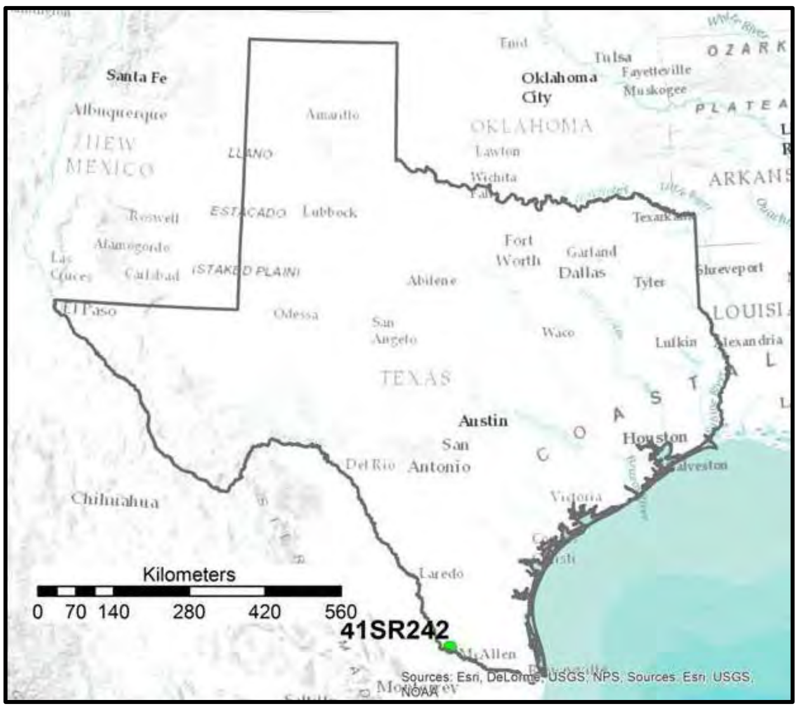

Figure 6.1. General location of site 41SR242 in Texas.

Site 41SR242 occupies mildly dissected uplands on the northern margin of the Rio Grande Valley. The project area is situated in the South Texas Brush Country natural region, and the Western Gulf Coastal Plain physiographic province. The uplands are underlain by the Eocene Jackson Group (Barnes, 1976; Figure 6.2), which outcrops locally in a roughly north-south oriented band approximately 10 miles wide but extends in a coast-parallel arc eastward into Louisiana. Overall, the Jackson Group consists of sandstone and clay that was deposited primarily in deltaic and littoral environments. Fisher et al. (1970) identify five principal depositional systems making up the Jackson Group: 1) a fluvial-deltaic system termed the Fayette system in the eastern part of the outcrop (from Lavaca County east to San Augustine); 2) a shelf (offshore) system east of this delta complex in Louisiana, termed the Yazoo-Moodys Branch system; and, in south Texas, a 3) strandplain-barrier bar system, 4) lagoonal-coastal plain system, and 5) shelf system that are arrayed parallel to the modern coast. The site rests astride thick sandy deposits associated with the barrier bar-strandplain. Older Eocene rocks, including the Yegua and Laredo

Groups, crop out upstream, while Miocene, Pliocene, and Pleistocene deposits compose the younger coastal plain sediments downstream.

Between Falcón Reservoir (Zapata County) and the head of the Holocene Rio Grande delta in extreme western Hidalgo County, a series of large Pleistocene terraces and discontinuous segments of Holocene floodplain are inset into the older rocks. Holocene deposits are also mapped in a series of large arroyos that drain south into the Rio Grande, including Arroyo Quiote, which flows just east of the site. Finally, the dissected upland margins are mantled with a variable and discontinuous drape of siliceous gravels that are mapped as the Uvalde Gravel by the Bureau of Economic Geology (Barnes 1976). This latter identification is somewhat problematic and merits additional discussion.

Uvalde gravel is an unconformable late Tertiary to Quaternary deposit that occurs primarily on the downthrown side of the Balcones Escarpment, which trends south-southwest from Dallas to San Antonio, then west to Del Rio (Byrd 1971). The designation was first proposed by Hill (1891) to describe upland gravel deposits of central and south Texas, but as Byrd (1971) documents, the definition and usage of the unit has been inconsistent and is somewhat confusing (e.g., Table 6.1). This is probably because Uvalde Gravel rests as an unconformable mantle on uplands and not as a confined stratigraphic unit, so broadly similar deposits of a variety of ages are conflated under a common rubric.

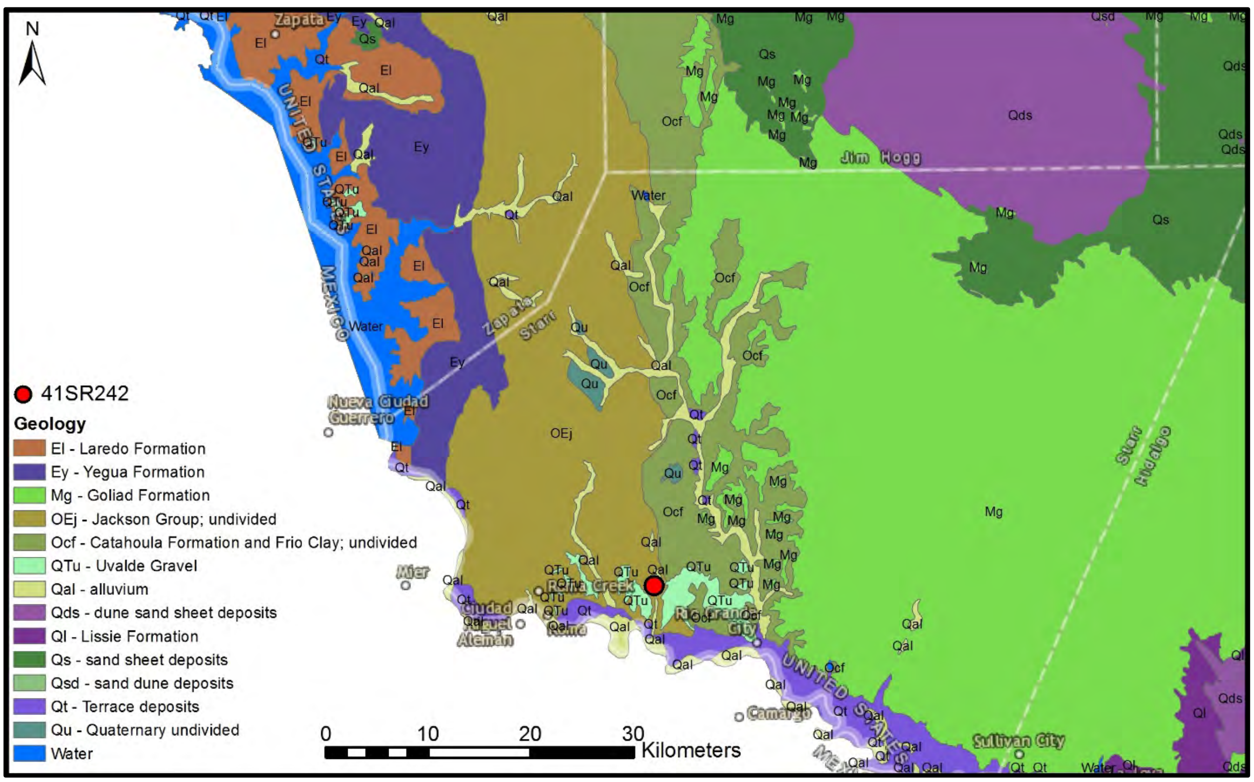

Figure 6.2. Geology of the area surrounding 41SR242, from McAllen-Brownwood GAT sheet.

Key to main stratigraphic units discussed in text: Qal=Holocene alluvium; Qs=Holocene sand sheet deposits; Qt = Pleistocene fluviatile terrace; TQu=Pliocene or Pleistocene Uvalde Gravel; Pg= Pliocene Goliad Fm.; MΦcf=Catahoula and Frio Fm (undivided); Ej=Eocene Jackson Gp.; Ey=Eocene Yegua Fm; El=Eocene Laredo Fm.

Table 6.1. High Gravels Mapped on Various Sheets of the Geologic Atlas of Texas in Central and South Texas

GAT Sheet	Year	Uvalde Gravel Listed?	Equivalent Unit	Composition / Description	Inferred Age	Comments
Abilene	1972	no	Qs1/Qs2	Chert, quartz, sandstone, limestone, igneous, and metamorphic rocks; Qs1 are < 10 feet thick, while Qs2 are 10–80 feet	Pleistocene	Seymour Fm; Unit Qs3 of the Seymour Fm is all limestone gravel and therefore probably distinct; interpreted as ancient deposits of Clear Fork of Brazos
Austin	1974	no	QHg	In the southeastern part of the map commonly exposed at the surface; northwestward, composed of an upper silty clay good for crop production and a lower coarse unit that yields some water	Pleistocene	Description speculates that unit possibly correlates with Onion Creek Marl
Beeville-Bay City	1975	no	—	—	Pliocene and Miocene, respectively	Probable equivalents are Willis and Goliad Fm
Brownwood	1976	no	Qhg	Caliche cemented gravel, pebbles, and cobbles of chert and limestone up to 4 inches long; occupies topographically high areas not necessarily associated with present drainage or divides	Recent or Pleistocene	It is unclear how recent deposits could possibly be associated with high gravels unrelated to modern drainages
Corpus Christi	1975	no	—	—		Nothing mapped older than Pleistocene Lissie
Crystal City-Eagle Pass	1976	**yes**	—	Caliche cemented gravel; well-rounded pebbles and cobbles of chert, some pebbles and cobbles of quartz and igneous rocks	Pliocene or Pleistocene	—
Dallas	1972	no	—	—		No high gravels mapped
Del Rio	1977	**yes**	—	Caliche cemented gravel; some boulders up to 1 foot in diameter; well-rounded cobbles of chert; some cobbles of quartz, limestone, and igneous rock	Pliocene or Pleistocene	—
Laredo	1976	**yes**	—	Chert; well-rounded pebbles and cobbles	Pliocene or Pleistocene	—
Llano	1981	no	—	—		—
San Angelo	1974	no	Qu and/or Qs3/Qao	—	Pleistocene	Probable equivalents are Pleistocene surficial deposits (undivided) and Seymour Fm and other Quaternary deposits (all Pleistocene)
San Antonio	1974 (rev 1981)	**yes**	—	Caliche cemented gravel; well-rounded cobbles of chert; some quartz, limestone, and igneous rock; forms extensive deposits in Medina and Uvalde Counties	Pliocene or Pleistocene	—
Seguin	1974	no	Qhg	—	Pleistocene and Pliocene, respectively	Probable equivalents are lower Pleistocene Willis and Pliocene Goliad Fm
Waco	1970	no	Qhg	Caliche cemented gravel; cobbles of well-rounded chert up to 5 inches in size; pebbles of variegated quartzite, limestone, chert, and quartz		—

In their purest form, Uvalde gravels consist of stream-worn siliceous gravels that occupy uplands of the Texas Coastal Plain (e.g., Byrd 1971). The gravels are dominated by chert but include occasional limestone and igneous rocks. An important component of most descriptions is location on divides, or in locations unrelated to modern drainages. This is generally interpreted as evidence of topographic inversion of the inner Texas Coastal Plain (that is, the ridge-top masses of gravel are believed to represent ancient valley-bottoms where these gravels originally accumulated, and which armored them from erosion so that the surrounding uplands were eventually eroded to form the modern lowlands). However, few of these characteristics are defining, and the term "Uvalde Gravel" is often applied to any upland siliceous gravel in central and south Texas. While a full discussion of the issue is beyond the scope of this document, it is worth noting that the deposits mapped in Starr County are restricted to areas close to the modern Rio Grande (Figure 6.3), and therefore appear unlikely to be "unrelated to modern drainages." Rather, it is considered likely that the deposits mapped as "Uvalde" gravels in the vicinity of 41SR242 actually represent diverse fluvial gravels, including cherts, petrified wood, limestone, and myriad igneous and metamorphic rocks reflecting, and delivered by, the vast ancestral Rio Grande drainage system during the middle to late Pleistocene.

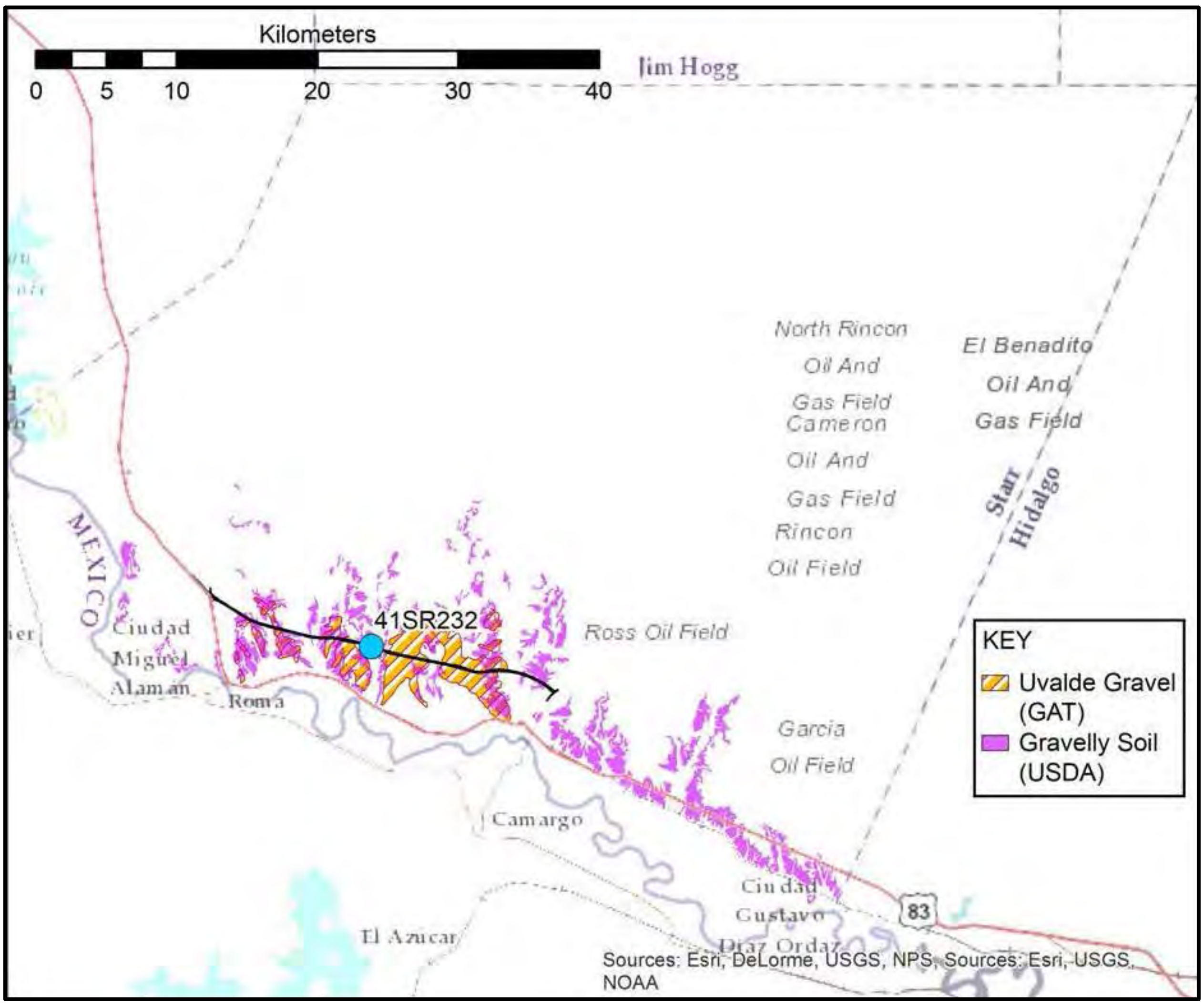

Figure 6.3. Distribution of gravel-dominated soils and geological formation in Starr County.

The site, as currently defined, measures approximately 175 m east/west by 75 m north/south in the proposed ROW but extends an unknown distance to the south. In addition, a separate site (41SR243) is mapped immediately to the northwest of the site (distance from centroid to centroid is approximately 180 m), and the most recent surveyors (SWCA) recommended that the two sites be combined. However, the current work focused on 41SR242 as currently defined.

The site is situated at an elevation of approximately 240 feet (73 m) amsl, on the northern margin of the Rio Grande Valley. A relatively small Rio Grande tributary, Arroyo Quiote, passes east of the site, and a small unnamed tributary of this arroyo passes to the south and west. The site sits on a convex, gently sloping interfluve between these two arroyos, which meet at a confluence approximately 0.5 km south of the site (Figure 6.4).

Restricted Information

Not for Public Disclosure

Figure 6.4. Topography surrounding 41SR242.

Soils mapped in the vicinity are illustrated in Figure 6.5. The site proper is entirely within the “Copita fine sandy loam, 0 to 3 percent slopes” mapping unit. Copita soils are classified as Aridic Calciustepts (Inceptisols) and exhibit a typical A1-A2-Bk1-Bk2-Ckr-R profile 37 inches thick. These nearly level to gently sloping upland soils formed in calcareous loamy residuum derived from sandstone predominantly of the Claiborne and Jackson Groups. The underlying bedrock is typically pale brown or gray calcareous sandstone. The Copita fine sandy loam soil mapping unit also includes areas of McAllen fine sandy loam and small areas of Zapata soils (Thompson et al. 1972). McAllen soils are also Aridic Calciustepts and exhibit a typical deep Ap-A-Bw-BCk profile developed in calcareous loamy sediments. Zapata soils are classified as Petrocalcic Calciustepts (Inceptisols) and exhibit a typical A1-A2-Bkkm1-Bkkm2 profile developed in older loamy calcareous alluvium. The other soils mapped in the vicinity are Ramadero loam, which is mapped downslope near the ephemeral arroyo flowing in from the west, and Matamoros silty clay, which is mapped in Arroyo Quiote to the east. Ramadero soils are Cumulic Haplustolls formed in alkaline alluvium, and exhibit a typical A1-A2-A3-Bw- Bk1-Bk2-BCk profile formed in sandy clay loam. Matamoros soils are Vertic Ustifluvents, and exhibit an Ap-C1-C2-2Ab-2Cb profile formed in silty clay alluvium.

Restricted Information

Not for Public Disclosure

Figure 6.5. Detail of Web Soil Survey map of the site, with the current boundary and Phase 1 trench locations added.

Key to mapping units: Cp= Copita fine sandy loam, 0 to 3 percent slopes; Mm = Matamoros silty clay; Ra = Ramadero loam.

According to generalized Texas Parks and Wildlife Department vegetation mapping (McMahan et al 1984), vegetation in the vicinity of the site is classified as Mesquite-Blackbrush Brush. This assemblage includes lotebush, ceniza, guajillo, desert olive, allthorn, whitebrush, bluewood, granjeno, guayacan, leatherstem, Texas pricklypear, tasajillo, kidneywood, yucca, desert yaupon, goatbush, purple three-awn, pink pappusgrass, hairy tridens, slim tridens, hairy grama, mat euphorbia, coldenia, dogweed, knotweed leafflower, and two-leaved senna (McMahan et al. 1984). However, the landowner reported that the property had been previously root plowed and cultivated, and the locale was relatively open shrubland during testing. Figure 6.6 is a Google Earth-derived birds-eye view of the site, facing southwest and showing the two arroyos and the general character of vegetation.

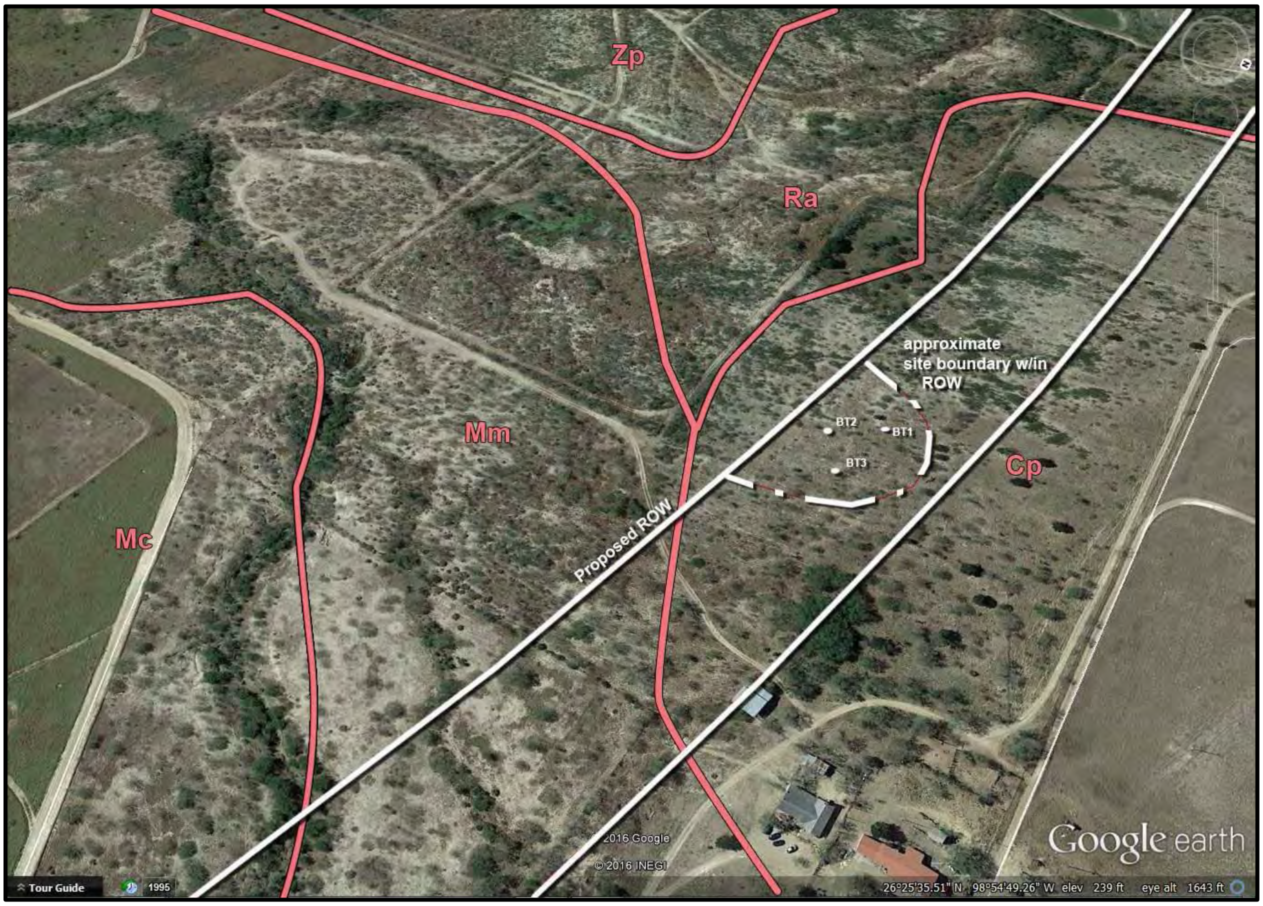

Figure 6.6. Simulated bird's eye view of 41SR242 and surroundings, facing southwest. Only Phase 1 trench locations are illustrated.

METHODS

Field Procedures Phase 1

For logistical reasons, we conducted Phase 1 relatively rapidly, and field recording was rapid and basic. Three BHTs (BHTs 1 – 3) were excavated in the boundary of the site to examine the stratigraphy and prospect for buried cultural material (see Figures 6.5 and 6.6). All BHTs were situated on a low-gradient upland surface situated a short distance upslope of the alluvial fills flanking Arroyo Quiote and its tributary. Two TxDOT archeologists (Ringstaff and Abbott) were present on site, and all trenching was actively monitored by at least one archeologist and a TxDOT district environmental staff member (Edd Paradise).

Each BHT was excavated with a backhoe equipped with a smooth-bladed, 3-foot bucket. Excavation was periodically paused where appropriate so that the walls and floor of each trench could be troweled and assessed. When a trench exposed obvious pre-Holocene deposits or reached a depth of approximately 150 cmbs, an archeologist entered the trench and scraped, examined, and recorded a section of each wall. No profiles were prepared in an archeological sense, but a section of sidewall of each trench was cleaned, photographed, and described using criteria outlined by Olson (1976) and Schoeneberger et al. (2012).

Excavation depth ranged between 75 cmbs and 140 cmbs in the three trenches. Archeological materials were noted and collected opportunistically with minimal control, but the location of each trench corner and of the single feature identified was taken with a survey-grade GPS unit.

Field Procedures Phase 2

During Phase 2, an additional 10 BHTs (BHT 4 – 13) were excavated across the site (Figure 6.7), and a small block and a few isolated hand TUs were excavated to evaluate cultural materials noted in the BHTs. The following discussion is primarily concerned with the trenches; see Chapter 5 for specific discussion of the hand excavations (note that BHTs were situated adjacent to each hand unit, so generalized contextual information is available). Methods employed were generally as described above. In addition, witness sections were recorded in BHT 8, situated a few meters north of the excavation block centered on BHT 1, and in BHT 4, situated approximately 30 m to the south of the block (see Figure 6.7). In BHT 8, documentation was accomplished with a 50 × 50-cm unit excavated in 10-cm levels to quantify artifact return by level, flanked by a stacked series of small soil samples taken at approximately 10-cm levels, and two large blocks were taken at depths of approximately 25 cm and 50 cm for micromorphological analysis. In BHT 4, a series of small soil samples were collected from the profile of BHT 4. At the suggestion of geoarcheologist Charles Frederick (who did the micromorphological analysis), these blocks were submitted for computed tomography (CT) analysis at The University of Texas High Resolution Computed Tomography Scan Facility (UTCT) in the Jackson School of Geosciences at The University of Texas at Austin before they were processed for thin sections.

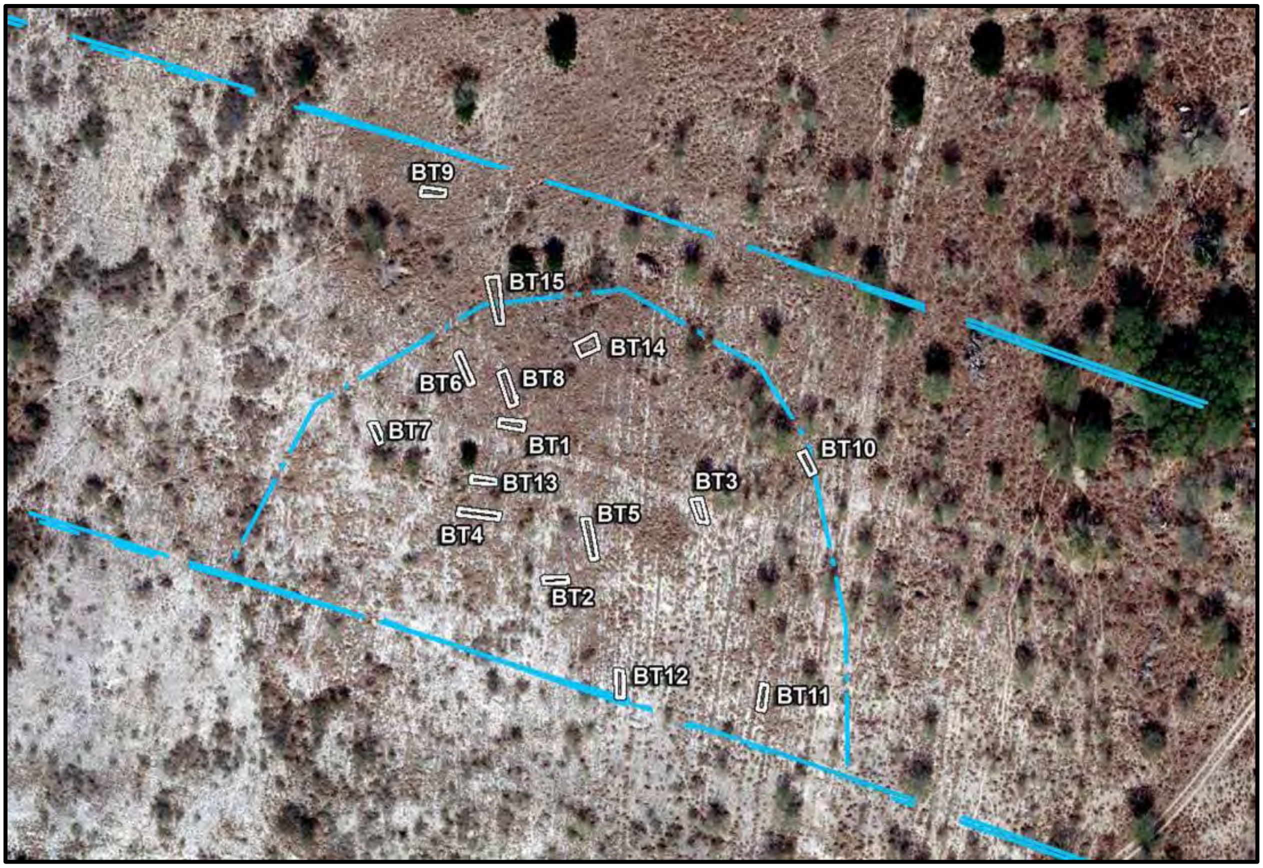

Figure 6.7. Plot of trench locations through Phase 3. Note north/south-trending scarring from root plow.

Field Procedures Phase 3

Phase 3 consisted of additional machine and hand excavations conducted by TxDOT archeologist Chris Ringstaff and a crew from Cox-McLain Environmental Consultants. Two additional BHTs, BHT 14 and BHT 15, were excavated during this phase. The author did not participate in this field phase; geoarcheological recording of trenches was performed by geoarcheologist (and Cox-McLain crew member) Corey Crawford.

LABORATORY PROCEDURES

The physical properties of the site were documented primarily through analysis of the two columns of magnetic susceptibility cube samples from BHT 4 and BHT 8, and micromorphology samples from BHT 8. Analyses conducted on the cube samples included magnetic susceptibility, particle size analysis, organic carbon content, calcium carbonate content, iron content, soil pH, and stable carbon isotope analysis. Magnetic susceptibility was determined using 2-cm cubes collected and packed in the field. All sample analyses were on the gravel-free fraction; the size of the samples was inadequate to provide a statistically-relevant gravel sample, so their presence was noted but not quantified.

Magnetic Susceptibility

Magnetic susceptibility is a general measure of the degree to which a sample may be magnetized, and provides basic information on the magnetic mineralogy of the sample, which may vary owing to a variety of factors, such as depositional processes, soil development, and human occupation. The general application of magnetic susceptibility in archeological studies has been discussed in detail by Dalan (2008) and Dalan and Bannerjee (1998). Frequency dependent magnetic susceptibility was calculated on cube samples to detect the concentration of ultrafine (< 0.03 μm) superparamagnetic ferromagnetic minerals occurring as crystals produced by biochemical processes in soil (Dearing 1999). Each cube was weighed, and the low frequency (470 Hz; χ lf) and high frequency (4700 Hz; χ hf) magnetic susceptibility was measured at the 0.1 setting on a Bartington MS2 meter using an MS2b sensor. The mass-corrected magnetic susceptibility (χ 1f) and coefficient of frequency dependency (Cfd) were then calculated. The coefficient of frequency dependency (χ fd) is the percentage difference in magnetic susceptibility measured at low and high frequency:

$$\chi \text{ fd} = ((\chi \text{ lf} - \chi \text{ hf}) / \chi \text{ lf}) \times 100 \quad (1)$$

Elevated values of χ fd (greater than approximately 10 percent [Gale and Hoare 1991:213]) are indicative of increased concentrations of fine-grained ferromagnetic minerals such as maghemite and magnetite in topsoils (Dearing et al. 1996).

Particle Size Analysis (Texture)

The particle size distribution (or texture) of the gravel-free portion of each sample was determined on a Beckman-Coulter LS 13-320 multi-wavelength laser sizer. Samples were first subsampled, and then placed in a small beaker on a hot plate to which concentrated (30 percent) hydrogen peroxide was added in order to remove organic matter, and a 5 percent solution of sodium hexametaphosphate was added to disperse the fine fraction. Samples were brought to a boil and left on the hot plate until the visible reaction (effervescence) had ceased or the color of the sediment had changed, at which point they were removed from the hot plate, cooled, and then measured on the LS-13-320. The results of these analyses are presented as percentages of sand, silt and clay, as well as in the form of descriptive statistics that are presented in phi units (a negative log base 2 conversion of millimeters). In the phi system, sands exhibit phi values between 0 and 4, silts between 4 and 9, and clay > 9 phi. The U.S. Department of Agriculture soil texture class for each sample was determined using the Soil Texture calculator provided by the Natural Resources Conservation Service (NRCS) website (NRCS n.d.).

Calcium Carbonate Equivalent (CCE)

Calcium carbonate equivalent percentage (%CCE) was calculated using a Chittick apparatus. A small split (either 1.7 gram or 0.85 gram, depending on the apparent carbonate content) of each sample was finely ground and passed through a 0.075-mm sieve, weighed, placed into a 250-ml Erlenmayer flask, and connected to the Chittick apparatus. The liquid level in the measuring burette was then set to -10 ml, the stopcock was closed so no gas could leave the system, and the leveling bulb was dropped to establish a vacuum inside the flask. At this point, the temperature and barometric pressure in the room were recorded. Then, 10 ml of 50 percent strength (approximately 6 N) hydrochloric acid was introduced into the flask, which was agitated intermittently until the reaction had ceased. At this point, the leveling bulb was raised until the liquid levels in the bulb and burette were equal, the volume of gas evolved was measured, and the calcium carbonate equivalent was calculated according to the method of Dreimanis (1962).

Organic Matter

The organic matter was estimated by percent loss-on-ignition at 500°C. Samples were placed in pre-weighed crucibles and then dried for 12 hours at 105°C, after which they were weighed, and then ignited in a muffle furnace for 2 hours at 500°C. Upon removal from the furnace samples were allowed to cool in a desiccator and then weighed. The organic matter content is calculated as the percentage weight loss between the dry weight and the post-500°C weight.

FIELD RESULTS

The BHTs at 41SR242 exposed broadly similar slope profiles consisting of brown to pale brown, sandy to silty loam with variable amounts of siliceous gravel. Shallow, ephemeral channels filled with poorly sorted gravel and sand demonstrate that some alluviation has occurred on site. In general, however, the profiles resemble the weathered upland profiles formed in silty sandstone bedrock that are mapped at the site by the NRCS (i.e., Copita soils). In several BHTs, the profile penetrated through this soil into weathered sandstone bedrock (C or Cr horizon). The individual BHT profiles are described in Appendix A. The most obvious unifying features among these profiles were relatively low-chroma colors in the 10YR range, the dominant loamy texture, and the character of soil structure, particularly in that portion between the base of the plow zone and the top of the subsoil.

This structure, which varied considerably in its degree of expression between trenches and within individual profiles, is difficult to describe using traditional nomenclature (e.g., Schoeneberger et al. 2012). It varies intermittently between granular and fine subangular blocky, albeit often with very abundant open pores and fine (insect-scale) krotovina. It is relatively soft in hand section, yet slightly hard to hard in place, and includes clasts that are weakly consolidated, yet prone to abrupt failure (i.e., collapse into loose single grains and fine aggregates) under slight to moderate compression when in hand sample. The pores vary in size from less than a millimeter to more than a centimeter in diameter, and most of them clearly represent insect burrows. Brushing of a cut sidewall with a stiff brush produces an irregular, knobby surface (Figure 6.8).

Figure 6.8. Detail of "knobby" texture produced by brushing vertical exposure with a stiff brush. Note snail shells, carbonate masses, charcoal flecks, and hollows formed as large *Rabdotus* shells were released and fell out.

My field judgment was that the structure is a direct consequence of pervasive bioturbation by insect-scale biota, including localized packing and cementing of pore walls; construction of biocoatings; and pelletal, loose, fibrous, and laminar backfilling of voids. The description of the soil structure I used in the field varied a little between trenches, but was always some variant of "biogenic granular structure." However, it is important to stress that this is not intended as a synonym for a typical granular structure produced (primarily by earthworms) in the upper A horizon of a subhumid to subarid soil profile, because it is not dominated by the pelletal shape typical of worm excreta. While this "knobby" type of soil structure is apparent throughout the profiles, it appears particularly pronounced in the lower B horizon, above the weathered sandstone of the BC and Cr horizons. My initial field impression was that larger (rodent-scale) krotovina were nearly absent—only one was noted on the profiles drawn—but subsequent review of trench photographs indicates that while relatively rare, rodent-scale burrows and krotovina are present in several BHTs and units (Figure 6.9).

Figure 6.9. Examples of rodent scale burrows and krotovina. A: Profile of 50 × 50 off wall of BHT 8; B: BHT 3 profile; C: Partially filled burrow in TU 5 floor; D: photo-enhanced image of the same feature shown in C, showing boundary.

Other than variation in soil structure and cultural material abundance, the most obvious difference within and between profiles was in the frequency and habit of gravels. In the western part of the site, gravels were relatively uncommon, dispersed through the profile, and typically relatively small (1–2 cm and smaller). However, there were two exceptions to this latter trend, both situated on the northwestern periphery of the site. In BHT 9, an apparent pit feature contained a number of larger gravels, at least two of which appeared burned (thermally fractured) (see Appendix A). Also, a gravelly zone including a number of large clasts was recorded at depth in BHT 15. In the eastern part of the site, several BHTs (e.g., BHT 5, BHT 10, and BHT 11) exhibited shallow, broad ephemeral channel facies containing a mix of loamy sands and gravels as large as 15–20 cm diameter. These gravels mantled irregular, abrupt scoured surfaces, and were clearly water-lain. However, the encasing matrix was very poorly sorted, ranging from sandy loam to fine gravel, suggesting minimal opportunity for hydraulic sorting of the sediment. Field observations suggest that these gravels derive from "Uvalde" gravel outcrops no more than a few hundred meters upslope and were delivered to the site by sheet flow and broad, ephemeral channelized flow.

The Problem in a Nutshell

In essence, the trajectory of geoarcheological investigations at 41SR242 was dictated by questions raised by BHT 1. The recorded profile of BHT 1 is abbreviated because we discontinued excavation of the BHT after encountering a feature (Feature 1) consisting of lithic flakes and *Rabdotus* snail shells at around 50 cmbs. The final recorded profile of BHT 1 was 65 cm thick, but the lower 10 cm of this was based on extrapolation from exposure around Feature 1; the actual documented section was 55 cm deep (see Appendix A). It revealed an Ap-A-Bk1-Bk2 profile developed in a calcareous sandy loam. The Ap horizon was 13 cm thick and consisted of somewhat gravelly, grayish brown silty to sandy loam. The gravels were pebble and granule-sized clasts of mixed siliceous lithology. As with all soils on the site, organic matter content was very low. The Ap horizon graded into a thin, discontinuous A horizon that was 5 cm thick at the measured section. It was similar to the Ap horizon, but slightly darker in color and somewhat more consolidated. Both horizons exhibited a weak biogenic granular structure with many open pores, but this structure was superimposed on a weak platy (i.e., weakly laminated) structure in the Ap horizon. The Bk1 horizon was 22 cm thick, and the much more structured B2k horizon extended to the base of the trench at approximately 65 cm.

It was this B2k horizon that yielded the concentration of cultural material (Feature 1), which we discovered while scraping the floor of the trench. We noted several snail shells after one particular backhoe "cut," so per procedure we stopped the machine, entered the shallow trench, and began to clean the area with trowels. Immediately, flakes and whole *Rabdotus* shells began to pop up from the floor. The flakes were particularly striking because they were predominantly flat-lying and in part resting directly on top of each other in a distinct pile, so that dislodging one tended to expose several more. We crudely scraped an area about twice the size of a large dinner plate, recovering dozens of flakes and snail shells (Figure 6.10). I admit I was very puzzled by this feature, as I had already decided based on my initial observations that the profile probably represented a weathered upland soil, and the potential for significant burial of archeological components with reasonable integrity was very limited. Yet here we were, in a dense pocket of flakes (some quite large) and intact snail shells that appeared likely to retain considerable integrity even though it was buried more than half a meter below the surface, with little indication of how that burial occurred.

Although I could not rule out colluvial accumulation, and some limited sheet aggradation was actually considered quite likely, the setting of the site is not particularly conducive to significant colluvial or alluvial aggradation. Figure 6.11 is an oblique view of a relatively high-resolution aerial photograph (0.3 m nominal pixel resolution) draped on a digital elevation model that has been vertically exaggerated to emphasize the landform setting in relation to the proposed alignment and the site boundary. Note that the site occupies a convex portion of the foot of a relatively short upland slope, where significant accumulation of low-energy sediment is not very likely.

Once we recognized the potential significance of the deposit, we elected to record the profile as it was, collect the loose artifacts, mark the location carefully, and backfill the trench pending additional excavations at the location. We excavated two other BHTs during that initial field session, one of which (BHT 2) contained a number of buried (albeit vertically and laterally dispersed) artifacts, and one of which (BHT 3) contained only a few of them (neither trench contained much gravel). Coming out of the field from the first phase of work, my primary working hypothesis was that burial of the flake and snail concentration that we dubbed Feature 1 was a consequence of biosedimentation by insects and annelids, and that it was preserved because disruptive bioturbation of the site deposits by larger fauna (e.g., rodents, reptiles) was rare. We designed subsequent geoarcheological investigations (in part) to test the viability of this hypothesis.

Figure 6.10. Sorted piles recovered from Feature 1, a cluster of lithic debitage and intact snail shells discovered at a depth of approximately 50–60 cmbs in BHT 1.

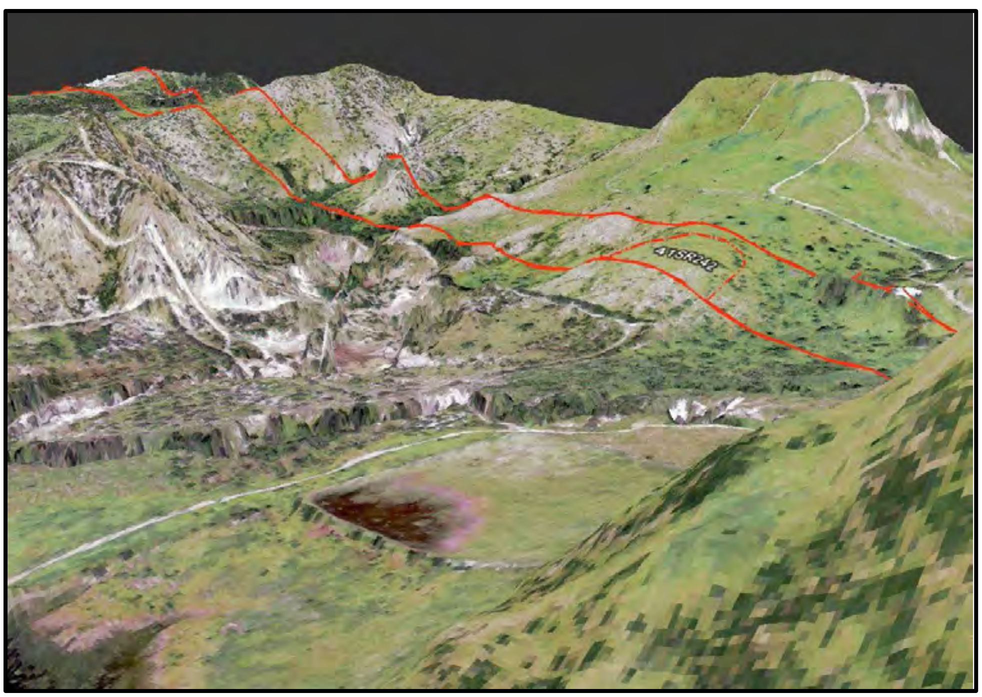

Figure 6.11. Oblique view of high-resolution aerial draped on DEM, showing the landscape setting of the site (convex footslope).

Phase 2 investigations occurred in February 2017, followed by Phase 3 in April 2017. These excavations involved 12 additional BHTs and a number of test pits. Two profiles were selected for additional documentation and sampling. BHT 8 was selected because it was both physically closest to and very similar in character to the previous exposure in BHT 1, while BHT 4 was selected because it exposed a relatively deep (1.5 m) profile that appeared among the most complete and clearly horizontal profiles on site. The remaining trenches were described and photo-documented but were not sampled for laboratory analysis.

BHT 8 was excavated immediately (approximately 3 m) upslope from BHT 1 and exposed an Ap1-Ap2-ABk profile developed in loam and sandy loam. Although the sediment appeared slightly grayer in color (hence the field designation of the thick lower horizon as an Abk rather than a Bk horizon), it was broadly similar to that exposed in the initial trench. The BHT 8 profile was sampled for textural and chemical characterization at an interval of 10 cm using plastic susceptibility cubes, and bulk samples for thin section characterization were taken from 15–23 cmbs (A and upper Bk1 horizon) and 45–53 cmbs (Bk2 horizon). The results of laboratory studies suggest a uniform profile marked by minor differences in texture (Figure 6.12). The only trend worth noting is a subtle trend of decreasing organic matter content through the Ap sequence (from 10–30 cmbs), and again through the Abk Horizon (40–80 cmbs). However, overall organic content is low, and none of the samples exceeds 1.2 percent OM based on loss on ignition. Calcium carbonate content is also relatively uniform, varying from around 10 percent in the Ap horizon to 16 percent at 50 cmbs in the Abk horizon. Overall magnetic susceptibility (as expressed by χ lf) trends very slightly down with depth, while frequency-dependent susceptibility (χ fd%) trends very slightly up. The magnitude of these measurements suggests that magnetic minerals are relatively rare overall, and that very fine, superparamagnetic (SP) grains are not present in any concentration (Dearing et al. 1996; Barker 2002).

BHT 4 was excavated approximately 20 m downslope of BHT 1. Although it also appears to represent an upland profile, it is far more heterogeneous than BHT 8 (Figure 6.13). Part of the reason for this is that it is simply a more complete profile, which extends into weathered bedrock. BHT 4 grades down through an Ap1-Ap2-Abk-Bk-BC-Cr profile, with soil textures ranging from loamy sand to clay loam (in contrast, all eight samples from BHT 8 are loam; see Figure 6.14). However, this variability does not appear to represent reorganization of the profile by traditional soil processes (e.g., eluviation and illuviation of clay, carbonate, and organic matter) and instead probably represents textural characteristics inherited from the parent material, possibly with additional biases imposed by soil fauna and additions of colluvium and sheetwash.

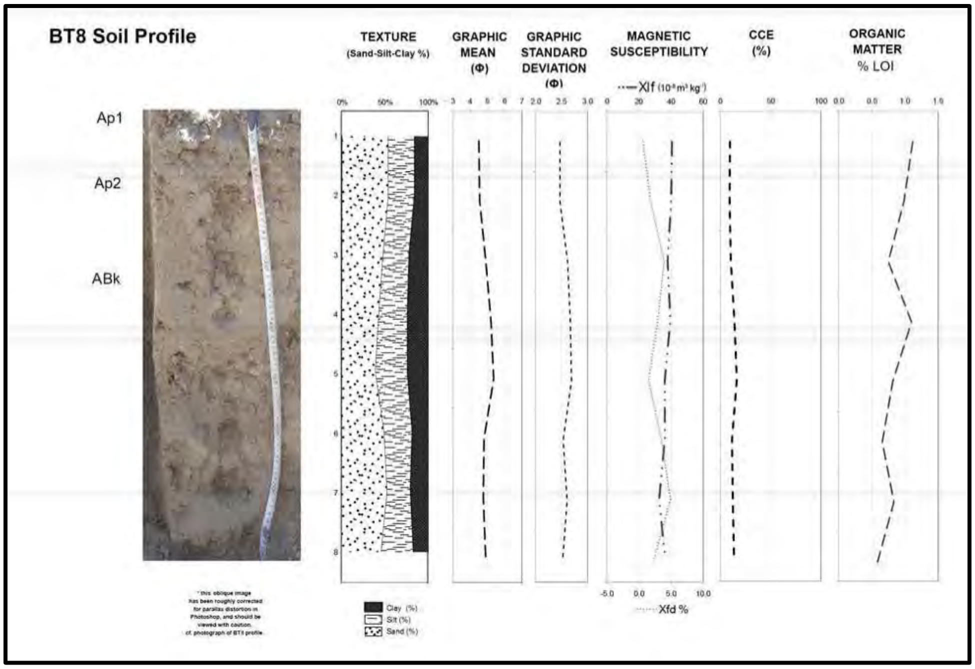

Figure 6.12. Results of laboratory analyses, BHT 8. Note that, to facilitate comparison, the scales of individual graphs in this figure conform with the scales of graphs in Figure 6.13.

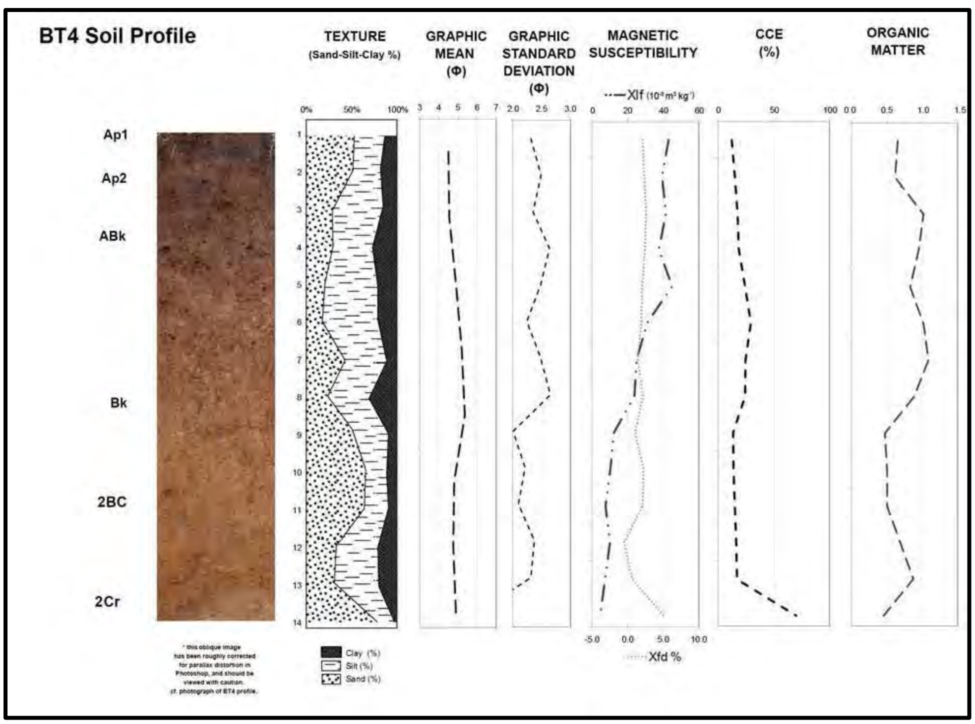

Figure 6.13. Results of laboratory analyses, BHT 4.

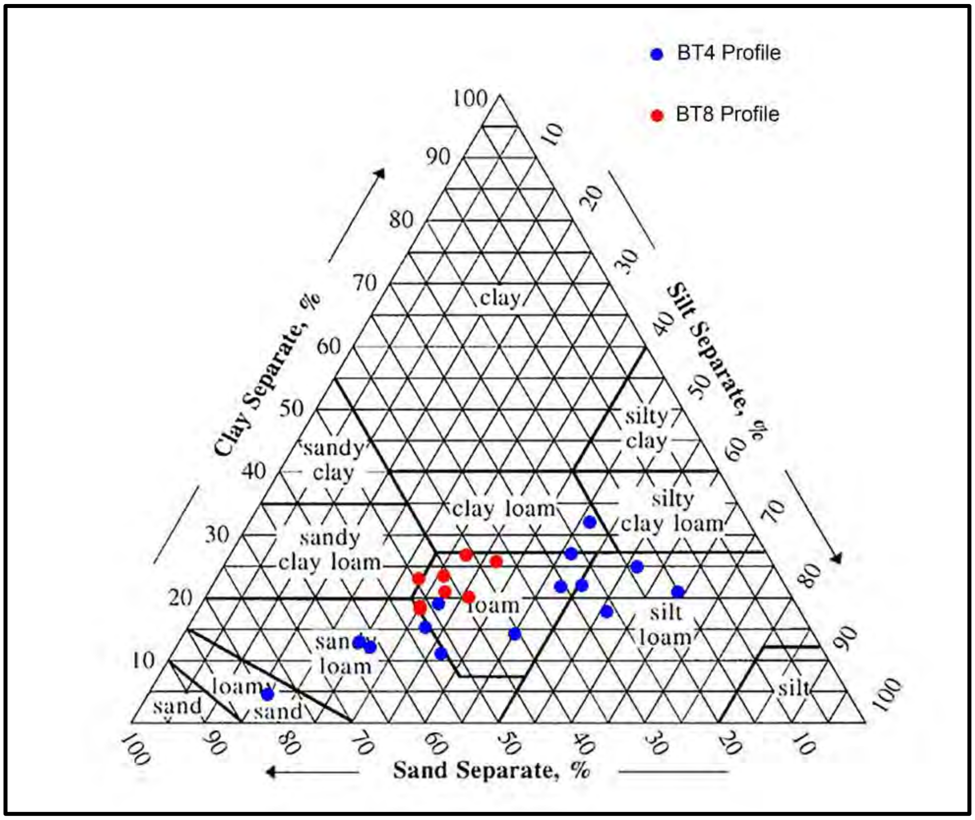

Figure 6.14. Textural plot of samples from BHT 4 and BHT 8.

Organic matter and carbonate content also vary in unexpected ways in BHT 4. The amount of organic matter is limited overall, and never exceeds 1.1 percent. However, the Ap1 and Ap2 horizons have an unexpectedly low organic content compared to the underlying horizons; noticeable enrichment does not occur until the upper Abk horizon. Similarly, there is a noticeable increase in organic content at the base of the profile in the lower 2BC horizon. Both of these trends defy ready explanation, but given the low overall concentration of organic matter, they are probably not particularly telling. The results of measurements of carbonate content (CCE%) are more puzzling, as the deeper horizons where pedogenic carbonate would be expected to accumulate (here designated the Bk and 2BC) have lower measured carbonate content than the overlying Abk. Although most of the carbonate accumulation observed in these horizons was segregated in masses and soft nodules, and may therefore be under-represented in the very small (8 cc) samples, it is very surprising that the measured $CaCO_3$ content of the Bk horizon is lower than in the overlying Abk. The low carbonate content of the underlying BC horizon is at odds with the bedrock (Cr horizon), which is a highly calcareous, carbonate-cemented sandstone with a CCE of >70 percent. Because the horizon does not appear unconformable based on the character of the contact (Figure 6.15), this suggests that the BC horizon has been substantially decalcified. The sharp decrease in sand content in the lower profile is also difficult to explain, as are the prominent gypsum crystals along the weathered contact. The most likely explanations are that the textural change represents inheritance from the parent material or a consequence of long-term textural segregation and sorting by insects, while the crystalline gypsum represents dissolution and re-precipitation of calcium sulfate cements in the underlying sandstone.

Figure 6.15. Example of brecciated sandstone at the base of the profile of BHT 11. This type of irregular contact, where oriented fragments of bedrock are brecciated and infilled with weathered sediment, is indicative of weathering in place.

The remaining BHTs varied from approximately 50 to 125 cm in depth. All of them terminated in or at the contact with weathered bedrock (BC or Cr horizon). The broad, shallow gravelly channels exposed in BHTs in the eastern part of the site (see Appendix A) clearly demonstrate that alluvial deposition has occurred on the site during the late Holocene. Nevertheless, as previously stated, I do not believe that there has been sufficient alluvial deposition to account for the burial and preservation of Feature 1. The following discussion further develops this argument and provides alternative theories for the burial of Feature 1, and by extension, the other buried cultural materials encountered at 41SR242.

DISCUSSION

The question of site burial is not merely of academic interest. The mechanism of burial relates to the potential for the deposits to have sufficient integrity to be eligible for the NRHP. While various members of the lay public, and even a few archeologists I have worked with over the years, have stated the belief that artifacts in sites "work themselves down" into soil, this is not the case. Artifacts do not act, they are acted upon by external forces. In the absence of cultural agency (i.e., intentional or unintentional burial), there is always some physical or biological mechanism (or suite of mechanisms) responsible for moving an artifact from the surface, where they are originally deposited, into the subsurface where they are found. In the case of the Cornelio Alvarez Sr. site (41SR242), there are four classes of mechanisms that I considered as potential preservation agents: 1) translocation downward from the living surface into the subsurface by an agent or by natural processes; 2) living surface burial by alluvial and/or colluvial sedimentation; 3) living surface burial by eolian sedimentation; and 4) living surface burial by biosedimentary processes. Each of these (non-mutually exclusive) alternatives is discussed in turn below.

Translocation

Many mechanisms are capable of moving artifacts down (or up) through a soil profile, but they can be subdivided into two broad categories: biological processes, where movement is attributable to the activity of organisms (animals and/or plants), and physical processes, where organisms play no direct role. What these mechanisms share is stratigraphic translocation; the artifacts have been moved through strata, so they are no longer associated with the original living surface, whether that be the modern surface (typical in the uplands) or a buried paleosurface.

Examples of physical displacement processes include vertic soil processes affecting expansive clay soils (including heave, which can lift artifacts by displacing the matrix they inhabit, and soil cracking, which can open conduits for materials to fall or slide deeper into a profile), frost heave, salt growth, and relatively rare events like earthquake-related liquefaction (Schiffer 1983; Waters 1992; Abbott 2001). Some types of slope failure can laterally displace artifacts as the encasing sediment moves as a unit or undergoes plastic deformation, making them intermediate between translocation and sedimentation processes.

Biological displacement occurs when the actions of organisms dislodge and move cultural material. Materials may move up or down the stratigraphic column, and accompanying lateral displacement is common (Schiffer 1983; Armour-Chelu and Andrews 1994). Plant root growth can lift and disrupt overlying deposits, disrupt and spread features, or lead to settling that displaces artifacts downward as plant roots decay. Burrowing animals can exhume buried artifacts, or provide conduits for artifacts to fall, slide, or wash more deeply into the profile. However, the size of the burrower generally dictates the size threshold of artifacts subject to movement, as burrowing mammals and reptiles can readily displace materials that could be caught by ¼-inch mesh, while invertebrates rarely do. Although both plants and animals can disrupt and translocate sediment, the speed with which animals operate is generally several orders of magnitude faster than plants.

Alluvial and/or Colluvial Transport and Sedimentation

From a technical perspective, alluvial sedimentation refers to deposition from flowing water, while colluvial sedimentation refers to slope-focused processes that are primarily gravity-driven (Bates and Jackson 1984; Whittow 1984). However, the boundaries of these processes are not as clear-cut as they first seem, and there is lack of sound agreement on the term "colluvium," which differs in usage between continents, disciplines, and even individuals (Miller and Juilleret 2015; 2016). In particular, investigators who are focused on process would tend to consider deposits laid down by unconfined overland flow alluvium, while those focused on resulting deposits would recognize the difficulty separating intimately associated wash-driven and gravity-driven deposits, and be more likely to include wash deposits under the broader rubric of colluvium. In either case, artifact burial occurs because fresh sediment derived from somewhere else on the landscape is introduced and accumulates on the site, burying the living surface and associated artifacts. If water is the agent of transport, it will exert tractive forces on the artifacts that vary depending on the speed and depth of the water column and can disrupt the spatial relationships between artifacts and sort them according to shape and weight.

Water can also erode unconsolidated sediments in a variety of ways, ranging from rapid loss of floodplain and terrace sediments by lateral erosion on the margin of a migrating stream, to shallow surface stripping by overland flow. In semi-arid to arid environments like Starr County, this work tends to be performed during short periods associated with rainfall events, and it is common on semi-arid archeological sites in fine-grained settings to see artifacts resting on short pedestals because the surrounding surface has been stripped by sheet erosion. Over time, episodes of aggradation and erosion can affect the same area repeatedly, whether at a large scale (e.g., a river valley) or small scale (e.g., an individual slope segment). Thus, artifacts may have a burial history that is complex and difficult to unravel.

Eolian Sedimentation

Wind also erodes, transports, and deposits sediment, and like water and gravity is capable of burying or exhuming surfaces. However, because air is much less dense than water, the grain size of materials affected by wind transport is much narrower, ranging roughly from medium sand to fine silt. Coarser materials are generally too massive to be entrained, while finer materials are more difficult to entrain, both because wind velocity drops precipitously in immediate proximity to the ground surface, and because silts and clays are typically bound together by various forms of interparticular attraction (Derbeyshire et al. 1979; Lancaster and Nickling 1994). However, finer sediments may be transported short distances as sand- or silt-sized soil aggregates, or once entrained, as suspended dust which can travel great distances. The impacts of saltating grains are important in dislodging coarser and finer particles (Bagnold 1941; Kok et al. 2012), so the wind speed necessary to initiate eolian erosion is greater than that needed to maintain it once it is initiated.

Eolian deposits are generally better sorted (i.e., more uniformly sized) than alluvial deposits, and far better sorted than colluvium. This means that eolian deposits are relatively easy to recognize, even in the absence of preserved bedding, but care must be taken because the character of the sediment supply can also dictate the texture of deposits—thus, alluvial and colluvial processes reworking older eolian sediment can create deposits that mimic the texture profile of an eolian deposit. While eolian processes will never transport gravel-sized clasts, silts and clays can be transported in suspension or as aggregate particles in the traction load.

Biosedimentation

Biosedimentation occurs because burrowing animals remove sediment at depth, carry it upwards, and eject it at the surface (Crossley 1986; Frederick 1996; Bagyaraj et al. 2016). Over the long term, this can result in the burial of materials on the surface as burrow ejecta accumulates and is remodeled by wind, rainsplash, overland flow, and similar processes.

However, there is an important difference between biosedimentation and other forms of deposition. Viewed in isolation, biosedimentation is essentially a closed system—any sediment burying a living surface represents material removed from the substrate beneath that living surface, while alluvium, colluvium, and eolian sediments are largely transported to the site from elsewhere. As a consequence, a purely biosedimentary sequence can only aggrade (thicken) an amount equivalent to the volume of pore spaces created in the subsurface; the overall thickness will remain relatively constant, but a given paleosurface associated with the profile will be both progressively buried, and progressively destroyed as it is increasingly riddled with fresh burrows. Thus, all things being equal, one would expect a paleosurface 5,000 years old to be buried approximately five times as deeply as one 1,000 years old.

Of course, things are never equal. In actuality, this “closed system” model probably never happens, because nothing is truly isolated in nature. Exhumed sediment is available for eolian deflation, rainsplash, and sheet erosion, and material from upslope is introduced by the same processes. Weathering of the profile, facilitated in no small part by burrowing, can add to the thickness of the soil column over time. Changes in porosity attributable to progressive burrowing will alter the volume of sediment, as can biotic additions. The intensity of biological activity in any given spot and at any given depth can wax and wane in response to seasonal or climatic shifts, competition from new species, or pure chance.

Nevertheless, in the absence of significant sediment influx or erosion, the net result of a bioturbation-dominated soil will be gradual burial and progressive destruction of any associated occupation surfaces without substantial net gain in soil thickness.

The nature of that destruction, however, will depend on the characteristics of the organisms involved. Although there are burrowing organisms capable of destroying and displacing a cobble- to boulder-sized feature like a burned rock hearth or an intact pot (e.g., bears, alligators, armadillos), most burrowing vertebrates are too small, and will simply work around large clasts rather than go to the trouble to exhume them (Butler 1995). Similarly, smaller burrowing vertebrates can readily disturb and displace pebble-sized artifacts like ceramic sherds, lithic tools, and lithic debitage, but burrowing arthropods are far more likely to leave such artifacts in place. Therefore, it may be possible to recover meaningful spatial data from such an assemblage. This does not mean that the site is intact, because smaller components of the assemblage (including microdebitage, pollen, phytoliths, and charcoal) may be in modified spatial and stratigraphic positions or removed entirely. In settings with more advanced turbation effects such as a termite nest, however, sediment may be reworked to the extent that formerly dispersed materials are concentrated at the base of activities (McBrearty 1990).

Moreover, the dynamics of burrowing behavior will vary significantly with depth depending on the specific behavior and level of activity of species involved. In most case, one would expect the intensity of burrowing behavior to decrease with depth, but the character of that change is likely non-linear (Wilkinson et al. 2009; Johnson et al. 2014). In addition, the behavior of individual species active at a given location may affect the trend, as different species occupy different depth ranges, or segregate their activities so that the character of the burrow varies with depth (Butler 1995; Bastardie et al. 2003; Reynolds and Wakkinen 1987).

Potential Processes of Artifact Burial at the Cornelio Alvarez Sr. Site

The current site is situated in the eroding margin of the Rio Grande Valley, on a subtly convex footslope segment approximately 300 m from an isolated upland remnant that is the primary source of the gravel. As Figure 6.16 shows (also see Figure 6.11), there is little opportunity for the type of protracted flooding that would be necessary for large volumes of fine-grained sediment to accumulate on this convex toeslope. The gravel lenses almost certainly represent ephemeral channels formed during extreme high-magnitude rain events, which seems the only way that clasts of that size (up to 15 cm diameter) could be mobilized and moved downslope. Given that the catchment only extends a few hundred meters upslope, the opportunity to entrain sediment is clearly limited. However, intense rainfall (such as provided by tropical storms) can do a great deal of geomorphic work on the type of under-vegetated slopes common in the region in a brief timespan. Therefore, I would expect significant overland transport of fine-grained sediment to occur during such an event.

Sediment yield would be further enhanced if the storm were to occur after an artificial disruption of the surface (e.g., plowing) or drought had limited cover vegetation. However, except where localized sediment traps like the lee side of microtopographic features (e.g., shrubs, burrow spoil) disrupt flow, the majority of this entrained fine-grained sediment would probably sheet across the site and accumulate downslope on the floodplain. That said, overland flow has clearly affected the site, and almost certainly contributed to both adding and removing sediment. The channelized gravels noted in BHT 5, BHT 10, BHT 11, and BHT 15 represent the product of concentrated, torrential slope runoff, with flow concentrating enough to both transport large gravels and incise small ephemeral channels (gullies). Given the setting, such high magnitude events are almost certainly the result of tropical storms making landfall and would occur with relatively low frequency.

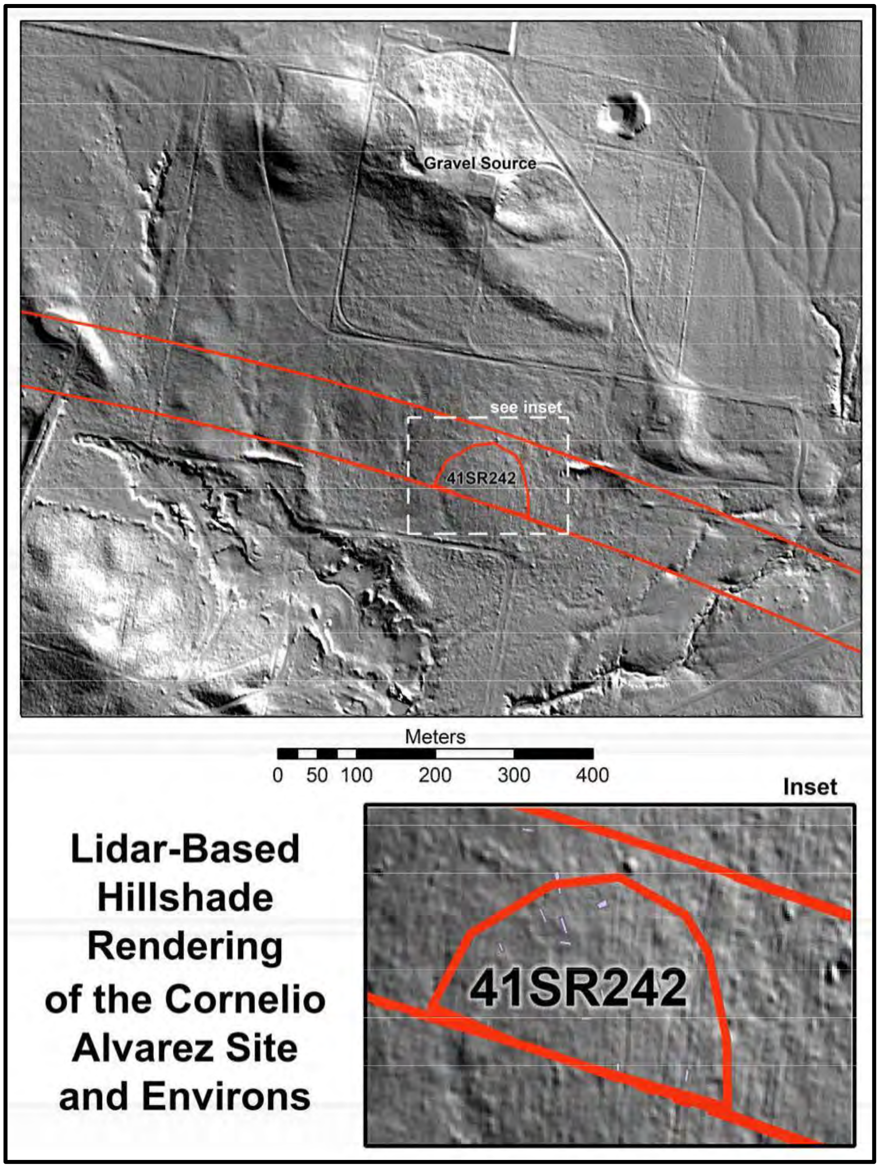

Figure 6.16. Lidar-based hillshade showing landforms and modern disturbances in the vicinity of 41SR242. Note prominent root plow scars visible in inset.

I therefore argue that traditional alluvial and colluvial processes of deposition are unlikely to have buried the Feature 1 assemblage. Even if fine-grained sediments did happen to accumulate sufficiently to bury an archeological assemblage, one would expect significant hydraulic sorting of materials buried by an intense flow, so the dense assemblage of whole snail shells and flakes represented by Feature 1 would be very unlikely to be preserved through such a mechanism.

Similarly, I cannot imagine a scenario where a dense assemblage of flakes and snail shells could be translocated deeply into the site matrix (i.e., intruded through existing strata) without destroying the associations between artifacts. It is true that pockets of snail shell can be concentrated in rodent burrows in the subsurface as a result of rodent behavior, but there is no reason to expect that lithic debitage would be concentrated in this manner.

Moreover, neither I nor the archeologists excavating the TUs observed any indication that the materials in Feature 1 were associated with a burrow feature during the initial trenching or the subsequent excavations, and the frequency of observable rodent-scale burrows in the site trenches was very low. In contrast, the frequency of fine burrows was very high, and the sediment was overprinted with a soil texture that appeared to be the result of pervasive pedoturbation by insect-scale organisms.

Consideration of bioturbative mechanisms of site burial (e.g., Frederick 1996; Leigh 1998) and site pedoturbation (e.g., Bateman et al. 2003; 2007) is most common in thick, sandy upland soils where macroscopic evidence of depositional and pedogenic process is limited (e.g., the Texas Sandy Mantle). Thus, much of the effort of these investigations is directed at documenting the presence of bioturbation in the first place, and only then estimating its effects on site integrity and dating. At the Cornelio Alvarez Sr. site (41SR242), the loamy nature of the sediment made macroscopic evidence of insect-scale turbation abundant—so abundant, in fact, that there was a danger that overprinting could conceal or have destroyed sedimentary evidence of other processes. For the reasons listed above, it appeared that the most likely scenario was that burial occurred primarily through the accumulation of ejecta produced by burrowing invertebrates over the long term. However, I also considered the possibility that sheetwash aggradation had occurred, or that historic land use practices had buried the material relatively recently. This latter possibility was considered because the site showed evidence of clearing, and the landowner, Cornelio (Cone) Alvarez, informed us that the entire area had been root plowed several decades before.

There are a number of methods to control brush used in south Texas, including controlled burning, mechanical methods, biological methods (e.g., goats), and chemical treatment (Hoffman 1975; NRCS 2012). Of these, mechanical methods are most disruptive to the soil (and the most effective). These methods include chaining, grubbing, chopping, shredding, raking, disking, and root plowing. According to Mr. Alvarez, the site was cleared using a bulldozer-mounted root plow, presumably like that illustrated in Figure 6.17. Even decades later, evidence of that plowing is clearly visible as north/south-oriented scars in the lidar-based hillshade (see inset, Figure 6.16), but is far from obvious on the ground (Figure 6.18) or in profile (see various photographs, Appendix A). Unlike a plow used for cultivation, root plows are not designed to overturn the soil surface. In standard configuration (as in Figure 6.17), they simply slice the roots off underground, disrupting only the area around the blade supports.

Figure 6.17. Illustrations of root plow equipment, showing the mechanics and impacts of use. Photographs from the internet (top left: http://www.industrialbuckets.com/English/Attachments/RootPlows/RootPlows.html; bottom right: https://www.youtube.com/watch?v=m-7MboQ6_QM.

Figure 6.18. Views of the site, showing character of topography and vegetation. A: facing south across center of site from vicinity of BHT 9. B: facing southwest at excavation. C: facing north from BHT 5. Note subtle ridge to west of trench and house in background, which sits on upland remnant. D: facing north toward excavation from general area of BHT 13. E: facing west-northwest across eastern part of site toward main excavation block. Note vague indication of north/south lineaments in vegetation in middle ground, particularly on left side of photograph. F: facing northeast from area of BHT 1, prior to reopening the area in April 2017. Note size of mesquite.

Root plows may also be fitted with accessory vanes designed to bring severed roots to the surface, which cause considerable disruption of the surface horizons (Hoffman 1975); however, the distinct plow lines visible in the lidar image suggest that these rakes were probably not used. Associated disturbances can also occur as a function of raking, piling, and burning the cut vegetation, not to mention the compression and churning damage imparted by a heavy tracked bulldozer.

It is telling that no evidence of the smooth cut across the profile made by a root plow was noted in the field. With the exception of the knife-like vertical struts, which cause localized disruption to the depth of plowing (usually 11–14 inches), soil damage from a root plow should be visible as a smooth, horizontal contact at the base of the plow zone. If no rake vanes are installed, soil above the cut would be lifted by the wing-shaped plow, then allowed to settle back down en masse as the plow passes, while the presence of low-angle rake vanes would thoroughly break up the soil, bringing the cut roots to the surface. In either case, the diagnostic feature should be a distinct, smooth, horizontal line marking the base of root plowing. The fact that no such feature was noted in any of the trenches, even though there is ample lidar-based evidence to support Mr. Alvarez's account, suggests that the contact has been largely obliterated by insect turbation in the past few decades. Therefore, this lack of a clear root plow cut is very instructive about the overall rate of profile turbation.

The cultural material at 41SR242 is both strewn across the surface, particularly in the southeast portion of the site, and stratified throughout the soil column. However, the uppermost solum was largely ignored during testing because of relatively sparse artifact content and perceived plow disturbance, and the majority of the materials were recovered from below 40 cmbs. Eleven radiocarbon ages, including four ages on *Rabdotus* snail shells and seven on charcoal, were determined on samples recovered from the site (Table 6.2). The first four samples dated were *Rabdotus* shells. They were run after the initial field session to get a broad idea of the age and integrity of the assemblage, even though *Rabdotus* shells often exhibit an age anomaly due to incorporation of dead carbon from limestone and soil carbonate (Goodfriend 1992; Goodfriend et al. 1999). Our purpose in dating the snail shells was not to arrive at an accurate estimate of the age of the site, but rather to obtain general insights into the age and integrity of Feature 1 before returning to the field (we had recovered no charcoal to that point). The remaining samples addressed wood charcoal, including mesquite (*Prosopis* sp.), acacia (*Acacia* sp.), and snakewood (*Condalia* sp.). All samples were from units in immediate proximity to each other surrounding Feature 1, and wood identifications were made by TxDOT ethnobotanist/archeologist Dr. Kevin Hanselka.

We pursued several lines of evidence related to the character of turbation processes and resulting morphological features during the analysis phase. Two bulk sample blocks, one from the presumed plow zone (15–23 cmbs) and one from below it (45–53 cmbs), were collected from the documented soil column in BHT 8. Each block was hand carried to the CT lab at the Jackson School of Geosciences, University of Texas at Austin, for CT scanning, then submitted to Dr. Charles Frederick for soil thin section analysis. I then examined and compared the results of these analyses, with particular emphasis placed on evidence of turbation and depositional mechanisms. In addition, radiocarbon dating of samples from the vicinity of Block 1 allowed for calculation of a crude minimum rate of soil turnover, and two additional sediment blocks—one containing a preserved bone fragment and one believed to capture the primary cultural stratum—were collected during the April field session and submitted for CT scanning. All of these analyses are discussed below.

Table 6.2. Radiocarbon results from 41SR242.

Sample	Context	Material	Beta Number	Corrected Age	Error	del 13C	Calibrated Age (2 Sigma)
SR242-1s	BHT 1, Feature 1, 50-60 cmbs (1 of 4)	*Rabdotus* spp. Snail shell	Beta 456114	6200	30	-8.1	BC 5225 to 5055
SR242-2s	BHT 1, Feature 1, 50-60 cmbs (2 of 4)	*Rabdotus* spp. Snail shell	Beta 456115	5010	30	-3.9	BC 3935 to 3860 BC 3810 to 3705
SR242-3s	BHT 1, Feature 1, 50-60 cmbs (3 of 4)	*Rabdotus* spp. Snail shell	Beta 456116	4640	30	-6.9	BC 3515 to 3395 BC 3385 to 33360
SR242-4s	BHT 1, Feature 1, 50-60 cmbs (4 of 4)	*Rabdotus* spp. Snail shell	Beta 456117	5130	30	-7.2	BC 3980 to 3935 BC 3870 to 3810
SR242-5C	TU 3, Level 3, 55 cmbs	*Prosopis* sp. (carbonized)	Beta 468117	3260	30	-24.1	**BC 1616 to 1493** BC 1481 to 1454
SR242-6C	TU 3, Level 3, 56 cmbs	*Prosopis* sp. (carbonized)	Beta 468115	2420	30	-23.1	BC 748 to 685 BC 666 to 642 BC 587 to 581 **BC 556 to 402**
SR242-7C	TU 1N, Level 4, 56 cmbs	*Prosopis* sp. (carbonized)	Beta 468116	2250	30	-24.1	BC 395 to 347 **BC 321 to 206**
SR242-8C	TU 5, Level 3, 57 cmbs	*Prosopis* sp. (carbonized)	Beta 468118	2160	30	-23.4	BC 358 to 279 **BC 259 to 108**
SR242-9C	TU 5, Level 3, 60 cmbs	*Prosopis* sp. (carbonized)	Beta 468119	3260	30	-22.5	**BC 1616 to 1493** BC 1481 to 1454
SR242-10C	TU 3, Level 1, 30-40 cmbs	*Condalia* sp. (carbonized)	Beta 468120	2450	30	-23.6	BC 754 to 681 BC 670 to 609 **BC 595 to 411**
SR242-11C	TU 5, Level 2, 50 cmbs	*Acacia* sp. (carbonized)	Beta• 468121	3020	30	-23	BC 1391 to 1337 **BC 1322 to 1191** BC 1177 to 1164 BC 1144 to 1131

The bolded range in the calibrated age of each charcoal sample represents the timespan with the highest probability (greatest area under the curve).
Sample Context Material Beta Number Corrected Age Error del 13C Calibrated Age (2 Sigma)

Radiocarbon Analyses

Figure 6.19 (see also Table 6.2) illustrates the calibrated probability curves of dated radiocarbon samples from the site by TU and depth. Two conclusions are immediately apparent from this figure. First, the *Rabdotus* shells date substantially (as much as 5,000 years) older than charcoal from the same setting. Second, the charcoal ages are themselves relatively widespread and not in stratigraphic order. Scott Pletka with TxDOT conducted a brief Bayesian analysis of these ages in OxCal (see Figure 6.19). This analysis suggested the charcoal resulted from repeated occupation over a timespan of no less than 1,196 and no more than 2,853 years at 2σ (95.4 percent) probability. Based on the probability curves, the most likely scenario is that the charcoal (and associated artifacts) began to accumulate episodically beginning around 1600 B.C. and ending approximately 100 B.C., a period of 1,500 years. However, the 2σ range of the "start" boundary extends as far back as 2474 B.C., while that of the "end" boundary extends as late as A.D. 730. In short, little can be said about the age and integrity of the assemblage other than it appears to represent repeated activity over more than a thousand years during the Late Archaic. Given these ages, the rate of burial of the material in Feature 1 appears to be between 0.038 cm/yr-1 and 0.011 cm/yr-1, which is lower than the rate of 1.89 cm/yr-1 to 0.158 cm/yr-1 calculated by Frederick (1996) for burial by earthworms on a test plot at Fort Hood.

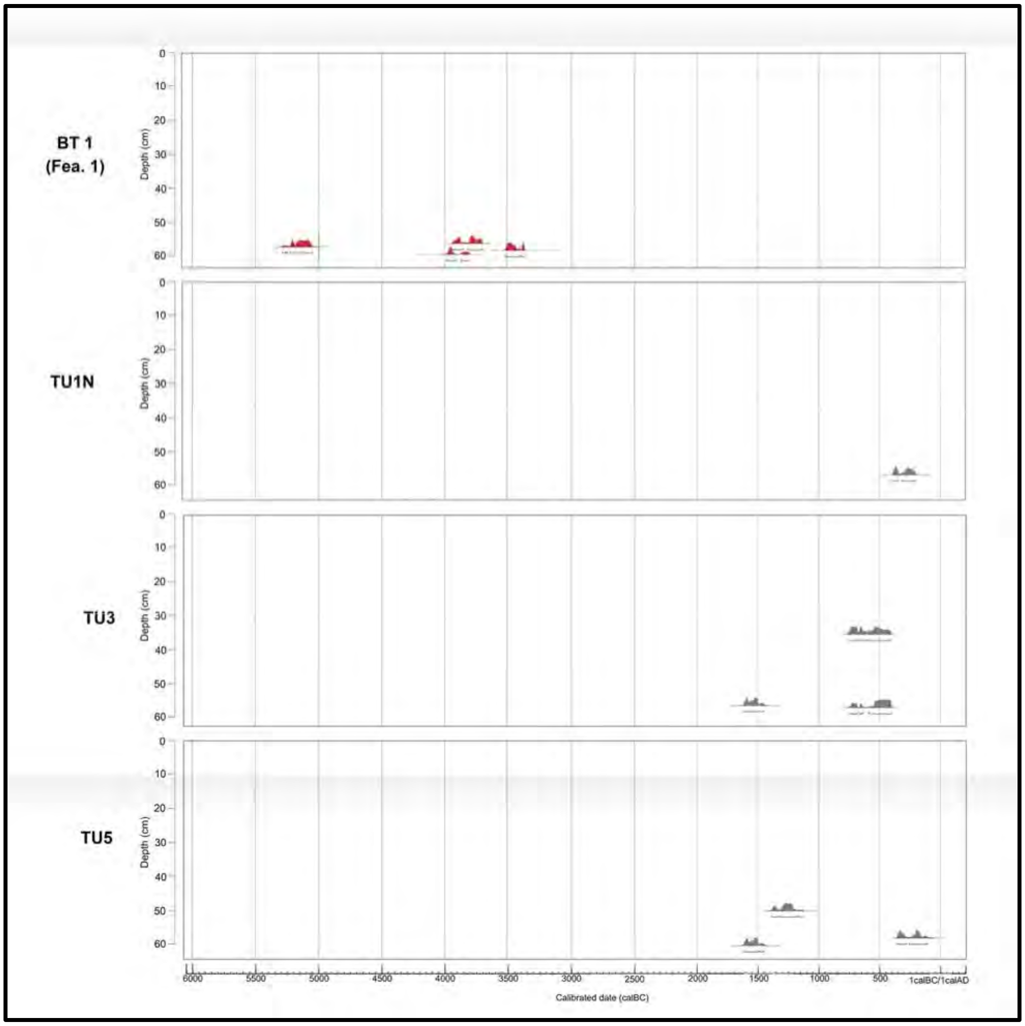

Figure 6.19. Radiocarbon results arranged by test unit and depth. Each sample is represented by the calibration curve for that sample, where the height of the curve at each year represents the relative probability that the sample dates to that year.

Thin Section / Computed Tomography (CT) Analyses

We conducted the thin section and CT analyses to look for vestiges of both depositional bedding and/or burrowing by microtene mammals, and to characterize the effects of burrowing by invertebrates like annelids, insects, and spiders. The relatively obscure discipline of *ichnology* is the study of trace fossils, which are sediment disruptions caused by living organisms—burrows, trackways, trails, and the like (Bates and Jackson 1984). It is often divided into two subfields: *paleoichnology*, the study of trace fossils in the rock record, and *neoichnology*, the study of modern trace fossils. Recently, a massive tome by Genise (2017) lays out ichnological observations specific to insects, a subfield termed *ichnoentomology*. He identifies insects with four variations in digging behavior, which he terms *rakers*, *pullers*, *pushers*, and *carriers*. Each of these burrowers produce burrows with different habits (size, inclination, pattern, etc.), some of which can be extremely large and elaborate architectural structures containing passages, brood chambers, living chambers, and other diverse structures. Insects also prepare the walls of burrows in different ways, including packing, lining, and coating, using ambient moisture and their own biological fluids and excreta to shape, mold, and stabilize burrow walls (Figure 6.20). Termites, in particular, combine excavated sediment with their own excrement to construct tube-like burrows that can not only represent below-ground labyrinths, but can extend far above the ground surface, rising up the sides of trees (or houses) to above-ground feeding sites, or, in the case of tropical termites, coalesced into immense freestanding mounds containing tons of excavated sediment (McBrearty 1990; Butler 1995). Earthworms also riddle the soil with burrows and eject copious amounts of sediment (relative to their size) at the surface (Frederick 1996; Zaller et al. 1997). Like many insects, they model burrow walls using a combination of pressure and mucous fluid, stabilizing burrow structures (Jégou et al. 2001). Unlike insects, many earthworms actually ingest and then excrete large volumes of soil material and can fundamentally affect the character of soil structure (Lee and Foster 1991; Jongmans et al. 2003). The role of earthworms in propagating soil fertility and soil structure has been recognized since Darwin (1881), and remains a focus of soil studies (e.g., Schrader and Zhang 1997; Resner et al. 2011). In general, the burrowing and associated biological activity (e.g., feeding, casting) of arthropods and earthworms serves to mix and aerate soil, aid decomposition, and promote infiltration and cycling of humus in soils. More to the point in the present context, this activity can both bury archeological sites and reorganize them in the subsurface, either dispersing buried occupations or collapsing dispersed materials into pseudo-occupations (McBrearty 1990; Armour-Chelu and Andrews 1994).

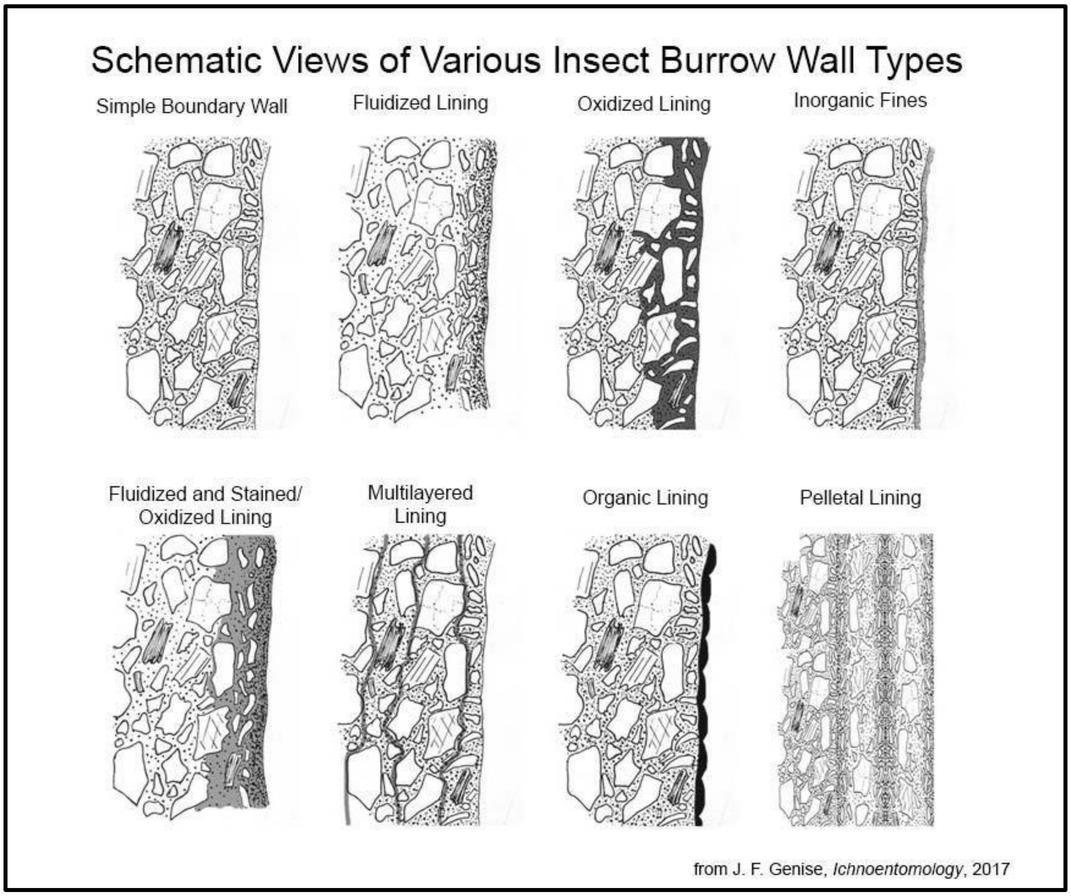

Figure 6.20. Variations in insect burrow wall morphology.

Thin Section/CT Analysis Methods

We collected bulk samples for thin section analysis from depths of 15–23 cm and 45–53 cm in the documented profile of BHT 8. Each sample was removed as an oriented block and carefully wrapped in heavy gauge aluminum foil, which was then wrapped with duct tape to secure the sample and placed in a padded box for transport. These samples were submitted to The University of Texas High Resolution

X- Ray CT Facility (UTCT), where they were scanned by Dr. Matthew Colbert on April 12, 2017 using the NSI scanner. The specific parameters of each scan are provided in Table 6.3. The individual scans were captured as 16 bit TIFF and 8 bit JPG images. Processing of the image stacks and analysis of the pore fabric was performed in ImageJ software (National Institute of Health), a powerful open-source image processing application, while 3D manipulation, volume calculation, and segmentation were performed with Aviso Lite (Thermo Fischer Scientific). The latter analysis involved expensive, specialized software, and was performed at UTCT. Several freeware options designed for medical use were employed in an attempt to further this analysis away from UTCT, but none of these attempts were particularly successful.

The scanned blocks were then provided to Dr. Charles Frederick, who carefully opened them, embedded them in polyester resin, and sliced them into slabs on a rock saw. Three slabs were selected for thin section preparation based on review of the slab faces, and submitted to National Petrographic for preparation of 2 × 3-inch thin sections. Initial review of the blocks was based on review of the slab faces, with particular attention paid to presumed biogenic structures. This was supplemented by comparison with flatbed-scanned images of each slide using backlit and “pseudo-dark field” illumination (Figure 6.21), and CT radiograph cross sections re-sliced in ImageJ software to align as closely as possible with the slab face. Thin section preparation and analysis is discussed in greater detail in Appendix B.

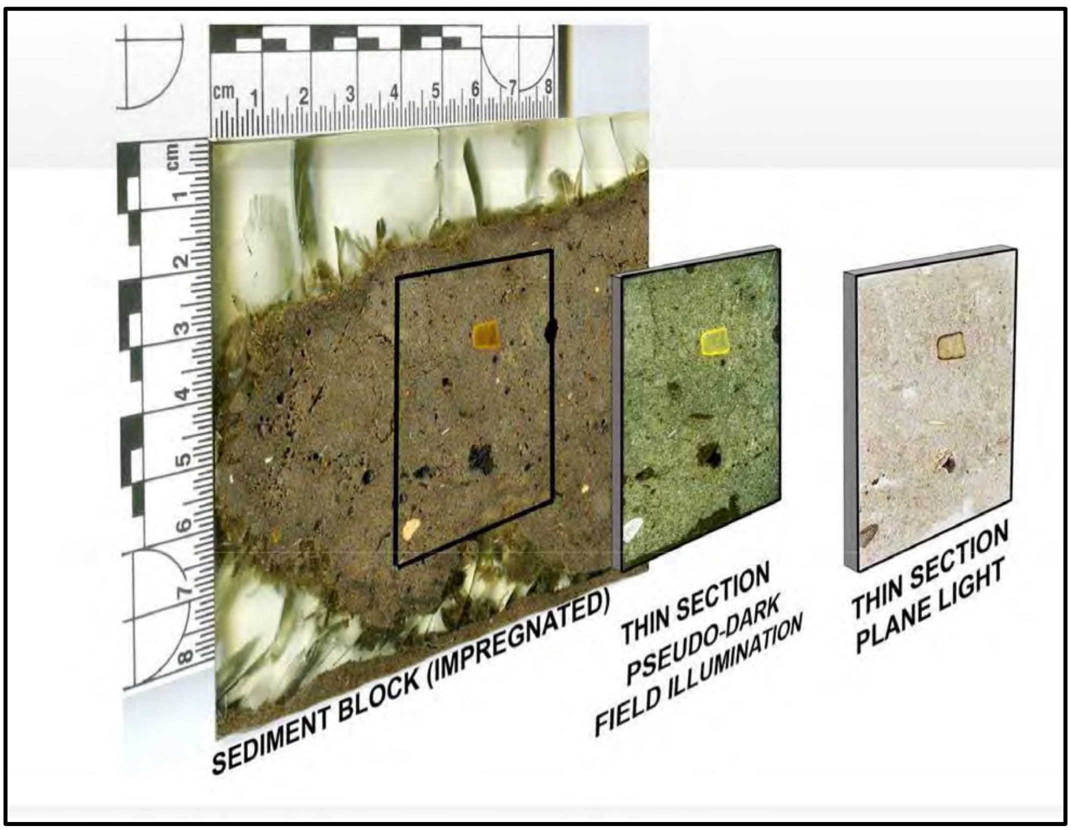

Figure 6.21. Schematic comparison of different macroscopic views of a typical thin section from 41SR242.

Table 6.3. CT Scan parameters

Sample	Facility	Scanner	Power Source	Detector	Scan Parameters	Voxel Size	Total Slices	Format
Upper (BHT 8, 15 to 23 cmbs)	UTCT, Matthew Colbert, April 12, 2017	NSI	Fein Focus High Power Source, 190 kV, 0.07mA	Perkin Elmer detector, aluminum filter	0.25 pF gain, 1 fps, 2×2 binning, no flip, source to object 553.0 mm, source to detector 1316.806 mm, continuous CT scan, 2 frames averaged, 0 skip frames, 1200 projections, 5 gain calibrations, 15 mm calibration phantom, data range [-1.0, 25.0] (grayscale adjusted from NSI defaults), beam-hardening correction = 0.3.	209.6 μm	796	16-bit TIFF, 8-bit JPG
Lower (BHT 8, 45 to 53 cmbs)	UTCT, Matthew Colbert, April 12, 2017	NSI	Fein Focus High Power Source, 190 kV, 0.07mA	Perkin Elmer detector, aluminum filter	0.25 pF gain, 1 fps, 2×2 binning, no flip, source to object 553.0 mm, source to detector 1316.806 mm, continuous CT scan, 2 frames averaged, 0 skip frames, 1200 projections, 5 gain calibrations, 15 mm calibration phantom, data range [-1.0, 25.0] (grayscale adjusted from NSI defaults), beam-hardening correction = 0.3.	209.6 μm	932	16-bit TIFF, 8-bit JPG
BALK 6 (south balk of TU 6, 35-50 cmbs)	UTCT, Matthew Colbert, June 28, 2017	NSI	GE Small Spot source, 250 kV, 0.7 mA	Perkin Elmer detector, brass filter	0.5 pF gain, 1 fps, 2×2 binning, no flip, source to object 910.928 mm, source to detector 1486.33 mm, continuous CT scan, 2 frames averaged, 0 skip frames, 1200 projections, 4 gain calibrations, 15 mm calibration phantom, data range [-0.2, 4.7] (grayscale adjusted from NSI defaults), beam-hardening correction = 0.25.	266.5 μm	846	16-bit TIFF, 8-bit JPG
TU4 (~50 cmbs, block containing skeletal material)	UTCT, Matthew Colbert, June 28, 2017	NSI	GE Small Spot source, 250 kV, 0.7 mA	Perkin Elmer detector, brass filter	0.5 pF gain, 1 fps, 2×2 binning, no flip, source to object 660.0 mm, source to detector 1486.33 mm, continuous CT scan, 2 frames averaged, 0 skip frames, 1200 projections, 4 gain calibrations, 15 mm calibration phantom, data range [-0.1, 4.0] (grayscale adjusted from NSI defaults), beam-hardening correction = 0.1.	168.4 μm	851	16-bit TIFF, 8-bit JPG

Finally, on June 28, 2017, Dr. Colbert scanned two additional sediment blocks collected by Mr. Ringstaff during the third field session in April. These blocks were collected by the field crew during the April 2017 field session. Collection methodology was similar to the initial two blocks, but these samples were designed to highlight specific archeological features (one block was collected to capture the primary artifact-bearing stratum between 50 and 60 cmbs, while the other contained a fragment of faunal bone [mandible] embedded in matrix). Neither of these samples was submitted for thin section analysis.

Computed Tomography (CT) Analysis

The four CT scans provide a remarkable picture of the character of the site deposits. The history and physics behind CT analysis and its application to geological materials have been summarized in detail many times before (e.g., Ketchum and Carlson 2001; Carlson et al. 2003; Taina et al. 2008), and will only be briefly addressed here. CT was developed for medical applications in the 1970s, and soon caught the interest of soil scientists (e.g., Petrovic et al. 1982; Hainsworth and Aylmore 1983). CT uses the power of computer image processing to distill a series of successive x-ray images taken of the same target from different vantage points into a virtual 3D model of the internal structures. This can be accomplished either by rotating the equipment around the target (as is typical in medical applications) or by turning the target itself on a turntable (which is typical of industrial applications and is how the current study was performed). X-ray imagery results when focused x-ray radiation is directed through the target to a receiver (which was originally film, but in CT and all other modern x-ray applications is a digital sensor). As the x-rays pass through the target to the sensor, they are attenuated by scatter and absorption in the target. The degree of attenuation depends on a variety of factors, including the density of the target material, its elemental composition and moisture content, and the overall thickness of material that the beam must pass through. This latter property leads to a phenomenon called beam hardening, which is a difficult problem to address; see http://www.ctlab.geo.utexas.edu/about-ct/artifacts-and-partial-volume-effects/ for a good discussion of this phenomenon and other complications.

With an old-fashioned film-based x-ray, the result is a film negative. The more attenuated the x-ray beam is, the less exposure that portion of the film receives, and the lighter it appears on the resulting x-ray. Thus, relatively dense structures are bright, while low-density structures are dark. Digital sensors generally follow this convention, producing images that are initially shades of gray, with denser (and therefore more attenuated) objects represented by lighter tones. In processing a CT scan, the computer uses the values from all the images to construct a three-dimensional matrix of attenuation values for each location in the object.

Much as a gray-scale photograph is represented digitally by two-dimensional pixels with different gray values, a CT dataset is composed of volumetric pixels or voxels. These are typically stored in an image stack, which is simply a series of gray-scale images representing successive slices through the three-dimensional space. Because they are not designed to image living tissue, the CT sensors used at UTCT are more energetic and capable of far better penetration and much higher resolution than medical scanners. The NSI scanner used for this study can image specimens at a resolution as fine as 10 ųm, but because the pixel resolution of the sensor is fixed, the resolution of the scan is limited by the size of the object (in other words, smaller objects can be scanned at higher resolution). Due to the relatively large size of the current samples, scanning was performed at a spatial resolutions between approximately 170 and 270 ųm, or 35 to 55 voxels per linear centimeter (equivalent to 42,875 to 166,375 voxels per cubic centimeter).

CT imagery can be further processed to highlight or isolate (segment) many aspects of the data, provided that the materials being imaged exhibit sufficient contrast in their x-ray response. Depending on the software involved, the voxel volume can either be virtually re-sliced to yield successive stacked images along any axis; processed to accentuate or isolate value differences; and used to calculate and display feature sizes, volumes, and spatial relationships. Isolation of individual features captured in the scan is a process termed segmentation. If the contrast between features and background is strong (e.g., between the skeleton and surrounding soft tissue in a medical CT scan), it is relatively easy to segment materials of interest using response thresholds. In contrast, segmentation of more subtle, low-contrast features requires user intervention to highlight the feature slice by slice and is a relatively labor-intensive process.

Most of the analysis of CT imagery collected during this study focused on the first two samples, which were taken from the same witness profile (BHT 8) sampled for textural and chemical analysis. Sample 1 was taken from the upper part of the profile of BHT 8, from 15–23 cmbs, while Sample 2 was from directly beneath it at 45–53 cmbs. Typical features visible in slices of these two samples are illustrated in Figures 6.22 and 6.23. The lower image in each figure represents a contrast-optimized gray-scale version of an individual image slice, while the upper images represent the same data slice with a purple-to-orange gradient LUT (lookup table) applied to it. Both images clearly show a history of long-term burrowing by insect-scale fauna, and no evidence of either larger (rodent-scale) burrowing (i.e., burrows with diameters of 5 cm or more) or preserved remnants of primary (depositional) bedding. There are many open or recently infilled pores ranging from less than a millimeter to more than a centimeter in size in both samples. These may represent insect burrows or root passages; however, very little root matter is recognizable in the imagery. Pore fills are generally less dense than the matrix, but there are many gradations in the density of these fills that probably reflect the age of the features, and there are so many overlapping burrow fills that intact expanses of matrix are difficult to identify. There are also several different types of burrows apparent, including simple burrows with no apparent wall modifications, burrows surrounded by matrix with a quasi-uniform increase in apparent density (which I term compression packing), and occasional burrows with organic lining. Similar features are apparent in the scan of the TU-6 balk, which is stratigraphically equivalent to the lower sample in TU 8 (Figure 6.24). The burrows with packing may represent either insect activity or root channels (or both); insect activity can result in packing/smoothing of tunnel walls (Genise 2017), and expansive growth of plant roots will necessarily displace and compress surrounding matrix.

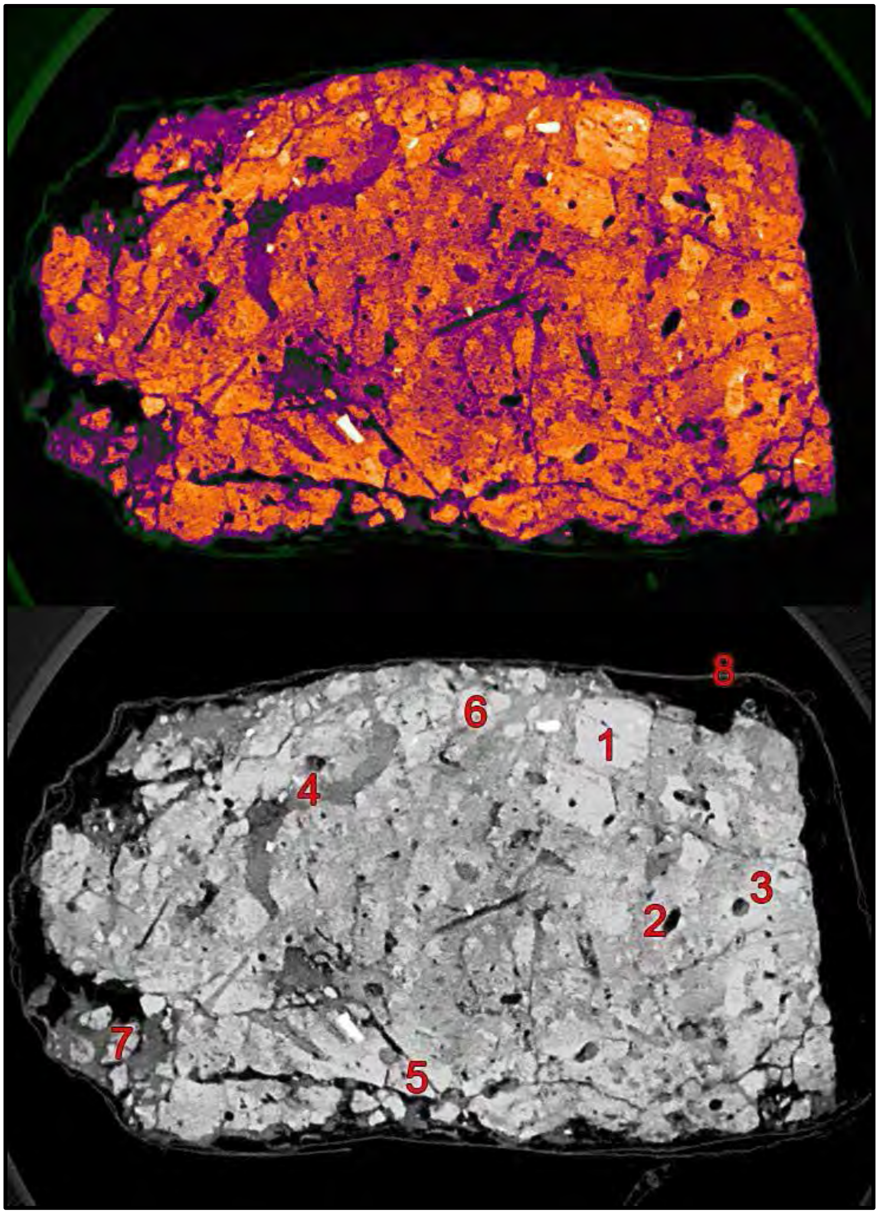

Figure 6.22. Representative cross section slice of upper (15-23 cm) block from BHT 8 in normal view and with orange-purple LUT gradient applied.

Figure shows examples of typical features (Images prepared in ImageJ):

1) angular fragments of dense sediment, presumably broken by root plowing, embedded in lower density matrix;
2) open channel in 2-3 mm range; minimal packing or wall modification apparent;
3) partially open channel in 2-3 mm range, significant wall compression extending several mm into matrix;
4) elongate channel in 3-5 mm range, mostly backfilled with low density sediment;
5) fractured dense sediment with no infilling matrix, probably resulting from removal of sediment block;
6) multiple small fractured clasts of relatively dense matrix embedded in lower density matrix, presumably attributable to root plowing;
7) fractured dense sediment with very low density infilling matrix, probably resulting from removal of sediment block; and
8) aluminum foil wrap.

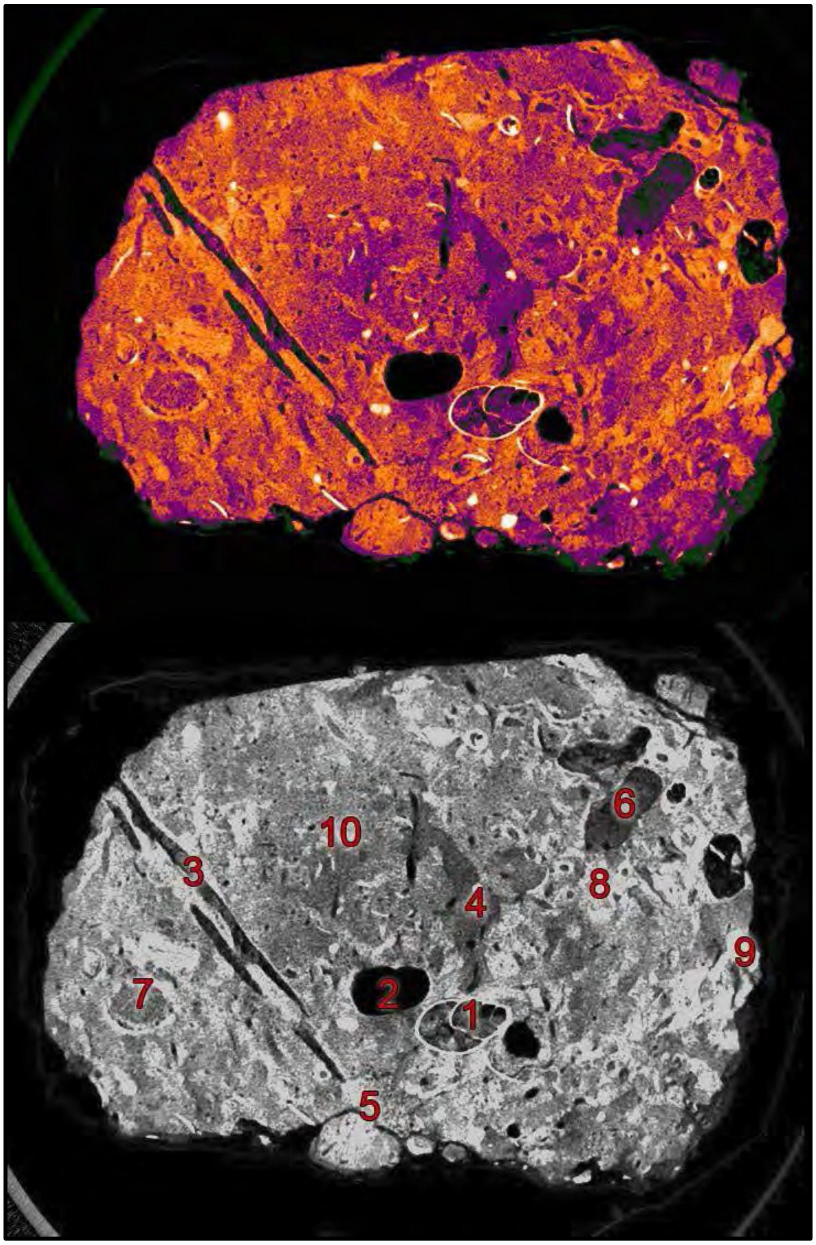

Figure 6.23. Representative cross section slice of lower (45-53 cm) block from BHT 8 in normal view and with orange-purple LUT gradient applied.

Figure shows examples of typical features (Images prepared in ImageJ):

1) partially infilled *Rabdotus* sp. Snail shell;
2) open pore in 10-15 mm size range, showing minimal packing;
3) two parallel burrows, probably produced by termites, showing 1–2 mm of wall packing;
4) network of large burrow galleries infilled with low density sediment;
5) fracture presumably attributable to sample recovery;
6) network of large burrow/galleries with very low density matrix infill;
7) old burrow/gallery with thin packing and organic lining, infilled with relatively dense matrix;
8) network of small (0.5-2 mm) burrows with 1–2 mm of compression packing [beneath and to left of number];
9) marginal fractures probably attributable to sample collection; and
10) area showing relatively low-density matrix with many fine pores and variable degrees of wall packing.

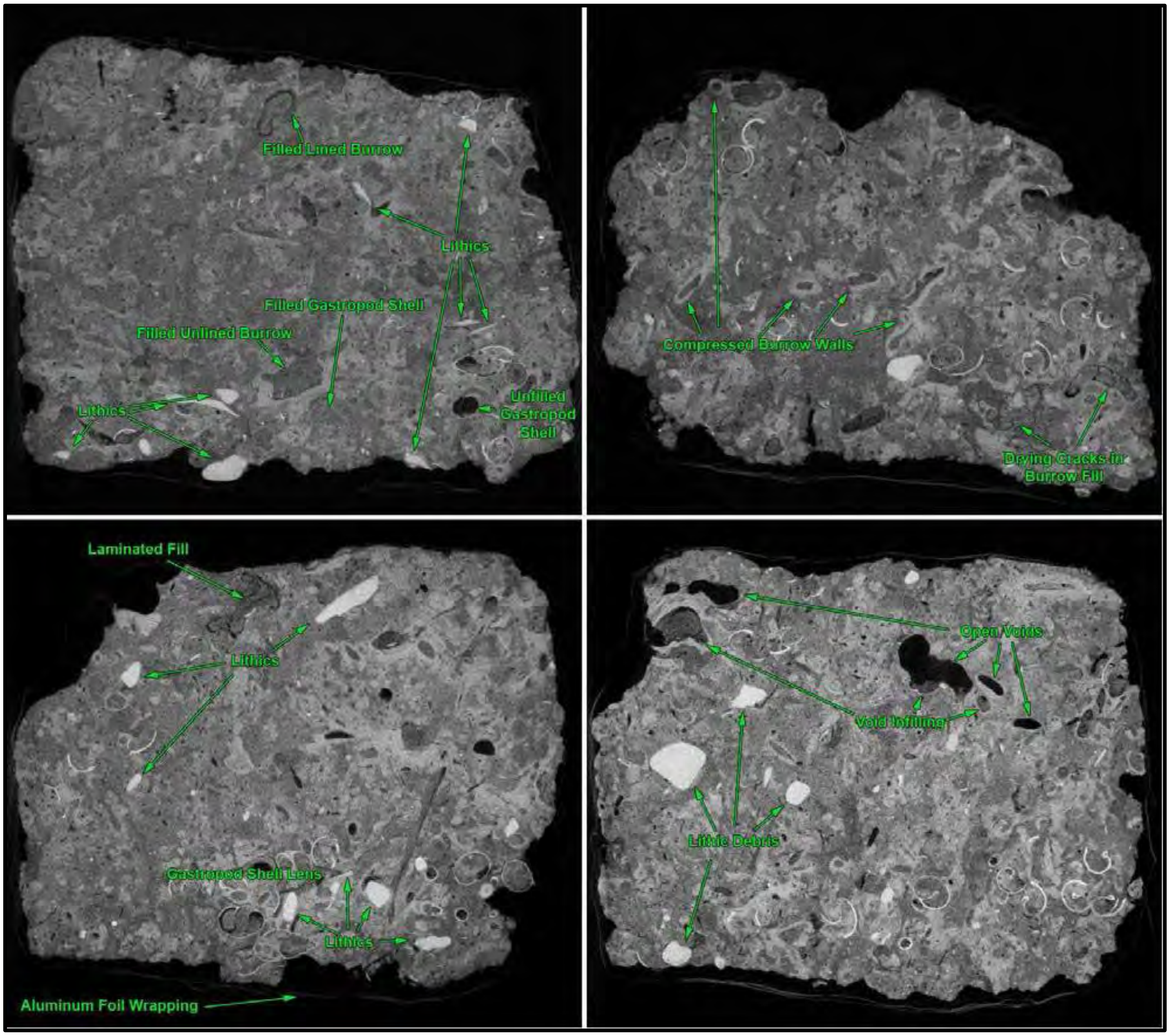

Figure 6.24. Annotated x-ray sections through the TU-6 block, prepared in ImageJ and annotated in Photoshop.

Visually, the principal distinction between the upper and lower samples is that the upper sample exhibits a number of linear/angular fractures and encased angular clasts, while the lower sample exhibit larger (>0.5 mm) pores and seems to lack the angular clasts entirely. These angular clasts are interpreted as the result of root plowing damage in the upper profile. The same may be true of the absence of large pores, but it is more likely that this reflects behavioral differences, with the relatively large pores representing galleries (rooms) and brooding chambers that are concentrated in the deeper parts of the profile. 3D modelling of the voids and low-density fills in the "upper" sample (Figure 6.25) suggests that these large voids are chambers and galleries rather than continuous burrows; although no comparable model was prepared from the "lower" sample for reasons of time (Aviso Lite is only available to us at UTCT), I was able to confirm that impression using sequential slice animations made in ImageJ. Figure 6.26 illustrates the distribution of the densest material in the TU 6 balk sample, and illustrates how specific features (in this case, fragments of lithic debitage) can be individually segmented out and highlighted. Note that this sample, which was collected to provide a sample of the densest cultural zone, shows only dispersed cultural material rather than a well-defined paleosurface.

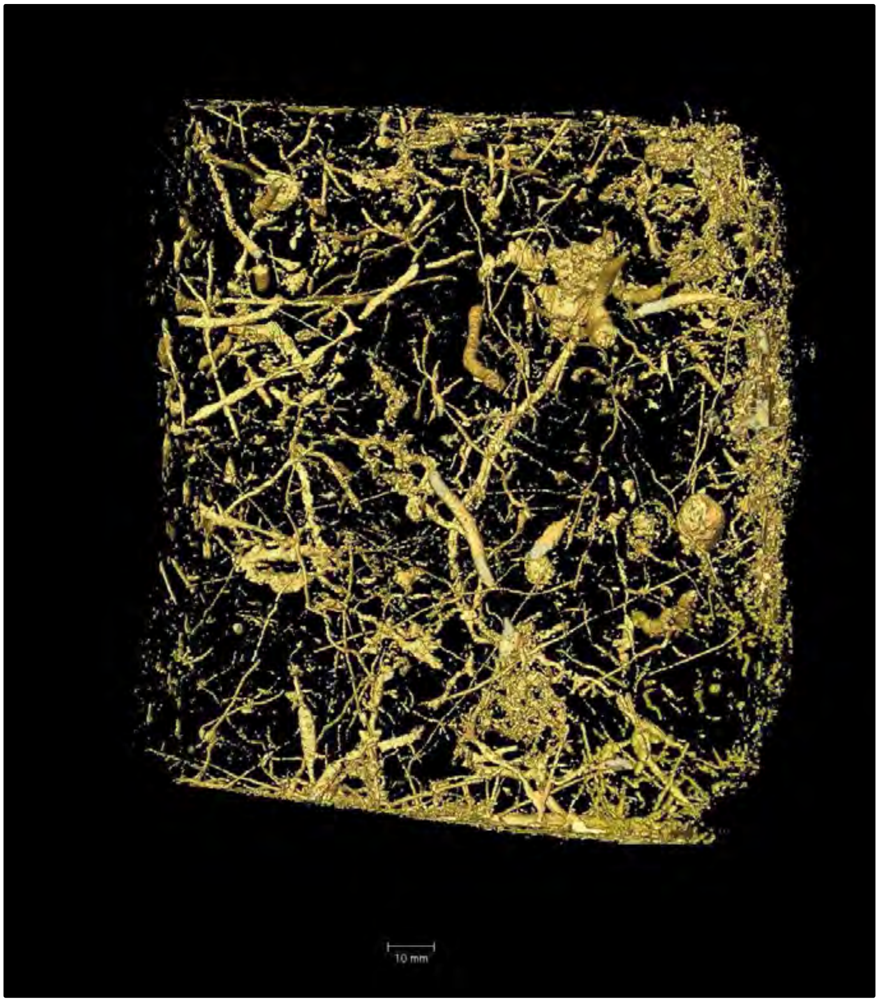

Figure 6.25. Aviso Lite rendering of very low-density segment (voids and very low density fills), showing the frequency and scale of internal voids in the "upper" sample. The image shows a 1-cm vertical slice through the block, which was necessary as the same view of the entire 15-cm-thick block is too densely packed to see through. Note that most voids are relatively continuous.

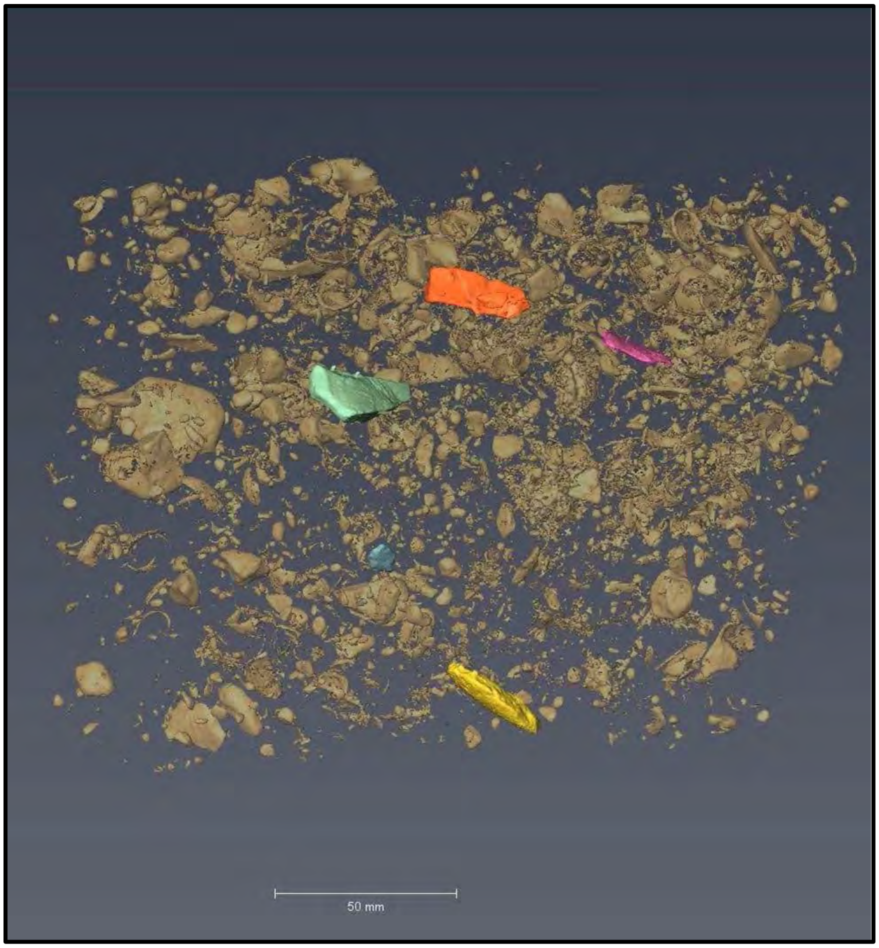

Figure 6.26. Aviso Lite rendering of the densest material in the TU6 block, which consists of pebbles and granules, abundant whole and crushed snail shells, lithic debitage, and probable fragments of burned sandstone. A few of the pieces of lithic debitage have been manually segmented to highlight them, but this process is incomplete.

To quantify the character of the soil, Aviso Lite was used to segment one of the block images into four segments—an “exterior” segment encompassing the airspace and wrapping (foil and tape), a very low density segment representing primarily interior void space, and “low density” and “high density” segments. I first defined the exterior using manual segmentation, and then segmented the interior space by shifting the 16-bit gray-scale thresholds and observing the results until the division matched my intuitive sense of the most natural division. The process was then repeated with the other sample, except that segmentation of the interior space was performed by using the same numerical boundaries used in the first sample. For this reason, the threshold between the interior boundaries, and particularly between the “low density” and “high density” segments, is completely arbitrary and does not represent any directly observable break point, but because the same thresholds were used, it does allow for direct comparison of the volume occupied by each of these segments in the two samples (Table 6.4). This analysis demonstrated that the upper sample had less than half the void space present in the lower sample, and a much higher ratio of high-density to low-density sediment. Although some of this difference may represent the nature of burrowing behavior at different depths (that is, the characteristic depths at which access tunnels transition into warrens of chambers used for living, storing food, raising young, etc.), some of the difference probably reflects compression and loss of pore space during the root plow process.

However, it is worth noting that the nature of root plowing will not necessarily cause such disruption (see above), and most of the void spaces scanned from the "upper" sample do not appear highly disrupted (see Figure 6.25). At the same time, the base of the root plow is not particularly evident, suggesting that much of the visible turbation (and open passages) may date to the last few decades.

To further explore the issue, I selected four representative cross sections from each sample for analysis of the pore structure. For comparability, I fit a 300 × 300 pixel window to each of these cross sections so that the entire field (or as much as possible) was occupied by matrix and internal pores. I then adjusted the threshold value in ImageJ until the binary image isolated the open pores as effectively as possible without including too much obvious matrix. This was sometimes very difficult, and a few of the samples include "pores" that are simply areas of very low density fill within a larger infilling feature. When the best approximation of open pore space was isolated, I then filled the pores so that interior fill fragments in large pores were minimized. I then used ImageJ to index the resulting images, count each pore, a number of "pores" appear to actually represent very low-density fill, particularly inside snail shells Image 773 134 261.308 1.95 6.609 the one large pore is actually a section of the block exterior and calculate its area. Figures 6.27 and 6.28 show the character of pore analysis, and Table 6.5 shows statistical summaries of the data. The discrimination provided by this method is far from perfect, but the results are clearly in line with the Aviso-based analysis described previously. Pores in the upper sample are no less numerous than in the lower sample, but they are far smaller in size, and the overall area occupied by pores is markedly reduced.

It is unclear to which degree this relates to differences in the insect taxa represented versus to the behavior of the same suite of insects at different depths in the profile. However, thin section analysis by Frederick (Appendix B) clearly indicates the presence of burrows with a variety of different morphologies, not only in form, but in the character and thickness of wall treatments and infillings. This alone implies that a number of different taxa are involved. Like the CT scans, it also shows evidence of many generations of overprinted burrows and of substantial disruption of the upper sample, presumably by plowing.

Unfortunately, there is no real basis for judging the time depth represented by these features. It is tempting to view them as the result of insect activity over the last three or four millennia, but the likelihood is actually that all visible burrow remnants represent a much shorter time depth. One indication of this is the absence of a recognizable cut associated with root plowing of the site, which Mr. Alvarez assured us occurred 20 to 30 years ago. This suggests that burrowing activity is intense enough to blur this contact in a very short span of time and raises significant questions about how long burrow features can persist before they are overprinted and destroyed. Of course, this also implies that evidence of other types of formation processes such as sheetwash deposition and rodent burrowing might have also be destroyed by insect overprinting. While there is clear evidence of water-lain deposits in the form of gravel lenses on some parts of the site, I have previously argued that this mechanism is unlikely to have buried Feature 1 without disrupting it. Unfortunately, given the unknown rate of turbation activity, it is not possible to use the absence of depositional strata to either support or contradict that argument.

In summary, I believe that insect and annelid surface casting is the most likely explanation for burial and preservation of Feature 1 at 41SR242. It may be responsible for the preservation of some other material clusters, but the only CT scan that addressed a comparable stratigraphic zone revealed deposits that contain dispersed artifacts, not an assemblage resting on a paleosurface, as Feature 1 appeared to be.
I suspect that the density of the flake and snail shell cluster in Feature 1 contributed to its preservation by inhibiting insect passage. While thin section and CT analysis demonstrate that the deposits are consistent with such an explanation, they do not demonstrate it. Rather, the cumulative evidence suggests that several processes are in play. In particular, the fact that there are prehistoric artifacts littering the surface demonstrates that insect casting cannot be the only process operating, because all artifacts would be buried if that were the case.

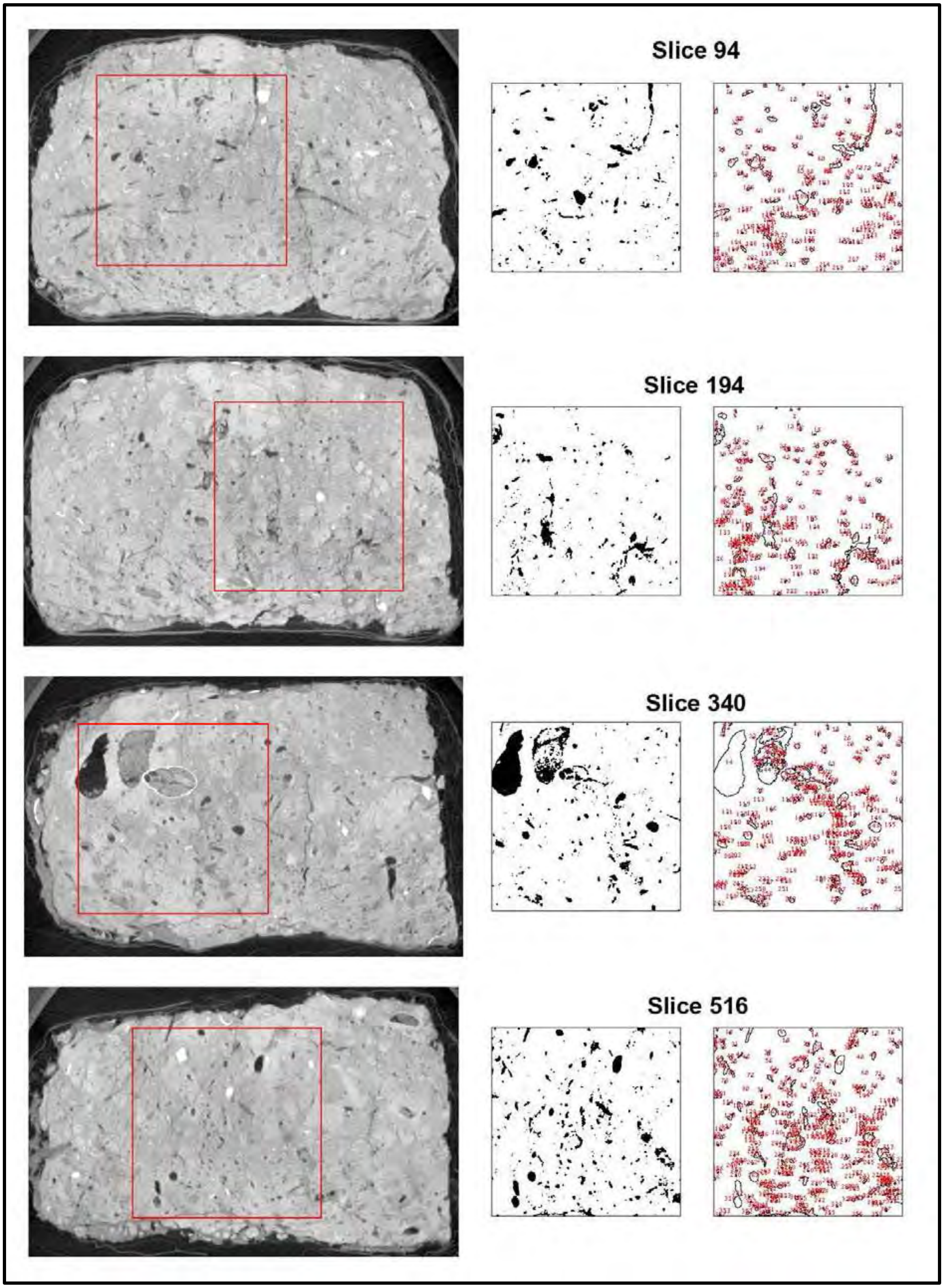

Figure 6.27. Pore analysis of upper block slices.

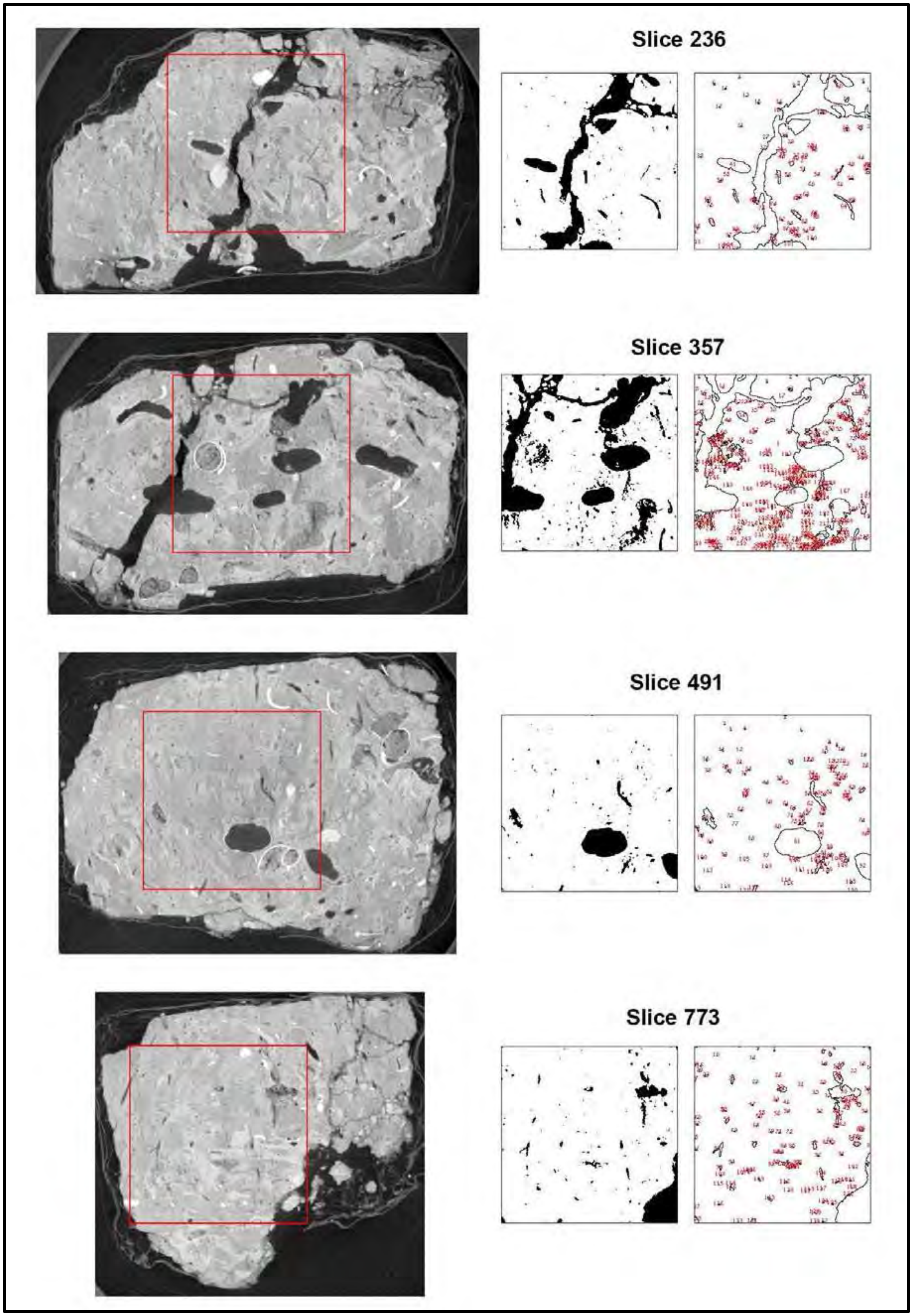

Figure 6.28. Pore analysis of lower block slices.

Table 6.4. Comparison of the Relative Frequency of Void Space, Low-density Sediment, and High-density Fill (including sediment, rock, and shell) in the "Upper" and "Lower" Block CT Scans

Segment	Voxel Count	Volume (cubic mm)	Relative Percentage
Upper (15–23 cmbs) Block CT Scan			
Exterior Voxels	116268265	1070619.98	(EXCLUDED)
Low Density Voxels	52401968	482527.145	29.20%
Internal Voids and Very Low Density Voxels	3668530	33780.512	2.00%
High Density Voxels	123658613	1138671.69	68.80%
Lower (45–53 cmbs) Block CT Scan			
Exterior Voxels	212269731	1954617.89	(EXCLUDED)
Low Density Voxels	63393104	583735.113	35.00%
Internal Voids and Very Low Density Voxels	8086173	74458.9366	4.50%
High Density Voxels	109778672	1010861.77	60.60%

Table 6.5. Results of Pore Analysis

Image (Slice) Number	Pore Count	Total Area (mm^2)	Average Area (mm^2)	Percentage of Total Area	Comments
Image 94	224	177.345	0.792	4.511	–
Image 194	227	179.99	0.793	4.552	–
Image 340	266	409.052	1.538	10.346	Many areas registering as small pores are actually gaps in the low-density fill of a few large pores
Image 516	358	282.396	0.789	7.142	–
Lower Block (45–53 cmbs)					
Image 236	106	553.282	5.22	13.993	One large pore is actually a section of the Block exterior
Image 357	284	999.764	3.52	25.286	A number of "pores" appear to actually represent very low density fill, particularly inside snail shells
Image 491	121	238.42	1.97	6.03	A number of "pores" appear to actually represent very low density fill, particularly inside snail shells
Image 773	134	261.308	1.95	6.609	The one large pore is actually a section of the block exterior

CONCLUSIONS

The following geoarcheological conclusions are possible regarding the Cornelio Alvarez Sr. site (41SR242):

- The site consists of lithic tools and debris, burned sandstone, limited bone and shell, and some historic artifacts. These artifacts are strewn across the surface and buried in the profile of a location on the convex footslope of a low-gradient upland adjacent to a low-order tributary of the Rio Grande River.
- Buried cultural material is present throughout the profile, but dense clusters that appear to represent cultural activity loci are present at depths of approximately 40–65 cm. Preliminary minimum analytic nodule (MAN) analysis of the lithic debris in Feature 1 suggests that the feature includes multiple biface thinning flakes from about a dozen analytic nodules. Given the diversity of the Rio Grande gravels, this supports the notion that the Feature 1 assemblage reflects a discrete behavioral event. However, the same cannot be said of the site as a whole. Bayesian analysis of radiocarbon ages from the site (see Figure 6.19) suggests that it spans at least 1,000 years, and possibly much longer.
- The site matrix is dominated by loams, but also includes sandy loams, silt loams, clay loams, and loamy gravel. The soil profile exhibits a pronounced and distinctive biogenic structure that gives a cut, brushed face a fine "knobby" appearance. This structure is present throughout the soil column, but most pronounced in a 30–50-cm-thick zone immediately above the transition to bedrock (BC and Cr horizon).
- Micromorphological and CT analyses document that this structure represents the cumulative result of intense turbation by insect-scale organisms (e.g., arthropods and earthworms). Because the diameter of intact burrows vary from less than a millimeter to more than a centimeter in maximum dimension, it is clear that several different faunal taxa are represented, and it is believed to represent the activity of a variety of insects and annelids such as termites, ants, ground wasps, earthworms, and various grubs (e.g., June bugs).
- There is also evidence of shallow, gravelly channels that represent ephemeral drainages flowing off higher portions of the landscape. However, that evidence consists of interbedded lenticular gravels representing shallow channels; there is no remnant bedding preserved in the fine-grained sediment. Given that these channel deposits are located only a few hundred meters downslope of the drainage divide, they are believed to represent very rare mobilization of upland gravels during very intense rain events generated by landfall of tropical storms.
- There is meager evidence of burrowing by rodents or other larger taxa capable of displacing and exhuming artifacts large enough to be caught in a ¼-inch screen mesh, but a few possible rodent krotovina were noted. It is possible that additional rodent-scale krotovina have been destroyed by subsequent insect/annelid burrowing.
- The absence of a clear-cut line at the depth of root plowing done only a few decades ago (per the landowner) suggests that reworking of the fine matrix is quite rapid. The poor understanding of the rates involved in this process limit interpretation, but because only a limited amount of sediment affected by a given burrow is actually exhumed, it is likely that the rate of subsurface mixing far exceeds that of surface casting.
- Surface casting by insects and annelids is proposed as the most likely mechanism of burial of Feature 1. Deposition from sheet flow may have also played a role, but is unlikely to have buried the feature at the depth and condition in which it was found. Although some limited silt may have been introduced and removed by wind, eolian deposition does not appear to have been an appreciable factor in a volumetric sense. Insect-exhumed sediment was certainly redistributed on

the surface by rainsplash, sheetflow, and probably wind. Micromorphological and CT data are consistent with such an explanation, but because the rates of insect disturbance and surface casting are so poorly understood, it does not demonstrate causality.

- The presence of artifacts of different ages at the surface (Figure 6.29) and lenses of gravel in the subsurface demonstrate that processes besides insect casting are also active, and it is likely that insect turbation is merely masking evidence of the importance of these other processes to site formation at 41SR242.
- There is no evidence of a buried paleosurface per se in this upland setting. Although Feature 1 appears largely intact based on examination of the debitage (see Chapter 7), most material appears to be distributed through the profile, particularly the B horizon of the soil, and radiocarbon data suggests that the material accumulated over a timespan of at least a thousand years. Accordingly, overall archeological integrity is considered relatively poor.
- Finally, regarding the methodology, we believe that the combination of traditional textural and chemical analysis, thin section analysis, and CT analysis provides for the potential to gain unprecedented insights into many pedological questions in a wide range of environments.

Figure 6.29. Detail of prehistoric and historic materials near BHT 2 (note that most materials are not in the position where they were found). Although the photograph was taken to illustrate the artifacts, it is also instructive because it documents the presence of remnant termite tubes (1) open burrows (2) and possible dung beetle balls (3).

CHAPTER 7. FEATURES, ARTIFACTS, AND ECOFACTS

The investigations at 41SR242 identified a dense cluster of cultural materials in surficial and buried contexts. The assemblage is the remains of intermittent prehistoric occupations on a gradually sloping upland margin, an ecotonal juncture between valley and upland settings. This chapter presents basic descriptive data of the features, artifacts, and ecofacts that were investigated or recovered during TxDOT's significance testing excavations on 41SR242. The materials are arranged by basic descriptive categories, and a few low-level interpretations are provided in this chapter, mainly regarding function and formation processes. Subsequently, Chapter 8 ties the findings into broader patterns.

FEATURES

A total of four prehistoric features were exposed through trench scraping and recovered or sampled through the hand excavation of TUs (Table 7.1). All four features were prehistoric and included a dense debitage concentration, two small clusters/concentrations of thermally altered rock, and an area of densely concentrated *Rabdotus* with burned rock and debitage.

Table 7.1. Site 41SR242 Features

Feature No.	Type	Provenience	Corrected Age (B.P.)	Dated Material	Associated Diagnostic Artifacts (Lot-Specimen No.)
1	Dense concentration of lithic debitage and land snails (*Rabdotus*)	BHT 1, TU 1, and TU 3	6200 (Beta 456114); 5010 (Beta 456115); 4640 (Beta 456116); 5130 (Beta 456117); 2250 (Beta 468116); 2450 (Beta 468120); 3260 (Beta 468117); 2420 (Beta 468115)	*Rabdotus* spp. snail shell; *Prosopis* sp. (carbonized); *Condalia* sp. (carbonized)	Unidentified Dart Point Base (175-065)
2	Small cluster of burned rock	TU 2	None		Prehistoric Ceramic Plain Body Sherd (170-006)
3	Scatter of burned rock likely representing a displaced hearth	TU 4 and TU 5	3020 (Beta 468121); 2160 (Beta 468118); 3260 (Beta 468119)	*Acacia* sp. (carbonized); *Prosopis* sp. (carbonized)	None
4	Dense concentration of lithic debitage and land snails (*Rabdotus*), and burned rock	BHT 15, TU 6, and TU 7	None	None	Tortugas Dart Point Preform (196-001); Unidentified Dart Point Base (199-159); Fresno Arrow Point (200-001)

Feature 1

Feature 1 was discovered during the excavation of BHT 1. It was encountered during trowel scraping of the trench walls and floor of BHT 1. The feature consisted of a dense concentration of lithic debitage and snails (*Rabdotus*) at a depth of approximately 50–60 cmbs in a relatively small area measuring approximately 50 × 50 cm. TU 1 was later expanded off the trench to recover any remaining portion of the debitage cluster. Based on the quantity of debitage recovered, adjacent TU 3 was opened. The Feature 1 cluster may also extend into TUs 4 and 5. No diagnostic artifacts were recovered in association with the feature.

During field investigations, the excavators observed flakes lying predominantly flat and often resting directly on top of each other in a distinct pile. The dense pocket of flakes occurred with intact snail shells that appeared likely to retain considerable integrity in a buried context. As discussed in Chapter 6, burial processes of the feature likely included insect turbation with lesser inputs by other processes such as deposition from sheet flow. Micromorphological and CT analyses document a soil structure that is the result of cumulative activity of intense turbation by insect-scale organisms (e.g., arthropods and earthworms).

A total of 1,069 pieces of debitage were recovered from TU 1 and 519 pieces of debitage were recovered from TU 3. Total debitage counts in TUs 4 and 5 are 306 and 403, respectively. The analysis focused on whether all this closely spaced debitage is the result of a single knapping event, secondary dump, or an overprinted palimpsest of multiple overlapping reduction events, as well as the geoarcheological assessment (e.g., formation processes).

After the initial trenching at 41SR242, four *Rabdotus* shells were submitted to Beta Analytic for radiocarbon analysis to get a broad idea of the age and integrity of the assemblage despite known issues with incorporation of dead carbon from limestone and soil carbonate (Goodfriend 1992; Goodfriend et al. 1999).Corrected ages on the shell ranged from 6200 ±30 yrs BP to 4640 ±30 yrs BP (Appendix C). During test excavations, three wood charcoal samples were recovered from TUs 1 and 3 (see Appendix C). The samples were identified by Dr. J. Kevin Hanselka as mesquite (n=3) and snakewood (n=1) and submitted to Beta Analytic for radiocarbon dating. The corrected ages ranged from 3260 +/30 yrs BP to 2250 ±30 yrs BP (see Appendix C; see also Chapter 6 discussion of radiocarbon dating).

Based on the analytic nodule analysis, the dense accumulation of debitage in a relatively discrete stratum, and the disposition of the flakes (stacked, lying flat), the feature is inferred to be a relatively intact behavioral event, a lithic reduction area or dump. Radiocarbon dating suggests the sediments in which Feature 1 was found likely accumulated over a millennium or more. Buried cultural material is present throughout the profile, but dense clusters that appear to represent cultural activity loci are present at depths of approximately 40 to 65 cmbs. Minimum analytical nodule analysis (MANA) (discussed below) identified biface thinning flakes from about a dozen analytic nodules. Although the Feature 1 assemblage is inferred to be a discrete behavioral event, isolable activity areas are uncommon on the site. Radiocarbon ages and temporal diagnostic data from the site suggests intermittent occupations over millennia.

Feature 2

Feature 2 consists of a small cluster of burned rock encountered during the excavation of BHT 4. Observed in profile, TU 2 was placed in a position to fully recover the cluster. Found relatively high in the profile at the contact with the Ap horizon, the first level began at approximately 20 cmbs. The feature consisted of a main cluster of approximately 13 large rocks consisting of angular sandstone fragments and stream-rolled cobbles weighing approximately 2.9 kilograms (Figure 7.1).

An additional 31 smaller pieces of burned rock weighing a total of 0.4 kg was recovered along with one biface, a modified flake, one small prehistoric ceramic sherd, and 165 pieces of debitage. Except for the sherd, no other diagnostic artifacts were associated with the feature and no carbon was recovered from the feature during the excavations. A soil sample was collected from the matrix removed from the main cluster, but additional analysis including flotation yielded no carbonized botanical remains for identification and radiocarbon dating.

Figure 7.1. Feature 2 in planview, facing north.

Six fragments of freshwater mussel shell were also recovered but are likely portions of the same specimen that was damaged during excavation. Four historic items consisting of two small ceramic sherds and two small pieces of thin oxidized metal were recovered from TU 2. Given the prior land-use impacts at the site (root plowing), the presence of a few historic artifacts is expected in and near the Ap zone contact.

Feature 3

Feature 3 was encountered during the expansion of the BHT 1 excavation area into a 2 × 2-m unit (Figure 7.2). The feature consists of a scatter of burned rock likely representing a displaced hearth. Feature 3 consisted of a scatter of highly fragmented and mostly small (<5 cm) burned rock across TUs 4 and 5 (see Figure 7.2). The feature yielded 190 burned rocks, mostly small fragments but including some larger pieces including angular sandstone fragments and stream-rolled cobbles weighing approximately 5.2 kg.

TUs 4 and 5 also yielded 709 pieces of debitage (306 and 403, respectively). As mentioned in the Feature 1 discussion, given the proximity of TU 4 to the adjacent debitage cluster, there may be overlap and association.

Within the scatter, four wood charcoal samples were recovered from TU 5. The samples were identified by Dr. J. Kevin Hanselka as mesquite (n=2) and acacia (n=1). The samples were submitted for radiocarbon dating range from 3260 ±30 yrs BP to 2160 ±30 yrs BP (see Chapter 6 for discussion of radiocarbon dates).

Figure 7.2. Feature 3 in planview, facing west

Feature 4

Feature 4 was discovered during the excavation of BHT 15 and consists of a dense concentration of *Rabdotus*, debitage, and burned rock (Figures 7.3, 7.4, and 7.5). TUs 6 and 7 were placed to recover the extent of Feature 4 as exposed in BHT 15. Like Feature 2, it was encountered just below the contact with the Ap horizon, the first level beginning at approximately 20 cmbs. The most curious aspect of the feature is the unusual density of *Rabdotus* snail shells, 2,769 complete shells and an unquantified number of fragmentary shells. Inspection of the shell showed no clear evidence of modification, but consumption of snail may not have left any indicators. Although there is some uncertainty as to whether the shell was naturally occurring or culturally introduced, the intensive clustering in association with cultural material is difficult to explain as a natural phenomenon. Frequent observations of high *Rabdotus* counts in central Texas burned rock middens has often been explained by the natural behavior of snails, namely the attraction to high organic content of midden contexts. But the small feature in this xeric setting does not seem to harbor sufficient organic content to explain such a concentration. A small cluster of 21 whole and fragmented burned rock was recovered in TU 7 weighing a total of 2.6 kg, along with 198 additional pieces weighing 5.7 kilograms.

Chipped stone recovery included one Tortugas point, three cores, four bifaces, a modified flake, and 854 pieces of debitage. Although this was the only feature to yield a diagnostic artifact, no carbon was recovered from the feature during the excavations. Flotation of a soil sample was collected from the matrix removed from the main cluster.

Figure 7.3. Feature 4 after discovery in BHT 15, facing southeast.

Figure 7.4. Feature 4 in planview on TU 6 Level 1 and TU 7 Level 2 floors, facing south.

Figure 7.5. Feature 4 in planview at base of TU 7 Level 2, facing west.

Debitage Analysis of Features 1 and 4 – Biface Production Sequences

Features 1 and 4 are distinct concentrations of debitage along BHT 1 and BHT 15, respectively (see Figure 5.1). Both features are isolable lithic reduction areas, or perhaps secondary discard loci. Feature 1 yielded two Late Archaic dates a millennium apart (3200 and 2200 BP, approximately) and Feature 4 is apparently associated with a Tortugas point, which falls within the temporal range of the Feature 1 radiocarbon dates. Based on characteristics of the debitage, both features are interpreted as comprising multiple segments of bifacial reduction sequences utilizing locally available materials. The knappers were clearly selecting high-grade silicon dioxide-based materials (agate, chert, quartzite, chalcedony, jasper) but to a far lesser extent were also using intrusive igneous (rhyolite or andesite) or metamorphosed sedimentary (siltstone, mudstone).

The features are stratigraphically discrete, but materials have likely been displaced both vertically and horizontally to varying extents. Nevertheless, the geomorphic and in-field archeological assessment of each feature seemed to indicate relatively good integrity. The total debitage recovered from the four levels of TU 1 was 1,195 flakes. The column sample yielded an additional 266 flakes, for a total of 1,461 pieces of debitage.

Analysis of Features 1 and 4 Debitage

Debitage analysis is designed to identify lithic reduction processes that occur at the particular locales, in this case Features 1 and 4, which are surmised to be isolable behavioral loci, whether activity areas where knapping occurred or secondary discard of debitage. Such reduction typically includes tool production, maintenance, and core reduction. To address these issues, the analysis of debitage from Features 1 and 4 used a complementary approach using TxDOT (2013) lithic protocols augmented by individual flake analysis methods devised by Root (2004). While there was substantive overlap in the two methods, the main difference is Root's use of a technological flake typology in addition to elements of the mass analysis and individual flake analysis. As a first step in the study, MANA was conducted of the feature debitage. This approach, first described by Kelly (1985) and later more formally defined by Larson (1990; 1994; Larson and Kornfield 1997), begins by sorting the mixed assemblage into raw material types. These types are "analytical nodules," the least common denominator for statistical populations. The results of the lithic debitage analyses for Features 1 and 4 are presented in Appendices D.1 and D.2)

Lithic Raw Materials and Selectivity

The MANA approach is most effective in assemblages with raw materials that are distinctive and internally homogenous, meaning they do not exhibit great variability within a single nodule. In general, the 41SR242 raw materials are highly variable in this regard. Some nodules of chert range from dark gray to tan to dark olive green. Consequently, the certainty of the raw material sort is inversely proportional to flake size—the larger flakes are relatively easy to confidently sort, but the smaller flakes represent only a small portion of the overall variability within any particular nodules. Accordingly, as a general caveat, there are inherent limitations to certainty in the raw material sort. SWCA tried to minimize the uncertainty by using visual characteristics coupled with long- and short-wave ultraviolet fluorescence.

The analysis identified 22 types of raw material composing Feature 1 and at least nine raw material types composing Feature 4 (Table 7.2). The vast majority of the materials are chert (19 of the 31 identified raw material types. This includes a small quantity of the distinctive regional El Sauz chert that was tentatively identified in both tool assemblage and debitage. Two types each of rhyolite, agate, quartzite, and chalcedony were differentiated, as well as one type of jasper, siltstone/mudstone, and petrified wood. Although 31 different raw material types were identified, the following analysis focuses on the five most common raw material types in Features 1 and 4. Many of the raw material types consist of only a flake or two or comprise mainly small, unanalyzable flakes.

Table 7.2. Lithic Material Types in 41SR242 Feature 1 and Feature 4 Assemblages

Lithic Material	Material Description	Munsell Colors	Nodule No.
CA1	Very pale brown speckled grainy chert	10YR7/3	152.12
CA2	Brownish yellow chert	10YR6/6	199.57
CA3	Red ferruginous mudstone or siltstone	2.5YR4/2	173.8
CA4	Banded very pale brown and grayish brown chert	10YR7/3; 10YR5/2	152.8
CA5	Light gray to pale yellow chert	10YR7/2; 2.5Y8/2	152.1; 152.7
CA6	Yellowish brown chert	10YR5/4	194.7
CA7	Pale brown chert	10YR6/3	199.46
CA8	Heat-treated reddish brown chert	5YR4/4	152.11; 153.13; 152.14
CA9	Heat-treated (?) gray chert	10YR6/1	198.25
CA10	Gray to light brown chert	10YR5/1; 10YR6/2	155.2
CA11	Semi-translucent dark grayish brown chert	10YR4/2	173.12
CA12	Very dark gray to brown chert	10YR3/1; 10YR4/3	156.6
CA13	Light yellowish brown chert	10YR6/4	199.49
CA14	Translucent speckled white and strong brown agate	10YR8/1	202.58
CA15	Coarse-grained yellow chert	10YR7/6	160.2
CA16	Strong brown and dark brown mottled chert	7.5YR5/8; 10YR3/2	167.2
CA17	Very dark brown to black rhyolite	10YR2/2; 10YR2/1	198.6

Lithic Material	Material Description	Munsell Colors	Nodule No.
CA18	Dark red agate	2.5YR3/6	171.1
CA19	Dark brown chert	5YR3/4	174.41
CA20	Brown chert	10YR4/3	199.43
CA21	Gray chert	10YR5/1	195.8
CA22	Heat-treated (?) grayish brown chert	10YR5/2	163.1
CA23	Semi-translucent light gray to reddish yellow chalcedony	10YR7/1; 5YR6/8	152.6
CA24	Dark grayish brown petrified palm wood	10YR3/2	159.34
CA25	Black chert	10YR2/1	152.9
CA26	Black quartzite	10YR2/1	152.2
CA27	Dark reddish brown jasper	2.5YR3/4	152.3
CA28	Grayish brown mottled quartzite	10YR5/2	152.1
CA29	White mottled chalcedony	10YR8/1; 10YR7/4	152.5
CA30	Dark brown rhyolite	7.5YR3/3	152.4
CA31	El Sauz chert (?)	10YR8/1; 10YR2/2	173.7

Flake Size

All debitage was sorted according to the size grades presented in Tables 7.3 and 7.4. There may be some bias in the less than 0.25-inch size grade, since most smaller flakes would have fallen through the most common-used screen size. Discounting the lowest size-grade, there is generally an inverse relationship between size and quantity; with one exception, the counts decline for each successive increase in size grade. Of the 236 analyzed flakes from the five most common raw material types in Feature 1, there is a slight bimodal distribution with 0.25 to 0.5 inch in maximum diameter being most common (see Table 7.3). Feature 4 counts show a more equitable distribution, with the majority of flakes between 0.5 and 1 inch (see Table 7.4). In general, flake size is an indicator of stage of reduction and/or parent material size. However, small flakes typically derive from all types and stages of reduction. They consist of complete and fragmentary debitage. Flake size is further considered in relation to other aspects discussed below.

Table 7.3. Feature 1 Debitage Size Grades of Five Most Common Raw Material Types

Flake Size	Material CA1		Material CA5		Material CA8		Material CA25		Material CA 28		Totals	
	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%
less than 0.25 inch	0	0.00%	6	8.96%	1	2.50%	3	6.38%	1	1.67%	**11**	**4.66%**
0.25 to 0.5 inch	4	18.18%	27	40.30%	10	25.00%	21	44.68%	18	30.00%	**80**	**33.90%**
0.5 to 0.75 inch	9	40.91%	11	16.42%	11	27.50%	13	27.66%	19	31.67%	**63**	**26.69%**
3/4 to 1 inch	2	9.09%	7	10.45%	10	25.00%	9	19.15%	7	11.67%	**35**	**14.83%**
greater than 1 inch	7	31.82%	16	23.88%	8	20.00%	1	2.13%	15	25.00%	**47**	**19.92%**
Totals	**22**		**67**		**40**		**47**		**60**		**236**	

Table 7.4. Feature 4 Debitage Size Grades of Two Most Common Raw Material Types

Flake Size	Material CA7		Material CA20		Totals	
	Count	%	Count	%	Count	%
less than 0.25 inch	5	5.62%	0	0.00%	**5**	**4.10%**
0.25 to 0.5 inch	21	23.60%	4	12.12%	**25**	**20.49%**
0.5 to 0.75 inch	26	29.21%	10	30.30%	**36**	**29.51%**
0.75 to 1 inch	21	23.60%	10	30.30%	**31**	**25.41%**
greater than 1 inch	16	17.98%	9	27.27%	**25**	**20.49%**
Totals	**89**		**33**		**122**	

Cortical States

Cortex is an indicator of several aspects, most notably stage of reduction and proximity to raw material outcrop. Although cortex can be present on fairly late stage reduction pieces, as a general principle, decortication occurs early in the process and decreases through the reductive stages. As an indicator of proximity to raw materials, cortex decreases as distance from sources increases. The premise is that rocks are heavy, and mass reduction occurs near outcrops in order to decrease transport costs (energy expended).

Of the 236 flakes from the three most common material types in Feature 1, cortex is present on 19.07 percent of debitage, a fairly high percentage consistently across all five materials in Feature 1 (Table 7.5). Cortex is present on 33.3 percent of the debitage from Feature 4 materials (Table 7.6). Compared to assemblages of strictly late stage activities such as edge rejuvenation and late stage bifacial reduction in which 0 percent cortex is a common expectation, this high amount of cortex implies use of locally available raw materials being brought to the site without too much prior off-site mass reduction and reduced on site from early through late stages of manufacture.

Table 7.5. Feature 1 Debitage Cortical States of Five Most Common Raw Material Types

% of Cortex on Flake	Material CA1		Material CA5		Material CA8		Material CA25		Material CA 28		Totals	
	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%
0%	18	81.82	60	89.55	22	55.00	35	74.47	56	93.33	**191**	**80.93**
1%–25 %	3	13.64	3	4.48	8	20.00	5	10.64	3	5.00	**22**	**9.32**
25%–50%	0	0.00	2	2.99	4	10.00	4	8.51	0	0.00	**10**	**4.24**
50%–75%	0	0.00	0	0.00	2	5.00	1	2.13	0	0.00	**3**	**1.27**
75%–100%	1	4.55	2	2.99	4	10.00	2	4.26	1	1.67	**10**	**4.24**
Totals	**22**		**67**		**40**		**47**		**60**		**236**	

Table 7.6. Feature 4 Debitage Cortical States of Two Most Common Raw Material Types

% of Cortex on Flake	Material CA7		Material CA20		Totals	
	Count	%	Count	%	Count	%
0%	102	86.44%	22	66.67%	**124**	**82.12%**
1%–25 %	10	8.47%	2	6.06%	**12**	**7.95%**
25%–50%	2	1.69%	3	9.09%	**5**	**3.31%**

% of Cortex on Flake	Material CA7		Material CA20		Totals	
	Count	%	Count	%	Count	%
50%–75%	1	0.85%	2	6.06%	**3**	**1.99%**
75%–100%	3	2.54%	4	12.12%	**7**	**4.64%**
Totals	**118**		**33**		**151**	

Platform Types

Striking platforms, like cortical states, indicate not only stage of reduction but also technological processes (e.g., unifacial, bifacial reduction). Excluding the missing and indeterminate platforms, which constitute the majority of the flakes, multi-faceted platforms predominate in all but one of the five most common raw Feature 1 materials types (Table 7.7). Likewise, multi-faceted flakes are most common in the Feature 4 materials (Table 7.8). This platform type is typically associated with bifacial reduction. Of equal importance is the amount of cortical and single-faceted (flat) platforms, which indicate earlier stages of reduction. The implication is that Features 1 and 4 represents biface production as a primary activity, and the majority of the reduction sequence from early through late stages is represented in the debitage.

Table 7.7. Feature 1 Debitage Platform Types of Five Most Common Raw Material Types

Platform Description	Material CA1		Material CA5		Material CA8		Material CA25		Material CA28		Totals	
	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%
Indeterminate	1	4.55%	1	1.49%	0	0.00%	2	4.26%	2	3.33%	**2**	**0.85%**
Cortical	2	9.09%	7	10.45%	3	7.50%	3	6.38%	1	1.67%	**12**	**5.08%**
Flat	1	4.55%	3	4.48%	2	5.00%	1	2.13%	1	1.67%	**6**	**2.54%**
Faceted	1	4.55%	3	4.48%	2	5.00%	0	0.00%	4	6.67%	**6**	**2.54%**
Multi-faceted	7	31.82%	13	19.40%	3	7.50%	10	21.28%	12	20.00%	**23**	**9.75%**
Abraded	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	**0**	**0.00%**
Missing	10	45.45%	40	59.70%	30	75.00%	31	65.96%	40	66.67%	**80**	**33.90%**
Totals	**22**		**67**		**40**		**47**		**60**		**236**	

Table 7.8. Feature 4 Debitage Platform Types of Two Most Common Raw Material Types

Platform Description	Material CA7		Material CA20		Totals	
	Count	%	Count	%	Count	%
Indeterminate	7	5.88%	2	6.06%	**9**	**5.92%**
Cortical	5	4.20%	3	9.09%	**8**	**5.26%**
Flat	3	2.52%	1	3.03%	**4**	**2.63%**
Faceted	7	5.88%	2	6.06%	**9**	**5.92%**
Multi-faceted	17	21.25%	8	47.06%	**25**	**16.45%**
Abraded	0	0.00%	0	0.00%	**0**	**0.00%**
Missing	80	67.23%	17	51.52%	**97**	**63.82%**
Totals	**119**		**33**		**152**	

Technological Flake Types

Technological flake classification directly addressing type of reduction and, to some extent, stage of reduction. Using Root's (2004) typology (see definitions in Chapter 4), six flake types are identified in the Features 1 and 4 assemblages, each type being a technological indicator of a step in the reduction sequence. Primary decortication and simple flakes predominate the early stages with complex and bifacial thinning flakes indicative of the mid- to later stages, and bifacial retouch in the final stages of shaping and rejuvenation. The complex flake is the most common type, representing a catchall category that contains many of the attributes of all technologies, including bifacial manufacture and prepared core reduction but is missing certain attributes (such as platforms) that allow positive identification in one of the other categories (Root 2004:76). Like simple flakes, these are not highly distinctive of any particular reduction process.

So excluding the non-diagnostic categories (i.e., shatter), bifacial thinning flakes are the most common in material types, followed complex and simple (Tables 7.9 and 7.10). This profile of everything from primary decortication through bifacial thinning reinforce the interpretation that all stages, early through late, are represented in the assemblage.

In addition to the flake types that are present, several flake types were not identified, indicating the lack of certain techniques. Blades, unifacial retouch, radial-break, notching, bipolar, and alternate flakes were not identified. Blade technology has not been recorded in the regional techno-complexes (early Paleoindian, Toyah, and other techno-complexes in which blade production is common are poorly defined in the Rio Grande delta). Unifaces are quite common in the area, but do not appear to be part of the Features 1 and 4 reduction activities. Radial breakage and bipolar reduction are uncommon strategies in the region and the sites. The Late Archaic and Late Prehistoric projectile points of the area are typically unnotched triangular, sub-triangular, or ovate types, and so the "gull-winged" notching flakes would not be expected. Alternate flakes are early reduction stage flakes to remove right-angle edges on blocky, squared-off nodules. Most of the locally available materials are rounded, heavily stream rolled, but these flake types may be incidental in reduction of all types of raw material. None were clearly identified in Features 1 and 4.

Table 7.9. Feature 1 Debitage Technological Flake Classes of Five Most Common Raw Material Types

Flake Class*	Material CA1		Material CA5		Material CA8		Material CA25		Material CA28		Totals	
	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%
Primary Decortication	1	4.55	2	2.99	3	7.50	0	0.00	1	1.67	**6**	**4.65**
Shatter	0	0.00	12	17.91	5	12.50	3	5.88	7	11.67	**17**	**13.18**
Biface Thinning	4	18.18	8	11.94	3	7.50	5	9.80	5	8.33	**15**	**11.63**
Bifacial Pressure	0	0.00	1	1.49	0	0.00	0	0.00	0	0.00	**1**	**0.78**
Simple	3	13.64	5	7.46	10	25.00	9	17.65	9	15.00	**18**	**13.95**
Complex	14	63.64	39	58.21	19	47.50	34	66.67	38	63.33	**72**	**55.81**
Totals	**22**		**67**		**40**		**51**		**60**		**129**	

*Technological flake classes defined by Root (2004)

Table 7.10. Feature 4 Debitage Technological Flake Classes of Two Most Common Raw Material Types

Flake Class*	Material CA7		Material CA20		Totals	
	Count	%	Count	%	Count	%
Primary Decortication	3	3.70%	4	12.12%	**7**	**6.14%**
Shatter	0	0.00%	0	0.00%	**0**	**0.00%**
Biface Thinning	10	12.35%	7	21.21%	**17**	**14.91%**
Bifacial Pressure	1	1.23%	0	0.00%	**1**	**0.88%**
Simple	26	32.10%	12	36.36%	**38**	**33.33%**
Complex	41	50.62%	10	30.30%	**51**	**44.74%**
Totals	**81**		**33**		**114**	

*Technological flake classes defined by Root (2004)

Summary and Interpretations of Features 1 and 4 Debitage

Features 1 and 4 represent isolable lithic reduction features, representing either in situ activities or secondary discard. For both, the testing likely captured a fairly robust representative sample, but not the entire population. The MANA study identified a minimum of 31 raw material types composing the features, although two factors warrant interpretive caution: 1) variability within raw material cobbles may introduce erroneous additional types, and 2) there are probably some introduced types, part of the site-wide background noise, that are not directly associated with the features. Nevertheless, there is reasonable confidence that the major material types represent individual reduction sequences in tool production. Many of the material types are statistically inviable, represented by only one or two flakes. Some of these small samples could represent background noise unassociated with the features. A number of methods, most using chemical or trace element analyses, can further assess the validity of the sort.

The feature debitage primarily represents distinct reduction sequences in which locally available raw materials—mainly select, high-grade cherts—were bifacially reduced from early to late stages. In most biface reduction models (e.g., Callahan 1979), mid-stage reduction often entails flakes that travel well beyond the mid-point of the biface. Consequently, the largest thinning flakes provide an approximate indication of maximum biface width (assuming all stages of reduction are represented, which is the case for both features). Considering the lack of large bifacial reduction flakes (few greater than 1 inch in maximum length), the items produced were small, less than 1 inch in maximum dimension. The flake size data warrants qualification, namely in considering the possibility that larger flakes were broken and are consequently not represented in the data. Such a scenario cannot be ruled out but is predicated on the notion that there were biases in breakage patterns, in which all larger flakes were subject to breakage, whereas only proportions of other size grades were subject to breakage. Notwithstanding the caveats, the maximum observed size of the debitage is typical of most of the regional projectile points, which are relatively narrow compared to many of the broad-bladed types in earlier periods and adjacent areas. The feature debitage is consistent with the expected manufacturing debris from the production of the point found within the feature.

Placing the feature within the larger context, the prevailing hypothesis posits a strategy of retooling on the sites whereby the inhabitants would target the local gravel outcrops during short-term occupations. The pattern is expected to yield discarded, exhausted items and a relatively complete reduction sequence from decortication to final pressure flaking. Initial cobble testing was expected to have occurred offsite at the source, but early-stage decortication is expected to have occurred on site. As noted, sorting the collection by raw material type will be the primary analytical tack to get specific isolable reduction sequences.

ARTIFACTS AND ECOFACTS

The cultural materials recovered during testing investigations include a total of 105 lithic tools, 3,567 pieces of debitage, and various ecofacts, such as faunal remains, snail shell, and macrofloral samples (Table 7.11). Subsequent to the fieldwork, all materials collected during the testing project were washed, sorted, and tabulated; pertinent samples were processed.

By and large, the analytical categories presented in this chapter follow those defined by TxDOT protocols (TxDOT 2013). These consist of standard artifact classes that are well defined and grounded in the literature and in practice. The specific types, such as for projectile points, rely on standard typologies, for example, Turner et al. (2011). No microscopic use-wear analysis was conducted on the artifact assemblage, hence categorization is based on morphology of the specimens.

Table 7.11. Materials Recovered from Site 41SR242

Materials Recovered	Count
Historic artifacts	100
Debitage	3,567
Bone	54
Burned Clay	1
Burned Rock	580
Projectile Points	21
Charcoal Sample	7
Discoid Uniface	1
Distally Beveled Scraper	2
Edge-Modified Utilized Flake	7
Bifaces	61
Mussel Shell	14
Nueces Tool	1
Ochre	1
Olmos Biface	1
Platform Rejuvenation Core Flake	1
Prehistoric Ceramic Plain Body Sherd	1
Rabdotus Shell	3,637
Refined Multidirectional Core	3
Side Scraper	1
Tortugas Dart Point Preform	5
Uniface	1
Grand Total	**8,067**

Projectile Points

The investigations recovered one Fresno, five Tortugas preforms, two Matamoros, one Refugio, nine Tortugas, three Desmuke, one Catan, two untyped stemmed points, and an untyped lanceolate point from various contexts, mostly surficial, across the site (Table 7.12). The known temporal range of these diagnostic artifacts indicates Late Archaic to Late Prehistoric occupations, with the untyped lanceolate perhaps representing an earlier component. Lerma points are poorly dated but generally considered Archaic. Quigg et al. (2000) date Refugio points to about 3400 B.P. based on findings at the Lino site, which showed them to be stratigraphically below Tortugas points. Based on sites such as Loma Sandia and Lino, Tortugas points dates to approximately 3200 to 2000 B.P. but more likely from about 2400 to 2700 B.P. based on direct dates of these points in funerary contexts. The Desmuke points date to the Late Archaic period beginning ca. 2400 to 1200 B.P. (Hester 2004). Matamoros points have a poorly dated temporal range. A date of 1000 B.P. was obtained in association with a Matamoros point at 41SP120 in nearby San Patrice County (Turner et al. 2011:133). However, the temporal range may be more extensive, as some have suggested Matamoros developed from the earlier Tortugas points. The radiocarbon dates from 41SR242 range from approximately 3400 to 2200 B.P., consistent with the timeframe of the most common diagnostic artifacts: Tortugas, Desmuke, and Refugio. Minor earlier and later components are suggested by the untyped lanceolate, Matamoros, and Fresno points.

Table 7.12. Projectile Points and Preforms Recovered from Site 41SR242

Lot No.	Specimen No.	FS No.	Artifact Description	Max. Length (mm)	Max. Width (mm)	Max. Thickness (mm)	Weight (g)
004	002	SC 04.02	Lerma-like Dart Point Base	43.22	29.83	8.52	9.9
005	001	SC 05.01	Tortugas Dart Point	29.67	35.66	8.96	11.2
006	001	SC 06.01	Tortugas Dart Point	60.99	28.75	8.37	11.6
007	001	SD 1	Tortugas Dart Point	38.90	24.37	7.97	8.6
008	001	SD 2	Tortugas Dart Point	39.75	33.12	7.44	10.7
011	001	SD 5	Tortugas Dart Point Preform	36.82	36.42	8.49	13.1
012	001	SD 6	Tortugas Dart Point Preform	68.20	34.16	18.52	37.0
013	001	SD 7	Tortugas Dart Point	40.90	26.26	5.64	7.7
015	001	SD 9	Unidentified Lanceolate Dart Point	41.01	27.94	6.20	6.9
016	001	SD 10	Catan Dart Point	35.77	24.50	5.85	5.3
036	001	SD2 01	Matamoros Dart/Arrow Point	32.61	20.31	5.58	4.0
037	001	SD2 02	Tortugas Dart Point	49.70	25.50	8.73	10.1
038	001	SD2 03	Tortugas Dart Point	24.11	26.03	5.85	4.9
039	001	SD2 04	Matamoros Dart/Arrow Point	35.26	26.06	4.87	4.0
040	001	SD2 05	Refugio Dart Point	70.00	23.57	10.24	19.6
041	001	SD2 06	Tortugas Dart Point	39.62	27.79	6.93	8.8
042	001	SD2 07	Tortugas Dart Point Preform	73.38	30.95	17.51	34.3
043	001	SB2 01	Lerma-like Dart Point Base	33.47	30.83	7.16	7.5
052	001	SB2 10	Lerma-like Dart Point Base	32.53	28.06	6.13	5.7
059	001	SB2 17	Tortugas Dart Point Preform	34.64	34.02	11.23	14.6
175	065	25.001	Unidentified Dart Point Base	17.12	25.40	5.96	2.8
196	001	40.001	Tortugas Dart Point Preform	44.37	35.20	8.75	15.7
199	159	43.002	Unidentified Dart Point Base	28.46	21.78	9.50	5.4
200	001	45.001	Fresno Arrow Point	28.80	23.59	6.45	5.4
210	005	54.001	Tortugas Dart Point	58.27	27.13	9.81	12.9

One tentatively identified Fresno point was recovered from Feature 4 in TU 7, Level 3 (Figure 7.6). The point is a straight-based triangular point missing the distal end with a transverse medial fracture. The point is roughly equivalent in size with Matamoros points, but the high width to thickness ratio and serration on the lateral margin are more consistent with Fresno than Matamoros points, which typically have a more robust bi-convex or beveled cross section. The raw material is a fine-grained, lusterless siltstone or mudstone.

The two Matamoros dart points were recovered from surface collection units (see Figure 7.6). The points are triangular, relatively thick compared to arrow points of roughly the same size, such as Zapata and Fresno points. Both specimens are complete, with one exhibiting bifacial beveling on the lateral margins indicative of resharpening. Both are made of fine-grained tan chert.

The complete, exhausted Catan, is small, heavily reduced by unifacial beveling on the lateral margins (see Figure 7.6). Its base is rounded to sub-trapezoidal and well-thinned. It is made of a grayish, fine-grained chert and a heavily reworked but complete point.

Eight of the Tortugas dart points were recovered from the surface, one was recovered in a subsurface context from BHT 8 (Figure 7.7). Six are made from a similar drab olive green chert, one is of agate, one of a dark black and gray banded chert, and one of yellowish mudstone. Three are proximal fragments truncated by medial-proximal transverse fractures, three are complete, and three are nearly complete, lacking only the distal tips. Only one (Specimen 037-001) shows alternate beveling from resharpening, with the beveling serving as an indicator of the hafting limits. The specimen is relatively narrow for the type and could conceivably be a Matamoros, although its length dimension makes it more consistent with the Tortugas (see Turner et. al 2011:133).

Figure 7.6. Small dart and possible arrow point recovered from site 41SR242. Left to right Lot-Specimen Nos. are: top row 200-001 and 016-001; bottom row 036-001 and 039-001.

Figure 7.7. Tortugas dart points recovered from site 41SR242. Left to right Lot-Specimen Nos. are: top row 006-001, 037-001 and 210-005; middle row 007-001, 013-001 and 041-001; bottom row 005-001, 008-001 and 038-001.

The five Tortugas preforms are all late-stage bifaces sufficiently shaped to distinguish the basic form and technological characteristics of the Tortugas type (Figure 7.8). Four of the preforms were recovered from the site surface and one came from Feature 4 in TU 6. Four are made from high-quality, fine-grained tan to pale brown chert and one is a black grainy chert or siltstone with distinctive tan bands. Three were discarded after medial transverse fracture and two were discarded after failure to thin from cumulative step fractures on one face.

The Refugio point, collected from the site surface, is a long, narrow point that is crudely made of a tannish, low-quality siltstone (Figure 7.9). One surface contains a black substance that could possibly be asphaltum, but this has not been tested. The point has a convex base, a low width to thickness ratio (2.5– 2:1), and relatively steep edge angles on the lateral margins.

Figure 7.8. Tortugas dart point preforms recovered from site 41SR242. Left to right Lot-Specimen Nos. are: top row 012-001 and 042-001; bottom row 011-001, 059-001, and 196-001

Figure 7.9. Refugio dart point recovered from site 41SR242 with possible asphaltum: Lot-Specimen No. 040-001.

Three Lerma-like dart points, all proximal fragments, were recovered from surface collection units (Figure 7.10). All three proximal fragments are very similar in shape, form, and technology, and all three were broken at about the same place with medial transverse fractures. They are sharply contracting bases, coming to a dull point. One is made of El Sauz chert, one of chalcedony, and one of a reddish siltstone. The chalcedony appears to be a late-stage manufacturing failure. Despite the sinuosity of the lateral edges, the heavy lateral grinding is either for hafting or platform preparation. The latter is suspected. Use through the life of the tool type often results in beveling and slight shoulders where the lateral margins are reworked. None of these indicators of use are present, but they could have been broken off with the distal ends. Although these points are found in a large region of South Texas Plains region (Turner et al. 2011:121), typological ambiguities create some uncertainty as to both the validity of the type and regional distribution. Lerma points were first identified by MacNeish (1958) in southern Tamaulipas, extending into southern, western, and coastal areas of Texas. He surmised the points to be Archaic, but similar points are also known from Paleoindian contexts. For example, the Iztapan Mammoth site in the Valley of Mexico yielded one point, associated with Pleistocene megafauna (Aveleyra A. de Anda 1956:21) that resembles those found on site 41SR242. The type tends to be a catchall grouping for all bi-pointed dart points, within which there might be typological valid sub-types.

Two fragmentary bases are too small to type (Figure 7.11). Found in Feature 1 in TU 3, the first base is a well-made contracting stem with a straight to slightly concave base reminiscent of possibly a Val Verde or maybe a wide Langtry, but it is too fragmentary to conclusively determine. The second point has a sub-rectangular base and weak shoulders although the distal end is broken and it is difficult to determine whether there may have originally been barbs. It is made of a black lusterless chert that appears heat damaged. The point does not clearly fit into a recognized type, but resembles the Palmillas type.

The untyped lanceolate point, collected from the site surface, is made of a peculiar black opaque and lusterless material, possibly metamorphosed shale (Figure 7.12). It is a material that is not identified in the site's debitage, suggesting possible exotic origins. The point is missing its distal end and one proximal corner. The one remaining lateral margin is heavily ground and the high width to thickness ratio is more suggestive of early technology rather than the Archaic triangular types.

Figure 7.10. Lerma-like dart point bases recovered from site 41SR242. Left to right Lot-Specimen Nos. are: top row 004-002; bottom row 052-001 and 043-001.

Figure 7.11. Unidentified dart point bases recovered from site 41SR242. Left to right Lot-Specimen Nos. are: 175-005 and 199-159

Figure 7.12. Unidentified Lanceolate dart point recovered from site 41SR242. Lot-Specimen No. 015-001.

Other Lithic Tools

The sites yielded various other lithic tools during the excavations, including 61 bifaces, one Olmos tool, Nueces tool, two beveled end scrapers, edge modified flakes, one possible chopper, cores and debitage (Table 7.13). The assemblages indicate a diverse range of activities.

Table 7.13. Other Lithic Tools Not Projectile Points Recovered from Site 41SR242

Lot No.	Specimen No.	Field No.	Artifact Description	Max. Length (mm)	Max. Width (mm)	Max. Thickness (mm)	Weight (g)
001	001	SC 01.01	Early-Stage Biface	39.11	22.84	21.05	42.2
001	002	SC 01.02	Late-Stage Biface	20.69	13.31	7.06	9.6
001	003	SC 01.03	Early-Stage Biface	32.99	29.40	10.62	10.8
001	004	SC 01.04	Edge-Modified Utilized Flake	37.87	63.28	15.74	18.9
001	005	SC 01.05	Edge-Modified Utilized Flake	52.78	58.94	15.74	20.5
002	001	SC 02.01	Late-Stage Biface	60.18	38.09	7.80	15.2
002	002	SC 02.02	Early-Stage Biface	73.83	50.66	27.99	106.9
002	003	SC 02.03	Early-Stage Biface	66.77	53.28	22.59	73.9
003	001	SC 03.01	Mid-Stage Biface	61.77	42.34	15.34	41.9
003	002	SC 03.02	Late-Stage Biface	40.70	39.93	9.43	15.3
004	001	SC 04.01	Mid-Stage Biface	64.08	49.92	17.52	52.5
005	002	SC 05.02	Late-Stage Biface	43.18	35.57	7.86	11.4
005	003	SC 05.03	Early-Stage Biface	68.55	43.22	22.51	61.7
006	002	SC 06.02	Early-Stage Biface	63.34	56.71	26.89	85.9
009	001	SD 3	Distally Beveled Scraper	39.40	29.52	6.67	10.1
010	001	SD 4	Late-Stage Biface	36.15	26.99	7.54	6.8
014	001	SD 8	Late-Stage Biface	36.45	25.54	6.84	4.9
017	001	SB 1	Mid-Stage Biface	49.43	56.76	11.77	33.9
018	001	SB 2	Perforator	38.75	20.53	9.40	7.6
019	001	SB 3	Mid-Stage Biface	58.60	46.23	15.45	39.0
020	001	SB 4	Discoid Uniface	38.52	34.21	14.91	17.6
021	001	SB 5	Late-Stage Biface	36.16	31.66	7.69	8.8
022	001	SB 6	Mid-Stage Biface	49.67	41.07	9.70	16.8
023	001	SB 7	Mid-Stage Biface	33.51	44.11	9.57	15.8
024	001	SB 8	Mid-Stage Biface	74.81	45.97	14.87	48.2
025	001	SB 9	Early-Stage Biface	75.49	51.43	22.65	84.9
026	001	SB 10	Early-Stage Biface	86.31	62.99	30.63	147.5
027	001	SB 11	Nueces Tool	54.89	46.91	12.62	39.4
028	001	SB 12	Early-Stage Biface	65.13	59.06	30.80	111.9
029	001	SB 13	Late-Stage Biface	59.77	42.24	8.55	19.5
030	001	SB 14	Mid-Stage Biface	29.22	54.60	11.34	20.5
031	001	SB 15	Distally Beveled Scraper	40.74	35.08	7.05	12.9
032	001	SB 16	Late-Stage Biface	35.69	23.62	7.99	4.3
033	001	SB 17	Late-Stage Biface	34.67	41.22	8.27	12.6
034	001	SB 18	Late-Stage Biface	33.82	29.95	8.22	9.4
035	001	SB 19	Side Scraper	111.80	82.55	40.97	408.3
044	001	SB2 02	Late-Stage Biface	52.65	31.65	9.74	12.5
045	001	SB2 03	Late-Stage Biface	38.64	29.59	8.72	8.5

Lot No.	Specimen No.	Field No.	Artifact Description	Max. Length (mm)	Max. Width (mm)	Max. Thickness (mm)	Weight (g)
046	001	SB2 04	Late-Stage Biface	36.82	34.82	8.88	13.5
047	001	SB2 05	Late-Stage Biface	50.37	39.22	7.06	11.6
048	001	SB2 06	Mid-Stage Biface	36.90	45.69	9.77	21.1
049	001	SB2 07	Mid-Stage Biface	49.51	50.93	13.42	32.4
050	001	SB2 08	Mid-Stage Biface	44.18	49.44	10.77	30.0
051	001	SB2 09	Early-Stage Biface	77.36	45.06	20.72	59.5
053	001	SB2 11	Early-Stage Biface	71.62	75.22	27.42	114.8
054	001	SB2 12	Mid-Stage Biface	68.32	32.29	16.78	34.8
055	001	SB2 13	Uniface	60.84	31.73	11.21	21.8
056	001	SB2 14	Early-Stage Biface	48.63	59.03	19.30	45.6
057	001	SB2 15	Mid-Stage Biface	70.29	40.41	18.60	45.4
058	001	SB2 16	Late-Stage Biface	43.45	27.82	6.62	8.1
060	001	SB2 18	Mid-Stage Biface	41.97	35.96	12.26	20.5
061	001	SB2 19	Olmos Biface	35.30	28.61	8.02	7.9
062	001	SB2 20	Early-Stage Biface	94.61	78.01	24.18	152.9
159	102	8.001	Edge-Modified Utilized Flake	38.29	23.67	13.01	8.3
167	016	16.001	Late-Stage Biface	39.39	41.65	9.40	18.7
169	005	19.001	Mid-Stage Biface	29.91	33.98	13.16	14.4
169	006	19.002	Late-Stage Biface	27.36	32.53	7.85	9.0
171	014	21.001	Late-Stage Biface	35.10	25.11	8.78	10.7
178	001	28.001	Late-Stage Biface	46.28	43.71	9.75	14.5
180	001	29.002	Early-Stage Biface	60.53	49.86	21.41	53.0
189	005	32.001	Late-Stage Biface	48.77	25.42	10.18	13.1
190	006	33.001	Edge-Modified Utilized Flake	25.43	20.75	7.59	3.3
197	001	41.001	Mid-Stage Biface	82.40	50.30	19.49	71.1
199	158	43.001	Mid-Stage Biface	31.19	41.80	12.31	16.0
201	069	46.001	Early-Stage Biface	38.29	42.72	14.21	27.1
203	138	48.001	Early-Stage Biface	45.36	44.93	15.44	31.8
203	139	48.002	Early-Stage Biface	54.10	52.32	27.65	64.8
203	140	48.003	Edge-Modified Utilized Flake	83.77	69.82	23.38	182.3
210	006	54.002	Late-Stage Biface	36.20	38.43	9.12	13.0
210	007	54.003	Mid-Stage Biface	31.46	46.83	15.55	21.4
210	008	54.004	Mid-Stage Biface	62.02	37.62	16.31	33.6
210	009	54.005	Early-Stage Biface	80.52	43.92	30.69	100.7
215	001	59	Mid-Stage Biface	79.36	44.05	19.75	48.0
216	001	60	Early-Stage Biface	90.91	45.10	21.92	100.8
219	001	63	Edge-Modified Utilized Flake	39.77	32.37	7.91	10.2
220	001	64	Edge-Modified Utilized Flake	52.30	26.50	23.39	21.7

Olmos Biface

One Olmos biface was recovered from the site surface. The tool is finely made and bifacially reduced from high-quality, two-toned tan and brown chert (Figure 7.13). The dorsal side has moderately steep beveling on the lateral sides and steeper beveling (circa 65 to 75 degrees) in the distal bit end. No clear evidence of hafting is noted. No burin spalls, which are commonly found on Olmos bifaces, are present along the distal lateral margins.

Nueces Tool

The Nueces tool, or scraper, was first defined from specimens recovered from the Oulline site (41LS3) and others in LaSalle County (Hester et al. 1969). The tools were defined as:

> …having a distinctive trapezoidal outline. The edges of the specimens are usually straight to convex; the widest side is steeply beveled….[and] are plano-convex in cross section (Hester et al. 1968:148).

One Nueces tool was recovered from the surface of 41SR242. Made from a yellowish grainy siltstone, the tool is unifacially worked with a steeply beveled (circa 75 degrees), convex distal (bit) end (see Figure 7.13).

Possible Perforator

One possible perforator was recovered from the site surface. The informal, bifacially reduced chert artifact appears to be retouched at its distal end to form a slight diamond-shaped cross section (see Figure 7.13). Use-wear is not clear at low-powered magnification. Given the informality of the tool and lack of clear use-wear, the function of this artifact is tentative.

Beveled End Scrapers

TxDOT recovered two very similar beveled end scrapers from the site surface. Both are well-thinned bifacial tools made from fine-grained chert with rectangular to sub-rectangular, slightly convex, tapered bases (Figure 7.14). The distal ends are unifacially beveled to about a 45-degree angle. It is possible both tools were made from recycled broken late-stage bifaces.

Discoidal Uniface

One curious specimen of undetermined function is a discoidal uniface recovered from the site surface. Made of a tan chert with stream-rolled cortex on the unworked side (see Figure 7.14). About 2.5 cm in diameter, the circular tool has small unifacial flaking originating completely around the margins. Two small flakes are removed from the cortical side, making it slightly bifacial. No use wear is evident and cortex is typically not used as a working edge. Consequently, the objective of the piece is undetermined.

Figure 7.13. Olmos Biface, Perforator, and Nueces Tool recovered from site 41SR242. Left to right Lot-Specimen Nos. are: top row Olmos biface 061-001, perforator 018-001; bottom row Nueces tool 027-001.

Figure 7.14. Unifaces and scrapers recovered from site 41SR242. Left to right Lot-Specimen Nos. are: top row discoidal uniface 020-001, uniface 055-001; bottom row beveled bifacial end scrapers 009-001 and 031-001.

Bifaces

This section discusses bifacially reduced tools that do not fit into any of the previously discussed categories such as points or preforms. A total of 61 bifaces were collected from 41SR242. As discussed in TxDOT protocols, the sequence of lithic bifacial reduction has been consistently viewed as a stage or step-like production process along a trajectory, from raw material to finished tool (Callahan 1974; Patterson 1977:60; Whittaker 1994). As the systematic reduction of the biface occurs, it goes through various sequential stages or steps distinguished by the manufacturing implement utilized, as well as the size, thickness, and form of the biface. Differentiation between the sequence and nature of these stages or steps is attributed to a host of variables including the form and quality of the parent raw material, the desired end product of the reduction process, and the flint knapping style or technique employed. Furthermore, previously completed tools may be reintroduced into the production trajectory to be repaired, rejuvenated, or recycle into a different form.

Previously completed tools, such as the beveled end scrapers discussed above, may be reintroduced into the production trajectory and can be repaired, rejuvenated or recycled into a different form. Although projectile points are bifaces, they are their own analytical category and are not included in the biface totals.

Although Callahan (1979) identified nine stages in biface production, these are condensed into three main stages for the purposes of the current study. In Callahan's analysis, stages 6 through 9 are related to the creation of hafting elements and notching. Callahan's Stage 1 is a cobble, flake, or shatter blank that has not been further modified—none of the specimens described here are unmodified, notched, or otherwise have hafting elements. Accordingly, we divide the assemblage into early, middle, and late stages. A primary variable used to define the stages of the reduction sequence were the width to thickness ratio, with consideration of edge sinuosity and edge angles. The edge angle and width to thickness ratios can vary between sites and within assemblages based upon the parent source being either flakes or cobbles and the desired finished product (Callahan 1979; Andrefsky 1998), biface cross section, and flaking patterns are also used to characterize each reduction stage. Breakage occurs during manufacture, use, discard, and taphonomic factors; the following uses breakage terms provided in the TxDOT protocols.

Early-Stage Bifaces

Nineteen early-stage bifaces were recovered, 14 of which were collected from surficial contexts (Figure 7.15). These specimens typically have an average width to thickness ratio between 2 and 3 and an average (mean) edge angle between 50 and 80 degrees. These artifacts are preliminary stages of reduction where there is little modification, such as prepared platforms. Flake scars are typically deep and short resulting in a scalloped or sinuous edge. These deep scars are characteristic of hard hammer percussion, which can leave a pronounced negative bulb. The profile is strongly biconvex when blanks are from thick, blocky, flakes or cobbles. Cortex is common, found on 14 of the 19 early-stage bifaces (73.7 percent). Discard was often the result of either breakage, material flaw, failure to thin, or exhaustion of utility (if used for flake production). Early-stage bifaces were likely being reduced for different tool forms; one specimen (Lot 025, Specimen 001) appears to have been intended as a gouge but was not completed.

Figure 7.15. Representative sample of late-stage bifaces recovered from Site 41SR242. Left to right Lot-Specimen Nos. are: top row 044-001, 047-001, 058-001 and 178-001; bottom row 005-002, 167-016 and 046-001.

There is roughly an equitable distribution in the counts of early, middle, and late stage bifaces on the site, which indicates the complete array of bifacial reduction was occurring and the site is close to the lithic raw material source. The occupants primarily were not conducting initial reduction off site, at a far-removed source, and solely bringing in later stage bifaces for further reduction. Conversely, they were exploiting local resources and early reduction occurred at the procurement locale as part of the selection process. The shape of the early-stage bifaces is generally amorphous or ovate, and likely resembling the shape of the parent lithic source.

Mid-Stage Bifaces

Twenty mid-stage bifaces were recovered, 14 from the site surface and six from buried contexts (Figure 7.16). Mid-stage bifaces typically have a width to thickness ratio between 3 and 4. Longer flakes are removed and flake scars continue to the center of the biface, especially on bifaces produced from cobble blanks. Edge angles are from 40 to 50 degrees. Cortex is significantly less common, found on only one of the 20 mid-stage bifaces. During the transition from early stage, mass reduction is statistically significant as cortex removal continues. The average weight of mid-stage bifaces (32.86 grams) is less than half the weight of early-stage bifaces (71.83 grams). The shapes become more regular and generic like ovate to oval pointed.

Figure 7.16 Representative sample of mid-stage bifaces recovered from Site 41SR242. Left to right Lot-Specimen Nos. are: top row 003-001, 054-001 and 019-001; bottom row 022-001, 023-001, 048-001 and 060-001.

Discard patterns appear equally divided between breakage and failure to thin. Ten of the 20 mid-stage bifaces are broken, usually transverse medial fractures, and 10 are complete but have various issues, such as stacked hinge fractures that preclude further thinning. Flake scars are large and shallow and cross the medial centerline of the biface and the biconvex profile is less pronounced. The edge is less sinuous, and the outline of the biface is defined. The number of shapes becomes increasingly diversified, with oval pointed or teardrop shapes being the highest. As an intermediate stage, a variety of percussive techniques that may have been used on the more-robust earlier stages may expose previously hidden flaws in the material, and the consequence of misplaced blows becomes more damaging. The trend is accelerated in the final stages, when the affects from material flaws or knapping mistakes results in catastrophic fracture.

Late-Stage Bifaces

A total of 22 late-stage biface were recovered, 16 from surficial contexts and six from subsurface contexts (Figure 7.17). These specimens have an average width to thickness ratio of about 4 to 5 and an edge angle of approximately 30 degrees. The biconvex cross section profile is less pronounced and the edge profile is straighter. The outline of the biface may be further shaped or refined at this stage. The trends in breakage patterns between early and mid-stage bifaces increases dramatically during late-stage reduction; 20 of the 22 late-stage bifaces (91 percent) are broken, usually with transverse medial fractures, compared to 50 percent breakage in the mid-stage bifaces. Oval pointed is the predominant shape, followed by subtriangular.

Since late-stage bifaces are the final stage of reduction without a formal tool designation, the category may nevertheless include some final tool forms, such as distal tips that cannot be clearly classified as a type. Consequently, some breakage may be the result of use as well as manufacturing.

Figure 7.17. Representative sample of late-stage bifaces recovered from Site 41SR242. Left to right Lot-Specimen Nos. are: top row 044-001, 047-001, 058-001 and 178-001; bottom row 005-002, 167-016 and 046-001.

Battered Cobble or Chopper

Choppers are a more expedient tool manufacturing technique and are typically more chunky specimens. One possible chopper was recovered from Feature 4 in TU 7. Stream-rolled cortex remain on one side and a single large flake was removed from the other side, possibly during its use. Battering on one end is evident by numerous short, stacked hinge fractures. Intensive heat damage has caused crazing and potlids on the other end. The artifact is made of a reddish-brown chert.

Edge-Modified Flake Tools

Edge-modified flake tools, frequently referred to as modified flakes, are flakes with deliberately retouched edges that lack standardized formal characteristics (Odell 2003). Utilized flakes, defined as unretouched flakes that have been modified as a result of use as tools, are included in this category as well. Both forms having been minimally shaped through use or retouch and are consequently considered informal or expedient tools. Normally, flaking scars are confined to less than 10 mm of the lateral margins and do not extend into the interior surface of the flake. The modification on these tools may be unifacial or bifacial, and they may have served multiple functional purposes, such as expedient knives, scrapers, or gravers. Utilized flakes can be the most problematic to identify accurately since edge damage through use is created through intensity, duration, and type of use. Additionally, edge damage can likewise occur through post-depositional processes that mimic use wear such as crushing and trampling.

Six modified flakes were recovered, three from surface collections, two from TU 5, and one from Feature 1 in TU 1. Except for one made of black rhyolite, all are chert flakes. None of the specimens are intensively retouched or edge damaged, only having subtle continuous nibbling along some margins. Given the many disturbances in the area (e.g., bulldozing and root plowing), some of the observed damage could be the result of modern activities.

Non-Feature Lithic Debitage

Detailed debitage analysis was conducted on the lithic reduction features, Features 1 and 4. SWCA conducted a much more limited analysis on the remainder of the debitage. There were 1,061 pieces of debitage recovered from the backhoe trenches, scrapes, column samples, and TUs on site 41SR242. Generally speaking, the debitage exhibits all stages of lithic reduction, including early through late reduction stages. The raw material consists of diverse materials reflecting the myriad locally available materials, but most is fine-grained chert made available through local sources. Additionally, some of the debitage exhibited evidence of heat treatment and/or burning.

Size-sorting showed the most common size grade (399 flakes) was between 0.5 and 0.75 inch in maximum dimension with 0.75 to 1 inch (296 debitage) and greater than 1 inch (210 pieces) the next highest grades. Less than 0.25 inch is the smallest category and largely attributable to screen size sampling bias. Between 0.25 and 0.5 inch grade yielded 142 pieces of debitage. The median size grade of 0.5 to 0.75 is likely more of a reflection of raw material size than stage of reduction, since all stages of reduction are reflected in the previously discussed biface assemblage.

Burned Rock

On site 41SR242, there were 628 pieces of burned rock weighing 18,105.0 grams, recovered from the backhoe trenches, scrapes, column samples, and TU during the testing excavations. The majority of these were associated with features. The average rock size was 28.82 grams. These materials will be discarded and not curated.

Cores

Two cores, a core fragment, and one core platform rejuvenation flake were recovered from 41SR242 (Table 7.14). Cores are objective pieces of lithic material from which another piece is detached (Andrefsky 1998). They exhibit negative flake scars created by fracturing, a reductive process that involves the removal of flakes from the core by striking it with a percussor, such as a billet or hammerstone. Flakes may also be detached through indirect percussion using a punch and through pressure. The primary purpose of cores is a source of flakes, which may be utilized or further reduced into stone tools. In some scenarios, a sharp margin of the core itself may be utilized as a stone tool.

Table 7.14. Cores and Platform Rejuvenation Core Flake Recovered from Site 41SR242

Lot No.	Specimen No.	Field No.	Artifact Description	Max. Length (mm)	Max. Width (mm)	Max. Thickness (mm)	Weight (g)
003	003	SC 03.03	Platform Rejuvenation Core Flake	67.12	62.17	25.38	81.3
164	036	13.001	Multidirectional Core	86.95	53.85	46.22	239.4
173	182	23.001	Multidirectional Core	69.26	49.68	22.53	59.2
187	005	30.001	Multidirectional Core	55.21	35.70	32.79	57.4

The two cores are informal, lightly used, and multidirectional with striking platforms on different axis and flakes removed in numerous directions. Both are made from locally available chert gravels. From Feature 1 in Level 3 of TU 1, one core is made of stream-rolled chert gravel with at least five flake scars from two faces; cortex remains on approximately 60 percent of the artifact. The second core is from TU 4, Level 3 and is a small fine-grained chert with multidirectional flake scars. No use wear, evidence of use as a core tool, is evident on either core.

The platform rejuvenation flake, recovered from the site surface, is a light-colored chalcedony. Multiple stacked hinge fractures are present on one side, which the knapper circumvented by knocking off the entire face to provide a more workable platform.

Finally, one core fragment is a coarse-grained rhyolitic angular fragment with several flake scars. The platform from which several flake scars originated has broken off. The piece is too fragmentary to discern its original form.

Prehistoric Ceramic Sherd

One small, thin undecorated prehistoric plainware ceramic sherd was recovered from Feature 2 in TU 2, Level 3 (Figure 7.18). Viewed under 200× magnification, the temper is coarse sand; no bone, shell, grog, or other tempering agent were noted. The sherd is untyped but is consistent with lower Gulf Coastal ceramics, which are thin-walled pots (e.g., Rockport Plain). The ceramic indicates a Late Prehistoric component.

Figure 7.18. Prehistoric ceramic sherd recovered from site 41SR242. Lot-Specimen No. 170-006.

Historic Artifacts

In addition to the prehistoric artifacts, the site also contains a historic component identified by a relatively diffuse scatter of glass, ceramics, metal, and a few miscellaneous items such as a spark plug and bullet cartridge. A total of 101 historic artifacts were recovered, 10 from subsurface contexts and the remainder from the site surface (Table 7.15).

Table 7.15. Historic Materials Recovered from Site 41SR242

Materials Recovered	Count
AC Sparkplug	1
Aqua Glass	7
Bailing Wire	2
Blue Transfer Ware Ceramic	1
Brown Glass	1
Colorless Glass	19
Iron Pipe	1
Earthenware Slip Glazed-Brown Ceramic	10
Earthenware Slip Glazed-Green Ceramic	1
Earthenware Slip Glazed-Tan Ceramic	1
Fence Staple	1
Heavy Gauge Wire	2
Manganese Glass	18

Materials Recovered	Count
Metal Bracket	1
Metal Buckle	1
Metal Perforated Strap	3
Miscellaneous Metal Fragments	2
Pistol Cartridge	1
Platform Rejuvenation Core Flake	1
Porcelain Ceramic Figurine Fragment	1
Sheet Metal	1
Undecorated Ironstone	1
Undecorated Whiteware Ceramic	23
Wire	1
Total	**101**

Forty-five of the artifacts (47.4 percent) are glass fragments, including 19 pieces of colorless glass, 18 pieces of manganese (purple) glass, seven aqua shards, and one brown shard. The colorless glass methods indicate a twentieth century (post-World War I) date, whereas the manganese glass suggest a pre-World War I date, since the use of manganese was discontinued during the war. All of the glass fragments are relatively small and have few diagnostic elements such a maker's marks, finishes, bases, stippling (post-dating 1940), seams or other or distinct manufacturing elements. Except one piece of window glass, which suggests an architectural feature, all of the glass are bottle fragments. Most items appear sand etched like beach glass, an indicator of long surface exposure. In general, the available diagnostic attributes indicate an early- to mid-twentieth-century occupation.

Thirteen metal artifacts include one iron sewer pipe fragment, one clothing clasp (like for overalls), four rusty wire fragments, two pieces of strap metal, an unidentified tool or machine part, a fencing nail, an ammunition cartridge, and three unidentified pieces of rusty iron. The ammunition cartridge appears to be a .44 to .50 caliber (the artifact is crushed making dimensions imprecise) with an "H" headstamp from the Winchester Repeating Arms Co in New Haven, Connecticut (International Ammunition Association 2019). Winchester produced the rim-fired bullet for use in Henry rifles for nearly a century beginning in the 1860s. None of the other metal fragments are temporally diagnostic.

One rusty, old spark plug was recovered from the site surface. It is an AC 44-5 plug with a Coralox ceramic insulator. The plug was made by AC Spark Plug Company before it merged with United Delco to form AC-Delco in 1974. The Coralox insulator appears on AC spark plug advertising in the 1940s and 1950s.

Finally, 36 fragments of historic ceramics were collected, 30 were from the site surface and three were from shallowly buried contexts in TUs 2 and 4 and BHT 8 (Figure 7.19). These include 21 undecorated whiteware sherds, a porcelain figurine fragment, 12 earthenware slip glazed brown ceramic fragments, one blue transfer ware, an undecorated ironstone. One whiteware sherd contained the margins of a black maker's mark, but it was too fragmentary to identify.

Overall, the historic artifact assemblage indicates an early- to mid-twentieth-century occupation. Most of the assemblage is domestic debris, such as ceramics, glass, porcelain figure, and window glass. It is unclear whether the assemblage is from primary discard from an occupation in or near the site or whether it derives from secondary discard (dumping) from nearby residences.

Figure 7.19. Representative sample of historic ceramics recovered from site 41SR242. Left to right Lot-Specimen Nos. are: top row 063-001, 071-001, 075-001, 126-001 and 150-001; middle row 142-001 and 064-001; bottom row 069-001, 104-001, 119-001, 143-001 and 147-001.

Faunal Remains

TxDOT and SWCA recovered and analyzed 52 vertebrate faunal remains from the excavation of archeological site 41SR242. Each element within the assemblage was thoroughly analyzed by Christopher Shelton, M.A., both macroscopically, and with the aid of a 10× microscope combined with an oblique angle light source. SWCA attempted to identify each specimen within the assemblage to skeletal element, as well as to the lowest possible level of taxonomic classification. A full accounting of the faunal analysis can be found in Appendix E.

The most prevalent taphonomic processes identified during the analysis are general weathering, geogenic acid etching, rodent gnawing, and/or burning (Figure 7.20; Appendix E). Anthropogenic taphonomy is biased against in the assemblage due to the prevalence of natural taphonomic processes; however, a total of eight (15.4 percent) specimens were found to exhibit signs of having been burned (Figure 7.21; Appendix E). Although burning can occur naturally, the specimens in the assemblage show variable degrees of burning on single elements. More specifically, single elements may have small portions of the element burned to black in color, while the rest of the element appears unaffected. This pattern of variable evidence of heating can indicate cooking/roasting. The burned potions of the bone may have been exposed during the butchery processes, while the rest of the element were protected from the direct flame by the remaining tissue (meat).

As a result of the high degree of fragmentation, poor preservational environment, and other taphonomic factors, few of the fragments could be attributed to specific elements and/or specific taxa (Appendix E). From the vertebrate assemblage, 10 (23.1 percent) specimens could not be defined beyond class Mammalia, seven (13.5 percent) specimens could be attributed to microfauna and/or biological order Rodentia, and five (9.6 percent) specimens could be contributed to the biological order Testudines (turtle/tortoise). Three specimen could be accurately attributed to the genus level. One specimen is a *Pecari tajacu*, more commonly known as a peccary or a javelina (Figures 7.22 and 7.23). Additionally, two fragments (specimens 214-001 [Figure 7.20] and 214-002) fit together and are part of a cow or bison phalange. Given the subsurface context with prehistoric artifacts, the bones are surmised to be bison.

Figure 7.20. Lot 214-001: Part of a bovid (likely bison) phalange, with the cortical surface obliterated by extensive rodent gnawing.

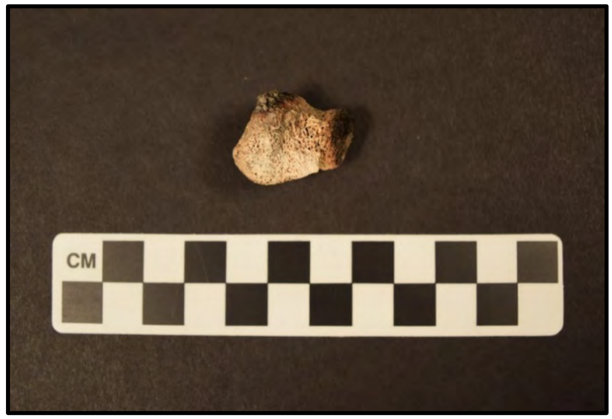

Figure 7.21. Lot 162-045: Trabecular bone fragment exhibiting indications of variable heating.

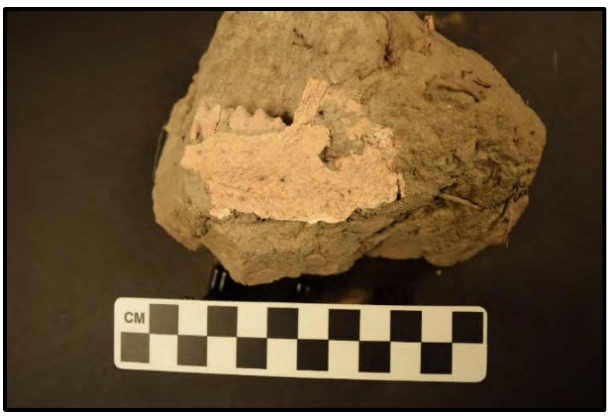

Figure 7.22. Lot 213-001: Javelina mandible with surrounding matrix.

Figure 7.23. Lot 213-001: Javelina mandible with surrounding matrix, focus on the occlusal surface of the molars.

Although anthropogenic surface modification is biased against in the assemblage due to natural taphonomy, anthropogenic processes can be inferred through variable burning, and to a lesser degree, fragmentation and fracture margins. As stated above, a total of eight elements exhibit evidence of variable burning, which could indicate a form of cooking. These elements, although unidentifiable to genus/species level, seem to seem to be associated with medium to large size mammals. In addition, the assemblage is highly fragmented. Of the fracture margins which can be observed, eight (33 percent) are recent breaks, which could have occurred during excavation, four (17 percent) are right angle (dry) breaks, and 12 (50 percent) are oblique or spiral (green) fractures. Although the assemblage could have been fragmented through numerous non-anthropogenic processes, the majority are green (oblique or spiral) fractures, which suggests the elements were broken perimortem. The presence of perimortem fracturing by itself is not evidence of anthropogenic processes. However, when a high degree of green fracture presence is combined with the presence of variable burning and associated artifacts, butchering and/or marrow processing may be inferred.

Snail Shell

There has been a long-running debate in Texas archeology on whether snail shells commonly found on prehistoric sites were collected and discarded as a food source or were naturally occurring, perhaps attracted to occupational sites because of a higher abundance of organic materials discarded by humans. Although 41SR242 does not provide conclusive evidence either way, it is noteworthy to document remarkably high quantities of snail shell, almost exclusively *Rabdotus*, in Features 1 and 4 (Table 7.16). A total of 868 snail shells were recovered from Feature 1; although these were found from 30 to 70 cmbs in TUs 1 and 3, the vertical distribution peaked between 50 and 60 cmbs. From Feature 4, a total of 2,769 snail shells were recovered from TUs 6 and 7. In both units, there is a clear spike in the Feature 4 vertical distribution between 40 and 50 cmbs.

Table 7.16. Snail Shells Recovered from Features 1 and 4

Feature No.	Provenience	Level	Elevation (cmbs)	Snail Shell Count
1	BHT1	–	50cm	71
1	BHT1/ TU1	–	50cm	117
1	TU1	Lv1	30-40cm	52
1	TU1	Lv2	40-50cm	24
1	TU1 S	Lv3	50-60cm	303
1	TU1 NW	Lv3	50-60cm	108
1	TU1 NE	Lv4	60-70cm	102
1	TU1 NE	Lv4	60-70cm	68
1	TU3	Lv1	30-40cm	13
1	TU3	Lv3	50-60cm	10
Feature 1 Total				**868**
4	BHT15/ TU6	Lv1	30-40cm	2
4	TU6	Lv1	30-40cm	431
4	TU6	Lv2	40-50cm	929
4	TU6	Lv3	50-60cm	491
4	TU7	Lv1	30-40cm	69
4	TU7	Lv2	40-50cm	532
4	TU7	Lv3	50-60cm	315
Feature 4 Total				**2,769**
Feature 1 and 4 Grand Total				**3,637**

CHAPTER 8. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

As part of the SL 195 project (CSJ: 3632-01-001), TxDOT conducted NRHP eligibility testing of the Cornelio Alvarez site (41SR242) in Starr County, Texas. Subsequent to the field investigations that occurred in February 2017, and April 2017, SWCA conducted artifact analysis, reporting, and curation preparation for the multi-component historic and prehistoric site. Investigations were conducted in compliance with Section 106 of the NHPA (54 USC 30601) and the ACT (9 NRC 191). The investigations assessed the site's eligibility for listing on the NRHP (36 CFR 60.4) and for designation as an SAL (13 TAC 26.8, 26.12). Christopher W. Ringstaff served as Principal Investigator under Texas Antiquities Permit Number 7912. This document provides the final results of the investigations and analyses to meet the requirements of the antiquities permit and Secretary of Interior guidelines. The additional data and interpretations provided in this report support the previous recommendations.

APE AND SITE DIMENSIONS

The tested portion of 41SR242 is located within the larger Project APE. The proposed SL 195 is a new roadway in southwestern Starr County extending from FM 755 to the intersection of U.S. Highway 83 and Loma Blanca Road. The total project length is 17.21 miles and varies between 300 and 450 feet in width. The entire SL 195 Project covers a total area of approximately 824.5 acres. Existing ROW composes approximately 24 acres and the remaining 800.5 acres is new ROW. No testing was done outside the APE. According to typical design sections, the depth of impacts is estimated to be up to 40 feet below the current ground surface for the bridge supports and up to 6 feet in depth for the rest of the project.

SUMMARY OF FINDINGS

The Cornelio Alvarez site (41SR242) is on a subtly convex footslope of a low-gradient upland adjacent to a low-order tributary of the Rio Grande River. Soils at the site have formed in calcareous loamy residuum derived from sandstone predominantly of the Jackson group. Accordingly, most of the cultural materials were on or near the current surface, and burial occurred through various pedogenic and bioturbation processes. Site 41SR242 has buried cultural materials present throughout the site's profile, but dense clusters appear to represent cultural activity loci at depths of approximately 40–65 cmbs.

With the exception of Features 1 and 4, no intact features were identified at 41SR242. Features 1 and 4 were discrete clusters of lithic debitage and intact *Rabdotus* snail shells discovered at a depth of approximately 50–60 cmbs in BHT 1 and 20-50 cmbs in BHT 15, respectively. The preliminary MAN analysis of the lithic debris in both features suggest that the feature includes multiple biface thinning flakes from about a dozens of analytic nodules. Given the diversity of the Rio Grande gravels, this supports the notion that the Features 1 and 4 assemblages reflected discrete behavioral events.

SUMMARY AND RECOMMENDATIONS OF RESEARCH DIRECTIONS

The Cornelio Alvarez site (41SR242) is recommended as eligible for the NRHP and as an SAL. Despite some of the mixed contexts at the site, there are feasible research directions that have been pursued and can be further studied in future archeological investigations. These directions include raw material availability, geoarcheological site formation model, and technological organization.

Raw Material Availability

The Rio Grande Delta is a region of stark contrasts between lithic-rich and lithic-poor areas. Understanding how indigenous groups responded to differential availability (such as through trade or mobility) is important to modeling technological organization. As lithic artifacts tend to be among the only classes that endure on many sites, the economic patterns in lithic production/acquisition, use, and discard provide one of the more viable research avenues.

However, lithic material distribution more importantly contributes to the broader topic of overall resource availability, which is the real question to better understanding upland sites like 41SR242 and others. Characterizing, stone, water, floral, and faunal resources (the latter two likely relying on proxy data) will be important in formulating future research questions.

Land Use

In regard to Archaic foraging, land use in the uplands of the Lower Rio Grande Plains is poorly understood and is closely tied to, as mentioned above, resource availability. Forays into these areas are certainly tied to acquiring resources other than lithic raw materials. Given the meager yet unusual presence of vertebrate remains at the site as well as the high-density land snail features (Features 1 and 4) provides some initial data to develop future research questions. The potential for additional faunal material suggests this line of inquiry may be further developed. With documented carbonized flora recovered from 41SR242, the potential for better understanding acquisition and use of upland floral resources may be possible.

Site Formation Processes

As discussed in Chapter 6, the regional archeological record forms within two primary depositional settings: 1) aggrading landforms such as alluvial terraces, and 2) non-aggrading or slowly-aggrading, stable landforms such as the upland landform on which 41SR242 occupies. Although non-aggrading landforms may have less potential for preservation, the tested site shows that there are burial processes, such as insects displacing sediments to the surface, that can provide conditions for preservation on a case-by-case basis. This, in part, appears to be the case at 41SR242, where insect and annelid surface casting is the most likely explanation for burial and preservation of Features 1 and 4. These two features suggest the biomantle phenomena recently documented at 41SR242 as well as in western Hidalgo County (Carpenter et al 2015), Particular attributes of both features (i.e., density of artifacts) supported its preservation by hindering insect passage. However, the overall analyses suggest that other processes have operated on the site. The fact that prehistoric artifacts litter the surface demonstrates that insect casting cannot be the only process operating since all artifacts would be buried if that were the case. The investigations at 41SR242 demonstrate that the combination of traditional textural and chemical analysis, thin section analysis, and CT analysis provides for the potential to gain unprecedented insights into many pedological questions in a wide range of environments. Considering that archeological sites in the region likely have similarly been affected by multiple factors, a variety of related analyses can provide the most informative approach for future research.

In terms of site formation and research directions, the salient point is that an understanding of site formation can help us better understand preservation limitations of the site and help in the development of the data recovery field methodology. In the instance of 41SR242, the geoarcheological understanding of the site, presence of single component living surfaces is unlikely. However, the potential for intact features within the site has been demonstrated.

Technological Organization

Lithic technological organization refers to the ways in which people procured, transported, manufactured, and used stone tools (Andrefsky 1994). Given the data that tend to survive at sites such as 41SR242, technological organization is among the most feasible research topics at similar sites, one that can be addressed through analysis of lithic assemblages and study of reduction stages.

In the regional literature, researchers have defined maritime, savannah, and desert adaptations among historic and prehistoric inhabitants in the far South Texas region. Most mobility models, grounded in ethnohistorical literature, depict inhabitants moving among habitats following seasonally available resources. The mobility, foraging strategies, and economic networks in these adaptations and models strongly link with lithic tool production, use, maintenance, and discard. As Ricklis and Cox (1993) note, technological organization is a subsystem of the larger culture, and the coastal inhabitants employed different strategies for different circumstances. Ricklis and Cox (1993) provide a model of lithic technological organization based on the Late Prehistoric archeological record along the central Texas coast. There are strong parallels between their study area and the setting of the La Joya sites.

Situated immediately adjacent to lithic sources, site 41SR242 primarily reflect Ricklis and Cox's Mode I, procurement, transport, and reduction of raw materials. The sites likely represent an embedded procurement locale where materials were acquired during the regular seasonal mobility schedule. Based on ethnohistorical descriptions, groups maintained large foraging territories that were generally not mutually exclusive (Campbell 1988:117). Multiple groups often overlapped, occupying the same territories and even sharing camps (Campbell 1988:117). Both residential and logistical mobility occurred on a seasonal basis, often exploiting intermittently available resources. Early accounts reported coastal groups moving inland during the summer to harvest the abundance of prickly pear fruit, which were found in great concentrations in Starr County (Campbell 1988:12). As part of these regular seasonal movements, site 41SR242 likely represents a short-term camp where retooling occurred, exploiting raw material outcrops that are immediately adjacent to the sites.

A strong component of activities occurring at 41SR242 included exploitation of relatively abundant local raw materials to produce tools. Occupational materials such as site furniture and ground stone are informal and unsubstantial, indicating low-intensity, short-term occupations. Consequently, the lithic activities perhaps reflect an embedded procurement strategy during short-term forays to exploit seasonal upland resources. In the vicinity of the tested sites, lithic raw material is abundant in downcut exposures. However, the Rio Grande delta, as well as the inland South Texas sandsheet to the north, is an exceedingly lithic-poor area. Assessing the discard patterns and reduction activities occurring on the site can contribute to a larger model of how the area occupants mapped onto the landscape. The model of technological organization suggests the Cornelio Alvarez site (41SR242) assemblages represents retooling in relatively lithic-rich areas on the margin of the lithic-poor areas, such as the Rio Grande Delta.

Based on the debitage analysis and assemblage, it appears bifacial production was a central focus in the technological organization on the site. To illustrate this point, the biface to core ratio is quite high on the Cornelio Alvarez site (41SR242), about 20 to 1 (61 bifaces excluding projectile points to 3 cores). In general, biface use increases with mobility, though Tomka (2001) identifies mitigating circumstances, and flake-core use increases with longer occupations. Comparing the biface-to-core ratios to other regional data, a four to one ratio is within reasonable expectations of hunter-gatherers according to North American data compiled by Parry and Kelly (1987) (Table 8.1). However, there may be a sampling bias—surface collection units at the Cornelio Alvarez site likely focused more on formal tools than cores. Nevertheless, the debitage analysis and the high numbers of brown bifaces shows an abundance of small biface production on site, and the important point is that as mobility increases, formal curated technology increases.

Table 8.1. Comparative Biface:Core Ratio Data from Parry and Kelly (1987)

Archeological Group	Sedentism/Mobility Pattern	Biface to Core ratio according to Parry and Kelly (1987)
Oaxaca Archaic	Quasi-sedentism	1.09
Oaxaca Formative	Sedentism	0.03
Black Mesa Archaic	Mobile hunter-gatherers	5.75
Black Mesa BMII	Quasi-sedentism	2.38
Black Mesa PI	Sedentism	0.45
Black Mesa PII	Sedentism	0.04
SW Colorado Archaic	Mobile hunter-gatherers	5.75
SW Colorado BMII	Early quasi-sedentism	2.83
SW Colorado BMIII	Quasi-sedentism	0.71
SW Colorado PI	Sedentism	0.95
SW Colorado PII	Sedentism	0.70
Chaco Preceramic	Quasi-sedentism	0.80
Chaco Puebloan	Sedentism	0.13
Knife River ND Paleo/EA	Mobile hunter-gatherers	3.52
Knife River ND Archaic	Mobile hunter-gatherers	2.92
Knife River ND Plains Village	Sedentism	1.34
Cornelio Alvarez Site	Mobile hunter-gatherers	20.1

Debitage is often a problematic artifact class, and analyses are often prone to simplistic or foregone conclusions. However, in discrete reduction features they can provide insight into not only the types of tools being produced but also post-depositional processes that affect sites, as explored on 41SR242.

ELIGIBILITY RECOMMENDATIONS

Evaluations of NRHP and SAL eligibility focused on two primary aspects of 41SR242: site integrity and potential data yield.

Site Integrity

Post-depositional processes at 41SR242 are generally not conducive to preservation of intact archeological surfaces, patterns, or other aspects of site structure. However, as the various investigative approaches to 41SR242 have demonstrated, there are some notable exceptions where isolated but informative data can be collected. The application of MAN analysis of the lithic debris, particularly in Feature 1, greatly assisted in identifying multiple biface thinning flakes from numerous Rio Grande nodules and determining the feature was a discrete behavioral event. Similarly, the combined use of traditional methods with newer approaches (i.e., CT analysis) offered unprecedented insights into the complex and varied natural post-depositional processes affecting the site. Effectively, these collaborative approaches have shed new light on previously disregarded data.

Potential Data Yield

As discussed in the previous chapters, potential data yield addresses the aspect of significance, the ability of a site to yield important information related to one or more meaningful contexts or research issues. Based on the testing investigations, 41SR242 contains sufficient data to substantively and explicitly address specific local or regional contexts. Although, the site does have limited preservation for organic remains, several radiocarbon samples from mesquite (*Prosopis* sp.), acacia (*Acacia* sp.), and snakewood (*Condalia* sp.). were identified and examined. Therefore, some organic preservation is present.
The artifact content is moderately robust, and the investigations suggest that discrete behavioral events are present (e.g., Feature 1). Although some mixing of the site deposits has occurred, there is evidence to indicate that beneficial information can be discerned from the larger features, when identified. Further, buried cultural material is present throughout the profile of 41SR242, but dense clusters that appear to represent cultural activity loci are present, particularly at approximately 40–65 cm. The radiocarbon data of 41SR242 indicates that the assemblage has a slightly mixed context. However, Bayesian analyses of the chronometric data indicates repeated activity over more than a thousand years during the Late Archaic, minimally from B.C. 1600–100.

Site Eligibility and Recommendations

Based on the considerations of integrity and potential data yield, 41SR242 is recommended as eligible for the NRHP and as an SAL. This recommendation pertains to the portions of the site within the APE. The site does extend beyond the APE, most notably to the north and south, and these areas have not been evaluated. Should additional work be required outside the current APE, additional assessment is warranted.

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APPENDIX A

Backhoe Trench Descriptions

James T. Abbott

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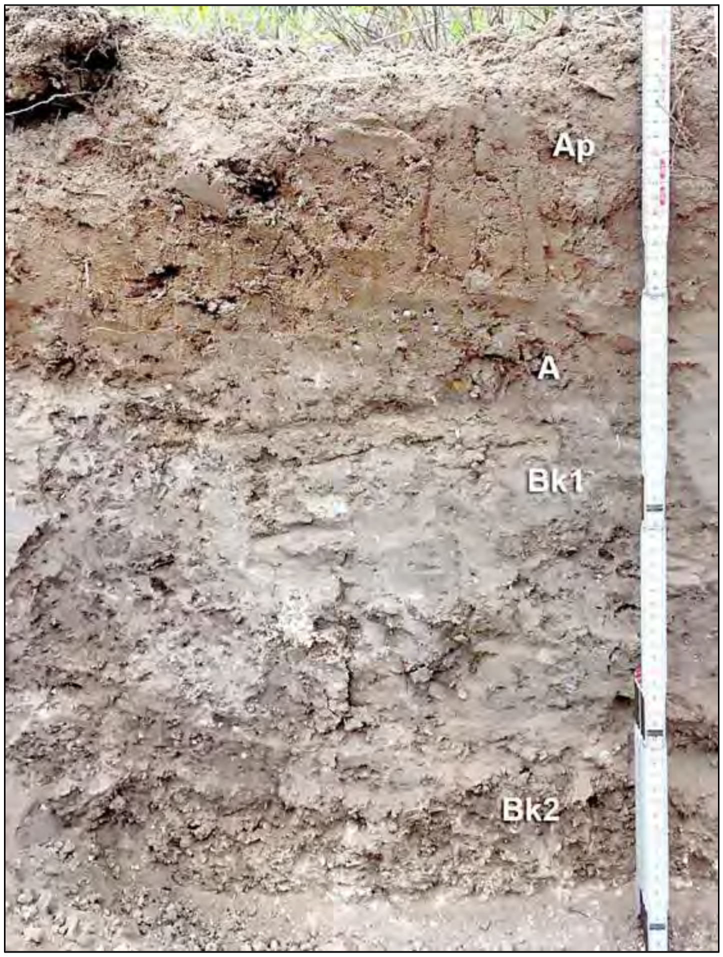


BT1:

0-13 cm: Ap horizon; sandy to silty loam; irregular platy structure superimposed on irregular biogenic granular structure; soft; 10YR 3/3 (dry); occasional roots; common fine pores and krotovina; clear boundary.

13-18 cm: A horizon; sandy to silty loam; irregular biogenic granular structure; soft; 10YR 3/2 (dry); occasional roots; common crushed snail shell; few fine siliceous gravels; gradual boundary.

18-40 cm: Bk1 horizon; sandy to silty loam; massive to weak, irregular biogenic granular structure; 10YR 4/2 to 5/2 (dry); many open pores and insect-scale krotovina; occasional fine roots; occasional flakes; few fine gravels; common crushed snail shell; few localized clusters of poorly bounded $CaCO^3$ nodules; abundant diffuse matrix carbonate; clear boundary.

40-65 cm: Bk2 horizon; sandy to silty loam; prominent irregular biogenic granular structure; 10YR 5/2 (dry); many open pores and insect-scale krotovina; occasional fine roots; common flakes; few fine gravels; few localized clusters of poorly bounded $CaCO^3$ nodules; abundant diffuse matrix carbonate; abundant whole and crushed snail shells (*Rabdotus spp.*); common to abundant lithic debitage.

Comments: From center of site. Base of exposed horizon contains a “feature” composed of hundreds of intact snail shells and dozens of flat-lying flakes (up to 3-4 cm maximum dimension) in physical contact or near contact. Excavated 12-14-16.

BT2:

0-10 cm: Ap1 horizon; loamy fine sand; massive; soft; 10YR 4/3 (dry); occasional roots; common fine pores and krotovina; sparse debitage; clear boundary.

10-22 cm: Ap2 horizon; loamy fine sand; irregular biogenic granular structure; soft; 10YR 4/2 (dry); occasional roots; common crushed snail shell; few fine siliceous gravels; localized zone of charcoal representing irregular root burn; clear smooth boundary.

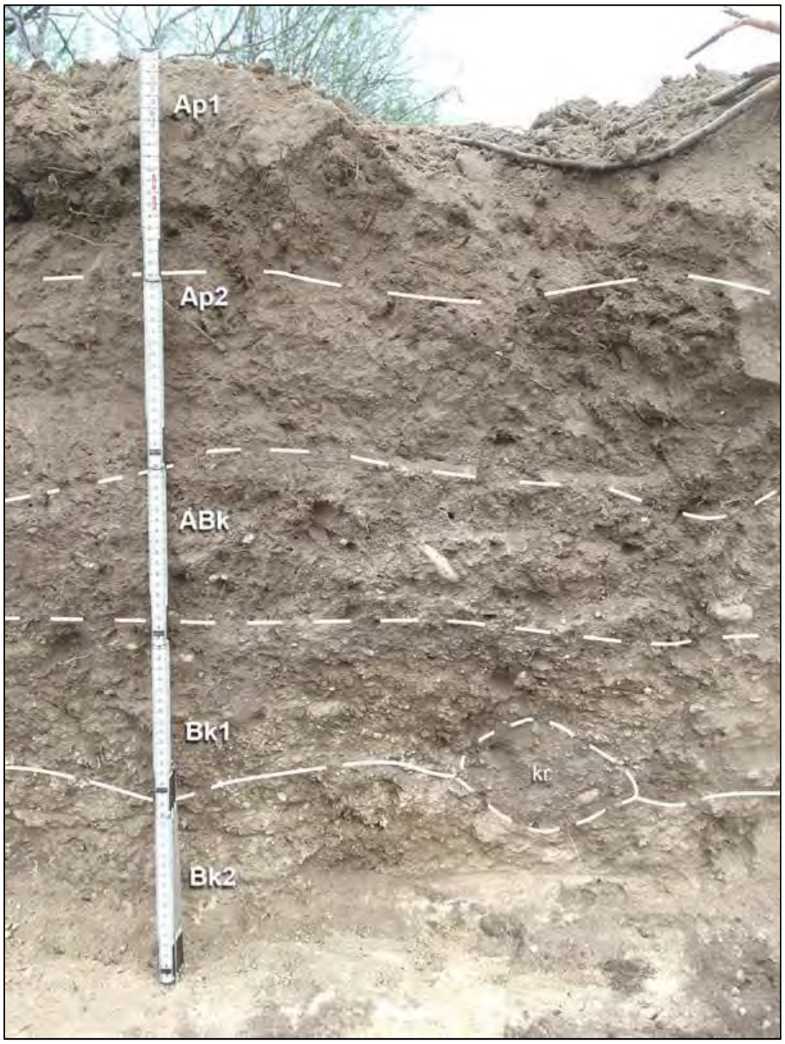
22-60 cm: Bk1 horizon; sandy to silty loam; massive to weak, irregular biogenic granular structure; slightly hard; 10YR 5/3 (dry); many open pores and insect-scale krotovina; occasional fine roots; occasional flakes; few fine gravels; common crushed snail shell; few localized clusters of poorly bounded CaCO3 nodules; abundant diffuse matrix carbonate; common dispersed intact snail shells (*Rabdotus spp*), lithic debitage, and small burned sandstone fragments; contains two thin subhorizontal concentrations of snail shell and debitage at approximately 40 and 55 cmbs; clear boundary.

60-95 cm: Bk2 horizon; sandy to silty loam; massive when cut; reveals irregular biogenic granular structure when brushed; slightly hard; 10YR 6/3 to 6/4 (dry); many open pores and insect-scale krotovina; few fine roots; common flakes; few fine gravels; few coarse masses of poorly bounded CaCO3; abundant diffuse matrix carbonate; common whole and crushed snail shells (Rabdotus spp.); gradual boundary. Excavated 12-14-16.

95-120 cm: BC horizon; sandy to silty loam; massive; slightly hard to ; 10YR 6/3 to 6/4 (dry); many open pores and insect-scale krotovina; abrupt wavy boundary.

120 cm: Cr horizon; medium graysandstone.

Comments: Cultural material, including flakes and burned sandstone, common through Ap and Bk1 horizon.



BT3:

0-20 cm: Ap1 horizon; loamy fine sand to fine sandy loam; massive; soft; 10YR 5/2 (dry); occasional roots; common fine pores and krotovina; clear boundary.

20-38 cm: Ap2 horizon; loamy fine sand; irregular biogenic granular structure; soft; 10YR 5/2 (dry); occasional roots; common crushed snail shell; few fine siliceous gravels; clear smooth boundary marked by fine gravel stone line.

38-61 cm: ABk horizon; gravelly loamy fine sand; irregular biogenic granular structure; soft; 10YR 5/2 (dry); occasional roots; common crushed snail shell; common dispersed fine siliceous gravels; gradual boundary.

61-78 cm: Bk1 horizon; loamy fine sand to sandy loam; irregular biogenic granular structure; soft; 10YR 5/2 (dry); occasional roots; common crushed snail shell; occasional dispersed fine siliceous gravels; clear smooth boundary.

78-95 cm: Bk2 horizon; loamy fine sand to sandy loam; common fine siliceous gravels; irregular biogenic granular structure; soft; 10YR 5/2 (dry); few coarse, poorly-bounded masses of calcium carbonate; localized zones of matrix carbonate accumulation.

Comments: No artifacts were observed during recording, but a few were noted by monitor (Ringstaff) during excavation. Excavated 12-14-16.

BT4:

0-8 cm: Ap1 horizon; sandy to silty loam; weak platy structure with superimposed irregular biogenic granular structure; soft; 10YR 5/2 to 5/3 (dry); occasional roots; common fine pores and krotovina; common snail shells (*Rabdotus spp.*) and lithic debitage; clear boundary.

8-36 cm: Ap2 horizon; gravelly fine sandy loam; weak subangular blocky structure with superimposed irregular biogenic granular structure; soft to slightly hard; 10YR 5/3 (dry); occasional roots; common crushed snail shell; common snail shells (*Rabdotus spp.*) and lithic debitage; clear boundary.

36-80 cm: ABk horizon; sandy to silty loam; massive to weak, irregular biogenic granular structure; slightly hard; 10YR 5/3 (dry); many open pores and insect-scale krotovina; occasional fine roots; few localized clusters of poorly bounded CaCO3 nodules; common dispersed intact snail shells (*Rabdotus spp*) and lithic debitage; contains burned rock feature (Fea. 2); clear boundary.

80-103 cm: Bk horizon; fine sandy loam; irregular biogenic granular structure; slightly hard; 10YR 6/3 (dry); occasional roots; occasional crushed snail shell; common soft, poorly bounded calcium carbonate masses; few crystals of gypsum; clear smooth boundary.

103-140 cm: 2BC horizon; fine sandy loam; massive; color varies from 2.5Y 7/3 to 10YR 7/4 (dry), with localized zones of 10YR 6/6 that appear to represent weak iron staining; occasional soft, poorly bounded masses of calcium carbonate; common crystals of gypsum, particularly in downward-deflected pockets along lower boundary; clear to abrupt wavy boundary.

140-160 cm: 2Cr horizon; weathered sandstone.

Comments: Samples for sediment analysis were taken from this profile. See laboratory profile. Excavated 2-21-17.

BT5:

0-15 cm: Ap horizon; sandy to silty loam; weak platy structure with superimposed irregular biogenic granular structure; soft; 10YR 4/3 (dry); occasional roots; common fine pores and krotovina; occasional fine siliceous gravels; clear boundary.

15-30 cm: AC1 horizon: gravelly loamy sand; most gravels are fine but contains pockets of cobbles to approx. 20 cm diameter; coarsens with depth (primarily due to gravel inclusions); 10YR 4/3 (dry); occasional roots; common fine pores and krotovina; gradual to clear boundary.

30-50 cm: AC2 horizon; grades from sandy loam to gravelly loamy sand with depth; 10YR 4/3 to 5/3 (dry); gravels to 10 cm diameter; fines are relatively hard and compact; carbonate filaments and some matrix carbonate; occasional roots; common fine pores and krotovina; clear boundary.

50-68 cm: Bk horizon; fine sandy loam; massive; slightly hard to hard; 10YR 6/3 (dry); occasional roots; occasional crushed snail shell; common soft, poorly bounded calcium carbonate masses.

Comment: Gravels and graded deposits indicate shallow channelized flow across surface here. Cluster of large cobbles was exposed by hand by J. Barrett and determined to be natural. No cultural material noted in profile. Trench terminated at compacted zone representing subsoil (BC or C horizon). Excavated 2-22-17 (recorded 2-23-17).

BT6:

0-12 cm: Ap horizon; sandy to silty loam; irregular platy structure superimposed on irregular biogenic granular structure; soft; 10YR 3/4 (dry); occasional roots; common fine pores and krotovina; clear boundary.

12-20: cm: A horizon; sandy to silty loam; irregular biogenic granular structure; soft; 10YR 3/4 (dry); occasional roots; common crushed snail shell; few fine siliceous gravels; gradual boundary.

20-50 cm: Bk1 horizon; sandy to silty loam; massive to weak, massive to irregular biogenic granular structure; 10YR 4/3 to 5/2 (dry); many open pores and insect-scale krotovina; occasional fine roots;; few fine gravels; few localized clusters of poorly bounded $CaCO^3$ nodules; abundant diffuse matrix carbonate; clear boundary.

50-70 cm: Bk2 horizon; sandy to silty loam; prominent irregular biogenic granular structure; 10YR 5/2 (dry); many open pores and insect-scale krotovina; occasional fine roots; few fine gravels; few localized clusters of poorly bounded $CaCO^3$ nodules; abundant diffuse matrix carbonate.

Comments: No cultural material noted in profile. Trench terminated at compacted zone representing subsoil (BC or C horizon). Excavated 2-22-17 (recorded 2-23-17).

BT7:

0-15 cm: Ap horizon; sandy to silty loam; irregular platy structure superimposed on irregular biogenic granular structure; soft; 10YR 3/4 (dry); occasional roots; common fine pores and krotovina; clear boundary.

15-22: cm: A horizon; sandy to silty loam; irregular biogenic granular structure; soft; 10YR 3/4 (dry); occasional roots; common crushed snail shell; few fine siliceous gravels; gradual boundary.

22-50 cm: Bk horizon; sandy to silty loam; massive to weak, massive to irregular biogenic granular structure; 10YR 4/3 to 5/2 (dry); many open pores and insect-scale krotovina; occasional fine roots; few fine gravels; few carbonate filaments; abundant diffuse matrix carbonate; clear boundary.

Comments: Similar to BT1 & BT6, but shallower. Trench terminated at compacted zone representing subsoil (BC or C horizon). No cultural material noted in profile. Excavated 2-22-17 (recorded 2-23-17).

BT8:

0-9 cm: Ap horizon; sandy to silty loam; irregular platy structure superimposed on irregular biogenic granular structure; soft; 10YR 4/3 (dry); occasional roots; common fine pores and krotovina; clear boundary.

9-40: cm: A horizon; sandy to silty loam; irregular biogenic granular structure; soft; 10YR 4/3 (dry); occasional roots; common crushed snail shell; sparse charcoal; occasional fragments of burned sandstone; dispersed lithic debitage few fine siliceous gravels; gradual boundary.

40-70 cm: Bk horizon; sandy to silty loam; massive to weak, massive to irregular biogenic granular structure; 10YR 4/3 to 5/2 (dry); many open pores and insect-scale krotovina; occasional fine roots; few fine gravels; few carbonate filaments; abundant diffuse matrix carbonate; clear boundary.

70-80 cm: Bk2 horizon; sandy to silty loam; weak subangular blocky with superimposed irregular biogenic granular structure; 10YR 5/2 (dry); many open pores and insect-scale krotovina; occasional fine roots; few fine gravels; few localized clusters of poorly bounded $CaCO^3$ nodules; abundant diffuse matrix carbonate.

Comments: See laboratory profile. Samples for sediment analysis, thin section analysis, and CT analysis were taken from this profile. The depressions left by the small textural cube samples are visible, but the larger block samples had not yet been collected when the photo was taken. Tortugas point recovered from trench at approximately 50 cmbs. Trench terminated at compacted zone representing subsoil (BC or C horizon). Excavated 2-22-17 (recorded 2-23-17).

BT9

0-25 cm: Ap horizon; sandy to silty loam; irregular platy structure superimposed on irregular biogenic granular structure; soft; 10YR 4/2 (dry); occasional roots; common fine pores and krotovina; clear boundary.

25-60 cm: Ak horizon; sandy to silty loam; massive to weak, irregular biogenic granular structure; slightly hard; 10YR 4/3 (dry); many open pores and insect-scale krotovina; occasional fine roots; few localized clusters of poorly bounded $CaCO_3$ nodules; common snail shell fragments; contains possible pit feature with burned rock in bottom; gradual boundary.

60-90 cm: Bk horizon; sandy to silty loam; massive to weak, massive to irregular biogenic granular structure; 10YR 5/2 to 6/3 (dry); common open pores and insect-scale krotovina; occasional fine roots;; few fine gravels; some diffuse matrix carbonate.

Comments: Possible pit was noted but not investigated. Trench terminated at compacted zone representing subsoil (BC or C horizon). Excavated 2-22-17 (recorded 2-23-17).

BT10:

0-6 cm: Ap1 horizon; sandy to silty loam; irregular platy structure superimposed on irregular biogenic granular structure; soft; 10YR 4/3 (dry); occasional roots; occasional siliceous gravels; common fine pores and krotovina; clearboundary.

6-40 cm: Ap2 horizon; gravelly fine sandy loam; weak subangular blocky structure with superimposed irregular biogenic granular structure; soft to slightly hard; 10YR 5/3 (dry); occasional roots; occasional small (thumb-sized) clasts of burned rock; common snail shells (*Rabdotus spp*); gradual boundary.

40-80 cm: C1 horizon; loamy gravel; very poorly sorted gravel to approx. 10 cm diameter; massive to crudely bedded; primarily rounded siliceous gravels, many with randomly oriented carbonate pendants; includes some possible burned rock clasts; 10YR 5/3 (dry); abrupt irregular boundary.

80-100 cm: 2 Bk horizon; sandy to silty loam; massive to weak, irregular biogenic granular structure; 10YR 6/3 (dry); common open pores and insect-scale krotovina; occasional fine roots;; few fine gravels; occasional fine, poorly bounded carbonate masses; some diffuse matrix carbonate.

Comments: Trench contains only reworked burned rock mixed with many unburned rocks in a shallow, channelized deposit. Randomly oriented carbonate pendants on gravel clasts indicate that this represents short-distance reworking of older, calcified Rio Grande gravels. Trench terminated at compacted zone representing subsoil (BC or C horizon).Excavated 2-22-17 (recorded 2-23-17).

BT11:

0-10 cm: Ap1 horizon; sandy to silty loam; irregular platy structure superimposed on irregular biogenic granular structure; soft; 10YR 4/3 (dry); occasional roots; occasional siliceous gravels; common fine pores and krotovina; clear boundary.

10-35 cm: Ap/C horizon; gravelly fine sandy loam to loamy gravel; weak subangular blocky structure with superimposed irregular biogenic granular structure; soft to slightly hard; 10YR 5/3 (dry); occasional roots; occasional small (thumb-sized) clasts of burned rock; common snail shells (*Rabdotus spp*); gradual boundary.

35-80 cm: 2BCk horizon; sandy to silty loam; massive to weak, irregular biogenic granular structure; 10YR 6/3 (dry); common open pores and insect-scale krotovina; occasional fine roots; abundant crushed snail shell; occasional fine, poorly bounded carbonate masses; some diffuse matrix carbonate; contains large fragments of underlying sandstone.

80-82 cm: 2Cr horizon: Weathered, brecciated sandstone bedrock.

Comments: Trench contains only small reworked burned rock fragments mixed with many unburned clasts in a shallow, channelized deposit. As in BT10, this represents short-distance reworking of older, calcified Rio Grande gravels. Trench terminated in brecciated sandstone bedrock. Excavated 2-22-17 (recorded 2-23-17).

BT12:

0-8 cm:	Ap1 horizon; sandy to silty loam; irregular platy structure superimposed on irregular biogenic granular structure; soft; 10YR 4/3 (dry); occasional roots; occasional siliceous gravels; common fine pores and krotovina; clear boundary.
8-42 cm:	Ap2 horizon; gravelly fine sandy loam; weak subangular blocky structure with superimposed irregular biogenic granular structure; soft to slightly hard; 10YR 5/3 (dry); occasional roots; occasional small (thumb-sized) clasts of burned rock; common snail shells (*Rabdotus spp*) and crushed snail shell; gradual boundary.
42-80 cm:	Bk horizon; sandy to silty loam; massive to weak, irregular biogenic granular structure; 10YR 6/3 (dry); common open pores and insect-scale krotovina; occasional fine roots;; few fine gravels; common fine, poorly bounded carbonate masses; some diffuse matrix carbonate; occasional thumb-sized fragments of thermally-fractured siliceous rock; clear boundary.
80-100 cm	2BC horizon; fine sandy loam; massive; slightly hard; 10YR 7/4 (dry).
Comments:	Trench terminated at compacted zone representing subsoil (BC horizon)

BT13:

0-15 cm: Ap1 horizon; sandy to silty loam; irregular platy structure superimposed on irregular biogenic granular structure; soft; 10YR 4/2 (dry); occasional roots; common fine pores and krotovina; clear boundary.

15-50 cm: Ap2 horizon; sandy to silty loam; irregular biogenic granular structure; soft; 10YR 4/2 (dry); occasional roots; common crushed snail shell; occasional siliceous gravels and cobbles; clear boundary.

50-95 cm: Bk horizon; sandy to silty loam; massive to weak, irregular biogenic granular structure; 10YR 5/2 (dry); common open pores and insect-scale krotovina; occasional fine roots; common fine gravels; common crushed snail shell; few localized clusters of poorly bounded $CaCO^3$ nodules; clear boundary.

95-120 cm: BC horizon; sandy to silty loam; massive; compact; slightly hard to hard; 10YR 6/2 to 7/4 (dry).

Comments: Trench situated between BT1 and BT4, but contained very little cultural material Trench terminated in compacted zone representing subsoil (BC or C horizon). Excavated 2-22-17 (recorded 2-23-17).

BT14:

0-42 cm:	Ap horizon; sandy to silty loam; 10YR 5/3 (dry); disturbed scattered flakes and shell.
42-79 cm:	B1 horizon; gravelly sandy to silty loam; 10YR 6/2 (dry); common fire cracked rock and flakes; 2% gravels 1-3 cm in size.
79-106 cm:	B2 horizon; gravelly sandy to silty loam; 10YR 7/3 (dry); 2% gravels 1-3 cm in size; $CaCO^3$ nodules; clear boundary.
106-125 cm:	C horizon; sandy to silty loam; weathered sandstone parent material; 2.5Y 8/2 (dry); includes sandstone fragments.
Comments:	Trench terminated in compacted zone representing subsoil (C horizon). Trench recorded by Corey Crawford.

BT15:

0-43 cm: Ap horizon; sandy loam; 10YR 5/3 (dry); clear boundary.

443-77 cm: B horizon; sandy loam; 10YR 6/2 (dry); contains snail shell, fire cracked rock and flakes; clear boundary.

777-110 cm: Bk horizon; sandy loam; 10YR 7/3 (dry); common $CaCO^3$ nodules; clear boundary.

100-125 cm: C horizon; gravelly sandy loam; 2.5Y 8/2 (dry); 30% gravels between 0.5 cm and 10 cm in diameter.

Comments: Trench terminated at compacted zone representing older alluvium (C horizon).Trench recorded by Corey Crawford.

APPENDIX B

Soil Micromorphology

Dr. Charles Frederick and Dr. James T. Abbott

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Soil Micromorphology and Micro CT Scanning of two Soil Blocks from 41SR242

by
Charles D. Frederick
Consulting Geoarchaeologist
Dublin, TX

Introduction

Two oriented soil blocks were collected from Trench 8 at site 41SR242 by Jim Abbott. One block was collected from a depth of 15-23 cm below the ground surface, in a portion of the profile that had been subjected to root plowing. The second sample was collected from a depth of 45-53 cm below the ground surface, in a portion of the profile where the dominant fabric appeared to be biogenic in nature, primarily associated with insect bioturbation. These blocks were wrapped in foil and tape in order to preserve their undisturbed fabrics.

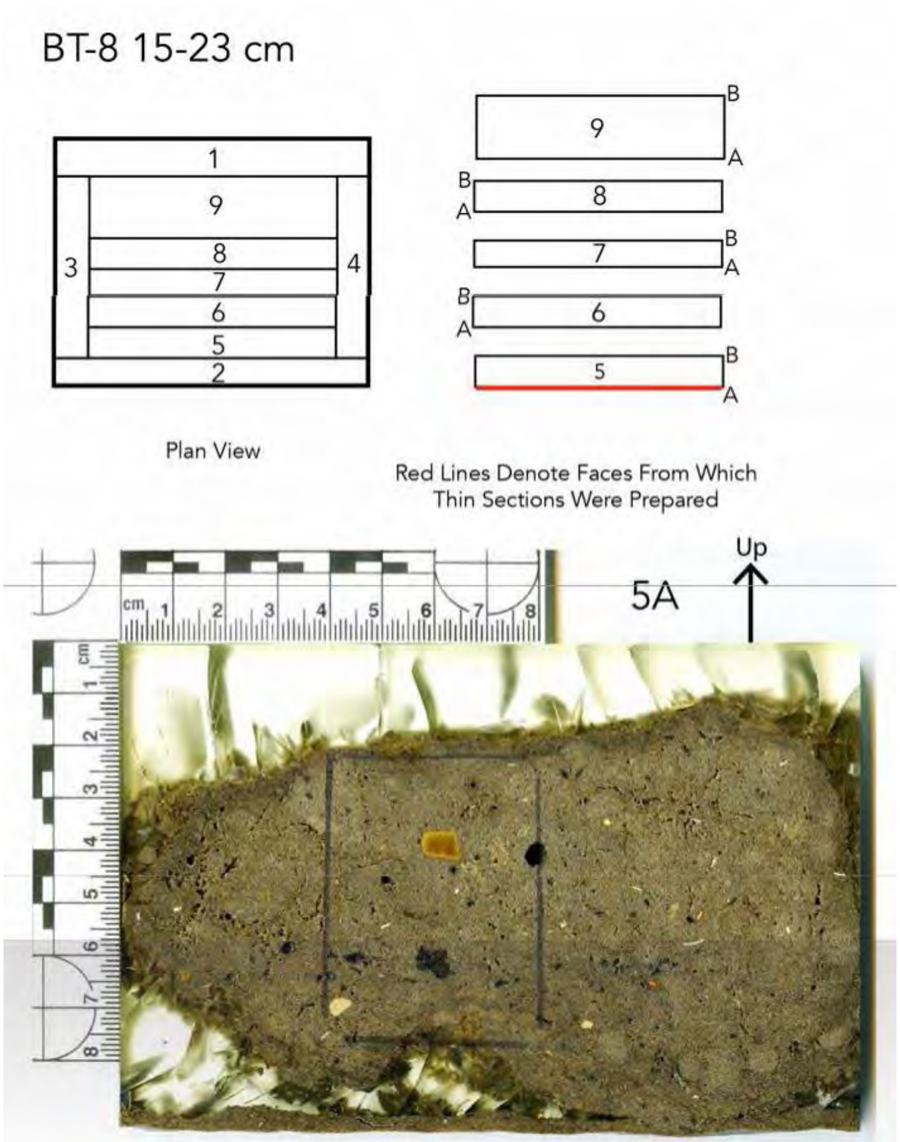

Figure B1: *Top Left*: Plan view of the soil block showing how it was slabbed on the rock saw. *Top Right*: An exploded view of the slabs for which two scans were ade, showing how they relate to each other, and the nomenclature used to designate them (A & B). *Bottom*: Reflected light scan of slab 5a. Black rectangle shows the area from which the thinsection was prepared.

The blocks were first submitted to the High-Resolution X-Ray Computed Tomography Facility at the University of Texas at Austin (UTCT; see http://www.ctlab.geo.utexas.edu) for CT scanning in order to provide a different view of the soil matrix. CT scanning has been done on soil before (cf. Huisman and Milek 2017; Hgan-Tillard and Huisman 2017) but is still a relatively novel process. After the CT scans were completed, the blocks were embedded in a polyester resin mixture (70% non-promoted polyester resin, 30% styrene, <1% methyl ethyl ketone peroxide) and after the resin had polymerized, the block were placed in a low temperature oven overnight to cure. They were then slabbed on a rock saw in order to provide multiple cross sections that could be directly compared to the micro CT scans. Figure B1 and Figure B2 show a plan view of the original consolidated block and how it was slabbed. All cut faces were scanned, and where a slab had two cut faces (as did most of the interior slabs) one side was designated A and the other B. Each face was then scanned using reflected light on a flatbed scanner. Three slabs, one from the upper block (15-23 cm, slab 5a) and two from the lower block (45-53 cm, slabs 6a and 8b) were selected for thin section preparation, specifically focusing on peofeatures associated with burrowing. Direct comparison of the reflected light scan and a cross-section derived from the 3D CT scan are provided on Figures B3, B4, and B5.

From each slab a single area, approximately 3 cm x 5 cm, was chosen for thin section manufacture, and the areas chosen are shown outlined in black ink on the lower portions of Figures B1 and B2. The selected areas were then trimmed on a tile saw, dried and then submitted to National Petrographic Service (Rosenberg, Texas) for the preparation of 2" x 3" thin sections. Upon receipt of the thin sections, each slide was scanned on a flat-bed scanner at a resolution of 1200 dpi using transmitted light, and using pseudo-darkfield conditions (reflected light with the scanner top open) which highlights different attributes of the deposits. Figure B6 shows the area of each slide in different states of preparation, specifically as viewed in transmitted light, pseudo darkfield, reflected light scan of slab, and approximate cross-section derived from the computed tomography.

These slide scans, which highlight different attributes of the materials, were then examined at various magnifications using a Zeiss AXIO Zoom v16 microscope under plane transmitted light, cross-polarized light, oblique incident light, and blue light epiflourescence in order to identify features associated with apparent biogenic activity. These features were then highlighted on the transmitted plane light scan using simple and dashed lines (see Figures B7, B9, and B11). Specific areas were then selected to highlight features of interest and photographed; the locations of these photos are shown on Figures B8, B10, and B12). For each thin section, a basic description was compiled of the overall slide. These descriptions are presented on Tables 1, 2 and 3.

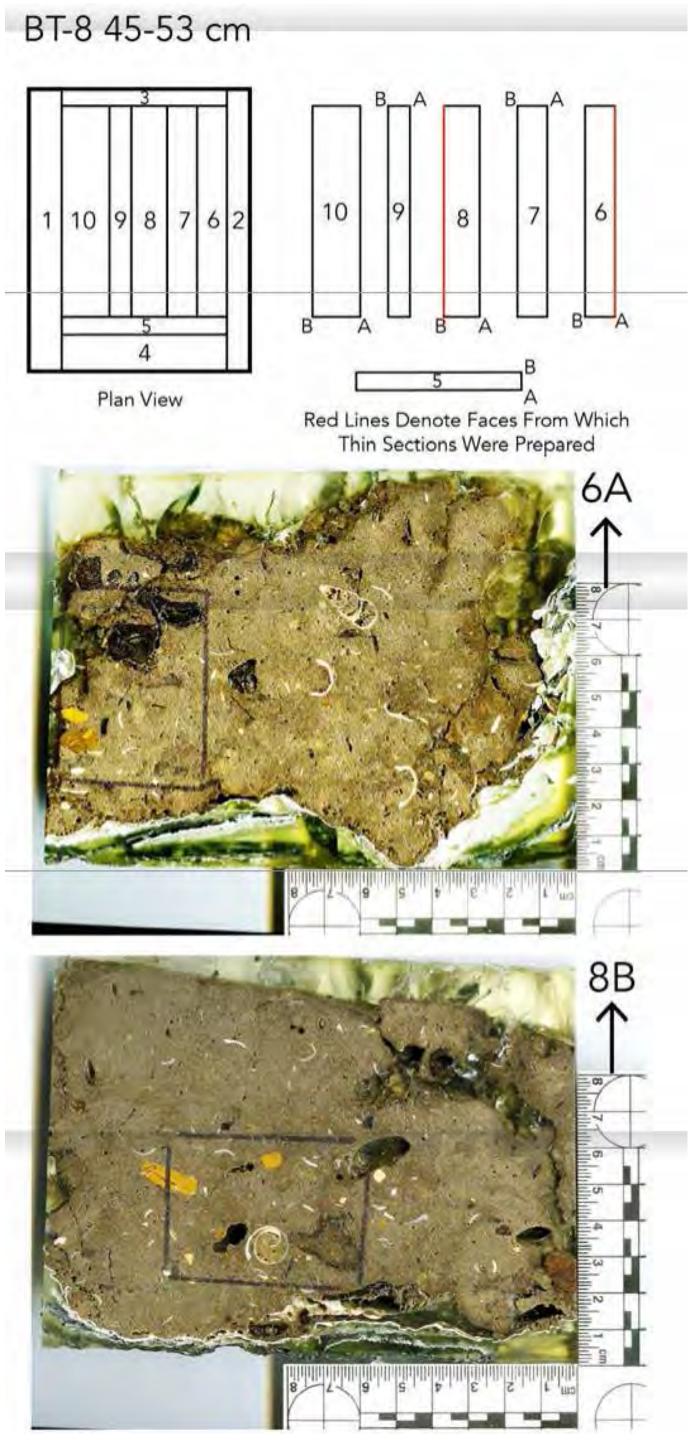

Figure B2: *Top Left*: Plan view of the block identifying the slabs created when the block was slabbed on the rock saw. *Top Right*: Both sides of each slab were scanned and this exploded view shows how the scanned slabs relate to each other. The red lines denote the scanned slabs used to prepare thin sections. *Middle*: Reflected light scan of slab 6a, with the black rectangle denoting the portion of the slab from which the thin section was prepared. *Bottom*: Reflected light scan of slab 8b. Black rectangle is the portion of the slab from which the thin section was prepared.

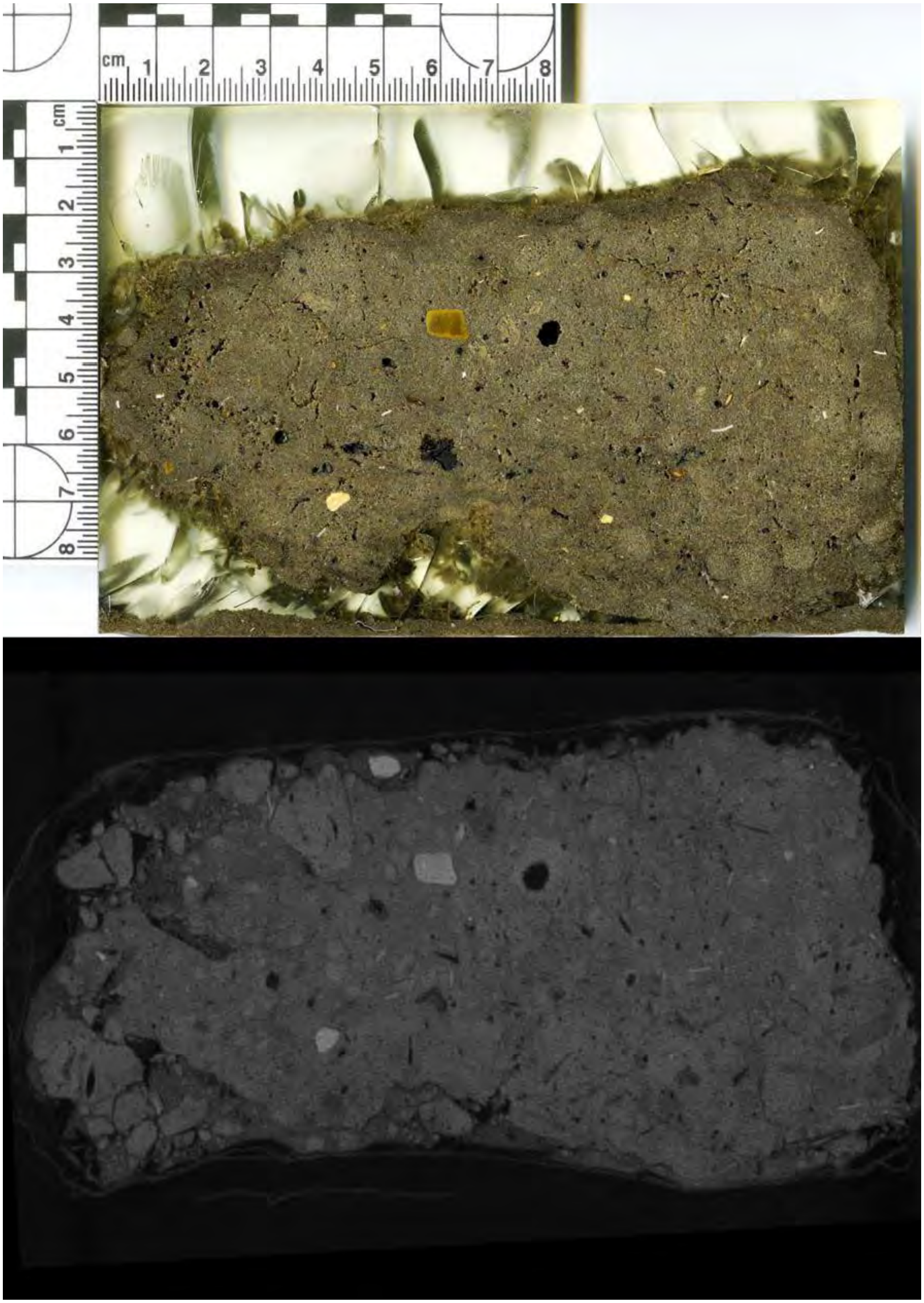

Figure B3: *Top Half*: Reflected light scan of slab 5a from the 15-23 cm depth block from which the thin section was prepared. *Bottom Half*: Cross-section derived from the CT scan data of approximately the same section line as shown in the top half.

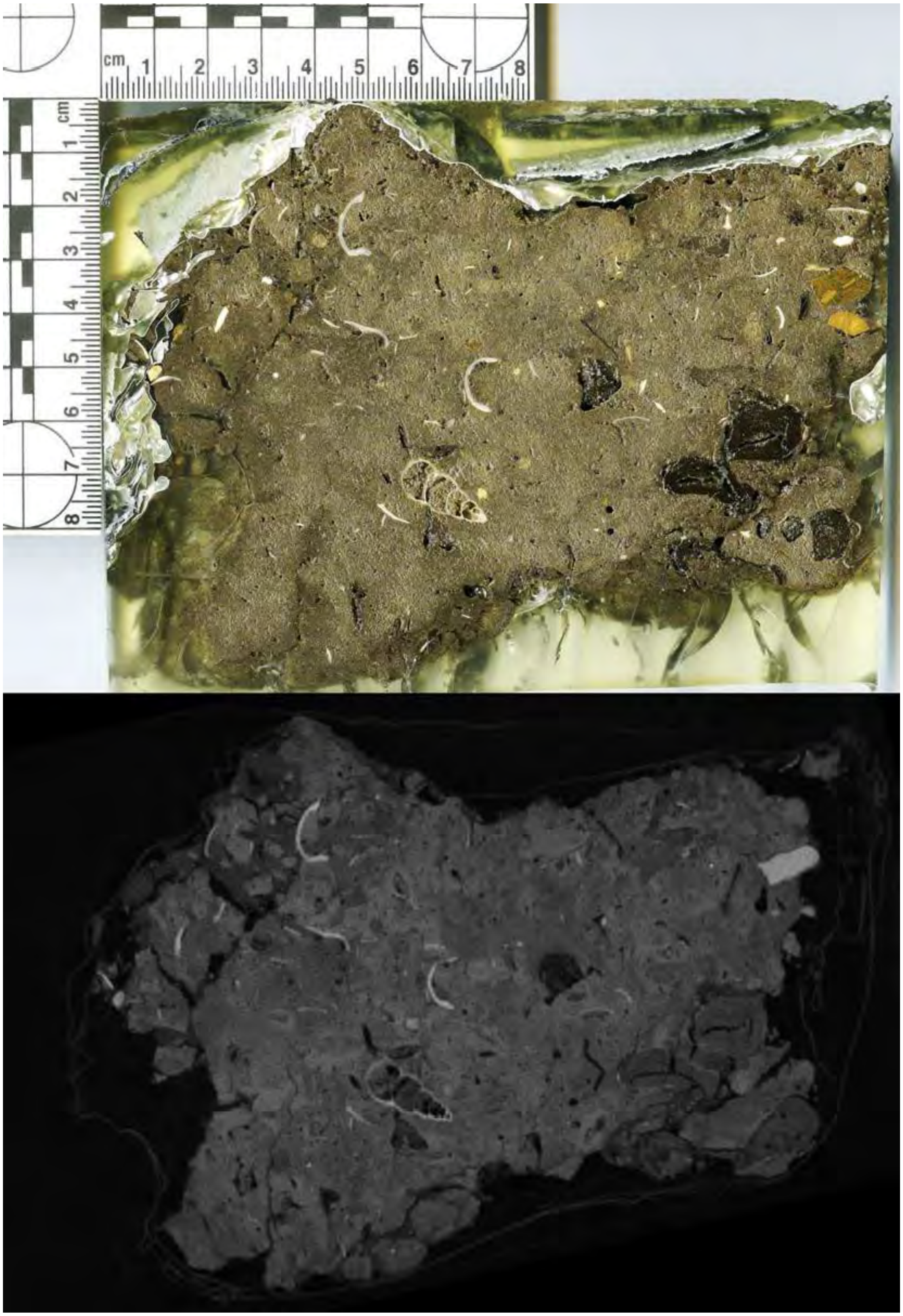

Figure B4: *Top Half*: Reflected light scan of slab 6a cut from the 45-53 cm block. *Bottom Half*: A CT scan derived illustration of approximately the same section line as shown above.

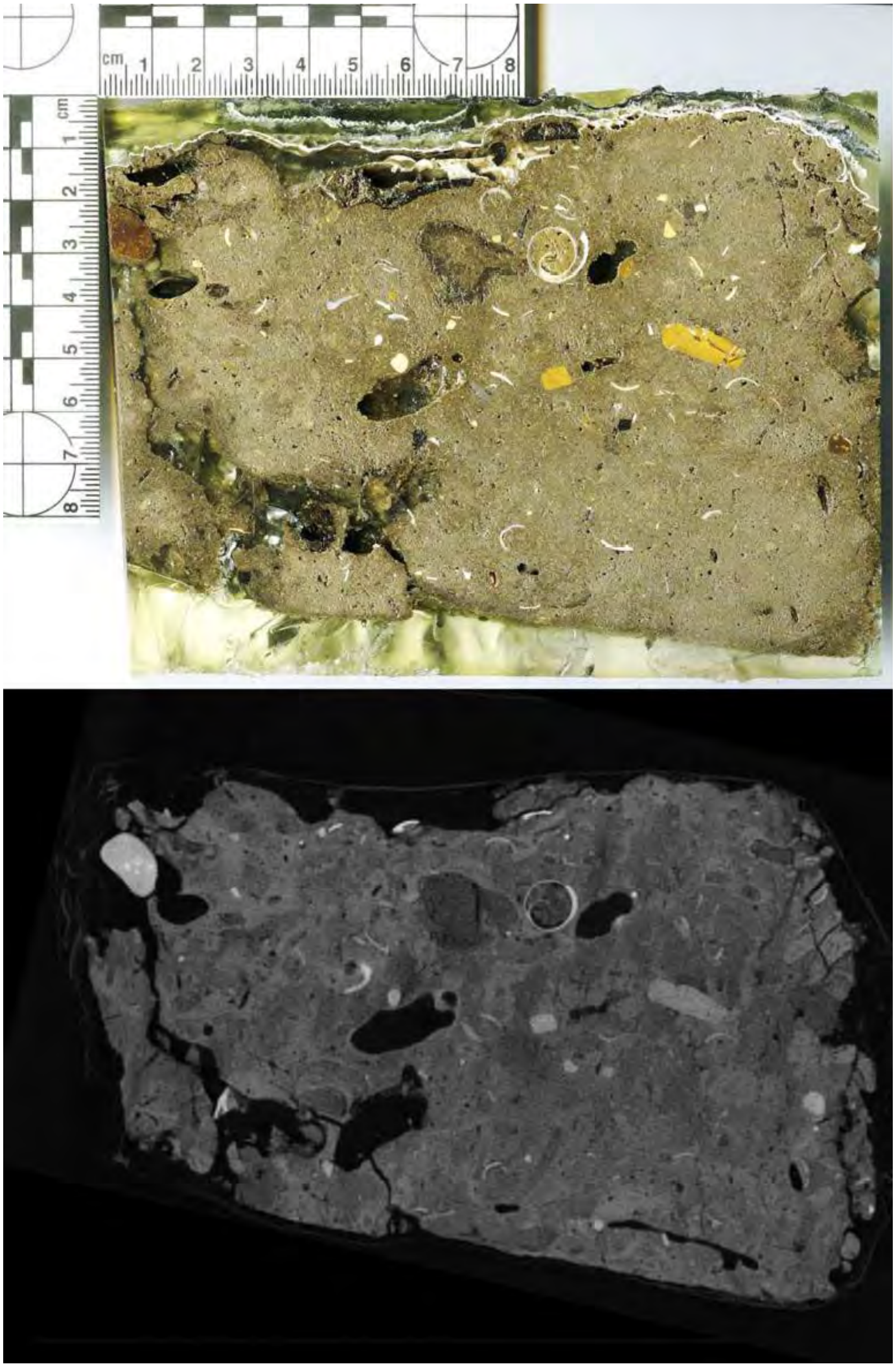

Figure B5: *Top Half*: Reflected light scan of slab 8b cut from the polyester embedded 45-53 cm block sample. *Bottom Half*: A CT scan of approximately the same section line as shown above.

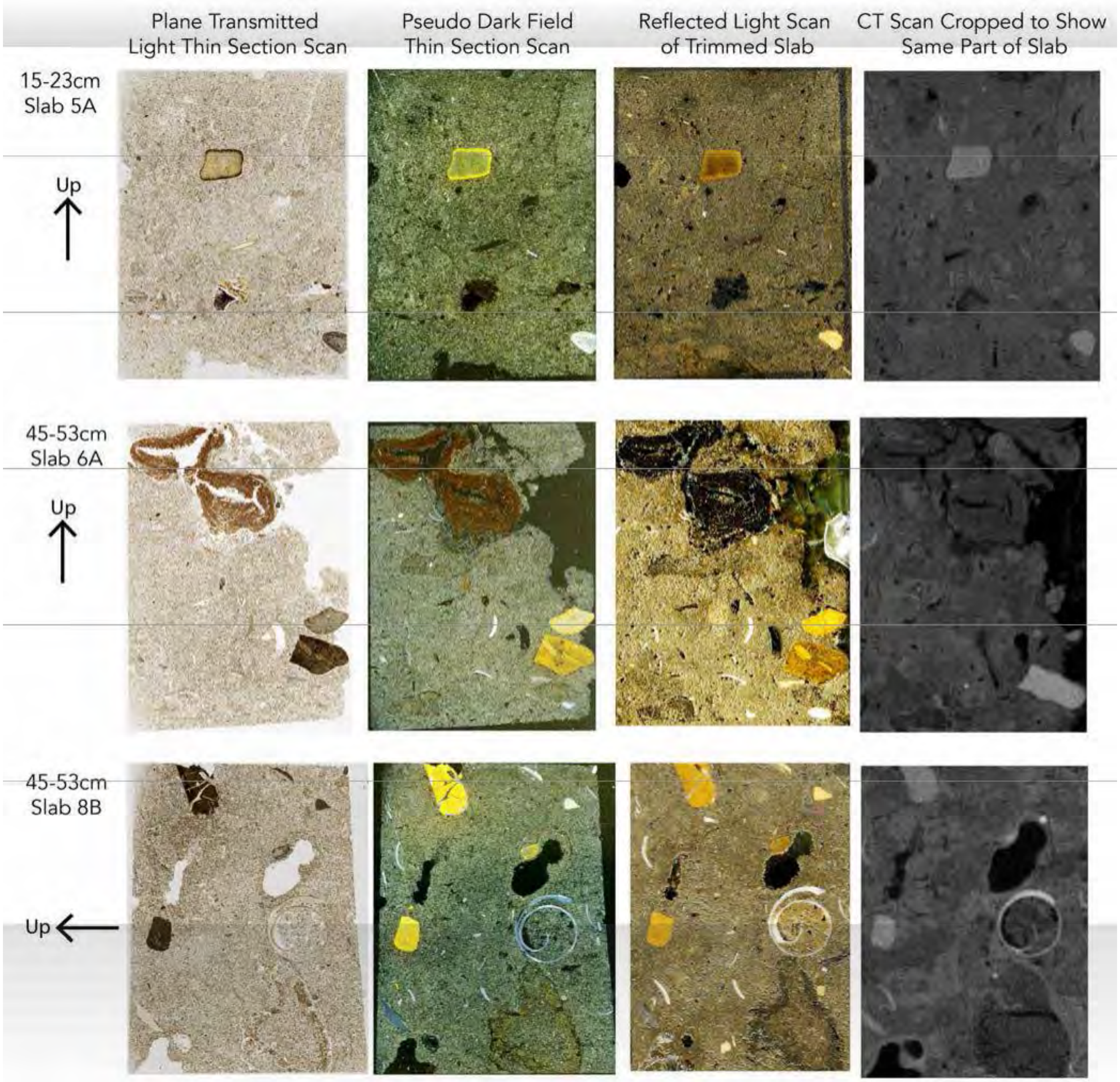

Figure B6: Four different views of the thin section slides (left two images) and source of the slides from which the three thin sections prepared from the embedded soil blocks(right two images). Top row is the single thin section made from the 15-23 cm depth block, while the lower two rows are the two thin sections made from the 45-53 cm depth block. The left column shows a transmitted light scan of each thin section. The second from left column shows each slide in pseudo-dark field, which highlights reflective mineral and biogenic mineral matter. The third column from the left shows a reflected light scan of the polyester embedded blank from which the slide was prepared. The fourth column is approximately the same field of view as seen from the CT scan, made before the block was impregnated with polyester resin.

Figure B7: View of the transmitted light scan of the thin section of sample 15-23 cm slab 5a annotated to highlight relatively distinct bioturbation related textural/fabric pedofeatures. The heavy dashed line in the top right outlines a relict ped fragment (which is much more clearly visible on the CT scan of this slab; see Figure B3). The solid lines surround a variety of features which vary in degree of cohesion, density of fine matrix, and textural patterns. Some of these exhibit (bottom left) bow-like fine-textured fill which may be in fills of silt sized material, or compressed and collapsed wall linings (See Figure Textural Features.jpg) . Others are spatially discrete concentrations of more silty matrix within less silty matrix, which are most likely passage features, but with few diagnostic attributes to support this inference. The rectangular box with a diagonal hatch line, in the lower half of the image is a zone containing numerous fragments of undecomposed woody material, the largest of which is in the center of the box and has a presumed fungal body along the top half of the large woody fragment.

Figure: B8: Transmitted plane light image of slide 15-23 cm slab 5a, showing the location of the two photomicrographs made from this thinsection.

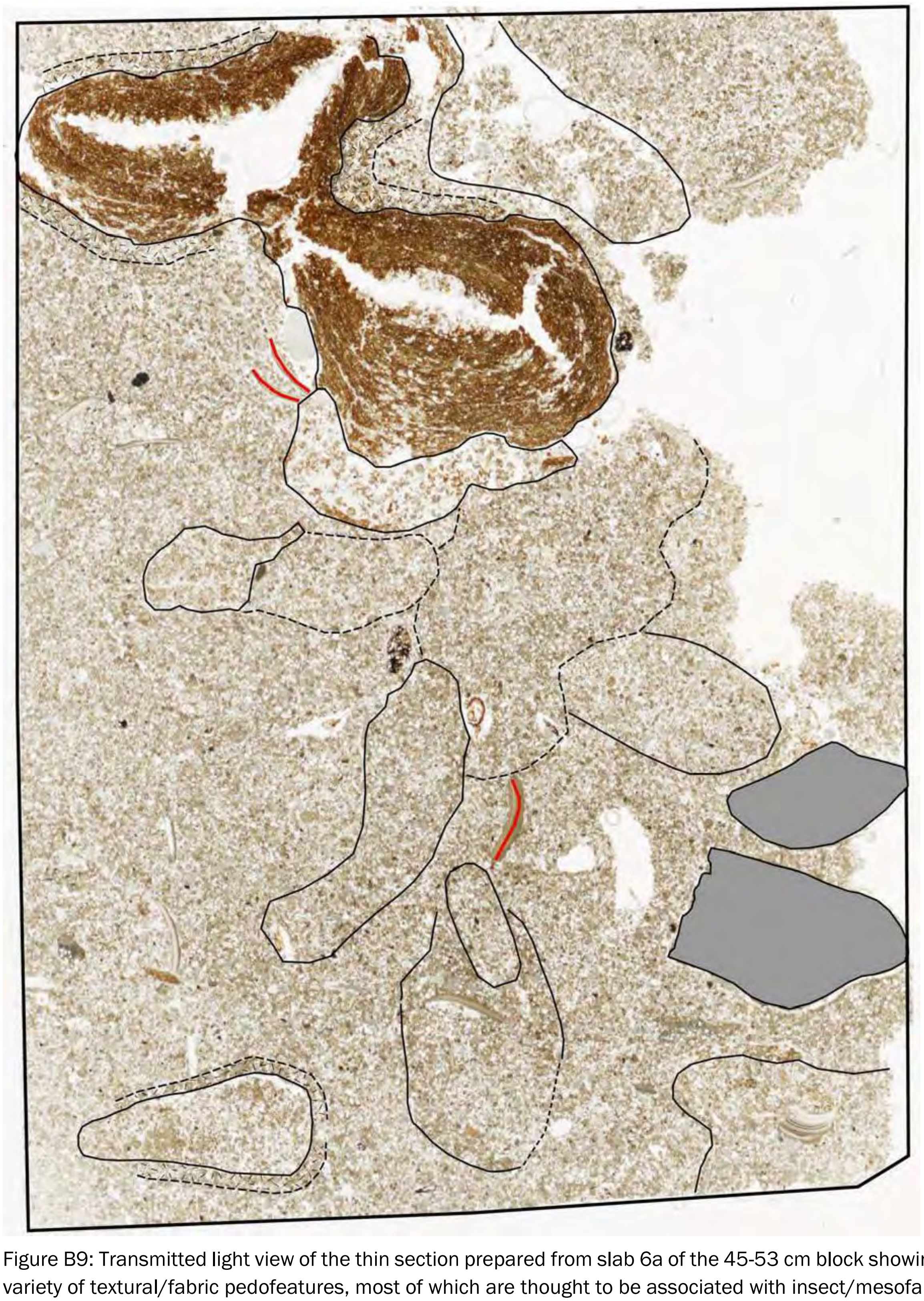

Figure B9: Transmitted light view of the thin section prepared from slab 6a of the 45-53 cm block showing a variety of textural/fabric pedofeatures, most of which are thought to be associated with insect/mesofauna bioturbation.

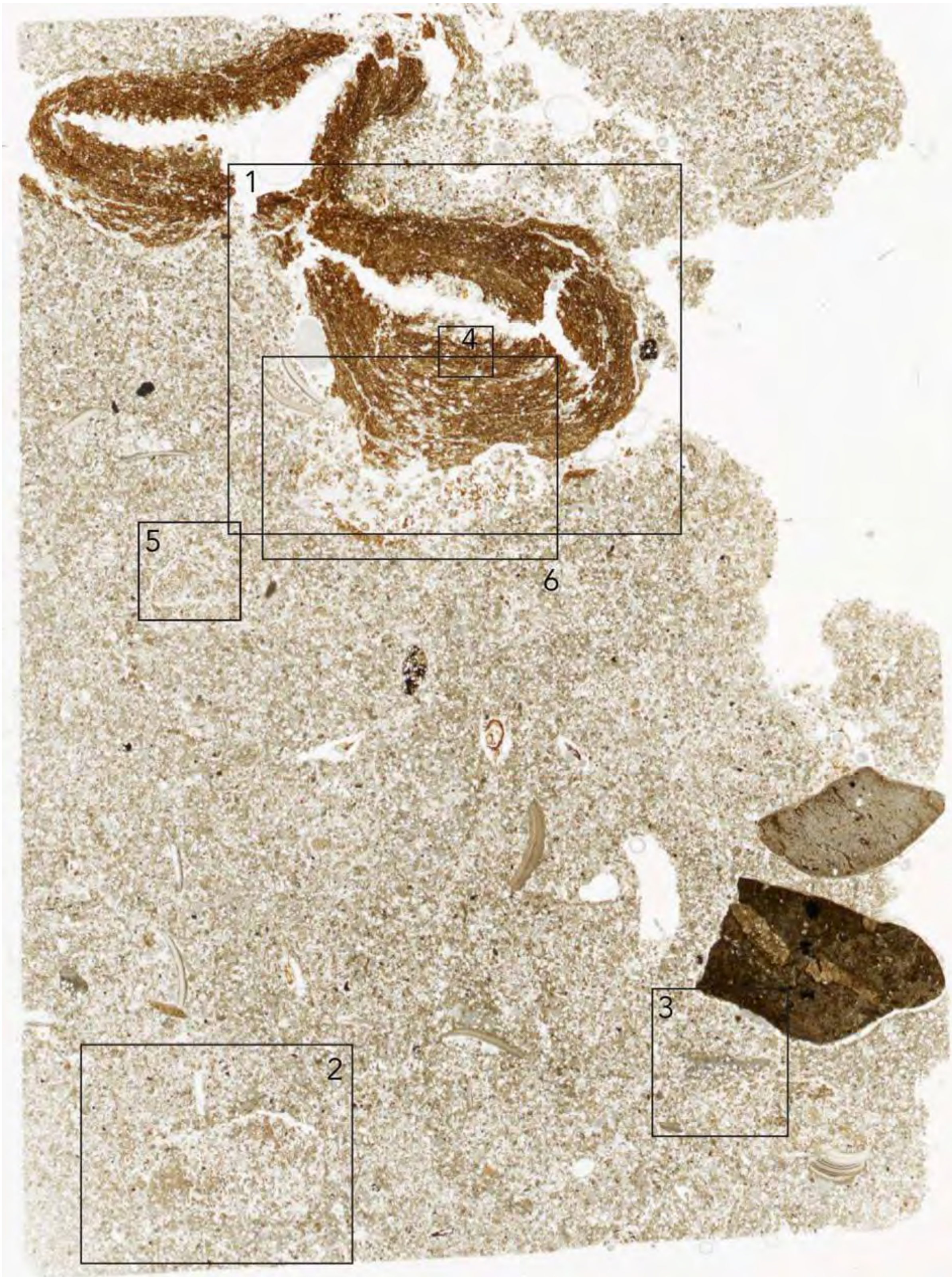

Figure B10: View of the plane light scan of the thin section prepared from slab 6a of the 44-53 cm block, showing the location of various photomicrographs made of this slide.

Figure B11: Annotated view of the transmitted light scan of the thin section made from slab 8b of the 45-53 cm block. Most of the features outlined are either open chambers or filled chambers with a relatively thick coat of sediment that is more organic rich and/or finer textured than the surrounding sediment. Also highlighted are other textural/fabric pedofeatures that are associated with faunal activity which exhibit clear edges, internal features that clearly denote them as passages or filled chambers, or areas with less dense matrix that is probably a passage featue (dashed line) but does not exhibit any infill attributes that clearly support this interpretation. Also highlighted are a transverse section of a snail shell (S) and a chert flake (F).

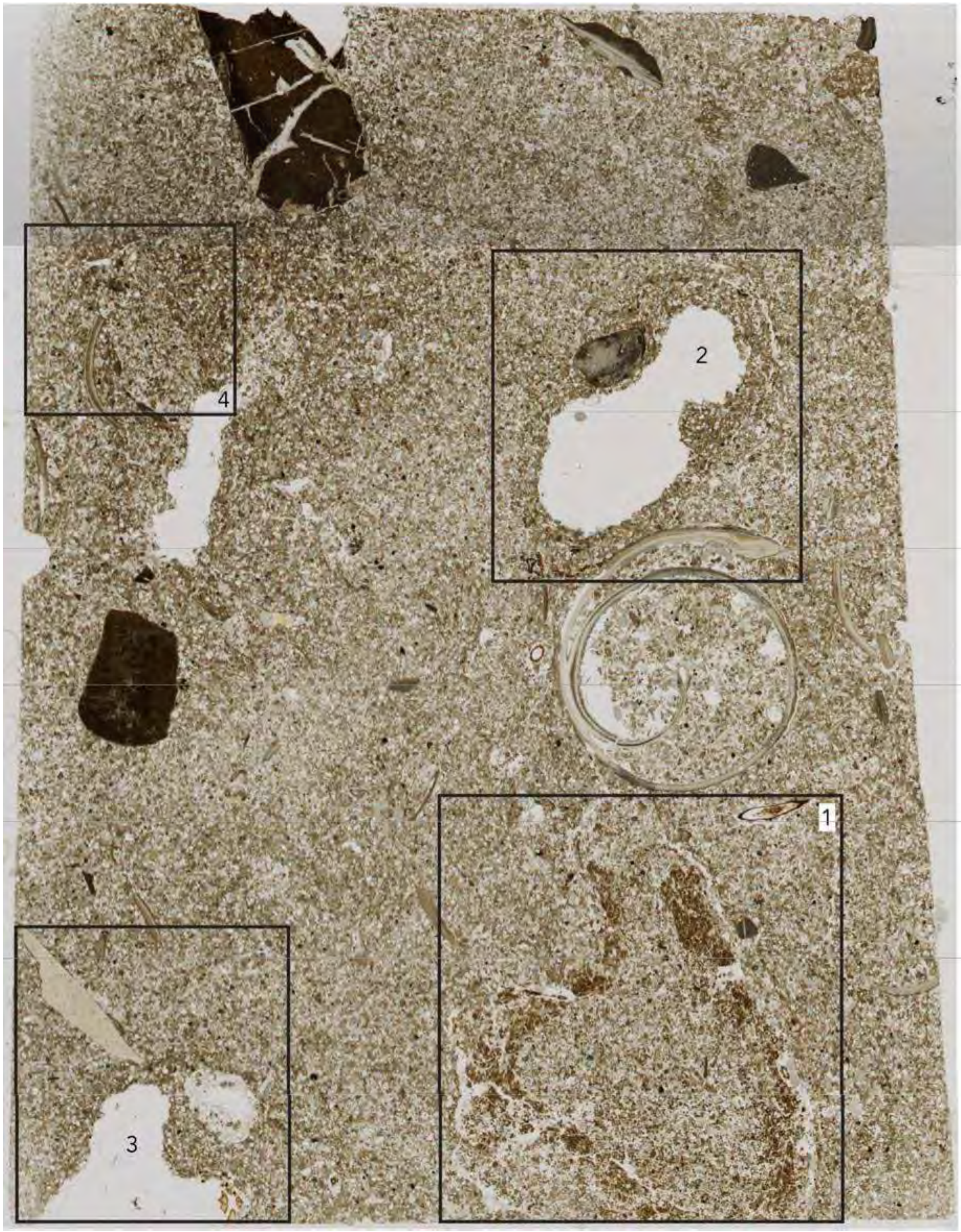

Figure B12: View of the transmitted light scan of the thin section prepared from slab 8b of the 45-53 cm block showing the location of photomicrographs made from this thin section.

Analysis

The results of this work revealed significant differences between the two blocks, which are summarized below. For analysis of the faunal related features guidance was provided by Genise (2017), Kooistra and Pulleman (2010), Nicosia and Stoops (2017), Bullock et al., (1985).

Sample 15-23 cm

This sample, as noted by Abbott in the field, contains numerous subrounded blocky fragments which presumably are portions of peds disturbed by the root plowing (see Figure B7). One of these was clearly visible in the top right of the thin section, but is even more distinct on the CT scan (see Figure B3). Although this sample exhibits numerous textural or fabric pedofeatures that are interpreted as associated with biogenic activity, unlike the lower block, most of these appear to be fragments, or very broad areas of similar fabric which contrasts with the surrounding matrix. The biogenic features here appear to be less common, less pervasive, and scattered throughout the block. In the lower third of this slide there is a 1-2 cm thick zone (highlighted with a broad rectangular box on Figure B7) where there numerous scattered, disarticulated fragments of primarily lignified woody tissue (presumably roots) some of which appear to have either fungal or plant organ tissue associated (Figure B13).

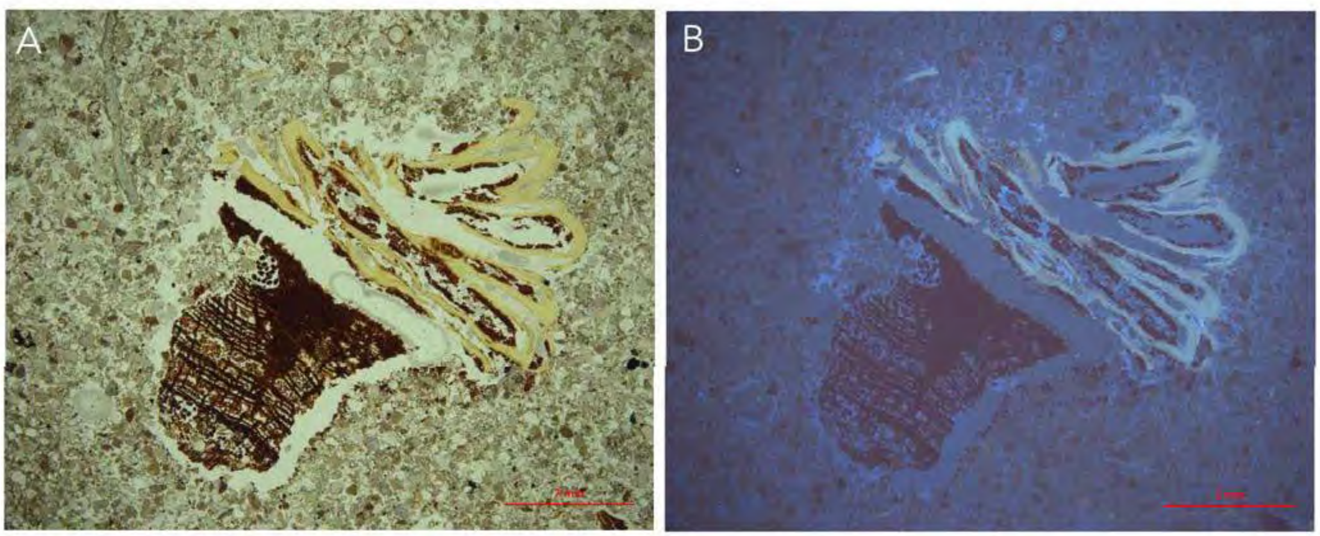

Figure B13: A. Plane light view of a large (2 x 3 mm) blocky fragment of lignified tissue, presummably a root (blocky lower half), and a complex folded light yellow structure that is either plant organ tissue or fungal hyphae. Sample 15-23 cm, slab 5a, photomicrograph 1. B. Same view as at left, but in blue light epifluorescence. Note that the plant tissue that is pale yellow in plane light fluoresces under blue light.

Sample 45-53 cm

This sample presents many more, clearly in situ, and most likely multiple generations of biogenic textural/fabric pedofeatures. The most distinct are centered on open vesicles/chambers than have various forms of linings, which range from dominantly organic matter with small amounts of mineralic material, to dominantly mineral material with traces of organic constituents, and various intergrades between these two end members. The features I have typically associated in the field with termite activity are like the large, open center vesicle with a thick laminated organic lining (slab 6a; Figure B14 panels A, B, C and D). I infer that features like that shown on Figure B14 panels E and F, and Figure B15 panels A and B, are aged and infilled versions of the same type of feature, but it is possible that they are completely different.

In addition to these large vesicles with variable linings and infillings, there are other types of biogenic structures present here as well. Some, such as the two shown on Figure B15 panels C, D (in situ in the 45-53 cm block), E and F (and disarticulated in the 15-23 cm block), exhibit fine-grained linings that are principally finer textured mineralic material rather than organic material. There are also areas which are filled with pellets/excrements which range widely in size from large pellets with little evidence of coalescence (Figure B16, panels C & D), to very small pellets/excrements that are smaller than the sand grains (Figure B16 panels A & B).
There are also traces of passage features with weakly preserved traces of bow-like structures (center bottom of slide 6a, not shown separately).

Hence the evidence for the lower block, in thin section, is one of a more complete and intact fabric associated with biogenic activity. Much of this appears to be associated with termites, but the fecal pellets and bow-like structured infills are clearly some other agent.

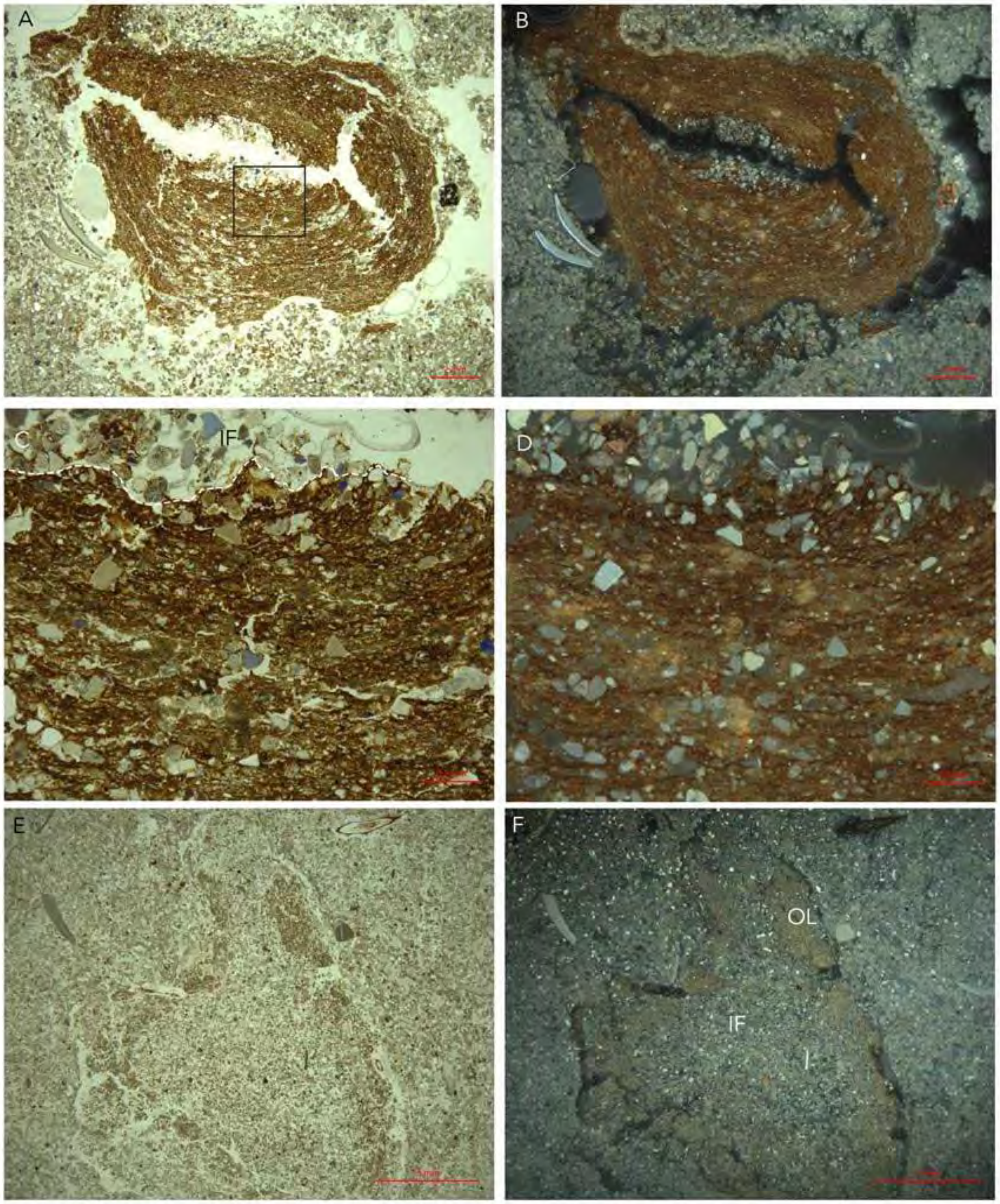

Figure B14: A. Multilayered dominantly organic lining with bow-like structure (compare to Genise 2017:53, Figure 3.14 b, example of termitic micromorphological features). Slab 45-53 6a-1, plane light. Square denotes area enlarged in panels C and D. B. Same as A, oblique incident light. C. Close up of the multilayered organic lining, plane light. Note the start of dominantly mineralic infill at the top of the frame (IF) separated by the white dashed line. D. Same view as C, but in oblique incident light, which emphasizes the mineralic component. The lighter colored areas most likely contain more fine mineral matrix which is calcium carbonate rich. E. A completely infilled vessicly that originally contained a multilayered organic lining. This feature most likely looked like the vessicle shown in A, prior to abandonent and infilling. Subsequent bioturbation has reworked the original organic lining in several places, and some of it appears to have been dispersed into the infilling. F. Same view as E but in oblique incident light. Here the organic lining is slightly more visible owing to its light brown reflection.

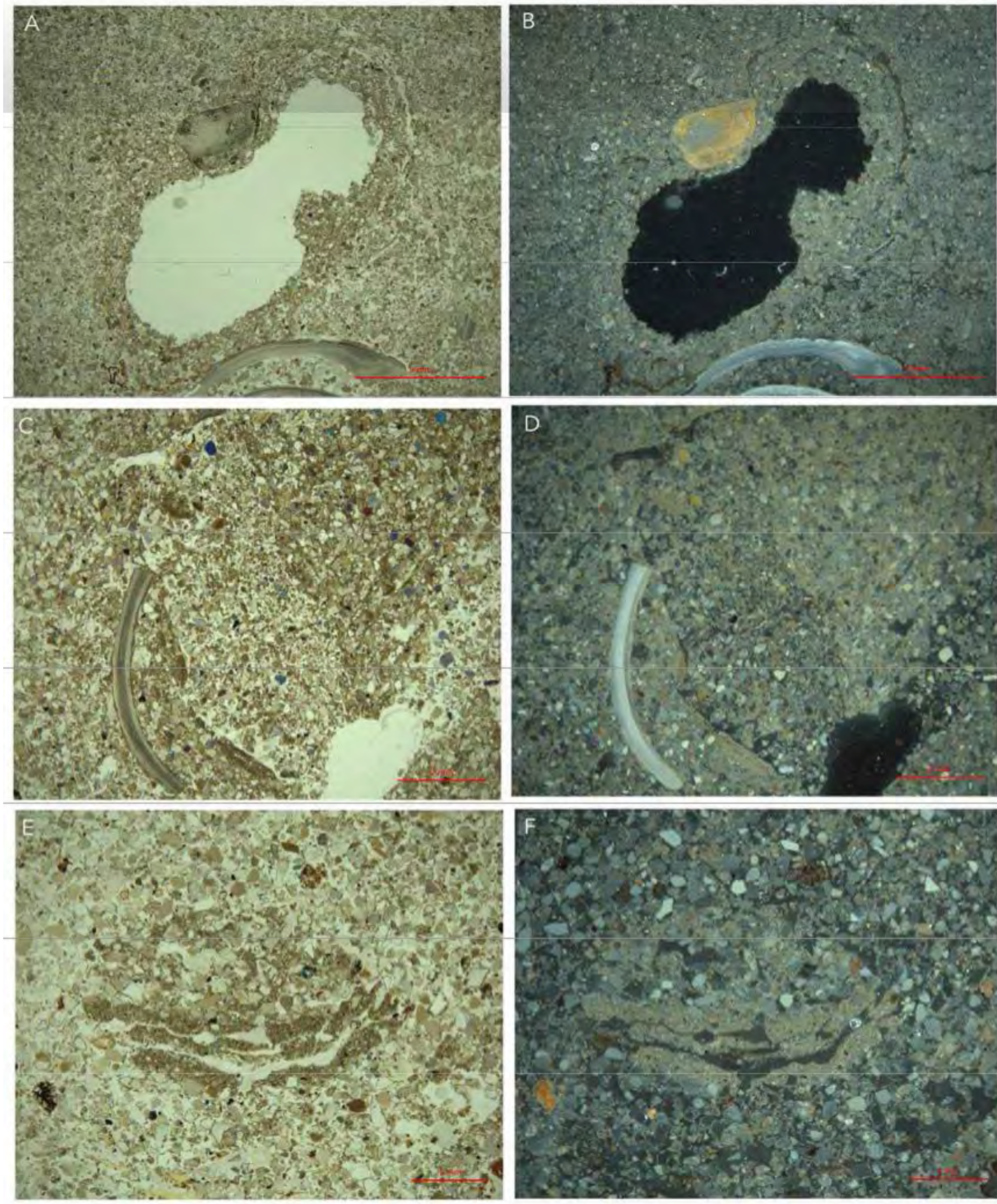

Figure B15: A. 45-53 slab 8B-2. An open vesicle with a stained lining approximately 1 mm thick. Compare with Genise 2017:17, Figure 2.9 d. This lining is parting from the plasma along a thin organic coat in the top right, but the particles show no clear preferred orientation. Given the shape I suspect this is termite related, but it also somewhat resembles a pupation chamber Genise 2017:342, Figure 13.22. B. Same as A, but as viewed in oblique incident light. C. 45-53 8B-4. A burrow filled with pellets and sand grains, and which preserves traces of a fine-textured lining, some of which may have been applied in a fluidized state (there is some preferred orientation of mineral grains within this layer). D. Same as C, but as viewed in oblique incident light. E. 15-23 5A-2. Part of a burrow fill or lining, but it is difficult to say which. The dark bands are a mixture of organic matter and fine earth which is calcium carbonate rich (exhibits a crystallitic b-fabric in cross-polarized light). F. Same as E, but viewed in oblique incident light.

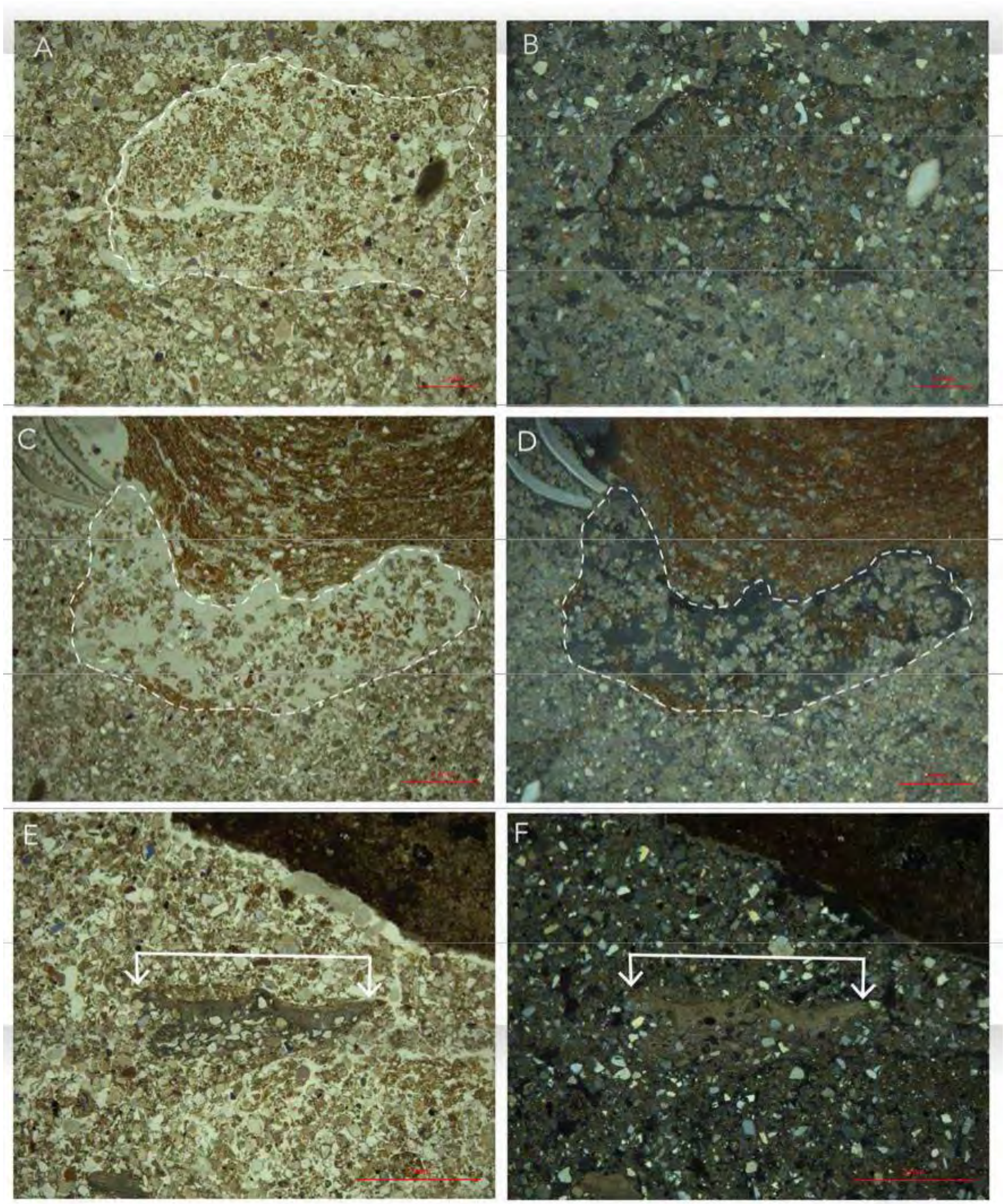

Figure B16: A. Plane light view of a wide passage feature/chamber (outlined in a dashed white line) filled with many very thin spherical pellets/excrements or organic mineralic material which are dark brown in plane light, and much smaller than the sand grains that are also present (sample 45-53 cm slab 6a photomicrograph 5). These pellets are weakly coalesced and porous. B. Same as previous photo, but view is in oblique incident light. Note how the chamber/passage is more clearly defined by the contrast between the organo-mineralic pellets (dark brown) and the more crystallitic b-fabric of the surrounding matrix (light yellow brown).C. An elongate passage feature filled with thin (200-500 micron) circular to ellipsoidal excrement/pellets, that ae weakly coalesced and very porous mineralic to organomineralic material. D. Same as previous photo but as seen in oblique incident light. E. A granule sized fragment of a calcium carbonate cemented sand (beneath and between the arrows), possibly a petrocalcic horizon, plane light. F. Same view as before but in crossed polarized light.

Table 1. Basic Thin Section Description of Sample 15-23 cm Slab 5a

Sample	15-23 cm Slab 5A	Description
Structure	Microstructucture	Intergrain channel to massive
	Dominant Orientation	none
Porosity	Planes	few
	Simple Packing	many
	Complex Packing	common
	Vesicles	rare
	Channels	few
	Cracks	none
	Vughs	none
Groundmass	Grain Size	loam
	Coarse Material Composition	Quartz, 0/1 to 0.4 mm, subrounded, 60-70% Plagioclase Feldspar, 0.1 to 0.4 mm, subrounded, 10-15% Chert, 0.1 to 0.4 mm, 5% to 10%, subrounded to rounded Traces: Microcline, petrocalcic horizon rock fragments, volcanic rock fragments,
	c/f_x ratio	80:20 (40 micron) to 70:30 (40 micron)
	c/f related distribution	Chitonic to open porphyric, few areas with enaulic
	b-fabric	speckled
	Optical features	Pale brown
Biominerals	Phytoliths	--
	Oxalates	--
	Fossils	Terrestrial snail, mostly fragments, 1-3 mm in length
Organic Matter	Opaque Dark	--
	Opaque Light	--
	Partly Decomposed	Zone towards bottom of the slide with numerous fragments of partly decomposed fragments of woody material (roots?)
Pedofeatures	Coats	--
	Infillings	--
	Crystals	--
	Nodules	--
	Excrements	Numerous passage features of various kinds.

Table 2. Basic Thin Section Description of Sample 45-53 cm Slab 6b

Sample	45-53 cm Slab 6B	Description
Structure	Microstructucture	spongy to vessicular
	Dominant Orientation	none
Porosity	Planes	none
	Simple Packing	Many
	Complex Packing	Common (10-20%)
	Vesicles	Few, 2 mm to >2 cm
	Channels	few
	Cracks	none
	Vughs	none
Groundmass	Grain Size	Clay loam
	Coarse Material Composition	Quartz, 0.05 to 0.2 mm, subrounded, 70% Plagioclase Feldspar, 0.1 to 0.2 mm, subrounded, 5% Chert, 0.05 to 0.2 mm, rounded, 10% Traces: Microcline, petrocalcic horizon fragments, Fe-cemented sand (opaque),
	c/f_x ratio	70:30 (40 micron)
	c/f related distribution	Close porphyric to enaulic
	b-fabric	Crystallitic to speckled
	Optical features	Pale brown
Biominerals	Phytoliths	--
	Oxalates	--
	Fossils	Terrestrial snail, mostly fragments, 0.5 to 4 mm in length
Organic Matter	Opaque Dark	--
	Opaque Light	--
	Partly Decomposed	Prominent laminated organic matter lining some vesicles, includes some small sand to coarse silt grains.
Pedofeatures	Coats	Few, 0.1 to 0.2 mm, carbonate lining larger framework grains
	Infillings	--
	Crystals	--
	Nodules	--
	Excrements	Numerous passage features of various kinds.

Table 3. Basic Thin Section Description of Sample 45-53 cm Slab 8b

Sample	45-53 cm Slab 8B	Description
Structure	Microstructucture	Massive to vesicular
	Dominant Orientation	none
Porosity	Planes	none
	Simple Packing	Many
	Complex Packing	Common (10-20%)
	Vessicles	Few, 2 mm to >1.5 cm
	Channels	none
	Cracks	none
	Vughs	none
Groundmass	Grain Size	Clay loam to loam
	Coarse Material Composition	Quartz, 0.1 to 0.4 mm, subrounded, 60-70% Plagioclase Feldspar, 0.1 to 0.4 mm, subrounded, 10-15% Chert, 0.1 to 0.4 mm, 5% to 10%, subrounded to rounded Volcanic rock fragments, 0.2 to 0.4 mm, 1-2%, rounded, 1-2% Traces: Microcline, petrocalcic horizon fragments,
	c/f_x ratio	70:30 (40 micron)
	c/f related distribution	Close porphyric to enaulic
	b-fabric	Crystallitic to speckled
	Optical features	Pale brown
Biominerals	Phytoliths	--
	Oxalates	--
	Fossils	Terrestrial snail, mostly fragments, 0.5-3 mm in length
Organic Matter	Opaque Dark	--
	Opaque Light	--
	Partly Decomposed	One prominent filled chamber that has a thick, partially preserved dominantly organic matter lining that itself has been partly disturbed by bioturbation, which contains a significant component of partially decomposed organic matter.
Pedofeatures	Coats	Few, 0.1 to 0.2 mm, carbonate lining larger framework grains
	Infillings	--
	Crystals	--
	Nodules	--
	Excrements	Numerous passage features of various kinds.

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APPENDIX C

Radiocarbon Data

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Beta Analytic Inc.
4985 S.W. 74 Court
Miami, Florida 33155 USA
PH: 305-667-5167
FAX: 305-663-0964
beta@radiocarbon.com
www.radiocarbon.com

Consistent accuracy delivered on time

Darden Hood
President

Ronald Hatfield
Christopher Patrick
Deputy Directors

July 03, 2017

Dr. Chris Dayton
Cox Mclain Environmental Consulting
8401 Shoal Creek Blvd.
No. 100
Austin, TX 78757
USA

RE: Radiocarbon Dating Results

Dear Dr. Dayton,

Enclosed are the radiocarbon dating results for seven samples recently sent to us. The report sheet contains the Conventional Radiocarbon Age (BP), the method used, material type, and applied pretreatments, any sample specific comments and, where applicable, the two-sigma calendar calibration range. The Conventional Radiocarbon ages have been corrected for total isotopic fractionation effects (natural and laboratory induced).

All results (excluding some inappropriate material types) which fall within the range of available calibration data are calibrated to calendar years (cal BC/AD) and calibrated radiocarbon years (cal BP). Calibration was calculated using one of the databases associated with the 2013 INTCAL program (cited in the references on the bottom of the calibration graph page provided for each sample.) Multiple probability ranges may appear in some cases, due to short-term variations in the atmospheric 14C contents at certain time periods. Looking closely at the calibration graph provided and where the BP sigma limits intercept the calibration curve will help you understand this phenomenon.

Conventional Radiocarbon Ages and sigmas are rounded to the nearest 10 years per the conventions of the 1977 International Radiocarbon Conference. When counting statistics produce sigmas lower than +/- 30 years, a conservative +/- 30 BP is cited for the result.

All work on these samples was performed in our laboratories in Miami under strict chain of custody and quality control under ISO/IEC 17025:2005 Testing Accreditation PJLA #59423 accreditation protocols. Sample, modern and blanks were all analyzed in the same chemistry lines by qualified professional technicians using identical reagents and counting parameters within our own particle accelerators. A quality assurance report is posted to your directory for each result.

The cost of the analysis was charged to the credit card provided. Thank you. As always, if you have any questions or would like to discuss the results, don't hesitate to contact us.

Sincerely ,

Darden Hood
Digital signature on file

Beta Analytic
RADIOCARBON DATING
Consistent accuracy delivered on time

DR. M.A. TAMERS and MR. D.G. HOOD
4985 S.W. 74th Court
Miami, Florida, USA 33155
PH: 305-667-5167 FAX: 305-663-0964
beta@radiocarbon.com

REPORT OF RADIOCARBON DATING ANALYSES

Dr. Chris Dayton — Report Date: July 03, 2017

Cox Mclain Environmental Consulting — Material Received: June 26, 2017

Sample Information and Data	Sample Code Number	Conventional Radiocarbon Age (BP) or Percent Modern Carbon (pMC) & Stable Isotopes Calendar Calibrated Results: 95.4 % Probability High Probability Density Range Method (HPD)
Beta - 468115	**SR242-6C**	**2420 +/- 30 BP** IRMS δ13C: -23.1 o/oo

Submitter Material:	Woody Material	**(74.8%)**	**556 - 402 cal BC**	**(2505 - 2351 cal BP)**
		(15.5%)	**748 - 685 cal BC**	**(2697 - 2634 cal BP)**
Analyzed Material:	Wood	**(4.7%)**	**666 - 642 cal BC**	**(2615 - 2591 cal BP)**
Pretreatment:	(charred material) acid/alkali/acid	**(0.4%)**	**587 - 581 cal BC**	**(2536 - 2530 cal BP)**

Analysis Service: AMS-Standard delivery
Percent Modern Carbon: 73.99 +/- 0.28 pMC
Fraction Modern Carbon: 0.7399 +/- 0.0028
D14C: -260.11 +/- 2.76 o/oo
∆14C: -266.09 +/- 2.76 o/oo(1950:2017)
Measured Radiocarbon Age: (without d13C correction): 2390 +/- 30 BP
Calibration: BetaCal3.21: HPD method: INTCAL13

Results are ISO/IEC-17025:2005 accredited. No sub-contracting or student labor was used in the analyses. All work was done at Beta in 4 in-house NEC accelerator mass spectrometers and 4 Thermo IRMSs. The "Conventional Radiocarbon Age" was calculated using the Libby half-life (5568 years), is corrected for total isotopic fraction and was used for calendar calibration where applicable. The Age is rounded to the nearest 10 years and is reported as radiocarbon years before present (BP), “present" = AD 1950. Results greater than the modern reference are reported as percent modern carbon (pMC). The modern reference standard was 95% the 14C signature of NIST SRM-4990C (oxalic acid). Quoted errors are 1 sigma counting statistics. Calculated sigmas less than 30 BP on the Conventional Radiocarbon Age are conservatively rounded up to 30. d13C values are on the material itself (not the AMS d13C). d13C and d15N values are relative to VPDB-1. References for calendar calibrations are cited at the bottom of calibration graph pages.

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DR. M.A. TAMERS and MR. D.G. HOOD
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PH: 305-667-5167 FAX: 305-663-0964
beta@radiocarbon.com

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Cox Mclain Environmental Consulting — Material Received: June 26, 2017

Sample Information and Data	Sample Code Number	Conventional Radiocarbon Age (BP) or Percent Modern Carbon (pMC) & Stable Isotopes Calendar Calibrated Results: 95.4 % Probability High Probability Density Range Method (HPD)
Beta - 468116	**SR242-7C**	**2250 +/- 30 BP** IRMS δ13C: -24.1 o/oo

Submitter Material: Woody Material

(64.1%) 321 - 206 cal BC (2270 - 2155 cal BP)
(31.3%) 395 - 347 cal BC (2344 - 2296 cal BP)

Analyzed Material: Wood
Pretreatment: (charred material) acid/alkali/acid

Analysis Service: AMS-Standard delivery
Percent Modern Carbon: 75.57 +/- 0.28 pMC
Fraction Modern Carbon: 0.7557 +/- 0.0028
D14C: -244.29 +/- 2.82 o/oo
Δ14C: -250.39 +/- 2.82 o/oo(1950:2017)
Measured Radiocarbon Age: (without d13C correction): 2240 +/- 30 BP
Calibration: BetaCal3.21: HPD method: INTCAL13

Results are ISO/IEC-17025:2005 accredited. No sub-contracting or student labor was used in the analyses. All work was done at Beta in 4 in-house NEC accelerator mass spectrometers and 4 Thermo IRMSs. The "Conventional Radiocarbon Age" was calculated using the Libby half-life (5568 years), is corrected for total isotopic fraction and was used for calendar calibration where applicable. The Age is rounded to the nearest 10 years and is reported as radiocarbon years before present (BP), "present" = AD 1950. Results greater than the modern reference are reported as percent modern carbon (pMC). The modern reference standard was 95% the 14C signature of NIST SRM-4990C (oxalic acid). Quoted errors are 1 sigma counting statistics. Calculated sigmas less than 30 BP on the Conventional Radiocarbon Age are conservatively rounded up to 30. d13C values are on the material itself (not the AMS d13C). d13C and d15N values are relative to VPDB-1. References for calendar calibrations are cited at the bottom of calibration graph pages.

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DR. M.A. TAMERS and MR. D.G. HOOD
4985 S.W. 74th Court
Miami, Florida, USA 33155
PH: 305-667-5167 FAX: 305-663-0964
beta@radiocarbon.com

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Cox Mclain Environmental Consulting — Material Received: June 26, 2017

Sample Information and Data	Sample Code Number	Conventional Radiocarbon Age (BP) or Percent Modern Carbon (pMC) & Stable Isotopes Calendar Calibrated Results: 95.4 % Probability High Probability Density Range Method (HPD)	
Beta - 468117	**SR242-5C**	**3260 +/- 30 BP**	IRMS δ13C: -24.1 o/oo

Submitter Material: Woody Material

Analyzed Material: Wood
Pretreatment: (charred material) acid/alkali/acid

Analysis Service: AMS-Standard delivery
Percent Modern Carbon: 66.64 +/- 0.25 pMC
Fraction Modern Carbon: 0.6664 +/- 0.0025
D14C: -333.58 +/- 2.49 o/oo
Δ14C: -338.96 +/- 2.49 o/oo(1950:2017)
Measured Radiocarbon Age: (without d13C correction): 3250 +/- 30 BP
Calibration: BetaCal3.21: HPD method: INTCAL13

(87.8%) 1616 - 1493 cal BC (3565 - 3442 cal BP)
(7.6%) 1481 - 1454 cal BC (3430 - 3403 cal BP)

Results are ISO/IEC-17025:2005 accredited. No sub-contracting or student labor was used in the analyses. All work was done at Beta in 4 in-house NEC accelerator mass spectrometers and 4 Thermo IRMSs. The "Conventional Radiocarbon Age" was calculated using the Libby half-life (5568 years), is corrected for total isotopic fraction and was used for calendar calibration where applicable. The Age is rounded to the nearest 10 years and is reported as radiocarbon years before present (BP), "present" = AD 1950. Results greater than the modern reference are reported as percent modern carbon (pMC). The modern reference standard was 95% the 14C signature of NIST SRM-4990C (oxalic acid). Quoted errors are 1 sigma counting statistics. Calculated sigmas less than 30 BP on the Conventional Radiocarbon Age are conservatively rounded up to 30. d13C values are on the material itself (not the AMS d13C). d13C and d15N values are relative to VPDB-1. References for calendar calibrations are cited at the bottom of calibration graph pages.

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DR. M.A. TAMERS and MR. D.G. HOOD
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PH: 305-667-5167 FAX: 305-663-0964
beta@radiocarbon.com

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Beta - 468118	**SR242-8C**	**2160 +/- 30 BP**	IRMS δ13C: -23.4 o/oo

Submitter Material: Woody Material

(55.3%) 259 - 108 cal BC (2208 - 2057 cal BP)
(40.1%) 358 - 279 cal BC (2307 - 2228 cal BP)

Analyzed Material: Wood
Pretreatment: (charred material) acid/alkali/acid

Analysis Service: AMS-Standard delivery
Percent Modern Carbon: 76.42 +/- 0.29 pMC
Fraction Modern Carbon: 0.7642 +/- 0.0029
D14C: -235.78 +/- 2.85 o/oo
∆14C: -241.94 +/- 2.85 o/oo(1950:2017)
Measured Radiocarbon Age: (without d13C correction): 2130 +/- 30 BP
Calibration: BetaCal3.21: HPD method: INTCAL13

Results are ISO/IEC-17025:2005 accredited. No sub-contracting or student labor was used in the analyses. All work was done at Beta in 4 in-house NEC accelerator mass spectrometers and 4 Thermo IRMSs. The "Conventional Radiocarbon Age" was calculated using the Libby half-life (5568 years), is corrected for total isotopic fraction and was used for calendar calibration where applicable. The Age is rounded to the nearest 10 years and is reported as radiocarbon years before present (BP), "present" = AD 1950. Results greater than the modern reference are reported as percent modern carbon (pMC). The modern reference standard was 95% the 14C signature of NIST SRM-4990C (oxalic acid). Quoted errors are 1 sigma counting statistics. Calculated sigmas less than 30 BP on the Conventional Radiocarbon Age are conservatively rounded up to 30. d13C values are on the material itself (not the AMS d13C). d13C and d15N values are relative to VPDB-1. References for calendar calibrations are cited at the bottom of calibration graph pages.

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beta@radiocarbon.com

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Beta - 468119	**SR242-9C**	**3260 +/- 30 BP** IRMS δ13C: -22.5 o/oo

Submitter Material: Woody Material

Analyzed Material: Wood
Pretreatment: (charred material) acid/alkali/acid

Analysis Service: AMS-Standard delivery
Percent Modern Carbon: 66.64 +/- 0.25 pMC
Fraction Modern Carbon: 0.6664 +/- 0.0025
D14C: -333.58 +/- 2.49 o/oo
Δ14C: -338.96 +/- 2.49 o/oo(1950:2017)
Measured Radiocarbon Age: (without d13C correction): 3220 +/- 30 BP
Calibration: BetaCal3.21: HPD method: INTCAL13

(87.8%) 1616 - 1493 cal BC (3565 - 3442 cal BP)
(7.6%) 1481 - 1454 cal BC (3430 - 3403 cal BP)

Results are ISO/IEC-17025:2005 accredited. No sub-contracting or student labor was used in the analyses. All work was done at Beta in 4 in-house NEC accelerator mass spectrometers and 4 Thermo IRMSs. The "Conventional Radiocarbon Age" was calculated using the Libby half-life (5568 years), is corrected for total isotopic fraction and was used for calendar calibration where applicable. The Age is rounded to the nearest 10 years and is reported as radiocarbon years before present (BP), "present" = AD 1950. Results greater than the modern reference are reported as percent modern carbon (pMC). The modern reference standard was 95% the 14C signature of NIST SRM-4990C (oxalic acid). Quoted errors are 1 sigma counting statistics. Calculated sigmas less than 30 BP on the Conventional Radiocarbon Age are conservatively rounded up to 30. d13C values are on the material itself (not the AMS d13C). d13C and d15N values are relative to VPDB-1. References for calendar calibrations are cited at the bottom of calibration graph pages.

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DR. M.A. TAMERS and MR. D.G. HOOD
4985 S.W. 74th Court
Miami, Florida, USA 33155
PH: 305-667-5167 FAX: 305-663-0964
beta@radiocarbon.com

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Sample Information and Data	Sample Code Number	Conventional Radiocarbon Age (BP) or Percent Modern Carbon (pMC) & Stable Isotopes Calendar Calibrated Results: 95.4 % Probability High Probability Density Range Method (HPD)
Beta - 468120	**SR242-10C**	**2450 +/- 30 BP** IRMS δ13C: -23.6 o/oo

Submitter Material:	Woody Material	**(53.2%)**	**595 - 411 cal BC**	**(2544 - 2360 cal BP)**
		(26.7%)	**754 - 681 cal BC**	**(2703 - 2630 cal BP)**
Analyzed Material:	Wood	**(15.5%)**	**670 - 609 cal BC**	**(2619 - 2558 cal BP)**
Pretreatment:	(charred material) acid/alkali/acid			
Analysis Service:	AMS-Standard delivery			
Percent Modern Carbon:	73.71 +/- 0.28 pMC			
Fraction Modern Carbon:	0.7371 +/- 0.0028			
D14C:	-262.87 +/- 2.75 o/oo			
Δ14C:	-268.82 +/- 2.75 o/oo(1950:2017)			
Measured Radiocarbon Age:	(without d13C correction): 2430 +/- 30 BP			
Calibration:	BetaCal3.21: HPD method: INTCAL13			

Results are ISO/IEC-17025:2005 accredited. No sub-contracting or student labor was used in the analyses. All work was done at Beta in 4 in-house NEC accelerator mass spectrometers and 4 Thermo IRMSs. The "Conventional Radiocarbon Age" was calculated using the Libby half-life (5568 years), is corrected for total isotopic fraction and was used for calendar calibration where applicable. The Age is rounded to the nearest 10 years and is reported as radiocarbon years before present (BP), "present" = AD 1950. Results greater than the modern reference are reported as percent modern carbon (pMC). The modern reference standard was 95% the 14C signature of NIST SRM-4990C (oxalic acid). Quoted errors are 1 sigma counting statistics. Calculated sigmas less than 30 BP on the Conventional Radiocarbon Age are conservatively rounded up to 30. d13C values are on the material itself (not the AMS d13C). d13C and d15N values are relative to VPDB-1. References for calendar calibrations are cited at the bottom of calibration graph pages.

DR. M.A. TAMERS and MR. D.G. HOOD
4985 S.W. 74th Court
Miami, Florida, USA 33155
PH: 305-667-5167 FAX: 305-663-0964
beta@radiocarbon.com

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RADIOCARBON DATING
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REPORT OF RADIOCARBON DATING ANALYSES

Dr. Chris Dayton — Report Date: July 03, 2017

Cox Mclain Environmental Consulting — Material Received: June 26, 2017

Sample Information and Data	Sample Code Number	Conventional Radiocarbon Age (BP) or Percent Modern Carbon (pMC) & Stable Isotopes Calendar Calibrated Results: 95.4 % Probability High Probability Density Range Method (HPD)	
Beta - 468121	**SR242-11C**	**3020 +/- 30 BP**	IRMS δ13C: -23.0 o/oo

Submitter Material: Woody Material

Analyzed Material: Wood

Pretreatment: (charred material) acid/alkali/acid

(73.1%)	**1322 - 1191 cal BC**	**(3271 - 3140 cal BP)**
(18.9%)	**1391 - 1337 cal BC**	**(3340 - 3286 cal BP)**
(2.0%)	**1144 - 1131 cal BC**	**(3093 - 3080 cal BP)**
(1.4%)	**1177 - 1164 cal BC**	**(3126 - 3113 cal BP)**

Analysis Service: AMS-Standard delivery
Percent Modern Carbon: 68.66 +/- 0.26 pMC
Fraction Modern Carbon: 0.6866 +/- 0.0026
D14C: -313.37 +/- 2.56 o/oo
Δ14C: -318.91 +/- 2.56 o/oo(1950:2017)
Measured Radiocarbon Age: (without d13C correction): 2990 +/- 30 BP
Calibration: BetaCal3.21: HPD method: INTCAL13

Results are ISO/IEC-17025:2005 accredited. No sub-contracting or student labor was used in the analyses. All work was done at Beta in 4 in-house NEC accelerator mass spectrometers and 4 Thermo IRMSs. The "Conventional Radiocarbon Age" was calculated using the Libby half-life (5568 years), is corrected for total isotopic fraction and was used for calendar calibration where applicable. The Age is rounded to the nearest 10 years and is reported as radiocarbon years before present (BP), "present" = AD 1950. Results greater than the modern reference are reported as percent modern carbon (pMC). The modern reference standard was 95% the 14C signature of NIST SRM-4990C (oxalic acid). Quoted errors are 1 sigma counting statistics. Calculated sigmas less than 30 BP on the Conventional Radiocarbon Age are conservatively rounded up to 30. d13C values are on the material itself (not the AMS d13C). d13C and d15N values are relative to VPDB-1. References for calendar calibrations are cited at the bottom of calibration graph pages.

Calibration of Radiocarbon Age to Calendar Years

(High Probability Density Range Method (HPD): INTCAL13)

(Variables: d13C = -23.1 o/oo)

Laboratory number **Beta-468115**

Conventional radiocarbon age **2420 ± 30 BP**

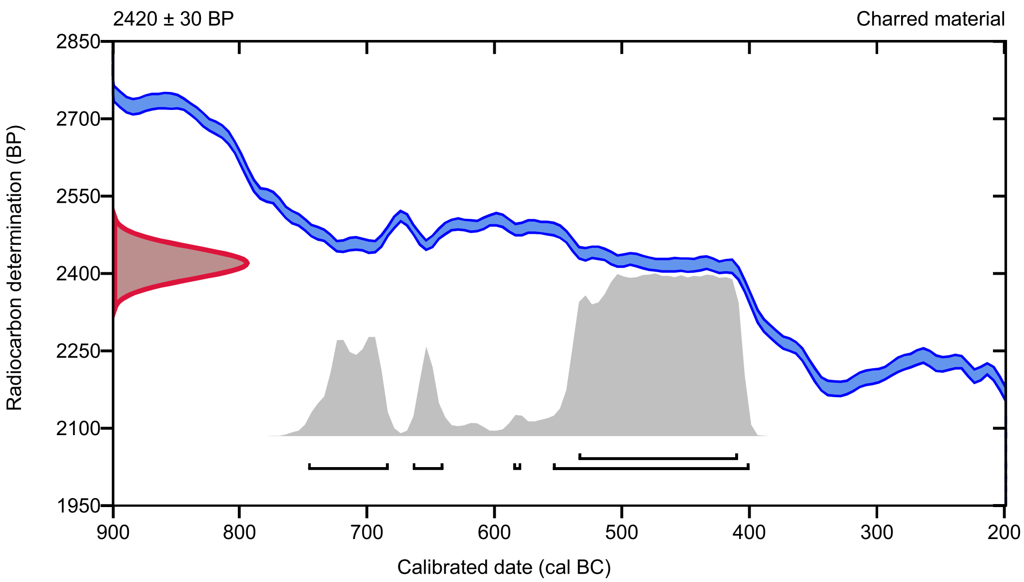
95.4% probability

(74.8%)	556 - 402 cal BC	(2505 - 2351 cal BP)
(15.5%)	748 - 685 cal BC	(2697 - 2634 cal BP)
(4.7%)	666 - 642 cal BC	(2615 - 2591 cal BP)
(0.4%)	587 - 581 cal BC	(2536 - 2530 cal BP)

68.2% probability

(68.2%)	536 - 411 cal BC	(2485 - 2360 cal BP)

SR242-6C



Database used

INTCAL13

References

References to Probability Method

Bronk Ramsey, C. (2009). Bayesian analysis of radiocarbon dates. Radiocarbon, 51(1), 337-360.

References to Database INTCAL13

Reimer, et.al., 2013, Radiocarbon55(4).

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Calibration of Radiocarbon Age to Calendar Years

(High Probability Density Range Method (HPD): INTCAL13)

(Variables: d13C = -24.1 o/oo)

Laboratory number **Beta-468116**

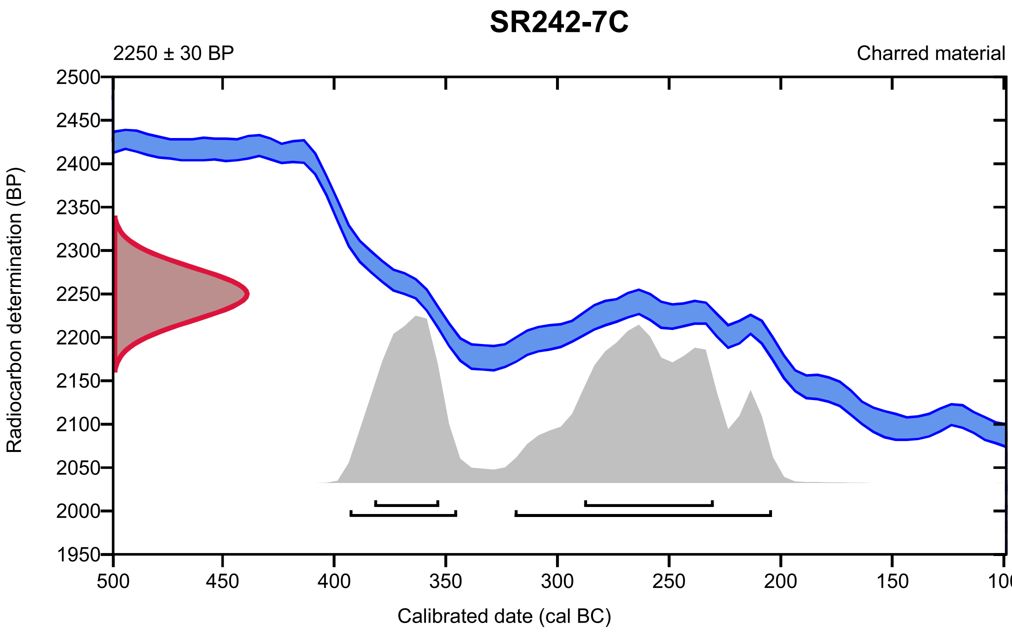
Conventional radiocarbon age **2250 ± 30 BP**

95.4% probability

(64.1%)	321 - 206 cal BC	(2270 - 2155 cal BP)
(31.3%)	395 - 347 cal BC	(2344 - 2296 cal BP)

68.2% probability

(43.7%)	290 - 232 cal BC	(2239 - 2181 cal BP)
(24.5%)	384 - 355 cal BC	(2333 - 2304 cal BP)



Database used

INTCAL13

References

References to Probability Method

Bronk Ramsey, C. (2009). Bayesian analysis of radiocarbon dates. Radiocarbon, 51(1), 337-360.

References to Database INTCAL13

Reimer, et.al., 2013, Radiocarbon55(4).

Calibration of Radiocarbon Age to Calendar Years

(High Probability Density Range Method (HPD): INTCAL13)

(Variables: d13C = -24.1 o/oo)

Laboratory number **Beta-468117**

Conventional radiocarbon age **3260 ± 30 BP**

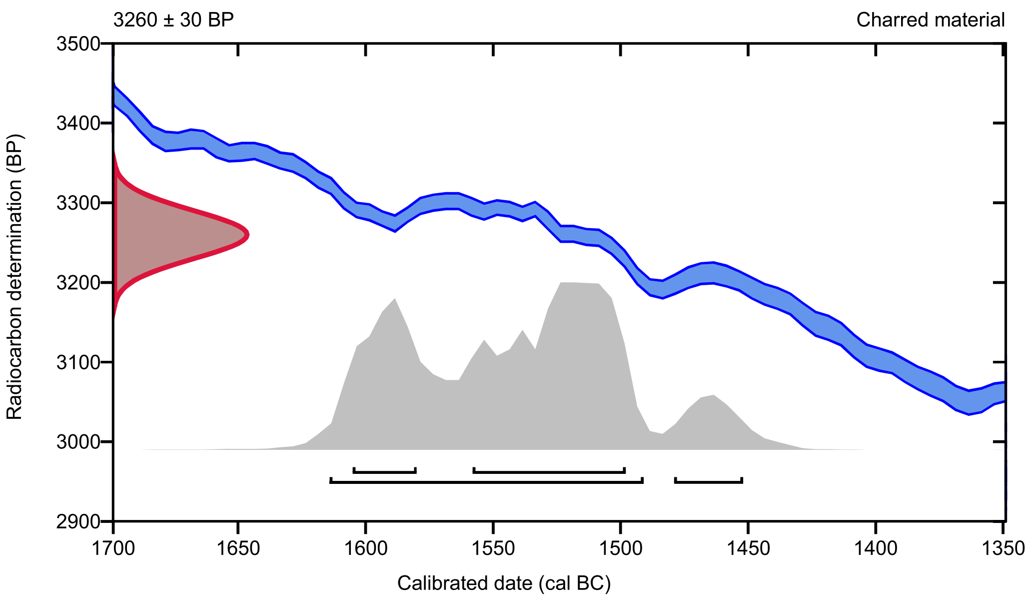
95.4% probability

(87.8%)	1616 - 1493 cal BC	(3565 - 3442 cal BP)
(7.6%)	1481 - 1454 cal BC	(3430 - 3403 cal BP)

68.2% probability

(48.5%)	1560 - 1500 cal BC	(3509 - 3449 cal BP)
(19.7%)	1607 - 1582 cal BC	(3556 - 3531 cal BP)

SR242-5C



Database used
INTCAL13

References
References to Probability Method
Bronk Ramsey, C. (2009). Bayesian analysis of radiocarbon dates. Radiocarbon, 51(1), 337-360.
References to Database INTCAL13
Reimer, et.al., 2013, Radiocarbon55(4).

Calibration of Radiocarbon Age to Calendar Years

(High Probability Density Range Method (HPD): INTCAL13)

(Variables: d13C = -23.4 o/oo)

Laboratory number **Beta-468118**

Conventional radiocarbon age **2160 ± 30 BP**

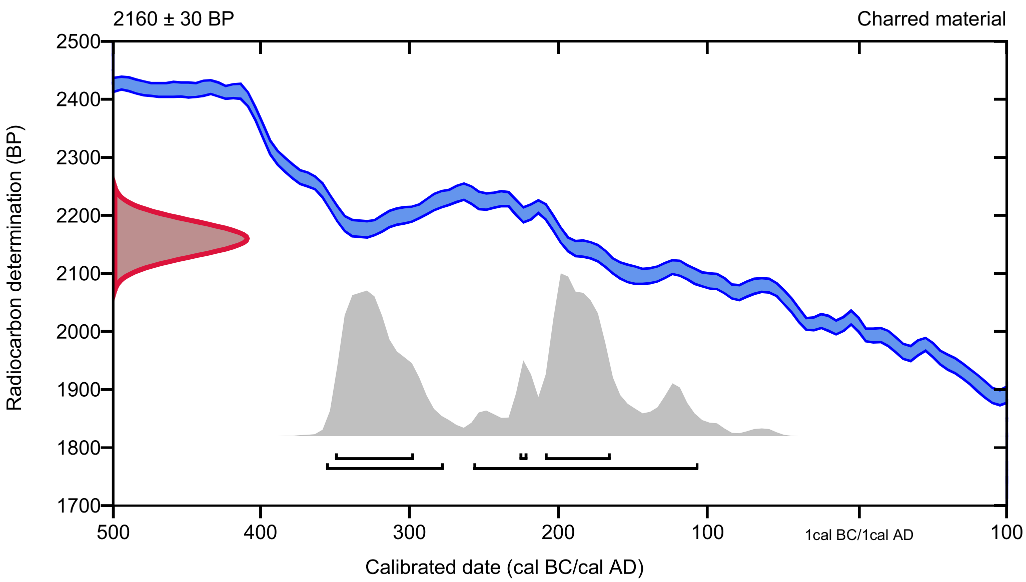
95.4% probability

(55.3%)	259 - 108 cal BC	(2208 - 2057 cal BP)
(40.1%)	358 - 279 cal BC	(2307 - 2228 cal BP)

68.2% probability

(34%)	352 - 299 cal BC	(2301 - 2248 cal BP)
(32.4%)	211 - 167 cal BC	(2160 - 2116 cal BP)
(1.9%)	228 - 223 cal BC	(2177 - 2172 cal BP)

SR242-8C



Database used

INTCAL13

References

References to Probability Method

Bronk Ramsey, C. (2009). Bayesian analysis of radiocarbon dates. Radiocarbon, 51(1), 337-360.

References to Database INTCAL13

Reimer, et.al., 2013, Radiocarbon55(4).

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Calibration of Radiocarbon Age to Calendar Years

(High Probability Density Range Method (HPD): INTCAL13)

(Variables: d13C = -22.5 o/oo)

Laboratory number **Beta-468119**

Conventional radiocarbon age **3260 ± 30 BP**

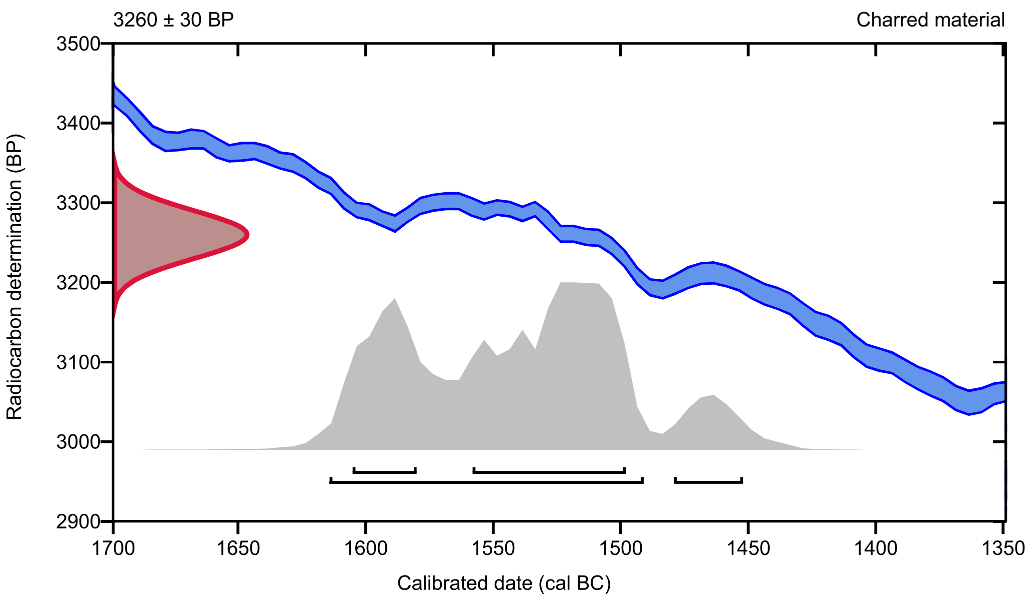
95.4% probability

(87.8%)	1616 - 1493 cal BC	(3565 - 3442 cal BP)
(7.6%)	1481 - 1454 cal BC	(3430 - 3403 cal BP)

68.2% probability

(48.5%)	1560 - 1500 cal BC	(3509 - 3449 cal BP)
(19.7%)	1607 - 1582 cal BC	(3556 - 3531 cal BP)

SR242-9C



Database used

INTCAL13

References

References to Probability Method

Bronk Ramsey, C. (2009). Bayesian analysis of radiocarbon dates. Radiocarbon, 51(1), 337-360.

References to Database INTCAL13

Reimer, et.al., 2013, Radiocarbon55(4).

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Calibration of Radiocarbon Age to Calendar Years

(High Probability Density Range Method (HPD): INTCAL13)

(Variables: d13C = -23.6 o/oo)

Laboratory number **Beta-468120**

Conventional radiocarbon age **2450 ± 30 BP**

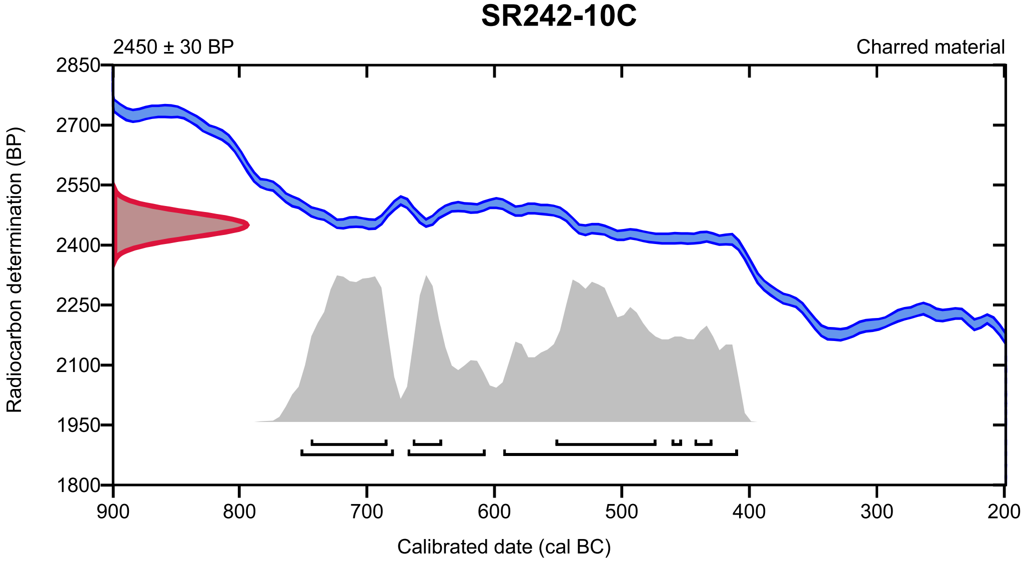
95.4% probability

(53.2%)	595 - 411 cal BC	(2544 - 2360 cal BP)
(26.7%)	754 - 681 cal BC	(2703 - 2630 cal BP)
(15.5%)	670 - 609 cal BC	(2619 - 2558 cal BP)

68.2% probability

(28.8%)	554 - 475 cal BC	(2503 - 2424 cal BP)
(24.6%)	746 - 686 cal BC	(2695 - 2635 cal BP)
(8.6%)	666 - 643 cal BC	(2615 - 2592 cal BP)
(4.1%)	445 - 431 cal BC	(2394 - 2380 cal BP)
(2.1%)	463 - 455 cal BC	(2412 - 2404 cal BP)

SR242-10C



Database used

INTCAL13

References

References to Probability Method

Bronk Ramsey, C. (2009). Bayesian analysis of radiocarbon dates. Radiocarbon, 51(1), 337-360.

References to Database INTCAL13

Reimer, et.al., 2013, Radiocarbon55(4).

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BetaCal 3.21

Calibration of Radiocarbon Age to Calendar Years

(High Probability Density Range Method (HPD): INTCAL13)

(Variables: d13C = -23.0 o/oo)

Laboratory number **Beta-468121**

Conventional radiocarbon age **3020 ± 30 BP**

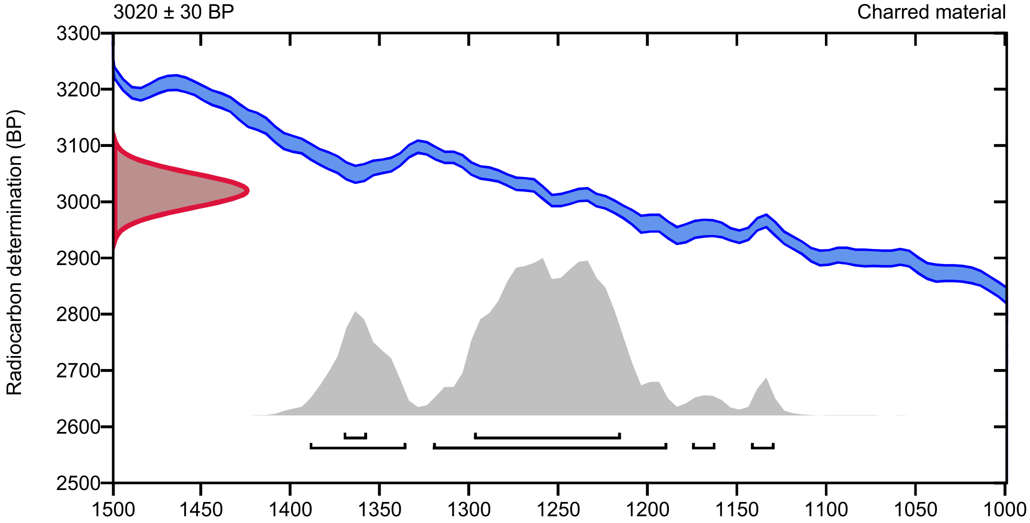
95.4% probability

(73.1%)	1322 - 1191 cal BC	(3271 - 3140 cal BP)
(18.9%)	1391 - 1337 cal BC	(3340 - 3286 cal BP)
(2%)	1144 - 1131 cal BC	(3093 - 3080 cal BP)
(1.4%)	1177 - 1164 cal BC	(3126 - 3113 cal BP)

68.2% probability

(61.2%)	1299 - 1217 cal BC	(3248 - 3166 cal BP)
(7%)	1372 - 1359 cal BC	(3321 - 3308 cal BP)

SR242-11C



Database used

INTCAL13

References

References to Probability Method

Bronk Ramsey, C. (2009). Bayesian analysis of radiocarbon dates. Radiocarbon, 51(1), 337-360.

References to Database INTCAL13

Reimer, et.al., 2013, Radiocarbon55(4).

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APPENDIX D

Lithic Analysis

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Appendix D.1. TxDOT 41SR242 Feature 1 Debitage Analysis

Lot No.	Specimen No.	Nodule No.	Flake Size	Percent Cortex	Platform Type	Thermal Alteration	Technological Class	Count	Comments
152	001	1.1	01	04	CRT	ANO	PRI	1	None
152	002	1.2	01	04	CRT	ANO	PRI	1	None
152	003	1.3	02	00	MSG	ANO	CMX	1	None
152	004	1.4	02	00	MSG	ANO	CMX	1	None
152	005	1.5	01	02	MSG	ANO	SIM	1	None
152	006	1.6	03	00	MSG	ANO	CMX	1	None
152	007	1.7	03	00	FCT	ANO	CMX	1	None
152	008	1.8	01	01	CRT	ANO	SIM	1	None
152	009	1.9	04	00	MSG	ANO	CMX	1	None
152	010	1.10	03	00	MSG	ANO	CMX	1	None
152	011	1.11	04	00	MSG	ANO	CMX	1	None
152	012	1.12	02	00	MSG	ANO	CMX	1	None
152	013	1.13	01	00	MLT	ANO	BTF	1	None
152	014	2.1	04	00	MSG	ANO	CMX	1	None
152	015	2.2	04	00	MSG	ANO	CMX	1	None
152	016	2.3	04	00	MSG	ANO	CMX	1	None
152	017	2.4	02	00	FLA	ANO	CMX	1	None
152	018	3.1	01	04	FCT	ANO	PRI	1	None
152	019	3.2	01	00	CRT	ANO	CMX	1	None
152	020	3.3	04	00	MSG	ANO	CMX	1	None
152	021	4.1	01	02	MSG	ANO	SHA	1	None
152	022	4.2	01	00	MSG	ANO	SHA	1	None
152	023	4.3	02	00	MSG	ANO	SHA	1	None
152	024	5.1	01	00	MSG	ANO	CMX	1	None
152	025	5.2	01	00	MLT	ANO	BTF	1	None
152	026	5.3	04	00	MLT	ANO	CMX	1	None
152	027	5.4	04	00	MSG	ANO	CMX	1	None
152	028	5.5	04	00	MSG	ANO	CMX	1	None
152	029	5.6	04	00	MLT	ANO	CMX	1	None
152	030	5.7	03	00	MLT	ANO	CMX	1	None
152	031	5.8	04	00	MSG	ANO	CMX	1	None
152	032	5.9	01	00	FLA	ANO	CMX	1	None
152	033	5.10	01	00	MLT	ANO	BTF	1	None
152	034	5.11	02	00	MSG	ANO	CMX	1	None
152	035	6.1	01	00	MLT	ANO	BTF	1	None
152	036	6.2	02	00	MSG	ANO	CMX	1	None
152	037	6.3	04	00	MSG	ANO	CMX	1	None
152	038	7.1	01	02	CRT	ANO	SIM	1	None
152	039	7.2	01	00	MLT	ANO	BTF	1	None
152	040	7.3	01	00	MSG	ANO	CMX	1	None
152	041	7.4	04	00	MSG	ANO	CMX	1	None
152	042	7.5	01	00	MLT	ANO	BTF	1	None
152	043	8.1	01	00	MLT	ANO	BTF	1	None
152	044	8.2	01	04	CRT	ANO	PRI	1	None
152	045	8.3	01	00	FCT	ANO	CMX	1	None
152	046	9.1	04	00	MLT	ANO	CMX	1	None
152	047	9.2	01	00	MLT	ANO	BTF	1	None
152	048	9.3	03	00	MSG	ANO	CMX	1	None
152	049	9.4	04	00	MSG	ANO	CMX	1	None
152	050	9.5	03	00	FLA	ANO	CMX	1	None
152	051	9.6	05	00	MSG	ANO	CMX	1	None
152	052	9.7	01	00	MSG	ANO	CMX	1	None
152	053	9.8	04	00	MSG	ANO	CMX	1	None
152	054	9.9	03	00	MSG	ANO	CMX	1	None
152	055	9.10	01	00	MLT	ANO	BTF	1	None
152	056	9.11	02	00	MSG	ANO	CMX	1	None
152	057	10.1	01	00	MSG	ANO	CMX	1	None
152	058	10.2	01	00	MLT	ANO	BTF	1	None
152	059	10.3	01	00	FCT	ANO	BTF	1	None
152	060	10.4	01	00	MSG	ANO	CMX	1	None
152	061	10.5	01	00	MSG	ANO	CMX	1	None
152	062	10.6	03	00	MSG	ANO	CMX	1	None
152	063	10.7	01	00	FCT	ANO	CMX	1	None
152	064	10.8	01	00	MSG	ANO	CMX	1	None
152	065	10.9	02	00	MLT	ANO	CMX	1	None
152	066	10.10	01	00	MLT	ANO	BTF	1	None

Appendix D.1. TxDOT 41SR242 Feature 1 Debitage Analysis

Lot No.	Specimen No.	Nodule No.	Flake Size	Percent Cortex	Platform Type	Thermal Alteration	Technological Class	Count	Comments
152	067	10.11	01	00	MLT	ANO	CMX	1	None
152	068	10.12	02	00	MSG	ANO	CMX	1	None
152	069	10.13	03	00	MSG	ANO	CMX	1	None
152	070	10.14	03	00	MSG	ANO	CMX	1	None
152	071	10.15	04	00	MSG	ANO	CMX	1	None
152	072	10.16	04	00	MSG	ANO	CMX	1	None
152	073	10.17	04	00	MSG	ANO	CMX	1	None
152	074	10.18	04	00	MSG	ANO	CMX	1	None
152	075	10.19	04	00	MSG	ANO	CMX	1	None
152	076	10.20	04	00	MSG	ANO	CMX	1	None
152	077	10.21	04	00	MSG	ANO	CMX	1	None
152	078	10.22	03	00	MLT	ANO	CMX	1	None
152	079	10.23	04	00	MSG	ANO	CMX	1	None
152	080	11.1	01	00	CRT	ANO	CMX	1	None
152	081	11.2	01	00	MLT	ANO	CMX	1	None
152	082	11.3	02	00	FLA	ANO	CMX	1	None
152	083	11.4	05	00	MSG	ANO	CMX	1	None
152	084	11.5	04	00	MSG	ANO	CMX	1	None
152	085	11.6	01	00	MLT	ANO	BTF	1	None
152	086	11.7	01	01	MLT	ANO	BTF	1	None
152	087	11.8	01	04	CRT	ANO	PRI	1	None
152	088	11.9	03	00	MSG	ANO	CMX	1	None
152	089	11.10	03	02	FLA	ANO	SIM	1	None
152	090	11.11	02	02	MSG	ANO	SIM	1	None
152	091	12.1	03	00	MLT	ANO	CMX	1	None
152	092	12.2	03	04	MSG	ANO	PRI	1	None
152	093	12.3	02	00	MSG	ANO	CMX	1	None
152	094	12.4	01	00	MLT	ANO	CMX	1	None
152	095	12.5	01	00	MLT	ANO	BTF	1	None
152	096	12.6	04	00	MSG	ANO	CMX	1	None
152	097	12.7	04	00	MLT	ANO	CMX	1	None
152	098	12.8	03	00	MSG	ANO	CMX	1	None
152	099	12.9	01	00	MLT	ANO	BTF	1	None
152	100	12.10	04	00	MSG	ANO	CMX	1	None
152	101	12.11	03	01	MSG	ANO	SIM	1	None
152	102	13.1	01	03	CRT	ANO	SIM	1	None
152	103	13.2	01	01	MLT	ANO	CMX	1	None
152	104	13.3	01	00	MLT	ANO	BTF	1	None
152	105	13.4	04	00	MSG	ANO	CMX	1	None
152	106	13.5	03	00	MSG	ANO	CMX	1	None
152	107	13.6	03	00	MSG	ANO	CMX	1	None
152	108	13.7	01	00	MSG	ANO	CMX	1	None
152	109	13.8	04	00	MSG	ANO	CMX	1	None
152	110	13.9	02	00	MSG	ANO	CMX	1	None
152	111	13.10	02	01	MSG	ANO	SIM	1	None
152	112	14.1	04	00	MSG	ANO	CMX	1	None
152	113	14.2	02	00	MSG	ANO	CMX	1	None
152	114	15.1	05	NA	NA	NA	SG4	38	Not Analyzed
153	001	1.1	01	04	CRT	ANO	PRI	1	None
153	002	2.1	01	00	MLT	ANO	CMX	1	None
153	003	3.1	01	02	MSG	ANO	SIM	1	None
153	004	4.1	01	00	MLT	ANO	BTF	1	None
153	005	4.2	03	00	MSG	ANO	SIM	1	None
153	006	4.3	03	00	MSG	ANO	CMX	1	None
153	007	5.1	01	00	FLA	ANO	CMX	1	None
153	008	5.2	03	02	MSG	ANO	SIM	1	None
153	009	6.1	03	00	MSG	IND	SIM	1	None
153	010	6.2	03	02	MSG	AOB	SIM	1	None
153	011	7.1	01	01	MSG	ANO	BTF	1	None
153	012	7.2	02	00	MSG	ANO	BTF	1	None
153	013	7.3	03	00	MSG	ANO	CMX	1	None
153	014	7.4	02	00	FCT	ANO	CMX	1	None
153	015	7.5	03	00	MLT	ANO	CMX	1	None
153	016	7.6	03	00	MLT	ANO	CMX	1	None
153	017	7.7	03	00	MSG	ANO	SIM	1	None
153	018	7.8	03	00	MLT	ANO	SIM	1	None

Appendix D.1. TxDOT 41SR242 Feature 1 Debitage Analysis

Lot No.	Specimen No.	Nodule No.	Flake Size	Percent Cortex	Platform Type	Thermal Alteration	Technological Class	Count	Comments
153	019	7.9	03	00	MLT	ANO	SIM	1	None
153	020	7.10	03	00	MLT	ANO	CMX	1	None
153	021	7.11	03	00	MSG	ANO	SIM	1	None
153	022	7.12	03	00	IND	ANO	CMX	1	None
153	023	7.13	03	00	MSG	ANO	SIM	1	None
153	024	7.14	03	00	FLA	ANO	SIM	1	None
153	025	7.15	03	00	MSG	ANO	SIM	1	None
153	026	7.16	03	00	MSG	ANO	SIM	1	None
153	027	7.17	04	00	MSG	ANO	SHA	1	None
153	028	7.18	04	00	MSG	AOB	SHA	1	None
153	029	8.1	02	01	CRT	AOB	SIM	1	None
153	030	8.2	02	00	FCT	ANO	CMX	1	None
153	031	8.3	03	03	FCT	ANO	SIM	1	None
153	032	8.4	04	02	MSG	ANO	SHA	1	None
153	033	9.1	02	00	MLT	ANO	CMX	1	None
153	034	10.1	02	00	MLT	ANO	CMX	1	None
153	035	10.2	02	04	MSG	ANO	BTF	1	None
153	036	11.1	02	04	IND	ANO	BTF	1	None
153	037	11.2	03	04	IND	ANO	SIM	1	None
153	038	11.3	03	01	MSG	ANO	SHA	1	None
153	039	11.4	03	02	MSG	ANO	SIM	1	None
153	040	11.5	04	00	MSG	ANO	SIM	1	None
153	041	11.6	04	02	MLT	ANO	SIM	1	None
153	042	12.1	02	00	MSG	ANO	CMX	1	None
153	043	12.2	03	00	MSG	ANO	CMX	1	None
153	044	12.3	03	00	MSG	ANO	SIM	1	None
153	045	12.4	02	01	CRT	ANO	SIM	1	None
153	046	12.5	04	00	MSG	ANO	SG4	1	None
153	047	13.1	02	01	MSG	ANO	BTF	1	None
153	048	13.2	03	04	FCT	ANO	PRI	1	None
153	049	13.3	03	01	IND	ANO	SIM	1	None
153	050	13.4	03	04	MSG	ANO	SIM	1	None
153	051	14.1	02	00	CMP	AOB	CMX	1	None
153	052	14.2	03	02	CRT	AOB	SIM	1	None
153	053	14.3	04	01	MSG	ANO	SHA	1	None
153	054	15.1	03	04	FLA	ANO	PRI	1	None
153	055	16.1	02	00	FCT	ANO	CMX	1	None
153	056	17.1	02	00	IND	ANO	SG4	1	None
153	057	18.1	03	04	MSG	ANO	SG4	1	None
153	058	19.1	03	00	FCT	ANO	CMX	1	None
153	059	19.2	04	00	MSG	ANO	SIM	1	None
153	060	20.1	03	00	MSG	ANO	CMX	1	None
153	061	20.2	03	02	MSG	ANO	SIM	1	None
153	062	20.3	03	00	MSG	ANO	SIM	1	None
153	063	20.4	03	00	MSG	ANO	SIM	1	None
153	064	20.5	03	00	MSG	ANO	SIM	1	None
153	065	20.6	04	00	MSG	ANO	SIM	1	None
153	066	21.1	03	04	MSG	ANO	PRI	1	None
153	067	21.2	03	01	FCT	ANO	SIM	1	None
153	068	21.3	04	04	IND	ANO	PRI	1	None
153	069	21.4	04	04	MSG	ANO	SHA	1	None
153	070	22.1	02	01	FCT	ANO	CMX	1	None
153	071	23.1	03	01	MSG	AOB	SHA	1	None
153	072	24.1	04	04	IND	ANO	SHA	1	None
153	073	25.1	03	00	IND	ANO	CMX	1	None
153	074	26.1	04	00	MSG	ANO	SG4	1	None
153	075	27.1	04	00	MSG	ANO	CMX	1	None
153	076	28.1	02	01	IND	AOB	SIM	1	None
153	077	28.2	02	00	MSG	ANO	CMX	1	None
153	078	28.3	02	04	MSG	AOB	PRI	1	None
153	079	28.4	04	00	MSG	ANO	SHA	1	None
153	080	29.1	02	00	MLT	ANO	BTF	1	None
153	081	29.2	04	00	MLT	ANO	SIM	1	None
153	082	30.1	03	01	MLT	ANO	CMX	1	None
153	083	30.2	04	00	MSG	AOB	SG4	1	None
153	084	31.1	03	03	MSG	ANO	SHA	1	None

Appendix D.1. TxDOT 41SR242 Feature 1 Debitage Analysis

Lot No.	Specimen No.	Nodule No.	Flake Size	Percent Cortex	Platform Type	Thermal Alteration	Technological Class	Count	Comments
153	085	32.1	04	00	FLA	ANO	SIM	1	None
153	086	32.2	04	00	MSG	AOB	SIM	1	None
153	087	32.3	03	00	MLT	ANO	CMX	1	None
153	088	32.4	03	00	MSG	ANO	CMX	1	None
153	089	33.1	04	00	MSG	ANO	SIM	1	None
153	090	33.2	04	00	MSG	ANO	SHA	1	None
153	091	34.1	03	00	MSG	ANO	SIM	1	None
153	092	35.1	04	00	MSG	ANO	SIM	1	None
153	093	36.1	02	04	CRT	ANO	PRI	1	None
153	094	36.2	02	00	FLA	ANO	CMX	1	None
153	095	36.3	03	04	IND	ANO	SIM	1	None
153	096	36.4	02	00	IND	ANO	CMX	1	None
153	097	36.5	03	00	MSG	ANO	CMX	1	None
153	098	36.6	03	04	MSG	ANO	SIM	1	None
153	099	36.7	03	01	MSG	ANO	SIM	1	None
153	100	36.8	04	00	FLA	ANO	SIM	1	None
153	101	36.9	04	00	FLA	AOB	SIM	1	None
153	102	37.1	01	00	MSG	ANO	SHA	1	None
153	103	37.2	03	01	MSG	ANO	SIM	1	None
153	104	38.1	03	02	MSG	ANO	SIM	1	None
153	105	38.2	03	00	MSG	ANO	SIM	1	None
153	106	39.1	04	00	MSG	ANO	SIM	1	None
153	107	39.2	04	00	MLT	ANO	SIM	1	None
153	108	39.3	04	00	FLA	ANO	SIM	1	None
153	109	39.4	04	00	MSG	ANO	SHA	1	None
153	110	40.1	02	00	IND	ANO	SIM	1	None
153	111	40.2	03	04	MLT	ANO	SIM	1	None
153	112	40.3	03	00	MSG	ANO	SIM	1	None
153	113	40.4	03	00	MSG	ANO	CMX	1	None
153	114	40.5	03	02	MSG	ANO	SIM	1	None
153	115	40.6	04	00	MLT	ANO	CMX	1	None
153	116	40.7	04	00	FLA	ANO	CMX	1	None
153	117	40.8	03	00	FLA	ANO	CMX	1	None
153	118	40.9	04	02	MSG	ANO	SIM	1	None
153	119	40.10	03	00	MSG	ANO	CMX	1	None
153	120	40.11	04	00	MSG	ANO	SIM	1	None
153	121	40.12	04	01	MSG	ANO	SIM	1	None
153	122	41.1	01	00	MLT	ANO	BTF	1	None
153	123	41.2	03	00	MSG	ANO	SIM	1	None
153	124	41.3	04	01	MSG	ANO	SHA	1	None
153	125	41.4	03	03	MSG	ANO	SIM	1	None
153	126	41.5	04	04	MSG	ANO	SIM	1	None
153	127	41.6	04	00	MSG	ANO	SIM	1	None
153	128	41.7	04	00	MSG	ANO	SIM	1	None
153	129	41.8	04	04	FCT	ANO	SIM	1	None
153	130	42.1	02	01	MSG	ANO	SIM	1	None
153	131	42.2	03	01	CRT	ANO	SIM	1	None
153	132	42.3	03	00	IND	ANO	SIM	1	None
153	133	42.4	02	00	MSG	ANO	BTF	1	None
153	134	42.5	03	00	FCT	ANO	SIM	1	None
153	135	42.6	03	01	CRT	ANO	SIM	1	None
153	136	42.7	03	00	MLT	ANO	SIM	1	None
153	137	42.8	03	00	MSG	ANO	SIM	1	None
153	138	42.9	04	00	MLT	ANO	CMX	1	None
153	139	43.1	03	00	MSG	ANO	CMX	1	None
153	140	43.2	03	00	MLT	ANO	CMX	1	None
153	141	43.3	04	01	MSG	ANO	SIM	1	None
153	142	43.4	02	03	FLA	ANO	SIM	1	None
153	143	43.5	03	00	MSG	ANO	SIM	1	None
153	144	43.6	04	00	MSG	ANO	SIM	1	None
153	145	43.7	04	00	MSG	ANO	SIM	1	None
153	146	44.1	04	01	MSG	AOB	SHA	1	None
153	147	44.2	04	00	MLT	ANO	CMX	1	None
154	001	1.1	03	00	MSG	ANO	SHA	1	None
154	002	2.1	04	00	FLA	ANO	SIM	1	None
154	003	3.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed

Appendix D.1. TxDOT 41SR242 Feature 1 Debitage Analysis

Lot No.	Specimen No.	Nodule No.	Flake Size	Percent Cortex	Platform Type	Thermal Alteration	Technological Class	Count	Comments
154	004	4.1	03	01	FCT	ANO	SIM	1	None
154	005	5.1	03	00	MSG	ANO	CMX	1	None
154	006	6.1	04	00	MLT	ANO	SIM	1	None
154	007	7.1	03	00	MSG	ANO	SIM	1	None
154	008	8.1	04	00	MSG	ANO	SIM	1	None
154	009	9.1	04	04	CRT	ANO	PRI	1	None
154	010	10.1	04	00	IND	ANO	SIM	1	None
154	011	11.1	04	00	MSG	ANO	SIM	1	None
154	012	12.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
154	013	13.1	04	00	MSG	ANO	SIM	1	None
154	014	13.2	04	00	MSG	ANO	SHA	1	None
154	015	13.3	04	00	MSG	ANO	SIM	1	None
155	001	1.1	02	00	MSG	AOB	CMX	1	None
155	002	1.2	02	00	MSG	ANO	CMX	1	None
155	003	1.3	04	00	MSG	ANO	SHA	1	None
155	004	1.4	02	02	MSG	ANO	SIM	1	None
155	005	1.5	02	00	MSG	ANO	SHA	1	None
155	006	1.6	03	03	MSG	ANO	SHA	1	None
155	007	1.7	02	01	CRT	ANO	CMX	1	None
155	008	2.1	01	00	MSG	ANO	BTF	1	None
155	009	3.1	04	00	IND	ANO	CMX	1	None
155	010	3.2	02	00	MSG	ANO	CMX	1	None
155	011	4.1	04	00	MSG	ANO	CMX	1	None
155	012	5.1	04	00	MSG	AOB	CMX	1	None
155	013	6.1	04	00	FCT	AOB	CMX	1	None
155	014	6.2	04	00	MSG	AOB	CMX	1	Potlid
155	015	6.3	04	00	MFT	ANO	CMX	1	None
155	016	7.1	03	02	CRT	ANO	SIM	1	None
155	017	7.2	04	00	MSG	ANO	CMX	1	None
155	018	7.3	04	00	MSG	ANO	CMX	1	None
155	019	8.1	04	00	MLT	ANO	CMX	1	None
155	020	8.2	04	00	MSG	ANO	CMX	1	None
155	021	9.1	04	00	MLT	ANO	CMX	1	None
155	022	9.2	04	00	FCT	ANO	CMX	1	None
155	023	9.3	04	01	MLT	ANO	SIM	1	None
155	024	10.1	04	00	FCT	ANO	CMX	1	None
155	025	10.2	04	03	MSG	ANO	PRI	1	None
155	026	11.1	04	00	FLA	ANO	CMX	1	None
155	027	11.2	04	00	IND	ANO	CMX	1	None
155	028	11.3	04	00	FCT	ANO	CMX	1	None
155	029	12.1	03	00	IND	ANO	CMX	1	None
155	030	12.2	03	00	MSG	ANO	CMX	1	None
155	031	12.3	04	00	FLA	ANO	CMX	1	None
155	032	13.1	01	00	MLT	ANO	BTF	1	None
155	033	14.1	02	00	MSG	ANO	CMX	1	None
155	034	15.1	02	00	MSG	ANO	CMX	1	None
155	035	15.2	04	03	MSG	ANO	CMX	1	None
155	036	15.3	04	00	MSG	ANO	CMX	1	None
155	037	16.1	03	00	MSG	ANO	CMX	1	None
155	038	17.1	04	00	CRT	ANO	CMX	1	None
155	039	18.1	01	01	MLT	ANO	BTF	1	None
155	040	18.2	04	00	FCT	ANO	CMX	1	None
155	041	19.1	03	04	CRT	ANO	PRI	1	None
155	042	20.1	04	00	MSG	ANO	CMX	1	None
155	043	21.1	04	02	FCT	ANO	SIM	1	None
155	044	22.1	04	00	MSG	ANO	CMX	1	None
155	045	23.1	04	00	MSG	ANO	CMX	1	None
155	046	23.2	04	00	MSG	ANO	CMX	1	None
155	047	23.3	04	00	MSG	ANO	CMX	1	None
155	048	23.4	04	00	MSG	ANO	CMX	1	None
155	049	24.1	03	00	MSG	ANO	CMX	1	None
155	050	25.1	03	01	MSG	ANO	CMX	1	None
155	051	26.1	04	00	FCT	ANO	CMX	1	None
155	052	27.1	04	00	MSG	ANO	CMX	1	None
155	053	28.1	02	00	MSG	ANO	CMX	1	None
155	054	28.2	04	00	FLA	ANO	CMX	1	None

Appendix D.1. TxDOT 41SR242 Feature 1 Debitage Analysis

Lot No.	Specimen No.	Nodule No.	Flake Size	Percent Cortex	Platform Type	Thermal Alteration	Technological Class	Count	Comments
155	055	28.3	04	04	CRT	ANO	PRI	1	None
155	056	28.4	04	00	CRT	ANO	SIM	1	None
155	057	28.5	04	00	MLT	ANO	CMX	1	None
155	058	29.1	04	00	MSG	ANO	CMX	1	None
155	059	30.1	04	00	MSG	ANO	CMX	1	None
155	060	30.2	04	00	MSG	ANO	CMX	1	None
155	061	31.1	04	00	MSG	ANO	CMX	1	None
155	062	32.1	04	00	CRT	ANO	CMX	1	None
155	063	33.1	04	00	MSG	ANO	CMX	1	None
155	064	34.1	05	00	MSG	ANO	SG4	1	None
155	065	35.1	05	00	MSG	ANO	SG4	1	None
156	001	1.1	03	00	MSG	ANO	SHA	1	None
156	002	2.1	03	00	MSG	ANO	CMX	1	None
156	003	2.2	03	03	CRT	ANO	PRI	1	None
156	004	3.1	01	00	MSG	ANO	CMX	1	None
156	005	4.1	01	02	FLA	ANO	SIM	1	None
156	006	4.2	03	00	MSG	ANO	CMX	1	None
156	007	4.3	04	04	MSG	ANO	CMX	1	None
156	008	4.4	04	00	MSG	ANO	SHA	1	None
156	009	4.5	05	00	MSG	ANO	SG4	1	None
156	010	5.1	02	00	MLT	ANO	BTF	1	None
156	011	6.1	02	00	FLA	ANO	CMX	1	None
156	012	7.1	03	02	MSG	ANO	SIM	1	None
156	013	7.2	03	00	MLT	ANO	CMX	1	None
156	014	7.3	03	00	MSG	ANO	CMX	1	None
156	015	7.4	03	00	MSG	ANO	CMX	1	None
156	016	7.5	04	00	MSG	ANO	CMX	1	None
156	017	7.6	04	00	MLT	ANO	CMX	1	None
156	018	7.7	04	00	MSG	ANO	CMX	1	None
156	019	7.8	05	00	MSG	ANO	SG4	1	None
156	020	8.1	01	02	CRT	ANO	SIM	1	None
156	021	8.2	04	00	FCT	ANO	CMX	1	None
156	022	9.1	04	00	MSG	ANO	CMX	1	None
156	023	9.2	05	00	MSG	ANO	SG4	1	None
156	024	10.1	02	00	MLT	ANO	CMX	1	None
156	025	10.2	03	00	FCT	ANO	CMX	1	None
156	026	11.1	04	00	MSG	ANO	CMX	1	None
156	027	11.2	04	00	MSG	ANO	CMX	1	None
156	028	11.3	04	00	MSG	ANO	CMX	1	None
156	029	11.4	04	00	MSG	ANO	CMX	1	None
156	030	11.5	04	00	MSG	ANO	CMX	1	None
156	031	11.6	04	00	MSG	ANO	CMX	1	None
156	032	11.7	05	00	MSG	ANO	SG4	1	None
156	033	12.1	01	01	CRT	ANO	CMX	1	None
156	034	12.2	02	00	MLT	ANO	CMX	1	None
156	035	12.3	03	00	FLA	ANO	CMX	1	None
156	036	13.1	04	00	MSG	ANO	CMX	1	None
156	037	13.2	03	00	FCT	ANO	CMX	1	None
156	038	14.1	03	00	MSG	ANO	CMX	1	None
156	039	15.1	05	00	MSG	ANO	SG4	1	None
156	040	16.1	04	00	MSG	ANO	CMX	1	None
156	041	17.1	04	00	MSG	ANO	CMX	1	None
156	042	18.1	03	00	FCT	ANO	CMX	1	None
156	043	19.1	04	00	MSG	ANO	CMX	1	None
156	044	20.1	04	00	MSG	ANO	CMX	1	None
156	045	21.1	03	00	MSG	ANO	CMX	1	None
156	046	21.2	04	00	MSG	ANO	CMX	1	None
156	047	21.3	04	00	MSG	ANO	CMX	1	None
156	048	21.4	05	00	MSG	ANO	SG4	1	None
156	049	22.1	02	03	CRT	ANO	SIM	1	None
156	050	23.1	02	01	MSG	ANO	SIM	1	None
156	051	24.1	02	03	MSG	ANO	SIM	1	None
156	052	25.1	02	03	CRT	ANO	SIM	1	None
156	053	25.2	03	00	MSG	ANO	CMX	1	None
156	054	26.1	03	00	MSG	ANO	CMX	1	None
156	055	27.1	03	03	MSG	AOB	SIM	1	None

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Lot No.	Specimen No.	Nodule No.	Flake Size	Percent Cortex	Platform Type	Thermal Alteration	Technological Class	Count	Comments
156	056	27.2	02	02	CRT	ANO	SIM	1	None
156	057	27.3	03	01	MSG	ANO	SIM	1	None
156	058	27.4	03	00	MLT	ANO	CMX	1	None
156	059	27.5	03	01	CRT	ANO	CMX	1	None
156	060	27.6	03	00	MSG	ANO	CMX	1	None
156	061	27.7	03	00	MSG	ANO	CMX	1	None
156	062	27.8	04	00	MLT	ANO	CMX	1	None
156	063	27.9	04	00	MSG	ANO	CMX	1	None
156	064	27.10	04	00	MSG	ANO	CMX	1	None
156	065	27.11	05	00	MSG	ANO	SG5	1	None
156	066	28.1	03	00	MSG	AOB	SHA	1	None
156	067	29.1	01	04	CRT	ANO	PRI	1	None
156	068	30.1	05	00	MSG	ANO	SG4	1	None
156	069	31.1	03	00	MSG	ANO	CMX	1	None
156	070	32.1	03	00	MSG	ANO	CMX	1	None
156	071	33.1	04	00	MSG	ANO	CMX	1	None
156	072	34.1	03	00	MLT	ANO	CMX	1	None
156	073	35.1	03	00	MSG	ANO	CMX	1	None
156	074	36.1	03	00	FCT	ANO	CMX	1	None
156	075	37.1	04	00	MSG	ANO	CMX	1	None
156	076	38.1	03	00	MSG	ANO	CMX	1	None
156	077	39.1	05	00	MSG	ANO	SG4	1	None
156	078	40.1	04	00	MSG	ANO	CMX	1	None
156	079	40.2	04	00	MSG	ANO	CMX	1	None
156	080	41.1	04	00	MSG	ANO	CMX	1	None
156	081	41.2	03	01	CRT	ANO	SIM	1	None
156	082	42.1	04	00	MSG	ANO	CMX	1	None
156	083	43.1	04	00	MSG	ANO	CMX	1	None
156	084	43.2	04	01	MSG	ANO	CMX	1	None
156	085	43.3	04	00	MSG	ANO	CMX	1	None
156	086	44.1	04	00	MSG	ANO	CMX	1	None
156	087	44.2	04	00	MSG	ANO	CMX	1	None
156	088	44.3	05	00	MSG	ANO	SG4	1	None
156	089	45.1	04	00	MSG	ANO	CMX	1	None
156	090	46.1	04	00	MSG	ANO	CMX	1	None
156	091	46.2	04	00	MSG	ANO	CMX	1	None
156	092	46.3	04	00	MSG	ANO	CMX	1	None
156	093	47.1	04	00	MSG	ANO	PRI	1	None
156	094	47.2	04	00	MSG	ANO	CMX	1	None
156	095	48.1	03	01	CRT	ANO	SIM	1	None
156	096	48.2	03	00	MSG	ANO	CMX	1	None
156	097	49.1	02	03	MSG	ANO	PRI	1	None
156	098	49.2	04	00	MSG	ANO	SIM	1	None
156	099	49.3	03	00	MSG	ANO	SIM	1	None
156	100	50.1	04	00	MSG	AOB	CMX	1	None
156	101	50.2	04	00	MSG	ANO	CMX	1	None
156	102	51.1	01	01	MSG	ANO	SIM	1	None
156	103	51.2	01	01	MSG	ANO	SIM	1	None
156	104	51.3	03	00	MSG	ANO	CMX	1	None
156	105	51.4	03	01	MSG	ANO	SIM	1	None
156	106	51.5	03	00	MSG	AOB	SHA	1	Potlid
156	107	51.6	02	03	MSG	ANO	SIM	1	None
156	108	51.7	03	04	FCT	ANO	PRI	1	None
156	109	51.8	04	00	MSG	ANO	CMX	1	None
156	110	51.9	04	01	CRT	ANO	CMX	1	None
156	111	51.10	04	00	MSG	ANO	CMX	1	None
156	112	51.11	04	00	MSG	ANO	CMX	1	None
156	113	51.12	04	00	MSG	ANO	CMX	1	None
156	114	51.13	04	00	MSG	ANO	CMX	1	None
156	115	51.14	04	00	MSG	ANO	CMX	1	None
156	116	51.15	04	00	MSG	ANO	CMX	1	None
156	117	52.1	04	00	MSG	ANO	CMX	1	None
156	118	53.1	03	00	MSG	ANO	CMX	1	None
156	119	53.2	04	00	MSG	ANO	CMX	1	None
156	120	53.3	04	00	MSG	ANO	CMX	1	None
156	121	54.1	04	00	MSG	ANO	CMX	1	None

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Lot No.	Specimen No.	Nodule No.	Flake Size	Percent Cortex	Platform Type	Thermal Alteration	Technological Class	Count	Comments
156	122	54.2	04	00	MSG	ANO	CMX	1	None
156	123	54.3	04	00	FLA	ANO	CMX	1	None
156	124	55.1	04	00	FCT	ANO	CMX	1	None
156	125	55.2	04	00	MSG	ANO	CMX	1	None
156	126	55.3	04	01	MSG	ANO	SIM	1	None
156	127	56.1	03	00	MSG	ANO	CMX	1	None
156	128	57.1	01	00	CRT	ANO	SIM	1	None
156	129	57.2	04	00	MSG	ANO	CMX	1	None
156	130	57.3	04	03	MSG	ANO	CMX	1	None
156	131	57.4	04	01	MSG	ANO	CMX	1	None
156	132	58.1	02	04	FLA	ANO	PRI	1	None
156	133	58.2	03	01	CRT	ANO	SIM	1	None
156	134	58.3	04	00	MSG	ANO	CMX	1	None
156	135	59.1	02	01	CRT	ANO	SIM	1	None
156	136	59.2	03	00	MSG	ANO	CMX	1	None
156	137	59.3	04	00	MSG	ANO	SHA	1	None
156	138	59.4	04	00	MSG	ANO	CMX	1	None
156	139	59.5	04	00	MSG	AOB	SHA	1	Potlid
156	140	59.6	04	00	MSG	AOB	SHA	1	None
156	141	60.1	02	00	MSG	ANO	CMX	1	None
156	142	60.2	02	01	MSG	ANO	CMX	1	None
156	143	60.3	02	00	MLT	ANO	BTF	1	None
156	144	60.4	04	00	MSG	ANO	CMX	1	None
156	145	60.5	04	00	MSG	ANO	CMX	1	None
156	146	60.6	04	00	MSG	ANO	CMX	1	None
156	147	60.7	05	00	MSG	ANO	SG4	1	None
156	148	61.1	03	04	MSG	ANO	PRI	1	None
156	149	61.2	04	04	FCT	ANO	PRI	1	None
156	150	61.3	04	00	MSG	ANO	CMX	1	None
156	151	62.1	04	00	MSG	ANO	CMX	1	None
156	152	62.2	03	00	MSG	ANO	CMX	1	None
156	153	63.1	04	00	MSG	ANO	CMX	1	None
156	154	64.1	04	00	FCT	ANO	CMX	1	None
156	155	65.1	02	00	CRT	ANO	CMX	1	None
156	156	65.2	03	01	CRT	AOB	SIM	1	None
156	157	65.3	04	00	MSG	ANO	CMX	1	None
156	158	65.4	04	00	MSG	ANO	CMX	1	None
156	159	65.5	04	00	MSG	ANO	CMX	1	None
156	160	66.1	04	02	MSG	ANO	SIM	1	None
156	161	66.2	04	00	MSG	ANO	CMX	1	None
156	162	66.3	04	00	MSG	ANO	CMX	1	None
156	163	66.4	04	00	MSG	ANO	CMX	1	None
156	164	66.5	04	01	MSG	ANO	CMX	1	None
156	165	66.6	05	00	MSG	ANO	SG4	1	None
156	166	67.1	03	00	MSG	ANO	CMX	1	None
156	167	67.2	03	01	MSG	ANO	SHA	1	None
156	168	68.1	04	00	MSG	ANO	SG4	1	None
156	169	69.1	05	00	MSG	ANO	NA	1	None
156	170	69.2	05	00	MSG	ANO	NA	1	None
156	171	70.1	04	05	MSG	ANO	PRI	1	None
156	172	70.2	04	00	MSG	ANO	CMX	1	None
156	173	70.3	04	00	MSG	ANO	CMX	1	None
157	001	1.1	03	00	MSG	ANO	SHA	1	None
157	002	2.1	01	00	MLT	ANO	CMX	1	None
157	003	3.1	02	03	MSG	AOS	SIM	1	None
157	004	4.1	04	00	FLA	ANO	CMX	1	None
157	005	5.1	02	01	MSG	ANO	SIM	1	None
157	006	6.1	04	00	MSG	ANO	SG4	1	None
157	007	7.1	04	00	MSG	ANO	SG4	1	None
157	008	8.1	04	00	MLT	ANO	CMX	1	None
157	009	8.2	04	00	MLT	ANO	CMX	1	None
157	010	8.3	04	00	MLT	ANO	CMX	1	None
157	011	9.1	04	00	MSG	ANO	CMX	1	None
157	012	9.2	03	00	IND	ANO	CMX	1	None
157	013	10.1	02	00	MLT	ANO	BTF	1	None
157	014	11.1	01	00	MLT	ANO	BTF	1	None

Appendix D.1. TxDOT 41SR242 Feature 1 Debitage Analysis

Lot No.	Specimen No.	Nodule No.	Flake Size	Percent Cortex	Platform Type	Thermal Alteration	Technological Class	Count	Comments
157	015	12.1	04	00	MLT	ANO	CMX	1	None
157	016	13.1	04	00	MSG	ANO	SG4	1	None
157	017	13.2	03	01	MSG	ANO	SHA	1	None
157	018	13.3	01	01	MSG	ANO	SIM	1	None
157	019	14.1	03	02	MSG	ANO	SIM	1	None
157	020	14.2	04	00	MLT	ANO	CMX	1	None
157	021	15.1	04	00	MSG	ANO	CMX	1	None
157	022	16.1	04	04	MSG	ANO	PRI	1	None
157	023	17.1	03	00	MLT	ANO	CMX	1	None
158	001	1.1	01	00	MLT	ANO	BTF	1	None
158	002	1.2	02	00	MLT	ANO	CMX	1	None
158	003	2.1	01	02	CRT	ANO	SIM	1	None
158	004	3.1	01	04	CRT	ANO	SIM	1	None
158	005	3.2	02	00	MSG	ANO	CMX	1	None
158	006	3.3	02	01	FLA	ANO	SIM	1	None
158	007	4.1	02	00	MLT	ANO	BTF	1	None
158	008	4.2	03	00	MSG	ANO	CMX	1	None
158	009	5.1	02	01	MSG	ANO	SIM	1	None
158	010	5.2	03	01	FLA	ANO	SIM	1	None
158	011	6.1	03	01	MSG	ANO	CMX	1	None
158	012	6.2	03	01	CRT	ANO	SIM	1	None
158	013	6.3	03	04	MSG	ANO	PRI	1	None
158	014	7.1	02	04	MSG	ANO	PRI	1	None
158	015	7.2	03	00	FLA	ANO	CMX	1	None
158	016	8.1	02	00	MSG	ANO	CMX	1	None
158	017	8.2	03	00	MSG	ANO	CMX	1	None
158	018	8.3	03	00	MLT	ANO	BPF	1	None
158	019	9.1	02	00	MLT	ANO	BTF	1	None
158	020	9.2	02	02	FLA	ANO	SIM	1	None
158	021	10.1	02	00	MLT	ANO	CMX	1	None
158	022	10.2	04	00	MLT	ANO	CMX	1	None
158	023	10.3	04	00	MSG	ANO	CMX	1	None
158	024	10.4	04	00	MSG	ANO	CMX	1	None
158	025	10.5	05	00	MSG	ANO	CMX	1	None
158	026	11.1	04	00	MLT	ANO	CMX	1	None
158	027	11.2	04	00	MSG	ANO	CMX	1	None
158	028	12.1	03	00	MLT	ANO	BTF	1	None
158	029	12.2	04	00	MSG	ANO	CMX	1	None
158	030	13.1	03	00	MSG	ANO	CMX	1	None
158	031	13.2	03	00	MSG	ANO	CMX	1	None
158	032	14.1	04	00	MSG	ANO	CMX	1	None
158	033	14.2	04	00	MSG	ANO	CMX	1	None
158	034	14.3	04	00	MSG	ANO	CMX	1	None
158	035	14.4	04	00	MSG	ANO	CMX	1	None
158	036	14.5	04	00	MSG	ANO	CMX	1	None
158	037	14.6	04	00	MSG	ANO	CMX	1	None
158	038	14.7	04	00	MSG	ANO	CMX	1	None
158	039	15.1	03	02	CRT	ANO	SIM	1	None
158	040	15.2	05	N/A	N/A	ANO	SIM	1	Not Analyzed
158	041	15.3	05	N/A	N/A	ANO	N/A	1	Not Analyzed
158	042	16.1	02	00	MSG	ANO	CMX	1	None
158	043	17.1	02	02	FLA	ANO	SIM	1	None
158	044	18.1	02	00	MLT	ANO	BTF	1	None
158	045	19.1	03	04	MSG	ANO	PRI	1	None
158	046	19.2	05	N/A	N/A	ANO	CMX	1	Not Analyzed
158	047	19.3	04	00	MSG	ANO	CMX	1	None
158	048	20.1	04	04	MSG	ANO	SIM	1	None
158	049	20.2	05	N/A	N/A	ANO	N/A	1	Not Analyzed
158	050	20.3	04	00	MSG	ANO	CMX	1	None
158	051	20.4	05	N/A	N/A	ANO	N/A	1	Not Analyzed
158	052	20.5	05	N/A	N/A	ANO	N/A	1	Not Analyzed
158	053	20.6	05	N/A	N/A	ANO	N/A	1	Not Analyzed
158	054	21.1	04	00	MSG	ANO	SIM	1	None
158	055	21.2	04	00	MSG	ANO	CMX	1	None
158	056	22.1	03	00	CRT	ANO	CMX	1	None
158	057	22.2	04	00	MSG	ANO	CMX	1	None

Appendix D.1. TxDOT 41SR242 Feature 1 Debitage Analysis

Lot No.	Specimen No.	Nodule No.	Flake Size	Percent Cortex	Platform Type	Thermal Alteration	Technological Class	Count	Comments
158	058	23.1	04	00	MSG	ANO	SIM	1	None
158	059	23.2	04	03	MSG	ANO	CMX	1	None
158	060	23.3	05	N/A	N/A	ANO	N/A	1	Not Analyzed
158	061	23.4	05	N/A	N/A	ANO	N/A	1	Not Analyzed
158	062	24.1	04	00	MSG	ANO	CMX	1	None
158	063	24.2	04	00	MSG	ANO	PRI	1	None
158	064	25.1	03	00	MSG	AOB	SHA	1	None
158	065	26.1	03	00	MSG	ANO	CMX	1	None
158	066	26.2	05	N/A	N/A	ANO	N/A	1	Not Analyzed
158	067	26.3	05	N/A	N/A	ANO	N/A	1	Not Analyzed
158	068	27.1	04	00	MSG	ANO	CMX	1	None
158	069	27.2	05	N/A	N/A	ANO	N/A	1	Not Analyzed
158	070	28.1	04	00	MSG	ANO	CMX	1	None
158	071	29.1	04	00	MSG	ANO	CMX	1	None
158	072	30.1	04	00	MSG	ANO	CMX	1	None
158	073	31.1	04	00	MSG	ANO	CMX	1	None
158	074	32.1	04	00	MSG	ANO	CMX	1	None
158	075	32.2	05	N/A	N/A	ANO	N/A	1	Not Analyzed
158	076	32.3	05	N/A	N/A	ANO	N/A	1	Not Analyzed
158	077	33.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
158	078	34.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
158	079	35.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
158	080	36.1	04	00	MSG	ANO	CMX	1	None
158	081	37.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
158	082	37.2	05	N/A	N/A	ANO	N/A	1	Not Analyzed
158	083	38.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
158	084	39.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
159	001	1.1	01	00	FLA	ANO	CMX	1	None
159	002	1.2	01	03	MSG	ANO	SIM	1	None
159	003	1.3	01	02	CRT	ANO	SIM	1	None
159	004	2.1	01	04	MSG	ANO	SIM	1	None
159	005	2.2	04	00	MSG	ANO	SG4	1	None
159	006	3.1	01	04	MSG	ANO	PRI	1	None
159	007	4.1	03	04	CRT	ANO	PRI	1	None
159	008	4.2	02	02	MSG	ANO	SIM	1	None
159	009	5.1	01	00	FLA	ANO	CMX	1	None
159	010	6.1	01	02	MSG	ANO	SIM	1	None
159	011	6.2	03	00	MLT	ANO	CMX	1	None
159	012	7.1	01	04	FLA	ANO	CMX	1	None
159	013	8.1	01	00	MSG	ANO	CMX	1	None
159	014	8.2	04	00	MLT	ANO	CMX	1	None
159	015	9.1	01	00	MSG	ANO	BTF	1	None
159	016	10.1	01	01	FLA	ANO	SIM	1	None
159	017	10.2	01	02	MLT	ANO	BTF	1	None
159	018	11.1	03	00	MSG	ANO	SHA	1	None
159	019	11.2	03	02	MSG	ANO	SIM	1	None
159	020	12.1	01	00	MLT	ANO	BTF	1	None
159	021	13.1	01	00	FCT	ANO	CMX	1	None
159	022	14.1	01	00	MSG	ANO	BTF	1	None
159	023	14.2	03	00	MSG	ANO	CMX	1	None
159	024	15.1	01	00	FLA	ANO	CMX	1	None
159	025	16.1	01	00	MSG	ANO	BTF	1	None
159	026	17.1	03	00	CRT	ANO	CMX	1	None
159	027	18.1	01	02	MSG	ANO	SIM	1	None
159	028	19.1	02	00	MSG	ANO	CMX	1	None
159	029	20.1	01	00	MSG	ANO	CMX	1	None
159	030	20.2	04	00	MSG	ANO	CMX	1	None
159	031	21.1	04	00	BPF	ANO	CMX	1	None
159	032	21.2	04	00	BPF	ANO	CMX	1	None
159	033	21.3	04	00	MSG	ANO	CMX	1	None
159	034	21.4	04	00	MSG	ANO	CMX	1	None
159	035	21.5	04	00	BPF	ANO	CMX	1	None
159	036	21.6	04	00	MSG	ANO	CMX	1	None
159	037	22.1	01	02	CRT	ANO	SIM	1	None
159	038	22.2	03	00	MSG	ANO	CMX	1	None
159	039	23.1	02	00	MSG	ANO	CMX	1	None

Appendix D.1. TxDOT 41SR242 Feature 1 Debitage Analysis

Lot No.	Specimen No.	Nodule No.	Flake Size	Percent Cortex	Platform Type	Thermal Alteration	Technological Class	Count	Comments
159	040	23.2	02	00	MSG	ANO	BTF	1	None
159	041	24.1	02	00	MLT	ANO	CMX	1	None
159	042	24.2	04	00	MSG	ANO	CMX	1	None
159	043	25.1	03	03	MSG	ANO	SIM	1	None
159	044	25.2	04	00	MSG	ANO	CMX	1	None
159	045	25.3	05	00	MSG	ANO	CMX	1	None
159	046	26.1	03	00	MSG	ANO	CMX	1	None
159	047	26.2	03	00	MLT	ANO	CMX	1	None
159	048	27.1	02	00	MSG	ANO	CMX	1	None
159	049	28.1	02	00	MSG	ANO	CMX	1	None
159	050	28.2	03	00	MSG	ANO	CMX	1	None
159	051	29.1	01	00	MLT	ANO	CMX	1	None
159	052	30.1	03	00	MSG	ANO	CMX	1	None
159	053	31.1	03	00	MSG	ANO	CMX	1	None
159	054	31.2	03	00	FCT	ANO	CMX	1	None
159	055	31.3	04	00	CRT	ANO	CMX	1	None
159	056	32.1	02	00	FLA	ANO	CMX	1	None
159	057	32.2	04	00	MSG	ANO	CMX	1	None
159	058	33.1	03	00	CRT	ANO	CMX	1	None
159	059	33.2	03	00	MSG	ANO	SIM	1	None
159	060	34.1	03	00	FCT	ANO	CMX	1	None
159	061	35.1	03	00	MSG	ANO	CMX	1	None
159	062	36.1	03	00	MSG	ANO	CMX	1	None
159	063	37.1	04	00	MSG	ANO	CMX	1	None
159	064	37.2	04	00	MSG	ANO	CMX	1	None
159	065	38.1	02	00	MSG	ANO	CMX	1	None
159	066	38.2	04	00	MSG	ANO	CMX	1	None
159	067	39.1	04	00	MLT	ANO	CMX	1	None
159	068	40.1	04	00	MSG	ANO	CMX	1	None
159	069	41.1	04	00	MSG	ANO	CMX	1	None
159	070	42.1	04	00	MSG	ANO	CMX	1	None
159	071	42.2	04	00	MSG	ANO	CMX	1	None
159	072	43.1	04	02	MSG	ANO	SHA	1	None
159	073	43.2	04	00	MSG	ANO	CMX	1	None
159	074	43.3	05	00	MSG	ANO	CMX	1	None
159	075	44.1	04	00	FCT	ANO	CMX	1	None
159	076	44.2	05	00	MSG	ANO	CMX	1	None
159	077	44.3	05	00	CRT	ANO	CMX	1	None
159	078	45.1	04	00	MSG	ANO	CMX	1	None
159	079	45.2	04	00	FCT	ANO	CMX	1	None
159	080	46.1	04	00	MSG	ANO	CMX	1	None
159	081	46.2	04	00	MSG	ANO	CMX	1	None
159	082	47.1	04	00	MLT	ANO	BPF	1	None
159	083	48.1	04	00	MSG	ANO	CMX	1	None
159	084	48.2	04	00	MSG	ANO	CMX	1	None
159	085	49.1	04	00	MSG	ANO	CMX	1	None
159	086	50.1	04	00	MSG	ANO	CMX	1	None
159	087	50.2	04	00	MSG	ANO	CMX	1	None
159	088	51.1	04	00	MSG	ANO	CMX	1	None
159	089	52.1	04	00	MSG	ANO	CMX	1	None
159	090	52.2	05	00	MSG	ANO	CMX	1	None
159	091	53.1	03	00	MSG	ANO	CMX	1	None
159	092	54.1	04	00	MSG	ANO	CMX	1	None
159	093	54.2	04	00	MSG	ANO	CMX	1	None
159	094	55.1	04	00	MLT	ANO	CMX	1	None
159	095	56.1	04	00	MSG	ANO	CMX	1	None
159	096	57.1	04	00	MSG	ANO	CMX	1	None
159	097	58.1	04	00	MSG	ANO	CMX	1	None
159	098	59.1	04	00	MSG	ANO	CMX	1	None
159	099	60.1	04	00	MSG	ANO	CMX	1	None
159	100	61.1	04	00	MSG	ANO	CMX	1	None
159	101	62.1	05	00	MSG	ANO	CMX	1	None
160	001	1.1	02	00	MLT	ANO	SIM	1	None
160	002	2.1	01	02	CRT	ANO	SIM	1	None
160	003	3.1	01	00	MLT	ANO	BTF	1	None
160	004	3.2	02	02	MSG	ANO	SIM	1	None

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Lot No.	Specimen No.	Nodule No.	Flake Size	Percent Cortex	Platform Type	Thermal Alteration	Technological Class	Count	Comments
160	005	3.3	03	00	MSG	AOB	SHA	1	None
160	006	4.1	01	00	MLT	ANO	BTF	1	None
160	007	4.2	04	00	FLA	ANO	CMX	1	None
160	008	4.3	04	00	MSG	ANO	CMX	1	None
160	009	4.4	04	03	MSG	ANO	SIM	1	None
160	010	4.5	05	00	MSG	ANO	SG4	4	None
160	011	5.1	04	00	MSG	ANO	CMX	1	None
160	012	6.1	01	00	FLA	ANO	CMX	1	None
160	013	6.2	01	00	MSG	ANO	CMX	1	None
160	014	6.3	04	00	MSG	ANO	CMX	1	None
160	015	7.1	04	00	MLT	ANO	CMX	1	None
160	016	7.2	04	00	MSG	ANO	CMX	1	None
160	017	7.3	04	00	MSG	ANO	CMX	1	None
160	018	8.1	04	00	MSG	ANO	CMX	1	None
160	019	9.1	04	00	MSG	ANO	CMX	1	None
160	020	10.1	04	00	MSG	ANO	BPF	1	None
160	021	10.2	04	00	MSG	ANO	CMX	1	None
160	022	10.3	04	00	MSG	AOB	SHA	1	None
160	023	10.4	04	00	MSG	ANO	CMX	1	None
160	024	10.5	04	00	MSG	ANO	CMX	1	None
160	025	11.1	03	01	FLA	ANO	SIM	1	None
160	026	12.1	01	04	FCT	ANO	SIM	1	None
160	027	13.1	01	00	MSG	ANO	CMX	1	None
160	028	14.1	04	00	MSG	ANO	CMX	1	None
160	029	14.2	04	00	MSG	ANO	SIM	1	None
160	030	15.1	01	01	FLA	ANO	CMX	1	None
160	031	15.2	01	00	FLA	ANO	CMX	1	None
160	032	16.1	01	00	MSG	ANO	CMX	1	None
160	033	17.1	01	01	MSG	ANO	SIM	1	None
160	034	17.2	04	00	CRT	ANO	CMX	1	None
160	035	18.1	01	00	FLA	ANO	CMX	1	None
160	036	18.2	02	00	FLA	ANO	CMX	1	None
160	037	18.3	01	01	CRT	ANO	SIM	1	None
160	038	18.4	04	00	CRT	ANO	CMX	1	None
160	039	19.1	03	00	FLA	ANO	CMX	1	None
160	040	19.2	03	00	MSG	ANO	CMX	1	None
160	041	19.3	03	02	CRT	ANO	SIM	1	None
160	042	20.1	04	00	MSG	ANO	CMX	1	None
160	043	20.2	04	02	MSG	ANO	SIM	1	None
160	044	20.3	05	00	MSG	ANO	CMX	1	None
160	045	21.1	03	00	MSG	ANO	CMX	1	None
160	046	21.2	04	00	MSG	ANO	CMX	1	None
160	047	22.1	03	00	MLT	ANO	CMX	1	None
160	048	22.2	04	00	MSG	ANO	CMX	1	None
160	049	23.1	01	00	CRT	ANO	CMX	1	None
160	050	23.2	04	00	MSG	ANO	CMX	1	None
160	051	23.3	04	00	MSG	ANO	SHA	1	None
160	052	23.4	05	N/A	N/A	ANO	N/A	1	Not Analyzed
160	053	24.1	02	00	MLT	ANO	BTF	1	None
160	054	24.2	04	00	MLT	ANO	BTF	1	None
160	055	24.3	04	00	MSG	ANO	CMX	1	None
160	056	24.4	04	00	MSG	ANO	CMX	1	None
160	057	24.5	04	00	MSG	ANO	CMX	1	None
160	058	24.6	04	00	MSG	ANO	CMX	1	None
160	059	24.7	04	00	MSG	ANO	CMX	1	None
160	060	24.8	04	00	MSG	ANO	CMX	1	None
160	061	24.9	04	00	MSG	ANO	CMX	1	None
160	062	24.10	05	N/A	N/A	ANO	N/A	1	Not Analyzed
160	063	25.1	04	00	MSG	ANO	CMX	1	None
160	064	25.2	04	00	MSG	ANO	CMX	1	None
160	065	25.3	04	00	MSG	ANO	CMX	1	None
160	066	25.4	05	N/A	N/A	ANO	N/A	1	Not Analyzed
160	067	26.1	03	00	MSG	ANO	CMX	1	None
160	068	26.2	03	02	MSG	ANO	CMX	1	None
160	069	27.1	03	00	CRT	ANO	CMX	1	None
160	070	27.2	04	00	MSG	ANO	CMX	1	None

Appendix D.1. TxDOT 41SR242 Feature 1 Debitage Analysis

Lot No.	Specimen No.	Nodule No.	Flake Size	Percent Cortex	Platform Type	Thermal Alteration	Technological Class	Count	Comments
160	071	27.3	04	00	MSG	ANO	CMX	1	None
160	072	27.4	04	00	MSG	ANO	CMX	1	None
160	073	27.5	05	N/A	N/A	ANO	N/A	1	Not Analyzed
160	074	28.1	04	00	MSG	ANO	CMX	1	None
160	075	28.2	04	03	MSG	ANO	SIM	1	None
160	076	28.3	05	N/A	N/A	ANO	N/A	1	Not Analyzed
160	077	29.1	04	00	MSG	ANO	CMX	1	None
160	078	29.2	03	00	MSG	AOB	SHA	1	None
160	079	29.3	04	00	MSG	ANO	CMX	1	None
160	080	30.1	03	01	CRT	ANO	SIM	1	None
160	081	31.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
160	082	31.2	05	N/A	N/A	ANO	N/A	1	Not Analyzed
160	083	31.3	05	N/A	N/A	ANO	N/A	1	Not Analyzed
160	084	32.1	04	00	MSG	ANO	CMX	1	None
161	001	1.1	04	03	CRT	ANO	SIM	1	None
161	002	2.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
161	003	2.2	05	N/A	N/A	ANO	N/A	1	Not Analyzed
161	004	3.1	02	00	MSG	ANO	CMX	1	None
161	005	4.1	04	00	MLT	ANO	CMX	1	None
161	006	4.2	05	N/A	N/A	ANO	N/A	1	Not Analyzed
161	007	5.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
161	008	6.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
161	009	7.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
161	010	7.2	05	N/A	N/A	ANO	N/A	1	Not Analyzed
161	011	8.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
161	012	9.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
161	013	10.1	04	00	MSG	ANO	CMX	1	None
161	014	11.1	02	00	FCT	ANO	CMX	1	None
161	015	12.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
161	016	13.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
161	017	14.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
161	018	15.1	04	00	MSG	ANO	CMX	1	None
161	019	15.2	05	N/A	N/A	ANO	N/A	1	Not Analyzed
161	020	16.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
161	021	17.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
161	022	18.1	04	00	MSG	ANO	CMX	1	None
161	023	19.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
161	024	20.1	03	00	MSG	ANO	CMX	1	None
161	025	21.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
161	026	22.1	04	00	MLT	ANO	BPF	1	None
161	027	22.2	04	00	MSG	ANO	CMX	1	None
161	028	22.3	05	N/A	N/A	ANO	N/A	1	Not Analyzed
161	029	23.1	04	00	FLA	ANO	CMX	1	None
162	001	1.1	04	00	MLT	ANO	BPF	1	None
162	002	2.1	04	00	MSG	ANO	SIM	1	None
162	003	3.1	05	00	MSG	ANO	CMX	1	None
162	004	3.2	03	00	FCT	ANO	CMX	1	None
162	005	4.1	03	00	MSG	ANO	CMX	1	None
162	006	4.2	05	00	MSG	ANO	CMX	1	None
162	007	5.1	03	00	MSG	ANO	CMX	1	None
162	008	6.1	02	00	MSG	ANO	CMX	1	None
162	009	6.2	04	00	MSG	ANO	CMX	1	None
162	010	7.1	05	00	MSG	ANO	CMX	1	None
162	011	8.1	04	00	MSG	ANO	CMX	1	None
162	012	9.1	02	04	MSG	AOB	SHA	1	None
162	013	9.2	04	00	MSG	AOB	SHA	1	Potlid
162	014	10.1	01	02	CRT	ANO	SIM	1	None
162	015	10.2	03	00	CRT	ANO	CMX	1	None
162	016	11.1	04	00	MSG	AOB	SHA	1	None
162	017	12.1	03	00	MSG	ANO	CMX	1	None
162	018	12.2	04	00	MSG	ANO	CMX	1	None
162	019	13.1	05	00	MSG	ANO	CMX	1	None
162	020	14.1	04	00	MSG	ANO	CMX	1	None
162	021	15.1	04	00	MSG	ANO	CMX	1	None
162	022	16.1	04	00	MSG	ANO	SHA	1	None
162	023	16.2	04	00	MSG	AOB	SHA	1	None

Appendix D.1. TxDOT 41SR242 Feature 1 Debitage Analysis

Lot No.	Specimen No.	Nodule No.	Flake Size	Percent Cortex	Platform Type	Thermal Alteration	Technological Class	Count	Comments
162	024	17.1	02	01	FCT	ANO	SIM	1	None
162	025	18.1	02	02	MSG	ANO	SIM	1	None
163	001	1.1	01	00	FCT	ANO	CMX	1	None
163	002	1.2	01	01	MLT	ANO	SIM	1	None
163	003	2.1	01	01	MSG	ANO	SIM	1	None
163	004	2.2	04	00	MLT	ANO	CMX	1	None
163	005	2.3	04	00	MSG	ANO	CMX	1	None
163	006	3.1	01	01	CRT	ANO	SIM	1	None
163	007	4.1	01	04	FLA	ANO	PRI	1	None
163	008	5.1	01	04	MSG	ANO	PRI	1	None
163	009	6.1	01	00	FLA	ANO	CMX	1	None
163	010	6.2	04	01	CRT	ANO	SIM	1	None
163	011	6.3	04	00	MSG	ANO	CMX	1	None
163	012	7.1	01	00	MSG	ANO	CMX	1	None
163	013	7.2	02	00	CRT	ANO	CMX	1	None
163	014	7.3	03	00	FLA	ANO	CMX	1	None
163	015	7.4	03	00	MSG	ANO	CMX	1	None
163	016	7.5	03	00	MLT	ANO	CMX	1	None
163	017	7.6	04	00	MSG	ANO	CMX	1	None
163	018	7.7	04	00	MSG	ANO	CMX	1	None
163	019	7.8	05	N/A	N/A	ANO	N/A	1	Not Analyzed
163	020	8.1	02	00	MSG	ANO	CMX	1	None
163	021	9.1	01	00	MSG	ANO	CMX	1	None
163	022	10.1	02	00	FLA	ANO	CMX	1	None
163	023	11.1	03	00	MSG	ANO	CMX	1	None
163	024	11.2	03	00	MSG	ANO	CMX	1	None
163	025	12.1	04	00	MSG	ANO	CMX	1	None
163	026	13.1	04	00	MSG	ANO	CMX	1	None
163	027	14.1	02	01	MSG	ANO	SIM	1	None
163	028	15.1	01	00	MSG	ANO	CMX	1	None
163	029	15.2	02	00	FCT	ANO	CMX	1	None
163	030	15.3	04	00	MSG	ANO	CMX	1	None
163	031	15.4	04	00	MSG	ANO	CMX	1	None
163	032	15.5	04	00	MSG	ANO	CMX	1	None
163	033	15.6	05	N/A	N/A	ANO	N/A	1	Not Analyzed
163	034	16.1	03	00	MSG	ANO	CMX	1	None
163	035	16.2	03	00	MLT	ANO	CMX	1	None
163	036	17.1	03	02	MSG	ANO	SHA	1	None
163	037	18.1	01	00	FCT	ANO	CMX	1	None
163	038	18.2	05	N/A	N/A	ANO	N/A	1	Not Analyzed
163	039	19.1	04	00	MSG	ANO	CMX	1	None
163	040	19.2	05	N/A	N/A	ANO	N/A	1	Not Analyzed
163	041	20.1	04	N/A	N/A	ANO	N/A	1	Not Analyzed
163	042	21.1	02	00	MLT	ANO	CMX	1	None
163	043	21.2	04	00	MSG	ANO	CMX	1	None
163	044	22.1	02	00	MSG	ANO	BTF	1	None
163	045	22.2	04	00	MSG	ANO	CMX	1	None
163	046	23.1	02	00	MLT	ANO	BTF	1	None
163	047	24.1	02	02	MLT	ANO	SIM	1	None
163	048	24.2	03	00	MLT	ANO	CMX	1	None
163	049	25.1	03	00	MSG	ANO	CMX	1	None
163	050	26.1	02	00	MSG	ANO	CMX	1	None
163	051	26.2	04	00	MSG	ANO	CMX	1	None
163	052	27.1	04	00	MLT	ANO	CMX	1	None
163	053	27.2	04	00	MSG	ANO	CMX	1	None
163	054	27.3	04	00	MSG	ANO	CMX	1	None
163	055	28.1	04	00	MSG	ANO	CMX	1	None
163	056	28.2	04	00	FCT	ANO	CMX	1	None
163	057	28.3	05	N/A	N/A	ANO	N/A	1	Not Analyzed
163	058	29.1	03	00	MSG	ANO	CMX	1	None
163	059	30.1	04	00	MSG	ANO	CMX	1	None
163	060	31.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
163	061	32.1	04	00	MSG	ANO	CMX	1	None
163	062	33.1	04	00	MSG	ANO	CMX	1	None
163	063	34.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
163	064	35.1	04	00	MSG	ANO	CMX	1	None

Appendix D.1. TxDOT 41SR242 Feature 1 Debitage Analysis

Lot No.	Specimen No.	Nodule No.	Flake Size	Percent Cortex	Platform Type	Thermal Alteration	Technological Class	Count	Comments
163	065	35.2	04	00	MSG	ANO	CMX	1	None
163	066	36.1	04	00	MSG	ANO	CMX	1	None
163	067	37.1	04	00	MSG	ANO	SHA	1	None
163	068	38.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
163	069	38.2	05	N/A	N/A	ANO	N/A	1	Not Analyzed
163	070	39.1	03	00	MSG	ANO	CMX	1	None
163	071	39.2	04	00	MSG	ANO	CMX	1	None
163	072	40.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
163	073	41.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
163	074	42.1	04	00	MSG	ANO	CMX	1	None
163	075	42.2	04	00	MSG	ANO	CMX	1	None
163	076	43.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
164	001	1.1	01	00	MLT	ANO	BTF	1	None
164	002	1.2	03	00	MSG	ANO	CMX	1	None
164	003	2.1	04	00	MSG	ANO	CMX	1	None
164	004	3.1	04	04	MSG	ANO	PRI	1	None
164	005	4.1	04	00	MSG	ANO	CMX	1	None
164	006	4.2	04	00	MSG	ANO	CMX	1	None
164	007	4.3	04	00	MSG	ANO	CMX	1	None
164	008	5.1	02	04	MSG	ANO	PRI	1	None
164	009	6.1	04	00	MLT	ANO	BPF	1	None
164	010	7.1	02	00	FCT	ANO	CMX	1	None
164	011	8.1	04	00	MSG	ANO	CMX	1	None
164	012	9.1	04	00	MSG	ANO	CMX	1	None
164	013	9.2	04	00	MSG	ANO	CMX	1	None
164	014	10.1	04	00	MSG	ANO	CMX	1	None
164	015	11.1	05	00	MSG	ANO	CMX	1	None
164	016	12.1	04	00	MSG	ANO	CMX	1	None
164	017	12.2	04	00	MSG	ANO	CMX	1	None
164	018	13.1	04	00	MSG	ANO	CMX	1	None
164	019	13.2	04	00	MSG	ANO	SHA	1	None
164	020	13.3	04	00	MSG	ANO	CMX	1	None
164	021	13.4	04	00	MSG	ANO	CMX	1	None
164	022	14.1	03	00	CRT	ANO	CMX	1	None
164	023	15.1	04	00	CRT	ANO	CMX	1	None
164	024	15.2	03	04	MSG	ANO	PRI	1	None
164	025	15.3	04	00	MSG	ANO	BPF	1	None
164	026	16.1	02	00	MSG	ANO	CMX	1	None
164	027	17.1	02	00	MLT	ANO	CMX	1	None
164	028	17.2	04	00	MSG	AOB	CMX	1	None
164	029	18.1	01	04	MSG	ANO	PRI	1	None
164	030	18.2	01	00	MSG	ANO	CMX	1	None
164	031	18.3	02	00	MSG	ANO	CMX	1	None
164	032	18.4	02	00	MLT	ANO	CMX	1	None
164	033	18.5	04	00	MSG	ANO	CMX	1	None
164	034	19.1	04	00	MSG	ANO	CMX	1	None
164	035	19.2	05	00	MSG	ANO	CMX	1	None
165	001	1.1	01	04	MLT	ANO	PRI	1	None
165	002	2.1	03	04	MSG	ANO	PRI	1	None
165	003	2.2	03	00	MLT	ANO	CMX	1	None
165	004	3.1	01	02	FLA	ANO	SIM	1	None
165	005	4.1	03	00	MLT	ANO	CMX	1	None
165	006	5.1	03	01	FLA	ANO	CMX	1	None
165	007	6.1	04	00	MSG	ANO	CMX	1	None
165	008	6.2	02	00	MLT	ANO	SIM	1	None
165	009	7.1	03	00	MLT	ANO	CMX	1	None
165	010	8.1	04	00	MSG	ANO	SHA	1	None
165	011	8.2	03	00	MLT	ANO	CMX	1	None
165	012	9.1	02	00	MLT	ANO	CMX	1	None
165	013	10.1	01	04	FCT	ANO	PRI	1	None
165	014	11.1	03	01	MSG	ANO	SHA	1	None
165	015	12.1	03	01	IND	ANO	SIM	1	None
165	016	12.2	03	02	MSG	ANO	SIM	1	None
165	017	13.1	03	00	MSG	ANO	CMX	1	None
165	018	14.1	03	03	MSG	ANO	SIM	1	None
165	019	15.1	01	00	MSG	ANO	CMX	1	None

Appendix D.1. TxDOT 41SR242 Feature 1 Debitage Analysis

Lot No.	Specimen No.	Nodule No.	Flake Size	Percent Cortex	Platform Type	Thermal Alteration	Technological Class	Count	Comments
165	020	16.1	01	01	MLT	ANO	SIM	1	None
165	021	17.1	01	01	CRT	ANO	SIM	1	None
166	001	1.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
166	002	2.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
166	003	3.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
166	004	4.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
166	005	5.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
166	006	6.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
166	007	7.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
166	008	8.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
166	009	9.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
166	010	10.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
166	011	11.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
166	012	12.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
166	013	13.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
166	014	14.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
166	015	14.2	05	N/A	N/A	ANO	N/A	1	Not Analyzed
166	016	15.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
166	017	15.2	05	N/A	N/A	ANO	N/A	1	Not Analyzed
166	018	16.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
166	019	16.2	05	N/A	N/A	ANO	N/A	1	Not Analyzed
166	020	17.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
166	021	17.2	05	N/A	N/A	ANO	N/A	1	Not Analyzed
166	022	18.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
166	023	18.2	05	N/A	N/A	ANO	N/A	1	Not Analyzed
166	024	18.3	05	N/A	N/A	ANO	N/A	1	Not Analyzed
166	025	19.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
166	026	19.2	05	N/A	N/A	ANO	N/A	1	Not Analyzed
166	027	20.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
166	028	20.2	05	N/A	N/A	ANO	N/A	1	Not Analyzed
166	029	21.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
166	030	21.2	05	N/A	N/A	ANO	N/A	1	Not Analyzed
166	031	22.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
166	032	23.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
166	033	23.2	05	N/A	N/A	ANO	N/A	1	Not Analyzed
166	034	23.3	05	N/A	N/A	ANO	N/A	1	Not Analyzed
166	035	24.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
166	036	24.2	05	N/A	N/A	ANO	N/A	1	Not Analyzed
166	037	25.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
166	038	25.2	05	N/A	N/A	ANO	N/A	1	Not Analyzed
166	039	26.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
166	040	26.2	05	N/A	N/A	ANO	N/A	1	Not Analyzed
166	041	26.3	05	N/A	N/A	ANO	N/A	1	Not Analyzed
166	042	27.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
166	043	27.2	05	N/A	N/A	ANO	N/A	1	Not Analyzed
166	044	28.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
166	045	28.2	05	N/A	N/A	ANO	N/A	1	Not Analyzed
166	046	29.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
166	047	29.2	05	N/A	N/A	ANO	N/A	1	Not Analyzed
166	048	30.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
166	049	30.2	05	N/A	N/A	ANO	N/A	1	Not Analyzed
166	050	30.3	05	N/A	N/A	ANO	N/A	1	Not Analyzed
166	051	31.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
166	052	31.2	05	N/A	N/A	ANO	N/A	1	Not Analyzed
166	053	31.3	05	N/A	N/A	ANO	N/A	1	Not Analyzed
166	054	31.4	05	N/A	N/A	ANO	N/A	1	Not Analyzed
167	001	1.1	01	03	FLA	ANO	SIM	1	None
167	002	2.1	01	01	MSG	ANO	SIM	1	None
167	003	3.1	02	04	MSG	ANO	PRI	1	None
167	004	4.1	01	00	FLA	ANO	CMX	1	None
167	005	5.1	01	00	MSG	ANO	CMX	1	None
167	006	6.1	03	00	MSG	ANO	CMX	1	None
167	007	7.1	01	00	FCT	ANO	BTF	1	None
167	008	8.1	04	00	CRT	ANO	CMX	1	None
167	009	9.1	05	00	MSG	ANO	SG4	1	None
167	010	10.1	01	01	CRT	ANO	SIM	1	None

Appendix D.1. TxDOT 41SR242 Feature 1 Debitage Analysis

Lot No.	Specimen No.	Nodule No.	Flake Size	Percent Cortex	Platform Type	Thermal Alteration	Technological Class	Count	Comments
167	011	10.2	03	00	MSG	ANO	CMX	1	None
167	012	11.1	02	00	MSG	ANO	CMX	1	None
167	013	11.2	01	00	MLT	ANO	BTF	1	None
167	014	12.1	04	00	MSG	ANO	CMX	1	None
167	015	13.1	05	00	MSG	ANO	SG4	1	None
171	001	1.1	01	01	CRT	ANO	SIM	1	None
171	002	2.1	02	00	FLA	ANO	CMX	1	None
171	003	3.1	01	01	CRT	ANO	SIM	1	None
171	004	4.1	02	04	MSG	ANO	PRI	1	None
171	005	5.1	03	00	MSG	ANO	CMX	1	None
171	006	6.1	03	00	MSG	ANO	CMX	1	None
171	007	7.1	03	02	FLA	ANO	SIM	1	None
171	008	8.1	03	00	MSG	ANO	CMX	1	None
171	009	9.1	01	01	CRT	ANO	CMX	1	None
171	010	9.2	05	00	MSG	ANO	CMX	1	None
171	011	10.1	03	00	MSG	ANO	CMX	1	None
171	012	11.1	04	00	CRT	ANO	CMX	1	None
171	013	11.2	04	00	CRT	ANO	CMX	1	None
172	001	1.1	02	00	MSG	ANO	CMX	1	None
172	002	1.2	04	04	MSG	ANO	PRI	1	None
172	003	2.1	01	00	FCT	ANO	CMX	1	None
172	004	3.1	02	00	MSG	ANO	CMX	1	None
172	005	4.1	03	00	MSG	ANO	CMX	1	None
172	006	4.2	03	00	FLA	ANO	CMX	1	None
172	007	5.1	03	00	MSG	ANO	CMX	1	None
172	008	5.2	04	04	MSG	ANO	PRI	1	None
172	009	6.1	01	00	MSG	ANO	CMX	1	None
172	010	7.1	01	00	FLA	ANO	CMX	1	None
172	011	8.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
172	012	9.1	04	04	MSG	ANO	PRI	1	None
172	013	10.1	02	02	MSG	ANO	SIM	1	None
172	014	10.2	04	00	MSG	ANO	CMX	1	None
172	015	11.1	03	04	MSG	ANO	PRI	1	None
172	016	12.1	02	01	CRT	ANO	SIM	1	None
172	017	12.2	02	00	MLT	ANO	CMX	1	None
172	018	12.3	03	00	MSG	ANO	CMX	1	None
172	019	13.1	04	00	MLT	ANO	BTF	1	None
172	020	13.2	02	00	MSG	ANO	CMX	1	None
172	021	13.3	04	00	MSG	ANO	CMX	1	None
172	022	14.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
172	023	15.1	04	00	MSG	ANO	CMX	1	None
172	024	15.2	05	N/A	N/A	ANO	N/A	1	Not Analyzed
172	025	16.1	04	00	MSG	ANO	CMX	1	None
172	026	16.2	04	00	MSG	ANO	CMX	1	None
172	027	16.3	05	N/A	N/A	ANO	N/A	1	Not Analyzed
172	028	16.4	05	N/A	N/A	ANO	N/A	1	Not Analyzed
172	029	17.1	04	00	MSG	ANO	CMX	1	None
172	030	18.1	02	02	FLA	AOB	SIM	1	None
172	031	18.2	04	04	MSG	ANO	PRI	1	None
172	032	18.3	04	00	MSG	ANO	CMX	1	None
172	033	18.4	05	N/A	N/A	ANO	N/A	1	Not Analyzed
172	034	19.1	04	00	MSG	ANO	CMX	1	None
172	035	20.1	03	00	MSG	ANO	CMX	1	None
172	036	20.2	04	00	FLA	ANO	CMX	1	None
172	037	20.3	04	00	MSG	ANO	CMX	1	None
172	038	20.4	04	00	MSG	ANO	CMX	1	None
172	039	20.5	05	N/A	N/A	ANO	N/A	1	Not Analyzed
172	040	20.6	05	N/A	N/A	ANO	N/A	1	Not Analyzed
172	041	21.1	03	00	MSG	ANO	CMX	1	None
172	042	21.2	04	00	MSG	ANO	CMX	1	None
172	043	22.1	02	00	MSG	ANO	CMX	1	None
172	044	22.2	03	00	MSG	ANO	CMX	1	None
172	045	22.3	05	N/A	N/A	ANO	N/A	1	Not Analyzed
172	046	22.4	05	N/A	N/A	ANO	N/A	1	Not Analyzed
172	047	23.1	04	00	MSG	ANO	CMX	1	None
172	048	23.2	04	00	MSG	ANO	CMX	1	None

Appendix D.1. TxDOT 41SR242 Feature 1 Debitage Analysis

Lot No.	Specimen No.	Nodule No.	Flake Size	Percent Cortex	Platform Type	Thermal Alteration	Technological Class	Count	Comments
172	049	23.3	04	00	MSG	ANO	CMX	1	None
172	050	24.1	01	00	MLT	ANO	CMX	1	None
172	051	25.1	01	02	CRT	ANO	SIM	1	None
172	052	25.2	04	00	MSG	ANO	CMX	1	None
172	053	25.3	05	N/A	N/A	ANO	N/A	1	Not Analyzed
172	054	25.4	05	N/A	N/A	ANO	N/A	1	Not Analyzed
172	055	25.5	05	N/A	N/A	ANO	N/A	1	Not Analyzed
172	056	26.1	04	00	MSG	ANO	CMX	1	None
172	057	26.2	04	00	MSG	ANO	CMX	1	None
172	058	26.3	04	00	MSG	ANO	CMX	1	None
172	059	26.4	05	N/A	N/A	ANO	N/A	1	Not Analyzed
172	060	26.5	05	N/A	N/A	ANO	N/A	1	Not Analyzed
172	061	27.1	04	00	MSG	ANO	CMX	1	None
172	062	28.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
172	063	29.1	05	N/A	N/A	ANO	N/A	1	Not Analyzed
172	064	30.1	04	02	CRT	ANO	SIM	1	None
172	065	30.2	04	00	MLT	ANO	CMX	1	None
172	066	30.3	04	00	MSG	ANO	CMX	1	None
172	067	30.4	04	00	MSG	ANO	CMX	1	None
172	068	30.5	04	00	MSG	ANO	CMX	1	None
172	069	30.6	05	N/A	N/A	ANO	N/A	1	Not Analyzed
173	001	1.1	01	00	FLA	ANO	MSG	1	None
173	002	1.2	01	03	MSG	ANO	SIM	1	None
173	003	2.1	01	00	MLT	ANO	BTF	1	None
173	004	2.2	04	00	MLT	ANO	MSG	1	None
173	005	3.1	02	00	FCT	AOB	MSG	1	None
173	006	4.1	01	00	MSG	ANO	BTF	1	None
173	007	5.1	01	00	MSG	ANO	MSG	1	None
173	008	6.1	02	00	MLT	ANO	MSG	1	None
173	009	7.1	02	00	CRT	ANO	MSG	1	None
173	010	8.1	02	00	FLA	ANO	MSG	1	None
173	011	9.1	02	00	MLT	ANO	BTF	1	None
173	012	10.1	03	00	MLT	ANO	BTF	1	None
173	013	10.2	04	00	MSG	ANO	MSG	1	None
173	014	11.1	02	03	MSG	AOB	SHA	1	None
173	015	11.2	04	00	MSG	ANO	MSG	1	None
173	016	11.3	04	00	MSG	ANO	MSG	1	None
173	017	11.4	04	00	FLA	ANO	MSG	1	None
173	018	11.5	04	00	MSG	ANO	MSG	1	None
173	019	11.6	05	N/A	N/A	ANO	N/A	5	Not Analyzed
173	020	12.1	01	01	CRT	ANO	SIM	1	None
173	021	12.2	03	01	CRT	AOB	SIM	1	None
173	022	12.3	04	02	CRT	ANO	MSG	1	None
173	023	12.4	04	00	MSG	ANO	MSG	1	None
173	024	12.5	04	00	MSG	ANO	MSG	1	None
173	025	12.6	05	N/A	N/A	ANO	N/A	2	Not Analyzed
173	026	13.1	03	00	CRT	ANO	MSG	1	None
173	027	13.2	04	00	CRT	ANO	MSG	1	None
173	028	13.3	04	00	MSG	ANO	MSG	1	None
173	029	13.4	04	00	MSG	ANO	SHA	1	Potlid
173	030	14.1	01	01	CRT	ANO	SIM	1	None
173	031	14.2	03	00	FCT	ANO	MSG	1	None
173	032	14.3	04	00	FLA	ANO	MSG	1	None
173	033	14.4	03	00	MSG	ANO	MSG	1	None
173	034	14.5	04	00	MSG	ANO	MSG	1	None
173	035	14.6	04	00	MSG	ANO	MSG	1	None
173	036	14.7	04	00	MSG	ANO	MSG	1	None
173	037	14.8	05	N/A	N/A	ANO	N/A	1	Not Analyzed
173	038	15.1	02	02	CRT	ANO	SIM	1	None
173	039	16.1	03	00	MSG	ANO	MSG	1	None
173	040	17.1	02	00	MSG	ANO	MSG	1	None
173	041	18.1	02	02	CRT	ANO	SIM	1	None
173	042	18.2	03	00	FLA	ANO	MSG	1	None
173	043	18.3	03	00	CRT	ANO	MSG	1	None
173	044	18.4	04	00	MSG	ANO	BPF	1	None
173	045	19.1	04	00	MSG	ANO	MSG	1	None

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Lot No.	Specimen No.	Nodule No.	Flake Size	Percent Cortex	Platform Type	Thermal Alteration	Technological Class	Count	Comments
173	046	19.2	05	N/A	N/A	ANO	N/A	1	Not Analyzed
173	047	20.1	01	02	MSG	ANO	SIM	1	None
173	048	20.2	02	00	MSG	ANO	MSG	1	None
173	049	20.3	03	00	MSG	ANO	MSG	1	None
173	050	20.4	04	00	MSG	ANO	MSG	1	None
173	051	20.5	04	00	MSG	ANO	MSG	1	None
173	052	20.6	04	00	MSG	ANO	MSG	1	None
173	053	20.7	04	00	MSG	ANO	MSG	1	None
173	054	20.8	04	00	MSG	ANO	MSG	1	None
173	055	20.9	04	00	MSG	ANO	MSG	1	None
173	056	20.10	04	00	CRT	ANO	MSG	1	None
173	057	21.1	03	04	MSG	ANO	PRI	1	None
173	058	21.2	04	00	FLA	ANO	MSG	1	None
173	059	22.1	01	03	MSG	ANO	SIM	1	None
173	060	22.2	03	00	MSG	ANO	MSG	1	None
173	061	22.3	03	00	MSG	ANO	MSG	1	None
173	062	22.4	03	00	MSG	ANO	MSG	1	None
173	063	22.5	04	00	MSG	ANO	MSG	1	None
173	064	22.6	04	00	MSG	ANO	MSG	1	None
173	065	22.7	04	00	MSG	ANO	MSG	1	None
173	066	22.8	04	00	MSG	ANO	MSG	1	None
173	067	22.9	04	00	MSG	ANO	MSG	1	None
173	068	22.10	04	00	MSG	ANO	MSG	1	None
173	069	22.11	04	00	MSG	ANO	MSG	1	None
173	070	22.12	04	00	MSG	ANO	MSG	1	None
173	071	22.13	05	N/A	N/A	ANO	N/A	3	Not Analyzed
173	072	23.1	02	01	CRT	ANO	SIM	1	None
173	073	24.1	02	00	MSG	ANO	MSG	1	None
173	074	25.1	03	00	MSG	ANO	MSG	1	None
173	075	26.1	03	00	MSG	ANO	CMX	1	None
173	076	26.2	03	00	MSG	ANO	CMX	1	None
173	077	26.3	04	00	MSG	AOB	SHA	1	Potlid
173	078	26.4	04	00	MSG	ANO	SHA	1	None
173	079	26.5	04	00	MSG	ANO	CMX	1	None
173	080	26.6	04	00	MSG	ANO	CMX	1	None
173	081	26.7	04	00	MSG	ANO	CMX	1	None
173	082	26.8	04	00	MSG	ANO	CMX	1	None
173	083	26.9	05	00	NA	ANO	SG4	1	None
173	084	27.1	02	01	CRT	ANO	CMX	4	None
173	085	27.2	04	00	MSG	ANO	CMX	1	None
173	086	27.3	05	00	NA	ANO	SG4	1	None
173	087	27.4	05	00	NA	ANO	SG4	1	None
173	088	27.5	04	00	MSG	ANO	CMX	1	None
173	089	27.6	05	00	NA	ANO	SG4	1	None
173	090	28.1	03	03	MSG	AOB	CMX	1	None
173	091	28.2	04	01	MSG	AOB	SHA	1	None
173	092	28.3	04	02	MSG	ANO	SHA	1	Potlid
173	093	28.4	04	00	MSG	ANO	CMX	1	None
173	094	28.5	05	00	NA	ANO	SG4	1	None
173	095	29.1	02	00	MSG	ANO	CMX	1	None
173	096	29.2	04	00	MSG	ANO	CMX	1	None
173	097	30.1	04	00	MSG	ANO	CMX	1	None
173	098	31.1	04	00	MSG	ANO	CMX	1	None
173	099	32.1	04	00	MSG	ANO	CMX	1	None
173	100	33.1	04	00	MSG	ANO	CMX	1	None
173	101	34.1	04	00	MSG	ANO	CMX	1	None
173	102	35.1	04	00	MSG	ANO	CMX	1	None
173	103	35.2	04	00	MSG	ANO	CMX	1	None
173	104	36.1	04	00	MSG	ANO	CMX	1	None
173	105	36.2	04	00	MSG	ANO	CMX	1	None
173	106	36.3	04	00	MSG	ANO	CMX	1	None
173	107	37.1	04	00	MSG	ANO	CMX	1	None
173	108	37.2	04	00	MSG	ANO	CMX	1	None
173	109	38.1	04	00	MSG	ANO	CMX	1	None
173	110	38.2	04	00	MSG	ANO	CMX	1	None
173	111	38.3	04	00	MSG	ANO	CMX	1	None

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Lot No.	Specimen No.	Nodule No.	Flake Size	Percent Cortex	Platform Type	Thermal Alteration	Technological Class	Count	Comments
173	112	39.1	04	00	MSG	ANO	CMX	1	None
173	113	40.1	04	00	MSG	ANO	CMX	1	None
173	114	40.2	04	00	MSG	ANO	CMX	1	None
173	115	40.3	04	00	MSG	ANO	CMX	1	None
173	116	40.4	04	00	MSG	ANO	CMX	1	None
173	117	41.1	04	00	MSG	ANO	CMX	1	None
173	118	41.2	04	00	MSG	ANO	CMX	1	None
173	119	41.3	05	00	NA	ANO	SG4	1	None
173	120	42.1	05	00	NA	ANO	SG4	1	None
173	121	42.2	05	00	NA	ANO	SG4	1	None
173	122	43.1	05	00	NA	ANO	SG4	1	None
173	123	44.1	05	00	NA	ANO	SG4	1	None
173	124	45.1	05	00	NA	ANO	SG4	1	None
173	125	46.1	05	00	NA	ANO	SG4	1	None
173	126	47.1	05	00	NA	ANO	SG4	1	None
173	127	48.1	05	00	NA	ANO	SG4	1	None
173	128	49.1	05	00	NA	ANO	SG4	1	None
173	129	50.1	05	00	NA	ANO	SG4	1	None
173	130	50.2	05	00	NA	ANO	SG4	1	None
173	131	51.1	05	00	NA	ANO	SG4	1	None
173	132	51.2	05	00	NA	ANO	SG4	1	None
173	133	52.1	05	00	NA	ANO	SG4	1	None
173	134	53.1	05	00	NA	ANO	SG4	1	None
173	135	54.1	05	00	NA	ANO	SG4	1	None
173	136	55.1	05	00	NA	ANO	SG4	1	None
173	137	56.1	04	00	CRT	ANO	CMX	1	None
173	138	56.2	05	00	NA	ANO	SG4	1	None
173	139	57.1	05	00	NA	ANO	SG4	1	None
173	140	57.2	05	00	NA	ANO	SG4	1	None
173	141	57.3	05	00	NA	ANO	SG4	1	None
173	142	58.1	04	00	MSG	ANO	CMX	1	None
173	143	58.2	05	00	NA	ANO	SG4	1	None
173	144	58.3	05	00	NA	ANO	SG4	1	None
173	145	58.4	05	00	NA	ANO	SG4	1	None
173	146	58.5	05	00	NA	ANO	SG4	1	None
173	147	59.1	05	00	NA	ANO	SG4	1	None
173	148	59.2	05	00	NA	ANO	SG4	1	None
173	149	59.3	05	00	NA	ANO	SG4	1	None
173	150	60.1	04	00	MSG	ANO	CMX	1	None
173	151	60.2	05	00	NA	ANO	SG4	1	None
173	152	60.3	05	00	NA	ANO	SG4	1	None
173	153	60.4	05	00	NA	ANO	SG4	1	None
173	154	61.1	05	00	NA	ANO	SG4	1	None
173	155	61.2	05	00	NA	ANO	SG4	1	None
173	156	61.3	05	00	NA	ANO	SG4	1	None
173	157	61.4	05	00	NA	ANO	SG4	1	None
173	158	61.5	05	00	NA	ANO	SG4	1	None
173	159	62.1	04	00	MSG	ANO	CMX	1	None
173	160	62.2	05	00	NA	ANO	SG4	1	None
173	161	62.3	05	00	NA	ANO	SG4	1	None
173	162	62.4	05	00	NA	ANO	SG4	1	None
173	163	62.5	05	00	NA	ANO	SG4	1	None
173	164	62.6	04	00	MLT	ANO	BPF	1	None
173	165	63.1	04	00	MSG	ANO	CMX	1	None
173	166	64.1	04	00	MLT	ANO	CMX	1	None
173	167	65.1	05	00	NA	ANO	SG4	1	None
173	168	65.2	05	00	NA	ANO	SG4	1	None
173	169	66.1	05	00	NA	ANO	SG4	1	None
173	170	66.2	05	00	NA	ANO	SG4	1	None
173	171	67.1	05	00	NA	ANO	SG4	1	None
173	172	67.2	05	00	NA	ANO	SG4	1	None
173	173	68.1	04	00	MSG	ANO	CMX	1	None
173	174	68.2	05	00	NA	ANO	SG4	1	None
173	175	69.1	05	00	NA	ANO	SG4	1	None
173	176	69.2	05	00	NA	ANO	SG4	1	None
173	177	69.3	05	00	NA	ANO	SG4	1	None

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Lot No.	Specimen No.	Nodule No.	Flake Size	Percent Cortex	Platform Type	Thermal Alteration	Technological Class	Count	Comments
173	178	69.4	05	00	NA	ANO	SG4	1	None
173	179	69.5	05	00	NA	ANO	SG4	1	None
173	180	70.1	05	00	NA	ANO	SG4	1	None
173	181	71.1	05	00	NA	ANO	SG4	1	None
174	001	1.1	01	04	CRT	ANO	PRI	1	None
174	002	2.1	01	00	MLT	ANO	CMX	1	None
174	003	2.2	01	00	MLT	ANO	BTF	1	None
174	004	2.3	02	00	MSG	ANO	SHA	1	None
174	005	2.4	04	00	MSG	ANO	CMX	1	None
174	006	3.1	01	00	MLT	ANO	BTF	1	None
174	007	3.2	02	00	MSG	ANO	CMX	1	None
174	008	3.3	04	00	MLT	ANO	CMX	1	None
174	009	3.4	04	00	MSG	ANO	CMX	1	None
174	010	3.5	05	00	MSG	ANO	SG4	1	None
174	011	4.1	01	00	MSG	ANO	CMX	1	None
174	012	5.1	01	00	MSG	ANO	CMX	1	None
174	013	6.1	01	02	CRT	ANO	SIM	1	None
174	014	6.2	01	00	MLT	ANO	BTF	1	None
174	015	6.3	02	00	MLT	ANO	CMX	1	None
174	016	6.4	04	00	FLA	ANO	CMX	1	None
174	017	6.5	04	00	MSG	ANO	CMX	1	None
174	018	6.6	05	00	MSG	ANO	SG4	2	None
174	019	7.1	01	01	MSG	ANO	SIM	1	None
174	020	7.2	04	02	MSG	ANO	SIM	1	None
174	021	8.1	01	03	FLA	ANO	PRI	1	None
174	022	9.1	01	00	MLT	ANO	BTF	1	None
174	023	9.2	04	00	MSG	ANO	PRI	1	None
174	024	10.1	01	00	MSG	ANO	CMX	1	None
174	025	11.1	01	00	MSG	ANO	CMX	1	None
174	026	12.1	01	00	MLT	ANO	CMX	1	None
174	027	12.2	02	02	MSG	ANO	SIM	1	None
174	028	12.3	04	00	MSG	ANO	CMX	1	None
174	029	12.4	04	00	MSG	ANO	CMX	1	None
174	030	12.5	05	00	MSG	ANO	SG4	1	None
174	031	12.6	05	00	MSG	ANO	SG4	1	None
174	032	12.7	05	00	MSG	ANO	SG4	1	None
174	033	12.8	05	00	MSG	ANO	SG4	1	None
174	034	12.9	05	00	MSG	ANO	SG4	1	None
174	035	13.1	02	00	MLT	ANO	BTF	1	None
174	036	13.2	03	00	MSG	ANO	CMX	1	None
174	037	13.3	04	04	MSG	ANO	PRI	1	None
174	038	13.4	04	00	CRT	ANO	CMX	1	None
174	039	13.5	04	00	MSG	ANO	CMX	1	None
174	040	13.6	04	00	MLT	ANO	BPF	1	None
174	041	13.7	04	04	MSG	ANO	PRI	1	None
174	042	13.8	04	00	MLT	ANO	BPF	1	None
174	043	14.1	02	04	MSG	ANO	PRI	1	None
174	044	15.1	04	04	MSG	ANO	PRI	1	None
174	045	16.1	02	04	CRT	ANO	PRI	1	None
174	046	16.2	05	00	MSG	ANO	SG4	1	None
174	047	16.3	05	00	MSG	ANO	SG4	1	None
174	048	17.1	02	00	MLT	ANO	BTF	1	None
174	049	18.1	02	00	MLT	ANO	CMX	1	None
174	050	18.2	02	00	FLA	ANO	CMX	1	None
174	051	18.3	03	00	MLT	ANO	CMX	1	None
174	052	18.4	03	00	MSG	ANO	CMX	1	None
174	053	18.5	03	00	MSG	ANO	CMX	1	None
174	054	18.6	04	00	MSG	ANO	CMX	1	None
174	055	18.7	04	00	MSG	ANO	CMX	1	None
174	056	18.8	05	00	MSG	ANO	SG4	1	None
174	057	18.9	05	00	MSG	ANO	SG4	1	None
174	058	18.10	05	00	MSG	ANO	SG4	2	None
174	059	19.1	02	00	MLT	ANO	BTF	1	None
174	060	20.1	04	00	MSG	AOB	SHA	1	Potlid
174	061	21.1	01	00	MSG	ANO	CMX	1	None
174	062	21.2	02	00	FLA	ANO	CMX	1	None

Appendix D.1. TxDOT 41SR242 Feature 1 Debitage Analysis

Lot No.	Specimen No.	Nodule No.	Flake Size	Percent Cortex	Platform Type	Thermal Alteration	Technological Class	Count	Comments
174	063	21.3	03	00	MSG	ANO	CMX	1	None
174	064	21.4	03	00	MSG	ANO	CMX	1	None
174	065	21.5	03	00	MSG	ANO	CMX	1	None
174	066	21.6	04	00	MSG	ANO	CMX	1	None
174	067	21.7	04	00	MSG	ANO	CMX	1	None
174	068	22.1	02	01	MSG	ANO	SIM	1	None
174	069	22.2	04	00	MSG	ANO	CMX	1	None
174	070	22.3	05	00	CRT	ANO	SG4	1	None
174	071	23.1	01	02	CRT	ANO	SIM	1	None
174	072	23.2	04	01	CRT	ANO	SIM	1	None
174	073	23.3	04	00	MSG	ANO	CMX	1	None
174	074	23.4	04	00	MSG	ANO	CMX	1	None
174	075	23.5	05	00	MSG	AOB	SG4	1	Potlid
174	076	24.1	01	01	CRT	ANO	SIM	1	None
174	077	24.2	04	00	MSG	ANO	CMX	1	None
174	078	25.1	02	00	CRT	ANO	CMX	1	None
174	079	26.1	01	04	MSG	ANO	CMX	1	None
174	080	26.2	03	00	FLA	ANO	PRI	1	None
174	081	27.1	01	00	FLA	ANO	BTF	1	None
174	082	27.2	02	00	FLA	ANO	CMX	1	None
174	083	27.3	04	00	MSG	ANO	CMX	1	None
174	084	28.1	01	00	FLA	ANO	CMX	1	None
174	085	28.2	01	01	CRT	ANO	SIM	1	None
174	086	28.3	02	00	MSG	ANO	CMX	1	None
174	087	28.4	03	00	MSG	ANO	CMX	1	None
174	088	28.5	03	00	CRT	ANO	CMX	1	None
174	089	29.1	03	04	CRT	ANO	PRI	1	None
174	090	30.1	01	00	FLA	ANO	CMX	1	None
174	091	30.2	04	00	MSG	ANO	CMX	1	None
174	092	30.3	03	00	FLA	ANO	CMX	1	None
174	093	30.4	04	00	FLA	ANO	CMX	1	None
174	094	30.5	04	00	MSG	ANO	CMX	1	None
174	095	31.1	02	00	FLA	ANO	CMX	1	None
174	096	31.2	04	00	MLT	ANO	CMX	1	None
174	097	31.3	04	00	FCT	ANO	CMX	1	None
174	098	31.4	03	00	MLT	ANO	BTF	1	None
174	099	31.5	04	00	MSG	ANO	CMX	1	None
174	100	31.6	04	00	FCT	ANO	CMX	1	None
174	101	31.7	04	00	MSG	ANO	CMX	1	None
174	102	32.1	02	00	MSG	ANO	CMX	1	None
174	103	32.2	04	00	MSG	ANO	CMX	1	None
174	104	32.3	05	00	MSG	ANO	CMX	1	None
174	105	33.1	04	04	MSG	ANO	PRI	1	None
174	106	33.2	04	00	MSG	ANO	CMX	1	None
174	107	34.1	01	01	CRT	ANO	SIM	1	None
174	108	34.2	03	00	NA	AOB	SHA	1	Potlid
174	109	34.3	04	00	NA	ANO	SHA	1	None
174	110	34.4	04	00	MSG	ANO	SHA	1	None
174	111	34.5	04	00	MSG	ANO	SHA	1	None
174	112	34.6	05	00	MSG	ANO	CMX	1	None
174	113	35.1	02	00	FLA	ANO	CMX	1	None
174	114	35.2	03	00	MLT	ANO	CMX	1	None
174	115	36.1	02	00	MLT	ANO	CMX	1	None
174	116	36.2	03	00	MSG	ANO	CMX	1	None
174	117	36.3	05	00	NA	ANO	SG4	1	None
174	118	37.1	04	00	MSG	ANO	CMX	1	None
174	119	38.1	04	00	MSG	ANO	BPF	1	None
174	120	38.2	04	00	MSG	ANO	CMX	1	None
174	121	38.3	05	00	NA	ANO	SG4	1	None
174	122	39.1	02	00	FLA	ANO	CMX	1	None
174	123	40.1	02	00	MSG	ANO	CMX	1	None
174	124	41.1	01	00	CRT	ANO	CMX	1	None
174	125	41.2	02	00	MSG	ANO	CMX	1	None
174	126	41.3	02	00	MSG	ANO	CMX	1	None
174	127	41.4	04	00	MSG	ANO	CMX	1	None
174	128	41.5	04	00	MSG	ANO	CMX	1	None

Appendix D.1. TxDOT 41SR242 Feature 1 Debitage Analysis

Lot No.	Specimen No.	Nodule No.	Flake Size	Percent Cortex	Platform Type	Thermal Alteration	Technological Class	Count	Comments
174	129	41.6	05	00	NA	ANO	SG4	1	None
174	130	41.7	05	00	NA	ANO	SG4	1	None
174	131	41.8	05	00	NA	ANO	SG4	1	None
174	132	42.1	03	00	MSG	ANO	CMX	1	None
174	133	42.2	04	00	MSG	ANO	CMX	1	None
174	134	43.1	04	00	MLT	ANO	CMX	1	None
174	135	44.1	03	00	MSG	ANO	CMX	1	None
174	136	45.1	04	00	MSG	ANO	SHA	1	None
174	137	45.2	04	00	MSG	ANO	CMX	1	None
174	138	45.3	04	00	MSG	ANO	CMX	1	None
174	139	46.1	04	00	MSG	ANO	CMX	1	None
174	140	47.1	04	00	MSG	ANO	SHA	1	None
174	141	48.1	05	00	NA	ANO	SG4	1	None
174	142	49.1	04	00	MSG	ANO	CMX	1	None
174	143	49.2	05	00	NA	ANO	SG4	1	None
174	144	49.3	05	00	MSG	ANO	CMX	1	None
174	145	50.1	03	00	MLT	ANO	BTF	1	None
174	146	51.1	03	00	MSG	ANO	CMX	1	None
174	147	51.2	04	01	MSG	ANO	SIM	1	None
174	148	52.1	04	00	MSG	ANO	CMX	1	None
174	149	52.2	04	00	MLT	ANO	BPF	1	None
174	150	52.3	04	00	MSG	ANO	CMX	1	None
174	151	53.1	05	00	NA	ANO	SG4	1	None
174	152	54.1	04	00	MSG	ANO	CMX	1	None
174	153	54.2	04	00	MSG	ANO	SHA	1	None
174	154	54.3	05	00	NA	ANO	SG4	1	None
174	155	55.1	05	00	NA	ANO	SG4	1	None
174	156	56.1	04	00	MSG	ANO	CMX	1	None
174	157	57.1	03	00	FLA	ANO	CMX	1	None
174	158	58.1	03	00	MSG	ANO	CMX	1	None
174	159	59.1	04	00	FLA	ANO	CMX	1	None
174	160	60.1	01	00	FCT	ANO	CMX	1	None
174	161	60.2	04	00	MSG	ANO	CMX	1	None
174	162	60.3	04	00	MSG	ANO	CMX	1	None
174	163	60.4	04	00	MSG	ANO	CMX	1	None
174	164	60.5	04	00	FLA	ANO	CMX	1	None
174	165	60.6	04	00	MSG	ANO	CMX	1	None
174	166	60.7	05	00	NA	ANO	SG4	1	None
174	167	60.8	05	00	NA	ANO	SG4	1	None
174	168	60.9	05	00	NA	ANO	SG4	1	None
174	169	60.10	05	00	NA	ANO	SG4	1	None
174	170	60.11	05	00	NA	ANO	SG4	2	None
174	171	61.1	02	04	MSG	ANO	PRI	1	None
174	172	62.1	04	00	MSG	ANO	CMX	1	None
174	173	63.1	04	00	MSG	ANO	CMX	1	None
174	174	64.1	04	00	MSG	ANO	SHA	1	None
174	175	64.2	04	00	MSG	ANO	SIM	1	None
174	176	65.1	04	04	MSG	ANO	PRI	1	None
174	177	66.1	01	01	CRT	ANO	SIM	1	None
174	178	66.2	02	00	MSG	ANO	CMX	1	None
174	179	66.3	04	00	MSG	ANO	CMX	1	None
174	180	66.4	04	00	MSG	ANO	CMX	1	None
174	181	66.5	04	00	FLA	ANO	CMX	1	None
174	182	66.6	05	NA	NA	ANO	SG4	1	None
174	183	66.7	05	NA	NA	ANO	SG4	1	None
174	184	66.8	05	NA	NA	ANO	SG4	1	None
174	185	66.9	05	NA	NA	ANO	SG4	1	None
174	186	67.1	02	04	FLA	ANO	PRI	1	None
174	187	67.2	03	00	MSG	ANO	CMX	1	None
174	188	67.3	04	03	MSG	ANO	SIM	1	None
174	189	67.4	05	NA	NA	ANO	SG4	1	None
174	190	67.5	05	NA	NA	ANO	SG4	1	None
174	191	68.1	04	00	MSG	ANO	CMX	1	None
174	192	68.2	04	01	MSG	ANO	SIM	1	None
174	193	68.3	04	00	MSG	ANO	CMX	1	None
174	194	69.1	05	NA	NA	ANO	SG4	1	None

Appendix D.1. TxDOT 41SR242 Feature 1 Debitage Analysis

Lot No.	Specimen No.	Nodule No.	Flake Size	Percent Cortex	Platform Type	Thermal Alteration	Technological Class	Count	Comments
174	195	70.1	03	04	MSG	ANO	PRI	1	None
174	196	70.2	04	03	MSG	ANO	SIM	1	None
174	197	70.3	04	04	MSG	ANO	PRI	1	None
174	198	70.4	04	00	MSG	ANO	CMX	1	None
174	199	70.5	04	00	MSG	ANO	CMX	1	None
174	200	70.6	04	00	MSG	ANO	CMX	1	None
174	201	70.7	04	00	MSG	ANO	CMX	1	None
174	202	70.8	04	04	MSG	ANO	PRI	1	None
174	203	70.9	04	00	MSG	AOB	SHA	1	None
174	204	70.10	04	00	MSG	AOB	SHA	1	None
174	205	70.11	04	00	MSG	AOB	SHA	1	None
174	206	70.12	05	NA	NA	ANO	SG4	1	None
174	207	71.1	04	00	FLA	ANO	CMX	1	None
174	208	71.2	04	00	FLA	ANO	CMX	1	None
174	209	71.3	05	NA	NA	ANO	SG4	1	None
174	210	72.1	04	00	MSG	AOB	SHA	1	Potlid
174	211	72.2	04	00	MSG	ANO	CMX	1	None
174	212	73.1	05	NA	NA	ANO	SG4	1	None
174	213	74.1	03	03	MSG	ANO	SIM	1	None
174	214	75.1	05	NA	NA	ANO	SG4	1	None
174	215	76.1	04	00	MSG	ANO	CMX	1	None
174	216	76.2	04	00	MSG	ANO	SHA	1	None
174	217	76.3	05	NA	NA	ANO	SG4	1	None
174	218	76.4	05	NA	NA	ANO	SG4	1	None
174	219	76.5	05	NA	NA	ANO	SG4	1	None
174	220	77.1	03	00	MSG	ANO	CMX	1	None
174	221	77.2	04	00	CRT	ANO	CMX	1	None
174	222	77.3	04	00	MSG	ANO	CMX	1	None
174	223	77.4	04	00	MSG	ANO	CMX	1	None
174	224	77.5	04	00	MSG	ANO	CMX	1	None
174	225	78.1	05	NA	NA	ANO	SG4	1	None
174	226	79.1	04	00	MSG	ANO	CMX	1	None
174	227	79.2	04	00	MSG	ANO	CMX	1	None
174	228	79.3	04	00	MSG	ANO	CMX	1	None
174	229	79.4	04	00	MSG	ANO	CMX	1	None
174	230	79.5	05	NA	NA	ANO	SG4	1	None
174	231	79.6	05	NA	NA	ANO	SG4	1	None
174	232	80.1	04	02	MSG	ANO	SIM	1	None
174	233	80.2	04	00	MSG	ANO	CMX	1	None
174	234	81.1	04	00	MSG	ANO	CMX	1	None
174	235	81.2	04	00	MSG	ANO	CMX	1	None
174	236	82.1	04	00	MSG	ANO	CMX	1	None
174	237	83.1	05	NA	NA	ANO	SG4	1	None
174	238	84.1	04	00	MLT	ANO	CMX	1	None
174	239	84.2	04	00	MLT	ANO	BPF	1	None
174	240	85.1	05	NA	NA	ANO	SG4	1	None
174	241	86.1	05	NA	NA	ANO	SG4	1	None
175	001	1.1	01	01	CRT	ANO	SIM	1	None
175	002	2.1	03	01	MLT	AOB	CMX	1	None
175	003	2.2	04	01	MLT	AOB	SG4	1	None
175	004	3.1	04	00	IND	ANO	CMX	1	None
175	005	3.2	04	00	MSG	ANO	SG4	1	None
175	006	4.1	03	00	MSG	AOB	CMX	1	None
175	007	5.1	01	00	MLT	ANO	CMX	1	None
175	008	5.2	01	04	MSG	ANO	PRI	1	None
175	009	5.3	04	01	MSG	ANO	SG4	1	None
175	010	6.1	01	02	MLT	AOB	SIM	1	None
175	011	6.2	02	00	MLT	AOB	SIM	1	None
175	012	7.1	03	00	MSG	ANO	SHA	1	None
175	013	7.2	03	00	MSG	ANO	CMX	1	None
175	014	7.3	04	00	MSG	ANO	SG4	1	None
175	015	8.1	01	01	FLA	ANO	SIM	1	None
175	016	8.2	03	00	MSG	ANO	CMX	1	None
175	017	8.3	04	00	MSG	ANO	SG4	1	None
175	018	9.1	02	04	MSG	ANO	PRI	1	None
175	019	9.2	03	04	MLT	ANO	PRI	1	None

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Lot No.	Specimen No.	Nodule No.	Flake Size	Percent Cortex	Platform Type	Thermal Alteration	Technological Class	Count	Comments
175	020	10.1	03	00	MSG	AOB	SHA	1	None
175	021	10.2	03	00	MLT	AOB	CMX	1	None
175	022	10.3	03	04	MSG	AOB	PRI	1	None
175	023	11.1	01	00	MLT	ANO	BTF	1	None
175	024	11.2	03	04	MSG	ANO	PRI	1	None
175	025	11.3	03	00	MSG	ANO	CMX	1	None
175	026	11.4	03	00	IND	ANO	CMX	1	None
175	027	11.5	04	00	FLA	ANO	CMX	1	None
175	028	12.1	02	01	MSG	AOB	SIM	1	None
175	029	13.1	01	00	FCT	ANO	BTF	1	None
175	030	14.1	02	04	MSG	AOB	SHA	1	None
175	031	15.1	03	01	MSG	ANO	SIM	1	None
175	032	16.1	02	01	FLA	AOB	SIM	1	None
175	033	17.1	01	02	MLT	ANO	SIM	1	None
175	034	18.1	03	01	MSG	AOB	SIM	1	None
175	035	19.1	01	00	MSG	ANO	SHA	1	None
175	036	19.2	04	00	MSG	AOB	SG4	1	None
175	037	20.1	03	01	CMP	AOB	SIM	1	None
175	038	20.2	04	00	IND	AOB	SG4	1	None
175	039	20.3	04	00	FCT	AOB	CMX	1	None
175	040	21.1	02	04	MSG	ANO	PRI	1	None
175	041	21.2	02	01	MSG	AOB	SIM	1	None
175	042	21.3	04	04	MSG	AOB	PRI	1	None
175	043	22.1	04	00	FCT	ANO	CMX	1	None
175	044	23.1	01	01	FLA	AOB	SIM	1	None
175	045	24.1	04	00	FLA	AOB	SIM	1	None
175	046	24.2	03	00	MSG	AOB	CMX	1	None
175	047	25.1	03	00	IND	ANO	CMX	1	None
175	048	26.1	04	00	MSG	ANO	SG4	1	None
175	049	27.1	03	04	FCT	ANO	PRI	1	None
175	050	28.1	03	02	MSG	ANO	SIM	1	None
175	051	28.2	04	00	FCT	ANO	CMX	1	None
175	052	29.1	02	00	IND	ANO	CMX	1	None
175	053	30.1	03	00	MLT	ANO	CMX	1	None
175	054	31.1	02	00	MSG	AOB	CMX	1	None
175	055	32.1	02	00	MLT	ANO	CMX	1	None
175	056	32.2	03	00	MSG	ANO	SIM	1	None
175	057	33.1	05	NA	NA	NA	NA	2	Not Analyzed
175	058	34.1	03	00	MLT	ANO	CMX	1	None
175	059	35.1	03	00	MSG	ANO	CMX	1	None
175	060	36.1	03	00	IND	ANO	SIM	1	None
175	061	37.1	03	00	MSG	ANO	SHA	1	None
175	062	38.1	04	00	MSG	AOB	SHA	1	None
175	063	39.1	04	04	MSG	ANO	PRI	1	None
175	064	39.2	05	NA	NA	NA	NA	1	Not Analyzed

Appendix D.2. TxDOT 41SR242 Feature 4 Debitage Analysis

Lot No.	Specimen No.	Nodule No.	Flake Size	Percent Cortex	Platform Type	Thermal Alteration	Technological Class	Count	Comments
194	001	1.1	01	01	CRT	ANO	SIM	1	None
194	002	2.1	01	04	IND	AOB	PRI	1	None
194	003	2.2	03	04	FCT	AOB	PRI	1	None
194	004	2.3	03	02	MSG	AOB	SIM	1	None
194	005	2.4	03	00	MSG	AOB	SIM	1	None
194	006	2.5	03	04	MSG	AOB	PRI	1	None
194	007	2.6	04	00	FCT	AOB	SIM	1	None
194	008	3.1	01	00	MLT	ANO	BTF	1	None
194	009	4.1	01	04	IND	ANO	SIM	1	None
194	010	4.2	04	00	MSG	ANO	SG4	1	None
194	011	5.1	01	04	MSG	ANO	PRI	1	None
194	012	6.1	01	03	MSG	ANO	SIM	1	None
194	013	6.2	03	01	FLA	ANO	SIM	1	None
194	014	7.1	01	00	MLT	ANO	BTF	1	None
194	015	7.2	02	00	MSG	ANO	BTF	1	None
194	016	7.3	01	00	MLT	ANO	BTF	1	None
194	017	7.4	01	00	MLT	ANO	BTF	1	None
194	018	7.5	02	00	IND	ANO	CMX	1	None
194	019	7.6	02	01	MSG	ANO	SIM	1	None
194	020	7.7	02	00	MSG	ANO	SIM	1	None
194	021	7.8	02	00	MSG	ANO	CMX	1	None
194	022	7.9	03	00	MSG	ANO	SIM	1	None
194	023	7.10	04	00	MSG	ANO	CMX	1	None
194	024	7.11	04	00	MLT	ANO	CMX	1	None
194	025	8.1	01	03	MLT	ANO	SIM	1	None
194	026	8.2	03	00	MSG	ANO	CMX	1	None
194	027	8.3	04	01	MSG	ANO	SHA	1	None
194	028	8.4	04	01	CRT	ANO	SIM	1	None
194	029	9.1	01	04	IND	ANO	PRI	1	None
194	030	9.2	01	01	CRT	ANO	CMX	1	None
194	031	9.3	02	01	CRT	ANO	SIM	1	None
194	032	9.4	03	00	MSG	ANO	CMX	1	None
194	033	9.5	03	04	FLA	ANO	PRI	1	None
194	034	9.6	04	01	FLA	ANO	SIM	1	None
194	035	10.1	01	04	CRT	ANO	PRI	1	None
194	036	11.1	01	00	MLT	ANO	BTF	1	None
194	037	11.2	03	00	MSG	ANO	CMX	1	None
194	038	11.3	04	00	MLT	ANO	CMX	1	None
194	039	12.1	01	04	MSG	ANO	SIM	1	None
194	040	12.2	04	04	MSG	ANO	SIM	1	None
194	041	13.1	02	01	MSG	ANO	SIM	1	None
194	042	13.2	03	01	MSG	ANO	SIM	1	None
194	043	14.1	02	00	MLT	ANO	CMX	1	None
194	044	14.2	03	02	FCT	ANO	SIM	1	None
194	045	14.3	02	00	MSG	ANO	SHA	1	None
194	046	14.4	03	00	MSG	ANO	SIM	1	None
194	047	14.5	03	02	MLT	ANO	SIM	1	None
194	048	14.6	03	00	MSG	ANO	CMX	1	None
194	049	14.7	04	00	MSG	ANO	SG4	1	None
194	050	15.1	01	00	MLT	ANO	BTF	1	None
194	051	15.2	02	01	MSG	ANO	SIM	1	None
194	052	15.3	04	00	MSG	ANO	CMX	1	None
194	053	16.1	02	00	MSG	ANO	SHA	1	None
194	054	17.1	01	00	MLT	ANO	CMX	1	None
194	055	17.2	03	00	MLT	ANO	BTF	1	None
194	056	17.3	03	01	MSG	ANO	SIM	1	None
194	057	17.4	04	00	MLT	ANO	CMX	1	None
194	058	17.5	03	01	FLA	ANO	SIM	1	None
194	059	18.1	02	00	MSG	ANO	CMX	1	None
194	060	19.1	04	00	MLT	ANO	CMX	1	None
194	061	19.2	04	00	MLT	ANO	CMX	1	None
194	062	19.3	04	00	MLT	ANO	CMX	1	None
194	063	20.1	02	00	MSG	ANO	CMX	1	None
194	064	20.2	02	04	FLA	ANO	PRI	1	None
194	065	21.1	04	00	MLT	ANO	CMX	1	None
194	066	22.1	02	00	MSG	ANO	CMX	1	None

Appendix D.2. TxDOT 41SR242 Feature 4 Debitage Analysis

Lot No.	Specimen No.	Nodule No.	Flake Size	Percent Cortex	Platform Type	Thermal Alteration	Technological Class	Count	Comments
194	067	22.2	03	01	MSG	ANO	SHA	1	None
194	068	22.3	03	04	MSG	ANO	PRI	1	None
194	069	22.4	04	04	MSG	ANO	PRI	1	None
194	070	23.1	02	00	MLT	ANO	BFT	1	None
194	071	23.2	04	00	MSG	ANO	CMX	1	None
194	072	24.1	03	04	MSG	ANO	PRI	1	None
194	073	24.2	03	01	FCT	ANO	SIM	1	None
194	074	25.1	04	04	MSG	ANO	PRI	1	None
194	075	26.1	03	04	MSG	ANO	SHA	1	None
194	076	26.2	04	04	MSG	ANO	PRI	1	None
194	077	26.3	04	00	MSG	ANO	SHA	1	None
194	078	27.1	03	00	MSG	ANO	CMX	1	None
194	079	27.2	03	00	MSG	ANO	CMX	1	None
194	080	28.1	03	00	MLT	ANO	CMX	1	None
194	081	29.1	03	01	CRT	ANO	SIM	1	None
194	082	29.2	04	00	MLT	ANO	CMX	1	None
194	083	30.1	03	00	MLT	ANO	CMX	1	None
195	001	1.1	03	01	FLA	ANO	SIM	1	None
195	002	1.2	04	00	MSG	ANO	CMX	1	None
195	003	1.3	04	00	MSG	ANO	SHA	1	None
195	004	2.1	02	01	CRT	ANO	SIM	1	None
195	005	2.2	03	00	FLA	ANO	SIM	1	None
195	006	2.3	04	00	MSG	ANO	IND	1	None
195	007	3.1	01	00	MSG	ANO	SIM	1	None
195	008	4.1	01	04	MSG	ANO	PRI	1	None
195	009	4.2	03	00	MSG	ANO	SHA	1	None
195	010	4.3	04	00	MSG	ANO	IND	1	None
195	011	4.4	04	00	CRT	ANO	IND	1	None
195	012	5.1	04	00	MLT	ANO	CMX	1	None
195	013	6.1	04	04	CRT	ANO	PRI	1	None
195	014	7.1	01	02	CRT	ANO	SIM	1	None
195	015	7.2	02	00	MLT	ANO	BTF	1	None
195	016	7.3	02	00	MLT	ANO	CMX	1	None
195	017	7.4	02	00	MSG	ANO	SIM	1	None
195	018	7.5	03	00	MSG	ANO	CMX	1	None
195	019	7.6	03	01	CRT	ANO	CMX	1	None
195	020	7.7	03	00	FCT	ANO	CMX	1	None
195	021	7.8	03	00	MSG	ANO	CMX	1	None
195	022	7.9	04	00	MSG	ANO	IND	1	None
195	023	7.10	04	00	MSG	ANO	IND	1	None
195	024	7.11	04	00	MSG	ANO	IND	1	None
195	025	8.1	02	00	MSG	ANO	CMX	1	None
195	026	8.2	03	00	MLT	ANO	CMX	1	None
195	027	8.3	03	00	MSG	ANO	IND	1	None
195	028	9.1	03	00	MSG	ANO	CMX	1	None
195	029	10.1	04	00	CRT	ANO	IND	1	None
195	030	11.1	02	03	MSG	ANO	SIM	1	None
195	031	12.1	02	03	MSG	ANO	SIM	1	None
195	032	12.2	04	00	MSG	ANO	IND	1	None
195	033	12.3	04	03	MSG	ANO	IND	1	None
195	034	13.1	03	00	MLT	ANO	CMX	1	None
195	035	13.2	02	00	MSG	ANO	BTF	1	None
195	036	13.3	02	00	MSG	ANO	BTF	1	None
195	037	13.4	03	00	MLT	ANO	BTF	1	None
195	038	14.1	02	03	MSG	AOB	SIM	1	None
195	039	14.2	02	04	CRT	ANO	PRI	1	None
195	040	15.1	02	03	CRT	ANO	SIM	1	None
195	041	15.2	02	03	MSG	ANO	SIM	1	None
195	042	15.3	04	04	MSG	ANO	SIM	1	None
195	043	16.1	02	00	FCT	ANO	CMX	1	None
195	044	17.1	04	00	MSG	ANO	IND	1	None
195	045	18.1	03	00	MSG	ANO	IND	1	None
195	046	19.1	02	00	MLT	ANO	BTF	1	None
195	047	19.2	04	00	MSG	ANO	IND	1	None
195	048	19.3	04	00	MSG	ANO	IND	1	None
195	049	19.4	04	00	MSG	ANO	IND	1	None

Appendix D.2. TxDOT 41SR242 Feature 4 Debitage Analysis

Lot No.	Specimen No.	Nodule No.	Flake Size	Percent Cortex	Platform Type	Thermal Alteration	Technological Class	Count	Comments
195	050	20.1	03	00	MSG	ANO	IND	1	None
195	051	20.2	04	00	MLT	ANO	IND	1	None
195	052	20.3	04	00	MLT	AOB	IND	1	None
195	053	21.1	02	01	CRT	AOB	SIM	1	None
195	054	21.2	04	00	MSG	ANO	IND	1	None
195	055	21.3	04	00	MSG	ANO	IND	1	None
195	056	22.1	04	00	MSG	ANO	IND	1	None
195	057	23.1	03	00	MLT	ANO	CMX	1	None
195	058	23.2	04	00	MSG	ANO	SIM	1	None
195	059	23.3	04	00	FLA	ANO	IND	1	None
198	001	1.1	01	01	FLT	ANO	CMX	1	None
198	002	1.2	02	01	MLT	ANO	CMX	1	None
198	003	1.3	01	01	FCT	ANO	SIM	1	None
198	004	2.1	01	01	CRT	ANO	SIM	1	None
198	005	2.2	01	00	MSG	ANO	SIM	1	None
198	006	3.1	04	00	MSG	ANO	SG4	1	None
198	007	3.2	03	00	MSG	ANO	CMX	1	None
198	008	3.3	03	00	IND	ANO	CMX	1	None
198	009	3.4	02	00	MSG	ANO	SIM	1	None
198	010	3.5	01	01	MSG	ANO	SIM	1	None
198	011	3.6	01	00	MSG	ANO	SHA	1	None
198	012	3.7	01	01	MLT	ANO	BTF	1	None
198	013	4.1	02	00	MSG	ANO	SHA	1	None
198	014	4.2	01	01	MSG	ANO	SIM	1	None
198	015	5.1	01	01	CRT	ANO	SIM	1	None
198	016	6.1	04	00	IND	ANO	SIM	1	None
198	017	6.2	03	02	IND	ANO	PRI	1	None
198	018	6.3	03	00	MSG	ANO	SHA	1	None
198	019	6.4	03	00	MSG	ANO	SIM	1	None
198	020	6.5	03	00	MSG	ANO	SIM	1	None
198	021	6.6	02	00	MLT	ANO	CMX	1	None
198	022	6.7	02	00	MSG	ANO	SIM	1	None
198	023	6.8	02	00	FLA	ANO	SIM	1	None
198	024	6.9	02	01	CRT	ANO	SIM	1	None
198	025	6.10	01	04	CRT	ANO	PRI	1	None
198	026	7.1	02	00	MLT	ANO	BTF	1	None
198	027	8.1	03	01	CRT	ANO	SIM	1	None
198	028	8.2	04	04	IND	ANO	PRI	1	None
198	029	8.3	03	01	IND	ANO	SIM	1	None
198	030	8.4	01	02	IND	ANO	SIM	1	None
198	031	8.5	01	01	FLA	ANO	CMX	1	None
198	032	9.1	03	00	MSG	ANO	SIM	1	None
198	033	9.2	04	00	MSG	ANO	SIM	1	None
198	034	9.3	03	00	MSG	ANO	SIM	1	None
198	035	9.4	03	01	FCT	ANO	SIM	1	None
198	036	9.5	03	00	MSG	ANO	CMX	1	None
198	037	9.6	02	00	MSG	ANO	SIM	1	None
198	038	9.7	02	00	IND	ANO	SIM	1	None
198	039	9.8	03	00	MSG	ANO	SIM	1	None
198	040	9.9	03	00	MSG	ANO	SIM	1	None
198	041	9.10	03	00	FLA	ANO	SIM	1	None
198	042	9.11	03	00	MLT	ANO	CMX	1	None
198	043	9.12	03	00	IND	ANO	SIM	1	None
198	044	9.13	03	00	MSG	ANO	SIM	1	None
198	045	9.14	03	00	MSG	ANO	CMX	1	None
198	046	9.15	02	00	IND	ANO	CMX	1	None
198	047	9.16	03	00	MLT	ANO	CMX	1	None
198	048	9.17	02	00	MSG	ANO	SIM	1	None
198	049	9.18	02	00	MLT	ANO	BTF	1	None
198	050	9.19	02	00	IND	ANO	CMX	1	None
198	051	9.20	02	00	MLT	ANO	CMX	1	None
198	052	9.21	02	00	MSG	ANO	SIM	1	None
198	053	9.22	02	00	MSG	ANO	SIM	1	None
198	054	9.23	01	00	MLT	ANO	BTF	1	None
198	055	9.24	02	01	MSG	ANO	SIM	1	None
198	056	9.25	02	00	MLT	ANO	CMX	1	None

Appendix D.2. TxDOT 41SR242 Feature 4 Debitage Analysis

Lot No.	Specimen No.	Nodule No.	Flake Size	Percent Cortex	Platform Type	Thermal Alteration	Technological Class	Count	Comments
198	057	9.26	02	04	IND	ANO	PRI	1	None
198	058	9.27	01	00	MSG	ANO	BTF	1	None
198	059	9.28	01	00	IND	ANO	CMX	1	None
198	060	9.29	01	00	MSG	ANO	CMX	1	None
198	061	9.30	01	00	MSG	ANO	SIM	1	None
198	062	9.31	01	00	MLT	ANO	CMX	1	None
198	063	9.32	01	00	MLT	ANO	BTF	1	None
198	064	9.33	01	01	CRT	ANO	SIM	1	None
198	065	9.34	01	01	MLT	ANO	BTF	1	None
198	066	9.35	01	00	MLT	ANO	BTF	1	None
198	067	10.1	02	01	FLT	ANO	SIM	1	None
198	068	10.2	02	01	CRT	ANO	SIM	1	None
198	069	10.3	01	00	MLT	ANO	CMX	1	None
198	070	11.1	02	00	MSG	ANO	CMX	1	None
198	071	11.2	03	00	MSG	ANO	SIM	1	None
198	072	12.1	01	01	CRT	ANO	SIM	1	None
198	073	13.1	03	02	MSG	ANO	SIM	1	None
198	074	13.2	03	01	MSG	ANO	SIM	1	None
198	075	13.3	03	01	MSG	ANO	SIM	1	None
198	076	13.4	04	02	IND	ANO	SIM	1	None
198	077	13.5	04	04	MSG	ANO	PRI	1	None
198	078	14.1	01	01	FCT	ANO	SIM	1	None
198	079	15.1	03	00	MLT	ANO	BTF	1	None
198	080	15.2	03	00	MSG	ANO	CMX	1	None
198	081	15.3	03	00	MLT	ANO	CMX	1	None
198	082	16.1	03	00	MLT	ANO	CMX	1	None
198	083	16.2	04	00	MSG	ANO	SG4	1	None
198	084	17.1	03	00	IND	ANO	CMX	1	None
198	085	17.2	03	00	MSG	ANO	CMX	1	None
198	086	18.1	03	00	MSG	ANO	SIM	1	None
198	087	19.1	01	01	IND	AOB	CMX	1	None
198	088	19.2	02	00	IND	ANO	CMX	1	None
198	089	20.1	03	00	MSG	ANO	SIM	1	None
198	090	21.1	02	01	MSG	ANO	SIM	1	None
198	091	21.2	04	00	IND	ANO	SG4	1	None
198	092	21.3	04	00	MSG	ANO	SG4	1	None
198	093	22.1	01	00	IND	ANO	CMX	1	None
198	094	23.1	01	04	MSG	AOB	PRI	1	None
198	095	24.1	03	02	FCT	ANO	SIM	1	None
198	096	24.2	03	02	MSG	ANO	SIM	1	None
198	097	24.3	03	01	FCT	ANO	SIM	1	None
198	098	24.4	03	00	MSG	ANO	SIM	1	None
198	099	25.1	01	00	MLT	ANO	BTF	1	None
198	100	26.1	01	00	MSG	ANO	SIM	1	None
198	101	26.2	03	00	MSG	ANO	SIM	1	None
198	102	27.1	03	01	FCT	ANO	SIM	1	None
198	103	27.2	04	00	IND	ANO	SG4	1	None
198	104	28.1	02	02	FLA	ANO	SIM	1	None
198	105	28.2	02	01	CRT	ANO	SIM	1	None
198	106	28.3	03	00	MSG	ANO	SHA	1	None
198	107	28.4	04	00	MSG	ANO	SG4	1	None
198	108	29.1	03	04	FCT	ANO	PRI	1	None
198	109	30.1	02	01	FLA	ANO	SIM	1	None
198	110	30.2	03	03	FCT	ANO	SIM	1	None
198	111	30.3	03	01	MSG	ANO	SIM	1	None
198	112	30.4	03	00	FCT	ANO	CMX	1	None
198	113	31.1	04	00	FCT	ANO	CMX	1	None
198	114	31.2	04	00	MLT	ANO	SG4	1	None
198	115	31.3	04	00	MLT	ANO	SG4	1	None
198	116	32.1	04	00	MLT	ANO	SG4	1	None
198	117	32.2	04	00	MSG	ANO	SG4	1	None
198	118	33.1	04	00	IND	ANO	SG4	1	None
198	119	33.2	04	04	MSG	ANO	PRI	1	None
198	120	33.3	03	01	MSG	ANO	SIM	1	None
198	121	34.1	03	01	FCT	ANO	SIM	1	None
198	122	34.2	03	04	IND	ANO	PRI	1	None

Appendix D.2. TxDOT 41SR242 Feature 4 Debitage Analysis

Lot No.	Specimen No.	Nodule No.	Flake Size	Percent Cortex	Platform Type	Thermal Alteration	Technological Class	Count	Comments
198	123	34.3	04	00	MSG	ANO	SG4	1	None
198	124	35.1	03	01	MSG	ANO	SIM	1	None
198	125	35.2	04	00	MSG	ANO	SG4	1	None
198	126	36.1	03	00	MSG	ANO	SIM	1	None
198	127	37.1	03	00	FCT	ANO	SIM	1	None
198	128	37.2	04	00	MSG	ANO	SG4	1	None
198	129	38.1	03	04	FCT	ANO	PRI	1	None
198	130	39.1	04	00	IND	ANO	SG4	1	None
198	131	39.2	04	00	MSG	ANO	SG4	1	None
199	001	1.1	01	04	CRT	ANO	PRI	1	None
199	002	1.2	01	02	FCT	ANO	SIM	1	None
199	003	2.1	01	00	MLT	ANO	CMX	1	None
199	004	3.1	01	00	FCT	ANO	BTF	1	None
199	005	3.2	02	00	MSG	ANO	SIM	1	None
199	006	3.3	04	00	MSG	AOB	IND	1	None
199	007	4.1	02	00	MSG	ANO	CMX	1	None
199	008	4.2	02	00	MSG	AOB	SHA	1	None
199	009	5.1	01	00	MSG	ANO	SHA	1	None
199	010	5.2	03	00	FCT	ANO	SHA	1	None
199	011	6.1	03	00	MLT	ANO	BTF	1	None
199	012	7.1	04	00	MLT	ANO	BPF	1	None
199	013	8.1	02	04	MSG	ANO	SIM	1	None
199	014	8.2	02	04	MSG	ANO	PRI	1	None
199	015	8.3	03	04	FCT	ANO	SIM	1	None
199	016	8.4	03	02	CRT	ANO	SIM	1	None
199	017	8.5	04	00	MSG	ANO	SIM	1	None
199	018	8.6	03	02	FLA	ANO	CMX	1	None
199	019	8.7	03	00	MLT	ANO	SIM	1	None
199	020	8.8	03	00	MLT	ANO	CMX	1	None
199	021	8.9	04	00	MSG	ANO	SIM	1	None
199	022	8.10	04	00	MSG	ANO	CMX	1	None
199	023	8.11	04	00	MLT	ANO	SG4	1	None
199	024	9.1	02	00	MSG	ANO	CMX	1	None
199	025	10.1	02	00	FCT	ANO	CMX	1	None
199	026	10.2	03	00	MSG	ANO	CMX	1	None
199	027	11.1	02	00	MSG	ANO	SIM	1	None
199	028	11.2	03	01	CRT	ANO	SIM	1	None
199	029	11.3	04	00	MSG	ANO	SHA	1	None
199	030	12.1	02	00	CRT	ANO	SIM	1	None
199	031	12.2	02	00	MSG	ANO	SHA	1	None
199	032	12.3	03	00	MSG	ANO	SHA	1	None
199	033	12.4	03	01	CRT	ANO	SIM	1	None
199	034	12.5	03	00	MSG	ANO	SHA	1	None
199	035	12.6	03	00	MSG	ANO	SHA	1	None
199	036	13.1	03	00	MLT	ANO	CMX	1	None
199	037	14.1	03	00	MSG	ANO	IND	1	None
199	038	15.1	02	00	MLT	ANO	BTF	1	None
199	039	15.2	03	00	MLT	ANO	BTF	1	None
199	040	16.1	01	00	FCT	ANO	CMX	1	None
199	041	16.2	04	00	MSG	ANO	CMX	1	None
199	042	16.3	04	00	FCT	ANO	CMX	1	None
199	043	16.4	04	00	MSG	ANO	CMX	1	None
199	044	17.1	04	00	FCT	ANO	CMX	1	None
199	045	18.1	04	01	FLA	ANO	SIM	1	None
199	046	19.1	02	00	MSG	ANO	CMX	1	None
199	047	19.2	03	00	MSG	ANO	CMX	1	None
199	048	19.3	04	00	MSG	ANO	CMX	1	None
199	049	19.4	04	00	MLT	ANO	CMX	1	None
199	050	19.5	04	00	MSG	ANO	SG4	1	None
199	051	20.1	04	00	MSG	ANO	CMX	1	None
199	052	20.2	04	00	MSG	ANO	CMX	1	None
199	053	20.3	04	00	MLT	ANO	CMX	1	None
199	054	20.4	04	00	MSG	ANO	CMX	1	None
199	055	20.5	04	00	MSG	ANO	CMX	1	None
199	056	21.1	04	00	MSG	ANO	CMX	1	None
199	057	22.1	04	00	MLT	ANO	CMX	1	None

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Lot No.	Specimen No.	Nodule No.	Flake Size	Percent Cortex	Platform Type	Thermal Alteration	Technological Class	Count	Comments
199	058	23.1	02	01	MLT	ANO	CMX	1	None
199	059	24.1	03	00	MSG	ANO	PRI	1	None
199	060	24.2	03	00	MSG	ANO	CMX	1	None
199	061	24.3	04	00	MSG	ANO	CMX	1	None
199	062	24.4	04	00	MLT	ANO	SG4	1	None
199	063	24.5	04	00	FLA	ANO	SG4	1	None
199	064	24.6	04	00	MSG	ANO	SG4	1	None
199	065	25.1	04	00	MSG	ANO	SG4	1	None
199	066	26.1	04	00	MSG	ANO	SG4	1	None
199	067	26.2	04	00	MSG	ANO	SG4	1	None
199	068	26.3	04	00	MSG	ANO	SG4	1	None
199	069	26.4	04	00	MSG	ANO	SG4	1	None
199	070	26.5	04	00	MSG	ANO	SG4	1	None
199	071	26.6	04	00	CRT	ANO	SG4	1	None
199	072	26.7	04	00	MSG	ANO	SG4	1	None
199	073	26.8	04	00	MSG	ANO	SG4	1	None
199	074	26.9	04	00	MSG	ANO	SG4	1	None
199	075	26.10	05	00	N/A	N/A	N/A	2	Not Analyzed
199	076	27.1	04	00	MSG	ANO	SHA	1	None
199	077	27.2	03	01	CRT	ANO	SIM	1	None
199	078	28.1	04	00	MSG	ANO	SG4	1	None
199	079	28.2	04	00	MSG	ANO	SG4	1	None
199	080	29.1	04	00	MSG	ANO	SG4	1	None
199	081	30.1	04	00	FCT	ANO	SG4	1	None
199	082	30.2	04	04	MSG	ANO	SG4	1	None
199	083	31.1	04	00	MSG	ANO	SG4	1	None
199	084	31.2	05	00	MSG	ANO	SG4	1	None
199	085	32.1	04	00	MSG	ANO	BPF	1	None
199	086	32.2	04	00	MSG	ANO	SG4	1	None
199	087	33.1	04	00	MSG	ANO	SG4	1	None
199	088	33.2	04	00	MSG	ANO	SG4	1	None
199	089	33.3	04	00	CRT	ANO	SG4	1	None
199	090	33.4	04	00	MSG	ANO	SG4	1	None
199	091	33.5	04	00	MSG	ANO	SG4	1	None
199	092	33.6	04	00	MSG	ANO	SG4	1	None
199	093	33.7	05	00	MSG	ANO	SG4	1	None
199	094	34.1	04	00	MSG	ANO	SG4	1	None
199	095	35.1	04	00	MSG	ANO	SG4	1	None
199	096	35.2	04	00	MSG	ANO	SG4	1	None
199	097	35.3	04	00	MLT	ANO	SG4	1	None
199	098	35.4	04	00	MSG	ANO	SG4	1	None
199	099	35.5	04	00	MLT	ANO	SG4	1	Possible notching
199	100	35.6	04	00	MSG	ANO	SG4	1	None
199	101	36.1	04	00	MSG	ANO	SG4	1	None
199	102	36.2	04	00	MSG	ANO	SG4	1	None
199	103	37.1	04	00	MSG	ANO	SG4	1	None
199	104	37.2	05	00	MSG	ANO	SG4	1	None
199	105	38.1	04	00	MLT	ANO	BPF	1	None
199	106	38.2	04	00	MLT	ANO	SG4	1	None
199	107	39.1	04	00	MSG	ANO	SG4	1	None
199	108	39.2	04	00	MSG	ANO	SG4	1	None
199	109	39.3	04	00	MLT	ANO	SG4	1	None
199	110	39.4	04	00	MSG	ANO	SG4	1	None
199	111	39.5	04	00	MSG	ANO	SG4	1	None
199	112	39.6	04	00	MSG	ANO	SG4	1	None
199	113	39.7	04	00	MSG	ANO	SG4	1	None
199	114	40.1	04	00	MSG	ANO	SG4	1	None
199	115	40.2	04	00	MSG	ANO	SG4	1	None
199	116	40.3	05	00	MSG	ANO	SG4	1	None
199	117	40.4	05	00	MSG	ANO	SG4	1	None
199	118	41.1	04	00	MLT	ANO	SG4	1	None
199	119	41.2	05	00	MSG	ANO	SG4	1	None
199	120	42.1	05	00	MSG	ANO	SG4	1	None
199	121	43.1	01	00	CRT	ANO	SIM	1	None
199	122	43.2	03	00	CRT	ANO	CMX	1	None
199	123	43.3	03	00	MSG	ANO	CMX	1	None

Appendix D.2. TxDOT 41SR242 Feature 4 Debitage Analysis

Lot No.	Specimen No.	Nodule No.	Flake Size	Percent Cortex	Platform Type	Thermal Alteration	Technological Class	Count	Comments
199	124	44.1	01	00	FLA	ANO	CMX	1	None
199	125	45.1	01	01	FCT	ANO	CMX	1	None
199	126	46.1	01	00	MLT	ANO	BTF	1	None
199	127	46.2	01	00	MLT	ANO	BTF	1	None
199	128	46.3	02	00	MSG	ANO	BTF	1	None
199	129	46.4	02	00	FCT	ANO	CMX	1	None
199	130	47.1	04	00	FCT	ANO	CMX	1	None
199	131	48.1	02	00	MLT	ANO	BTF	1	None
199	132	49.1	02	00	FCT	ANO	CMX	1	None
199	133	50.1	01	00	MLT	ANO	BTF	1	None
199	134	50.2	04	00	MLT	ANO	CMX	1	None
199	135	51.1	04	00	MLT	ANO	CMX	1	None
199	136	52.1	01	04	FLAT	ANO	PRI	1	None
199	137	52.2	02	00	MSG	ANO	CMX	1	None
199	138	52.3	04	00	FCT	ANO	CMX	1	None
199	139	53.1	02	00	MSG	ANO	SHA	1	None
199	140	53.2	02	00	MSG	ANO	SHA	1	None
199	141	54.1	03	00	MSG	ANO	CMX	1	None
199	142	55.1	03	00	MSG	ANO	CMX	1	None
199	143	55.2	03	04	MSG	ANO	PRI	1	None
199	144	55.3	03	00	MSG	ANO	CMX	1	None
199	145	55.4	04	00	MSG	ANO	CMX	1	None
199	146	55.5	04	00	MLT	ANO	CMX	1	None
199	147	55.6	04	00	MSG	ANO	CMX	1	None
199	148	55.7	05	00	MSG	ANO	CMX	1	None
199	149	56.1	04	00	CRT	ANO	CMX	1	None
199	150	57.1	04	00	MSG	ANO	CMX	1	None
199	151	57.2	04	00	MSG	ANO	CMX	1	None
199	152	58.1	03	00	MSG	ANO	CMX	1	None
199	153	59.1	03	04	MSG	ANO	SIM	1	None
199	154	59.2	04	03	CRT	ANO	CMX	1	None
199	155	59.3	04	00	MSG	ANO	CMX	1	None
199	156	60.1	04	00	MSG	ANO	CMX	1	None
199	157	60.2	04	00	MSG	ANO	CMX	1	None
201	001	1.1	01	03	CRT	ANO	SIM	1	None
201	002	1.2	03	04	MSG	ANO	PRI	1	None
201	003	1.3	03	03	MSG	ANO	SIM	1	None
201	004	1.4	04	03	MSG	ANO	SHA	1	None
201	005	2.1	01	00	MLT	ANO	BTF	1	None
201	006	3.1	03	01	CRT	ANO	SIM	1	None
201	007	3.2	02	00	MSG	ANO	BTF	1	None
201	008	3.3	03	00	MSG	ANO	SIM	1	None
201	009	3.4	03	00	MSG	ANO	CMX	1	None
201	010	4.1	01	03	CRT	ANO	SIM	1	None
201	011	5.1	01	01	MLT	ANO	SIM	1	None
201	012	6.1	01	00	FLA	ANO	CMX	1	None
201	013	6.2	03	00	FLA	ANO	SHA	1	None
201	014	6.3	03	00	MSG	ANO	CMX	1	None
201	015	7.1	01	03	FLA	ANO	SIM	1	None
201	016	7.2	02	01	CRT	ANO	SIM	1	None
201	017	8.1	02	01	MSG	ANO	SIM	1	None
201	018	8.2	04	00	MSG	ANO	SG4	1	None
201	019	8.3	04	00	MSG	ANO	SHA	1	None
201	020	8.4	03	00	MSG	ANO	CMX	1	None
201	021	9.1	01	03	MLT	ANO	SIM	1	None
201	022	9.2	03	01	MSG	ANO	SIM	1	None
201	023	10.1	04	01	MSG	AOB	SG4	1	None
201	024	11.1	03	00	MSG	ANO	CMX	1	None
201	025	11.2	03	00	MSG	ANO	CMX	1	None
201	026	11.3	04	00	MSG	ANO	SG4	1	None
201	027	11.4	03	01	MSG	ANO	SIM	1	None
201	028	12.1	03	00	MSG	ANO	CMX	1	None
201	029	12.2	03	01	CRT	ANO	SIM	1	None
201	030	12.3	03	01	MLT	ANO	SIM	1	None
201	031	13.1	02	00	MSG	ANO	SIM	1	None
201	032	14.1	03	00	MLT	ANO	CMX	1	None

Appendix D.2. TxDOT 41SR242 Feature 4 Debitage Analysis

Lot No.	Specimen No.	Nodule No.	Flake Size	Percent Cortex	Platform Type	Thermal Alteration	Technological Class	Count	Comments
201	033	14.2	04	00	MLT	ANO	CMX	1	None
201	034	14.3	04	00	FLA	ANO	CMX	1	None
201	035	15.1	04	03	FLA	ANO	SIM	1	None
201	036	15.2	04	00	MSG	ANO	PRI	1	None
201	037	16.1	03	00	MLT	ANO	CMX	1	None
201	038	17.1	03	00	MSG	ANO	CMX	1	None
201	039	18.1	04	00	MSG	AOB	CMX	1	None
201	040	18.2	04	00	MSG	AOB	SG4	1	None
201	041	18.3	04	01	MSG	ANO	SIM	1	None
201	042	19.1	03	00	MLT	ANO	SIM	1	None
201	043	19.2	04	00	MSG	ANO	SG4	1	None
201	044	19.3	04	00	MSG	ANO	SG4	1	None
201	045	19.4	04	00	MSG	ANO	CMX	1	None
201	046	19.5	04	00	MSG	ANO	SG4	1	None
201	047	20.1	04	00	MLT	ANO	CMX	1	None
201	048	20.2	04	00	MSG	ANO	SG4	1	None
201	049	20.3	04	00	MSG	ANO	SG4	1	None
201	050	20.4	04	00	MSG	ANO	SG4	1	None
201	051	20.5	04	00	MSG	ANO	SG4	1	None
201	052	20.6	04	00	MSG	ANO	SG4	1	None
201	053	21.1	04	00	MSG	ANO	CMX	1	None
201	054	22.1	03	00	MLT	ANO	BTF	1	None
201	055	22.2	04	00	MSG	ANO	SG4	1	None
201	056	23.1	02	00	MSG	ANO	CMX	1	None
201	057	23.2	04	00	MSG	ANO	CMX	1	None
201	058	23.3	04	00	MLT	ANO	SG4	1	None
201	059	23.4	04	00	MSG	ANO	CMX	1	None
201	060	24.1	04	00	MSG	ANO	SG4	1	None
201	061	25.1	04	01	MSG	ANO	SIM	1	None
201	062	26.1	04	00	MSG	ANO	SG4	1	None
201	063	26.2	04	00	CRT	ANO	SIM	1	None
201	064	26.3	04	01	CRT	ANO	SIM	1	None
201	065	27.1	04	01	MSG	AOB	SIM	1	None
201	066	27.2	04	02	MSG	AOB	CMX	1	None
201	067	28.1	04	00	IND	ANO	CMX	1	None
201	068	29.1	03	02	MSG	AOB	SIM	1	None
202	001	202.1.1	1	4	MSG	ANO	PRI	1	None
202	002	202.1.2	3	0	MSG	ANO	CMX	1	None
202	003	202.2.1	1	0	FLA	ANO	CMX	1	None
202	004	202.2.2	3	2	IND	ANO	SIM	1	None
202	005	202.2.3	3	3	MSG	ANO	SIM	1	None
202	006	202.2.4	4	0	MSG	ANO	SG4	1	None
202	007	202.3.1	2	3	FLA	ANO	SIM	1	None
202	008	202.3.2	3	0	MLT	ANO	CMX	1	None
202	009	202.3.3	4	0	MSG	ANO	CMX	1	None
202	010	202.3.4	4	0	MSG	ANO	CMX	1	None
202	011	202.3.5	4	0	MLT	ANO	CMX	1	None
202	012	202.3.6	4	0	FLA	ANO	CMX	1	None
202	013	202.3.7	4	0	MSG	ANO	CMX	1	None
202	014	202.3.8	3	3	MSG	ANO	CMX	1	None
202	015	202.3.9	4	0	MLT	ANO	CMX	1	None
202	016	202.3.10	4	0	MSG	ANO	SG4	1	None
202	017	202.3.11	4	0	MSG	ANO	SG4	1	None
202	018	202.4.1	2	4	CRT	ANO	PRI	1	None
202	019	202.4.2	3	2	MSG	ANO	CMX	1	None
202	020	202.4.3	3	1	MSG	ANO	SIM	1	None
202	021	202.4.4	3	0	MSG	ANO	BTF	1	None
202	022	202.4.5	4	0	IND	ANO	CMX	1	None
202	023	202.5.1	3	0	MSG	ANO	CMX	1	None
202	024	202.5.2	3	1	CRT	ANO	CMX	1	None
202	025	202.5.3	2	0	FLA	ANO	SIM	1	None
202	026	202.5.4	3	0	MSG	ANO	CMX	1	None
202	027	202.6.1	2	0	MSG	ANO	BTF	1	None
202	028	202.6.2	3	0	MLT	ANO	BTF	1	None
202	029	202.6.3	3	0	MSG	ANO	CMX	1	None
202	030	202.6.4	3	0	MSG	ANO	CMX	1	None

Appendix D.2. TxDOT 41SR242 Feature 4 Debitage Analysis

Lot No.	Specimen No.	Nodule No.	Flake Size	Percent Cortex	Platform Type	Thermal Alteration	Technological Class	Count	Comments
202	031	202.7.1	3	0	MLT	ANO	CMX	1	None
202	032	202.7.2	3	0	MSG	ANO	CMX	1	None
202	033	202.8.1	1	2	FLA	ANO	SIM	1	None
202	034	202.8.2	1	1	FLA	ANO	CMX	1	None
202	035	202.8.3	4	0	MSG	ANO	CMX	1	None
202	036	202.8.4	3	1	FCT	ANO	CMX	1	None
202	037	202.8.5	4	0	MLT	ANO	CMX	1	None
202	038	202.8.6	3	3	MSG	ANO	CMX	1	None
202	039	202.8.7	3	0	MLT	ANO	CMX	1	None
202	040	202.8.8	3	1	MSG	ANO	CMX	1	None
202	041	202.9.1	3	4	MSG	ANO	PRI	1	None
202	042	202.9.2	3	0	FCT	ANO	CMX	1	None
202	043	202.9.3	4	0	MSG	ANO	CMX	1	None
202	044	202.9.4	4	4	MSG	ANO	CMX	1	None
202	045	202.9.5	4	0	MSG	ANO	CMX	1	None
202	046	202.9.6	4	1	MSG	ANO	CMX	1	None
202	047	202.9.7	4	4	MSG	ANO	CMX	1	None
202	048	202.9.8	4	0	MSG	ANO	SG4	1	None
202	049	202.10.1	1	0	MLT	ANO	BTF	1	None
202	050	202.10.2	1	4	CRT	ANO	PRI	1	None
202	051	202.10.3	3	0	FLA	ANO	CMX	1	None
202	052	202.10.4	3	0	MSG	ANO	CMX	1	None
202	053	202.10.5	3	0	MSG	ANO	CMX	1	None
202	054	202.10.6	4	0	MLT	ANO	CMX	1	None
202	055	202.10.7	4	3	MSG	ANO	SHA	1	None
202	056	202.10.8	4	0	MSG	ANO	SG4	1	None
202	057	202.10.9	4	0	MSG	ANO	SG4	1	None
202	058	202.11.1	1	2	FLA	ANO	SIM	1	None
202	059	202.11.2	4	0	MSG	ANO	CMX	1	None
202	060	202.11.3	4	0	MSG	ANO	CMX	1	None
202	061	202.11.4	4	0	IND	ANO	CMX	1	None
202	062	202.11.5	4	0	MSG	ANO	CMX	1	None
202	063	202.11.6	4	0	MSG	ANO	CMX	1	None
202	064	202.12.1	2	0	MLT	ANO	BTF	1	None
202	065	202.12.2	4	2	CRT	ANO	CMX	1	None
202	066	202.12.3	2	3	MSG	ANO	SIM	1	None
202	067	202.12.4	4	0	MLT	ANO	SIM	1	None
202	068	202.12.5	4	1	CRT	ANO	CMX	1	None
202	069	202.13.1	3	1	MSG	ANO	CMX	1	None
202	070	202.13.2	4	0	MSG	ANO	CMX	1	None
202	071	202.13.3	5	0	MSG	ANO	SG4	1	None
202	072	202.14.1	3	0	MLT	ANO	BTF	1	None
202	073	202.14.2	4	0	MLT	ANO	CMX	1	None
202	074	202.14.3	4	0	FLA	ANO	SG4	1	None
202	075	202.15.1	4	0	IND	ANO	SG4	1	None
202	076	202.16.1	4	1	CRT	ANO	CMX	1	None
202	077	202.16.2	3	1	CRT	ANO	CMX	1	None
202	078	202.16.3	4	0	MSG	ANO	CMX	1	None
202	079	202.17.1	2	0	MSG	ANO	BTF	1	None
202	080	202.17.2	3	0	FLA	ANO	CMX	1	None
202	081	202.17.3	3	0	MSG	ANO	CMX	1	None
202	082	202.17.4	4	0	MSG	ANO	CMX	1	None
202	083	202.17.5	4	0	MSG	ANO	CMX	1	None
202	084	202.17.6	4	0	MSG	ANO	CMX	1	None
202	085	202.17.7	4	0	MLT	ANO	CMX	1	None
202	086	202.17.8	4	0	MLT	ANO	SG4	1	None
202	087	202.17.9	4	0	MLT	ANO	SG4	1	None
202	088	202.18.1	3	4	CRT	ANO	PRI	1	None
202	089	202.18.2	3	2	CRT	ANO	SIM	1	None
202	090	202.18.3	4	0	MSG	AOB	SHA	1	None
202	091	202.18.4	4	0	CRT	ANO	SG4	1	None
202	092	202.18.5	4	0	CRT	ANO	CMX	1	None
202	093	202.18.6	4	0	MLT	ANO	CMX	1	None
202	094	202.18.7	3	0	MLT	ANO	CMX	1	None
202	095	202.18.8	4	0	MLT	ANO	CMX	1	None
202	096	202.19.1	1	1	CRT	ANO	SIM	1	None

Appendix D.2. TxDOT 41SR242 Feature 4 Debitage Analysis

Lot No.	Specimen No.	Nodule No.	Flake Size	Percent Cortex	Platform Type	Thermal Alteration	Technological Class	Count	Comments
202	097	202.19.2	4	0	MSG	ANO	CMX	1	None
202	098	202.19.3	4	0	MSG	ANO	CMX	1	None
202	099	202.19.4	4	3	MSG	ANO	SHA	1	None
202	100	202.19.5	4	0	MSG	ANO	CMX	1	None
202	101	202.20.1	2	0	MSG	ANO	CMX	1	None
202	102	202.20.2	2	0	MSG	ANO	BTF	1	None
202	103	202.21.1	3	0	MSG	ANO	CMX	1	None
202	104	202.21.2	3	0	MSG	ANO	CMX	1	None
202	105	202.22.1	1	0	MSG	ANO	BTF	1	None
202	106	202.22.2	3	0	MLT	ANO	BTF	1	None
202	107	202.22.3	3	0	MSG	ANO	SIM	1	None
202	108	202.22.4	4	0	MSG	ANO	CMX	1	None
202	109	202.22.5	4	0	MLT	ANO	CMX	1	None
202	110	202.23.1	4	0	MSG	ANO	CMX	1	None
202	111	202.24.1	3	1	CRT	ANO	SIM	1	None
202	112	202.25.1	4	1	MSG	ANO	CMX	1	None
202	113	202.25.2	4	0	MSG	ANO	CMX	1	None
202	114	202.25.3	4	1	CRT	ANO	CMX	1	None
202	115	202.25.4	4	0	MLT	ANO	CMX	1	None
202	116	202.25.5	4	0	MSG	ANO	SG4	1	None
202	117	202.25.6	4	2	MLT	ANO	CMX	1	None
202	118	202.25.7	4	0	MLT	ANO	CMX	1	None
202	119	202.25.8	4	0	MSG	ANO	CMX	1	None
202	120	202.25.9	4	2	MSG	ANO	CMX	1	None
202	121	202.25.10	4	0	MSG	ANO	CMX	1	None
202	122	202.26.1	4	4	CRT	ANO	PRI	1	None
202	123	202.26.2	4	2	MSG	ANO	SIM	1	None
202	124	202.26.3	4	4	MSG	ANO	SG4	1	None
202	125	202.26.4	4	0	MSG	ANO	SG4	1	None
202	126	202.27.1	4	0	MLT	ANO	CMX	1	None
202	127	202.27.2	4	0	MSG	ANO	CMX	1	None
202	128	202.28.1	4	0	MSG	ANO	CMX	1	None
202	129	202.29.1	2	0	MLT	ANO	CMX	1	None
202	130	202.29.2	4	0	MLT	ANO	CMX	1	None
202	131	202.29.3	2	0	MSG	ANO	SIM	1	None
202	132	202.30.1	4	0	MSG	ANO	CMX	1	None
202	133	202.30.2	4	0	MSG	ANO	CMX	1	None
202	134	202.30.3	5	0	MSG	ANO	SG4	1	None
202	135	202.30.4	4	0	MSG	ANO	CMX	1	None
202	136	202.31.1	4	0	MSG	ANO	CMX	1	None
202	137	202.31.2	4	0	MSG	ANO	CMX	1	None
202	138	202.31.3	4	0	MSG	ANO	CMX	1	None
202	139	202.32.1	4	0	MSG	ANO	CMX	1	None
202	140	202.33.1	3	0	MSG	ANO	BTF	1	None
202	141	202.34.1	4	0	MLT	ANO	CMX	1	None
202	142	202.35.1	4	0	MSG	ANO	CMX	1	None
202	143	202.35.2	5	0	MSG	ANO	SG4	1	None
202	144	202.36.1	2	0	FLA	ANO	CMX	1	None
202	145	202.36.2	4	0	MSG	ANO	SHA	1	None
202	146	202.37.1	4	0	MSG	ANO	CMX	1	None
202	147	202.38.1	4	0	MSG	ANO	CMX	1	None
202	148	202.38.2	4	0	MSG	ANO	CMX	1	None
202	149	202.38.3	4	0	MSG	ANO	CMX	1	None
202	150	202.39.1	3	4	CRT	ANO	PRI	1	None
202	151	202.40.1	4	4	CRT	ANO	PRI	1	None
202	152	202.40.2	4	0	MLT	ANO	CMX	1	None
202	153	202.40.3	4	0	MSG	ANO	SG4	1	None
202	154	202.40.4	4	0	CRT	ANO	SG4	1	None
202	155	202.41.1	4	2	MSG	AOB	SHA	1	None
202	156	202.41.2	4	0	MSG	AOB	SHA	1	None
202	157	202.41.3	4	0	MLT	ANO	CMX	1	None
202	158	202.41.4	4	0	MLT	ANO	SG4	1	None
202	159	202.41.5	4	0	FCT	ANO	CMX	1	None
202	160	202.42.1	3	0	MSG	ANO	BTF	1	None
202	161	202.42.2	4	0	MSG	ANO	SG4	1	None
202	162	202.43.1	4	0	MSG	ANO	SG4	1	None

Appendix D.2. TxDOT 41SR242 Feature 4 Debitage Analysis

Lot No.	Specimen No.	Nodule No.	Flake Size	Percent Cortex	Platform Type	Thermal Alteration	Technological Class	Count	Comments
202	163	202.43.2	4	0	MSG	ANO	SG4	1	None
202	164	202.43.3	4	0	MSG	ANO	SG4	1	None
202	165	202.44.1	4	0	MSG	ANO	SG4	1	None
202	166	202.44.2	4	0	MSG	ANO	SG4	1	None
202	167	202.44.3	4	0	MSG	ANO	SHA	1	None
202	168	202.45.1	4	0	MSG	ANO	CMX	1	None
202	169	202.45.2	4	0	MSG	ANO	SG4	1	None
202	170	202.46.1	4	0	MSG	ANO	CMX	1	None
202	171	202.47.1	4	0	MSG	ANO	CMX	1	None
202	172	202.48.1	4	0	MSG	ANO	SG4	1	None
202	173	202.48.2	4	0	MSG	ANO	SG4	1	None
202	174	202.49.1	4	0	MSG	ANO	CMX	1	None
202	175	202.50.1	4	0	IND	ANO	CMX	1	None
202	176	202.51.1	4	0	MSG	ANO	CMX	1	None
202	177	202.51.2	4	4	FLA	ANO	PRI	1	None
202	178	202.51.3	4	0	MSG	ANO	SG4	1	None
202	179	202.52.1	4	0	MSG	ANO	BTF	1	None
202	180	202.52.2	4	0	MLT	ANO	SG4	1	None
202	181	202.53.1	4	0	MSG	ANO	SG4	1	None
202	182	202.53.2	4	0	MSG	ANO	SG4	1	None
202	183	202.54.1	4	0	MLT	ANO	SG4	1	None
202	184	202.54.2	4	0	MSG	ANO	SG4	1	None
202	185	202.55.1	4	0	MSG	ANO	SG4	1	None
202	186	202.55.2	4	0	MSG	ANO	SG4	1	None
202	187	202.56.1	4	0	MSG	ANO	SG4	1	None
202	188	202.56.2	4	0	MSG	ANO	CMX	1	None
202	189	202.57.1	4	0	MSG	ANO	SG4	1	None
202	190	202.57.2	4	0	MSG	ANO	SG4	1	None
202	191	202.58.1	1	0	MSG	ANO	BTF	1	None
202	192	202.59.1	3	4	MSG	ANO	PRI	1	None
203	1	1.1	1	04	MSG	ANO	PRI	1	None
203	2	1.2	1	04	CRT	ANO	PRI	1	None
203	3	1.3	2	02	FLA	ANO	SHA	1	None
203	4	2.1	2	00	MLT	ANO	BTF	1	None
203	5	2.2	2	00	FLA	ANO	SIM	1	None
203	6	2.3	3	00	MSG	ANO	CMX	1	None
203	7	3.1	2	03	MSG	ANO	SIM	1	None
203	8	3.2	3	04	FLA	ANO	PRI	1	None
203	9	3.3	3	00	MSG	ANO	CMX	1	None
203	10	3.4	3	00	FCT	ANO	CMX	1	None
203	11	3.5	4	00	MSG	ANO	CMX	1	None
203	12	3.6	4	03	CRT	ANO	SIM	1	None
203	13	4.1	2	00	MLT	ANO	CMX	1	None
203	14	4.2	2	00	CRT	ANO	CMX	1	None
203	15	4.3	3	00	MSG	ANO	CMX	1	None
203	16	4.4	4	04	CRT	ANO	PRI	1	None
203	17	5.1	1	04	MLT	ANO	BTF	1	None
203	18	5.2	1	00	FCT	ANO	CMX	1	None
203	19	6.1	3	04	MSG	ANO	SHA	1	None
203	20	6.2	4	03	FLA	ANO	CMX	1	None
203	21	7.1	1	00	CRT	ANO	SIM	1	None
203	22	8.1	4	02	MSG	ANO	SIM	1	None
203	23	9.1	4	00	MSG	ANO	CMX	1	None
203	24	10.1	2	00	MSG	ANO	CMX	1	None
203	25	10.2	2	00	FCT	ANO	CMX	1	None
203	26	10.3	2	02	FCT	ANO	SIM	1	None
203	27	10.4	3	00	MSG	ANO	CMX	1	None
203	28	11.1	3	00	FCT	ANO	CMX	1	None
203	29	11.2	4	00	FCT	ANO	CMX	1	None
203	30	11.3	4	00	MSG	ANO	CMX	1	None
203	31	11.4	4	00	MLT	ANO	CMX	1	None
203	32	11.5	4	00	MSG	AOB	SHA	1	None
203	33	11.6	5	00	MSG	ANO	CMX	1	None
203	34	12.1	3	00	MSG	ANO	CMX	1	None
203	35	13.1	3	00	FCT	ANO	CMX	1	None
203	36	13.2	3	00	FLA	ANO	CMX	1	None

Appendix D.2. TxDOT 41SR242 Feature 4 Debitage Analysis

Lot No.	Specimen No.	Nodule No.	Flake Size	Percent Cortex	Platform Type	Thermal Alteration	Technological Class	Count	Comments
203	37	13.3	4	00	MLT	ANO	CMX	1	None
203	38	13.4	3	03	FCT	ANO	SIM	1	None
203	39	13.5	4	00	MLT	ANO	CMX	1	None
203	40	13.6	4	00	MSG	ANO	CMX	1	None
203	41	13.7	4	00	MSG	ANO	CMX	1	None
203	42	13.8	4	00	MSG	ANO	CMX	1	None
203	43	13.9	4	00	MSG	ANO	CMX	1	None
203	44	13.10	4	00	MSG	ANO	CMX	1	None
203	45	13.11	4		MSG	ANO	CMX	1	None
203	46	13.12	4	01	MSG	ANO	CMX	1	None
203	47	13.13	4	00	MSG	ANO	CMX	1	None
203	48	13.14	5	NA	N/A	N/A	N/A	1	None
203	49	13.15	4	00	MLT	ANO	CMX	1	None
203	50	13.16	5	NA	N/A	N/A	N/A	1	None
203	51	13.17	4	00	MSG	ANO	CMX	1	None
203	52	13.18	4	00	MSG	ANO	CMX	1	None
203	53	13.19	4	00	MSG	ANO	CMX	1	None
203	54	13.20	4	00	MSG	ANO	CMX	1	None
203	55	13.21	5	NA	N/A	N/A	N/A	1	None
203	56	13.22	5	NA	N/A	N/A	BPR	1	None
203	57	13.23	5	NA	N/A	N/A	N/A	1	None
203	58	14.1	4	03	MSG	AOB	CMX	1	None
203	59	14.2	4	00	MSG	ANO	CMX	1	None
203	60	14.3	4	00	MSG	ANO	CMX	1	None
203	61	14.4	5	NA	N/A	N/A	BPR	1	None
203	62	14.5	4	00	MSG	ANO	CMX	1	None
203	63	14.6	5	NA	N/A	N/A	N/A	1	None
203	64	15.1	4	00	MLT	ANO	CMX	1	None
203	65	15.2	4	00	MSG	ANO	CMX	1	None
203	66	15.3	4	00	MSG	ANO	CMX	1	None
203	67	15.4	4	00	MSG	ANO	CMX	1	None
203	68	15.5	4	00	MSG	ANO	CMX	1	None
203	69	15.6	4	00	MSG	ANO	CMX	1	None
203	70	15.7	4	00	MSG	ANO	CMX	1	None
203	71	16.1	4	00	MSG	ANO	CMX	1	None
203	72	16.2	4	00	MSG	ANO	CMX	1	None
203	73	16.3	4	00	MSG	ANO	CMX	1	None
203	74	16.4	4	00	MSG	ANO	CMX	1	None
203	75	17.1	4	04	MSG	ANO	CMX	1	None
203	76	18.1	1	02	MSG	ANO	SIM	1	None
203	77	18.2	1	03	MSG	ANO	SIM	1	None
203	78	18.3	2	00	MLT	ANO	CMX	1	None
203	79	18.4	2	00	MLT	ANO	CMX	1	None
203	80	18.5	3	02	MSG	ANO	SIM	1	None
203	81	18.6	4	00	MSG	ANO	CMX	1	None
203	82	19.1	3	00	MLT	ANO	CMX	1	None
203	83	19.2	3	00	MSG	ANO	CMX	1	None
203	84	19B.1	3	00	FCT	ANO	CMX	1	None
203	85	19B.2	3	00	MSG	ANO	CMX	1	None
203	86	19B.3	4	00	MSG	ANO	CMX	1	None
203	87	20.1	2	04	CRT	ANO	PRI	1	None
203	88	20.2	3	00	MLT	ANO	CMX	1	None
203	89	21.1	2	00	CRT	ANO	CMX	1	None
203	90	21.2	3	00	FLA	ANO	CMX	1	None
203	91	21.3	4	00	MLT	ANO	CMX	1	None
203	92	21.4	4	00	MSG	ANO	CMX	1	None
203	93	21.5	4	04	CRT	ANO	CMX	1	None
203	94	21.6	4	00	FLA	ANO	CMX	1	None
203	95	22.1	3	00	MLT	ANO	CMX	1	None
203	96	22.2	3	00	MSG	ANO	CMX	1	None
203	97	22.3	5	NA	N/A	N/A	N/A	1	None
203	98	22.4	4	00	MLT	ANO	BPR	1	None
203	99	23.1	1	03	MSG	ANO	SIM	1	None
203	100	23.2	2	00	FLA	ANO	CMX	1	None
203	101	23.3	3	00	MSG	ANO	CMX	1	None
203	102	23.4	4	00	MSG	ANO	CMX	1	None

Appendix D.2. TxDOT 41SR242 Feature 4 Debitage Analysis

Lot No.	Specimen No.	Nodule No.	Flake Size	Percent Cortex	Platform Type	Thermal Alteration	Technological Class	Count	Comments
203	103	24.1	2	00	MSG	ANO	CMX	1	None
203	104	24.2	2	00	MSG	ANO	CMX	1	None
203	105	24.3	4	00	MSG	ANO	CMX	1	None
203	106	24.4	4	00	MLT	ANO	CMX	1	None
203	107	25.1	4	00	MLT	ANO	CMX	1	None
203	108	25.2	4	00	MSG	ANO	CMX	1	None
203	109	25.3	5	NA	N/A	N/A	N/A	1	None
203	110	25.4	5	NA	N/A	N/A	BPR	1	None
203	111	26.1	3	00	MSG	ANO	CMX	1	None
203	112	26.2	4	00	MSG	ANO	CMX	1	None
203	113	26.3	4	04	CRT	ANO	PRI	1	None
203	114	27.1	4	00	MSG	ANO	CMX	1	None
203	115	27.2	4	00	MSG	ANO	SHA	1	None
203	116	27.3	4	00	MSG	ANO	CMX	1	None
203	117	27.4	4	00	MSG	ANO	CMX	1	None
203	118	27.5	4	00	MSG	ANO	CMX	1	None
203	119	27.6	4	00	MSG	ANO	CMX	1	None
203	120	28.1	4	00	MLT	ANO	CMX	1	None
203	121	28B.1	4	00	MSG	ANO	SHA	1	None
203	122	29.1	4	00	MSG	ANO	CMX	1	None
203	123	29.2	5	NA	N/A	N/A	N/A	1	None
203	124	30.1	3	01	MLT	ANO	CMX	1	None
203	125	30.2	4	00	MSG	ANO	CMX	1	None
203	126	31.1	2	00	FCT	ANO	CMX	1	None
203	127	32.1	3	04	MSG	ANO	CMX	1	None
203	128	32.2	3	00	MSG	ANO	CMX	1	None
203	129	33.1	3	00	CRT	ANO	CMX	1	None
203	130	34.1	4	04	MSG	ANO	PRI	1	None
203	131	34.2	5	NA	N/A	N/A	N/A	1	None
203	132	35.1	5	NA	N/A	N/A	N/A	1	None
203	133	35.2	5	NA	N/A	N/A	N/A	1	None
203	134	35.3	5	NA	N/A	N/A	N/A	1	None
203	135	36.1	5	NA	N/A	N/A	N/A	1	None
203	136	36.2	5	NA	N/A	N/A	N/A	1	None
203	137	36.3	5	NA	N/A	N/A	N/A	1	None

Appendix D.3. TxDOT 41SR242 Points, Other Lithic Tools, and Cores Analysis

Lot No.	Spec. No.	FS No.	6. Type	7. Subtype/ Identity	Count	8. Max Length (mm)	9. Max Width (mm)	10. Max Thick (mm)	11. Weight (g)	12. Edge Angle	13. Stage	14. Portion	17a. Distal Edge Morphology	17b. Left Lateral Edge Morphology	17c. Right Lateral Edge Morphology	19. Edge Construction Type	21. Flaking Attrition	27. Lithology	29.1 Point Ratio (#8/#9)	29.2 Blade Length (Left)	29.3 Blade Length (Right)	29.4 Base/ Stem Length or Basal Inflection	29.5 Base/ Stem Width	29.11 Base to Blade Ratio (Length)	29.12 Base to Blade Ratio (Width)	29.13 Base/ Stem Ratio	29.14 Base Form	29.15 Stem form	29.16 Distal Base Form	26.17 Lateral Base/ Stem Form	29.18 Blade Curvature (Left)	29.19 Blade Curvature (Right)	29.23 Base Angle (Left)	29.24 Base Angle (Right)
001	001	SC 01.01	Biface	Early-Stage	1	39.11	22.84	21.05	42.2	65	INR	PRX	IND	CVX	CVX	BFB	NPR	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
001	002	SC 01.02	Biface	Late-Stage	1	20.69	13.31	7.06	9.6	35	PRF	PRX	IND	CVX	CVX	BFB	NPR	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
001	003	SC 01.03	Biface	Early-Stage	1	32.99	29.40	10.62	10.8	35	INR	PRX	IND	CVX	CVX	BFB	NPR	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
001	004	SC 01.04	Edge-Modified	Utilized	1	37.87	63.28	15.74	18.9	43	NAP	PME	IND	CVX	CVX	NAP	UFU	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
001	005	SC 01.05	Edge-Modified	Utilized	1	52.78	58.94	15.74	20.5	63	NAP	CMP	NAP	NAP	CVX	NAP	BFU	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
002	001	SC 02.01	Biface	Late-Stage	1	60.18	38.09	7.80	15.2	40	PRF	IND	IND	CVX	CVX	BFB	NPR	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
002	002	SC 02.02	Biface	Early-Stage	1	73.83	50.66	27.99	106.9	70	INR	CMP	CVX	CVX	CVX	BFC	NPR	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
002	003	SC 02.03	Biface	Early-Stage	1	66.77	53.28	22.59	73.9	50	INR	MED	IND	CVX	CVX	BFB	NPR	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
003	001	SC 03.01	Biface	Mid-Stage	1	61.77	42.34	15.34	41.9	50	BLK	CMP	CVX	CVX	CVX	BFC	NPR	SLM	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
003	002	SC 03.02	Biface	Late-Stage	1	40.70	39.93	9.43	15.3	45	PRF	CMP	CVX	CVX	CVX	BFC	NPR	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
003	003	SC 03.03	Platform Rejuvenation Core Flake	NAP	1	67.12	62.17	25.38	81.3	45	NAP	NAP	NAP	NAP	NAP	NAP	NPR	CHL	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
004	001	SC 04.01	Biface	Mid-Stage	1	64.08	49.92	17.52	52.5	50	BLK	CMP	CVX	CVX	CVX	BFC	NPR	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
004	002	SC 04.02	Dart	Desmuke Base	1	43.22	29.83	8.52	9.9	40	FST	DIS	CVX	CVX	CVX	BFD	NPR	CHL	1.45	43.66	37.41	NAP	NAP	NAP	NAP	NAP	NAP	NAP	2	NAP	2	2	NAP	NAP
005	001	SC 05.01	Dart	Tortugas	1	29.67	35.66	8.96	11.2	40	FST	PRX	IND	CVX	CVX	BFB	NPR	OTH - AGATE	0.83	25.35	25.47	3.17	34.42	0.11	0.97	NAP	1	NAP	NAP	NAP	2	2	48	51
005	002	SC 05.02	Biface	Late-Stage	1	43.18	35.57	7.86	11.4	35	PRF	MED	IND	CVX	CVX	BFB	NPR	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
005	003	SC 05.03	Biface	Early-Stage	1	68.55	43.22	22.51	61.7	50	INR	CMP	CVX	CVX	CVX	BFC	NPR	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
006	001	SC 06.01	Dart	Tortugas	1	60.99	28.75	8.37	11.6	40	FST	CMP	CVX	CCV	CVX	BFC	NPR	CRT	2.12	57.92	60.98	4.84	28.96	0.08	1.01	NAP	1	NAP	1	NAP	4	2	42	43
006	002	SC 06.02	Biface	Early-Stage	1	63.34	56.71	26.89	85.9	60	INR	IND	IND	CVX	CVX	BFB	NPR	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
007	001	SD 1	Dart	Tortugas	1	38.90	24.37	7.97	8.6	60	FST	PME	IND	CVX	CVX	BFB	UBO	CRT	1.60	37.24	38.75	2.93	24.18	0.08	0.99	NAP	1	NAP	NAP	NAP	2	2	45	41
008	001	SD 2	Dart	Tortugas	1	39.75	33.12	7.44	10.7	55	FST	PME	IND	CVX	CVX	BFB	NPR	CRT	1.20	36.80	37.12	4.53	33.05	0.11	1.00	NAP	2	NAP	NAP	NAP	2	2	41	46
009	001	SD 3	Scraper	Distally Beveled Scraper	1	39.40	29.52	6.67	10.1	50	REJ	PRX	IND	CVX	CVX	BFC	UFD	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
010	001	SD 4	Biface	Late-Stage	1	36.15	26.99	7.54	6.8	60	PRF	DIS	CVX	CVX	CVX	BFD	NPR	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
011	001	SD 5	Dart Preform	Tortugas Preform	1	36.82	36.42	8.49	13.1	55	PRF	PRX	IND	CVX	CVX	BFB	NPR	OTH - METAMOR SHALE	1.01	36.16	30.48	3.04	34.52	0.08	0.95	NAP	2	NAP	NAP	NAP	2	2	43	47
012	001	SD 6	Dart Preform	Tortugas Preform	1	68.20	34.16	18.52	37.0	80	PRF	CMP	CVX	CVX	CVX	BFC	NPR	CRT	2.00	68.53	67.36	6.65	28.08	0.10	0.82	NAP	1	NAP	1	NAP	2	2	54	56
013	001	SD 7	Dart	Tortugas	1	40.90	26.26	5.64	7.7	60	FST	PME	IND	CVX	CVX	BFB	BFB	SST	1.56	40.20	41.49	5.40	26.26	0.13	1.00	NAP	1	NAP	NAP	NAP	2	2	42	46
014	001	SD 8	Biface	Late-Stage	1	36.45	25.54	6.84	4.9	50	PRF	DIS	CVX	CVX	CVX	BFD	NPR	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
015	001	SD 9	Dart	Unidentified Lanceolate	1	41.01	27.94	6.20	6.9	40	FST	PME	IND	CVX	CVX	BFB	NPR	OTH - SLATE	1.47	27.75	33.49	3.51	16.13	0.09	0.58	NAP	0	NAP	NAP	NAP	2	2	NAP	42
016	001	SD 10	Dart	Catan	1	35.77	24.50	5.85	5.3	55	FST	CMP	CVX	CVX	CVX	BFC	UFB	CRT	1.46	29.42	28.32	7.46	15.27	0.21	0.62	NAP	2	NAP	1	NAP	2	2	41	43
017	001	SB 1	Biface	Mid-Stage	1	49.43	56.76	11.77	33.9	60	BLK	PRX	IND	CVX	CVX	BFB	NPR	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
018	001	SB 2	Perforator	Perforator	1	38.75	20.53	9.40	7.6	70	IND	IND	IND	CVX	CVX	BFB	NPR	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
019	001	SB 3	Biface	Mid-Stage	1	58.60	46.23	15.45	39.0	65	BLK	CMP	CVX	CVX	CVX	BFC	NPR	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
020	001	SB 4	Uniface	Discoid Uniface	1	38.52	34.21	14.91	17.6	65	NAP	CMP	CVX	CVX	CVX	UNC	NPR	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
021	001	SB 5	Biface	Late-Stage	1	36.16	31.66	7.69	8.8	40	PRF	IND	IND	CVX	CVX	BFB	NPR	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
022	001	SB 6	Biface	Mid-Stage	1	49.67	41.07	9.70	16.8	45	BLK	DIS	CVX	CVX	CVX	BFD	NPR	FWD	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
023	001	SB 7	Biface	Mid-Stage	1	33.51	44.11	9.57	15.8	55	BLK	PRX	IND	CVX	CVX	BFB	NPR	CHL	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
024	001	SB 8	Biface	Mid-Stage	1	74.81	45.97	14.87	48.2	60	BLK	DME	CVX	CVX	CVX	BFD	NPR	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
025	001	SB 9	Biface	Early-Stage	1	75.49	51.43	22.65	84.9	60	INR	CMP	CVX	CVX	CVX	BFC	NPR	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
026	001	SB 10	Biface	Early-Stage	1	86.31	62.99	30.63	147.5	70	INR	CMP	CVX	CVX	CVX	BDU	NPR	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
027	001	SB 11	Uniface	Nueces Tool	1	54.89	46.91	12.62	39.4	65	FST	CMP	CCV	CVX	CVX	UDB	UFD	OTH - MUDSTONE	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
028	001	SB 12	Biface	Early-Stage	1	65.13	59.06	30.80	111.9	85	IND	CMP	CVX	CVX	CVX	BFC	NPR	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP

Appendix D.3. TxDOT 41SR242 Points, Other Lithic Tools, and Cores Analysis

Lot No.	Spec. No.	FS No.	6. Type	7. Subtype/ Identity	Count	8. Max Length (mm)	9. Max Width (mm)	10. Max Thick (mm)	11. Weight (g)	12. Edge Angle	13. Stage	14. Portion	17a. Distal Edge Morphology	17b. Left Lateral Edge Morphology	17c. Right Lateral Edge Morphology	19. Edge Construction Type	21. Flaking Attrition	27. Lithology	29.1 Point Ratio (#8/#9)	29.2 Blade Length (Left)	29.3 Blade Length (Right)	29.4 Base/ Stem Length or Basal Inflection	29.5 Base/ Stem Width	29.11 Base to Blade Ratio (Length)	29.12 Base to Blade Ratio (Width)	29.13 Base/ Stem Ratio	29.14 Base Form	29.15 Stem form	29.16 Distal Base Form	26.17 Lateral Base/ Stem Form	29.18 Blade Curvature (Left)	29.19 Blade Curvature (Right)	29.23 Base Angle (Left)	29.24 Base Angle (Right)
029	001	SB 13	Biface	Late-Stage	1	59.77	42.24	8.55	19.5	60	PRF	LEM	IND	IND	CVX	BFB	NPR	CHL	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
030	001	SB 14	Biface	Mid-Stage	1	29.22	54.60	11.34	20.5	60	BLK	PRX	IND	CVX	CVX	BFB	NPR	CHL	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
031	001	SB 15	Scraper	Distally Beveled Scraper	1	40.74	35.08	7.05	12.9	45	REJ	PRX	IND	CVX	CVX	BFB	UFD	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
032	001	SB 16	Biface	Late-Stage	1	35.69	23.62	7.99	4.3	65	PRF	DIS	CVX	CVX	CVX	BFD	NPR	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
033	001	SB 17	Biface	Late-Stage	1	34.67	41.22	8.27	12.6	45	PRF	PRX	IND	CVX	CVX	BFB	NPR	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
034	001	SB 18	Biface	Late-Stage	1	33.82	29.95	8.22	9.4	55	PRF	PRX	IND	CVX	CVX	BFB	NPR	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
035	001	SB 19	Side Scraper	NAP	1	111.80	82.55	40.97	408.3	80	IND	CMP	CVX	CVX	CVX	BDU	BFU	CHL	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
036	001	SD2 01	Arrow	Matamoros	1	32.61	20.31	5.58	4.0	60	FST	CMP	CVX	CVX	CVX	BFC	BFB	CRT	1.61	33.27	32.67	2.85	20.31	0.09	1.00	NAP	1	NAP	1	NAP	2	2	36	39
037	001	SD2 02	Dart	Tortugas	1	49.70	25.50	8.73	10.1	60	FST	CMP	CVX	CVX	CVX	BFC	BFB	CRT	1.95	48.80	51.09	5.36	24.70	0.11	0.97	NAP	1	NAP	1	NAP	2	2	50	49
038	001	SD2 03	Dart	Tortugas	1	24.11	26.03	5.85	4.9	55	FST	PRX	IND	CVX	CVX	BFB	NPR	CRT	0.93	21.64	22.77	5.05	26.07	0.21	1.00	NAP	1	NAP	NAP	NAP	2	2	46	41
039	001	SD2 04	Arrow	Matamoros	1	35.26	26.06	4.87	4.0	40	FST	CMP	CVX	CVX	CVX	BFC	BFB	CRT	1.35	38.22	35.13	4.32	26.03	0.12	1.00	NAP	1	NAP	1	NAP	2	2	40	37
040	001	SD2 05	Dart	Refugio	1	70.00	23.57	10.24	19.6	70	FST	CMP	CVX	CVX	CVX	BFC	BFB	SST	2.97	67.59	68.86	9.74	21.08	0.14	0.89	NAP	1	NAP	1	NAP	2	2	52	48
041	001	SD2 06	Dart	Tortugas	1	39.62	27.79	6.93	8.8	55	FST	PME	IND	CVX	CVX	BFB	BFB	CRT	1.43	39.11	36.27	4.57	27.48	0.12	0.99	NAP	1	NAP	NAP	NAP	2	2	46	39
042	001	SD2 07	Dart Preform	Tortugas Preform	1	73.38	30.95	17.51	34.3	70	FST	CMP	CVX	CVX	CVX	BFC	NPR	CRT	2.37	73.15	73.13	10.88	29.42	0.15	0.95	NAP	1	NAP	1	NAP	2	2	48	52
043	001	SB2 01	Dart	Desmuke Base	1	33.47	30.83	7.16	7.5	55	FST	PRX	IND	CVX	CVX	BFB	NPR	UMM	1.09	35.75	34.54	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	2	2	NAP	NAP
044	001	SB2 02	Biface	Late-Stage	1	52.65	31.65	9.74	12.5	45	PRF	CMP	CVX	CVX	CVX	BFC	NPR	CHL	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
045	001	SB2 03	Biface	Late-Stage	1	38.64	29.59	8.72	8.5	55	PRF	DIS	CVX	CVX	CVX	BFD	NPR	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
046	001	SB2 04	Biface	Late-Stage	1	36.82	34.82	8.88	13.5	55	PRF	PRX	IND	CVX	CVX	BFB	NPR	CHL	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
047	001	SB2 05	Biface	Late-Stage	1	50.37	39.22	7.06	11.6	50	PRF	PME	IND	CVX	CVX	BFB	NPR	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
048	001	SB2 06	Biface	Mid-Stage	1	36.90	45.69	9.77	21.1	55	BLK	PRX	IND	CVX	CVX	BFB	NPR	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
049	001	SB2 07	Biface	Mid-Stage	1	49.51	50.93	13.42	32.4	50	BLK	DIS	CVX	CVX	CVX	BFD	NPR	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
050	001	SB2 08	Biface	Mid-Stage	1	44.18	49.44	10.77	30.0	60	BLK	PRX	IND	CVX	CVX	BFB	NPR	CHL	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
051	001	SB2 09	Biface	Early-Stage	1	77.36	45.06	20.72	59.5	65	INR	CMP	CVX	CVX	CVX	BFC	NPR	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
052	001	SB2 10	Dart	Desmuke Base	1	32.53	28.06	6.13	5.7	50	FST	PRX	IND	CVX	CVX	BFB	NPR	CRT	1.16	34.46	35.37	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	2	2	NAP	NAP
053	001	SB2 11	Biface	Early-Stage	1	71.62	75.22	27.42	114.8	65	INR	PRX	IND	CVX	CVX	BFB	NPR	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
054	001	SB2 12	Biface	Mid-Stage	1	68.32	32.29	16.78	34.8	70	BLK	CMP	CVX	CVX	CVX	BFC	NPR	UMM	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
055	001	SB2 13	Uniface	NAP	1	60.84	31.73	11.21	21.8	55	IND	IND	IND	CVX	CVX	BDU	UFB	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
056	001	SB2 14	Biface	Early-Stage	1	48.63	59.03	19.30	45.6	65	INR	DIS	CVX	CVX	CVX	BFD	NPR	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
057	001	SB2 15	Biface	Mid-Stage	1	70.29	40.41	18.60	45.4	65	BLK	CMP	CVX	CVX	CVX	BFC	NPR	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
058	001	SB2 16	Biface	Late-Stage	1	43.45	27.82	6.62	8.1	50	PRF	DIS	CVX	CVX	CVX	BFD	BFB	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
059	001	SB2 17	Dart Preform	Tortugas Preform	1	34.64	34.02	11.23	14.6	60	PRF	PRX	IND	CVX	CVX	BFB	NPR	CRT	1.02	33.56	32.21	7.44	33.90	0.21	1.00	NAP	1	NAP	NAP	NAP	2	2	43	45
060	001	SB2 18	Biface	Mid-Stage	1	41.97	35.96	12.26	20.5	50	BLK	PRX	IND	CVX	CVX	BFB	NPR	OTH - PETRIFIED PALMWOOD	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
061	001	SB2 19	Adze	Olmos Biface	1	35.30	28.61	8.02	7.9	60	FST	CMP	CVX	CVX	CVX	BFC	UFC	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
062	001	SB2 20	Biface	Early-Stage	1	94.61	78.01	24.18	152.9	60	INR	CMP	CVX	CVX	CVX	BFC	NPR	RHY	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
159	102	8.001	Edge-Modified	Utilized	1	38.29	23.67	13.01	8.3	45	N/A	N/A	CVX	NAP	NAP	NAP	BFU	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
164	036	13.001	Flake	NAP	1	86.95	53.85	46.22	239.4	85	NAP	NAP	NAP	NAP	NAP	NAP	NPR	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
167	016	16.001	Biface	Late-Stage	1	39.39	41.65	9.40	18.7	55	PRF	PME	IND	CVX	CVX	BFB	NPR	CHL	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
169	005	19.001	Biface	Mid-Stage	1	29.91	33.98	13.16	14.4	60	BLK	MED	IND	CVX	CVX	BFB	NPR	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
169	006	19.002	Biface	Late-Stage	1	27.36	32.53	7.85	9.0	60	PRF	PRX	IND	CVX	CVX	BFB	NPR	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
171	014	21.001	Biface	Late-Stage	1	35.10	25.11	8.78	10.7	60	PRF	MED	IND	CVX	CVX	BFB	BFB	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP

Appendix D.3. TxDOT 41SR242 Points, Other Lithic Tools, and Cores Analysis

Lot No.	Spec. No.	FS No.	6. Type	7. Subtype/ Identity	Count	8. Max Length (mm)	9. Max Width (mm)	10. Max Thick (mm)	11. Weight (g)	12. Edge Angle	13. Stage	14. Portion	17a. Distal Edge Morphology	17b. Left Lateral Edge Morphology	17c. Right Lateral Edge Morphology	19. Edge Construction Type	21. Flaking Attrition	27. Lithology	29.1 Point Ratio (#8/#9)	29.2 Blade Length (Left)	29.3 Blade Length (Right)	29.4 Base/ Stem Length or Basal Inflection	29.5 Base/ Stem Width	29.11 Base to Blade Ratio (Length)	29.12 Base to Blade Ratio (Width)	29.13 Base/ Stem Ratio	29.14 Base Form	29.15 Stem form	29.16 Distal Base Form	26.17 Lateral Base/ Stem Form	29.18 Blade Curvature (Left)	29.19 Blade Curvature (Right)	29.23 Base Angle (Left)	29.24 Base Angle (Right)
173	182	23.001	Flake	NAP	1	69.26	49.68	22.53	59.2	65	NAP	NAP	NAP	NAP	NAP	NAP	NPR	RHY	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
175	065	25.001	Dart	Unidentified Base	1	17.12	25.40	5.96	2.8	45	FST	PRX	IND	CVX	CVX	BFB	NPR	CRT	0.67	NAP	NAP	0.98	NAP	0.06	NAP	NAP	NAP	NAP	3	1	0	0	NAP	NAP
178	001	28.001	Biface	Late-Stage	1	46.28	43.71	9.75	14.5	40	PRF	PME	IND	CVX	CVX	BFB	NPR	SST	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
180	001	29.002	Biface	Early-Stage	1	60.53	49.86	21.41	53.0	60	INR	CMP	CVX	CVX	CVX	BFC	NPR	CHL	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
187	005	30.001	Flake	NAP	1	55.21	35.70	32.79	57.4	75	NAP	NAP	NAP	NAP	NAP	NAP	NPR	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
189	005	32.001	Biface	Late-Stage	1	48.77	25.42	10.18	13.1	55	PRF	IND	CVX	CVX	CVX	BFC	NPR	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
190	006	33.001	Edge-Modified	Utilized	1	25.43	20.75	7.59	3.3	40	N/A	N/A	IND	CVX	IND	NAP	UFU	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
196	001	40.001	Dart Preform	Tortugas Preform	1	44.37	35.20	8.75	15.7	50	PRF	PME	IND	CVX	CVX	BFB	NPR	CRT	NAP	NAP	NAP	7.39	33.43	NAP	0.95	NAP	1	NAP	NAP	NAP	2	2	46	42
197	001	41.001	Biface	Mid-Stage	1	82.40	50.30	19.49	71.1	60	BLK	CMP	CVX	CVX	CVX	BFC	NPR	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
199	158	43.001	Biface	Mid-Stage	1	31.19	41.80	12.31	16.0	60	BLK	DIS	CVX	CVX	CVX	BFD	NPR	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
199	159	43.002	Dart	Unidentified Base	1	28.46	21.78	9.50	5.4	55	FST	PME	IND	CVX	CVX	BFB	NPR	OTH - MUDSTONE	NAP	NAP	NAP	14.41	15.91	0.51	0.73	0.91	1	1	NAP	1	2	2	50	56
200	001	45.001	Arrow	Fresno	1	28.80	23.59	6.45	5.4	45	FST	PME	IND	CVX	CVX	BFB	NPR	CRT	NAP	28.57	28.91	5.76	23.09	0.20	0.98	NAP	2	NAP	NAP	NAP	2	2	36	38
201	069	46.001	Biface	Early-Stage	1	38.29	42.72	14.21	27.1	60	INR	IND	CVX	CVX	CVX	IND	NPR	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
203	138	48.001	Biface	Early-Stage	1	45.36	44.93	15.44	31.8	65	INR	IND	CVX	CVX	CVX	BFC	NPR	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
203	139	48.002	Biface	Early-Stage	1	54.10	52.32	27.65	64.8	70	INR	CMP	CVX	CVX	CVX	BFC	NPR	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
203	140	48.003	Edge-Modified	Utilized	1	83.77	69.82	23.38	182.3	80	N/A	CMP	CVX	NAP	NAP	NAP	NPR	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
210	005	54.001	Dart	Tortugas	1	58.27	27.13	9.81	12.9	60	FST	CMP	CVX	CVX	CVX	BFC	NPR	CRT	NAP	58.73	60.75	11.79	26.58	0.20	0.98	NAP	1	NAP	1	NAP	2	2	47	50
210	006	54.002	Biface	Late-Stage	1	36.20	38.43	9.12	13.0	50	PRF	IND	IND	CVX	CVX	BFB	NPR	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
210	007	54.003	Biface	Mid-Stage	1	31.46	46.83	15.55	21.4	65	BLK	IND	IND	CVX	CVX	BFB	NPR	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
210	008	54.004	Biface	Mid-Stage	1	62.02	37.62	16.31	33.6	55	BLK	CMP	CVX	CVX	CVX	BFC	NPR	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
210	009	54.005	Biface	Early-Stage	1	80.52	43.92	30.69	100.7	75	INR	CMP	CVX	CVX	CVX	BFC	NPR	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
215	001	59	Biface	Mid-Stage	1	79.36	44.05	19.75	48.0	60	BLK	CMP	CVX	CVX	CVX	BFC	NPR	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
216	001	60	Biface	Early-Stage	1	90.91	45.10	21.92	100.8	65	INR	CMP	CVX	CVX	CVX	BFC	NPR	FWD	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
219	001	63	Edge-Modified	Utilized	1	39.77	32.37	7.91	10.2	45	N/A	N/A	NAP	NAP	STR	NAP	UFU	OQZ	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
220	001	64	Edge-Modified	Utilized	1	52.30	26.50	23.39	21.7	55	N/A	N/A	NAP	CVX	NAP	NAP	UFU	CRT	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP

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APPENDIX E

Faunal Analysis

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Lot No.	Spec. No.	FS No.	Provenience	Ftr.	Level	Depth (cmbs)	Presence	Weathering Stage	Surface Visibility	Surface Present	Skeletal Element	Side	Fragment Type	Taxon	Common Name	Body Size	Adult/ Subadult	Burned	Margin Angle	Max Length	Max Width	Max Thickness	Weight (g)	Comments
152	115	1	BHT1	1			Frag	0	100	100	Humerus	Distal, right	Distal epiphysis	Microfauna	Unknown	Micro	Adult	No	Oblique	21.8	7.9	3.3	<0.1	Microfauna distal humerus. Possible small rodent.
152	116	1	BHT1	1			Frag	2	100	>50	Carapace	Unknown	Carapace	Testudines	Turtle/Tortoise	1	Adult	No	Right	16.2	12.9	8.3	0.6	Edge fragment of a large carapace.
152	117	1	BHT1	1			Frag	2	100	>50	Carapace	Unknown	Carapace	Testudines	Turtle/Tortoise	1	Adult	No	Right	14.3	9.4	5.4	0.2	Ventral fragment of a carapace. Refits with .002.
152	118	1	BHT1	1			Frag	2	100	>50	Unknown	Unknown	Unknown	Unknown	Unknown	N/A	Unknown	No	Fresh	7.4	6.5	2.7	<0.1	Very small, unidentifiable bone fragment.
158	085	7	TU1	1	3	50-60	Frag	1	100	<50	Long bone	N/A	Unknown	mammal	Unknown	1	Unknown	No	Fresh	106.5	6.4	6.3	3.5	Small long bone. Has been rodent gnawed beyond recognition. Refits with .002. Possibly a tibia.
158	086	7	TU1	1	3	50-60	Frag	1	100	<50	Long bone	N/A	Unknown	mammal	Unknown	1	Unknown	No	Fresh	45.6	8.3	4.4	0.6	Small long bone. Has been rodent gnawed beyond recognition. Refits with .001. Possibly a tibia.
158	087	7	TU1	1	3	50-60	Frag	1	100	100	Carapace	N/A	Carapace	Testudines	Turtle/Tortoise	1	Unknown	No	N/A	34.6	29.9	3.5	2.0	Carapace fragment. Has a hole in the top. The area is thin and the margins might be unbroken, but the whole could be a tooth puncture.
162	026	11	TU1N	1	3	50-60	Frag	1	100	100	Plastron	Unknown	Plastron	Testudines	Turtle/Tortoise	1	Unknown	No	N/A	23.3	16.6	2.1	0.4	Plastron fragment.
162	027	11	TU1N	1	3	50-60	Frag	1	100	100	Plastron/Carapace	Unknown	Plastron/Carapace	Testudines	Turtle/Tortoise	1	Unknown	No	N/A	36.1	12.3	3.2	0.8	Either a plastron or carapace fragment. Likely plastron
162	028	11	TU1N	1	3	50-60	Whole	0	100	100	Tooth	Unknown	Unknown	Rodentia	Rodent	Micro	Adult	No	N/A	19.0	5.7	2.1	0.2	Rodent canine tooth.
162	029	11	TU1N	1	3	50-60	Frag	1	100	100	Unknown	Unknown	Unknown	Unknown	Unknown	N/A	Unknown	No	Right	11.6	4.2	2.0	<0.1	Small cortical fragment. Not enough to make any determinations.
162	030	11	TU1N	1	3	50-60	Frag	0	100	100	Humerus	Distal, Left	Distal epiphysis	Rodentia	Rodent	Micro	Adult	No	Oblique	15.7	7.4	3.5	<0.1	Left distal humerus of a rodent. More robust than the previous 1.001.
162	031	11	TU1N	1	3	50-60	Frag	N/A	N/A	N/A	Unknown	Unknown	Unknown	Unknown	Unknown	N/A	Unknown	No	N/A	10.1	7.0	5.2	<0.1	Small, trabecular fragment.
162	032	11	TU1N	1	3	50-60	Frag	0	100	100	Unknown	Unknown	Unknown	Unknown	Unknown	N/A	Unknown	No	Spiral	26.0	8.8	4.7	0.2	Large cortical fragment of a small animal. Extensive rodent tooth drag marks on the margins.
162	033	11	TU1N	1	3	50-60	Whole	0	100	100	Ischium	right	N/A	Unknown	Unknown	1-2	subadult	No	N/A	20.7	16.2	3.1	0.4	Unfused ischium. Unsure of what animal.
162	034	11	TU1N	1	3	50-60	Frag	0	100	100	Tibia	Right	Proximal Epiphysis	Unknown	Unknown	Micro	Adult	No	Oblique	13.1	4.7	3.0	<0.1	Proximal tibia. Epiphysis is worn off. Micro fauna.
162	035	11	TU1N	1	3	50-60	Frag	N/A	N/A	N/A	Unknown	Unknown	Trabecula	Unknown	Unknown	N/A	Unknown	Yes	N/A	19.3	7.7	8.2	0.4	Trabecular fragment. Burned to black but not calcined.
162	036	11	TU1N	1	3	50-60	Frag	N/A	N/A	N/A	Unknown	Unknown	Trabecula	Unknown	Unknown	N/A	Unknown	Yes	N/A	13.7	10.6	9.6	0.4	Trabecular fragment. Burn coloration from black to unburned.
162	037	11	TU1N	1	3	50-60	Frag	3	N/A	N/A	Unknown	Unknown	Trabecula	Unknown	Unknown	N/A	Unknown	No	N/A	13.7	10.7	10.1	0.8	Trabeculae fragment. No sign of burning. One very small patch of cortical surface, appeared very weathered.
162	038	11	TU1N	1	3	50-60	Frag	N/A	N/A	N/A	Unknown	Unknown	Trabecula	Unknown	Unknown	N/A	Unknown	No	N/A	10.4	9.9	7.5	0.1	Trabeculae fragment. No sign of burning.

Lot No.	Spec. No.	FS No.	Provenience	Ftr.	Level	Depth (cmbs)	Presence	Weathering Stage	Surface Visibility	Surface Present	Skeletal Element	Side	Fragment Type	Taxon	Common Name	Body Size	Adult/ Subadult	Burned	Margin Angle	Max Length	Max Width	Max Thickness	Weight (g)	Comments
162	039	11	TU1N	1	3	50-60	Frag	3	100	<50	Unknown	Unknown	Unknown	Mammal	Unknown	2-3	Unknown	No	Fresh	21.0	14.5	10.2	1.1	Large fragment. Mostly trabecular with some cortex. Likely from a size 2 or 3 mammal.
162	040	11	TU1N	1	3	50-60	Frag	3	N/A	N/A	Unknown	Unknown	Trabecula	Unknown	Unknown	N/A	Unknown	No	N/A	14.4	9.9	7.7	0.3	Trabeculae fragment. No sign of burning. One very small patch of cortical surface, appeared very weathered.
162	041	11	TU1N	1	3	50-60	Frag	N/A	N/A	N/A	Unknown	Unknown	Trabecula	Unknown	Unknown	N/A	Unknown	Yes	N/A	12.1	10.3	7.2	0.2	Trabecular fragment. Burn coloration from black to unburned.
162	042	11	TU1N	1	3	50-60	Frag	N/A	N/A	N/A	Unknown	Unknown	Trabecula	Unknown	Unknown	N/A	Unknown	Yes	N/A	9.4	7.5	5.7	<0.1	Trabecular fragment. Burn coloration from black to unburned. Very small piece of cortical surface.
162	043	11	TU1N	1	3	50-60	Frag	4	N/A	N/A	Unknown	Unknown	Trabecula	Unknown	Unknown	N/A	Unknown	Yes	N/A	16.5	10.5	8.3	0.6	Mostly trabecular. The part that is cortical has been obliterated by weathering and heat modification. Gradient of heat color changes from black to unburned.
162	044	11	TU1N	1	3	50-60	Frag	1	N/A	N/A	Unknown	Unknown	Unknown	Unknown	Unknown	N/A	Unknown	Yes	N/A	9.2	6.4	2.8	<0.1	Mostly trabecular. Gradient of heat color changes from black to unburned.
162	045	11	TU1N	1	3	50-60	Frag	3	100	>50	Unknown	Unknown	Unknown	mammal	Unknown	2-3	Unknown	Yes	N/A	29.6	20.5	19.2	3.9	Large bone fragment from a large mammal. Appears to be an articulating surface, but not enough to determine element. Small patches of black burn marks. The rest is unburned.
174	242	24	TU3	1	3	55	Frag	0	100	100	Mandible	right	N/A	Rodentia	Rodent	Micro	Adult	No	N/A	13.5	8.7	3.2	<0.1	Proximal portion of a rodent mandible, right side. Includes two molars.
174	243	24	TU3	1	3	55	Whole	0	100	100	Tooth	Unknown	N/A	Rodentia	Rodent	Micro	Adult	No	N/A	7.1	1.8	1.8	<0.1	Appears to be a molar M1 (possibly from .001).
174	244	24	TU3	1	3	55	Whole	0	100	100	Vertebra	N/A	N/A	Unknown	Unknown	Micro	Unknown	No	N/A	7.5	5.2	4.3	<0.1	Microfauna cervical vertebra.
174	245	24	TU3	1	3	55	Frag	2	N/A	N/A	Unknown	Unknown	Unknown	Unknown	Unknown	N/A	Unknown	No	N/A	8.7	4.5	1.4	<0.1	Cortical bone fragment, Probably flaked off of a larger piece.
174	246	24	TU3	1	3	55	Frag	N/A	100	100	Tooth	Unknown	Enamel	mammal	Unknown	2-3	Unknown	No	N/A	12.6	8.9	2.0	0.3	Large piece of tooth enamel. Cannot tell if it is cervid or bovid.
174	247	24	TU3	1	3	55	Frag	3	100	<50	Unknown	Unknown	Unknown	Unknown	Unknown	N/A	Unknown	No	Oblique	18.9	9.5	2.3	0.5	Unidentifiable cortical fragment. Weathering has obliterated the surface.
175	066	25	TU3	1	4		Frag	1	100	100	Unknown	Unknown	Unknown	Unknown	Unknown	N/A	Unknown	No	Oblique	10.8	2.8	1.7	<0.1	Small cortical splinter.
175	067	25	TU3	1	4		Whole	1	100	100	Vertebra	N/A	N/A	Reptile	Snake	1	Adult	No	N/A	14.5	7.9	7.3	0.5	Small snake vertebra. Cannot identify to species. Not a viper. Possibly a small rat snake.
176	006	26	TU4	3	1		Frag	1	100	100	Long bone	Unknown	Unknown	Unknown	Unknown	1	Unknown	Yes	Oblique	8.7	6	3.4	<0.1	Long bone, possibly metapodial. Small fragment, Burned, nearly calcined.

Lot No.	Spec. No.	FS No.	Provenience	Ftr.	Level	Depth (cmbs)	Presence	Weathering Stage	Surface Visibility	Surface Present	Skeletal Element	Side	Fragment Type	Taxon	Common Name	Body Size	Adult/ Subadult	Burned	Margin Angle	Max Length	Max Width	Max Thickness	Weight (g)	Comments
176	007	26	TU4	3	1		Frag	1	100	100	Unknown	Unknown	Unknown	Unknown	Unknown	N/A	Unknown	No	Fresh	26.1	10.1	1.8	0.6	Unknown bone fragment with thin cortex and no trabeculae. Possibly from a large bird.
176	008	26	TU4	3	1		Frag	0	100	100	Unknown	Unknown	Unknown	Microfauna	Unknown	Micro	Unknown	No	Oblique	11.6	5.5	3.2	<0.1	Microfaunal fragment, possibly part of the inominant.
176	009	26	TU4	3	1		Frag	0	100	100	Unknown	Unknown	Epiphysis	Microfauna	Unknown	Micro	Adult	No	Right	8.7	3.9	2.2	<0.1	Microfaunal fragment, possibly part of the Ulna. Micro mammal or small bird
177	005	27	TU4	3	2	40-50	Frag	4	100	0	Unknown	Unknown	Unknown	Unknown	Unknown	N/A	Unknown	No	N/A	10.9	6.8	2.5	<0.1	Heavily weathered, small cortical fragment.
177	006	27	TU4	3	2	40-50	Frag	4	100	0	Unknown	Unknown	Unknown	Unknown	Unknown	N/A	Unknown	No	N/A	5.6	5.0	1.4	<0.1	Heavily weathered, small cortical fragment.
177	007	27	TU4	3	2	40-50	Frag	4	100	0	Unknown	Unknown	Unknown	Unknown	Unknown	N/A	Unknown	No	N/A	5.2	5.1	1.9	<0.1	Heavily weathered, small cortical fragment.
191	005	35	TU5	3	3	50-60	Frag	4	100	0	Unknown	Unknown	Unknown	Unknown	Unknown	N/A	Unknown	No	N/A	11.5	10.3	1.9	<0.1	Heavily weathered, small cortical fragment.
205	004	50	BHT8	–	2	10-20	Frag	3	100	<50	Unknown	Unknown	Unknown	Unknown	Unknown	N/A	Unknown	No	Oblique/ Fresh	15.0	11.1	2.4	<0.1	Small cortical fragment. Heavily weathered. Appears to have a recent cut on the surface, probably a trowel mark.
205	005	50	BHT8	–	2	10-20	Frag	1	100	100	Tooth	Unknown	Enamel	Mammal	Unknown	2-3	Unknown	No	N/A	15.5	7.7	4.4	0.3	Probably cervid. Cannot say for certain.
211	004	55	BHT8	–		68	Frag	4	100	0	Long Bone	Unknown	Metaphysis	Mammal	Unknown	1	Unknown	No	Oblique/ Fresh	42.5	9.6	10.1	2.5	Extreme weathering and rodent gnawing have obliterated the surface.
213	001	57	TU4	3		50	Frag	1	50	100	Mandible fragment	Left	Mandible with 2 molars	*Pecari tajacu*	Peccary/Javalena	2	Adult	No						Mandible fragment with the m2 and m3 in socket. The m3 is fully erupted, but there is little wear on the cusps, probably a young adult. Tooth morphology would indicate a peccary. The bone fragment was removed in a block of surrounding matrix. The bone is so fragmentile, that I left it in the matrix after uncovering the occlusal surface of the teeth.

Lot No.	Spec. No.	FS No.	Provenience	Ftr.	Level	Depth (cmbs)	Presence	Weathering Stage	Surface Visibility	Surface Present	Skeletal Element	Side	Fragment Type	Taxon	Common Name	Body Size	Adult/ Subadult	Burned	Margin Angle	Max Length	Max Width	Max Thickness	Weight (g)	Comments
214	001	58	BHT1	1		40-45	Frag	3	100	50	Phalange	Unknown	Epiphysis	mammal	Bovid	2	Adult	No	Oblique	55.1	17.0	12.4	7.0	Fragment piece fits with Specimen 214.002, forming part of a phalange. The animal is cow sized but given the context is surmised to be *bison*. Cortical bone is quite thick. Weathering on surface is high, and the surface shows signs of extensive rodent gnawing and tooth drags. Cortex is 7mm thick. Weathering on surface is high, and the surface shows signs of extensive rodent gnawing and tooth drags. Fragment margins have been recently broken.
214	002	58	BHT1	1		40-45	Frag	3	100	>50	Phalange	Unknown	Epiphysis	mammal	Bovid	2	Adult	No	Fresh	44.3	14.4	8.5	2.5	Fragment piece fits with Specimen 214.002, forming part of a phalange. The animal is cow sized but given the context is surmised to be bison. Cortical bone is quite thick. Weathering on surface is high, and the surface shows signs of extensive rodent gnawing and tooth drags. Cortex is 7 mm thick. Weathering on surface is high, and the surface shows signs of extensive rodent gnawing and tooth drags. Fragment margins have been recently broken.
214	003	58	BHT1	1		40-45	Frag	2	100	<50	Unknown	Unknown	Unknown	mammal	Unknown	2	Unknown	No	Fresh	15.4	12.9	5.7	0.5	Unidentifiable bone fragment. Possible muscle attachments/landmarks on surface, but not enough to identify. Surface has been weathered. One possible tooth puncture.
214	004	58	BHT1	1		40-45	Frag	3	100	<50	Unknown	Unknown	Unknown	mammal	Unknown	2	Unknown	No	Fresh	14.8	11.3	5.6	0.5	Unidenfiable bone fragment. Surface has been heavily weathered.
214	005	58	BHT1	1		40-45	Frag	3	100	<50	Unknown	Unknown	Unknown	Unknown	Unknown	N/A	Unknown	No	Oblique	18.4	8.4	6.2	0.5	Nearly all trabecular bone. Small patch of cortical is very thin and heavily weathered. Unable to determine animal size.

APPENDIX F

Historic Artifacts

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Lot No.	Spec. No.	FS No.	Provenience	Level	Elevation (cmbs)	Feature No.	Artifact Class	Artifact Subclass	Artifact Type	Artifact Subtype/ Identity	Artifact Description	Count	Weight (g)	Material	Completeness	Comments
063	001	H 01-1	Controlled Surface Collection	Surface	Surface	–	Historic Ceramic	Historic	Historic Ceramic	–	Earthenware Slip Glazed-Brown Ceramic	1	8.5	Ceramic	Fragment-Indet	None
064	001	H 01-2	Controlled Surface Collection	Surface	Surface	–	Historic Ceramic	Historic	Historic Ceramic	–	Undecorated Whiteware Ceramic	1	58.0	Ceramic	Fragment-Base	Burned
065	001	H 01-3	Controlled Surface Collection	Surface	Surface	–	Glass	Historic	Glass	–	Manganese Glass	1	2.5	Glass	Fragment-Indet	None
066	001	H 02-1	Controlled Surface Collection	Surface	Surface	–	Glass	Historic	Glass	–	Manganese Glass	1	11.5	Glass	Fragment-Indet	Patinated
067	001	H 02-2	Controlled Surface Collection	Surface	Surface	–	Glass	Historic	Glass	–	Manganese Glass	1	8.0	Glass	Fragment-Indet	Patinated
068	001	H 02-3	Controlled Surface Collection	Surface	Surface	–	Glass	Historic	Glass	–	Manganese Glass	1	4.0	Glass	Fragment-Indet	Patinated
069	001	H 02-4	Controlled Surface Collection	Surface	Surface	–	Historic Ceramic	Historic	Historic Ceramic	–	Undecorated Whiteware Ceramic	1	5.0	Ceramic	Fragment-Base	Partial back stamp only very small sliver of image no wording visible
070	001	H 03	Controlled Surface Collection	Surface	Surface	–	Glass	Historic	Glass	–	Manganese Glass	1	2.5	Glass	Fragment-Indet	None
071	001	H 04-1	Controlled Surface Collection	Surface	Surface	–	Historic Ceramic	Historic	Historic Ceramic	–	Earthenware Slip Glazed-Brown Ceramic	1	7.0	Ceramic	Fragment-Indet	None
072	001	H 04-2	Controlled Surface Collection	Surface	Surface	–	Glass	Historic	Glass	–	Aqua Glass	1	1.5	Glass	Fragment-Indet	None
073	001	H 05-1	Controlled Surface Collection	Surface	Surface	–	Historic Ceramic	Historic	Historic Ceramic	–	Undecorated Whiteware Ceramic	1	5.0	Ceramic	Fragment-Indet	None
074	001	H 05-2	Controlled Surface Collection	Surface	Surface	–	Glass	Historic	Glass	–	Colorless Glass	1	2.5	Glass	Fragment-Indet	None
075	001	H 06-1	Controlled Surface Collection	Surface	Surface	–	Historic Ceramic	Historic	Historic Ceramic	–	Earthenware Slip Glazed-Green Ceramic	1	8.0	Ceramic	Fragment-Base	None
076	001	H 06-2	Controlled Surface Collection	Surface	Surface	–	Glass	Historic	Glass	–	Brown Glass	1	1.5	Glass	Fragment-Indet	None
077	001	H 06-3	Controlled Surface Collection	Surface	Surface	–	Glass	Historic	Glass	–	Colorless Glass	1	1.0	Glass	Fragment-Indet	Slightly patinated
078	001	H 07-1	Controlled Surface Collection	Surface	Surface	–	Cartridge	Historic	Cartridge	–	Pistol Cartridge	1	3.5	Metal	Complete	Unknown caliber
079	001	H 07-2	Controlled Surface Collection	Surface	Surface	–	Glass	Historic	Glass	–	Colorless Glass	1	3.5	Glass	Fragment-Indet	Patinated
080	001	H 07-3	Controlled Surface Collection	Surface	Surface	–	Glass	Historic	Glass	–	Colorless Glass	1	1.5	Glass	Fragment-Indet	Slightly patinated
081	001	H 07-4	Controlled Surface Collection	Surface	Surface	–	Sparkplug	Historic	Sparkplug	–	AC Sparkplug	1	40.0	Metal and Plastic	Fragment-Indet	Oxidized
082	001	H 08-1	Controlled Surface Collection	Surface	Surface	–	Wire	Historic	Wire	–	Bailing Wire	1	1.0	Metal	Fragment-Indet	Oxidized
083	001	H 08-2	Controlled Surface Collection	Surface	Surface	–	Glass	Historic	Glass	–	Colorless Glass	1	<0.5	Glass	Fragment-Indet	Patinated
084	001	H 09-1	Controlled Surface Collection	Surface	Surface	–	Metal	Historic	Metal	–	Metal Bracket	1	342.5	Metal	Complete	Oxidized
085	001	H 09-2	Controlled Surface Collection	Surface	Surface	–	Metal	Historic	Metal	–	Sheet Metal	1	52.0	Metal	Fragment-Indet	Oxidized
086	001	H 09-3	Controlled Surface Collection	Surface	Surface	–	Metal	Historic	Metal	–	Metal Perforated Strap	2	20.5	Metal	Fragment-Indet	Oxidized
087	001	H 09-4	Controlled Surface Collection	Surface	Surface	–	Metal	Historic	Metal	–	Metal Perforated Strap	1	31.5	Metal	Fragment-Indet	Oxidized

Lot No.	Spec. No.	FS No.	Provenience	Level	Elevation (cmbs)	Feature No.	Artifact Class	Artifact Subclass	Artifact Type	Artifact Subtype/ Identity	Artifact Description	Count	Weight (g)	Material	Completeness	Comments
088	001	H 10-1	Controlled Surface Collection	Surface	Surface	–	Historic Ceramic	Historic	Historic Ceramic	–	Earthenware Slip Glazed-Brown Ceramic	1	1.5	Ceramic	Fragment-Indet	None
089	001	H 10-2	Controlled Surface Collection	Surface	Surface	–	Historic Ceramic	Historic	Historic Ceramic	–	Earthenware Slip Glazed-Brown Ceramic	1	1.0	Ceramic	Fragment-Indet	None
090	001	H 10-3	Controlled Surface Collection	Surface	Surface	–	Glass	Historic	Glass	–	Colorless Glass	1	6.5	Glass	Fragment-Indet	None
091	001	H 11-1	Controlled Surface Collection	Surface	Surface	–	Historic Ceramic	Historic	Historic Ceramic	–	Earthenware Slip Glazed -Brown Ceramic	1	1.0	Ceramic	Fragment-Rim	None
092	001	H 11-2	Controlled Surface Collection	Surface	Surface	–	Glass	Historic	Glass	–	Colorless Glass	1	3.5	Glass	Fragment-Indet	None
093	001	H 11-3	Controlled Surface Collection	Surface	Surface	–	Glass	Historic	Glass	–	Aqua Glass	1	1.0	Glass	Fragment-Indet	None
094	001	H 11-4	Controlled Surface Collection	Surface	Surface	–	Glass	Historic	Glass	–	Colorless Glass	1	3.0	Glass	Fragment-Rim	None
095	001	H 11-5	Controlled Surface Collection	Surface	Surface	–	Glass	Historic	Glass	–	Colorless Glass	1	1.0	Glass	Fragment-Indet	None
096	001	H 12-1	Controlled Surface Collection	Surface	Surface	–	Historic Ceramic	Historic	Historic Ceramic	–	Undecorated Whiteware Ceramic	1	0.5	Ceramic	Fragment-Indet	None
097	001	H 12-2	Controlled Surface Collection	Surface	Surface	–	Historic Ceramic	Historic	Historic Ceramic	–	Undecorated Whiteware Ceramic	1	0.5	Ceramic	Fragment-Indet	None
098	001	H 12-3	Controlled Surface Collection	Surface	Surface	–	Glass	Historic	Glass	–	Aqua Glass	1	6.5	Glass	Fragment-Indet	Patinated
099	001	H 12-4	Controlled Surface Collection	Surface	Surface	–	Glass	Historic	Glass	–	Aqua Glass	1	1.5	Glass	Fragment-Indet	Patinated
100	001	H 13	Controlled Surface Collection	Surface	Surface	–	Glass	Historic	Glass	–	Manganese Glass	1	1.0	Glass	Fragment-Indet	None
101	001	H 14-1	Controlled Surface Collection	Surface	Surface	–	Glass	Historic	Glass	–	Colorless Glass	1	1.0	Glass	Fragment-Indet	None
102	001	H 14-2	Controlled Surface Collection	Surface	Surface	–	Glass	Historic	Glass	–	Manganese Glass	1	2.5	Glass	Fragment-Indet	None
103	001	H 14-3	Controlled Surface Collection	Surface	Surface	–	Glass	Historic	Glass	–	Manganese Glass	1	7.0	Glass	Fragment-Indet	Patinated
104	001	H 15	Controlled Surface Collection	Surface	Surface	–	Historic Ceramic	Historic	Historic Ceramic	–	Undecorated Whiteware Ceramic	1	2.0	Ceramic	Fragment-Rim	None
105	001	H 16-1	Controlled Surface Collection	Surface	Surface	–	Historic Ceramic	Historic	Historic Ceramic	–	Undecorated Whiteware Ceramic	1	3.5	Ceramic	Fragment-Indet	None
106	001	H 16-2	Controlled Surface Collection	Surface	Surface	–	Historic Ceramic	Historic	Historic Ceramic	–	Undecorated Whiteware Ceramic	1	4.0	Ceramic	Fragment-Indet	None
107	001	H 17-1	Controlled Surface Collection	Surface	Surface	–	Historic Ceramic	Historic	Historic Ceramic	–	Undecorated Whiteware Ceramic	1	1.5	Ceramic	Fragment-Indet	None
108	001	H 17-2	Controlled Surface Collection	Surface	Surface	–	Historic Ceramic	Historic	Historic Ceramic	–	Undecorated Whiteware Ceramic	1	1.5	Ceramic	Fragment-Rim	None
109	001	H 17-3	Controlled Surface Collection	Surface	Surface	–	Metal	Historic	Metal	–	Heavy Gauge Wire	1	31.5	Metal	Fragment-Indet	None
110	001	H 17-4	Controlled Surface Collection	Surface	Surface	–	Metal	Historic	Metal	–	Heavy Gauge Wire	1	11.0	Metal	Fragment-Indet	None
111	001	H 18-1	Controlled Surface Collection	Surface	Surface	–	Glass	Historic	Glass	–	Aqua Glass	1	2.0	Glass	Fragment-Indet	Patinated
112	001	H 18-2	Controlled Surface Collection	Surface	Surface	–	Glass	Historic	Glass	–	Manganese Glass	1	<0.5	Glass	Fragment-Indet	None

Lot No.	Spec. No.	FS No.	Provenience	Level	Elevation (cmbs)	Feature No.	Artifact Class	Artifact Subclass	Artifact Type	Artifact Subtype/ Identity	Artifact Description	Count	Weight (g)	Material	Completeness	Comments
113	001	H 18-3	Controlled Surface Collection	Surface	Surface	–	Metal	Historic	Metal	–	Fence Staple	1	2.5	Metal	Complete	Oxidized
114	001	H 19-1	Controlled Surface Collection	Surface	Surface	–	Glass	Historic	Glass	–	Manganese Glass	1	2.5	Glass	Fragment-Indet	Patinated
115	001	H 19-2	Controlled Surface Collection	Surface	Surface	–	Glass	Historic	Glass	–	Manganese Glass	1	1.5	Glass	Fragment-Indet	Patinated
116	001	H 19-3	Controlled Surface Collection	Surface	Surface	–	Glass	Historic	Glass	–	Manganese Glass	1	1.5	Glass	Fragment-Rim	Patinated
117	001	H 19-4	Controlled Surface Collection	Surface	Surface	–	Historic Ceramic	Historic	Historic Ceramic	–	Undecorated Whiteware Ceramic	1	0.5	Ceramic	Fragment-Indet	None
118	001	H 19-5	Controlled Surface Collection	Surface	Surface	–	Historic Ceramic	Historic	Historic Ceramic	–	Undecorated Whiteware Ceramic	1	1.5	Ceramic	Fragment-Indet	None
119	001	H 19-6	Controlled Surface Collection	Surface	Surface	–	Historic Ceramic	Historic	Historic Ceramic	–	Blue Transfer Ware Ceramic	1	<0.5	Ceramic	Fragment-Rim	None
120	001	H 20-1	Controlled Surface Collection	Surface	Surface	–	Glass	Historic	Glass	–	Manganese Glass	1	3.0	Glass	Fragment-Indet	None
121	001	H 20-2	Controlled Surface Collection	Surface	Surface	–	Glass	Historic	Glass	–	Colorless Glass	1	3.5	Glass	Fragment-Indet	Patinated
122	001	H 20-3	Controlled Surface Collection	Surface	Surface	–	Historic Ceramic	Historic	Historic Ceramic	–	Undecorated Whiteware Ceramic	1	2.0	Ceramic	Fragment-Indet	None
123	001	H 20-4	Controlled Surface Collection	Surface	Surface	–	Historic Ceramic	Historic	Historic Ceramic	–	Undecorated Whiteware Ceramic	1	–	Ceramic	Fragment-Indet	Missing
124	001	H 21-1	Controlled Surface Collection	Surface	Surface	–	Glass	Historic	Glass	–	Colorless Glass	1	1.0	Glass	Fragment-Indet	Slightly patinated
125	001	H 21-2	Controlled Surface Collection	Surface	Surface	–	Glass	Historic	Glass	–	Manganese Glass	1	0.5	Glass	Fragment-Indet	None
126	001	H 22	Controlled Surface Collection	Surface	Surface	–	Historic Ceramic	Historic	Historic Ceramic	–	Earthenware Slip Glazed-Brown Ceramic	1	6.5	Ceramic	Fragment-Indet	None
127	001	H 23	Controlled Surface Collection	Surface	Surface	–	Historic Ceramic	Historic	Historic Ceramic	–	Undecorated Whiteware Ceramic	1	3.0	Ceramic	Fragment-Indet	None
128	001	H 24	Controlled Surface Collection	Surface	Surface	–	Glass	Historic	Glass	–	Colorless Glass	1	4.0	Glass	Fragment-Indet	Slightly patinated
129	001	H 25	Controlled Surface Collection	Surface	Surface	–	Historic Ceramic	Historic	Historic Ceramic	–	Undecorated Whiteware Ceramic	1	3.5	Ceramic	Fragment-Base	None
130	001	H 26-1	Controlled Surface Collection	Surface	Surface	–	Glass	Historic	Glass	–	Manganese Glass	1	6.0	Glass	Fragment-Indet	None
131	001	H 26-2	Controlled Surface Collection	Surface	Surface	–	Glass	Historic	Glass	–	Manganese Glass	1	2.0	Glass	Fragment-Indet	None
132	001	H 26-3	Controlled Surface Collection	Surface	Surface	–	Glass	Historic	Glass	–	Manganese Glass	1	3.0	Glass	Fragment-Indet	None
133	001	H 26-4	Controlled Surface Collection	Surface	Surface	–	Glass	Historic	Glass	–	Manganese Glass	1	0.5	Glass	Fragment-Indet	None
134	001	H 27	Controlled Surface Collection	Surface	Surface	–	Glass	Historic	Glass	–	Aqua Glass	1	10.5	Glass	Fragment-Base	Patinated
135	001	H 28	Controlled Surface Collection	Surface	Surface	–	Metal	Historic	Metal	–	Bailing Wire	1	28.0	Metal	Fragment-Indet	Oxidized
136	001	H 29	Controlled Surface Collection	Surface	Surface	–	Metal	Historic	Metal	–	Cookware	1	283.0	Metal	Fragment-Rim	Oxidized
137	001	H 30	Controlled Surface Collection	Surface	Surface	–	Glass	Historic	Glass	–	Colorless Glass	1	26.0	Glass	Fragment-Indet	Highly patinated

Lot No.	Spec. No.	FS No.	Provenience	Level	Elevation (cmbs)	Feature No.	Artifact Class	Artifact Subclass	Artifact Type	Artifact Subtype/ Identity	Artifact Description	Count	Weight (g)	Material	Completeness	Comments
138	001	H 31-1	Controlled Surface Collection	Surface	Surface	–	Glass	Historic	Glass	–	Colorless Glass	1	4.5	Glass	Fragment-Indet	Slightly patinated
139	001	H 31-2	Controlled Surface Collection	Surface	Surface	–	Glass	Historic	Glass	–	Colorless Glass	1	4.5	Glass	Fragment-Indet	Slightly patinated
140	001	H 31-3	Controlled Surface Collection	Surface	Surface	–	Glass	Historic	Glass	–	Colorless Glass	1	2.5	Glass	Fragment-Indet	Slightly patinated
141	001	H 31-4	Controlled Surface Collection	Surface	Surface	–	Glass	Historic	Glass	–	Colorless Glass	1	1.5	Glass	Fragment-Indet	Slightly patinated
142	001	H 31-5	Controlled Surface Collection	Surface	Surface	–	Historic Ceramic	Historic	Historic Ceramic	–	Earthenware Slip Glazed-Tan	1	18.0	Ceramic	Fragment-Indet	Painted line designs
143	001	H 31-6	Controlled Surface Collection	Surface	Surface	–	Historic Ceramic	Historic	Historic Ceramic	–	Porcelain Ceramic Figurine Fragment	1	1.0	Ceramic	Fragment-Indet	None
144	001	H 32-1	Controlled Surface Collection	Surface	Surface	–	Historic Ceramic	Historic	Historic Ceramic	–	Undecorated Whiteware Ceramic	1	4.5	Ceramic	Fragment-Rim	None
145	001	H 32-2	Controlled Surface Collection	Surface	Surface	–	Glass	Historic	Glass	–	Aqua Glass	1	2.0	Glass	Fragment-Indet	Patinated
146	001	H 33	Controlled Surface Collection	Surface	Surface	–	Historic Ceramic	Historic	Historic Ceramic	–	Undecorated Whiteware Ceramic	1	6.0	Ceramic	Fragment-Rim	None
147	001	H 35-1	Controlled Surface Collection	Surface	Surface	–	Historic Ceramic	Historic	Historic Ceramic	–	Undecorated Ironstone	1	8.0	Ceramic	Fragment-Base	Partial Backstamp "...ONSTONE CHINA"
148	001	H 35-2	Controlled Surface Collection	Surface	Surface	–	Historic Ceramic	Historic	Historic Ceramic	–	Undecorated Whiteware Ceramic	1	10.0	Ceramic	Fragment-Base	None
149	001	H 35-3	Controlled Surface Collection	Surface	Surface	–	Wire	Historic	Wire	–	Wire	1	–	Ceramic	Fragment-Rim	Missing
150	001	H 36	Controlled Surface Collection	Surface	Surface	–	Historic Ceramic	Historic	Historic Ceramic	–	Earthenware Slip Glazed-Brown Ceramic	1	3.5	Ceramic	Fragment-Indet	Green stripe decoration
151	001	H 37	Controlled Surface Collection	Surface	Surface	–	Historic Ceramic	Historic	Historic Ceramic	–	Earthenware Slip Glazed-Brown Ceramic	1	0.5	Ceramic	Fragment-Indet	None
169	008	19	TU2	Lvl 2	30-40cm	2	Historic Ceramic	Historic	Earthenware Slip Glazed		Earthenware Slip Glazed Brown Ceramic	1	0.5	Ceramic	Fragment-Indet	None
176	011	26	TU4	Lvl 1	30-40cm	3	Historic Ceramic	Historic	Earthenware Slip Glazed		Earthenware Slip Glazed Brown Ceramic	1	<0.5	Ceramic	Fragment-Indet	None
177	008	27	TU4	Lvl 2	40-50cm	3	Glass		Glass		Colorless Glass	1	0.5	Glass		Heavily patinated
205	006	50	BHT 8	Lvl 2	10-20cm	–	Historic Ceramic	Historic	Historic Ceramic	–	Undecorated Whiteware Ceramic	2	4.5	Ceramic	Fragment-Indet	2 changed from 1