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Investigating Life Histories and Taskscapes through Microscale Geoarchaeological Analysis in Fort Davis, Texas from the 1870s to 1930s

By
Erin Christine Rodriguez

A dissertation submitted in partial satisfaction of the
requirements for the degree of
Doctor of Philosophy
in
Anthropology
in the
Graduate Division
Of the
University of California, Berkeley

Committee in charge:
Professor Lisa A. Maher, Chair
Professor Laurie A. Wilkie
Professor William E. Dietrich

Fall 2016

Investigating Life Histories and Taskscapes through Microscale Geoarchaeological Analysis in Fort Davis, Texas from the 1870s to 1930s

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This project applies microscale geoarchaeological analysis to four sites from late 1800s and early 1900s in Fort Davis, Texas in order to reconstruct life histories, past taskscapes, and show the potential of geoarchaeological analysis in a historic archaeology context. The military post at Fort Davis was established in 1854 along the San Antonio-El Paso road through the high Chihuahua Desert in Far West Texas. The civilian town of Fort Davis quickly formed near the post. After withdrawing during the Civil War, the army reoccupied the Fort in 1867 and over the next twenty years it was periodically home to every company of African-American "Buffalo Soldiers" in the United States army. In 1961 the Fort became a National Historic Site under the National Parks Service. The four sites investigated in this dissertation include two residences on Fort property which date to the 1800s: the Laundresses' Quarters and the Enlisted Married Men's Quarters. Two additional sites are from civilian areas of town: the Smith-Carlton Casa Vieja (the oldest standing, continuously occupied adobe structure in town), and a midden and nearby foundations on the Francell-Byerley Property which date to the 1920s and 1930s. Analysis at each site focused on a combination of fundamental soil chemical analyses (soil pH and soil organic matter) and microstratigraphic methods (particle size analysis and soil micromorphology). These approaches, combined with historical data, are used to develop life histories for each of the four sites. Additionally, taskscapes associated with residence and discard activities (the tasks most commonly represented in the four sites) are discussed. These analyses show how microscale archaeology, rarely incorporated into historical archaeology projects, can provide a significant line of evidence when combined with archaeological and historical sources.

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Acknowledgements

As with all research, this project would not have been possible without the contributions, time, energy, insights, advice, and assistance of many different people.

First, my greatest thanks to my advisors and committee for their patience, insights, and guidance in completing this work: Lisa A. Maher, Laurie A. Wilkie, William Dietrich, Ruth Tringham, Garrison Sposito

Second, I wish to thank my co-director, research partner, and friend, Katrina Eichner, for bringing me onto the FODAAP project, listening to my many rants about dirt, and keeping me sane. Without you this would not have been possible.

Third, I would like to thank the many residents of Fort Davis who have supported our project over the years. To Larry and Beth Francell for always welcoming us and inviting us to excavate on their property. To Susan and Craig Springer along with the extended Carlton family for their curiosity and willingness to have us dig square holes in their yard. To Jenny and Scott Turner of Mountain Trails Lodge for housing us two years in a row. And many thanks Manny Dutchover and family, Lonn Taylor, Matt Walter, Mark Emerson, and the many residents who have stopped by the sites over the years for welcoming us to your town.

To the staff and volunteers at Fort Davis National Historic Site, a huge thank you for your invaluable support, without which this project would not have been possible: John and Regina Heiner, John Morlock, Chris and Liz Wilcox, Armando Valerio and Family, Al Gonzalez, the entire maintenance staff for always helping us with crises, Bill Manhart, and Chelsea.

To the Center for Big Bend Studies at Sul Ross University, gratitude for welcoming us to west Texas archaeology and for helping us with supplies, equipment, and lab space: William (Andy) Cloud, Rodger Boren, Susan Chisholm, David Keller, Bobby Gray, and Kendra.

I owe a great deal of gratitude to our three years of field school students and staff volunteers that made this project possible. Archaeology is a team effort and this research would not have been possible without the time and energy of all of you: Ed De Haro, Leah Grant, Gloria Keng, Nika Monokandilos, Shannon Pfeiffer, David Hyde, Annie Danis, Naphtalie Jeanty, Ambrose Davila, Richard J. Terk, Elizabeth Flores, Carlisia Mccord, Alyssa Scott, Mario Castillo, Elizabeth Flores, Carlisia McCord, Shauna Mundt, Jennifer Davis, Victoria Sandsor, Chandler Fitzsimons, Nick Perez, Jackson Huang, Thomas Banghart,

An extra thanks to Nick Perez for his expertise with GIS and willingness to create maps for FODAAP.

My apprentices through the Undergraduate Research Apprenticeship Program (URAP) gave a great deal of time and patience to process samples and digitize stratigraphic profiles: Kelsey Brahms, Tammy Gu, Hannah Schnell, Alex Walton

To Jackson Huang and the Summer Mentoring And Research Teams (SMART) program: thank you for your time and dedication which helped me move through the final research stages.

And finally: many thanks to the following organizations and people for your many and varied support over the years, without which this dissertation could not have been possible: UC Berkeley Anthropology Department, UC Berkeley Archaeological Research Facility, Nico Tripcevich, Tomeko Wyrick, Stahl Grant, UCB Graduate Division Summer Grant, Rosemary Joyce, NSF GRFP, Lowie-Olson Fund, UCB Graduate Assembly

CHAPTER 1 INTRODUCTION

A geoarchaeological perspective within anthropological archaeology offers the opportunity to unravel the many interrelated environmental and anthropogenic processes by which archaeological sites are created, maintained, and changed through time in order to reconstruct those events and activities key to understanding past human experience. While geoarchaeology is routinely incorporated into archaeological projects investigating the deep past, it is much less commonly used within historic archaeology and studies of the more recent past. The tight temporal controls possible through historic artifact analysis and the use of written and oral histories make certain aspects of geoarchaeology, which can incorporate very broad time scales, less applicable for investigating the recent past. Microscale geoarchaeology, however, has the potential to produce data on similar, or even tighter, temporal scales to historic archaeology. It also provides access to information which cannot be recovered from standard excavation techniques as well as details about aspects of daily life not recorded in historic documents.

Microscale geoarchaeology is essentially the study of archaeological sediments and soils at the microscale, including the use of chemical, physical, and microstratigraphic methods such as analyses of pH, organic matter content, particle size analysis and, perhaps most significantly, micromorphological analysis. Micromorphology is the microscopic analysis of thin sections manufactured from undisturbed stratified samples of sediment from archaeological excavations. This analysis investigates physical traces of individual archaeological events that result in microscopic impacts on the physical environment which are visible at the microscopic scale. In collaboration with the tight temporal control of historic archaeology, micromorphology has the potential to reconstruct individual past events and impacts from human actions, along with natural processes that filter the way the archaeological record is preserved and excavated.

This project applies a microscale geoarchaeological perspective to four historic archaeological sites from the late 1800s and early 1900s in Fort Davis, Texas. The sites were investigated between 2013 and 2015 by the Fort Davis Archaeological Project and include residences of both civilian and military personnel. Located in the Fort Davis Mountains of the Chihuahua Desert of Far West Texas, the sites reflect United States territorial expansion and lifeways in the Reconstruction Era after the United States Civil War from 1861 to 1865. This project uses microscale geoarchaeological analyses to show how integrating a geoarchaeological approach within historic and archaeological lines of evidence can provide the level of detail necessary to reconstruct past microhistories and interpret taskscapes of past actions and their effects on the landscape. The following sections will provide a brief background on the region and sites as well as a discussion of the major questions of the project.

FAR WEST TEXAS AND FORT DAVIS IN THE MID TO LATE 1800S

The mid to late 1800s in the United States were a time of many changes. The country expanded westward through territories gained from Mexico in the Treaty of Guadalupe-Hidalgo at the close of the Mexican-American War in 1848, additional territories gained through the Oregon Treaty with Great Britain in 1846, and the annexation of Texas in 1845. Originally part of Mexico, The Republic of Texas declared independence from Mexico in 1836 and existed for a short time as an independent nation. Formal annexation into the United States was delayed due to disagreements over whether to admit Texas, which would become a large slave-holding state and, thereby, upset the balance of power between free and slave-holding states. Texas was eventually annexed in 1845.

The westward expansion of the United States through the annexation of Texas, as well as the incorporation of territories gained in the Treaties mentioned above, brought with it a westward movement of U.S. citizens looking for opportunities in the new territories. It was also accompanied by increased efforts by the U.S. government (via the military) to suppress and restrict movement of native peoples already residing in those territories. In Texas, many of these conflicts are collectively referred to as the Texas-Indian Wars, which began when Texas was part of Mexico and continued through independence and annexation by the United States. Consisting of conflicts between Euro-Texas settlers and native groups these conflicts were one of the driving reasons for the installment of military posts, such as Fort Davis, on major roadways to protect travelers headed west.

Texas declared its succession from the United States and allegiance to the Confederate States in 1861 at the start of the American Civil War, which lasted until 1865. Rooted in territorial disagreements and contentions between slave-holding and free states, the United States Civil War was a defining feature of the mid-1800s, and the post-war Reconstruction Period in the southern states brought with it a great deal of social unrest. The war itself had limited direct impact upon the area of Far West Texas and Fort Davis. However, the attempted transformation of the reincorporated confederate states through federal Reconstruction had a lasting impact on all regions of the south.

As will be discussed in more detail in Chapter 4, the military post at Fort Davis was established in 1854 to protect westward travelers on the San Antonio-El Paso Road from attacks by native groups. During the Civil War the fort was minimally occupied, but during Reconstruction it was home to four African American regiments, also known as the Buffalo Soldiers. The fort was closed in 1891, but in 1961 was recognized as a National Historic Site (NHS) by the National Parks Service (NPS). This study refers to the fort (as opposed to the civilian town of the same name) as “the military post at Fort Davis”, “FODA” (the NPS acronym), “FODA-NHS” or “Fort Davis NHS”. Two sites included in this study come from land currently incorporated into Fort Davis NHS: the Laundresses’ Quarters (also called FODA-LQ) and the Enlisted Married Men’s Quarters (also called FODA-MM). For maps showing the location of Fort Davis see Chapter 4.

After the founding of Fort Davis NHS a civilian town grew up around it which comprises the modern town named Fort Davis. Historically, Fort Davis was composed of three smaller towns known as New Town, Chihuahua, and Fort Davis. The terms “civilian town of Fort Davis”, “town of Fort Davis”, and “modern Fort Davis” refer to the three towns collectively. The term “historic Fort Davis” is used to refer to the portion of modern Fort Davis which was historically called Fort Davis (as opposed to the portions of town known as Chihuahua and New Town). Two of the sites investigated as part of this study are located in what is now the modern town of Fort Davis. The Smith-Carlton Casa Vieja (CV or Casa Vieja) is located in historic Fort Davis. The Francell-Byerley Property is located in New Town on land that was originally part of the military post of Fort Davis.

THE FORT DAVIS ARCHAEOLOGY PROJECT (FODAAP)

The Fort Davis Archaeology Project (abbreviated as FODAAP to incorporate the NPS abbreviation FODA for Fort Davis NHS) was started in 2013 by Professor Laurie Wilkie and her doctoral student Katrina Eichner. The goal of the project was to investigate gendered and racialized experiences of civilian and military inhabitants of Fort Davis post and town during the late 1800s, after the Civil War. Over three years the project investigated eight sites in Fort Davis

NHS, the modern town of Fort Davis, and the surrounding region (one site not included in this study was located at The Nature Conservancy Fort Davis Mountains Preserve about 20 miles from Fort Davis NHS).

As part of FODAAP, this project aimed to incorporate microscale geoarchaeological methods into the analysis of several FODAAP excavations in order to interpret life histories (Tringham 1994) of daily life associated with each site and reconstruct taskscapes (Ingold 1993) formed through the interplay of anthropogenic, geological, pedological processes. Four FODAAP sites were included in this study. Two are located at Fort Davis NHS: FODA-LQ and FODA-MM.

The Laundresses' Quarters (FODA-LQ) were several residences constructed during the 1870s which housed laundresses working for the military post. These were investigated by Ground Penetrating Radar and surface survey in 2013 and by excavation in 2015. The Enlisted Married Men's Quarters (FODA-MM) were located at the base of the cliff slope north of Fort Davis NHS parade ground and were home to married enlisted soldiers and their families during the 1870s and 1880s. FODA-MM was investigated by excavation in 2015. Further details on each site and FODAAP's investigations are presented in Chapters 4 and 5.

Two sites within the modern town of Fort Davis were also included in this study: the Francell-Byerley Property and the Smith-Carlton Casa Vieja. The Francell-Byerley Property is located east of FODA-NHS on property that was originally incorporated into the military post, but that is now owned by the Byerley family. Excavations in 2014 focused on a midden and nearby structure. The Smith-Carlton Casa Vieja, located in historic Fort Davis, is the oldest standing adobe structure in town and was originally built by an African-American soldier from the military post at Fort Davis in 1873. It was purchased by the Carlton Family in 1911 and their descendants still own the property. Excavations were conducted at the Smith-Carlton Casa Vieja in 2014. Full details of each site and FODAAP investigations are presented in Chapters 4 and 5.

LIFE HISTORIES AND TASKSCAPES OF HISTORIC FORT DAVIS

This project investigates two major questions through geoarchaeological analyses at the Fort Davis, Texas, sites mentioned above. First, the study seeks to reconstruct life histories (Tringham 1994) associated with historic events at the four sites investigated by this project. Geoarchaeological analyses, observations from excavation, and historical and oral history accounts are combined to deepen understandings of the events and people who resided at each of the four sites. These life histories detail the interconnected ways in which the actions and lives of inhabitants impact and are impacted by the physical landscape and built environment. Each of the four sites has a different degree of preservation in terms of archaeological remains, as well as written records and local memory. This leads to varying degrees of detail for each site with the most complete microhistory coming from the Smith-Carlton Casa Vieja, and the sparsest from the Francell-Byerley Property. Further detail on this study's use of microhistories and its grounding in household archaeology is presented in Chapter 2.

The second question aims to interpret taskscapes (Ingold 1993) associated with daily activities documented across the four sites, particularly traces of habitation and disposal activities. The taskscape framework developed by Ingold (1993) links the transitory, ephemeral network of daily human actions associated with dwelling, to the landscape through the physical impact that human actions (as well as processes and events associated with animal, geological, pedological, and other sources) have upon the landscape. The potential of micromorphology to identify discrete traces of particular events, whether human or other, provides a method by which to locate these physical traces of the taskscape within the modern landscape.

The taskscape portion of the project aims to not only interpret past taskscapes associated with the historic archaeological sites investigated in this study, but to also demonstrate how geoarchaeological analysis is essential to the study of archaeological taskscapes. Ingold's (1993) taskscape approach integrates the physical results of human and other impacts upon the landscape. Human activity is situated within a landscape that is also altered/modified by a wide range of biotic and abiotic environmental forces. Therefore, all sources must be considered in reconstructing taskscapes associated with past human activities. This study uses the case of Fort Davis to show how geological and pedological processes directly impact the archaeological record of past taskscapes. Further discussion of taskscapes and the use of the taskscape perspective in this study can be found in Chapter 2.

SUMMARY

The following dissertation situates itself with household archaeology and the archaeology of daily life, as outlined in Chapter 2. These perspectives are used to inform the major research questions of the project: the interpretation of microhistories at each of the four sites as well as interpretation of taskscapes associated with past actions. Chapter 3 outlines the geoarchaeological perspective of the project, as well as describes the development of the specific methods used. Chapter 4 presents a brief history of Fort Davis itself and describes previous archaeological research at historic sites at FODA-NHS. An overview of work by FODAAP between 2013 and 2015 is also presented. Chapter 5 describes the specific methods utilized during excavation and laboratory analyses. Chapter 6 is a presentation of the geoarchaeological data undertaken for this dissertation. Chapter 7 summarizes the results of the data analysis and offers preliminary comparisons between sites. Chapter 8, the discussion, is divided into five sections. The first section presents historic materials identified in micromorphological thin sections as part of this project. The second summarizes typical micro-facies seen across the Fort Davis sites. The third section describes patterns in sedimentary and pedological processes seen at the Fort Davis sites through the geoarchaeological analyses presented here. The final two sections utilize the previous conclusions to approach the major questions of this study. The fourth section of the discussion approaches each site individually to reconstruct a microhistory using written, oral history, geoarchaeological, and excavation data. The final section compares similar areas across the sites and also integrates previously outlined understandings of Fort Davis pedological and geological processes to reconstruct taskscapes particular to certain activities and contexts.

CHAPTER 2 HOUSEHOLD ARCHAEOLOGY, LIFE HISTORIES AND TASKSCAPES

INTRODUCTION

This research project makes use of combination of a taskscape approach (Ingold 1993) and a life history (Tringham 1994) approach to the archaeology of residential spaces. By combining these frameworks with microscale geoarchaeological analysis, the project elucidates the events and actions associated with daily life at four Fort Davis sites which both shaped and were shaped by actions of residents. Growing out of household archaeology, the archaeology of daily life focuses on quotidian activities and experiences of past peoples seen through archaeological remains and other lines of evidence, such as historical records, geoarchaeology, and architecture. Early household archaeology in the 1980s sought to develop an alternative to traditional kinship-based models (Bender 1967; Laslett and Wall 1972; Yanagisako 1979; Hammel 1984, Wilk and Netting 1984; Wilk and Rathje 1982; Arnould and Netting 1982) in order to generate cross-cultural comparisons of social structures. Over time the field diversified to include a wider range of anthropological questions and a proliferation of methods and theories utilized under the umbrella of household archaeology. Additionally, ideas and concepts from adjacent fields, such as geography and gender studies, have been incorporated into a modern 'archaeology of daily life' (Tringham 2000).

By using both a taskscape (Ingold 1993) and life history approach this project seeks to understand the fluid, continuous, and interactive nature of past taskscapes, as well as how those taskscapes create life-histories of specific places over time. The variation in how history and archaeology are preserved in Fort Davis, Texas, provides an ideal location to apply this approach by demonstrating variation in how the past is understood and preserved in Fort Davis. Two of the sites under study here are abandoned and nearly forgotten (the Francell-Byerley property and the Laundresses' Quarters at NPS Fort Davis) and two are publically recognized as historically significant places (the Smith-Carlton house and Overland Trail Museum), belying how social and geological processes in the present effect how narratives of the past are constructed.

This chapter reviews a brief history of household archaeology, as well as contributions from activity area studies, the archaeology of gender, and experiential archaeology as they relate to the study of taskscapes and life histories in Fort Davis, Texas.

HISTORY OF HOUSEHOLD ARCHAEOLOGY

Household studies in archaeology build on studies in related fields such as history, demography, and anthropology, where the concept of households was first developed as an alternative to the term family. As early as the 1960s researchers recognized that the concept of family was culturally-specific and therefore lacked utility for cross-cultural analysis, a primary aim of anthropology. In its early form the term 'household' was differentiated from 'family' by being defined as a co-residential and economic unit, rather than as a kin grouping (Bender 1967; Laslett and Wall 1972; Yanagisako 1979). However, many authors merely used the term household as an economic definition of family. For example, Laslett and Wall (1972) review the distinction between household and family but define the relevant members of a co-residential group as those who are kin-related. Bender (1967) discusses problems of using either household or family as analytic terms but concludes by saying that the nuclear family is the universal basic unit of social organization because “biological phenomena are always given social meaning” (501).

Other noted problems with early definitions of the household concept are the lack of clarity in defining domestic functions and the prevalence of assumptions of universal power relationships within households. Bender (1967) rightly critiques loose definitions of household but does not himself elucidate the concept beyond the idea that households are performed in the home and are associated with cooking and childcare. As shown by Yanagisako (1979), domestic activities are usually identified as those actions performed by women within the home. Households are tautologically defined as places where household activities take place, the household activities themselves being defined by their performance within the household. Another, usually implicit, assumption is that, in their idealized form, all households will have a male head (Laslett and Wall 1972:24).

A common concern of early household archaeologists was the identification and comparison of household types between cultures and time periods (Bender 1967; Hammel 1984; Laslett and Wall 1972). Hammel (1984), in particular, was frustrated with the notion of defining household types for societies because of the variation introduced by the developmental cycle of the family and presence of households that do not conform to idealized types. The problems with the concepts of household and family are so great, according to Hammel (1984), that it was necessary to "to propose a category so formal, abstract, and devoid of specific cultural content as to rid it of bias" (41). However, how such a category would be useful is not addressed.

Although problematic, the attempts by early researchers to separate the concepts of households and families were ultimately useful. The importance of external factors and the developmental life of households and families were often conflated, as were problems of cross-culturally comparing domestic groups (Laslett and Wall 1972; Bender 1967; Yanagisako 1979). In considering the historical process of households, researchers not only included the developmental cycle of individual households, but also the external factors that could cause household change in the long term (Laslett and Wall 1972; Yanagisako 1979).

In 1981 a conference was held to advance household studies from descriptive in nature to discussion of various household functions (Arnould and Netting 1982). One of the products of this conference was a household model based on specific activities related to production, societal reproduction, distribution, transmission, and co-residence (Wilk and Netting 1984; Wilk and Rathje 1982; Arnould and Netting 1982). The authors recognized that not all households would perform all five functions (listed above) and that other functions would sometimes be present. The model provides a useful base both for household studies in general and household archaeology in particular as the functions discussed by the authors are realized in the same activities that produce artifactual material.

More recent household studies in archaeology often use households as a basic analytic unit for the analysis of broad societal change or as a small-scale extension of settlement studies (Banning and Byrd 1989; Drennan 1988). Households are seen as the place where cultural reproduction takes place and therefore useful for studying cultural evolutionary change (Ringle and Andrews 1988; Rice 1988; Rathje and McGuire 1982; Cliff 1988; Bawden 1982) and social and economic organization (Whalen 1988; Bogucki and Grygiel 1981; Beaudry 1989; Bawden 1982; Ashmore 1988; Sutro and Downing 1988). As stated by Freidel (1989:864), "[d]espite the great difficulties facing the analysis and interpretation of households, the resolution of really fundamental issues in the study of ancient civilization lies in this empirical arena". Households were sometimes positioned as a part of middle range theory since, being the residence of people who produced material culture, they are seen as the best unit for connecting material culture and behavior (Wilk and Rathje 1982; Bogucki and Grygiel 1981).

Another approach to the analysis of household that has been taken up by archaeologists is Levi-Strauss's House Society Model. While this concept was developed by Levi-Strauss within bounds of his studies of kinship and marriage systems (Levi-Strauss 1969, 1982; Gillespie 2007:41), many archaeologists have instead conflated the House as synonymous with the physical house or residential structure corresponding to a household (Gillespie 2000, 2007, Chesson 2003, Beck 2007). Levi-Strauss's definition of a House Society grounds the concept intrinsically within kinship and marriage (with marriage viewed as the exchange of women by men):

corporate body [also translated as moral person] holding an estate made up of both material and immaterial wealth, which perpetuates itself through the transmission of its name, its goods, and its titles down a real or imaginary line, considered legitimate as long as this continuity can express itself in the language of kinship or of affinity and, most often, of both (Lévi-Strauss 1982:174).

Household archaeology, in contrast, formed through direct resistance to kinship studies and the desire to find an analytic unit to investigate co-residential groups that did not rely upon assumptions of kinship (Wilk and Netting 1984; Wilk and Rathje 1982; Arnould and Netting 1982). For this reason the present project does not consider archaeological studies of House societies as falling within the domain of household archaeology and the archaeology of domestic life.

Despite limitations in the types of questions asked about residential spaces and residential groups, early studies were beneficial in critically assessing relationships between households and also for contributions in connecting material culture and behavior. The analysis of activity areas was used to connect the products of behavior with certain spaces (Ashmore and Wilk 1988) and will be discussed more in depth in the following section. Several writers utilize information about activity areas, (Reid and Whittlesley 1982; Bogucki and Grygiel 1981; Samuels 1989), artifact distributions (Leventhal and Baxter 1988), or architecture (Bawden 1982; Stanish and Rice 1989; Aldenderfer 1993) along with other lines of evidence such as ethnoarchaeological research (Kramer 1982), or ethnographic/ethnohistoric evidence (Samuels 1989; Stanish and Rice 1989; Spencer-Wood 1989; Netting 1982; Beaudry 1989; Weeks 1988; Sutro and Downing 1988) to address a variety of questions related to daily life and residential spaces.

THE INVESTIGATION OF ACTIVITY AREAS

The contemporary concept of household aims to produce meaningful cross-cultural analyses of residential units and social structures. However, as more researchers focus on households, the variety and complexity of questions asked of residential spaces increases. Among these are studies in which households themselves are an object of interest, rather than a backdrop for societal-scale questions about the past. One of avenues of study is the analysis of residential activity areas associated with daily household activities. Many of the following studies sought to define functional spaces within a household's residence, or activity areas, in an effort to understand the 'inner workings' of the household as a microcosm of the broader social system. Such studies of activity areas and the use of space within a household frame themselves in many ways in relation to broader themes of interest in household studies, as will be discussed below.

As discussed previously, household archaeology is sometimes pursued as middle range research under the assumption that the actions of daily life are intrinsically linked to material culture and, arguably, more static or predictable compared to other social structures due to the small scale of the household and repetitive nature of activities performed within it in relation to other social groups, such as settlements or cultures. Activity areas (in households and elsewhere), as the locations where human behavior and material culture interact, can be studied under an extension of such middle range concerns in order to provide linking arguments between material culture and anthropological questions of interest to researchers (Bogucki and Grygiel 1981; Coleman Goldstein 2008; Hendon et al. 1989; Lyons 1989; Sutro and Downing 1988). For instance, Bogucki and Grygiel (1981) suggest it is "easier to perceive correlations among specific configurations of archaeological remains and the behavior that produced them at small settlements than it is at complex sites" (Bogucki and Grygiel 1981:69). Analysis of activity areas is an extension of this principle by dividing the household into even smaller units which can be conceptualized as proportionally closer to connecting patterns of material culture and specific behaviors to make inferences about societal processes.

Similarly to the positioning of activity areas as part of middle range concerns, analysis of activity areas is also used by researchers who position households as a small-scale unit within a settlement system. They focus on using the organization of activity areas and residential space to posit a household form or structure (Hendon et al. 1989; Coleman Goldstein 2008; Lyons 1989; Leventhal and Baxter 1988). From there, researchers define typical household types that can be used as a base unit in the study of settlement patterns and social organization.

A range of approaches is adopted by researchers concerned with the study of activity areas. While analysis of artifact concentrations on floors of residential spaces is likely one of the most popular approaches (Leventhal and Baxter 1988; Reid and Whittlesley 1982; Hendon et al. 1989; Bogucki and Grygiel 1981; Ciolek-Torrello 1984; Ciolek-Torrello 1985; Ciolek-Torrello 1986; Ciolek-Torrello 1989), studies based on architectural form (Knight 1989; Sutro and Downing 1988;), chemical signatures in floors (Terry et al. 2004; Manzanilla and Barba 1990), and ethnographic studies (Sutro and Downing 1988; Lyons 1989; Kent 1984; Horne 1982) are also utilized and each is discussed below.

Studies of activity areas in households based on architectural form often work under the assumption that form follows function (Nash 2002). Architecture, including internal architecture such as benches and functional features such as hearths, is used to make inferences about the usage of residential space. While it would appear that this type of analysis is most applicable in cases with standing architecture, it has also been undertaken in regions where that is not the case. For instance, Knight (1989) analyzed fifty-six Iroquoian longhouses from the Ball Site using the locations of pits and postholes to infer the internal arrangements of hearths, pits, walls, and benches.

Another common approach to spatial analysis of activity areas and the use of domestic space is through patterning of artifactual remains across house floors. The extensive project at 14th century CE Grasshopper Pueblo in Arizona (Ciolek-Torrello 1984; Ciolek-Torrello 1985; Ciolek-Torrello 1986; Ciolek-Torrello 1989; Ciolek-Torrello and Reid 1974; Reid and Whittlesley 1982) used concentrations of artifacts on room floors to assign rooms to one of nine functions. Leventhal and Baxter (1988) used cluster analyses of ceramic types to investigate the function of structures at Copan in Honduras, while Hendon (1989) utilized both architectural and artifactual information from fourteen Copan patios to analyze the organization of domestic space.

Another comparative line of evidence utilized by many researchers is ethnographic investigation of the use of space among modern peoples. Kent (1984), in a study of Navajo, Spanish-American, and Euro-American households in the United States, found differences in the designation of single-function and sex-specific activity spaces amongst the three households, with Euro-American households more likely to segment space into single-function and sex-specific areas. Lyons (1989) investigated the spatial organization of households Northern Cameroon where the division or shared use of household space relates both to women's status and the degree of competition or cooperation among co-wives.

While some of the studies of activity areas discussed above fall into the trap of early approaches and maintain a peopleless and static vision of a household, they also make significant contributions towards an archaeological understanding of the organization and use of domestic space. In particular, three issues addressed by these activity area studies that remain at the forefront of this research are the multi-functionality of domestic space for multiple residential activities simultaneously, the use of space beyond the residential structure, and issues of deposition and post-deposition.

As discussed earlier, ethnographic work by Kent (1984) directly addressed issues of mono-functional use of space, or, rather, the lack of mono-functional use of space, among different cultural groups. She found that the limitation of activities to a specific domestic area was more common among Euro-American households than the other groups in her study. Further, both Hendon (1989) and Leventhal and Baxter (1988) in their studies of activity areas at Copan, concluded that space was multifunctional, with individual structures used for a range of activities.

That the performance of domestic activities is not spatially bound by residential architecture has also been addressed by several researchers. In their early study of residential spaces at Brzesc Kujawski in Poland, Bogucki and Grygiel (1981) explicitly included outside spaces in their definition of a household this spatial cluster of spaces as their unit of analysis. Kent (1984) also found that Navajo households in particular used space beyond residential structures to perform domestic tasks.

A final issue addressed by studies of activity areas is a concern with depositional contexts in the interpretation of residential use of space. This is addressed most explicitly in work by Kuijt (1989) in distinguishing between activity areas and refuse deposits from around 1300CE at the Jack Harkey Site 1 in New Mexico. Here, he found that large amounts of archaeological material was recovered from secondary refuse deposits, although smaller material was more likely to be deposited near the area of use. This is a particularly important finding for activity area analysis as it suggests that the majority of archaeological material is not deposited at the site of use, but in specific disposal locations. Spatial analysis of artifact concentrations, therefore, is only of limited use in defining activity areas.

Studies of activity areas have made important contributions to the understanding and investigation of the use of domestic space and how it relates to household organization and the societal-level socio-economic and political structures in which the household is embedded. Although less concerned with envisioning the actions and interactions of people in households, these analyses created a foundation for studies concerned with gender, life-histories of houses, and the construction of place through households.

Gendered Activity Areas

Activity areas were and are one of the obvious avenues for engendering household archaeology, although problems of artifact attribution, as will be discussed later, become central. Using various sources (artistic depictions, ethnographic analogy, ethnohistoric and historic sources) authors have linked specific genders to specific material culture and, through material culture distributions, to specific spaces (Hendon 1997; LeMoyne 2003; Coleman Goldstein 2008; Gero and Scattolin 2002; Allison 1999; Bowser and Patton 2004; Gilchrist 1994; Hegmon et al 2000). Many researchers implicitly rely upon task-differentiation frameworks (Spector 1998) or other ethnographic evidence for the spatial assignation of gendered workspaces (Bowser and Patton 2004).

Many authors have utilized gendered analysis of activity areas to investigation interaction and power relationships among genders. Gilchrist (1994) analyzes architectural patterning to interpret avenues of seclusion and access in female and male gendered spaces in historic European monasteries to examine gendered power relations, while Hendon (1997) uses artifact concentrations to define gendered activity areas in order to show that women's spaces were not spatially segregated and elite Maya women at Copan were not secluded. Through reference to the multi-purpose use of space seen in the archaeological material Hendon argues against the seclusion of women in elite compounds. LeMoyne (2003) explores how Dorset and Inuit architecture in the Arctic reflects domestic group organization and relations between women of the same household. She uses this analysis to demonstrate changes in social organization and gendered relationships from the earlier Dorset communal homes to single-family Inuit residences. Gero and Scattolin's (2002) analysis of residences at Yutopian, Argentina, discussed more thoroughly later, also uses gendered activity areas to show how all-inclusive labels of complementarity and hierarchy are not sufficient for describing gender relations.

Work by Kent (1984) has shown that not only are linkages between gender and workspaces culturally-specific, but that the degree workspace separation is also closely connected to culture. Kent's ethnographic work showed variations in how families from different cultural backgrounds use their living space, as well as variation in the degree of flexibility in gendered use of space (1984). In her study, Euro-American families had overall the strictest division in gendered use of space, while the Navajo and Spanish-American (Kent's descriptive term) families exhibited more fluid spatial designation of labor.

Steadman (2015) also discusses how architectural analysis can be linked to gender through the analysis of gender-specific structures or spaces in her review of household studies in archaeology. However, despite stating that the analysis of gender in the archaeological record is more complex than simply assigning tasks by gender and analyzing their material correlates, Steadman's (2015) review discussion of the gendered analysis of architecture primarily focuses on men's and women's gender-specific structures, as well as architectural evidence for seclusion or segregation of architectural elements by gender. In addition, she maintains that public/private divisions of residential space are not only useful distinctions cross-culturally, but that this division can also be connected to gendered status. She further maintains this distinction in differentiating between domestic and public spheres. These divisions are in direct contrast to several ethnographic studies showing how not only are the categories of 'public' and 'private' not cross-culturally distinct or relevant, but that the connections between these categories and gendered power relations are equally complex (Kent 1994, Bowser and Patton 2004, Helliwell 1992).

As previously discussed, Kent's (1994) ethnographic work has shown that flexibility in use of space is highly culturally-specific. Distinctions between public and private areas, as well as between women's and men's spaces, vary amongst the families she describes in her study. Further work by Bowser and Patton (2004) shows how, even in a case of prescribed public and private spaces, the boundary between these spaces remains fluid and all family members maintain roles in the public life of the community through use of these spaces. Helliwell's (2004) work among the Dayak people of Borneo shows how even private, enclosed spaces within individual longhouse compartments are part of public discourse and community participation. These studies, among others, show the complex, multi-faceted relationships between varied ideas of privacy and publicity and highlight how communities and households negotiated gendered use of spaces in flexible ways that are not easily contained by the binary division of public and private.

Space Syntax, Built Space, and Experience of Households

Although not always self-identified as such, there are a series of publications concerned with interactions of people through household space and their experience of the physical house. Many of these studies use an analysis of the physical space of the house (space syntax) to interpret relationships between residents and other occupants (Bowser and Patton 2004, Gilchrist 1994, Hegmon et al 2000). Several of these pieces are concerned with activity areas or gendered spaces, but also with how those spaces would have been experienced by the people using and creating them and how the physical spatial characteristics of those spaces would have, in turn, shaped the people (Bowser and Patton 2004; Gilchrist 1994; Hegmon, et al 2000; Helliwell 1992; Pink 2004). Most of these studies also highlight the fluid relationship between so-called public and private spaces, as well as the uncomfortable distinction between domestic and public spheres, a division which is not universally relevant.

Bowser and Patton's (2004) study, while ethnographic in nature, focuses on the differing uses of male and female domestic space in the Ecuadorian Amazon and how it is used in the formation of alliances by both men and women. Hegmon *et al.* (2000), relying on practice theory, outline a variety of ways in which the placement of activity areas and the organization of labor across them can affect people's experience of the household, with a particular focus on power relations among pre-European contact households in the southwestern United States. The organization of household space is both shaped by and shapes social interaction of participants (Hegmon 2000). Similarly, Fisher (2009), working at the Bronze Age site of Enkomi in Cyprus, uses access analysis to investigate how built space structures social relationships through controlling patterns of movement, as well as encoding socially-specific meanings and symbolism. Banning (2010) argues changes in house construction patterns between isolated, walled-off houses to porous, clustered household groups reflect strategic economic decisions by heads of households. In a different vein, Pink (2004) and Helliwell (1992) are both concerned with sensory experience of houses, with Helliwell focusing on the constant noise and interaction within Dayak longhouses, and Pink on gendered performativity and sensory constructions of domestic space in modern homes in the United Kingdom and Spain.

THE MATERIALITY OF HOUSES: LIFE HISTORIES AND TASKSCAPES

While many studies of households have tried to separate the concept of household from the material remains of houses with which they are (sometimes problematically) archaeologically associated, recent work has also been concerned with the physical house and its role in the creation and mediation of social relations. Studies of architecture, such as those pursued by Tringham (1994), Hendon (2010), and Steadman (2015) emphasize the materiality of the house itself in studies of the household and residential life. These studies, among others, show how the house itself is not a static container of daily life, but an active presence in the shaping of life events and relationships of residents, while also being recursively shaped by those actions.

Life Histories

Concerns with the 'use-life' of physical houses (the source of building materials, manner of construction, manner of abandonment/destruction, etc.) have been expanded upon by studies in which the life cycle of a house is conceived of as a 'life history' (Tringham 1994). While a use-life focuses on the cycle of construction, usage, and abandonment/destruction of the physical house, a life history approach reflects and is formed by the lives of the people who reside within it. Connections between the physical materiality of the house and the actions and lives of the people residing with it can be seen in rituals of destroying or renewing a house (Guerrero *et al.* 2009; Tringham 1994; Tringham 2000) and through the presence of hidden, but known areas of the house. For instance, at Tell Halula in Syria, Guerrero *et al.*(2009) found associations between burials of individuals within particular spaces of the house and renewal events (Guerrero *et al*. 2009). The deaths of (supposed) residents thus affects the physical life-course of the house. The presence of the burial, whether visible or not, would have also been known to the continuing residents and that would have become part of their mnemonic experience of the house. Similarly, through work in Honduras, Hendon connects storage practices as a gendered, morally-charged, economic practice and controlled (remembered) knowledge, to the creation of identities within the broader, socially constructed, landscape. In her 2010 book, Hendon defines households as communities of practice following Lave and Wenger (1991) in order to broaden her discussion of houses as "*places* that are spatially and socially constructed through nondiscursive practices that create embodied spaces that provide the active background to daily life" (Hendon 2010:124 italics original). Memory is externalized in houses and other material objects, which then act in the creation of relational subjectivity: the act of living in the physical house inscribes it with memory and meaning creating a *place* with significance beyond a physical location. The routine actions of daily life—cleaning, cooking, using household objects, interacting with other household members and guests—construct an understanding of place that is both shared among household members and individually variable based on the different positionalities of the same people and their varied memories and understandings of knowledge and events associated with the house.

Viewing the physical house as a material presence with a life history integrates the individual and shared understandings of house residents into analysis of the physical space of the house. Life histories not only reflect the lives of residents but also situate the house and the practice of daily activities across the space of the house as integral to the creation and maintenance of individual subjectivities and ideologies. As stated by Moore (1986:x)

The organization of space is not simply a backdrop to social activity, but is the active and interactive context within which social relations and social structures are produced and transformed. Space in this context is never neutral, but neither is it ever fixed or static.

Organization of household space is not predetermined, nor does its organization predetermine the meanings and understandings of its residents. The routine, daily actions that create the house as *place* enact meanings upon the physical space of the house. However, these meanings are not permanent, but malleable and fluid. New routines, new activities, new household members, along with other factors, can alter the embodied meaning of space within the house. As the meaning of the house as *place* is constructed through the life history of routine activities which enact meaning upon the space, any change to those activities, or to how the people living in the house perceive those activities, can alter their attached meanings.

Houses provide the ‘background’ (Hendon 2010) against which activities are performed. This background is crucial to understanding the meanings attached to those activities. The house itself plays a role in the creation of meaning both as a context for actions between humans and as a participant in social relations (Hendon 2010). As shown by Pink (2004) the material aspects of a house are altered and affected by its residents in part through the creation of their (gendered) identities and this socially-constructed space in turn affects the residents. Life-histories of places integrate the lives and actions of residents, along with their intended meanings, into the physical space of the house.

The materiality of houses and the organization of space within them, through their role in the construction of gendered identities and subjectivities, contributes to the construction of social identity, social cohesion, and social differentiation through the performance of daily life.

Spatial arrangements that affect access, movement, relative position to others, what is seen, and who interacts with whom are means of controlling space and people. They contribute to intersubjective relations and social differentiation and are thus connected to the realization of such abstractions as gender, class, seniority, and solidarity that we commonly invoke when discussing social identity (Hendon 2010:106).

Houses as places and the organization of space within them are thus intimately interwoven with issues of social identity, power, and the creation and performance of intersubjective consciousness. As articulated by Massey:

From the symbolic meaning of spaces/places and the clearly gendered messages which they transmit, to straightforward exclusion by violence, spaces and places are not only themselves gendered but, in their being so, they both reflect and affect the ways in which gender is constructed and understood. The limitation of women's mobility, in terms both of identity and space, has been in some cultural contexts a crucial means of subordination. Moreover the two things - the limitation on mobility in space, the attempted consignment/confinement to particular places on the one hand, and the limitation on identity on the other - have been crucially related (Massey 1994:179)

The life history approach to houses in archaeological research builds upon earlier concerns with the ‘use-life’ of physical houses (the source of building materials, manner of construction, manner of abandonment/destruction, etc.). A life history approach connects the physical house to its social significance (Tringham 1994, Tringham 2000, Hendon 2010) by relating the material structure to the lives and actions of the people who reside within it. Not only a static backdrop for human action, the physical house affects and is affected by the actions, interactions, and meanings of the people who reside in it. Similar to a taskscape approach (below), life histories provide an analytic means to connect physical traces of human activity with events and actions in the human past. While life-histories relate to the longitudinal narratives of a place, taskscapes are spatially (as well as temporally) fluid.

Taskscapes

One approach which applies concepts from geography and anthropology to the issue of understanding past daily lives is Ingold’s (1993) taskscape or dwelling perspective. Similarly to the previous discussion of life histories, in this view, spaces or places are constructed through the daily moments, routine tasks, and small events through which humans experience their lives, construct their relationships with others, and interact with their surroundings throughout diverse contexts (Ingold 1993). This approach builds upon geographic investigations of the social construction of place as a continuously negotiated, situated, and unbounded process of meaning and contestation through the constant action and interaction between people and space (Moore 1984, Massey 1994, Thift 1996, Parkes and Thrift 1978, Pred 1984).

The taskscape, like the life history of the house, is composed of the routine activities, movements, and actions of people (along with animals and natural processes) which result in a physical mark upon the landscape (Ingold 1993). These activities do not occur in spatial or temporal isolation as discrete series of events or marked positions in space. Instead, they are part of an uninterrupted spatial and temporal fabric of moments, events, and locations. As observed by Ingold (1993:158), "Every task takes its meaning from its position within an ensemble of tasks, performed in series or in parallel, and usually by many people working together". The taskscape, then is "an array of related activities" (Ingold 1993:158) with spatial, temporal, and social dimensions linking them. In contrast to life histories, taskscapes are more spatially and temporally continuous.

The small, routine events of the taskscape form the continuous, ever-flexible, and never static texture of human history which is physically manifest in the landscape. Each human action, along with actions of animals and nautral processes, leaves a physical trace within the landscape. The landscape thereby contains the physical traces of past human events, interactions, as well as the effects of natural and animal processes. The landscape incorporates the spatiality of these events, while also compressing their temporal aspects. Ingold explains the landscape as the "congealed" form of the taskscape (1993:163). The landscape, like the house, is produced through the actions of the taskscape, but in its physical form the landscape compresses the fluidity of the taskscape while embodying many of the meanings originally attributed to it.

Ingold's (1993) analysis of the relationship between landscape and taskscape gives archaeology and geoarchaeology, in particular, a basis by which to investigate past taskscapes through the analysis of modern physical landscapes. The physical landscape is the compressed, physical remains of past, as well as current, landscapes. Understandings of the geological and pedogenic processes which affect archaeological sites show how the physical remains of past human events are continuously effected by ongoing natural processes including deposition, erosion, and pedogenesis. Gearchaeology offers a means to extricate the remains of past taskscapes from the palimpsest which is the modern archaeological landscape.

Two archaeological approaches utilizing a taskscape perspective have been presented by Scattolín *et al*. (2009) and Boivin (2000). Scattolín *et al.*(2009) utilize a taskscape approach in an architectural analysis of a household compound in Yutopian, Argentina. While they do not incorporate geoarchaeological analyses, they do show how a taskscape approach can be applied to an archaeological context. In their analysis, Scattolín *et al.*(2009) treat the architecture of the house compound as the 'landscape' was formed through the daily, everyday tasks of residents and thereby represents not a static background for human activity, but a changing, maleable physical manifestation of the taskscape.

Work by Boivin (2000) has directly utilized micromorphological methods to interpret past taskscapes of ritual and renovation at Neolithic Çatalhöyük in Turkey in comparison to ethnohistoric accounts from contemporary households in Rajasthan, India. She shows how several repetitive cycles associated with the household group and individuals are realized through physical modifications to house floors. Homes are refloored in relation to specific life events of residents, effecting both the physical space of the house as well as the meaning associated it by residents (Boivin 2000). She then undertakes analysis of floor and wall plastering sequences at Çatalhöyük to suggest the presence of similar significant cyclical events relating to the plastering of home surfaces.

CONCLUSION

This project utilizes a life history and taskscape approach rooted in household archaeology to investigate patterns of daily life associated with four sites within historic Fort Davis, Texas in the late 1800s and early 1900s. From its beginnings in the 1980s, household archaeology has shown the importance of investigating microscale events, interactions, and activities of past daily life in order to understand the quotidian experiences of past people. Analyses of activity areas and considerations from the archaeology of gender and experiential archaeology show the important of understanding the people whose actions, meanings, and relationships form, reform, and reflect themselves within the physical space of the house. Life history approaches consider the entire course of the house as *place*, as well as the meaning imbued within the material structure by the people who build, maintain, reside in, and abandon or abolish them. Taskscapes provide a holistic, integrated view in which human actions, environmental processes, and the physical landscape are entwined. This last approach provides an entryway for microscale geoarchaeological approaches which investigate the physical traces of human action, environmental process, and other events which leave a marked impact upon the landscape. The accumulation and compression of these events over time creates the physical landscape and can be (at least partially) untangled through the use of microscale geoarchaeological methods in combination with archaeological and historical approaches.

Microscale geoarchaeological methods provide an unparalleled avenue to recover microscopic remains of daily activities left *in situ* as well as the physical impacts of daily activities on the landscape. Most remnants of daily activities, including artifactual remains and architecture, can be substantially affected by human actions such as cleaning, renovation, disposal and post-depositional alterations to occupation sites. However, microscale geoarchaeological methods provide a means to not only detect undisturbed, *in situ* remnants of daily activities but also to assess the impacts of anthropogenic and natural alterations to archaeological contexts. Chapter 3 details these approaches as well as their uses within archaeological approaches to daily life and residential spaces.

CHAPTER 3 GEOARCHAEOLOGICAL APPROACHES TO FORT DAVIS AND ENVIRONS

INTRODUCTION

Geoarchaeology, as the incorporation of specifically earth sciences approaches into archaeological research programs, began as a resource for utilizing geological insights to support archaeological questions (Huckleberry 2000). Geologists working as part of archaeological projects throughout the 1900s were concerned with elucidating stratigraphic relationships and natural post-depositional processes and establishing chronology based on absolute dating techniques (Leach 1992, Huckleberry 2000). These investigations were important for orienting sequences of events at archaeological sites, but their goals was often intellectually distinct from the social questions asked by archaeologists. The importance of geoarchaeology increased as part of the development and growth of environmental archaeology and settlement studies with processual archaeology in the 1960s. It was also particularly important as a means of studying site formation processes (Schiffer 1983).

Modern geoarchaeology builds on these foundations by directly utilizing geological and pedological approaches to investigate social questions, rather than primarily as a means of providing context for archaeological remains. This is what Leach (1992:402) describes as "archaeology done by geological methods", rather than geology applied to discrete problems in archaeology without being incorporated into fundamental question of the broader research program. Geoarchaeology as a part of a more 'social' archaeology incorporates questions related to material culture, such as chemical and provenance studies that can be connected to movements of people across the landscape, understanding technological processes and *chaîne opératoire*, and research into the social symbolism of particular geological materials (Goren and Goring-Morris 2008, Huckleberry *et al.* 2003). The analysis of landscapes through geomorphology has been used to inform settlement pattern research (Macklin 1999, Schuldenrein 2007, Rech et. al 2007, Schuldenrein and Clark 2001) and to investigate palaeoenvironments as they relate to subsistence practices and human-environment relationships (Wilkinson 2003, Woodward *et al.* 2001, Hunt *et al.* 2007, Kemp *et al.* 1998, Beach *et al.* 2006, Fisher *et al.* 2003, Goldberg and Yosef 1990, Maher 2011, Karkanas *et al.* 2011). At the smaller scale, microscale analyses have been used for intra-site studies of activity area patterning and use of space (Boivin 2000, Matthews *et al.* 1997, Matthews 1995, Rosen 1989, Cook *et al.* 2006, Cruise and MacPhail 2000, Entwistle and Abrahams 1997, Entwistle *et al.* 2000, Entwistle *et al.* 1998, Jones *et al.* 2010, Karkanas 2006, King 2007, MacPhail 1994, Middleton and Price 1996, Parnell *et al.* 2002, Sullivan and Kealhofer 2004). For a summary of selected major geoarchaeological questions, see Table 3.1.

Research Topic	Selected Relevant Citations
Social Symbolism of Geological Materials	Goren and Goring-Morris 2008, Huckleberry *et al.* 2003
Settlement Patterns	Macklin 1999, Schuldenrein 2007, Rech et. al 2007, Schuldenrein and Clark 2001
Palaeoenvironments	Wilkinson 2003, Woodward *et al.* 2001, Hunt

	et al. 2007, Kemp *et al.* 1998, Beach *et al.* 2006, Fisher *et al.* 2003, Goldberg and Yosef 1990, Maher 2011, Karkanas *et al.* 2011
Activity Area Patterning	Boivin 2000, Matthews *et al.* 1997, Matthews 1995, Rosen 1989, Cook *et al.* 2006, Cruise and MacPhail 2000, Entwistle and Abrahams 1997, Entwistle *et al.* 2000, Entwistle *et al.* 1998, Jones *et al.* 2010, Karkanas 2006, King 2007, MacPhail 1994, Middleton and Price 1996, Parnell *et al.* 2002, Sullivan and Kealhofer (2004)

Table 3.1: Selected References for Major Geoarchaeological Research Topics

This chapter will review geological and pedological knowledge and methods utilized in geoarchaeological research, with particular emphasis on processes common to arid lands and the methods used in this study. The chapter then discusses research related to questions central to this study, in particular the micromorphology of floors and living spaces, architectural and construction materials, middens, and the use of geoarchaeology within the subdiscipline of Historical Archaeology. Finally, I present a brief discussion of the environmental setting of Fort Davis, Texas, and a summary of previous environmental research at Fort Davis National Historic Site (FODA-NHS).

UNDERSTANDING GEOLOGICAL AND SOIL PROCESSES FOR USE IN GEOARCHAEOLOGICAL RESEARCH

The use of soil analysis for archaeological problems relies on an understanding of geological, pedological, and anthropogenic processes that affect soils and can be identified using techniques such as micromorphology and soil chemistry. This section details several of the more common and significant of these processes, as well as the various traces visible in micromorphological and chemical analyses.

The *in situ* development of soils from geologic parent material is an integral part of the analysis of archaeological deposits. The factors responsible for soil development are summarized as climate, organic matter, relief (topography), parent material, and time (Jenny 1941). Climate, the overall environmental conditions in which a soil forms, provides the conditions under which various soil processes occur. Climate determines the amount of water introduced to the soil through rainfall, the impacts of frost, the rate of decomposition of organic matter, as well as the amount of vegetation and faunal presence affecting the soil. Organic matter, includes both vegetation and animal components (also including soil fungi and microbes). Organic matter as inputs into a soil affects both the chemical composition of a soil through the introduction of humic material, but also the physical makeup of the soil through bioturbation. Relief, or topography, refers to the physical environment in which a soil forms, which determines which geological processes will most affect it. For instance, a soil formed on a hillslope will be more intensely subjected to erosion than a soil forming in a valley basin. Parent material refers to the underlying geological material in which the soil forms. This may include bedrock which over time weathers into a soil, or may be loose sediment that develops into a soil through *in situ* changes. In both situations, the development of a soil has the potential to overwrite the earlier geological stratigraphic. Finally, time is the factor necessary for the previous factors to act on a parent material in order to create a soil. Younger soils, which have had less time to develop, will be less well expressed than older soil which have seen the impacts of the soil forming factors for longer periods of time (Jenny 1941).

Variation in these factors accounts for the differences seen among the existing categories of soil families, such as gelisols which form under cold climatic conditions, aridisols which form under dry conditions with little available water, and vertisols which are composed of expansive clays (Birkeland 1999, MacPhail and Goldberg 1990). A variety of processes occur in soils with reference to these factors and these variations account for specific patterns of soil development that can be analyzed using micromorphology. Several of these pedogenic processes and their micromorphological signatures are discussed below. Table 3.2 provides a broader suite of possible pedogenic processes and their micromorphological traces.

Soil Process	**Description**	**Physical Traces**	**Selected Citations**
Weathering	Neoformation[1] of silicates into clay minerals in upper horizons	Weathered primary silicates such as quartz, feldspars, olivine	Marcelino *et al.* 2010
Translocation	Movement of clay from upper to lower horizons	Clay coatings and infillings in lower horizons. Absence of clay in upper horizons.	Kühn *et al.* 2010. Marcelino *et al.* 2010, Courty *et al.* 1989
Precipitation of Calcium Carbonate Features	Accumulation of calcium carbonate as coatings, infillings, pendants, or calcrete; particularly in arid soils	Presence of calcium carbonate features and calcitic groundmass (These can result from various sources, not only soil formation)	Durand *et al.* 2010, Bullock 1985
Precipitation of Gypsic Features	Accumulation of gypsum as crystals, infillings, and coatings; particularly in arid soils	Gypsum crystals and gypsic groundmass (can result from various sources, not only *in situ* formation)	Poch *et al.* 2010
Spodic Materials	Translocation of organically complexed forms of iron and aluminum[2]	Depleted upper horizons. Lower horizons contain accumulations of iron, aluminum, and organic matter	Wilson and Righi 2010
Calcium-iron-	Neoformation of bone	acidic soils from	Adderley *et al.* 2001

[1] Neoformation refers to chemical changes as part of the weathering of a soil that result in the transformation of one mineral into new form(s).

[2] Accumulations of iron and aluminum in soils can occur as mechanical or chemical weathering products or as byproducts of biological activity.

phosphate Infillings	hydroxyapatite	moist, temperate regions	
Decomposition of Organic Matter	Decomposition creating soil humus and humic horizons	Various – depends on types of organic matter and decomposition	Stolt and Lindbo 2010, Bullock 1985, Courty *et al.* 1989
Faunal Activity	Lifecycle of soil fauna and effect on soil structure leading to bioturbation	Voids created by movement of soil fauna resulting in pedofeatures and excrement of soil fauna	Kooistra and Pulleman 2010, Fitzpatrick 1988, Courty *et al.* 1989
Crust formation through Wetting/Drying	Periodic rainfall in arid soils produces overland flow and forms crusts at soil surface	Crusts are easily broken and intermixed with soil matrix. They are often recovered in partial and relict form	White 1999, Fedoroff and Courty 1999, Pagliani and Stoops 2010
Redox	Waterlogging reduces oxygen content causing reduction of iron and manganese (along with other elements)	Seen as mottles or gley spots in soil matrix. Re-exposure to oxygen causes oxidation of the same compounds	Lindbo *et al.* 2010, Courty *et al.* 1989

Table 3.2: Selected References for Major Geoarchaeological Research Topics

Pedogenesis and Horizontation

Soil formation, or pedogenesis, is the process by which parent materials (e.g., sediments) are weathered by the five soil forming factors, resulting in the development of soil horizons. This process, called horizonation, produced vertical variation in the parent material as a result of *in situ* chemical and physical changes to the sediment. Silicate materials such as quartz, feldspars, olivine, and micas are gradually weathered through a process called neoformation, producing clay minerals such as smectite and kaolinite, and metal oxides such as gibbsite and goethite **(**Brewer 1964b, Sposito 2008, Kühn *et al.* 2010, Marcelino *et al.* 2010, Birkeland 1999**)**. Standard soil horizons are described using the A,B, C horizon system, although additional horizons are also used in soil descriptions (USDA 1999). The A horizon sits closest to the surface and contains organic matter accumulated from decay of organic materials at the surface. Movement of water through the soil profile leaches minerals such as calcium, carbon, iron, and aluminum from the A horizon into the underlying B horizon. Higher accumulations of these clay minerals are associated with more developed soil horizons. Such processes are often specific to soil climatic types, including leaching of calcium minerals in A horizons associated with re-precipitated[3] calcium carbonate as calcite coatings (and other calcitic features) in B horizons (Bullock 1985, Durand *et al.* 2010). Horizonation is also associated with the translocation of

[3]Calcium-Carbonate (a salt common to arid lands soils) is highly soluble in water. Introduction of water to the soil profile (often through periodic rainfall) causes calcium carbonate features to dissolve and recrystallize within the soil profile.

carbon, iron, and aluminum (formation of spodosols) from A horizons to B horizons. The C horizon, located below the B horizon, contains minimally weathered parent material. Standard techniques can be used to detect such features of soil formation through identification of microstructures in the B horizon (Birkeland 1999, Bullock 1985, Wilson and Righi 2010).

Weathering of Clay

Weathering of the clay fraction in soils also affects the ability of soils to absorb geochemical traces associated with anthropogenic activity that are sometimes used as markers for detecting archaeological activity areas. Pedogenesis weathers preexisting clays into poorly crystalline forms which alters the capacity of soil components to adsorb elemental inputs. The potential for identification of human activities through chemical concentrations in soils is therefore related to parent material and the degree of weathering of the soil material. However, due to the complexity of soil chemical processes, no single mechanism is responsible for the retention of anthropogenically-introduced elements in soils (Oonk *et al.* 2009). For instance, neoformation of hydroxyapatite in animal bone (particularly fish) can produce calcium-iron-phosphate infilling materials in acidic soils from moist, temperate, subboreal regions (Adderley *et al.* 2001).

Biological Processes

Decomposition of organic matter, such as overlying brush from plants and animals, introduces organic matter to the soil profile collectively referred to as humus. Organic components of soil are notoriously difficult to characterize chemically (Sposito 2008). However, micromorphological analysis of soil organic matter can be used to define the humic layer at the soil surface as well as to assess the degree of decomposition and to define specific humic horizons (Stolt and Lindbo 2010, Bullock 1985). Other biological processes which leave detectable micromorphological traces include plant roots which can be observed as live (at the time of sampling), decomposing, or as voids, sometimes later filled by other soil materials such excrement of soil fauna or secondary minerals (Koositra and Pulleman 2010, Fitzpatrick 1988). Similar to bioturbation by larger animals, bioturbation by earthworms causes movement of small soil inclusions, some of which can have archaeological significance (such as small animal bones or microliths) and can disturb or overprint stratigraphy of importance to archaeological interpretations. Earthworms can also create calcite spheruliths and granules from mineralized calcium carbonate excretions (Armour-Chelu and Andrews 1994, Canti 1998). Movement of soil by tree roots or naturally uprooted trees (tree throw) is also detectable through recognizable micromorphological features (MacPhail and Goldberg 1990). These processes of soil disturbance have particular archaeological significance through their potential to affect preservation and location of buried archaeological materials. Tree clearance, especially on a large scale for agriculture, can induce increased soil erosion which can remove occupational horizons or relocate archaeological material. Similarly, action by earthworms not only can mobilize archaeological materials in soils, but is also associated with dark earth developments created through intensive human activity (MacPhail 1994).

While many mineralogical and biological pedogenic processes leave detectable traces in soils, the continuous nature of soil development and geological processes means that most soil features are in a constant state of formation, reworking and destruction and may be variably visible to the archaeologist at the time of analysis. Erosion is one of the most drastic of these processes and can either be part of natural sedimentary processes (Fedoroff *et al.* 1988) or effected by human activities like land clearance for agriculture or terracing (MacPhail 1992, Goodman-Elgar 2008). Periodic waterlogging of soils through elevated water tables, flooding (whether natural or for irrigation), or land management practices, can also cause changes in the chemical makeup of soils by initiating oxidation-reduction processes, particularly for iron and manganese soil components which produce mottling or gleying of soils (Birkeland 1999, Lindbo *et al.* 2010).

SOIL PROCESSES COMMON TO ARID CLIMATES

As discussed previously, climate is one of the primary factors accounting for differences in soil development. Arid soils, in particular, undergo pedogenic processes distinctly different from soils forming in wetter climatic regimes through both the absence of water to facilitate leaching, erosion, and weathering, and through differences in the number and types of vegetation and soil fauna that exist in arid soils. Arid lands also include distinct landforms (i.e., dunes, rock deserts) particular to these environments (White 1999, Derbyshire 1999, Fedoroff and Courty 1999). Studies of soil fauna in sandy, arid soils compared with soils from moss, grass, heather, and pine landscapes suggest that inhabitants of arid soils are transient, rather than permanent residents (Van der Drift 1964), so their effects on soil development, such as bioturbation and input of organic matter through excrement, tend to be less intense. Aeolian processes are particularly important in arid lands due to the lack of vegetative ground cover to stabilize soil surfaces. Due to this, many arid lands soils are continuously affected by processes of erosion and deposition. The following sections discuss addition processes specific to arid lands soils.

Effects of Sporadic Rainfall in Arid Lands

Episodic rainfall leads to instability in soil structure due to dramatic shifts between wet and dry conditions, which produces particular features in arid environments. Periodic, intense rainfall characteristic of environments with alternating wet and dry seasons, results in overland flow due to the limited infiltration capacity of arid lands soils When followed by a lack of rain, crusts then form in the water saturated subsoil as it dries out (White 1999, Fedoroff and Courty 1999). These crusts are fragile and easily broken, after which they can be reincorporated into the soil matrix and are visible as fragmentary remains microscopically (Fedoroff and Courty 1999, White 1999).

Increased aridity reduces the depth of active soil horizons and restricts pedological development (Fedoroff and Courty 1999). Limited rainfall results in restricted translocation and weathering of clay leading to shallow argillic horizons that are formed rapidly during periods of instability through episodic rainfall (Fedoroff and Courty 1999, White 1999). Windblown dust plays a more prominent role in arid soils than wetter regions by being a primary mechanism for the addition of secondary carbonates and clay particles (White 1999, Fedoroff and Courty 1999).

Carbonate Processes in Arid Lands

As previously mentioned, calcium carbonate processes may be a significant component of arid land soils. Distinct, carbonate-rich horizons can form *in situ* through the precipitation of carbonates in soil material (Birkeland 1999, Gile *et al.* 1966). Pedogenic carbonate horizons or calcretes (as opposed to carbonate materials from biological sources such as earthworm excrement) form through precipitation of carbonate from supersaturated soil water in the host sediment, particularly when high concentrations of clay in the sediment create a low porosity barrier restricting movement of water and supporting the precipitation of carbonates higher in the soil profile (Barudžija *et al.* 2010). Additionally, carbonate concentrations can be enriched from calcium saturated groundwater or through calcium inputs from aeolian-borne sediments (Machette 1985, Birkeland 1999).

Calcrete Formation

The development of carbonate as a stage in calcrete formation varies depending upon soil characteristics, such as texture and the amount of calcium carbonate present in the soil (Wieder and Yaalon 1982). In calcareous, medium-textured (sandy to silty or loamy) soils the density of microcalcite nodules (crystals smaller than 1-8μm) increases homogeneously over time along with a parallel decrease in non-carbonate clay. In non-calcareous, medium to fine-textured (silty to clayey) soils, carbonates re-precipitate in intra-pedal and inter-pedal voids as sparites (crystals greater than >20μm) and calcans. In partly calcareous, coarsely-textured (sandy) soils, additions of calcareous dust create a cutanic calciasepic fabric in the C horizon (a fabric including microcalcites where non-carbonate clays and fine carbonates are indistinguishable) (Wieder and Yaalon 1982). Similar developments were seen in comparisons of carbonate development in non-calcareous gravelly and non-gravelly soils (soils containing significant percentage of particles larger than sand) (Birkeland 1999, Machette 1985, Gile *et al.* 1966).

Development of carbonate-rich horizons (caliches and calcretes) progresses from thin, discontinuous coatings in coarse-grained soils and faint coatings in fine-grained soils (as discussed in the above paragraph) to increased coatings and fillings in coarse-grained soils or the development of carbonate nodules in fine-grained materials. Once carbonate material completely fills the void space between soil materials the horizon becomes cemented and can be considered a caliche or calcrete. At this point, continued precipitation leads to the formation of a laminar carbonate horizon overlaying the cemented materials (Birkeland 1999, Gile *et al.* 1966).

Two additional later stages of carbonate formation have also been identified in calcic soils of the southwestern United States (Machette 1985). A fourth stage consists of the development of thick calcium carbonate lamina and incipient pisolites. Following this the calcic horizon undergoes periods of brecciation and breaking, followed by pistolite formation and re-lamination of breccia fragments (Machette 1985).

Carbonates as Proxies for Soil Age

Pedogenic carbonates (carbonate materials created through soil formation processes rather than organic sources) have been used as proxies for soil age (Bowler and Polach 1971, Machette 1985). As carbonates develop in the presence of the CO_2 in soil air they can be used to determine both soil age through radiocarbon dating and as a proxy for climatic conditions as indicated through stable isotope ratios of oxygen and carbon. Investigations of soil age and climatic conditions have explicit archaeological applications in dating palaeosols and occupation layers and for investigating palaeoenvironmental conditions (Bowler and Polach 1971, Duetz *et al. 2001)*.

Dating soil carbonates for soil age is problematic for a variety of reasons. Precipitation of soil carbonates occurs continuously over long time scales (10^3 – 10^6 years) (Duetz *et al.* 2001) allowing for overprinting where both radioactively dead carbon and younger carbon are included into carbonate accretions (Bowler and Polach 1971). Additional sources of contamination for radiocarbon ages of soil carbonates include: variation in temperature and carbonate accumulation, changes in the carbon content of soil organic matter and soil respiration rates, incorporation of aeolian carbonates, precipitation of carbonates from groundwater as discussed

above, and partial dissolution and re-precipitation of carbonates incorporating new atmospheric CO^2 (Duetz *et al.* 2001).
While many studies have still found that radiocarbon ages of soil carbonates correlate reasonably well with independent chronologies based upon charcoal and geomorphic sequencing (Duetz 2001, Pustovoytov 2002, Srivastava 2001), other studies have found significant discrepancies (Bowler and Polach 1971). Analysis of soil carbonate C14 dates across a semi-arid to humid climatic cline in southeastern Australia showed that carbonate dates were significantly younger than the surrounding sediment and the discrepancy increases with increasingly humid zone soils (Bowler and Polach 1971). In groundwater, the C13/C12 ratio had been used to determine possible contamination, but the same ratio was constant across the climatic zone making it not useful for soil carbonates (Bowler and Polach 1971). Errors associated with dating of soil carbonates are also often much larger than the archaeological periods of interest, particularly for historic periods where artifact dating can place sites within a single decade.

Other attempts to use carbonates for dating has relied upon stratified carbonate coatings where lamina within the coating formed under changing climatic conditions. Analysis of these coatings have been utilized in palaeoenvironmental reconstructions with particular value to archaeologists undertaking landscape reconstructions associated with archaeological sites (Pustovoytov 2002, Duetz 2001, Srivastava 2001). In drier phases, pure calcium carbonate lamina develop with well-formed, parallel-oriented crystals, while in wetter periods more soil and organic inclusions lead to darker-colored lamina with poorly-formed and randomly-oriented crystals (Pustovoytov 2002). Additionally, stable isotopes of soil carbonates are strongly linked to soil organic matter and soil fauna as they form in relate to soil CO_2. However, stable isotope values can be affected variously by climatic change, groundwater, or by carbonates precipitated from limestone parent material (Pustovoytov 2002). $\delta^{13}C$ isotopic values are of particular value for environmental reconstructions as shifts between dominant C3 and C4 values indicate shifts from drought resistant flora to wetter conditions (Srivastava 2001, Pustovoytov 2002). $\delta^{18}O$ values provide information about moisture regimes and mean temperature; however, values of $\delta^{18}O$ also correlate with soil age (Pustovoytov 2002). Further, carbonates formed at depth do not reflect the dominant moisture regime, but rather an average composition (Srivastava 2001).

Carbonate Development and Archaeological Research

As a significant component of soil development in arid lands, carbonates have a substantial effect upon archaeological materials and research. The presence of carbonate in soils increases soil pH, which can directly affect archaeological materials. While in many cases it results in better preservation, especially of organic material like bone, in alkaline conditions, it can also affect the mineralization of archaeological materials and produce salt crusts on artifacts and features that obscure surface detail, other residues, or affect the structural integrity of the objects.

The development of carbonate-rich horizons can also significantly alter archaeological stratigraphy similar to the overprinting of depositional stratigraphy by soil development processes. Even when archaeological stratigraphy formed through strictly anthropogenically-influenced deposition, those stratigraphic boundaries can be overwritten and erased by the subsequent dissolution and precipitation of carbonate materials within the sediment. This leads to significant problems for archaeological researchers who rely on stratigraphic relationships to establish the relative sequence of events of human activity.

GEOARCHAEOLOGICAL METHODS AND THE ANALYSIS OF ACTIVITY AREAS

This project makes use of several microscale geoarchaeological methods for analyzing archaeological sites. These include chemical methods such as pH and organic matter analysis, which are used to better understand pedogenic processes across Fort Davis and look for possible effects of human occupation. Other microscale analyses include particle size analysis and micromorphological analysis. These analyses, along with another common microscale analysis (phosphate analysis) which is not included in this study, are discussed below.

Geochemical Methods: Soil pH and Organic Matter Analysis

Soil pH is important both as an indicator of soil processes and anthropogenic activities. As discussed in the carbonate section, increasing precipitation of soil carbonates in arid land soils corresponds to an increase in soil pH and also has implications for the preservation of archaeological stratigraphy. Soil pH can also be affected by human activity. Middens or other areas of refuse disposal, for example, can contain a wide variety of materials whose decay and decomposition impacts soil pH (Table 3.2).

As discussed in the section on soil formation, inputs of organic matter into sedimentary parent material are a significant component of soil development. In arid lands, this input is generally decreased as there is less overall groundcover. However, organic inputs to soils can be alternatively either increased or decreased through human activity. A midden containing high amounts of food waste, for example, would be expected to have higher percentages of organic matter compared to the surrounding area. The interior of a house, in contrast, would be expected to have less since construction of buildings would generally remove previous groundcover which would provide organic inputs.

Specific procedures for pH and organic matter analysis can be found in Chapter 5.

Geochemical Methods: Phosphate Analysis

Phosphorus present in soils as organic and inorganic phosphates was one of the earliest elements used to detect human occupation in general (Eidt, 1984, Wilson *et al.* 2007, Holliday 2007). Phosphorus can be introduced to soils through organic refuse from food waste and stabling, or from natural sources such as the weathering of phosphatic minerals common in parent materials of some soils. Analysis of the distribution of organic and inorganic phosphates (represented as the ratio of total phosphorus to inorganic phosphorus) shows that phosphates are primarily inorganic near dwellings, while high rates of organic phosphates occur near animal stabling areas and agricultural fields (MacPhail *et al.* 2000).

However, despite the widespread use of phosphate enrichment as an indicator of human activity, the analysis of phosphate is complicated by a variety of concerns as exemplified by Holliday (2007). Phosphate can enter soils through several different sources. In addition to mineralogical phosphates, human activities can introduce phosphate into soils through ashes from burning, manure and other animal excrements, animal food and organic construction material, and food remains, among other materials. However, other human activities such as agriculture, cleaning, and high traffic movement can also deplete soil phosphate levels (Holliday 2007).

Once present in soils, there are several pathways by which phosphates can be chemically altered to occur in different forms within the soil (Holliday 2007). Phosphate can occur in both organic and inorganic forms within soils depending on the source of the phosphate as well as what chemical alterations it has undergone as part of the soil. These different phosphate forms have varying degrees of stability within the soil. Easily extractable phosphate includes phosphate that can be taken up by plants and is highly mobile within the soil. At the other end of the scale is highly immobile mineralized phosphate which requires strong chemicals to extract. This can include both mineralized forms natural to the local geology as well as potentially anthropogenic phosphate inputs which have mineralized over long periods of time. These different modes of phosphate within the soil do not easily translate to different phosphate sources, so it is not possible to directly correlate between a type of phosphorus observed in the soil and the anthropogenic inputs of interest to archaeologists (Holliday 2007).

Adding to the complexity of phosphate analysis, there are also a wide variety of methods for extracting phosphates from soils, none of which directly correspond to a particular phosphate source or chemical mode of phosphate within the soil. Holliday (2007) provides a detailed review of soil phosphate analysis for archaeology, including not only an overview of soil phosphate chemistry but also a review and comparison of phosphate extraction methods used in archaeology which details the complexities of this analysis.

This study did not undertake phosphate analysis due to both the complexity of the analysis and its limited analytical usefulness within the context of Fort Davis. First, due to the complexity of phosphate processes within soils, it can be of limited use in archaeological situations where the locations of sites and their general use is already established through historical records, photographs, and oral history accounts. Secondly, limited deposition of sediment throughout the modern town of Fort Davis (discussed in detail in Chapter 8) causes the archaeological ground surface and modern ground surface to be nearly identical in most locations. In this situation, any archaeologically relevant inputs of phosphate (such as from animal stabling or other anthropogenic activities) would be significantly contaminated by modern activities such as animal pasturing or the practice of controlled burning to reduce ground cover.

Microstratigraphic Methods: Particle Size Analysis

Particle size analysis investigates the proportional frequency of soil/sediment particles of different sizes. Within the fine fraction of a soil (the sand, silt, and clay sized particles) different relative frequencies of these particles correspond to typical patterns of soil horizonation. Typically, clay and fine silt sized particles are translocated from the upper horizons into the B horizon during soil formation. The lower horizons (the C horizon) are minimally weathered parent material, usually composed of primarily larger particles. Comparison of relative frequencies of particles sizes can thereby provide information about whether vertical variation within an excavation profile is the result of distinct depositional events (as is the case with geological or archaeological stratigraphy), or the development of soil horizons through pedogenesis. Particle size analysis therefore has significant implications for interpreting the duration of soil development and assess whether vertical variation in an excavation profile is due to pedogenesis or depositional events. Specific procedures for particle size analysis utilized by this project can be found in Chapter 5.

Microstratigraphic Methods: Micromorphological Methods

The final method utilized by this project is soil micromorphology: the description and analysis of thin sections derived from blocks of sediment collected *in situ* from exposed profiles and surfaces (Figure 3.1). Undisturbed blocks of sediment are impregnated with resin and trimmed, cut and ground until they are 35-30μm thick (Figure 3.2) and analyzed using a petrographic microscope (Courty et. al. 1989). Microscopic soil features and their spatial relationships can be identified and described in order to interpret depositional, post-depositional, and pedogenic processes caused by both natural and anthropogenic influences. Tables 6 and 7 include features identifiable through micromorphological analysis as well as their related geological, pedogenic, and anthropogenic processes. Terms used for different components of the micromorphological matrix vary by researcher, particularly those relating the coarse (large-grained) and fine (fine-grained) fractions (Courty *et al.* 1989, Brewer 1964a; 1964b, Fitzpatrick 1993, Bullock 1984). The specifics of micromorphological thin sectioning, along with methods of identification and analysis of micromorphology samples, are discussed in detail in Chapter 5.

Figure 3.1: Photographs showing collection of a micromorphology sample from an archaeological excavation unit in Fort Davis, Texas. Left showing collection of a sample by Erin Rodriguez. Right shows a sample after removal from a profile.

Figure 3.2: Photograph showing sequence from epoxy-impregnated block (left), to trimmed block (center), to thin section slide (right).

Characteristic	Description	Purpose
Mineralogy	Identification of minerals	Information about sedimentary source material, neoformation, and pedogenic processes
Boundaries and Thickness of microstratigraphic units	Boundary types between units and thickness of units	Determine relationships between microstratigraphic units
C/F related distribution	Coarse/Fine Related Distribution (Monic Enualic, Gerfuric, etc.)	Relates to source material and depositional/post-depositional processes
Microstructure	Shape and relationship of peds and aggregates to fine fraction (Crumb, granular, lenticular, etc.)	Relates to source material and depositional/post-depositional processes
Coarse Fraction	Mineralogical identification, orientation, shape, size, sorting	Relates to source material and depositional/post-depositional processes
Fine Fraction	Mineralogical identification, orientation, shape, size, sorting	Relates to source material and depositional/post-depositional processes
Void Patterns	Relationship and pattern of empty spaces in soil structure	Relate to post-depositional processes, faunal activity, agriculture
Fabric	Description of sediment fabric too fine to be differentiate (clay coatings, etc.)	Relates to source material and depositional/post-depositional processes

Organic Material	Identification and description of organic matter (humus) as well as organic inclusions such as plant remains, charcoal, microfaunal remains etc.	Definition of humic horizons and organic inclusions
Archaeological Materials	Microstrata or aggregates of plaster, mudbrick, microartifacts	Relates to anthropogenic activities, construction, etc.
Other Inclusions	Shell, bone, sediment aggregates, etc.	

Table 3.3: Table detailing categories of micromorphological analysis and their use in archaeological interpretation. These categories correspond to those used on micromorphology recording forms for this dissertation
(see Appendix I for a sample form and Appendix III for completed recording forms for each analyzed sample). (Courty 1989, Fitzpatrick 1993, Stoops *et al.* 2010, Brewer 1964b)

Mineral Characteristic	Description
Color, Pleochronism	Mineral Color under polarized light. Pleochronism relates to color changes with rotation under polarized light
Crystal Form	Habitual crystal forms are particular to mineral type
Cleavage	Typical breakage of crystal
Refractive Index and Relief	Difference between the crystal's RI and the RI of the impregnating resin determines the degree to which the crystal is well defined in thin section
Anisotropy	Anisotropic minerals go extinct under crossed polarized (XP) light with every 90° rotation of the microscope stage
Interference colors and Birefringence	Interference colors observed under XP light show the birefringence of the mineral
Twinning	Splitting of the crystal into components with alternating extinction
Optic Sign	(+) or (-), determined from accessory plate and change of interference colors or from interference figure
Length Fast/Slow	Orientation of the mineral to the microscope polarizer (determined using an accessory plate)
Interference Figure	Determine if the mineral is uniaxial or biaxial using a Bertrand lens.

Table 3.4: Table detailing properties of minerals used for petrographic identification
(Perkins and Henke 2004, Fitzpatrick 1993).

Micromorphology and Activity Area Analysis

Identification of activities across occupation surfaces and floors is essential for many archaeological research questions and can be greatly aided by the use of micromorphology. As micromorphological samples are undisturbed sections of archaeological profiles they contain intact microstratigraphy which can be used to characterize archaeological floors and identify remnants of human activities.

Floors and occupation surfaces provide information not only about locations of activities but also about construction techniques and processes of renovation that impact the physical surface of floors and that can be indicative of cyclic patterns of renovation and cleaning (Boivin 2000). Gé *et al.* (1993) compared the features associated with constructed floors and non-constructed occupation surfaces in tells (archaeological sites creates over long periods of times resulting in large mounds of concentrated archaeological materials) to occupation surfaces in other archaeological contexts in order to identify key features associated with floors and surfaces (Figure 3.1). In intentionally constructed floors they identified three distinct zones. The passive zone, which is the lowermost unit, is generally relatively homogeneous with possible remains from organic materials (phytoliths, voids) indicating intentionally deposited materials. The reactive zone is the middle unit and is constructed of similar materials to the passive zone but the structure is modified by trampling as seen in disaggregation, compaction, and the incorporation of anthropogenic constituents. The active zone is the uppermost unit and is highly variable depending on activities and frequency of cleaning. It is formed by the addition of anthropogenic constituents and reworking of the floor construction materials and is usually distinguished from the reactive zone by a clear boundary of horizontally-elongated cavities (Gé *et al.* 1993).

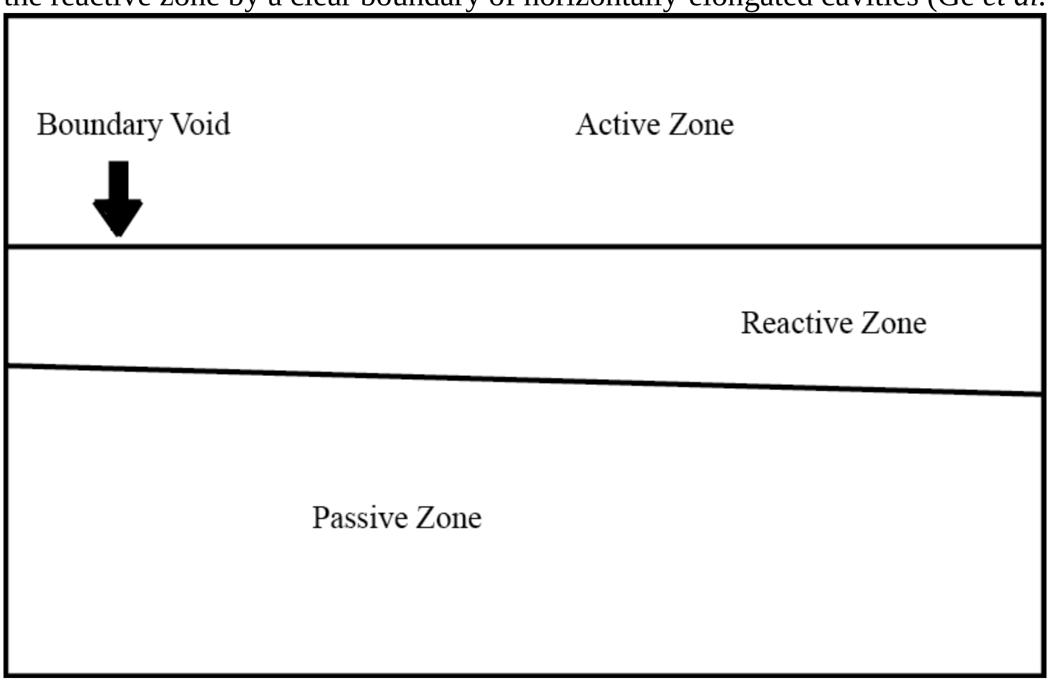


Figure 3.3: Typical Zones within an archaeological earthen floor. The uppermost zone (the active zone) is composed of material overlying the floor itself which is continuously affected by activities occurring across the floor. The central zone (the reactive zone) is the surface of the floor itself which is affected by trampling and other actions in the active zone. The underlying passive zone (the lowermost zone) is minimally affected by actions across the floor.

Analysis of formal floor sequences through micromorphology not only documents the construction and usage-derived zones of floors, but also shows cycles of renovation associated with surfaces (Boivin 2000, Karkanas and Efsratiou 2009). Boivin (2000) discusses the cyclic process of cleaning and renovation associated with the floors of contemporary mud-brick and plastered houses in Rajasthan, India, and compares it with sequences of floor renovation from mud-brick and plastered house constructions at the Neolithic village of Çatalhöyük, Turkey. She finds that processes of renovation and construction of floors are closely tied to cyclical events and processes of house residents such as yearly festivals and life events. In Greece, micromorphological analysis of plaster floors showed that the floor unit identified in the field was actually a sequence of prepared floors separated by trampled occupation surfaces formed through aggregation and compaction of debris (Karkanas and Efsratiou 2009).

Unprepared occupation surfaces in tells showed similar features to constructed surfaces, but generally only two zones were apparent (Gé *et al.* 1993). The lower unit is thin and relatively compact, but with a more open fabric than the passive zone of constructed floors. The upper unit is weakly cohesive and similar to the active zone of constructed floors (Gé *et al.* 1993). Comparison with other archaeological contexts showed the effects of preservation on floor features. While some surfaces were identical to surfaces in tells, others lacked continuity or were present only as aggregates with microstructures typical of the zones outlined above (Gé *et al.* 1993). The importance of micromorphology for identifying disturbed remains of living surfaces is particularly important in situations where intact surfaces are not preserved (Zerboni, 2011). Reworking of stratigraphy through natural processes such as root disturbance and bioturbation, along with human activities like pits, middens, stabling of animals, subsequent reutilization of structures, can not only disrupt evidence of occupation surfaces but can also homogenize occupation zones into dark earth (MacPhail 1994).

Characterizing activities across floors and surfaces is aided by micromorphology through the increased visibility of *in situ* remains of micro-materials deposited through human activities. Comparison of three early urban sites in the Near East (Çatalhöyük in Turkey, Tell Brak in Syria, and Saar in Bahrain) showed the potential of micromorphology for differentiating activity areas (Matthews *et al.* 1997). Using micromorphological analysis from all three sites it was possible to define similarities in deposits from roofed and unroofed areas through evidence of trampling, reworking, and presence of wind and water-laid deposits in unroofed areas (Matthews *et al.* 1997). Further, locations associated with specific activities such as food preparation, cooking, storage, and reception also had distinct micromorphological traces (Matthews *et al.* 1997). Analysis of micromorphological remains at Tell Abu Salabikh in Iraq from the third millennium BCE showed activity area characteristics similar to the three sites detailed above (Matthews 1995). Additionally, characteristics of deposits associated with discard, trampling, sweeping, and the use of mats or rugs are detailed (Matthews 1995). For details of the micromorphological characteristics of each context see Table 6.

Intensity of activity and patterns of traffic across floors can also produce variation in micromorphological constituents (Matarazzo *et al.* 2010, Goldberg and Whitbread 1993). Analysis of surfaces covered by the Avellino eruption of Vesuvius showed variable degrees of compaction across the living surface with a particularly compacted area near the entrance (Matarazzo *et al.* 2010). However, in their analysis of a recently abandoned Bedouin tent floor, Goldberg and Whitbread found that areas associated more traffic but less depositional activity such as sleeping areas, general activity areas, and the kitchen contained more compacted sediments with small voids (Goldberg and Whitbread 1993). Areas with less traffic but higher rates of deposition, such as the midden and hearth, were composed of sediments with more open spaces preserved (Goldberg and Whitbread 1993).

Micromorphology of Architectural and Construction Materials

In architectural contexts micromorphology is used not only to document construction of floors but also other architectural features. Analysis of the experimental earthwork built at Overton Down in the UK, yielded information on the construction and pedogenic processes associated with earth-based barrows (Cruise and MacPhail 2000). At the Medieval Motte of Werken in Belgium construction levels and methods were differentiated using micromorphology, along with post-depositional effects associated with redox reactions induced by a rising groundwater table (Gebhardt and Langohr 1999). At the Taraco Peninsula in Bolivia analysis of an abandoned mudbrick structure documented the post-occupation sequence of adobe weathering, including possible secondary usage and renovation, collapse and increased biological activity during periods of disuse (Goodman-Elgar 2008). Micromorphology has also been used to characterize construction mortar, wall plaster, and floor plaster based upon the type and frequency of voids as well as the remains of roves and other architectural features (Matthews 1995, Courty *et al.* 1989).

Deposit Type	Fabric Description	Inclusions	Citation
Roofed – Food Prep	Depends on Surface Type	Parallel oriented lenses of organo-mineral deposits; grindstone fragments; vegetal voids; phytoliths; pottery fragments	Matthews *et al.* 1997: Matthews 1995
Roofed – Food Cooking	Depends on Surface Type	Organo-mineral fine material; burnt fuel/oven plaster fragments; organic aggregates; bone; lithic flakes; burnt debris and ashes	Matthews *et al.* 1997; Matthews 1995
Roofed Storage	Depends on Surface Type	Charred seeds/grains in varying concentrations; use of rugs	Matthews *et al.* 1997; Matthews 1995
Roofed Reception	Depends on Surface Type	Possible small amounts of charred plant remains or phytoliths; use of rugs	Matthews *et al.* 1997; Matthews 1995
Roofed Ritual	Depends on Surface Type	Variable	Matthews *et al.* 1997
Unroofed domestic and streets	Variable; wind and water-laid deposits; possibly reworked through trampling into thick homogeneous occupation deposits;	Dung; organo-cultural refuse; other	Matthews *et al.* 1997
Stables	Mixing/homogenization of surfaces deposits through trampling	Dung; Spherulites, Staining	Matthews *et al.* 1997, Cruise and MacPhail 2000, Hubbard 2010.
Middens	Discrete deposition lenses; massive deposition; wind and water-laid deposits; burning; intergrain aggregate or linked related distribution; complex packing void microstructure; unoriented; some reworking by trampling	Variable	Matthews *et al.* 1997; Matthews 1995

Use of Mats	Layered lenses of plant remains; sandy deposits on floors from shaking out rugs.	Organic remains (phytoliths), rare	Matthews 1995
Trampling	Unoriented and randomly distributed; homogenized. Porphyric related distribution; densely compacted.	Variable – depends on context.	Matthews 1995
Sweeping	Small subrounded components with moderate-poor orientation and layering. Enaulic or gefuric related distribution with complex packing voids.		Matthews 1995

Table 3.5: Table detailing micromorphological features typical of specific activity areas with citations

Micromorphology of Middens

Micromorphological analysis has been used in midden contexts for analysis of microstratigraphy from individual dumping episodes and to identify specific features and formation processes of middens. At Robert's Haven in Scotland, micromorphological analysis of fish-rich middens was used to determine that the midden formed continuously through accumulation of domestic rubbish rather than sporadically through seasonal fish processing for trade (Simpson and Barrett 1996). In Tierra Del Fuego, Argentina, the specific issues associated with cold climate shell middens were documented through comparisons between experimental samples indicative of human-developed shell middens and control samples from environmental contexts (Villagran *et al.* 2011). Chemical analysis of middens by Eberl (*et al.* 2012) has shown significant variation in chemical variation of midden (in terms of concentrations of soil phosphorus) likely related to variation in midden composition.

GEOARCHAEOLOGICAL RESEARCH IN HISTORICAL ARCHAEOLOGY

The geoarchaeological methods reviewed above have been shown to produce highly insightful information on archaeological sites from a variety of time periods. However, very rarely have these methods (and particularly micromorphology) been utilized within North American Historical Archaeology (the archaeology of the recent past since European colonialism using a combination of archaeological methods, historical records, and oral histories). This section discusses previous work incorporating geoarchaeological methods into historic archaeological research programs focused on residences and activity areas.

The use of geoarchaeological methods with historic archaeology has often focused on determining activity areas with historic archaeological sites. Sullivan and Kealhofer (2004) utilized phytolith analysis and soil chemical analysis to identify six separate activity areas within and around a 17th century residence in Williamsburg, Virginia. Archer *et al.* (2006) utilized a micromorphological approach to investigate the use of a single subsurface feature with a 17th century house from the Atkinson Site in James City County, Virginia, thought to be a root cellar used for food storage. They concluded that the use of a geoarchaeological approaches yielded high resolution interpretation which was not possible from other lines of evidence. In both these studies, geoarchaeological methods were part of a broader research program, but their conclusions were limited and isolated from the primary archaeological questions pursued by researchers at these sites.

In contrast, Entwistle (*et al.* 1998) utilized geochemical analysis of soils from 18th century Scottish settlements using ICP-MS to show than some of the farmsteads appear to reoccupy earlier arable fields. In this study, geoarchaeological methods were directly utilized to foster archaeological interpretations, in a manner closer to the definition of geoarchaeology offered by Leach (1992). This study also shows how geoarchaeological methods can be incorporated into historical archaeology research to offer interpretations of changes in landscape use of and life histories of places that are not possible using other lines of evidence alone. Milek and Roberts (2012) compared the benefits of multi-element analysis, soil micromorphology, organic matter, magnetic susceptibility, micro refuse analysis, pH and electrical conductivity for the identification of activity areas in a Viking Age house in Iceland. They concluded that the most useful information was provided by multi-element and soil micromorphological analyses, while the other approaches mostly confirmed or solidified field observations (Milek and Roberts 2012). These analyses suggest the usefulness of microscale geoarchaeology for historic archaeology research by showing how these methods can be used to investigate aspect of life histories not visible through other lines of evidence.

Fort Davis Environmental Summary

This project is focused on four sites within the modern town of Fort Davis, Texas. Fort Davis is located within the Davis Mountains of the Chihuahua Desert in the Trans-Pecos region of West Texas. The area exhibits many of the typical environmental processes common to arid regions. The climate within the Chihuahua Desert is semi-arid with an average annual rainfall of 480m (McIntyre and Studd 2013). The bedrock geology of the Davis Mountains consists primarily of low-silica mafic igneous rocks (basalts and similar rock classifications) formed during the Tertiary and metamorphosed Cretaceous sedimentary deposits intercut by erosional exposures of sedimentary deposits (Anderson 1968). Fort Davis itself lies at 1487masl on a plain composed of Quaternary alluvial fan deposits. The surrounding mountains to the north and south of Fort Davis National Historic Site (including Sleeping Lion Mountain and Hospital Canyon) are composed primarily of high-silica felsic igneous rocks (generally categorized as rhyolite- this is a high silica rock), which are visible in columnar exposures on cliff faces. Additionally, mafic igneous bedrock (basalt) is also visible at the Fort (McIntyre and Studd 2013).

Climate is one of the primary factors that accounts for differences in soil development. Arid soils, in particular, undergo pedogenic processes distinctly different from wetter soils through not only the absence of water to facilitate leaching, erosion, and weathering but also through differences in the number and types of vegetation and soil fauna (White 1999, Derbyshire 1999, Fedoroff and Courty 1999). Increased aridity reduces the depth of active soil horizons and also restricts many pedological processes necessary for soil development (Fedoroff and Courty 1999). It is important to keep these processes in mind while evaluating the effects of post-depositional processes on archaeological resources at Fort Davis National Historic Site.

A recent vegetation and soil monitoring survey at Fort Davis National Historic Site recorded that local soils consist of rocky loams and sandy loams with low water retention capacity (McIntyre and Studd 2013). Soils generally had low percentages of organic matter and an average bulk density between 0.8 and $1.5 g/cm^3$ (McIntyre and Studd 2013). Biological crusts composed of cyanobacteria, algae, lichens, and brypophytes are common. Similar crusts found throughout the Chihuahua Desert increase soil resistance to wind and water erosion which is essential to soil retention in an arid environment. Analysis of historical photographs by Haynie (2000) suggests four historical vegetation communities: grama grassland, mixed desert scrub, stool scrub, and montane chaparral. In addition, two modern vegetation communities, sandy arroyo scrub, and canyon scrub, have also been identified (Haynie 2000).

Due to low annual rainfall and predominant aeolian erosion, development of soil horizons is minimal in Fort Davis. Minimal deposition means that in many cases the historic surface is impacted by modern, active soil surface. Further discussion of evidence for this based on FODAAP soil analysis is offered in Chapter 8. Carbonate rich or calcic horizons are a common feature of arid soils and are also present at Fort Davis National Historic Site. These have been encountered both in trenching activities by Fort Davis NHS (Eichner and Rodriguez 2015) and excavations by FODAAP around the town. Analysis of several variables affecting carbonate development in Fort Davis is offered in Chapter 8.

Conclusion

The use of geological methods within archaeology has gone from providing contextual information on site-formation processes and environmental factors to using geological and pedological methods to investigate social questions about the human past. This project uses methods from soil chemistry (soil pH and organic matter content) and microstratigraphic methods (particle size analysis and micromorphology) to investigate life histories of four residential sites in historic Fort Davis, Texas, and reconstruct past taskscapes associated with residences and midden contexts. The following chapter with briefly outline the history of Fort Davis since the Fort was founded in 1854 by the United States Army as well as the history of historical archaeological research in the town and at Fort Davis National Historic Site.

CHAPTER 4 A BRIEF HISTORICAL BACKGROUND OF FORT DAVIS, TEXAS (1800S TO PRESENT)

INTRODUCTION

The military post of Fort Davis, Texas, was established in 1854 prior to the United States Civil War. The fort was established on the San Antonio-El Paso Road as at outpost to protect travelers headed west to the gold rush from attacks by native groups such as the Apache and Comanche (Greene 1986, Wooster 1990). The post is located in the high Chihuahua Desert of the Trans-Pecos Region of Far West Texas (Figure 4.1). The fort was originally within a small canyon (now called Hospital Canyon) at the base of Sleeping Lion Mountain. It is located near Limpia Creek in what is now Jeff Davis County and is at an elevation of 1430m (Billings 1974) (Figure 4.2).

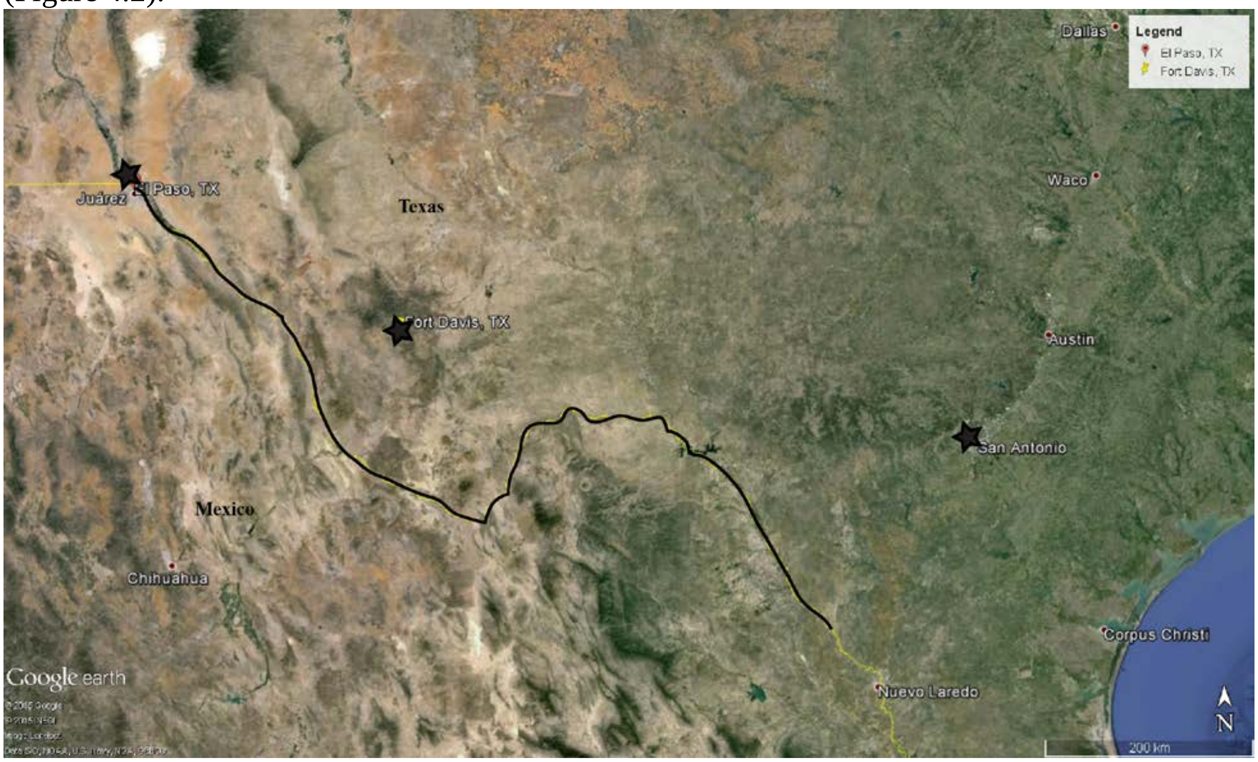


Figure 4.1: Fort Davis, Texas, shown within West Texas and the Texas-Mexico Border.

Figure 4.2: Fort Davis National Historic Site showing the location of Sleeping Lion Mountain, Hospital Canyon and the First Fort, the Second Fort Parade Ground, the (reconstructed) San Antonio-El Paso Road and Limpia Creek.

The Trans-Pecos region of Texas was defined through the Compromise of 1850 that defined territories gained during the Mexican-American War (1846 to 1848). The Compromise determined which territories and new states (including areas of Texas, New Mexico, Utah and California) were admitted as free states or slave-holding states, and also resolved a territorial dispute between the United States and Texas by defining the Trans-Pecos region as part of the United States. Subsequently, Fort Davis further served as a monitoring post for the U.S.-Mexico border (Wooster 1990).

Prior to the establishment of Fort Davis there were several Spanish missions to the west and south of what would later be Fort Davis. However, there was no sustained European settlement of the area prior to the establishment of the military post at Fort Davis. The U.S. attempted to isolate native tribes in the Trans-Pecos region with the establishment of a reservation on the Brazos River in 1854. However this strategy did not succeed as tribes refused to be confined to the reservation (Greene 1986). Attacks by native groups on travelers and settlers were so common that from 1849 to 1881 they were characterized as the Texas Indian Wars (Greene 1986). Evidence for previous settlement of the region around Fort Davis by native groups consist of pictographs, irrigation systems, mounded rock graves, and chipped lithic flakes (Greene 1986, Raht 1963, Scobee 1963). It is unclear whether the site was occupied when it was selected for settlement as an army post (Scobee 1963).

During the United States Civil War the Fort was sparsely occupied with usually no more than 100 men resident at a time (Wooster 1990). The Fort shifted from Union to Confederate hands in 1861, and back to Union control in 1862. After falling under Union control it was used sporadically until it was reestablished as a military post after the war in 1867 (Greene 1867, Wooster 1990).

The Second Fort

When the Fort was reestablished in 1867 during the post-Civil War Reconstruction a new parade ground and barracks were built further east of the original Fort structures at the mouth of Hospital Canyon. This is generally termed the Second Fort in contrast to the First Fort that was located within Hospital Canyon (Greene 1986). The modern Fort Davis Historic Site includes the remains of both forts, but reconstructions consist primarily of Second Fort structures. Once reestablished the Fort also housed four of the post-Civil War army's African American regiments, also known as the Buffalo Soldiers. During this time 23 Medals of Honor were awarded to African-American soldiers fighting in the Indian Wars in the Trans-Pecos region (Wooster 1990). As Texas had supported the confederacy during the Civil War, the stationing of African American troops at Fort Davis during the Reconstruction Period was accompanied by race-motivated acts of violence by Texas Rangers (Leckie 1967), white Army officers (Schubert 2003), and civilians (Wooster 1990, Schubert 2003, Leckie 1967).

Construction of buildings for the Second Fort was plagued by setbacks and other problems. Throughout both occupations the Fort faced severe problems with construction and funding shown through many accounts of soldiers and other residents living in tents or dilapidated buildings while construction of long-term structures was delayed (Wooster 1990, Greene 1986). Lack of supplies meant that many buildings remained unfinished or had leaky roofs or were otherwise in need of repairs (Greene 1986). The barracks were poorly plastered and adobe walls were exposed to the elements leaving the adobe structures to slump and melt, as well as experience water pooling within the barracks themselves (Greene 1986). The Enlisted Married Men's Quarters (one of which was investigated by this project) were described as dilapidated adobe huts (Greene 1986). Based on an historic photograph (Figure 4.3), HB 202, the residence from the Enlisted Married Men's Quarters that was investigated by FODAAP, consisted of a main wooden structure, an addition to the northwest portion of the main structure, and a canvas-roofed addition to the southwest area of the main structure. The Levy Resource Study (Appendix K in Greene 1986) includes a similar description of HB 202 and the associated privy (HB 224).

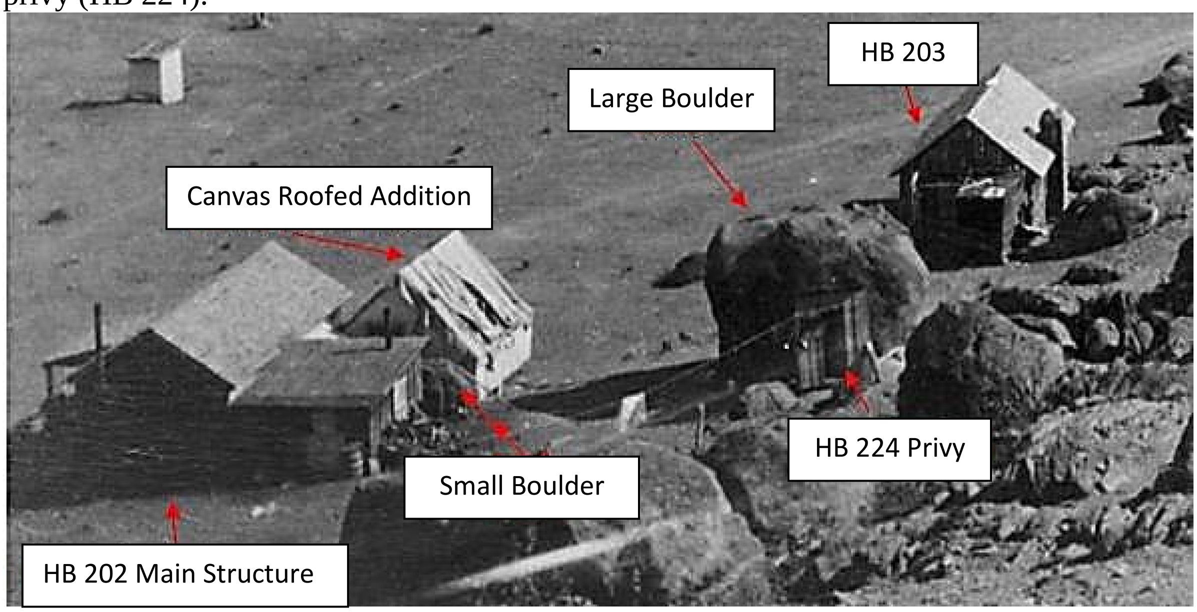


Figure 4.3: Historic Photograph (circa 1885) of HB 202 and HB 224. Provided by NPS FODA (HG-28).

Work as a laundress was one of the few occupations available to single women in Fort Davis as housekeeping for officer's families was often done by enlisted men (Wooster 1990). Originally, laundresses were employed by the Army with two laundresses assigned to each unit (Greene 1986). However, over time the army discontinued the official use of laundresses. Additionally, there are reports that payment was consistently late or otherwise withheld, particularly for isolated posts like Fort Davis (Wooster 1990). Census records indicate, however, the presence of women near the post employed as laundresses throughout the Fort's occupation (Greene 1986). Records from the Fort indicate that laundresses lived in a variety of structures including rough wood and adobe huts, abandoned fort structures, and tents. These residences are generally described as run down and unkept (Greene 1986). Greene's 1986 resource study indicates the presence of four structures attributed as laundresses' residences placed northeast of the parade ground along the San Antonio-El Paso Road. A historic photograph from the Fort Davis archive (Figure 4.4) shows four wooden structures with slanted roofs placed to the east of the road. Excavations by FODAAP in 2015 included two of these structures as well as the surrounding yard space (discussed below). The historic structure study by Levy (Appendix K in Greene 1986) indicates the presence of stone foundations for each these four buildings. The study also indicates that the foundations are covered by the fill of the 1910 road built to the west of the structures (the modern NPS service road is considered a reconstruction of the San Antonio-El Paso Road).

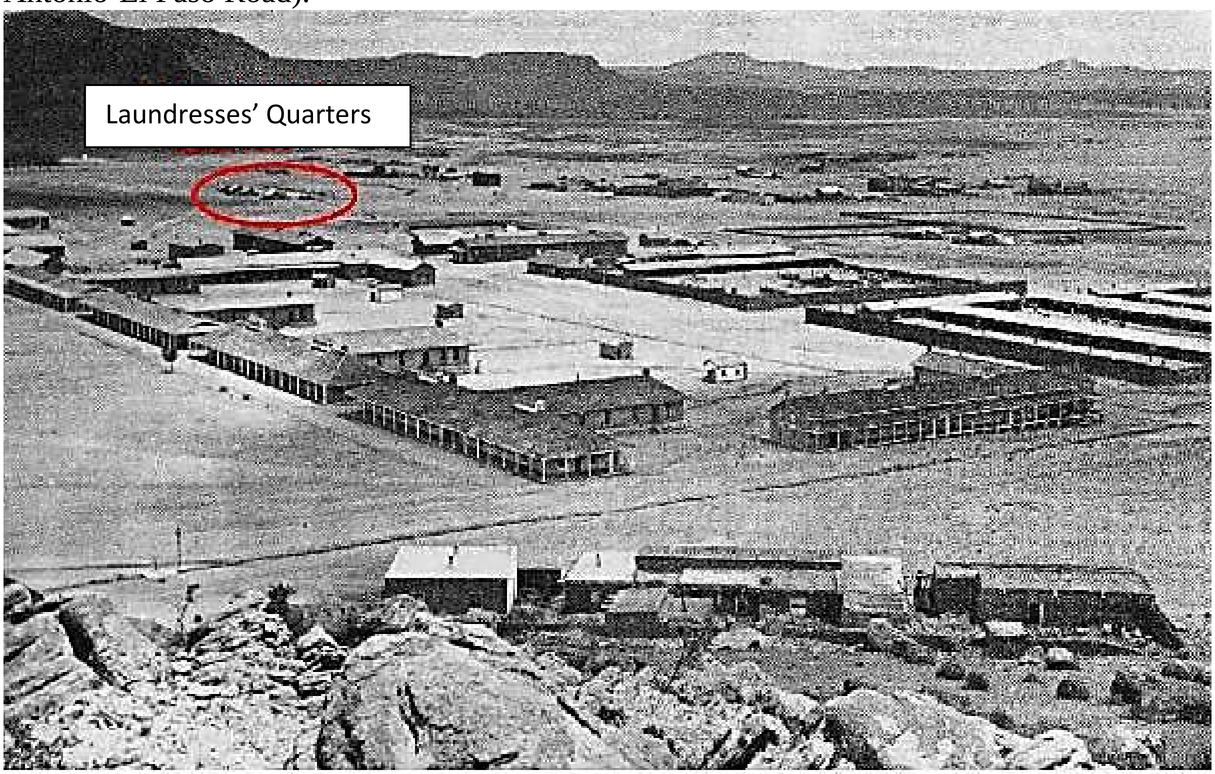


Figure 4.4: Historic Photograph (circa 1885) of FODA parade ground from Sleeping Lion Mountain showing Laundresses' Quarters in background. (from NPS FODA HG-49).

Civilian Fort Davis

The civilian towns of Fort Davis, Chihuahua, and New Town (now collectively known as Fort Davis) grew up around the military post and were populated by European settlers (including many new immigrants), Mexican-American residents, as well as African-American families connected to the Fort (Figure 4.5). Two sites investigated in this study are located within civilian Fort Davis. First, the midden and structure on the Francell-Byerley property are located on land that was originally owned by the Fort near civilian New Town. However, during the time when the midden accumulated (the 1920s and 1930s) the land was in private hands. It is currently unclear who owned the land during this period. The second site, the Smith-Carlton Casa Vieja, is located within the area of town originally known as Fort Davis (rather than Chihuahua or New Town). Although this area of town was predominately white, the Casa Vieja was built by a retired African American soldier, Archie Smith, and he lived there with his Mexican wife until 1911 when the property was bought by the white Carlton family.

In 1891 Fort Davis was closed and the military post moved west 20 miles to Marfa where a new railroad had been built. The civilian population remained, but during the 1900s there were generally around 1000 residents (Wooster 1990). In 1961 the Fort was recognized as Fort Davis National Historic Site and it is now part of the United States National Parks Service.

Figure 4.5: Map showing the locations of the civilian towns of Chihuahua, Fort Davis, and New Town, along with FODAAP excavation sites at FODA-LQ, FODA-MM, the Francell-Byerley property, and the Smith Carlton Casa Vieja.

PREVIOUS ARCHAEOLOGICAL RESEARCH AND FODAAP INVESTIGATIONS

Little archaeological work prior to FODAAP's investigations has been done at the military post of Fort Davis, and no prior work has been carried out in the civilian town. Excavations by Charles Voll (1968) were intended to locate the placement of First Fort structures. Other work in the 1960s focused on restoration and preservation of the buildings. Greene's Historic Resource Study (discussed in depth below) incorporates previous work by James Ivey which was used to number and identify historic structures of the post (Greene 1986). A brief excavation of the barracks was conducted by Ellen A. Kelley of Blue Mountain Consultants in 1983 and 1984. Rescue excavations were carried out on some of the First Fort features in the 1990s. Finally, excavations in the commissary in 2004 and results of a trenching project in 2009 have been minimally documented.

1984 Kelley Excavations

The excavations carried out in 1983 and 1984 by Ellen A. Kelley were done at request of Fort Davis NPS. Kelley was asked to volunteer her time and the excavation was carried out by volunteers. Most subsequent analyses, such as the identification of artifacts, drawing of maps and profiles, and field photography were to be undertaken by Fort personnel and were not included in the excavation report (Kelley 1984). There is currently no evidence that such documentation was undertaken. The Park's intention in undertaking the excavation was to interpret barrack life at the

Fort in the 1880s. However, the structure excavated was occupied in the 1870s. A later report analyzing materials from the 1983 and 1984 excavations by Brunnemann and Williams (1991) shows that the material recovered was related to post-Fort trash disposal by civilian families who reoccupied the Fort grounds after it was abandoned.

Greene's 1986 Historic Resources Study

The historic resources study undertaken by Greene in 1986 provides the most comprehensive overview available of the historic structures and archaeological resources associated with Fort Davis National Historic Site. The report includes the results of an Historic Structures Report (Greene 1986 appendix K) by archaeologist James Ivey. This work was carried out by pedestrian survey and produced descriptions and numberings of Fort buildings which are later referenced by Greene (1986). The survey also placed metal marking stakes at the southeast corner of each building identified. These stakes were utilized by FODAAP in locating structures which are no longer visible, such as HB 202 (Figure 4.13). FODAAP co-director Katrina Eichner contacted Ivey in 2015 and confirmed that Appendix K is the only report associated with this survey.

1990s Excavations

In 1994 flooding in Hospital Canyon exposed a stone foundation associated with one of the Second Fort Barracks. Regional Archaeologist James Bradford of the Intermontaine Region of NPS carried out an assessment of the feature and determined it was related to First Fort constructions (Bradford 2015). This represents the only modern archaeological analysis of First Fort structures.

2004 Commissary Excavations

Additional excavations at Fort Davis NHS were undertaken in 2004 in the commissary as part of building repair work. The material from these excavations is divided between the Western Archaeological and Conservation Center in Tucson, Arizona, and Fort Davis (uncatalogued). Fort Davis park staff located notebooks related to these excavations in 2014, but no report exists except for a Park Powerpoint presentation.

2009 Trenching

A trenching project was carried out by the Park between December 11, 2008 and February 2, 2009 in the main parade ground to install water pipes and IT computer lines (Williams 2009a and 2009b). This project was done without supervision or consultation with archaeologists despite the proximity of the trenching to 26 Second Fort structures (not including standing sinks and kitchen structures) and nine First Fort structures. After the trenching encountered large archaeological deposits, archaeologist Timothy E. Roberts (Cultural Resources Coordinator for the West Texas Region of the Texas Parks and Wildlife Department) visited the site. On January 8, 2009, Roberts drew a plan and stratigraphic profile of a large midden encountered by the trench near HB-23 (one of the barracks). Some backdirt from the trenching was screened during his visit, but the project was not stopped and archaeological methods were not discussed. When the midden was encountered again during further trenching by the same project no maps, drawings, or other reports were recorded. On January 21, additional deposits were encountered and Roberts was again called to site. This time, trenching was stopped until his arrival and continued slowly with archaeological input. Photographs and GPS readings were taken, but no drawings or maps were made. At no point during the trenching project were NPS archaeologists contacted and the two visits by Roberts were the only archaeological consultations carried out. Analysis of the archaeological material recovered was conducted by FODAAP co-directors Katrina Eichner and Professor Laurie Wilkie in 2013 and 2014 and can be found in the final report to FODA (Eichner and Rodriguez 2014).

Fort Davis Archaeological Project Investigations (2013 to 2015)

The Fort Davis Archaeological Project (FODAAP), directed by Katrina Eichner, Erin Rodriguez, and Professor Laurie Wilkie conducted archaeological investigations in Fort Davis from 2013 to 2015. These investigations included a range of survey and excavation conducted at Fort Davis National Historic Site (FODA NHS) and at several additional sites in the town of Fort Davis and the surrounding area.

FODAAP 2013

In 2013 FODAAP began its first fieldwork in Fort Davis, Texas. The project sought to investigate domestic spaces associated with both military and civilian populations to better understand gendered and racial interactions among residents. The project carried out catch and release surface survey at NPS FODA, along with limited subsurface geophysical testing and GPS mapping. Full details of this work can be found in Eichner and Rodriguez (2014). The goal of the summer fieldwork was to locate residential sites of interest to the project as preliminary work towards future excavations. Surveys focused on four major areas within FODA NPS: the Laundresses' Quarters to the north of the parade ground (designated FODA-LQ in 2015), a field east of the parade ground that was hypothesized to have been the first location of the enlisted married men's quarters of the second fort (this was a different location that 2015 excavation in FODA MM and is not included in this study), and yard space behind one of the enlisted men's barracks.

The Laundresses' Quarters at FODA were identified during informal pedestrian survey by Eichner and Wilkie. The location was approximately consistent with the cultural resources survey conducted by Greene (1986) which relied on earlier work by Levy (Appendix K in Greene 1986). The area is north of the parade ground and east of the current service road. It is an area with moderate vegetation ground cover including mesquite trees and several types of cacti. Several moderately-sized arroyos cut through the area, impacting the movement of sediments and archaeological materials through runoff. Historical photographs (Figure 4.4) show four low-roofed structures in this area. The structures appear to be built from wood with slanting roofs and attached fences. The San Antonio-El Paso Road runs directly to the west of the structures.

Catch and release surface survey in this area was conducted by Eichner and a crew of UC Berkeley undergraduate students and aimed to map concentrations of archaeological materials across the area. Additional Ground Penetrating Radar (GPR) survey was conducted by the author in specific areas thought to be associated with the residential structures of the laundresses' as determined by Greene's (1986) survey. Five grids were surveyed within the laundresses' quarters, four of which showed no evidence of foundations or other architectural features. The fifth grid was placed near exposed foundations of HB 211 (which was later the focus of excavations in 2015). Figure 4.6 shows the location of 2013 survey areas in FODA-LQ and the results are discussed below.

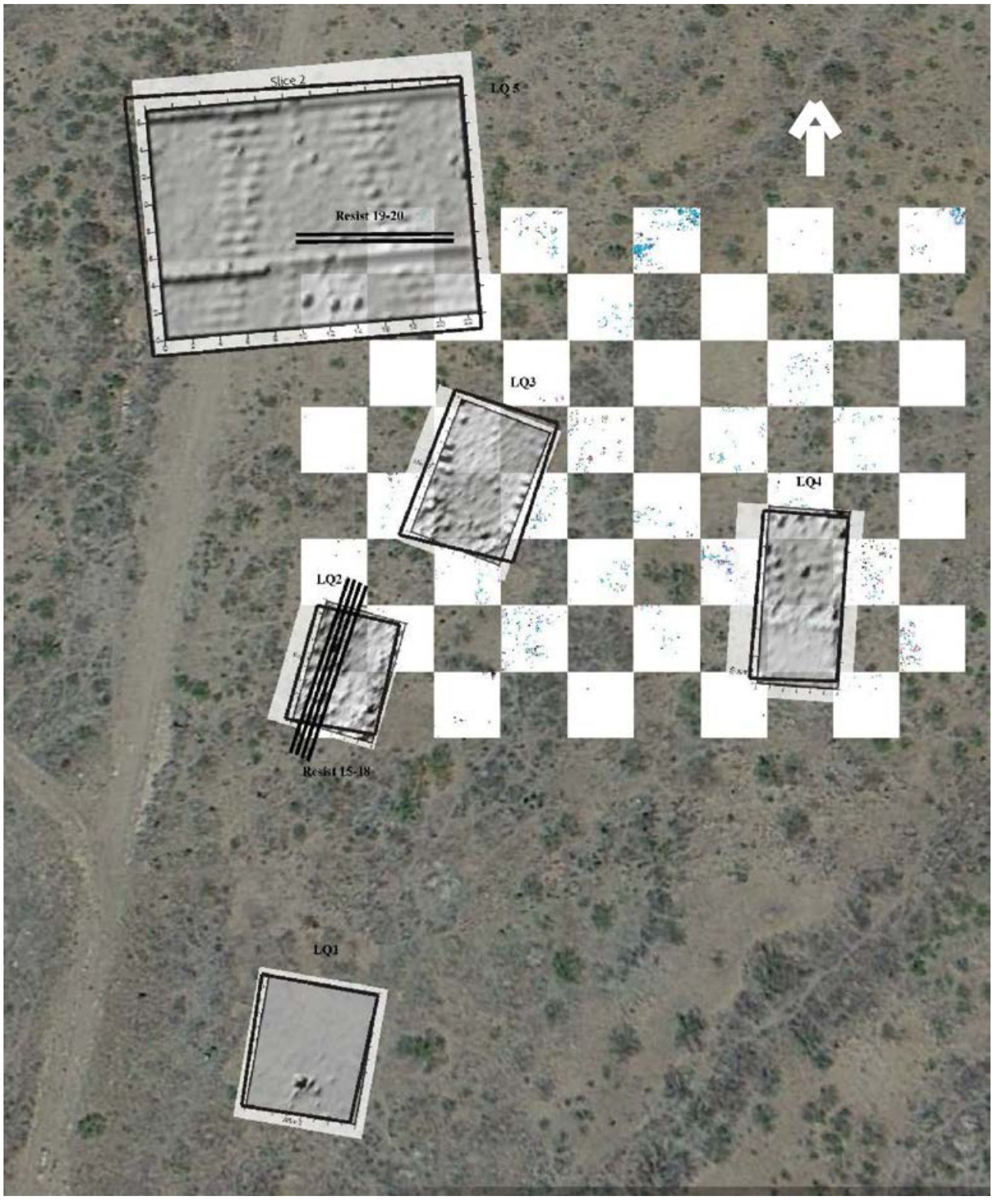


Figure 4.6: Map showing the locations of GPR (overlay images), Resistivity (parallel black lines), and Pedestrian Survey in FODA-LQ during season 2013 (checkboard). Map created by Katrina Eichner for FODAAP's 2014 report to Fort Davis NHS

GPR near HB 211 showed a rectilinear stone foundations running north and west of the exposed section (Figure 4.7). Additionally, GPR showed that the structure ran underneath the currently NPS service road. This road is a reconstruction of the original San Antonio-El Paso Road which ran through Fort Davis. GPR survey (as well as excavations in 2015) show that the modern road is slightly east of the original road, explaining how it currently runs over the historical foundations. Soil resistivity survey was also conducted but did not produce reliable results. Due to the very dry, sandy soil, large quantities of water had to be introduced in order for the resistivity survey to run, thereby affecting the results. This was the case with all resistivity work carried out in 2013.

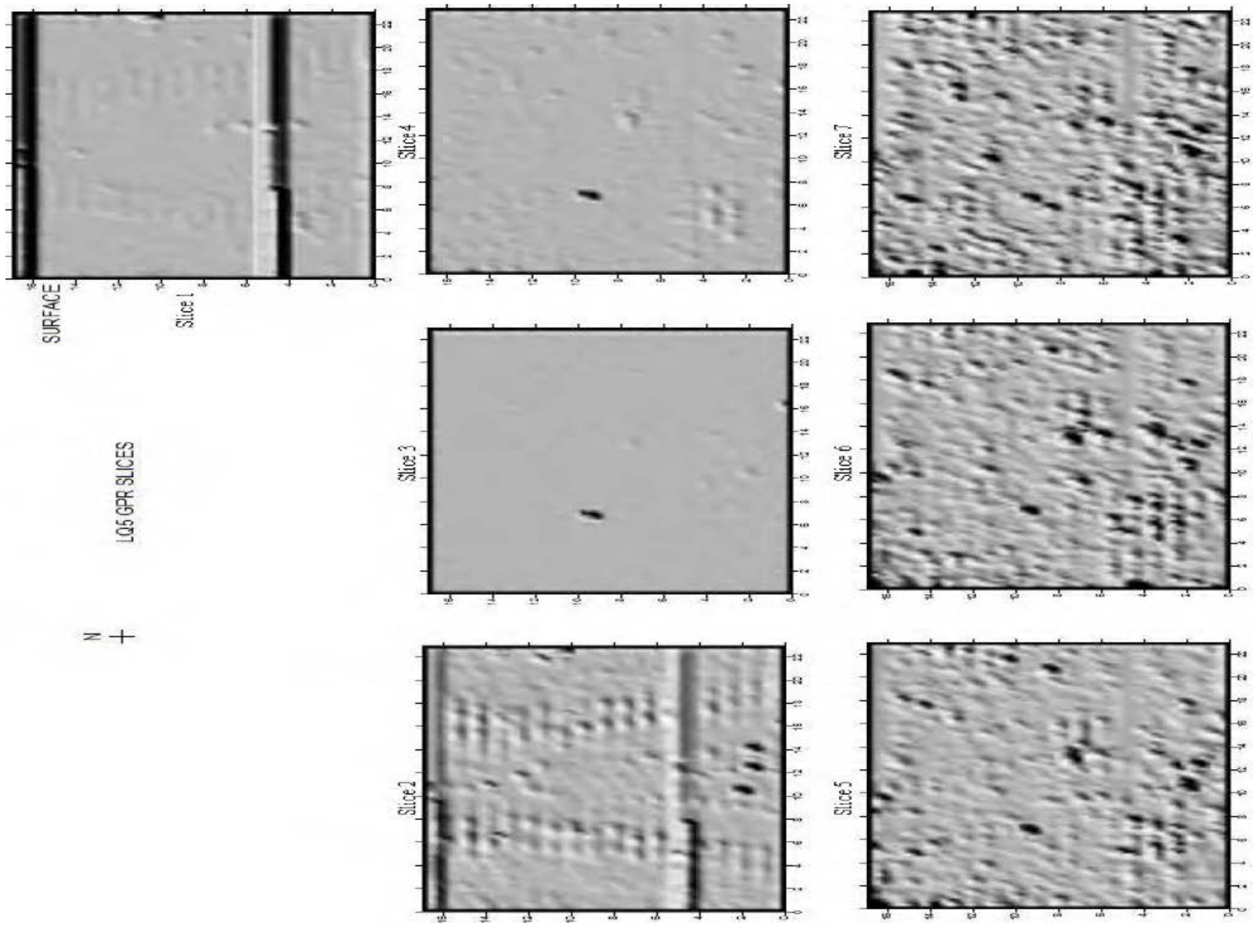


Figure 4.7: GPR slices from survey in FODA-LQ in 2013. Slice 2 shows remains of a stone foundation running north-south in HB-211 which was later excavation in 2015.

Additional survey in 2013 focused on an area to the east of the parade ground that was hypothesized to be the first location of the enlisted married men's quarters during the second fort. This area is currently an open, grassy field with a concentration of gopher holes and ant hills. Catch and release survey revealed a low frequency of archaeological materials. GPR survey did not show any architectural features in the area. Resistivity survey was similarly inconclusive. Finally, brief surface survey and GPR was conducted in the rear yard of HB-22. This area is an open, grassy space which is located in the central part of FODA National Historic Site and sees a high rate of traffic from Fort visitors. Surface survey showed a low density of surface artefactual materials. GPR did not recover any architectural features, but did show a reasonably high density of metal artifacts subsurface.

FODAAP co-directors K. Eichner and L. Wilkie also conducted analysis of archaeological materials recovered during the 2009 trenching project at the Fort Davis parade ground. These materials were recovered during the excavation of a trench for a water line during which no archaeologist was present. Full details can be found in the FODAAP report to NPS (Eichner and Rodriguez 2014).

FODAAP 2014

In 2014 FODAAP did not secure a permit to excavation at Fort Davis NHS due to administrative issues at the National Parks Service. Instead the project excavated at three properties within the town of Fort Davis and also conducted surface survey at The Nature Conservancy Fort Davis Mountains Preserve. Sites were chosen based on their affiliation with significant areas related to late 1800s Fort Davis, as well as the interest of private landowners. Of the four sites, two are included in this dissertation: the Francell-Byerley property and the Smith-Carlton Casa Vieja. FODAAP also conducted excavations at the Overland Trail Museum and, as previously mentioned, survey at TNC Fort Davis Mountains Preserve.

The Francll-Byerley Property

The Francell-Byerley Property is located east of Fort Davis NHS (Figure 4.8). The property was originally owned by the post and may have been used for cavalry drills, among other purposes (Greene 1986). It was later sold to private landowners, but land records for the property are incomplete. Based on oral histories by town residents the property has alternatively been the residence of nuns for the nearby Catholic Church, the home of a local Hispanic family, or the town dump. It is currently owned by the Byerley family but is generally referred to as the Francell Property by town residents.

Figure 4.8: Francell A excavation on the Francell-Byerley Property in 2014. FODA NHS is visible in the background.

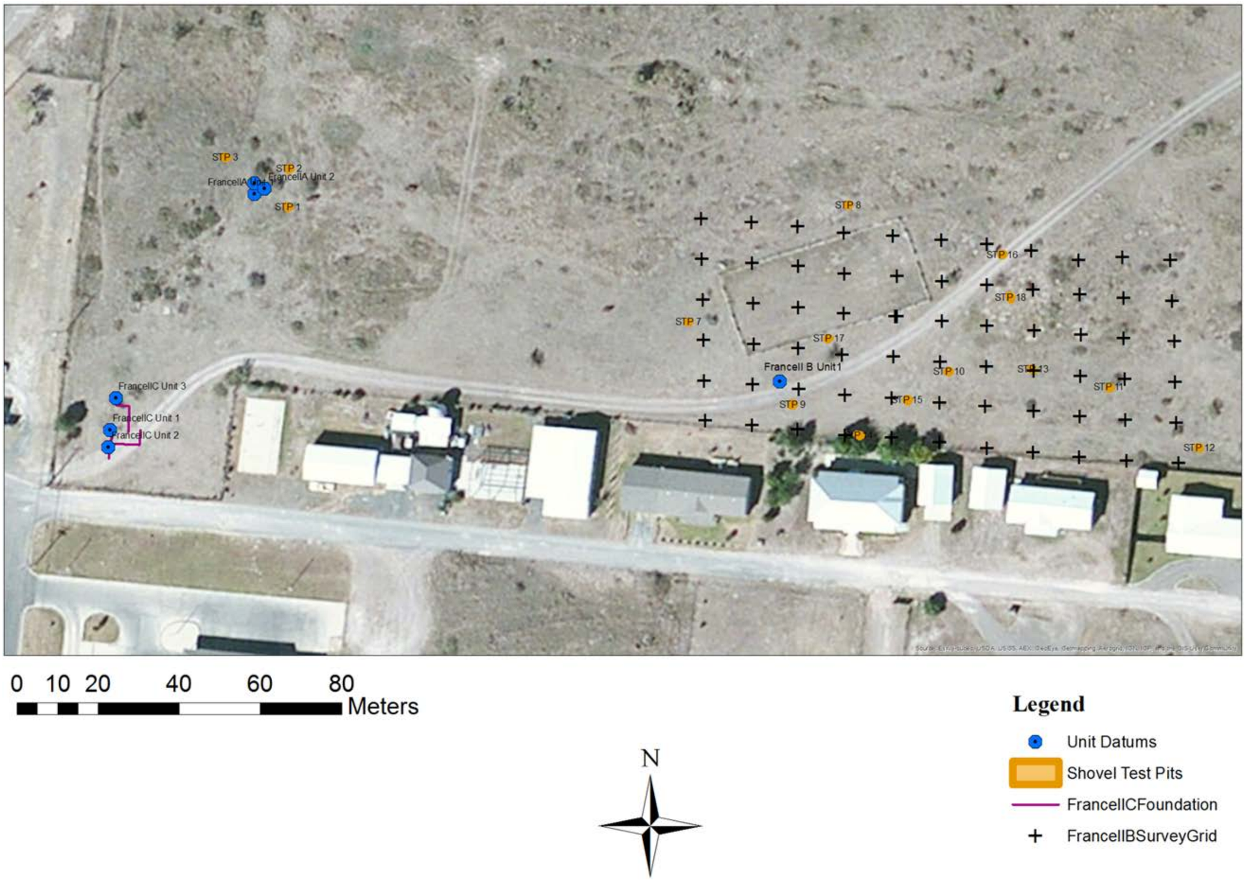


Figure 4.9: Locations of 2014 Excavations and Surface Survey at the Francell-Byerley Property show excavation location Francell A and C as well as surface survey and shovel test pit locations in Francell B.

Excavations at the Francell-Byerley property in 2014 focused on three major areas denoted as Francell A, Francell B, and Francell C (Figure 4.9). Francell A was a dense surface scatter and subsurface midden deposit located on a small ridge in the western central part of the property. Three 1m by 1m excavation units were placed in these areas. However, due to the density of the artifacts, Francell A Unit 3 was closed after only one context was excavated in order to concentrate on the two remaining units. These units contained a very high frequency of fragmented metal, glass, ceramic, charred material, and ash along with large intact glass, metal, and ceramic remains. Eichner dated the midden debris to the 1920s and 1930s based on artifact frequencies. An additional three 50cm by 50cm shovel test pits were placed around the extent of the midden and showed it to be a localized deposit.

The second area of investigation, Francell B, was a broad surface scatter of 1880s artifacts to the east of Francell A (Figure 4.9). One 1m by 1m excavation unit and several 50cm by 50cm shovel test pits were placed within this surface scatter. With the exception of a small burning feature with no associated artifacts, no archaeological features were recovered in Francell B. Extensive surface collection of a 50m x 100m area with the scatter was conducted by Eichner and the 2014 field crew. This area is not included in this dissertation.

The third area of excavation at the Francell-Byerley property was the foundations of a small structure near the entrance to the property which was designated Francell C (Figure 4.9). Three 1m by 1m excavation units were placed around the structure. One was placed in a central room and recovered a low frequency of architectural debris (glass and nails) along with fragmented plaster. Another unit was placed south of the structure near the entrance road to the property and contained very little archaeological material. A third unit was placed in the yard space to the north of the structure and revealed an intact wooden post with metal bindings. Little other archaeological material was recovered.

The second site from the 2014 excavations which is included in this dissertation is the Smith-Carlton Casa Vieja. Located in the southern part of the town of Fort Davis, the site is the oldest standing adobe structure in Fort Davis (Figure 4.5). Its history has been preserved by the Carlton family, who gained recognition of the structure as a Texas State Historic Landmark in 2014 (Figure 4.10). The Casa Vieja was built as a single floor adobe in 1873 by Archie Smith, a retired Buffalo Soldier from the post at Fort Davis, who lived there with his Hispanic wife. His wife was Catholic, and since there was no church in town Smith built an open air breezeway with a vaulted ceiling at the north end of the house where Catholic services were held. In 1911, the property was purchased by Emmett Carlton who built a new house on the property (the Big House) and used the enclosed part of the structure as a hay barn. The Casa Vieja was restored (and the chapel at the north end enclosed) in the 1970s and was occupied by Don and Vida Carlton. Now, it is used seasonally as a residence for the extended Carlton family while they are in Fort Davis. In 2011 a wildfire burned through the property which razed many outbuildings and left deep burn marks on trees in the yard. Surface scatter on the property is a palimpsest of material from the late 1800s through present day. Excavations in 2014 included three units placed adjacent to the adobe structure and one unit placed in the rear yard. Minimal artefactual material or architectural features were recovered (Figure 4.11)

Figure 4.10: Smith-Carlton Casa Vieja in 2014. The main adobe structure is to the right while the main entrance is the enclosed breezeway chapel. The line of trees in front of the house are the remains of a former fence line.

Figure 4.11: Locations of 2014 Excavations at the Smith-Carlton Casa Vieja

FODAAP's 2014 investigations also included a surface survey conducted at The Nature Conservancy Fort Davis Mountains Preserve at the remains of a pinery/sawmill. Located over 10 miles from Fort Davis, historical records indicate that several pineries were placed in the mountains to produce lumber for the Fort (Wooster 1990). Investigation by FODAAP included surface survey and GPS mapping of archaeological surface scatter near a series of dams built on a small mountain drainage. This investigation is not included in this dissertation.

Finally, in 2014 FODAAP excavated two 1m by 1m units in the rear yard of the Overland Trail Museum in the town of Fort Davis. The Museum was originally the home of Nick Mersfelder, a resident and business owner in Fort Davis during the late 1800s. Now the town museum, the structure has been renovated and the yard landscaped. FODAAP was invited by the town's historical society to excavate in the rear yard, but due to landscaping limited material was recovered. These excavations were not included in this dissertation.

FODAAP 2015

In 2015 FODAAP completed excavations at three areas at FODA NHS, as well as conducting limited excavations at the Smith-Carlton Casa Vieja. Full details of the FODA excavations can be found in the report submitted to the National Parks Service in July 2016 (Wilkie, Eichner, and Rodriguez 2016).

Excavations at the Laundresses' Quarters (FODA LQ) were carried out by FODAAP co-director K. Eichner. Excavations were planned to investigate the visible remains of HB 211 (located by through visible foundations and GPR survey in 2013). Additional units were intended to locate the remains of the three other laundresses' residences as well as investigate a broad, sparse surface scatter of late 1800s artifacts located in the arroyos to the east of the structures (Figure 4.12). Due to time constraints and concerns by NPS over the amount of sediment removed during excavations, most excavation units in this area were 50cm x 50cm or 1m x 50cm in size.

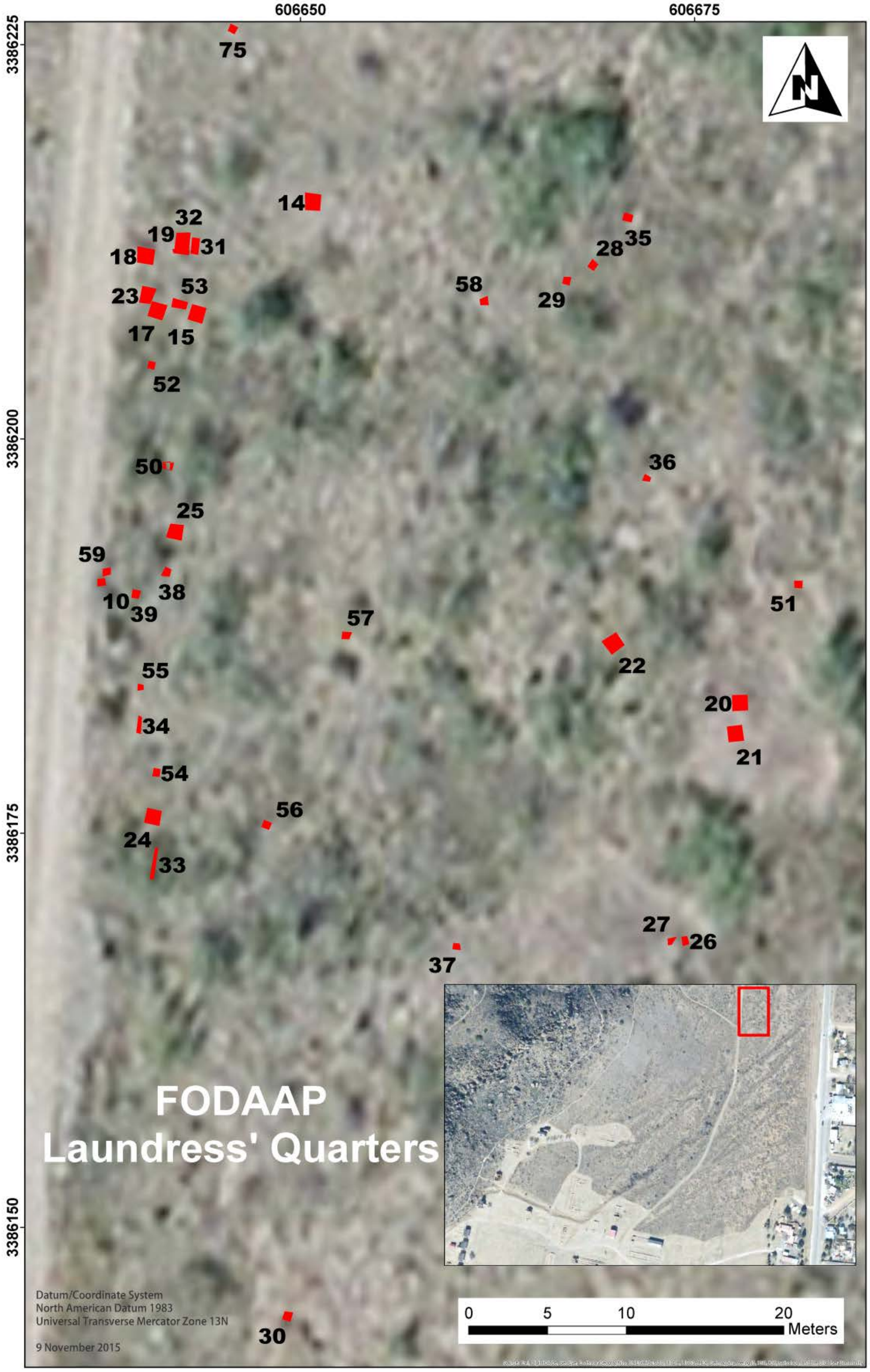


Figure 4.12: Locations of 2015 Excavation in FODA NHS Laundresses' Quarters (FODA-LQ). Map created by Nick Perez for the FODAAP report to Fort Davis NHS (Wilkie, Eichner and Rodriguez 2016).

A second area of excavations was place near HB 202 in the Enlisted Married Men's quarters. This is not the same location as the area surveyed by FODAAP in 2013. Rather, HB 202, along with several other residences, was located at the base of the cliff slope to the north of the parade ground (Figure 4.13). This area is densely vegetated, with large boulders and shallow bedrock. Figure 4.3 shows HB 202 built around a small boulder, with a larger boulder located to the west with a privy (HB 224) directly to the north. This photograph was used to locate the HB 202 stake in the dense vegetation cover. The photograph further informed the placement of excavation units as directed by FODAAP co-directors Eichner and Rodriguez. The photograph (Figure 4.13) shows a main wooden structure similar to other contemporary residences in the Enlisted Married Men's Quarters. Several additions appear to have been added to this original structure included a wooden attachment at the northwestern edge of the structure and a canvas-roofed addition on the southwestern side. These three components of the resident enclose the smaller boulder seen in the photograph. Excavations by FODAAP were conducted in 1m by 50cm and 50cm by 50cm excavation units placed in HB 202 itself as well as adjacent outdoor and yard spaces. No architectural features were recovered and artefactual material appears to have sloped downhill as the structure dilapidated (Wilkie, Eichner, and Rodriguez 2016).

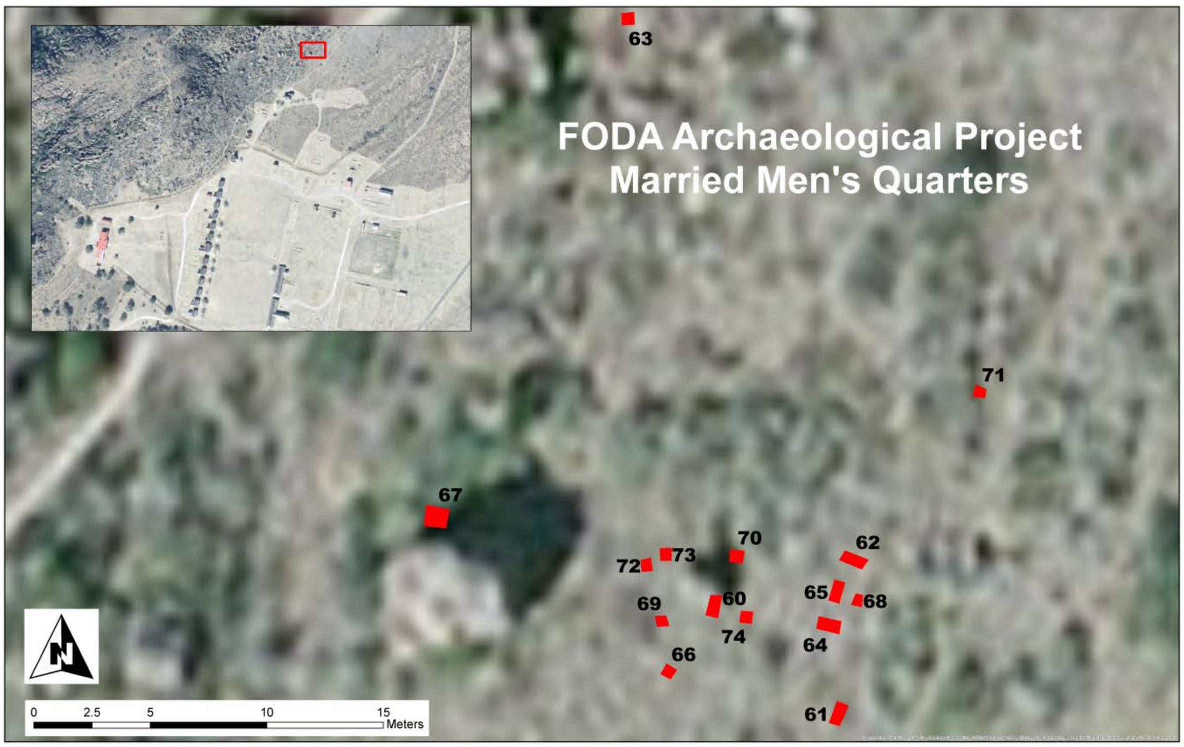


Figure 4.13: Locations of Excavations in FODA NHS Enlisted Married Men's Quarters (FODA MM). Map created by Nick Perez for the FODAAP report to Fort Davis NHS (Wilkie, Eichner and Rodriguez 2016).

The third area investigated at FODA NHS was HB 22, one of the Enlisted Men's Barracks. These excavations were conducted by Professor Wilkie and are not included in this dissertation. Finally, in 2015 FODAAP briefly returned to the Smith-Carlton Casa Vieja to place two 50cm by 50cm units in the front yard space. Neither of these units contained architectural features and very little artefactual material was recovered.

CONCLUSION

Archaeological analysis of Fort Davis, Texas, provides an important opportunity to study daily life and interactions of a diverse community in an isolated region of the United States during the many social changes happening after the United States Civil War. With very little archaeological research conducted on this period in the region this study, along with the parallel studies being conducted by K. Eichner and L. Wilkie, provide essential insights into lifeways and community interactions during this time period. This work is still ongoing and will be presented by K. Eichner and L. Wilkie, respectively, when completed. As this study is also one of the few investigations to incorporate geoarchaeological analysis into a historical archaeological context, it shows the depth and potential of geoarchaeological insights for historic archaeology, as well as for archaeology conducted in regions with minimal previous research. Subsequent work by FODAAP will seek to further integrate these lines of evidence once analysis of the artifactual material is completed.

CHAPTER 5 FIELD AND LABORATORY METHODS

FIELD METHODS

All geoarchaeological samples included in this project were collected in 2014 and 2015 as part of the Fort Davis Archaeology Project (FODAAP). FODAAP has conducted three field seasons of research into the post-civil war occupation of the post at Fort Davis (Fort Davis National Historic Site (FODA-NHS)) as well as the surrounding communities of New Town, Chihuahua, and Fort Davis, all of which comprise the modern town of Fort Davis, Texas. The project is directed by myself, fellow UCB graduate student Katrina Eichner, and UCB professor Dr. Laurie Wilkie. Over the 2014 and 2015 field seasons, the Fort Davis Archaeology Project conducted investigations at seven sites in the modern town of Fort Davis and the surrounding areas. Of these, four are discussed here. The following sections review the methodology of this research program outlined in depth in Chapter 4.

The 2013 field season involved investigations at Fort Davis NHS under permit 13-FODA-1. Investigations included surface survey without collection and geophysical analysis using soil resistivity and ground penetrating radar (GPR). Results from these surveys are detailed in the Previous Research section of Chapter 4. Soil resistivity had limited success due to the dryness of the soil. GPR analysis in the laundresses' quarters (which were excavated in 2014) showed the presence of rectangular stone foundations underneath the current NPS service road. GPR survey in nearby areas where the Greene (1986) resource survey depicted the neighboring laundress residences did not show foundations or distinguishing features.

In 2014 FODAAP conducted investigations at four sites in Fort Davis and the surrounding area. Two of these sites (the Francell-Byerley Property and the Smith-Carlton Casa Vieja) are included in this research. The other two sites include the Pinery and the Overland Trail Museum. The Pinery is located at The Nature Conservancy (TNC) Davis Mountains Preserve. In 2014 FODAAP completed surface survey of the area around three dams which were used for logging and lumber operations by the historic residents of Fort Davis NHS. No excavations were conducted and no soil was collected as excavation was not permitted under the TNC permit. Because no soil was collected this site was not included in this project. The other site not included here is the Overland Trail Museum, originally the home of Nick Mersfelder, a European immigrant to Fort Davis in the late 1800s. The house is now the museum for the modern town of Fort Davis and FODAAP conducted limited excavations in the back yard at the invitation of the town's historical society. Excavations recovered very little material related to the historic occupation of the house, and modern wires were uncovered at the base of a 1 meter deep excavation unit, showing evidence for modern disruption of the historic contexts. Due to this evidence for disruption and the lack of historic material recovered, this site was omitted from study here.

In 2015 FODAAP carried out investigations at Fort Davis NHS under permit 15-FODA -1. The FODAAP team conducted excavation in three areas: the enlisted men's barracks (structure HB 22), the laundresses' quarters (HB 211, HB 212, HB 221, HB 222), and the enlisted married men's quarters (HB 202 and HB 224) (Figures 4.11 and 4.12). Excavations at HB 22 were carried out by Professor Wilkie and are not included in this study as they were carried out under a separate research design. Investigations at the laundresses' quarters and enlisted married men's quarters were designed by Eichner and the author and carried out by Eichner. Both of these areas date to the second occupation of the Fort after the Civil War (1867 to 1891). Details of these investigations can be found in the Laundresses' Quarters and Enlisted Married Men's Quarters sections of Chapter 6.

Excavation

The FODAAP excavation methodology was designed collaboratively by Eichner and the author. Excavation units were 1m by 1m units or smaller. In 2014 the project used 1m x 1m excavation units and 50cm x 50cm shovel test pits. In 2015 the project used primarily 50cm by 50cm units or 50cm by 1m units. FODAAP's permit with FODA-NHS specified the total square meter of excavation allowed, therefore, use of smaller units allowed the project to test more locations that would have been possible with 1m by 1m units. Example excavation forms (for units and shovel test pits) along with micromorphology sampling forms are shown in Appendix I.

Excavation proceeded by *context* defined as discrete natural or archaeological stratigraphic units uncovered either horizontally or vertically. Contexts were differentiated in the field based on differences in soil characterization, such as color, texture, compactness, or inclusions, as well as variation in artifact content. Each context received a unique number within that excavation unit. When a context extended more than 10cm in depth it was subdivided into levels designated by letters. These sub-contexts were also used to delimit horizontal variation in artifact content within the same context. Each context was recorded on a separate excavation form where excavators recorded basic sedimentary characterization data, including Munsell color (wet and dry), texture, compactness, and a summary of major inclusions such as organic matter, charcoal, or large rocks. Plan maps were drawn on the reverse of each form at the close of each context. Photographs of the opening and closing of each context were also taken at this time. Final profile maps were drawn at the close of the unit and after final photographs were taken. Profile maps were drawn of each wall of every excavation unit by the excavator. Final photographs of each unit showing its position relative to other units and landscape features were taken as units were completed and at the close of each field season.

Sample Collection

During excavation, bulk soil samples and flotation samples were taken from each context during excavation by the field crew. By request of historic archaeologists and National Parks Service personnel, bulk soil samples (approximately 400g of soil or sediment) were passed through a 1/4in screen to remove artifacts and placed in an acid-free bag for transportation. Samples were poured directly through the screen and into the sample bag by the excavator. Each sample received a unique identification number recorded on the excavation forms. Flotation samples were also collected for future research, but are not included in this study as there was no paleoethnobotanist currently on staff.

Undisturbed blocks of soil or sediment were collected for micromorphological analysis. Details on the use of micromorphology for archaeological analysis can be found in Chapter 3. Further explanation of the analysis of micromorphology within this study will be presented in the lab analysis section of this chapter. With a few exceptions, soil micromorphology samples (abbreviated MM on FODAAP 2014 and SMS on FODAAP 2015 materials) were taken from excavation profiles after excavation was completed, final photographs were taken, and final maps were drawn (Figures 3.1 and 3.2). Profiles maps were used to place samples over context boundaries. Every attempt was taken to collect samples that represented an entire stratigraphic profile in order to characterize vertical variation within the soil or sediment. In some cases lower contexts were extremely compact due to carbonate development which prevented sampling of certain contextual boundaries. Similarly, contexts that were extremely loose, such as several areas of midden deposits with high ash content, were exceptionally difficult to sample. Units were selected for micromorphological sampling based on archaeological content with preference for units with stratigraphically identifiable deposits of archaeological material, as well as units in known residential areas, such as residence foundations.

Off-Site Comparative Samples

As the entire modern town of Fort Davis contains archaeological remains there is no clear “off-site” location to collect comparative samples. Instead, at each site a location away from major areas of anthropogenic material was selected to collect comparative soil/sediment samples to establish a baseline for local geological and pedological processes in the absence of intensive anthropogenic activity.

At the Francell-Byerley property three 50cm by 50cm shovel test pits were placed beyond the eastern, northern, and western extents of the midden deposit and away from the nearby structure foundations and late 1800s surface artifact scatter. No artifacts or other inclusions indicating anthropogenic content were recovered from these test units. As the midden deposit itself was a very dense concentration of artifacts, charcoal, and ash it can be confidentially assumed that these test pits are beyond the extent of the midden. Bulk soil samples and micromorphology samples were collected from these units.

At the Casa Vieja intensive occupation over the past 130 years has resulted in the presence of archaeological material over the majority of the property, including across the ground surface. In addition, due to modern occupancy of the property, the project aimed to minimize excavation. In place of shovel test pits, a near-surface sediment survey was conducted over a 80m by 80m section of the property. The survey area was gridded and bulk soil samples were taken at 20m intervals unit using a Trimble GPS unit. Samples were taken from 5cm below surface, removing the surface level of plant material, as well as an underlying layer of charcoal and ash present in some locations. No micromorphological samples were taken.

The placement of excavation units at Fort Davis NHS was constrained by FODAAP's permitting guidelines and the conservation mission of the National Parks Service. At the Laundresses' Quarters at Fort Davis NHS test units were placed away from the main residential areas to look for midden deposits, outdoor activity areas, and other anthropogenic features as allowed under FODAAP's excavation permit (Figure 4.12, units on the eastern edge of the excavation area away from the road). Several of these units produced contexts with minimal evidence of anthropogenic activity. Bulk samples were taken from all contexts of all excavations units, including those with minimal archaeological material to serve as comparative samples. However, in the interests of time and budgeting constraints micromorphological samples were only taken from a selection of units in the most archaeological sensitive locations near the historic structures. Details of these samples and their locations can be found in Chapter 6.

In the Enlisted Married Men's Quarters at Fort Davis NHS (Figure 4.13, unit 71) one 50cm by 50cm excavation unit was placed in the field north of the structure in an area with minimal surface artifact scatter. Bulk samples were collected from this unit but micromorphology samples were not due to time and budgeting constraints. In both the laundresses' quarters and enlisted married men's quarters excavations in general included limited evidence of archaeological stratigraphy. Additionally, micromorphology samples were taken from a range of contexts aiming to reflect the variety of anthropogenic, pedological and geological processes taking place across the site.

Summary Maps and Tables

Figures 4.8 (Francell-Byerley Property), 4.10 (Smith-Carlton Casa Vieja), 4.11 (Laundresses' Quarters at FODA), and 4.12 (Enlisted Married Men's Quarters at FODA) show the locations of excavations at each of the four sites analyzed. As discussed above bulk soil samples were collected from each excavation context in each excavation unit. Micromorphology samples were collected based on contexts of particular interest to the research questions, as discussed in the previous section, rather than randomly. Only a subset of these were analyzed due to time and budget constraints. Of the bulk samples collected, all were analyzed for pH and percentage of organic matter. A selection, intended to correspond to locations of analyzed micromorphology samples, was analyzed for particle size analysis. Methods of these analyses are discussed in the following section. Figures 5.1, 5.2, 5.3 and 5.4 below show the locations of analyzed micromorphology samples and locations were particle size analysis was performed on bulk samples.

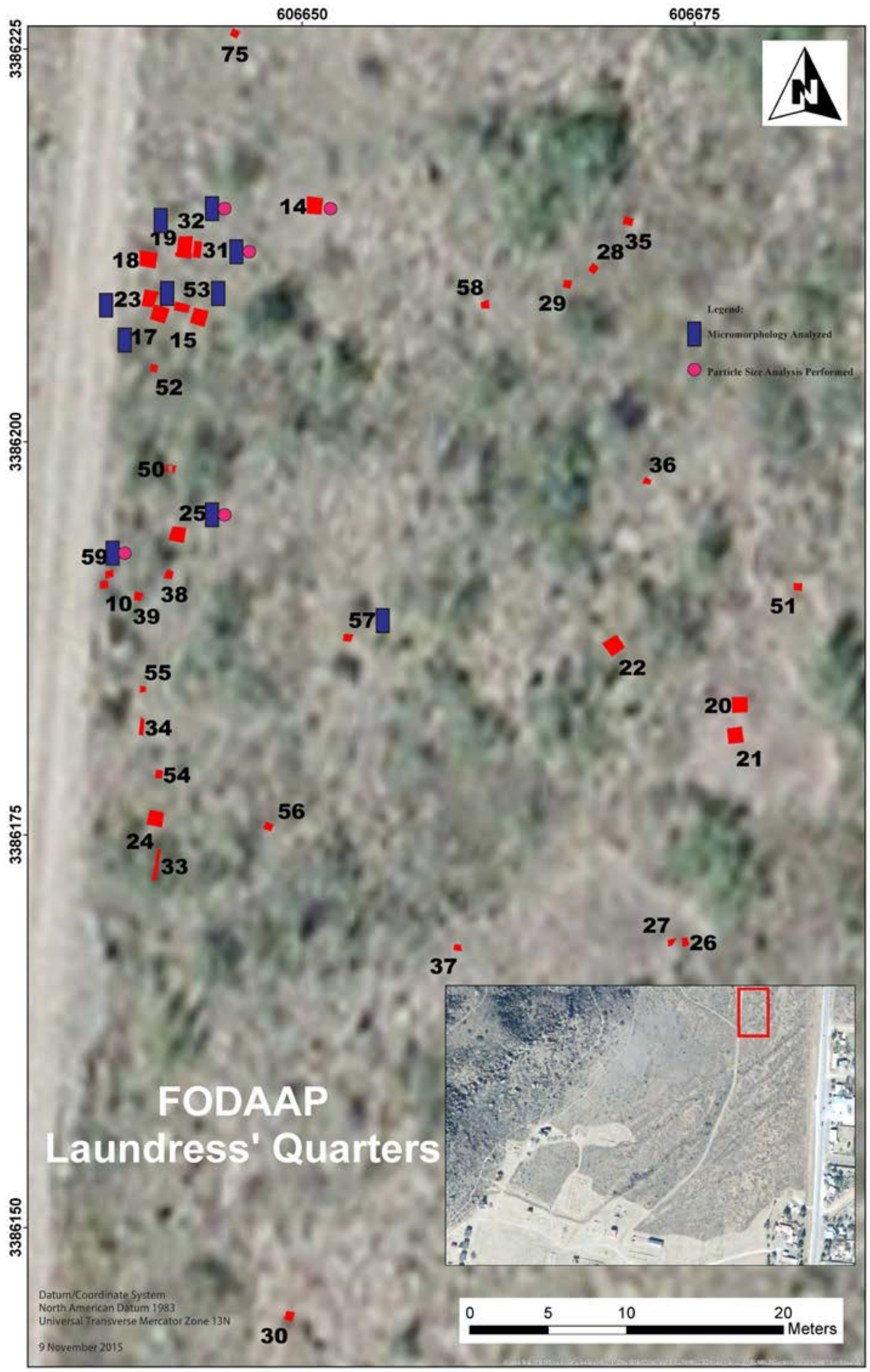


Figure 5.1: Map of the Laundresses' Quarters at FODA-NHS showing locations of excavation units (red), locations of analyzed micromorphology samples (blue), and locations of samples analyzed for particle size (pink)

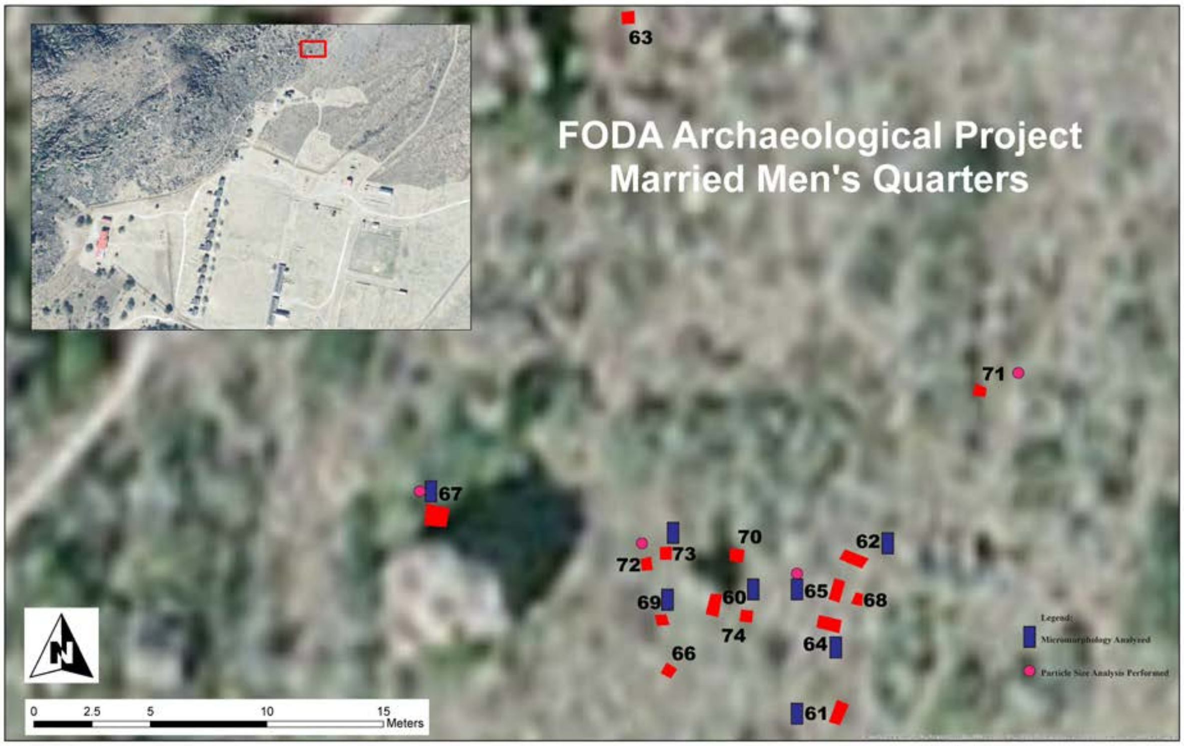


Figure 5.2: Map of Enlisted Married Men's Quarters at FODA-NHS showing locations of excavation units (red), locations of analyzed micromorphology samples (blue), and locations of samples analyzed for particle size (pink)

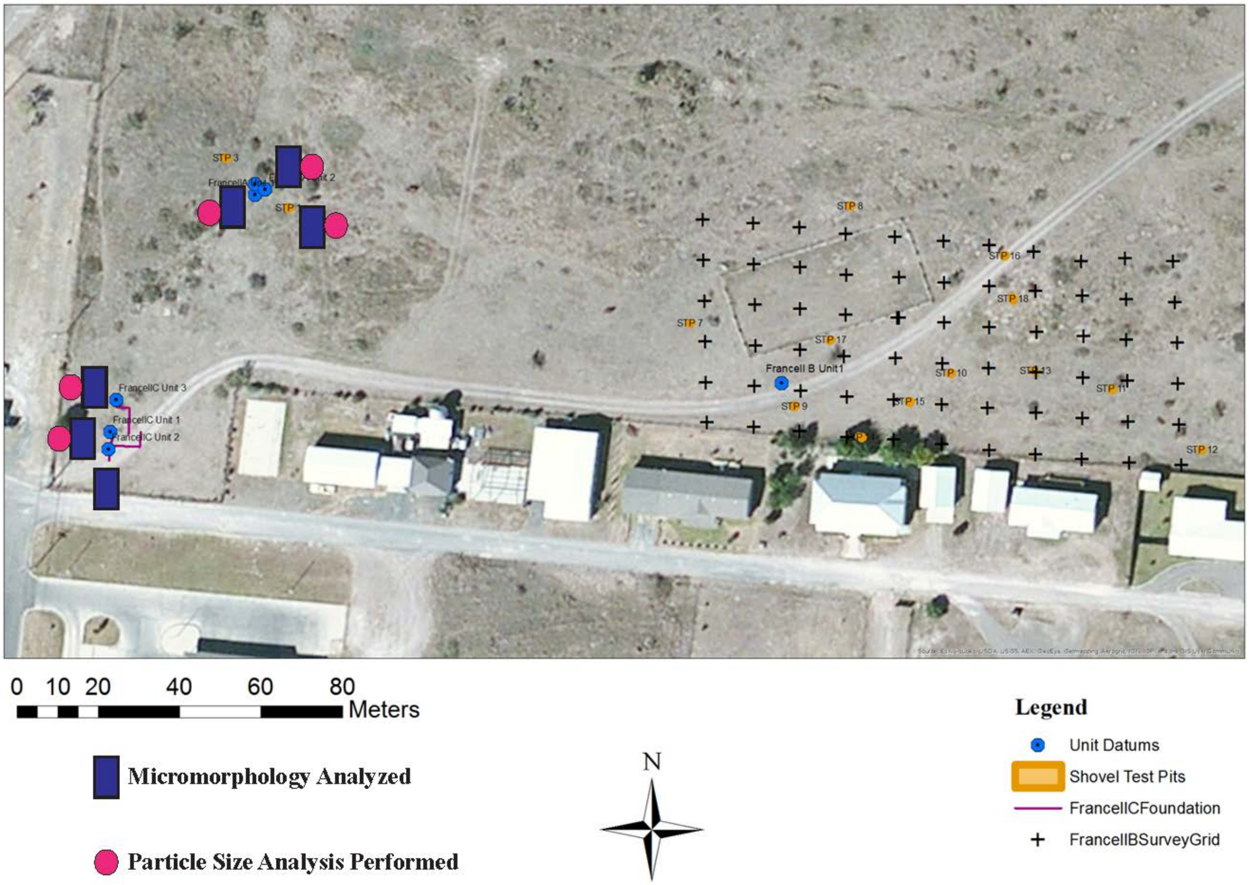


Figure 5.3: Map of Francell-Byerley Property showing locations of excavation units (blue circles and yellow squares), locations of analyzed micromorphology samples (blue rectangles), and locations of samples analyzed for particle size (pink circles)

Figure 5.4: Map of Casa Vieja showing locations of excavation units (yellow squares), locations of analyzed micromorphology samples (blue rectangles), and locations of samples analyzed for particle size (pink circles)

LABORATORY METHODS

The laboratory methods for this project included geochemical analyses (pH and organic matter content) and microstratigraphic methods (particle size analysis and micromorphological analysis). Geochemical analyses were performed on all samples from included sites while microstratigraphic methods were performed on a selection of samples.

Geochemical Methods

pH analysis was conducted on all samples from the four sites following Page *et al.* (1982). Five grams of each bulk sample was passed through a 2mm screen and oven-dried overnight to remove moisture. Each sample was mixed with 5ml of ultrapure water and pH was measured using an Oakton Acorn pH meter. The pH meter was calibrated using buffer solutions of pH 4 and pH 7.

Organic matter analysis was conducted using the loss-on-ignition method (Page *et al.* 1982). Five grams of each sample was passed through a 2mm screen and oven-dried overnight to remove moisture. Each sample was reweighed after drying and this weight recorded as the pre-ignition weight. The samples were then placed in a muffle oven at 440^{o} C overnight. After cooling, the samples were reweighed. Organic matter content was calculated as the difference between the post-ignition and pre-ignition weights as a percentage of pre-ignition weight.

Microstratigraphic Methods: Particle Size Analysis

Particle size analysis was conducted on a selection of samples following the ASTM International (D422- 63, approved 2007) standard method for hydrometer analysis. ASTM International (originally the American Society for Testing and Materials) establishes standard methods for analysis for a wide variety of disciplines and techniques. All samples from the 2014 excavations (the Francell-Byerley property and the Smith-Carlton Casa Vieja) were analyzed with these methods to determine particle size distributions. This information is useful in establishing the presence of soil horizons and characterizing variability between anthropogenic and non-anthropogenic context. For the 2015 excavations (the Laundresses' Quarters and Enlisted Married Men's Quarters at Fort Davis NHS) a selection of samples were processed. As mentioned previously, bulk samples were taken from all excavated contexts. However, as particle size analysis is a time-intensive process, only samples from contexts where micromorphological samples were processed were also analyzed for particle size analysis. Samples were selected based on locations of micromorphological analysis and included samples from interiors and exteriors of residential spaces along with yard spaces. Contexts from the privy (HB 224) excavation in the enlisted married men's quarters were also included. Because samples were taken using a sieve, particle size distributions only include particle sizes of sand, silt, and clay and do not include relative proportions of larger rocky inclusions.

Particle size analysis was done following the hydrometer method (ASTM D422- 63, 2007) following removal of carbonates and organic matter. Forty grams of each sample was passed through a 2mm sieve and oven-dried overnight. Carbonates were removed from each sample using sodium acetate, adjusted to pH 5 with acetic acid (Page *et al.*1982). For each sample, 10ml of 1M sodium acetate was added to the dried sample, along with 100ml of ultrapure water (water that is as close to H_20 as possible through the removal of soluble salts, minerals and other substances normally dissolved in water). As salts (such as carbonates) in soil can act to bind soil particles together it is necessary to use water without these materials to prevent contamination of the sample. Samples were placed in a centrifuge (Thermo IEC Centra CL3) for 10 minutes at 1500rpm. The supernatant was extracted and disposed of. The samples were then washed twice using 100ml ultrapure water in the centrifuge for 10 minutes at 1500rpm. After carbonates were removed, each sample was placed in a muffle oven at 440^{o} C overnight to remove organic matter. From this point on only ultrapure water was used for sedimentation to prevent introduction of additional soluble salts to the samples.

Once cooled, the samples were lightly ground with a mortar and pestle to break up any remaining aggregates and placed in bottles with 100ml hexametaphosphate solution to disaggregate clay particles. Samples were placed on a table shaker overnight. Each sample was placed in a 1L sedimentation cylinder and the sediment and hexametaphosphate solution was diluted to 1L.

A 152H hydrometer was used for sedimentation measurements. The hydrometer is placed within the sedimentation cylinder as the sediment settles. As the sediment settles the reading on the hydrometer reflects the amount of the sample which remains in suspension, thereby reflecting the relative proportion of fine fraction (silts and clays) within the sample. Each sample was shaken manually and hydrometer measurements were taken after agitation at 30 seconds, 10 minutes, 30 minutes, 60 minutes, 90 minutes, 120 minutes, 250 minutes, and 1440 minutes. Temperature measurements were taken at 10 minutes, 30 minutes, 60 minutes, 120 minutes, 250 minutes, and 1440 minutes. Measurements from a blank sample containing only the hexametaphosphate solution and ultrapure water were also taken.

After the final hydrometer measurements were taken each sample was passed through a 53μm screen. The remaining sediment was oven-dried overnight. Each sample was then shaken for 2 minutes in a mechanical shaker with screen sizes of 1mm, 500μm, 250μm, 125μm, 63μm, and 53μm. Weights of sediment in each screen were recorded.

Particle size calculations were done following the ASTM (2007) method. Sand size fractions from the 1mm through 63μm were combined to estimate the percentage of sand in each sample. Estimations of the percentage of silt and clay were taken from hydrometer measurements corresponding to 50μm and smaller (silt) and 5μm and smaller (clay). These combined percentages are represented in stacked bar charts in the data section.

Statistical Analyses of Bulk Samples

Statistical analysis of bulk analysis variables (pH, percentage of organic matter, percentage of sand, percentage of silt, and percentage of clay) was performed using confidence intervals for two standard deviations from the site mean of each variable. For each site, confidence intervals were computed using the means of each variable by unit. For example, at the Laundresses' Quarters, mean pH was computed for each excavation unit. The variation of these means was then used to calculate a two standard deviation confidence interval (Drennan 2004). Single variable scatterplots in Chapter 6 show the spread of each variable by site with confidence intervals denoted by red lines. Means occurring outside the confidence interval (outside the red lines on the scatterplots) can be interpreted as being significantly different from the site mean.

The decision to use confidence intervals rather than statistical testing was based on the unfitness of the data for statistical analysis. Validity of statistical test requires that the dataset meet necessary assumptions, the most important being randomness and independence (Drennan 20044). Neither of these assumptions was true for this dataset, so comparison was done using confidence intervals instead of hypothesis testing.

Non-linear correlation coefficients were calculated for each site to compare bulk analysis variables. These coefficients show the strength of co-variance of each pair of variables (Drennan 2004). For example, if percentage of organic matter and percentage of silt have a high positive correlation coefficient, it can be interpreted that as organic matter increases the percentage of silt also increases. For reasons similar to why confidence intervals were sued in place of hypothesis testing, significance of each correlation coefficient was not calculated. Instead, each is evaluated based on the strength of the coefficient and examination of scatterplots. For instances where an outlier data point produced a strong correlation, that data point was removed in order to assess the relationship between the majority of the data points of each variable (Drennan 2004).

Microstratigraphic Methods: Micromorphology

The procedure for collection of micromorphology samples is discussed in Chapter 3. After samples are collected in the field (Figure 3.1) they were sent to Applied Petrographic Services Inc. for thin sectioning (Figure 3.2). Samples for processing were selected based on archaeological context as determined by field observations with a preference for samples from residential areas (interior and exterior to structures), as well as middens and other disposal contexts. The specific samples selected are discussed in Chapter 6. The thin section process included drying of the intact sample and impregnation with resin while under vacuum conditions. Once this process is complete a trimmed sample is cut from the original impregnated block. A thin section 30μm in width is cut from this trimmed sample through precise grinding. The thin section is mounted on a glass slide for microscopic analysis.

Each sample was described using a description form developed by the author for the FODAAP samples, but based on established criteria for micromorphological analysis (Courty 1989, Fitzpatrick 1993, Stoops et al. 2010, Brewer 1964b) and adapted from forms used by the Geoarchaeology Laboratory directed by L. Maher at UC Berkeley. An example form is presented in Appendix I. Major reference materials and collections for description included Stoops 2003 and Stoops *et al.* 2010, as well as Courty *et al.* 1989 and a reference collection of slides from the Geoarchaeology Laboratory directed by L. Maher at UC Berkeley. For each sample description, the thin-section slide was divided into separate *beds* based on variation in sedimentary characteristics and inclusions. Beds were defined both on distinct visual differences in natural and archaeological characteristics, as well as the presence of a boundary visible either macroscopically or at 20X magnification. If small amounts of variation were present without a bed (e.g., the boundary was diffuse) this was described (i.e., the upper part of the bed is somewhat more compact versus the lower part of the bed, but no clear boundary is visible).

In addition to the description form, each slide was scanned at 3200dpi on a flatbed scanner (Epson Perfection 3170 scanner) and the resulting image uploaded into an accompanying form using Illustrator (see Appendix I for an example). This was used to record the locations of beds and boundaries, as well as all images taken of the slide under the microscope.

For each slide, an initial description was made of the sample context in excavation profiles along with beds and boundaries visible in thin section. Each bed was then described separately with a resulting interpretation. For slides with multiple beds, a final interpretation of the entire slide was also included. Initial description began with characterization of the fabric including color, sorting, ratio of coarse to fine fraction, and the related distribution of the fabric. Microstructure, clay or carbonate content, and b-fabric were also described. For the coarse and fine fractions a summary of grain size, shape, orientation and composition of the fabric were recorded. Voids were described in terms of shape as well as percentage of total area. Orientation of particular void types (such as channel voids) as well as associations between voids and other features such as plant material or carbonate development were also recorded. For an overview of micromorphological descriptive terms see Chapter 3.

Mineralogical description recorded average size, density, distribution and weathering or alteration characteristics for major minerals and rocky inclusions. Given the local bedrock geology of Fort Davis, for most slides this included quartz, trachyte, tuff and occasional basalt, limestone, or conglomerate. Feldspars and micas also occur regularly as accessory minerals. The same characteristics were recorded for organic material and any other materials identified. Organic materials commonly included charcoal, ash, plant remains (unburnt or mildly burnt), and insect excrement. Other materials often included bone, eggshell, metal, ceramic, glass and plaster. Distribution for materials was recorded either generally (such as, plant material commonly found in channel voids), or specifically using the grid system on the image form (such as eggshell in J3).

The recording system for secondary features was developed based on initial analysis of the FODAAP slides and references to Stoops *et al.* 2010 and Wieder and Yaalon 1982. These analyses indicated substantial carbonate development in the form of microsparitic and sparry carbonate nodules, with minimal carbonate in the soil fabric. Coatings and hypocoatings were recorded by type of clay or carbonate. Average thickness, location (such as void or rock type, and the upper or lower side of the rock), and b-fabric type were recorded. Void infillings were recorded in a similar style including type of clay or carbonate (or combination), average thickness, location (and type of void), and b-fabric.

Carbonate nodules were described separately by type following Wieder and Yaalon 1982 with additional types defined through observation of the FODAAP samples. Microsparites (the most common nodule type) were defined as micritic carbonate with individual crystals smaller than 20μm (Figure 5.5 A and B). For slides in which there was a large number of microsparites (also call micritic nodules), subsampling was used to count the total number of nodules (recorded as density). Subsampling was done by counting and measuring the total number of microsparites at three discrete locations (at 20X magnification) in the upper, middle, and center of bed. These locations are marked as MSbed# on the slide image form. For slides in which it was possible to measure and describe all nodules, this was done instead of subsampling. Average diameter was recorded along with nodule fabric, particularly whether or not the nodule also included soil fabric and its similarity to the fabric of the surrounding bed. A description of location and shape was also included.

For the remaining types of nodules all instances in each slide were counted, measured, and identified. The average diameter, fabric description, and a summary of location and shape were also recorded. These include sparite nodules, compound nodules, mixed crystallization nodules, diffuse carbonate patches, and fragmented nodules, all of which are described below.

Sparite (or sparry) nodules were defined as carbonate nodules with crystals larger than 20μm (Figure 5.5 C and D). Compound nodules were defined as unfragmented nodules containing more than one discrete microsparitic nodule bound by undifferentiated carbonate or clay fabric (Figure 5.5 E and F). The fabric of both the inner microsparitic nodules and the binding fabric was recorded. Mixed crystallization nodules contained both sparitic and microsparitic crystals, but did not contain internal microsparitic nodules. Diffuse carbonate patches were areas of carbonate impregnated fabric that were not discrete from the fabric of the surrounding bed, unlike nodules (Figure 5.6 A and B). Fragmented nodules were generally appear similar in morphology to diffuse carbonate patches but were composed of predominantly calcite with some inclusions of soil fabric (Figure 5.6 C and D). These were interpreted as a later stage in carbonate development from the diffuse carbonate patches (further discussion of this interpretation is provided in Chapter 8).

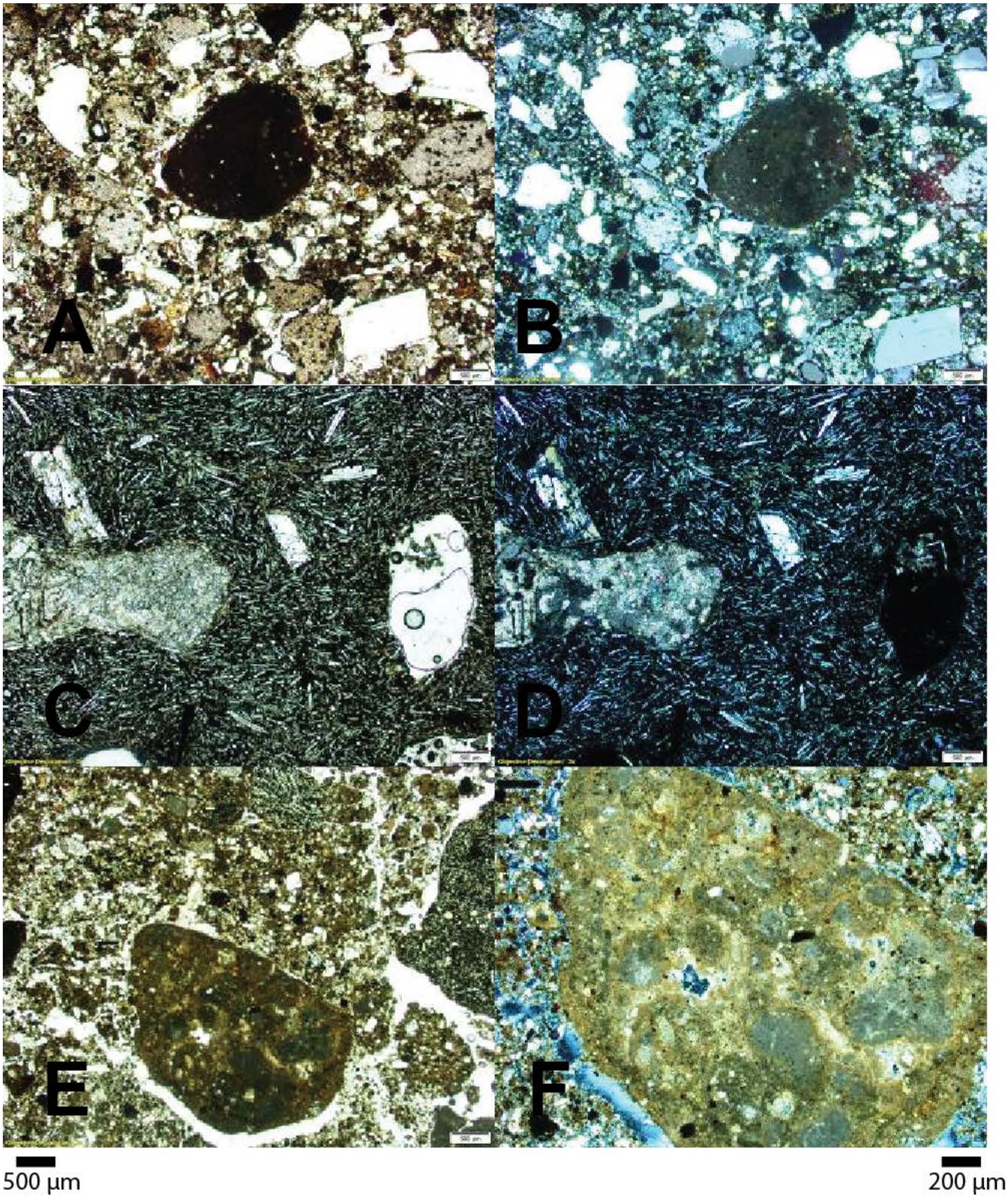


Figure 5.5: Micritic carbonate nodules in PPL (A) and XPL (B) from FODA LQ Unit 59 slide 1508593. Sparry calcite infilling in basalt pore in PPL (C) and XPL (D), FODA MM Unit 64 slide 1021671. Compound Carbonate nodules from Francell A STP 1 in PPL (E) and XPL (F). F is at 40X magnification. All other images are at 20X.

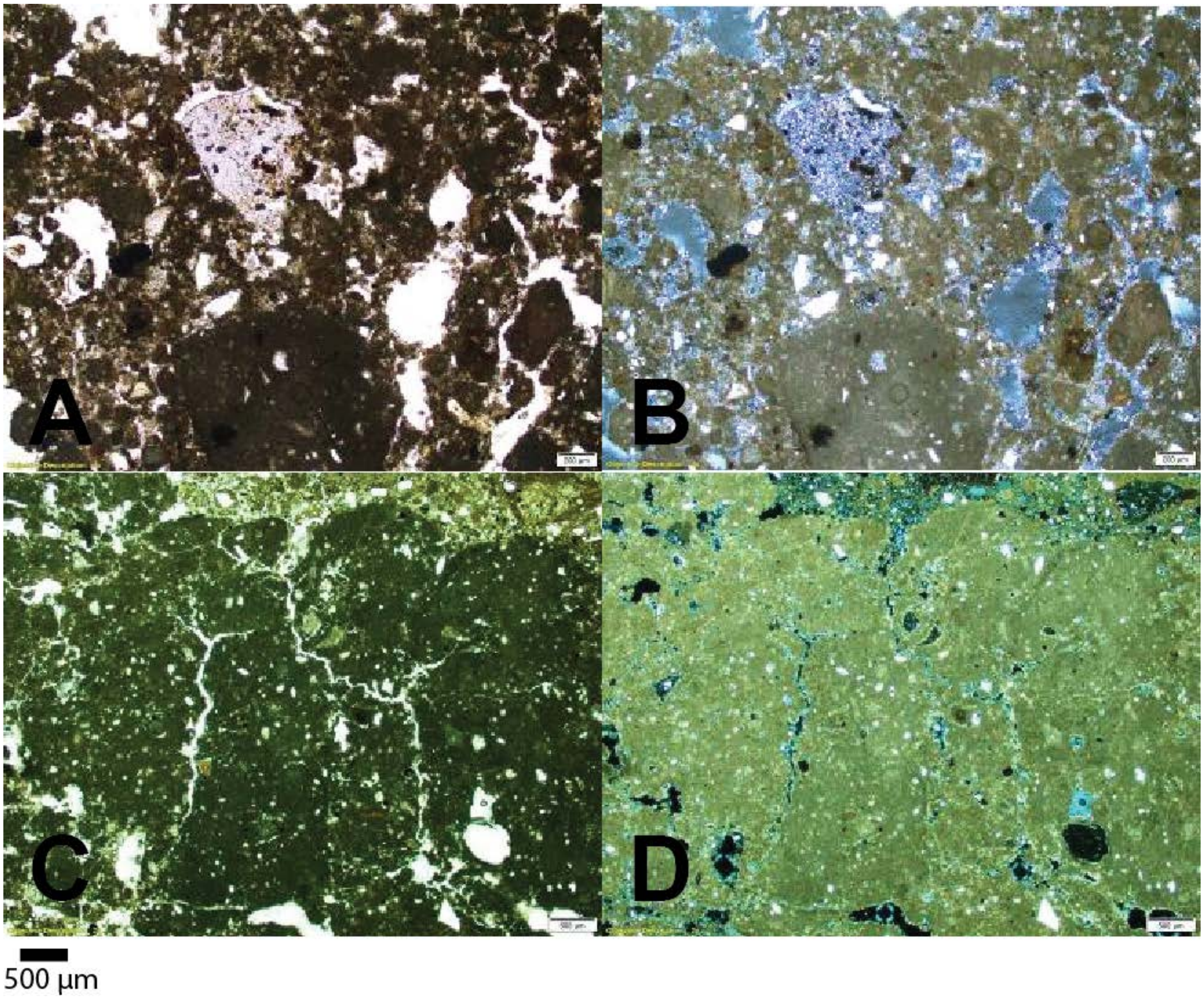


Figure 5.6: Diffuse Carbonate Patches in Casa Vieja Unit 1 slide 1020622. In PPL (A) and XPL (B). Fragmented Carbonate Nodule from Casa Vieja Unit 3, slide 1020614. In PPL (C) and XPL (D). All images taken at 20X magnification.

Rare secondary features were also recorded in terms of location, size, and a general description relying on Stoops *et al.* 2010. These included other carbonate features (uncommonly calcified roots), phosphatic features, and depletion features from water saturation.

Images were taken of the fabric of each bed, boundaries between beds, as well as features of particular interest to slide interpretation. A scale was saved in each image and the location of the images recorded on the slide image form. A description of each image was also recorded. Images as they appeared on the microscope were upside down compared to macroscopic analysis of the slide and not all images were rotated prior to being saved. For this reason, some images within this dissertation appear upside down because they have been rotated to correspond to the direction of the flatbed scan.

SUMMARY

The preceding chapter outlined methods used for excavation and laboratory analysis as part of this project. Excavation procedures were developed collaboratively with FODAAP co-director, K. Eichner, while laboratory procedures reference a range of disciplinary standards. The data gathered as a result of these analyses is presented in the following chapter (Chapter 6) and summarized in Chapter 7. Appendix I contains example field and laboratory forms used to record observations. Raw data for bulk analyses can be found in Appendix II. Complete micromorphology recording forms can be found in

Appendix III. Full excavation information for all FODAAP sites is presented in FODAAP site reports and is available upon request to either the author or the National Parks Service.

CHAPTER 6 DATA

This Chapter presents the results of geoarchaeological analyses on samples taken from the four sites excavated in Fort Davis in 2014 and 2015: the Francell-Byerley Property, the Smith-Carlton Casa Vieja, and Laundresses' Quarters at FODA-NHS, and the Enlisted Married Men's Quarters at FODA-NHS. For each site, results from pH analysis, organic matter analysis, particle size analysis, and micromorphological analysis are presented. A summary of previous research, including results from FODAAP's surface investigations in 2013 can be found in Chapter 4. Methods of excavation, laboratory analysis, and statistical analysis can be found in Chapter 5. Sample recording forms can be found in Appendix I. Tables of raw data from bulk soil analyses (pH, Organic Matter, and Particle Size Analysis) can be found in Appendix II. Micromorphology description forms for each sample analyzed can be found in Appendix III.

LAUNDRESSES' QUARTERS GEOARCHAEOLOGICAL ANALYSES

Excavations in the Laundresses' Quarters

Excavations in 2015 in the Laundresses' Quarters at FODA focused on investigating activity spaces and disposal areas associated with the four structures (HB211, HB212, HB221, HB222) identified on the Greene (1986) cultural resources survey. In historic photographs the four structures appear to be wooden, low roofed structures located on the eastern side of the San Antonio-El Paso road at some distance from the parade ground (Figure 4.2). Greene's (1986) survey of the grounds at FODA placed stakes marking the locations of these buildings also east of the current Service Road that also serves as a reconstruction of the historic San Antonio-El Paso Road.

Investigations in 2013 by FODAAP used Ground Penetrating Radar to survey the areas associated with the building identification stakes (For a discussion of the GPR data see Chapter 4). Survey identified stone foundations associated with the HB211, the furthest north of the four laundress residences, but no evidence of the other three structures was recovered. GPR showed the foundations to extend underneath the reconstructed road (see Figure 4.7). The foundations had a roughly rectangular shape with the majority of the interior space located underneath the road.

In 2015, excavations in the area of HB211 included both interior and exterior spaces. Excavation Units were a mixture of 1m x 1m Units along with smaller 50cm x 50cm and 1m x 50cm Units (Figure 4.12) Three Units placed around the exposed eastern foundation of the structure recovered a threshold stone interpreted as the rear door of the structure (Units 19, 31, and 32) (Figure 6.13). Another cluster of Units (16, 17, and 23) near the southeast corner of the foundation recovered a large feature of ash and artefactual material, mostly construction debris (FIGURE 6.23). Two Units placed in the yard space of HB211 were largely sterile with no apparent archaeological stratigraphy (Units 14 and 15). Micromorphology samples from Units 19, 31, 32, 16, 17, and 23 were collected and analyzed. An additional two samples from Unit 53, placed just outside the southeast corner of the foundation, were processed for a total of 15 micromorphology samples from HB211.

Additional excavation Units were placed south from HB211 in the area east of the road where HB212, HB221, and HB222 were hypothesized to be located (Figure 4.12). No architectural evidence for these structures was located and only limited archaeological material was recovered. However, several Units in the hypothesized area of HB212 recovered mortar and construction debris (Units 25, 38, and 39). Unit 25 was placed along a linear feature of basalt stones which excavators suggested may have been stabilization for a fence (FIGURE XX). Little archaeological material was recovered and the Unit likely represents yard space. In the final week of excavations a 50cm x 50cm test Unit placed on the very eastern edge of the road uncovered a stone foundation Unit 59. On the western side of the foundation interpreted as the interior of the structure (Wilkie, Eichner and Rodriguez 2016), nails, fragments of wood, blue-painted plaster, and adobe subflooring were uncovered. An additional 50cm x 50cm Unit (Unit 10) was placed on the south side of Unit 59, but here the stratigraphy was more disturbed. One micromorphology sample was taken from Unit 59 due to its small size. An additional four samples were processed from Unit 25.

Additional excavations in the Laundresses' Quarters included covering several areas noted to have a dense surface scatter of artifacts. These included several areas in the arroyo to the south and east of the structures. None of these scatters extended more than 10-15cm below the surface and the densest artifact concentrations were at or near the surface. The broad horizontal extent of the debris scatter with a lack of vertical depth suggests a shallow and wide refuse area to the east of the Laundresses' Quarters. Runoff, particularly in the arroyo, would have moved material further east.

Several additional Units contained unique Contexts. Units 27 and 26 were placed at the southeast extent of the arroyo that runs around the southern end of the Laundresses' Quarters (Figure 4.12). The Units were placed in an open, flat area near three basalt stones. The ground surface was slightly higher on the western side of the stones (Unit 27) which was the upslope side of the arroyo. This suggests accumulation of sedimentary material against the stones. Excavation revealed very fine-grained, dark, moist sediment. Field identification suggested a significant clay content. Based on the location of the Units at the base of the arroyo it is likely that this was a location where runoff water would pool, allowing finer-grained particles to settle out. Additional moisture due to pooling encouraged decaying organic material to accumulate, leading to the darker color.

Overall, 48 excavation Units were completed in the Laundresses' Quarters in 2015. The majority of these were 50cm x 50cm Units, with a few 1m x 1m Units, two 50cm x 1m Units, and one 0.25m x 2m trench. Two hundred and fifty-six bulk samples and 24 micromorphology samples were processed from the two structures located by FODAAP in the Laundresses' Quarters (HB211 and HB212).

Bulk Soil Analysis

pH Analysis

pH analysis to measure sediment and soil acidity was conducted on 256 samples from excavations in the FODA Laundresses' Quarters. For all samples taken together, the overall mean pH was 7.10, with a standard deviation of 0.59. The only Unit with a mean pH beyond two standard deviations from the mean was Unit 35 with a mean of 5.50 (Figure 6.1). This Unit was placed near a cactus and contained a large ash feature. Four out of five Contexts within this Unit had observably lower pH than the rest of the Laundresses' Quarters. Table 6.1 shows the mean pH per excavation Unit.

Contexts from four other Units had pH values beyond two standard deviations from the mean. Context 1 from Unit 34 had a pH of 5.90. Other Contexts from that Unit were also in the low 6 range, generally increasing with depth. The excavator's notes record that sediment in this Unit had little artefactual material. The other Contexts with low pH are also all surface Contexts from Units with very little archaeological content (Units 50, 52, and 75).

Comparing Units from near archaeological structures (Units 10, 16, 19, 23, 32, 59, 18, 17, 31, 53, 39, 38, and 25) with Units containing little archaeological material which were not located near structures or surface scatters (Unit 27, 26, 33, 24, 54, 56, 55, 50, 52, and 34), the Units nearby structures had an overall higher mean pH. Units nearby structures had a mean pH of 7.37 with a standard deviation of 0.23 while Units with little to no archaeological association had a mean pH of 6.78 with a standard deviation of 0.41. This difference is not significant, however, it is suggestive. Not only do the non-archaeologically associated Units have a lower pH, they also have a higher variation in pH as indicated by the larger standard deviation of the mean pH within each unit. This may indicate that archaeological structures are associated with an increase in soil pH, possibly associated with increased carbonate precipitation in the soil.

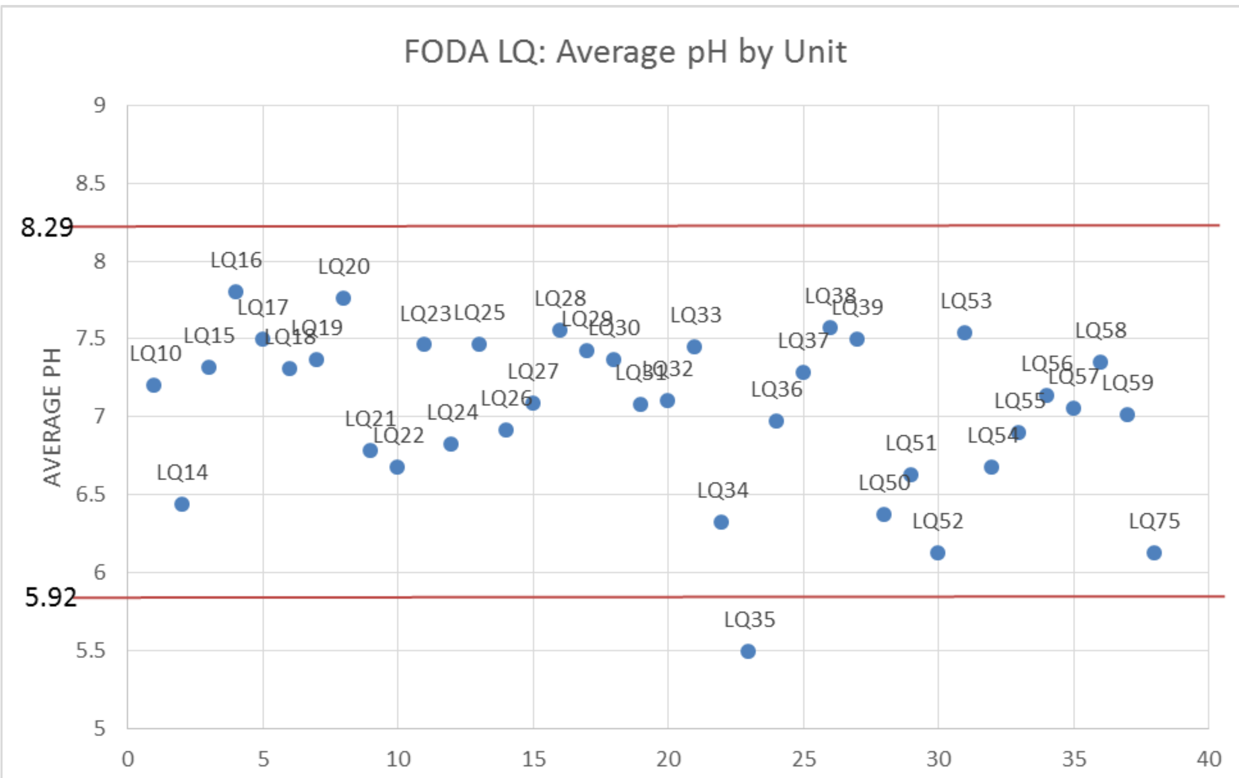


Figure 6.1: A Scatterplot showing Average pH for all bulk samples taken from each excavation unit in the Laundresses' Quarters at FODA-NHS. Red lines represent the boundaries of a 2-Standard Deviation Confidence Interval.

Unit	Mean pH	Unit	Mean pH
LQ10	7.200833	LQ32	7.103333
LQ14	6.433333	LQ33	7.4475
LQ15	7.316667	LQ34	6.325
LQ16	7.801111	LQ35	5.494
LQ17	7.4975	LQ36	6.97
LQ18	7.308571	LQ37	7.2825

LQ19	7.365882	LQ38	7.568571
LQ20	7.76	LQ39	7.496
LQ21	6.784286	LQ50	6.37
LQ22	6.675	LQ51	6.6225
LQ23	7.458462	LQ52	6.1275
LQ24	6.821667	LQ53	7.539231
LQ25	7.466154	LQ54	6.672
LQ26	6.91	LQ55	6.893333
LQ27	7.088	LQ56	7.133333
LQ28	7.5525	LQ57	7.053333
LQ29	7.422	LQ58	7.346
LQ30	7.363333	LQ59	7.014444
LQ31	7.08	LQ75	6.122

Table 6.1: Average pH for each excavation unit in the Laundresses' Quarters at FODA-NHS

Variables Compared	Correlation
%Sand vs. Organic Matter	-0.1273
%Sand vs. pH	0.0812
%silt vs. Organic Matter	0.0871
%silt vs. pH	-0.1007
%clay vs. Organic Matter	0.0855
%clay vs. pH	-0.0699
%silt vs Context	0.2045
%sand vs Context	-0.2229
Organic Matter vs pH	0.1209
Organic Matter vs. Context	-0.0763
pH vs. Context	0.1209

Table 6.2: Correlation Coefficients for comparisons between bulk soil analyses at the Laundresses' Quarters.

Units including Contexts with significant archaeological material interpreted as disposal events had a wide variation in pH (see Appendix 2 for complete results of bulk soil analyses). These included Units from the ash and construction dump in HB 211 (Units 16 and 23), Units 35, 28, and 29 with the large ash feature near a cactus, and Units 20, 21, and 30 from areas of surface scatter. Of these Units, several had comparably low pH values including Unit 35 (mean 5.50), and Unit 21 (mean 6.78). Others had comparably high pH values including Unit 20 (mean 7.76) and Unit 16 (7.80). The high variability in these Contexts suggests that disposal can have variable effects on soil pH.

Using Context number as a proxy for depth, a correlation of 0.12 was found between Context and pH, indicating no significant correlation (see Table 6.2).

Organic Matter Analysis

Organic matter Context measures the percentage of sample Context which is composed of organic matter. The 256 bulk samples from the Laundresses' Quarters were analyzed for organic matter content. Overall, Contexts from the Laundresses' Quarters contained very little organic matter with an average of 2.62% and a standard deviation of 1.40% (Figure 6.2). However, one sample (Unit 23 Context 5) is an outlier with 20.29% organic matter (not shown in

Figure 6.2). This Context is from the midden and ash deposit within the south end of HB211. A comparable Context from Unit 16 (also the ash and midden deposit) also had a high percentage of organic matter, but within the normal range for the Laundresses' Quarters (Unit 16 Context 3 mean = 4.61%). Removing the outlier Context (Unit 23 Context 5) from the dataset gives an overall mean of 2.55% with a standard deviation of 0.86% for the Laundresses' Quarters. Table 6.3 shows the average proportion of organic matter per excavation unit. Recorded proportion of organic matter per Context can be found in Appendix II.

Using this second mean value, two Units have mean percentages of organic matter beyond two standard deviations from the site mean. Unit 21 had a mean of 4.40% organic matter while Unit 26 had a mean of 4.51% organic matter. Unit 21 is from a dense surface scatter in the arroyo to the east of the laundresses' residences. The high percentage of organic matter in this Unit is likely due to debris from the artifact scatter. Nearby Units 20 and 22 also had artifact-rich Contexts with percentages of organic matter higher than two standard deviations from the mean. Unit 26 also had an average percentage of organic matter beyond two standard deviations from the site mean. This was the Unit with fine-grained sedimentary material in the runoff pooling area of the southern arroyo. The high percentage of organic matter in this Unit is likely related to the high moisture observed in this Unit. Two Contexts in nearby Unit 27 also had percentages of organic matter higher than two standard deviations from the mean.

Context 3C from Unit 53 had a percentage of organic matter of 4.50%. This is one of three arbitrary contexts at the same depth (3A, 3B, and 3C) which the excavator utilized to separate artifacts from different areas of the Unit. Context 3C is from south of the stone foundation of HB 211. The bulk samples from the other adjacent contexts were not unusual for the Laundresses' Quarters. It is likely that this sample's high percentage of organic matter is related to construction material. Context 5 from Unit 59 (in HB212) had a percentage of organic matter of 5.22%, likely related to construction debris. The other Contexts from that Unit were not unusual for the Laundresses' Quarters. Context 5 contained construction material and debris, but was not associated with the possible wood floor of HB212.

Finally, Context 3C from Unit 52 had a percentage of organic matter of 0.64%, more than two standard deviations below the overall mean for the Laundresses' Quarters. As this context is quite deep (50cm) and little archaeological material was recovered in the Unit overall, the low amounts of organic matter are likely more likely related to natural processes than anthropogenic inputs.

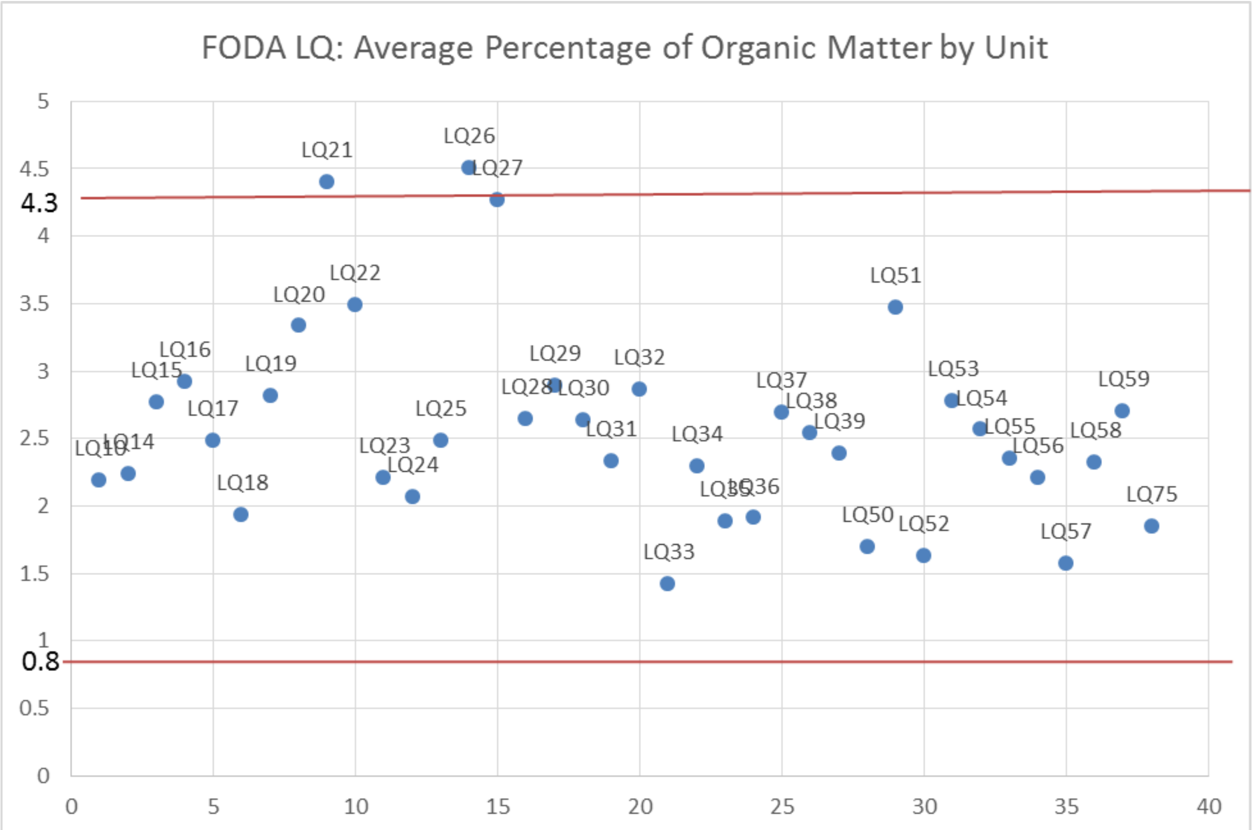


Figure 6.2: Scatter plot showing mean Percentage of Organic Matter by excavation unit for the Laundresses' Quarters at FODA-NHS. The red lines show the boundary of a 2-standard deviation confidence interval.

Unit	Average % Organic Matter	Unit	Average % Organic Matter
LQ10	2.18	LQ32	2.86
LQ14	2.23	LQ33	1.42
LQ15	2.76	LQ34	2.29
LQ16	2.91	LQ35	1.88
LQ17	2.48	LQ36	1.91
LQ18	1.93	LQ37	2.69
LQ19	2.81	LQ38	2.53
LQ20	3.33	LQ39	2.38
LQ21	4.39	LQ50	1.70
LQ22	3.48	LQ51	3.47
LQ23	2.21	LQ52	1.62
LQ24	2.06	LQ53	2.77
LQ25	2.48	LQ54	2.56
LQ26	4.50	LQ55	2.35
LQ27	4.26	LQ56	2.21
LQ28	2.64	LQ57	1.57
LQ29	2.89	LQ58	2.32
LQ30	2.63	LQ59	2.70

Table 6.3: Mean percentage of organic matter for each excavation unit in the Laundresses' Quarters at FODA-NHS.

Organic matter content was plotted against pH values to see if a significant correlation existed between the two variables (Table 6.2). The outlier sample from Unit 23 Context 5 was excluded from this analysis because as an outlier it will have a disproportionate effect upon the correlation. The correlation coefficient for the two variables was 0.12, showing no significant correlation between pH and organic matter content for the Laundresses' Quarters. Using increasing Context number to indicate increasing depth below surface, a correlation of -0.08 was found between percentage of organic matter and context, indicating no significant correlation.

Particle Size Analysis

Twenty-eight samples from the Laundresses' Quarters were analyzed for particle size distribution by the hydrometer method (see Chapter 5). Samples were selected based on proximity to locations of micromorphology samples (Figure 5.1) and included a profile from inside and outside the HB211 threshold in Units 31, 32, and 19 as well as Unit 14 (a mostly sterile Unit in the yard of HB211), Contexts from both sides of the basalt stones in Unit 25, and a profile from Unit 59 in HB212. Table 6.4 shows recorded percentages of clay (< 0.0055mm), silt (0.0055 to 0.063mm) and sand (0.063 to 2mm) for each context analyzed.

Site	Unit	Context	FODAAP Sample ID	%Clay	%Silt	%Sand
FODALQ	32	1	0021194	11.48	15.60	80.12
FODALQ	32	5	1021269	11.97	17.39	69.35
FODALQ	32	7	1021362	12.01	19.23	69.11
FODALQ	32	8A	1021426	11.17	17.63	76.06
FODALQ	32	8C	1021469	11.15	15.25	78.94
FODALQ	31	1	1021223	11.93	19.24	74.61
FODALQ	31	4	1021241	12.27	22.66	69.27
FODALQ	31	6	102139	12.95	20.46	73.65
FODALQ	31	10	1021382	11.37	20.83	72.98
FODALQ	31	11	102146	11.34	17.46	77.20
FODALQ	14	2	1020741	11.66	15.91	74.86
FODALQ	14	3	0020754	12.17	19.89	75.66
FODALQ	14	4	1020837	12.22	17.11	74.69
FODALQ	59	1	1508719	11.59	18.31	76.14
FODALQ	59	2	1508721	12.23	19.54	76.55
FODALQ	59	4	1508725	12.15	16.26	78.24
FODALQ	59	5	1508727	11.96	15.94	82.12
FODALQ	59	7	1508789	11.95	13.77	79.77
FODALQ	59	8	1508926	12.44	17.54	70.71
FODALQ	59	9	1508937	12.99	18.73	69.31
FODALQ	25	1	1020989	12.98	17.05	81.49

FODALQ	25	3East	1021045	12.98	17.05	81.49
FODALQ	25	2West	1021001	10.17	17.81	74.52
FODALQ	25	5West	1021041	9.76	16.41	77.48
FODALQ	25	6West	1021060	12.15	17.16	77.36
FODALQ	25	7	0021114	10.05	16.93	76.27
FODALQ	25	8A	1021181	12.70	17.50	75.24
FODALQ	25	8C	1021196	12.21	16.22	78.91

Table 6.4: Percentages of clay, silt, and sand for each analyzed sample from the Laundresses' Quarters at FODA-NHS.

Overall, sediment from all contexts exhibits a texture of sandy silt, with a mean of 75.36% sand (standard deviation of 3.81%), 17.85% silt (standard deviation of 2.04%), and 11.85% clay (standard deviation 0.83%). No context has percentages more than two standard deviations from the mean. In most units subsurface samples have slightly higher percentages of silt than surface and lower Contexts, but the pattern is not strongly expressed.

Profiles from Unit 31 and Unit 32 on the interior and exterior of the HB211 threshold were analyzed in order to see if there was variation in particle size distribution based on interior and exterior space. In both units percentages of silt were slightly higher in subsurface Contexts and lower again in contexts from the base of the units. This is consistent with evidence for weak soil horizon development. The units are overall similar. Figure 6.3 shows the south excavation profile of Units 31 and 32. Figure 6.4 and 6.5 show the particle size distribution by context for analyzed contexts in each Unit.

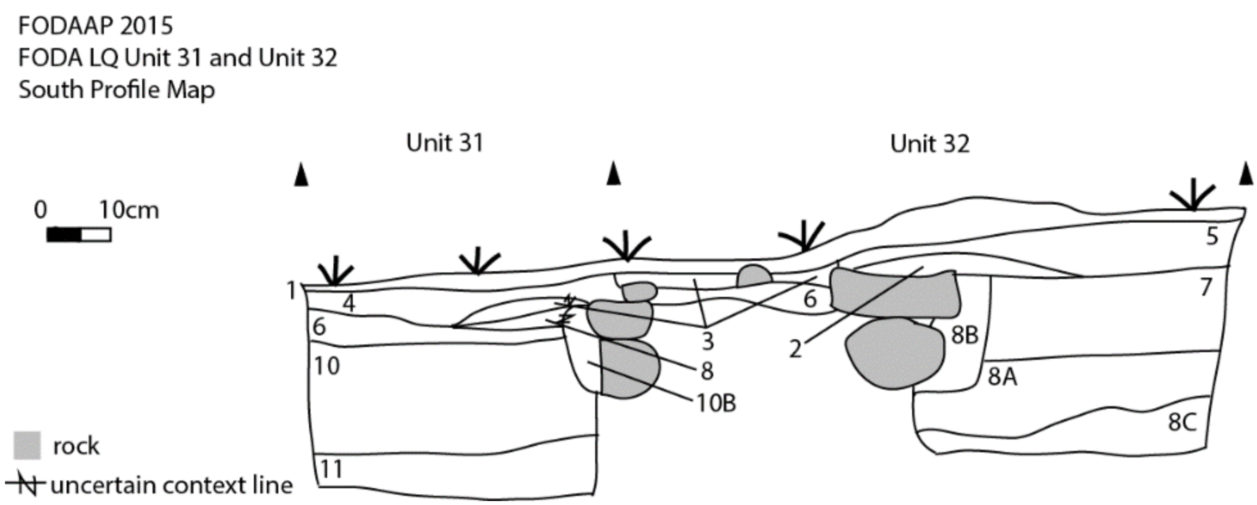


Figure 6.3: Stratigraphic Profile Map of the south profiles of Units 31 and 32 showing Contexts on either side of the eastern foundation of HB 211.

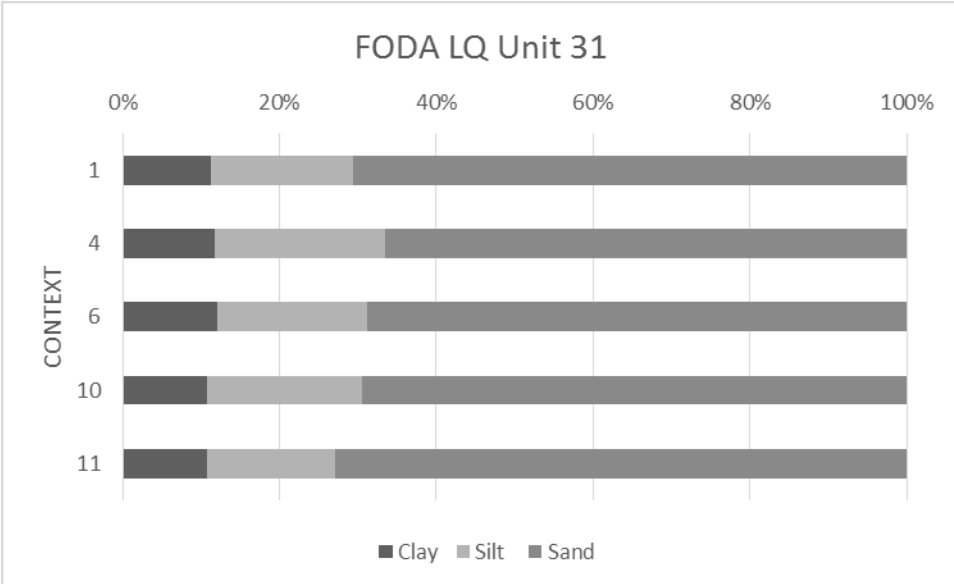


Figure 6.4: Bar chart showing relative percentages of clay, silt and sand for analyzed contexts in Unit 31.

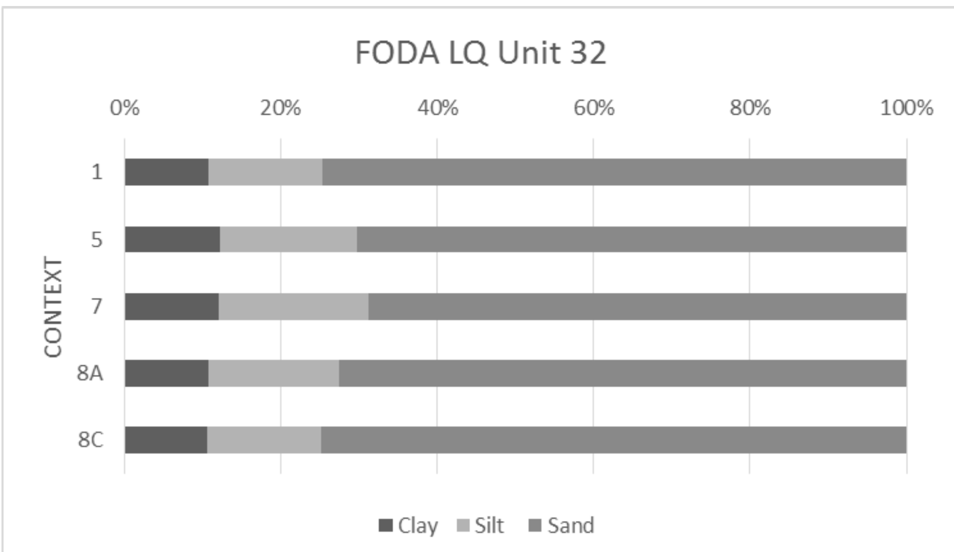


Figure 6.5: Bar chart showing relative percentages of clay, silt and sand for analyzed contexts in Unit 32.

Unit 14 from the yard of HB211 had very limited stratigraphy, differentiated in the field primarily on texture and compactness. Particle size analysis showed very little variation between Contexts with a slightly higher percentage of silt in Context 3 compared to overlying Context 2 and underlying Context 4. Overall, however, the Unit was similar to the stratigraphy documented from Units 31 and 32 in the structure. Figure 6.6 shows the west excavation profile of Unit 14. Figure 6.7 shows the particle size distribution by Context for analyzed Contexts in Unit 14.

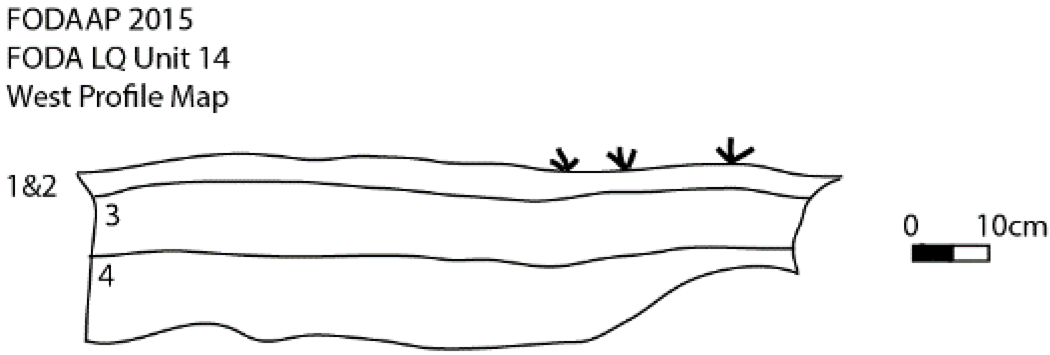


Figure 6.6: Stratigraphic drawing showing the west profile of Unit 14.

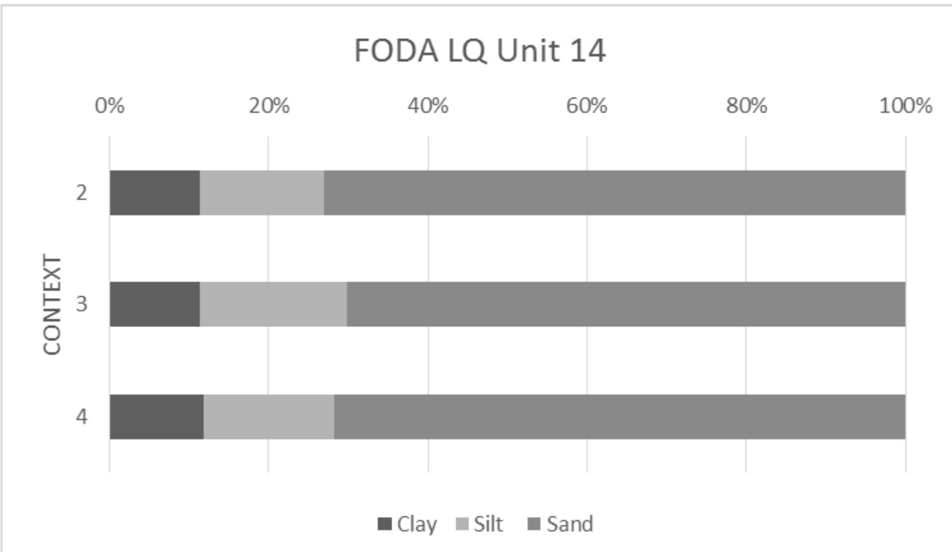


Figure 6.7: Bar Chart showing the relative percentages of clay, silt, and sand for analyzed contexts in Unit 14.

Samples from Unit 25 in the yard space of HB212 were taken from both sides of the basalt stones, from the surface (Context 1), the Context below the stones (Context 7) and contexts from the southeastern quadrant which was excavated to a greater depth than the rest of the unit (Contexts 8A and 8C). No significant variation is present in the profile based on contexts on either side of the stones. There is slight variation in the percentages of finer particles across the profile, but without significant patterns. Figure 6.8 shows the south excavation profile of Unit 25. Figure 6.9 shows the particle size distribution by context for analyzed contexts in Unit 25.

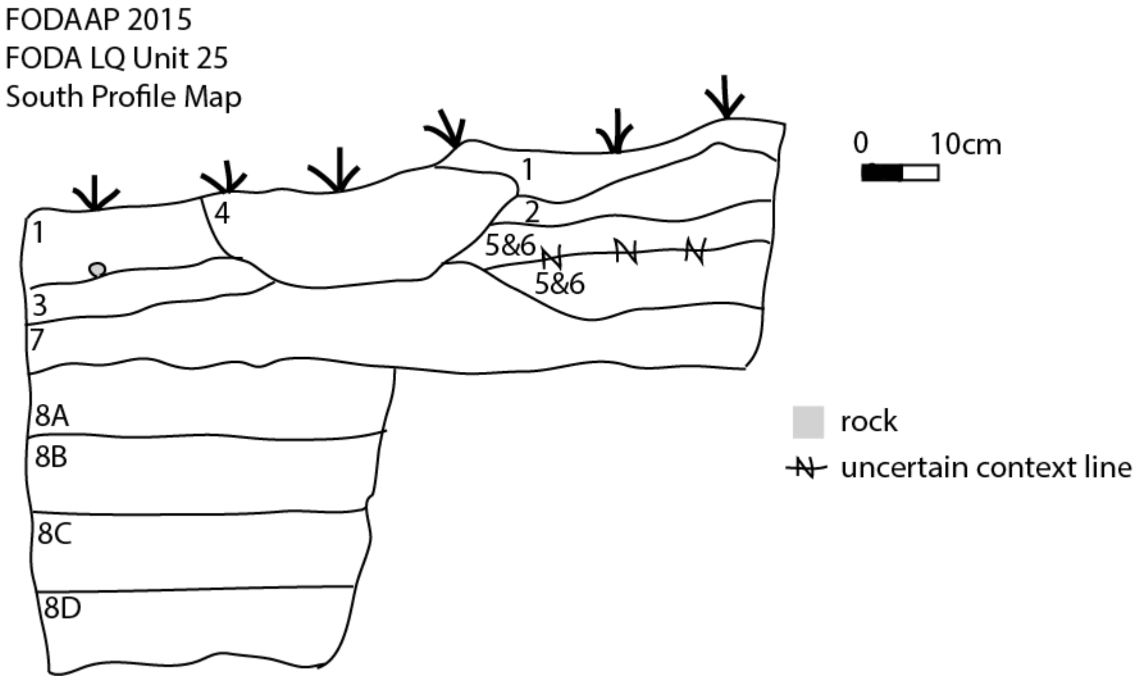


Figure 6.8: Stratigraphic Drawing showing the south profile of Unit 25 with Contexts on either side of a line of basalt stones (Context 4) interpreted as a possible fence line for HB 212.

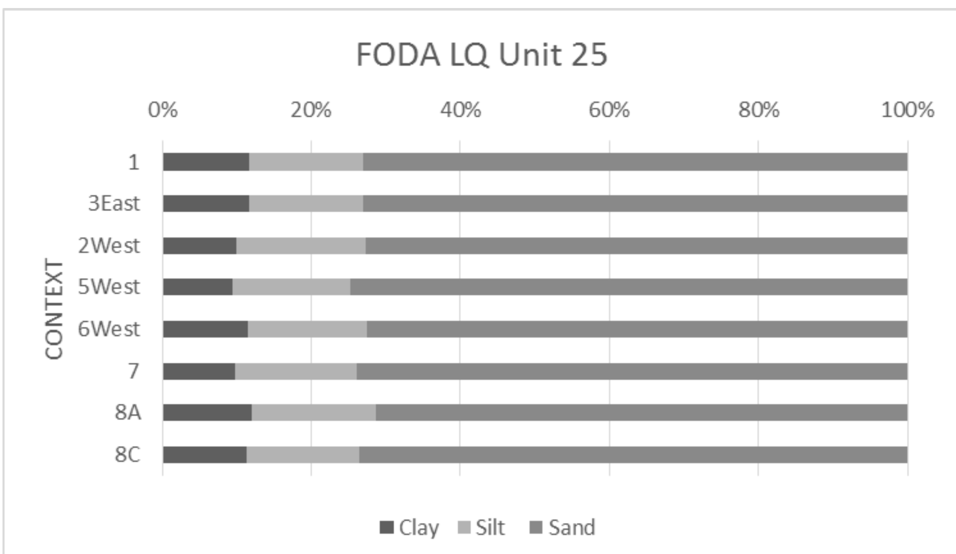


Figure 6.9: Bar Chart showing relative percentages of clay, silt, and sand for analyzed contexts in Unit 25.

Samples from Unit 59 in HB212 were taken to show the profile of the unit. Similar to the other units from the Laundresses' Quarters, there is minimal variation in particle size distribution. There is a slight increase in silt particles in the subsurface Context 2, with decreasing percentages of silt in lower Contexts until Contexts 8 and 9. In the field, Contexts 8 and 9 were extremely compact and described by excavators as possible adobe subfloor. The particle size analysis shows that these contexts have higher percentages of clay and silt than any of the overlying contexts, but not by a significant margin. Figure 6.10 shows the south excavation profile of Unit 59. Figure 6.11 shows the particle size distribution by context for analyzed contexts in Unit 59.

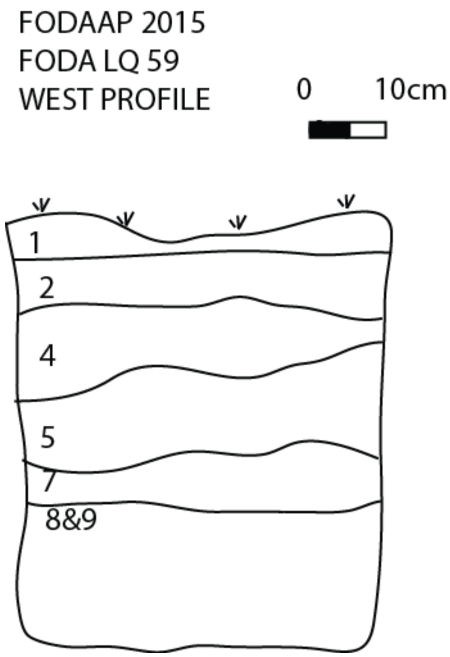


Figure 6.10: Stratigraphic Drawing of the west profile of Unit 59 from the interior of HB 212.

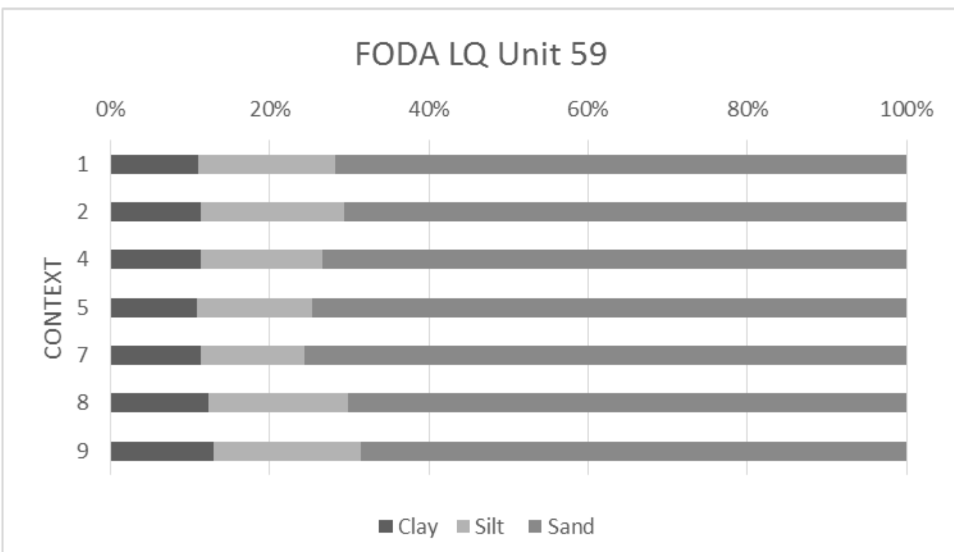


Figure 6.11:Bar Chart of relative percentages of clay, silt, and sand from analyzed context in Unit 59.

Correlations were computed between percentages of sand, silt, and clay with percentage of organic matter, soil pH, and Context (used as a proxy for depth). No significant correlations were found (Table 6.2)

Micromorphology Analysis

A total of 24 micromorphology samples were collected from the Laundresses Quarters in order to assess spatial variation in anthropogenic activities as well as soil and sedimentary processes across the site.

HB211

Fifteen micromorphology samples from HB211 were analyzed. Figure 6.12 shows the main area of excavation in HB 211. These included eight samples from the interior of the structure and seven samples from the exterior. Of the interior samples, six came from an area of excavation overlapping the eastern foundation of the structure (Units 19, 32, and 31). Excavations in this area uncovered a threshold stone and the location is interpreted as the rear door of the structure (6.13). An additional two interior samples come from excavations in the southeast corner of the foundation (Units 16 and 23). Here, a large ash deposit with historic architectural debris (nails, glass, and metal) was uncovered (Figure 6.23).

Of the seven exterior samples, two are located in the exterior space of the Units 19, 31, and 32 excavations, just outside the rear door of the structure. Two additional samples were taken from Unit 53, just to the east of the southeast corner of the foundation where extensive mortar wash was recovered during excavation. The final three samples are from Unit 17 to the south of the ash deposit in Unit 16 and outside the stone foundation.

Figure 6.12: Photograph showing the main excavation areas in HB 211 facing southwest. The cluster of units in the foreground is Units 19, 31, and 32. The three units near the plat in the central of the image are units 16, 17, and 23.

HB211 Interior Space: Units 19 and 32

Units 19, 32, and 31 form a single area of excavation around the western stone foundation of structure HB211 and include the rear door of the structure (the Units in the foreground of 6.12). Units 19 and 32 include space in the interior of the structure, while Unit 31 is exterior. During excavation in Units 19 and 32 a dirt surface (Context 7) was identified which was the target of micromorphological sampling in the Units. The deposits overlying this surface contained some metal artifacts (nails) as well as wood fragments, charcoal, and eggshell. Artifacts were concentrated in the southern portion of Unit 19.

Three samples were taken from the western profile of Unit 19 (1020651, 1020650, and 1020649) shown in Figure 6.13 and Figure 6.14. Both samples 1020651 and 1020650 include fragments of the dirt surface, while 1020649 includes the underlying deposits.

Analysis of sample 1020651 (Figure 6.15) suggests that it primarily contains the deposits overlying the earthen surface identified by excavators. The lower section of the slide includes a few peds of compacted medium brown sediment with oriented sand-sized particles and a clear compacted boundary with the surrounding loose matrix (Figure 6.15). These are interpreted as highly disturbed fragments of the dirt surface which have been incorporated into the Aeolian accumulation overlying it. No anthropogenic debris was identified in the slide despite the nearby presence of nails, wood, and charcoal recovered by excavators.

Figure 6.13: Photograph of units 19, 31, and 32 facing west and showing the locations of micromorphology samples.

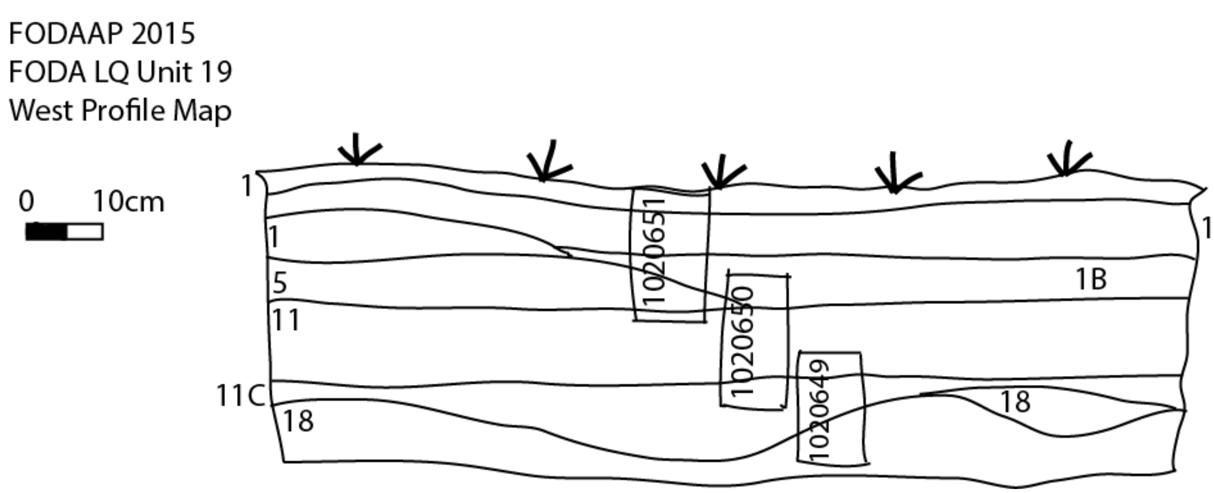
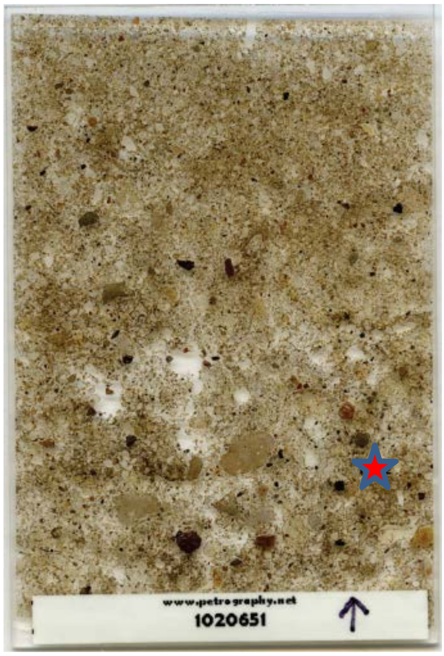


Figure 6.14: Stratigraphic Drawing showing the location of micromorphology samples in the west profile of Unit 19.



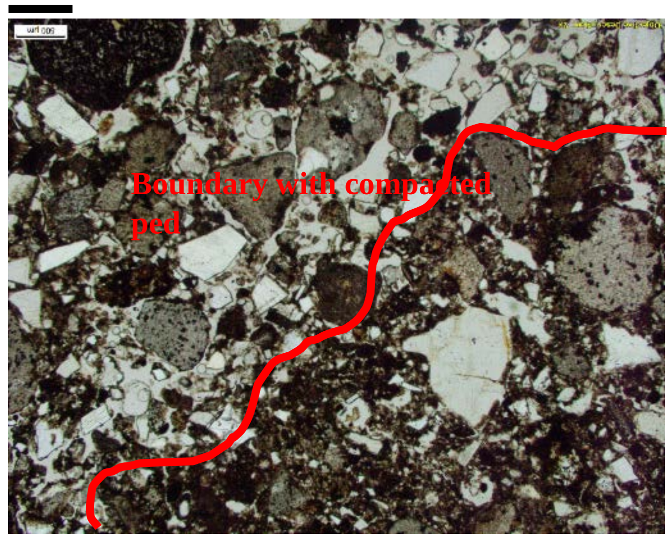


Figure 6.15: A flatbed scan of the thin section slide from SMS Sample 1020651 (left) and a closeup image of compacted sediment within the sample. No discrete beds were identified within the sample. Scale bar is equal to 400µm

Sample 1020650 (Figure 6.16) includes a very difficult to discern boundary zone interpreted as a poorly expressed occupational surface. The material overlying the surface (sample 1020650 bed 1) is natural sedimentary accumulation with high void space and no anthropogenic debris. The boundary between Beds 1 and 2 is marked by an increase in compaction in Bed 2. While Bed 1 has on average 30 to 40% void space made up of primarily packing voids, Bed 2 has only 10% void space composed of small planar voids more typical of a trampled surface. Bed 2 also includes a single fragment of eggshell.

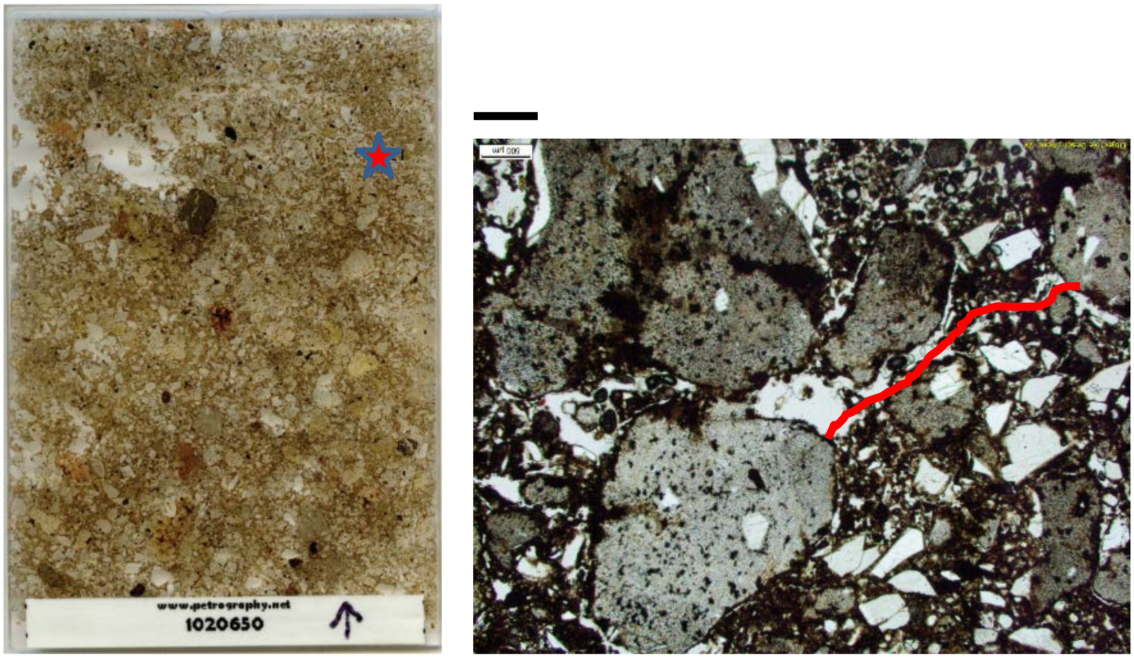


Figure 6.16: A flatbed scan of the thin-section slide made from SMS Sample 1020650 (left) and a close-up showing the boundary between compacted dirt surface and overlying material. No discrete beds were identified within the sample. Scale bar is equal to 400µm.

Sample 1020649 (Figure 6.17) characterized the compacted sediment underlying the dirt surface and archaeological Contexts. No anthropogenic material was identified in this slide. The sedimentary material is overall similar to overlying slides. Void space is between 20 and 30% with larger voids present in the base of the slide. Packing voids are the majority of voids with vertical channel voids (sometimes with loose sediment or organic material) making up the remainder. This sample is interpreted as natural compacted subsoil with drainage voids allowing water to pass through the context rather than pooling,

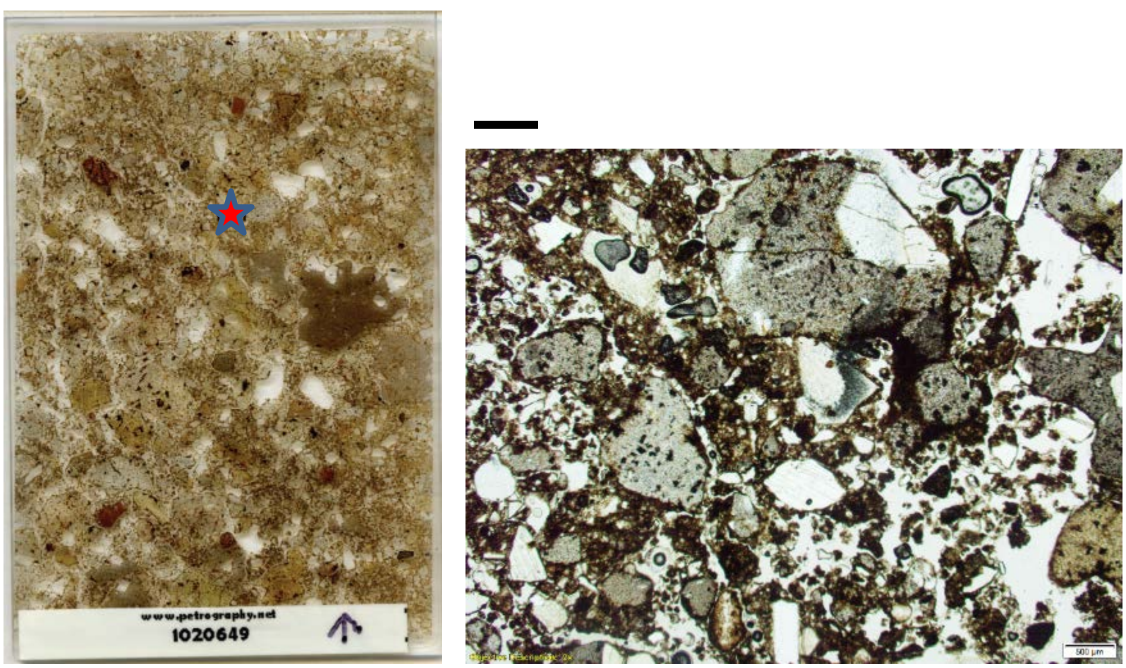


Figure 6.17: A flatbed scan of the thin-section slide made from SMS Sample 1020650 (left) and a close-up showing the boundary between compacted dirt surface and overlying material. No discrete beds were identified within the sample. Scale bar is equal to 400µm.

Sample 1508496 was taken from the north profile of Unit 19 and contained the best preserved instance of the occupational surface from the interior of HB211 (Figure 6.18 and Figure 6.20) The overlying sediment (Sample 1508496, Bed 1) is a highly heterogeneous bed composed of loose sediment and isolated compacted peds which are interpreted as disturbed surface fragments. The ped structure is overall more compacted than the surrounding fabric, with a crumbly or laminated structure, and with a moderately sorted coarse fraction. Peds generally have a clear boundary with the surrounding loose, unsorted sediment. One of the peds contains a small eggshell fragment. Near the boundary of Bed 2 (interpreted as the surface), there is a small amorphous metal accumulation, possibly leached iron from a metal artifact. The boundary with Bed 2 is vague but visible without magnification, but is highly distinct at 20x magnification (Figure 6.19). While exhibiting a similar mineralogy to bed 1, bed 2 has overall less void space (5% to 10% compared with 20% void space in bed 1), there is some localized parallel orientation of particles near the boundary, and the boundary is characterized by a horizontal void space and intact plant material. Two very small fragments of plaster (about 600um in maximum dimension) were identified within the surface near the boundary with bed 1. Otherwise, no anthropogenic debris was identified within the surface itself.

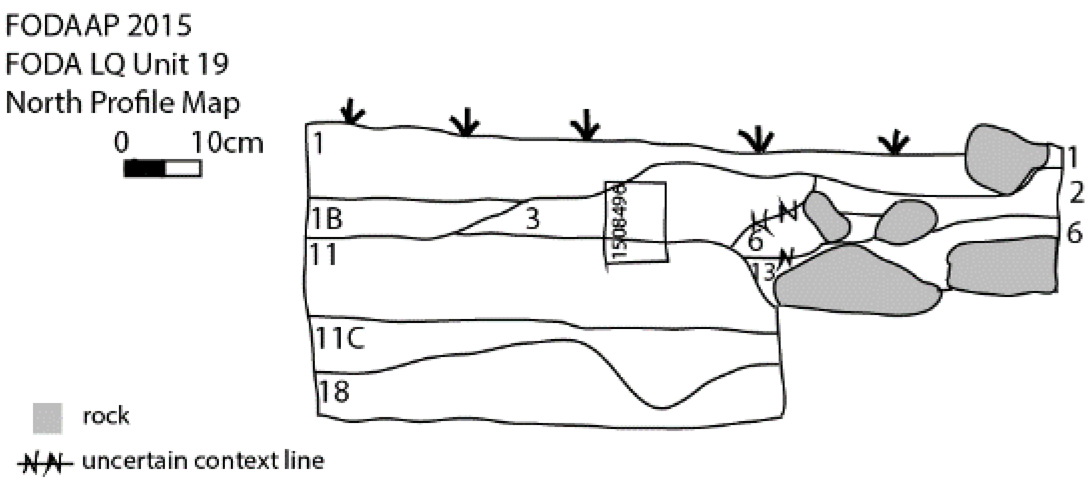


Figure 6.18: Stratigraphic drawing of the north profile of Unit 19 showing the placement of micromorphology samples

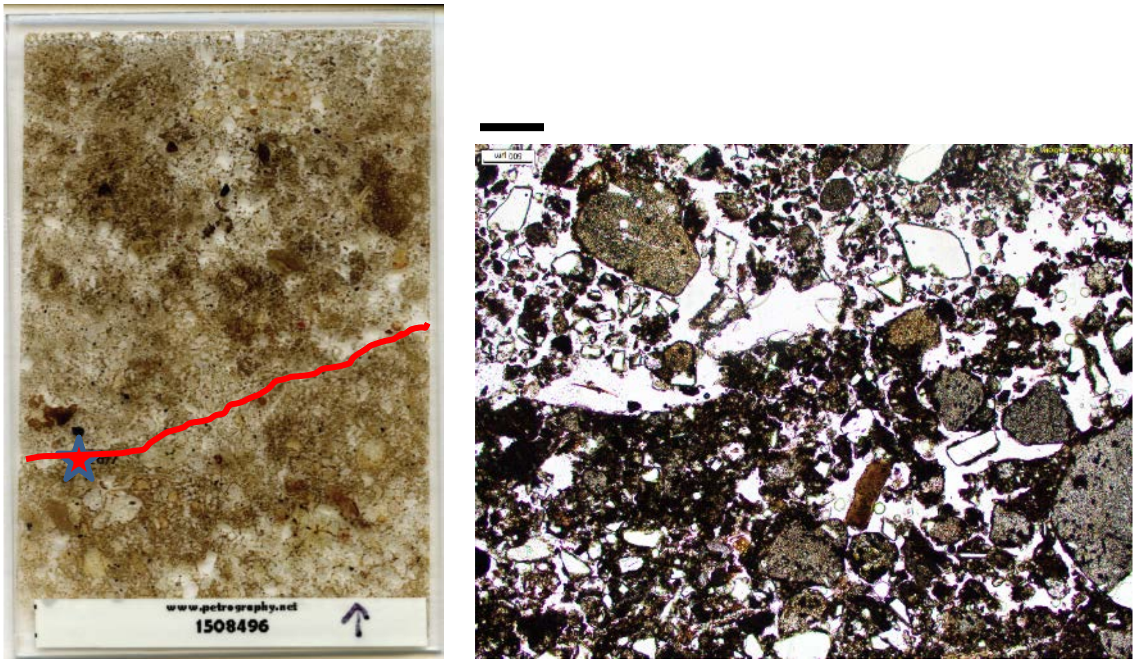


Figure 6.19: A flatbed scan of the thin-section slide made from SMS Sample 1020496 (left) and a close-up showing the boundary between compacted dirt surface and overlying material. Red line on image to the left shows the boundary between bed 1 (above) and bed 2 (be

In addition to the four samples from Unit 19, two micromorphology samples from Unit 32 (also in the interior of HB211) were analyzed (Figure 6.20). Unit 32 was placed directly abutting Unit 19 to the south. The two samples (1508494 and 1508495) were taken from just inside the structure against the foundation itself. This location was selected as intentionally prepared floors will likely be best preserved near structure walls as these locations have the least traffic. The area near walls will also often contain the most anthropogenic debris from the occupation of the house due to sweeping patterns.

Sample 1508494 (Figure 6.21) included contexts related to the earthen surface discussed for Unit 19. Analysis of the sample showed disturbed fragments of the occupational surface intermixed with loose sediment similar to that seen in samples 1020651 and 1508496. There is some dark organic staining around vughy voids in the lower part of the slide likely from insect activity.. The presence of a large plant is likely the cause of increased organic matter in this Unit compared to other interior Units. No anthropogenic material was identified in this slide.

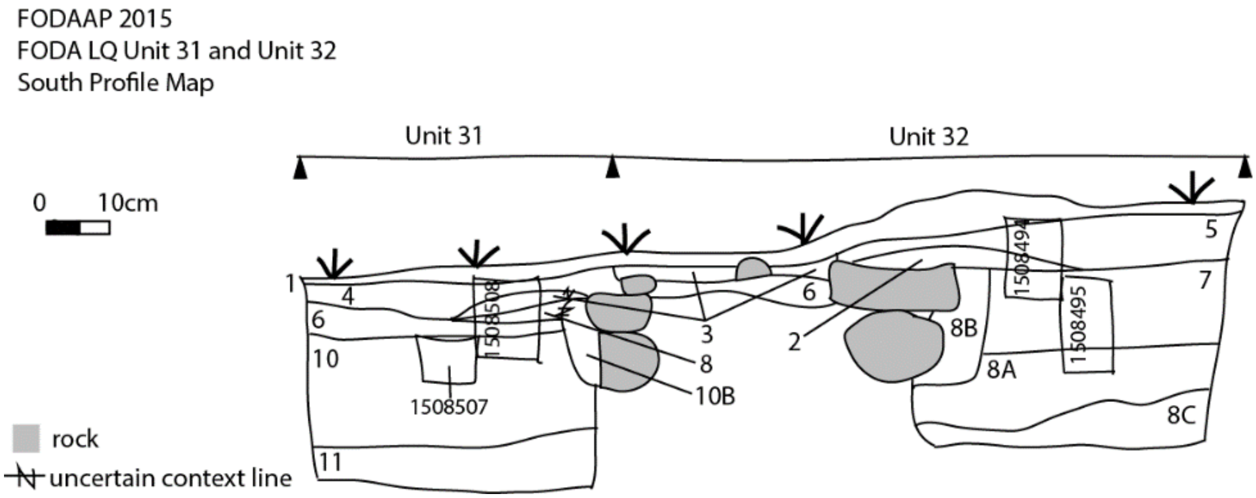


Figure 6.20: Stratigraphic drawing of the south profile of units 31 and 32 showing the interior and exterior of the foundation of HB 211. Locations of micromorphology samples are indicated.

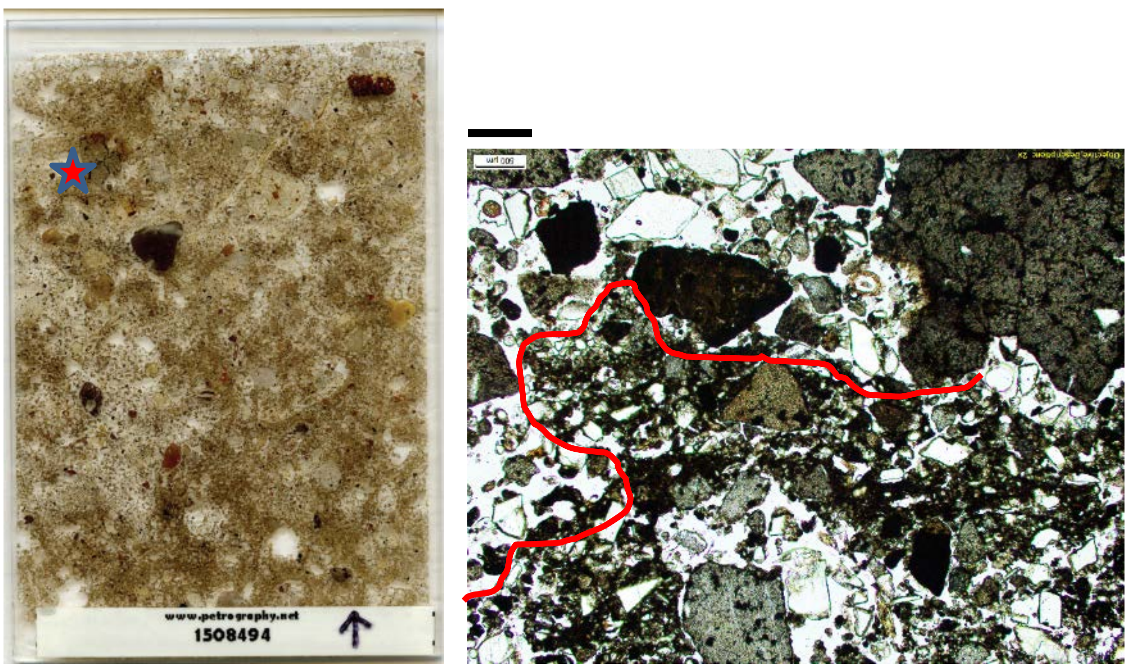
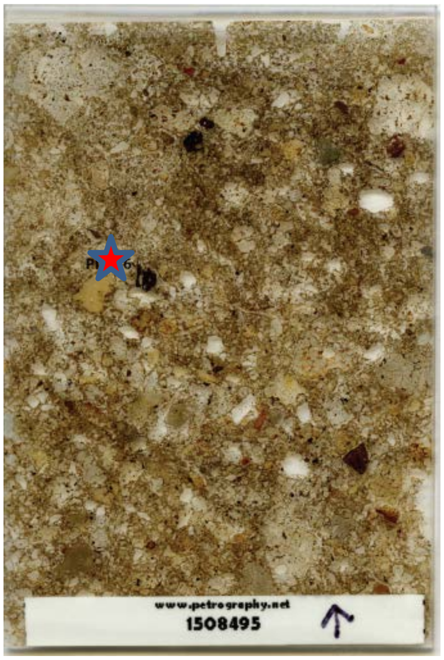


Figure 6.21: A flatbed scan of the thin-section slide made from SMS Sample 1020494 (left) and a close-up showing a fragment of the HB211 occupational surface (red line). No discrete beds were identified within the sample. Scale bar is equal to 400µm.

Sample 1508495 (Figure 6.22) was taken from contexts below sample 1508494 in Unit 32, but still including contexts analogous to the dirt surface identified in Unit 19. While this sample included no evidence of a surface or disturbed surface fragments, some localized horizontal orientation of coarse and fine particles in the lower part of the slide is likely the result of sweepings. Three small metal fragments are present, with no evidence for leaching. Two carbonate nodules are also present.



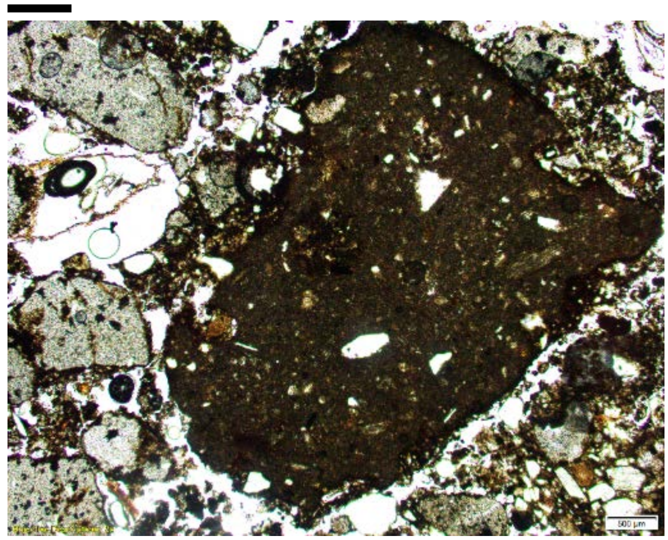


Figure 6.22: A flatbed scan of the thin-section slide made from SMS Sample 1020495 (left) and a close-up showing a micritic carbonate nodules incorporating organic material. No discrete beds were identified within the sample. Scale bar is equal to 400µm.

HB211 Interior Space: Units 16 and 23

Excavations in the southeast corner of the HB211 foundation uncovered an isolated ash deposit overlying a concentration of artefactual debris (Figure 6.23). Two samples were taken of the ash and debris deposits. Sample 1508506 was taken from the ash and underlying deposits in the south profile of Unit 16 (Figure 6.24 to characterize the underlying boundary of the feature which might provide determine whether the ash was the result of *in situ* burning, or a dumping event after burning elsewhere. Sample 1020648 was taken from a baulk between Units 23 and 16 and includes the ash deposit and overlying Contexts (Figure 6.25).

Sample 1020648 (Figure 6.26 contains two distinct beds differentiated by a sharp increase in ash content in the lower bed. The overlying bed (Bed 1) is similar to upper contexts throughout the Laundresses' Quarters, consisting of naturally-deposited, loose sediment, with minimal evidence for pedogenic or secondary processes. Fine ash and a single bone fragment are present near the boundary with bed 2 (the ash deposit). There is no trampled surface or sharp boundary to mark the distinction between beds 1 and 2, instead the boundary is characterized by a sharp increase in the quantity of ash in bed 2, which comprises the majority of the densely packed (5% to 10% void space) fine fraction. Charcoal (10%) as well as a fragment of bone, eggshell, and two pieces of metal (Figure 6.27) are also present in bed 2. There are also several pieces of plaster in the lower portions of the slide and mystery material similar to that seen in sample 1508509 from Unit 17. While there is some localized horizontal orientation of the fine fraction in bed 2, the fabric is overall unoriented, as would be expected from a dumping event.

Figure 6.23: Photograph showing excavation areas in the interior of HB 211 (Units 16, 17, 53, 23), facing west. Foundations stones in the foreground are the eastern foundation of HB 211.

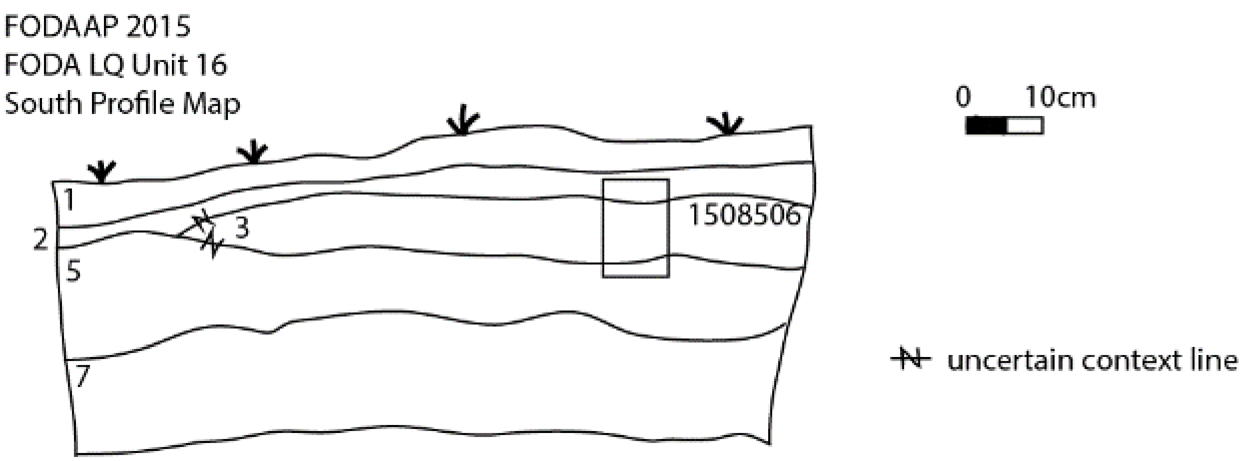


Figure 6.24: Stratigraphic drawing of the south profile of Unit 16 in the interior of HB 211, showing the location of micromorphology samples.

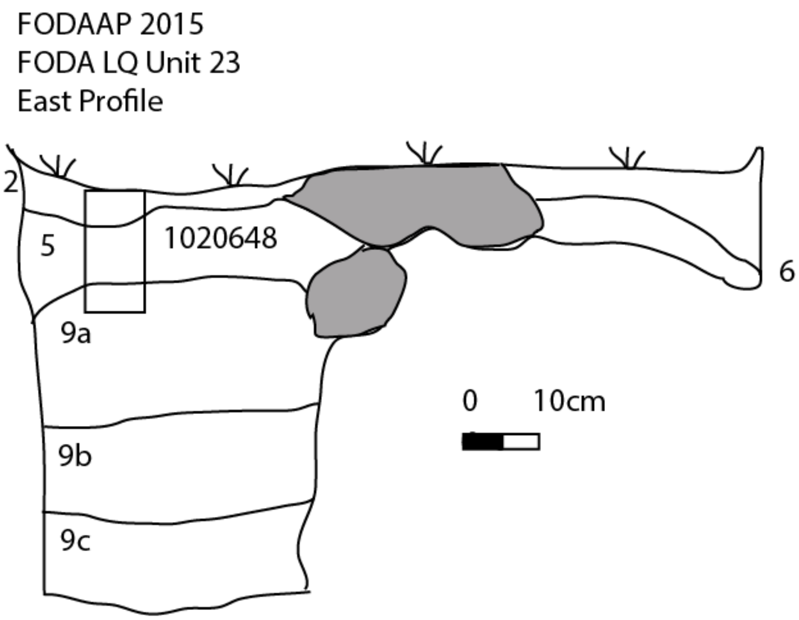
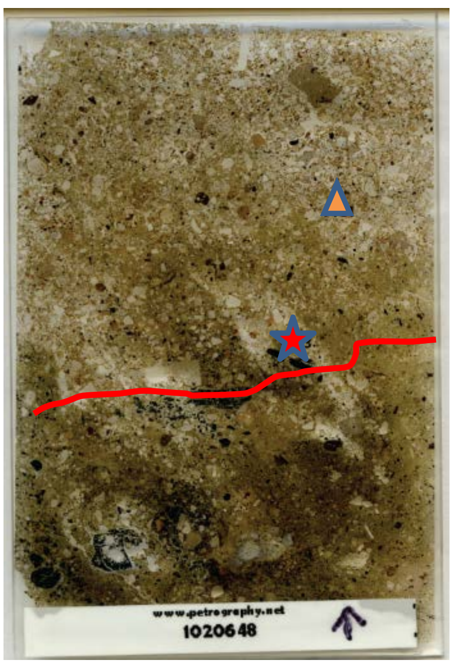


Figure 6.25: Stratigraphic Drawing of the east profile of Unit 23 in the interior of HB 211, showing the location of micromorphology samples.



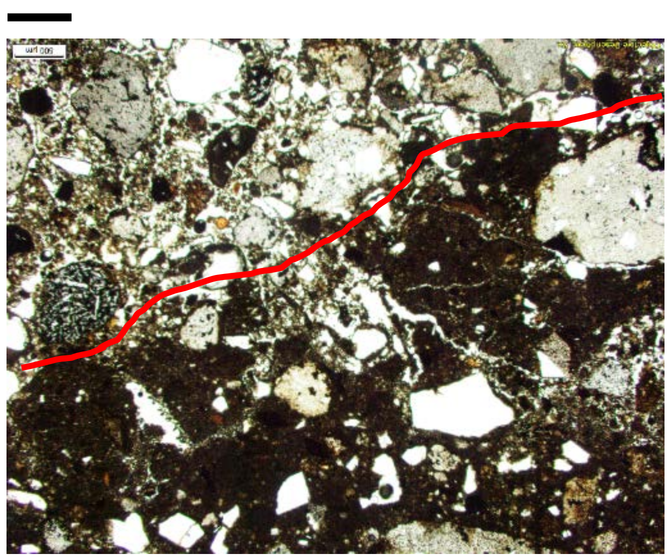


Figure 6.26: A flatbed scan of the thin-section slide made from SMS Sample 1020648 (left) and a close-up (the red star) showing the boundary between the midden deposit and overlying. Red line indicates the boundary between Bed 1 (above) and Bed 2 (below). Scale bar equal to 400µm

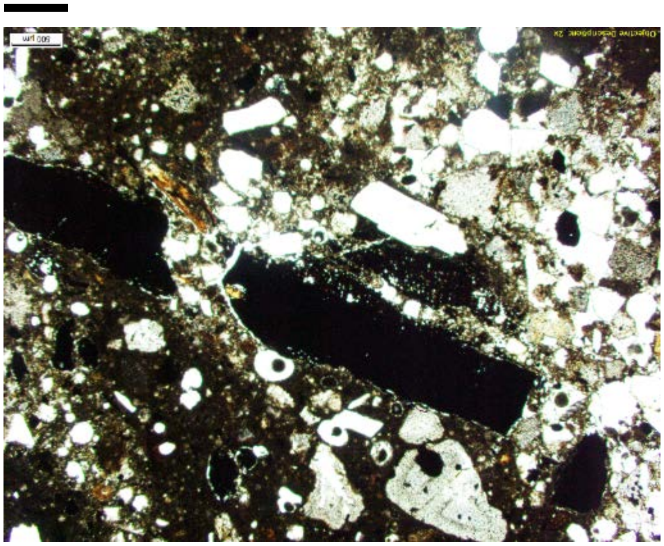


Figure 6.27: A close up image of SMS Sample 1020648 Picture 3 (green triangle location) showing metal fragment in bed 2 (the midden deposit). Scale bar is equal to 400µm.

Sample 1508506 (Figure 6.28) includes both the ash deposit as well as underlying Contexts to investigate whether the ash resulted from *in situ* burning. If the material burned in place then the underlying Context should show direct evidence of heating. Sample 1508506 contains three distinct beds differentiated by the amount of ash in the fine fraction and density of coarse rock and mineral fragments. Bed 1 comprises the ash deposit itself with low void space (5% to 10%), low concentration of coarse particles (C:F ratio of 20:80) and a fine fraction almost entirely composed of ash. Coarse and fine charcoal is also present, along with bone (2% to 5%), metal (<2%), and charred plant material (2%). Bed two is a thin layer marked by a decrease in concentration of ash (20 to 30%) of total area, increased concentration of coarse particles (C:F ratio of 40:60), and an increase in void space (up to 15%). One large fragment of plaster (Figure 6.29), along with several smaller fragments, are present in the bed. The boundary between beds 2 and 3 is gradual and difficult to discern macroscopically, although moderately clear at 20x magnification (Figure 6.29). The fabric of bed 3 is similar to bed 2, but with no ash present in the fine fraction. Additionally, no charcoal and no direct evidence for burning of the sediment itself was found in the bed. Unburned plant remains are present, but no anthropogenic material was identified.

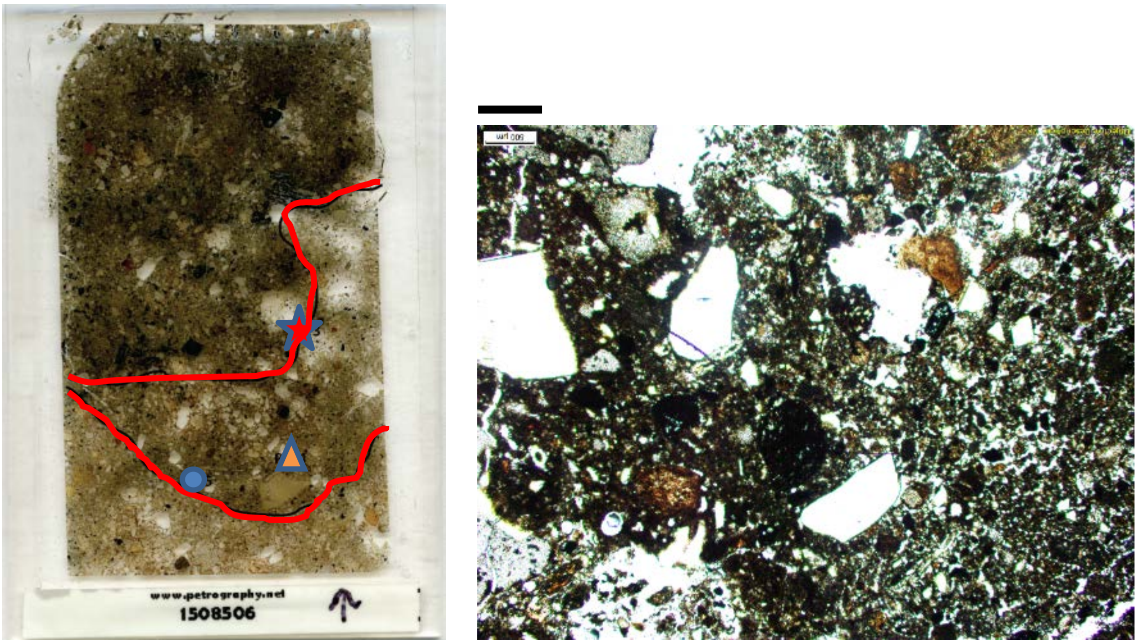


Figure 6.28: A flatbed scan of the thin section from SMS Sample 1508506 (left) and a closeup of the boundary between beds 1 and 2 (midden deposit and underlying material), in the location indicated by the red triangle. Red lines show boundaries between beds. Scale bar is equal to 500µm

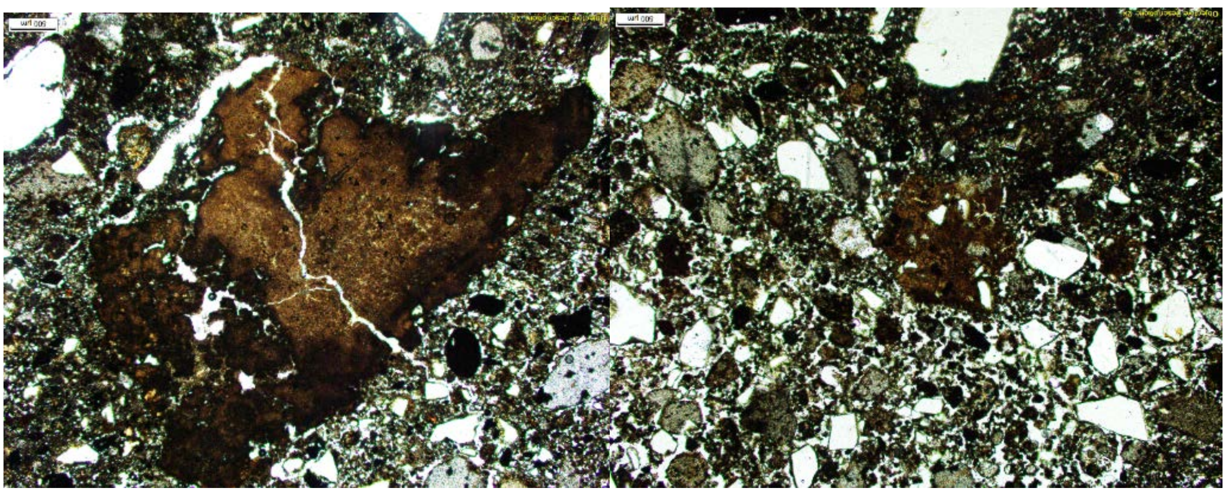
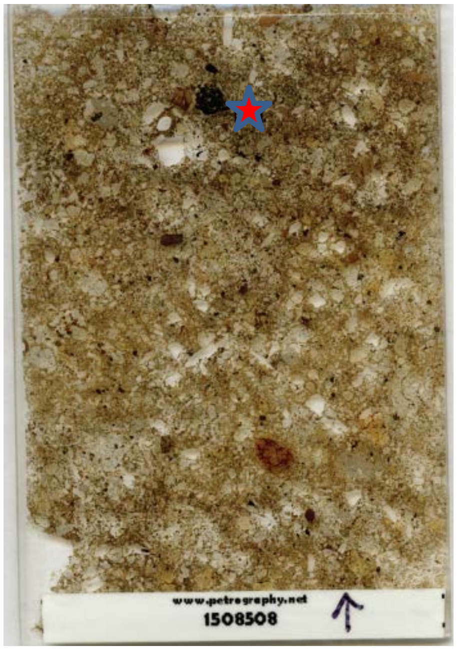


Figure 6.29: Left image is a closeup (in the green triangle location on Figure 6.28) of SMS sample 1508506 showing a piece of burnt plaster. Right image (blue circle location on Figure 6.28) shows the boundary between beds 2 and 3.

HB211 Exterior Space: Unit 31

Unit 31 is part of the excavation area including Units 19 and 32 which lies across the eastern side of the stone foundation of HB211 in area where a threshold stone suggests the rear door of the structure was located (Figure 6.13).Excavations in Unit 31 recovered a quantity of nails, many of which were found upright. Two samples were taken from the southern profile of Unit 31. Sample 1508508 includes the upper Contexts where nails were recovered. Sample 1508507 includes the lower Contexts.

Sample 1508508 (Figure 6.30) includes excavation contexts that had upright nails and an overall organic-rich soil as described by excavators. The upper part of the slide has a moderately organic fine fraction giving the matrix an overall darker color and a more crumbly to spongy texture than seen in other units from the Laundresses' Quarters. The fabric is overall compacted with less than 15% void space. Significantly, no channel voids with plant remains are present which would indicate roots or plant activity. The lower part of the slide contains much less organic matter than the upper part, but the change is too gradual to define a boundary. Additionally, there is no difference in mineralogy or sediment structure to classify them as separate beds. One fragment of metal was identified in the organic-rich part of the slide.



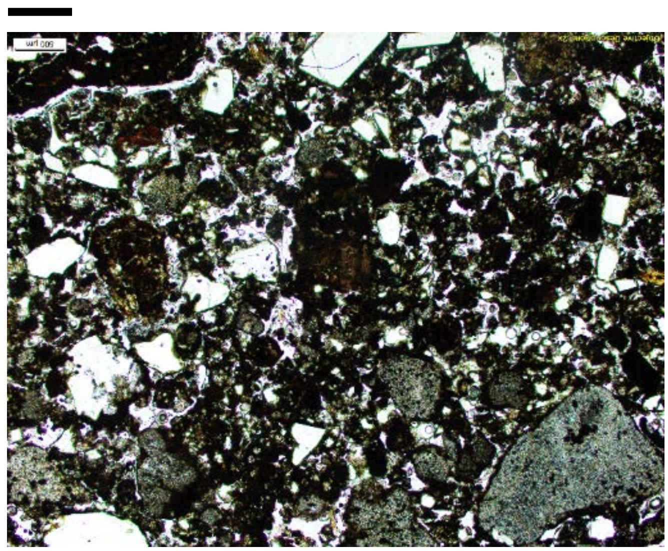


Figure 6.30: A flatbed scan of the thin section of SMS Sample 1508508 (left) and a closeup of the spongy matrix in the upper part of the slide. No distinct beds were identified. Scale bar is equal to 400µm.

Sample 1508507 (Figure 6.31) is a small thin section (25mm by 40mm instead of the usual 70mm by 40mm) comprised of the lower contexts of Unit 31. The sample shows highly compacted Contexts (only 2% void space) of sedimentary material typical of the Laundresses' Quarters. Plant remains are rare, largely amorphous and unidentifiable due to decomposition, and largely present in the upper portion of the slide. The slide shows no evidence of carbonate development. No anthropogenic materials were recovered. This sample is interpreted as natural, sterile sediment typical of the Laundresses' Quarters.

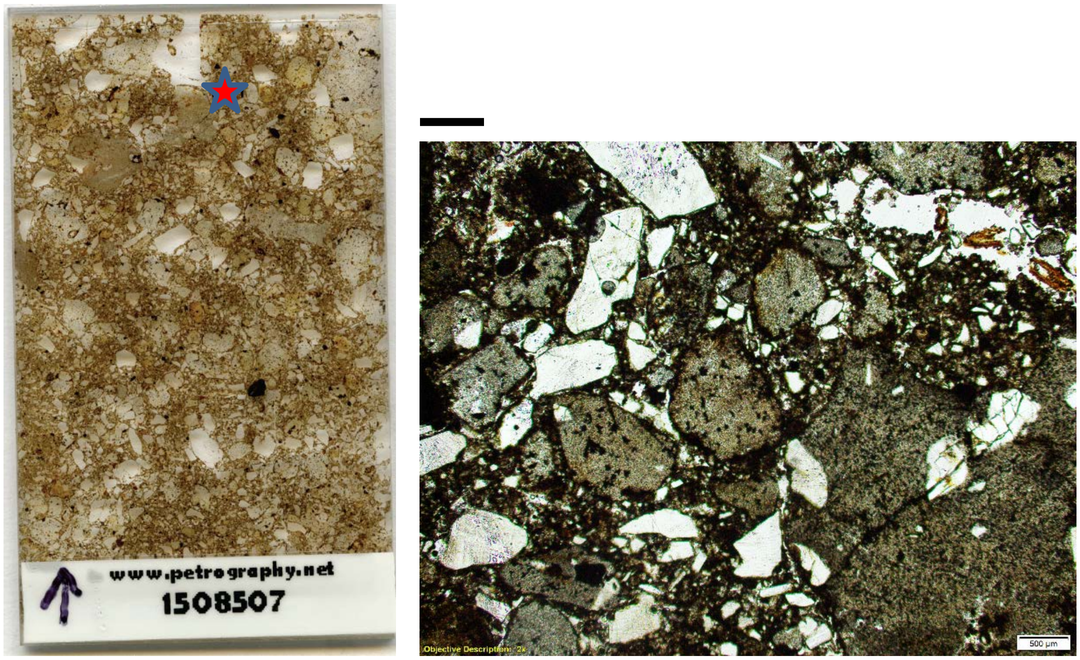


Figure 6.31: A flatbed scale of the thing section of SMS Sample 1508507 and a close up showing the sediment matrix. No distinct beds were identified. Scale bar is equal to 400µm.

HB211 Exterior Space: Unit 53

Unit 53 is located just east of the southeastern corner of the foundation of HB211. Two samples (1508502 and 1508497) were taken from the eastern profile of the Unit (Figure 6.32 and 6.33).

Figure 6.32:Photograph of Unit 53 facing east showing the eastern profile with micromorphology samples as well as foundation stones from the eastern foundation of HB 211 (foreground).

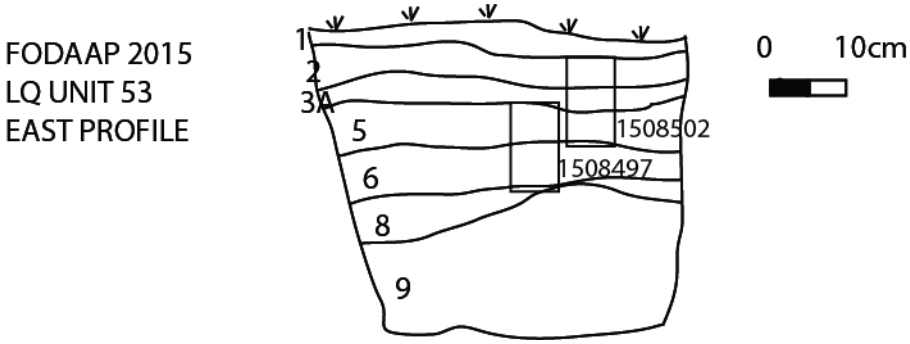


Figure 6.33: Stratigraphic drawing of the east profile of Unit 53 showing the location of micromorphology samples.

Sample 1508502 (Figure 6.34 includes the upper contexts of Unit 53 and is dominated by a large, iron-stained tuff fragment, most likely a piece of construction material from HB 211. There are no boundaries in this sample but the upper part of the sample is generally less densely packed and the lower portion is denser with higher amounts of amorphous organic matter in the fine fraction. Void space mostly includes packing voids, with some vughs and channels containing large plant fragments. A fragment of plaster and piece of metal are present in the upper portion of the slide and are likely remnants of construction material or debris related to the midden feature in nearby unit 16.

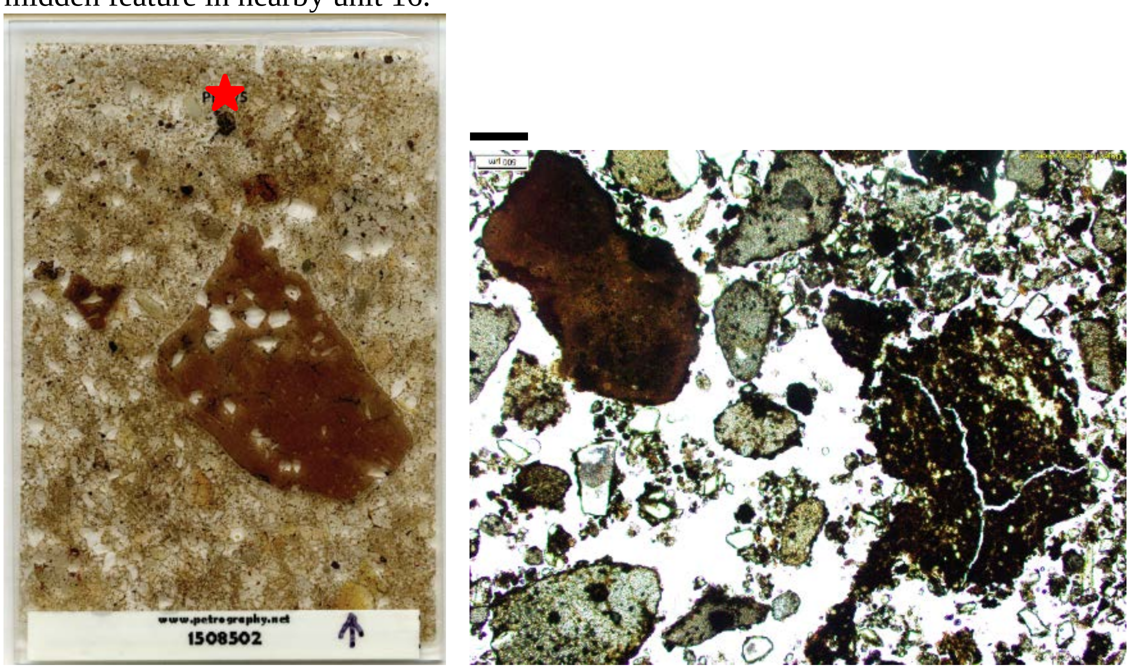


Figure 6.34: A flat bed scale of the thin section from SMS Sample 1508502 and a close up showing corroded metal and plaster. No discrete beds were identified within this slide. Scale bar equals 400 µm.

Sample 1508497 (Figure 6.35 is from Contexts directly beneath 1508502 and contains sterile sediment with an organic rich matrix and spongy microstructure. No anthropogenic materials were recovered. Compared to sample 1508507 (the compacted sterile sediment underlying the decaying wood boards in Unit 31) this sample has overall more void space (between 10% and 20%) and a higher presence of organic matter in both the coarse and fine fractions.

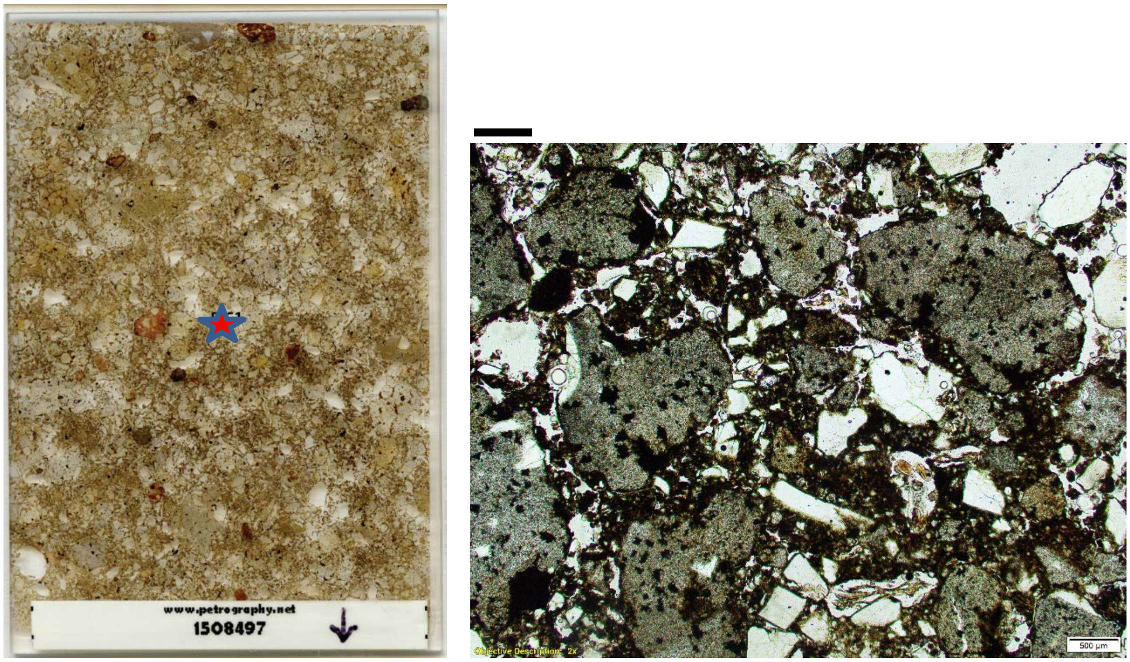


Figure 6.35: A flatbed scan of the thin section from SMS Sample 1508497 and a close up showing the sedimentary matrix. No discrete beds were identified within this sample. Scale bar is equal to 400µm.

HB211 Exterior Space: Unit 17

Unit 17 is located to the south of HB 211 directly against the foundation and adjacent to Unit 16 (Figure 6.23). Three samples were taken from Unit 17 (1508509, 1508492, 1508493) to cover the west profile of the Unit and characterize the sediment outside the structure (Figure 6.36).

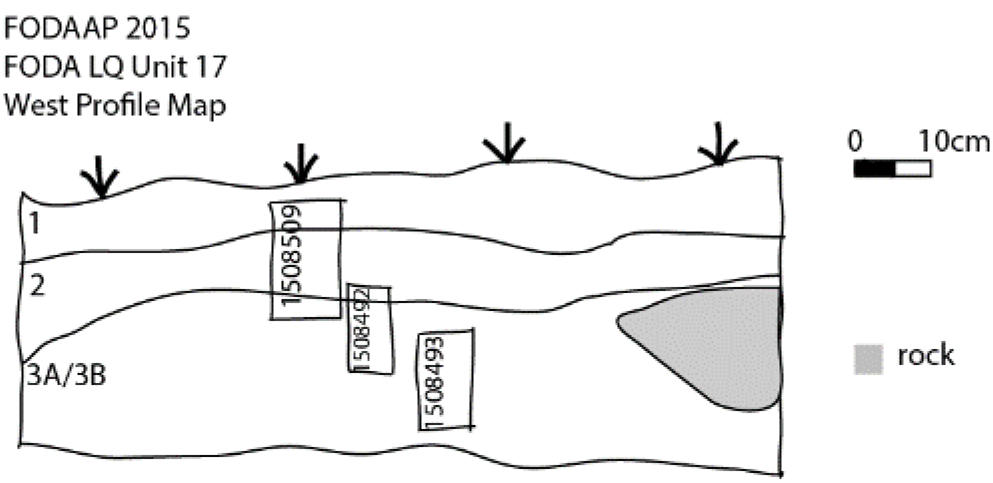


Figure 6.36: Stratigraphic drawing of the west profile of Unit 17 showing the locations of micromorphology samples.

Sample 1508509 (Figure 6.37) includes the upper contexts of Unit 17 and has no obvious bedding. The matrix is less densely compacted in the upper part of the slide (10% to 20% void space) and more densely packed in the lower portion (2% to 5% void space). Highly decayed plant remains are present throughout and the lower portion of the slide includes some amorphous organic matter in the fine fraction. An unidentified white material (opaque in polarized and cross-polarized light) in present in the upper left of the slide. A large piece of iron-stained limestone is present in the lower portion of the slide. Limestone does not occur commonly in samples from the Laundresses' Quarters so this may be an introduced construction material either from HB211 or from the road.

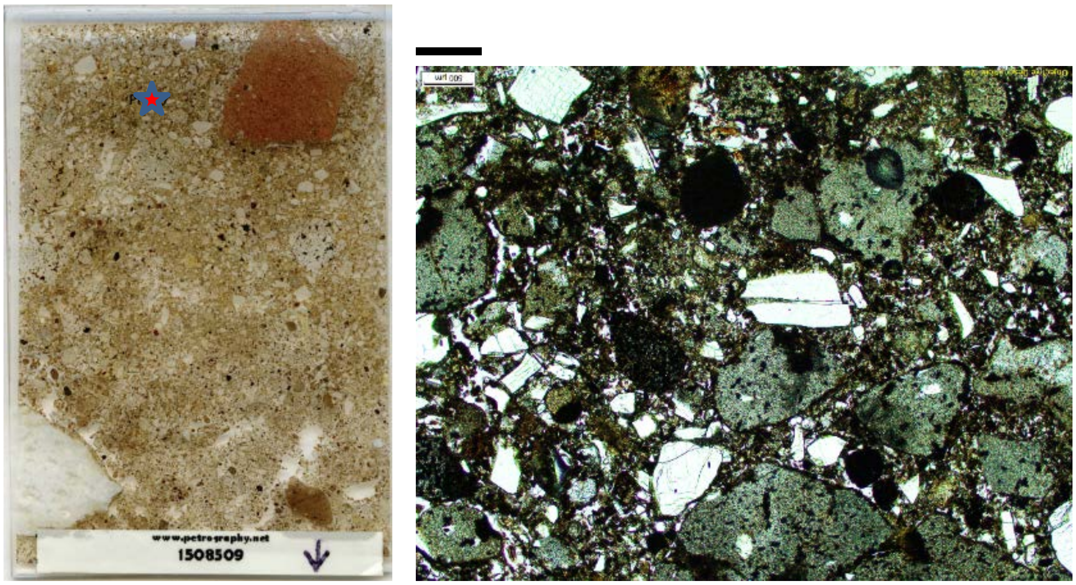


Figure 6.37: a flatbed scan of the thin section from SMS Sample 1508509 and a closeup show the sedimentary matrix. No discrete beds were identified within this sample. Scale bar equals 400µm.

Sample 1508492 (Figure 6.38) is from the middle Contexts of Unit 17. The sample is disaggregated in the uppermost portion of the slide. Overall the sample has a compacted fabric (<5% void space) with a spongy microstructure and organic matter concentrated in the upper portion of the slide. Organic matter includes both high decayed plant remains in channels and vughy voids as well as amorphous organic remains in the fine fraction of the upper intact portion of the slide. No anthropogenic materials were identified.

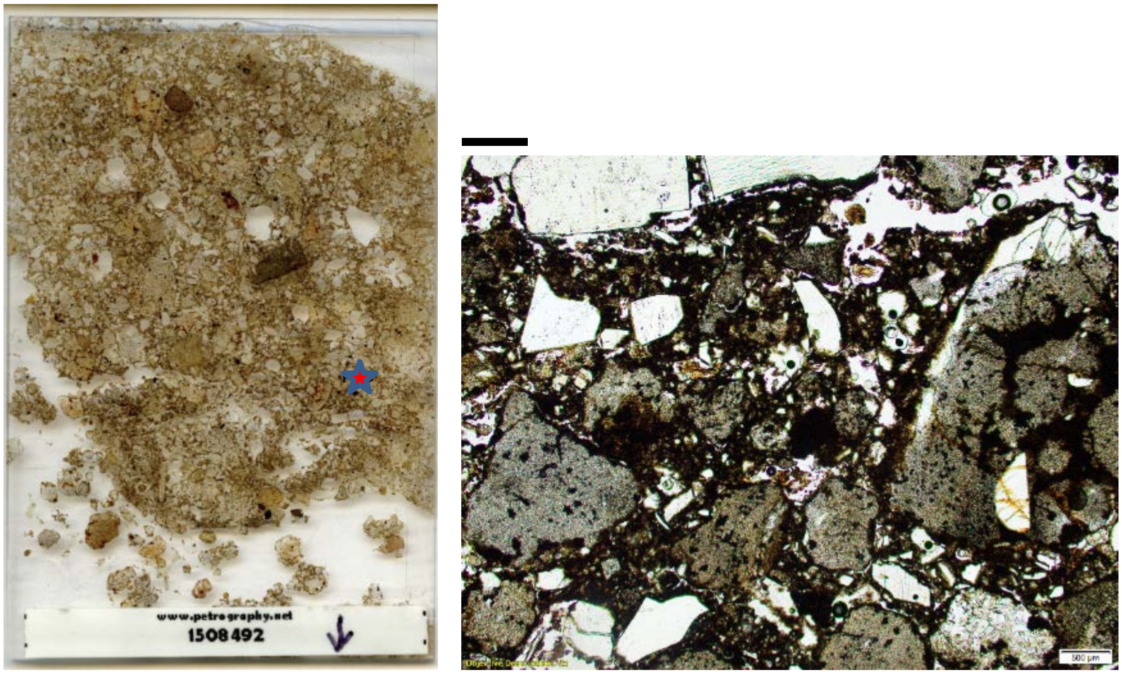


Figure 6.38:A flatbed scale of the thin section from SMS Sample 1508492 and a close up showing the organic-rich matrix. No discrete beds were identified within this sample. Scale bar is equal to 400 µm.

Sample 1508493 (Figure 6.39) shows the compacted, low-organic underlying sediments of Unit 17. Sediment is typical of the Laundresses' Quarters and is highly compacted in the upper portion of the slide (<5% void space) and slightly more open in the lower portion (5% to 10% void space). Some coarse plant remains are present (2%) but there is little to no organic material in the fine fraction. No anthropogenic materials were recovered.

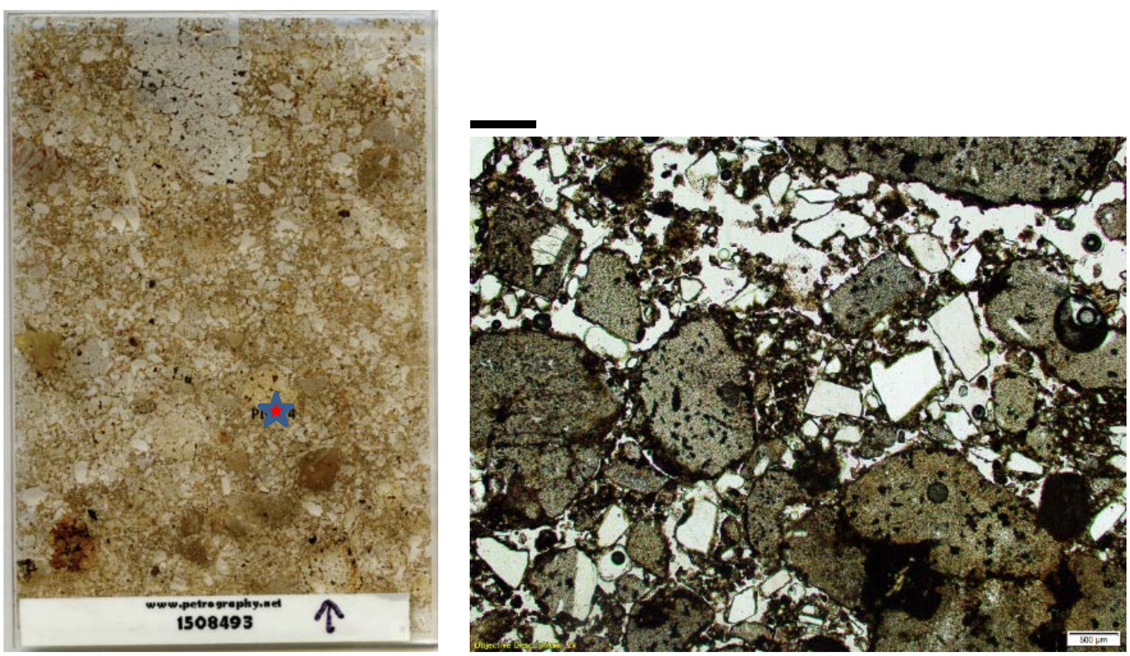


Figure 6.39: A flatbed scan of the thin section from SMS Sample 1508493 and a close up showing the sedimentary matrix. No discrete beds were identified within this slide. Scale bar is equal to 400µm.

HB 212

HB212 was located in the final week of excavation when Unit 59 (placed just to the east of the road) uncovered part of the foundation and interior of the structure. One micromorphology slide was taken from Unit 59 due to limited profile space in which to collect samples. Previous excavation in the area to the east of HB212 included Unit 25, which was placed overlying a line of basalt stones. Mortar and nails were recovered near the stones, leading excavators to suggest that these were support for a fence line east of structure HB212. Four samples were taken from HB212. Samples 1508501 and 1508500 were taken from the interior of the yard (west of the basalt stones) and samples 1508499 and 1508498 were taken from the exterior of the yard (east of the basalt stones).

HB212 Interior Space: Unit 59

A single sample was taken from Unit 59 due to the small area of interior space from HB212 exposed (Unit 59 was 50cm by 50cm test Unit bisected by the foundation of HB212, Figure 6.40 and 6.41). Sample 1508593 was taken from the moderately compact sediment overlying the adobe subfloor (Figure 6.42). This context included fragments of wood, mortar and plaster. Several pieces of wood associated with nails led excavators to suggest that the structure originally had a wood floor. There was no evidence for a dirt surface in the Unit. Sample 1508593 (Figure 6.43) is comprised of compacted, fine-grained sediment with few voids (<5% void space overall) which include both vughs and vertical channel voids without organic matter. Fabric is overall massive and although the fine fraction includes amorphous organic material it is in insufficient quantity to lend the matrix a spongy or crumbly texture.

Figure 6.40: Photograph showing Unit 59 and Unit 10 in the Laundresses' Quarters at FODA-NHS facing east. The eastern foundation of HB 212 is visible in Unit 59.


Figure 6.41: Photograph showing the eastern foundation of HB 212 in Unit 59 with SMS sample 1508593 visible.

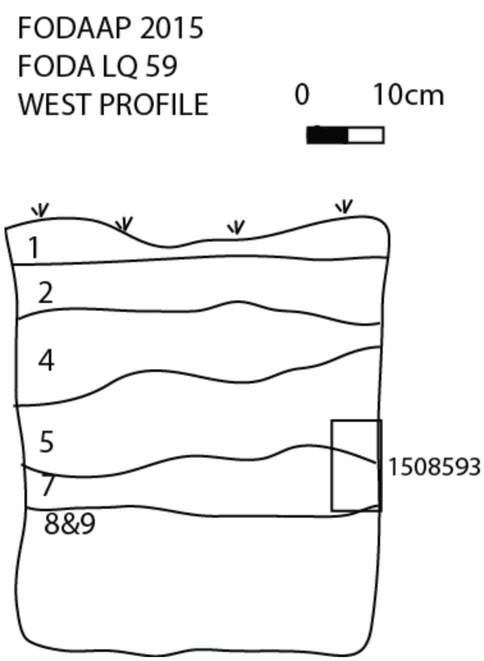


Figure 6.42: Stratigraphic drawing of the western profile of Unit 59 with micromorphology sample indicated.

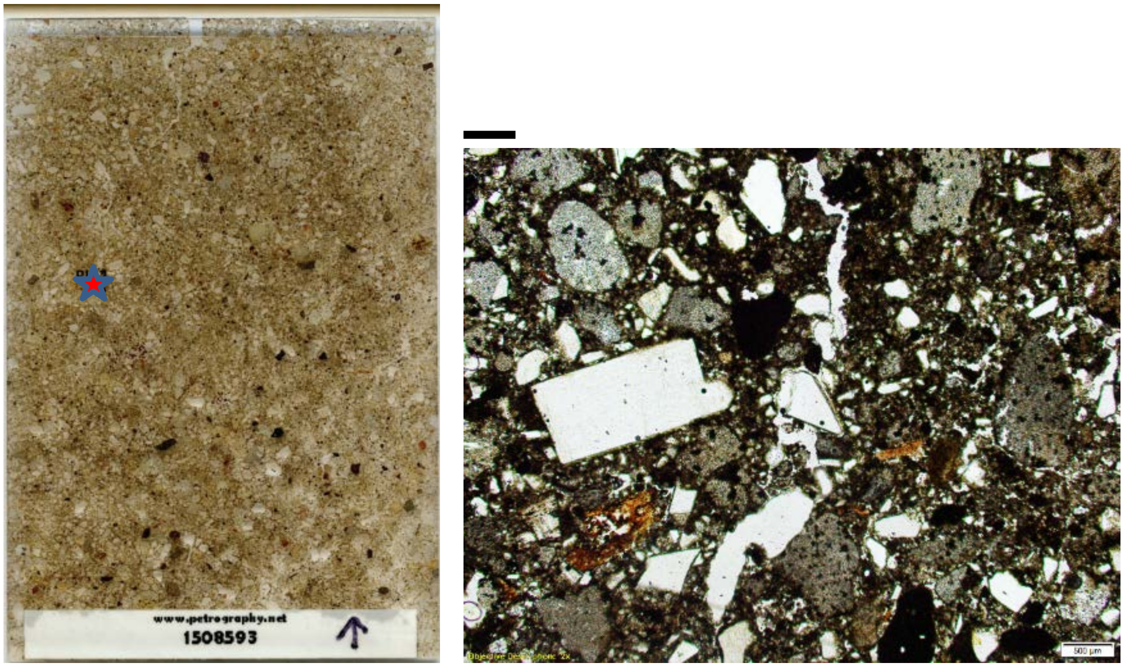


Figure 6.43: A flatbed scan of the thin section from SMS Sample 1508593 (left) and a closeup showing organic matter from decaying wooden floors in the sedimentary matrix. No distinct beds were identified in this slide. Scale bar is equal to 400µm.

HB212 Exterior Space: Unit 25

Four samples from Unit 25 were taken from either side of a line of basalt stones which was interpreted in the field as a fence line for the yard area of HB212 (Figure 6.44 and 6.45). Two samples were taken from both the interior and exterior of the yard space, on the western and eastern side of the basalt stones, respectively.

Figure 6.44: Photograph showing the southern profile of Unit 25. The unit was placed to the east of HB 212 bisecting a line of basalt stones thought to be reinforcing a fence line.

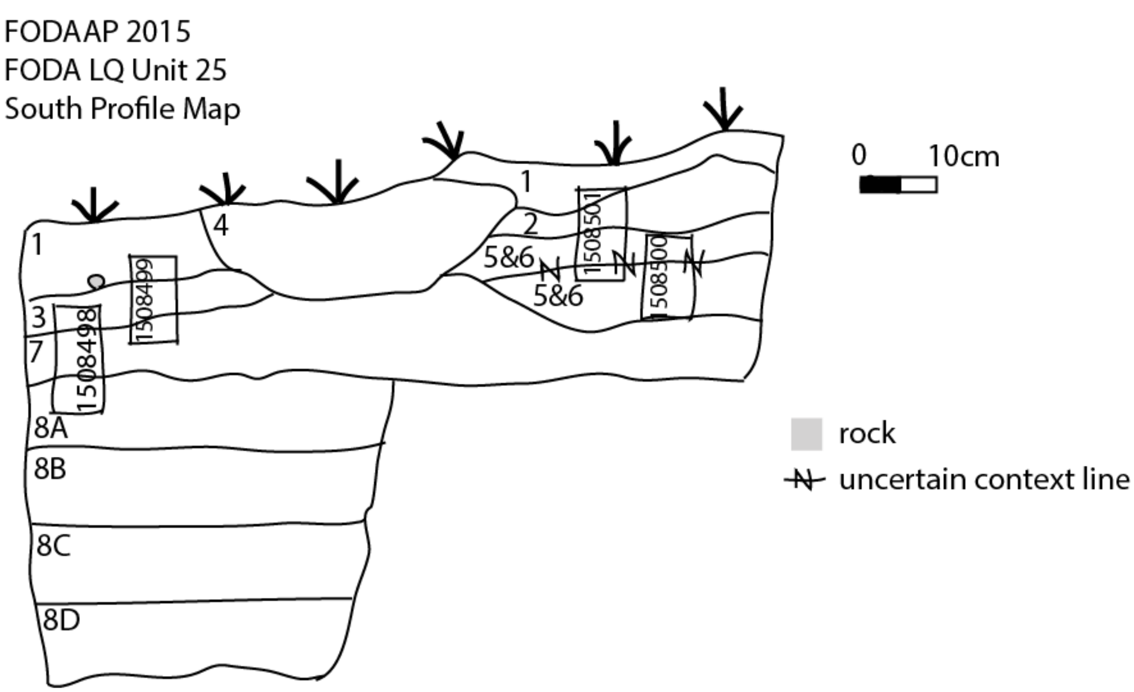


Figure 6.45: Stratigraphic Profile drawing of the southern profile of Unit 25 showing the locations of micromorphology samples.

Sample 1508501 (Figure 6.46) was taken from the upper Contexts on the western side of the basalt stones (the interior of the yard space). The sample has no evidence of bedding and is composed of moderately organic sediment with variable compaction (possible indicating disaggregation of the sample during transportation) with a poorly expressed spongy microstructure. Void space includes packing voids in loose, potentially disaggregated sections (10% to 30% void space) along with planar and vughy voids (containing decayed plant material) in the more compacted sections (5% void space overall). A large (30mm) fragment of reddish material is present in the center left of the slide. At 20x magnification the material appears to be an organic-mineral mixture, possibly a dung-based plaster or daub which could have been used to seal fence posts.

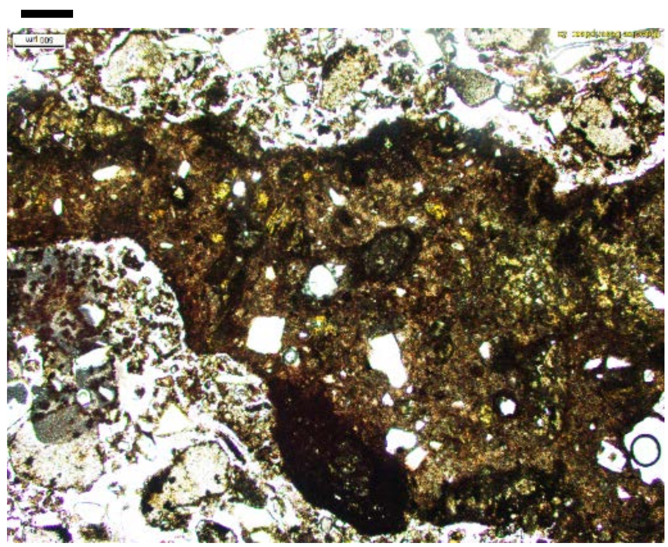


Figure 6.46: A flatbed scan of the thin section from SMS Sample 1508501 (left) and a close up showing dung based plaster. No discrete beds were identified within the slide. Scale bar is equal to 400µm.

Sample 1508500 (Figure 6.47) is from the contexts directly below 1508501 on the interior of the possible fence line (west of the basalt stones). Sample 1508500 is highly variable, but without directly evidence of bedding. The overall fabric of the sample is compacted sediment with minimal organic matter in the fine fraction. This is interspersed with larger channel voids (~700um in width) associated with decayed plant material and dark organic hypocoatings, interpreted as the remains of decayed roots. Some of these voids also have loose sedimentary fill. A fragment of organo-mineral material similar to the dung plaster or daub from 1508501 is also present midway through the slide. Organic-stained channel voids from this sample, along with evidence for organic material in the above sample (1508501) suggest vegetation, which would be expected for an outdoor space. In particular, these samples are taken directly uphill from a line of rocks which would increase water retention in this location by blocking the downslope flow of water, therefore increasing the likelihood of plant growth.

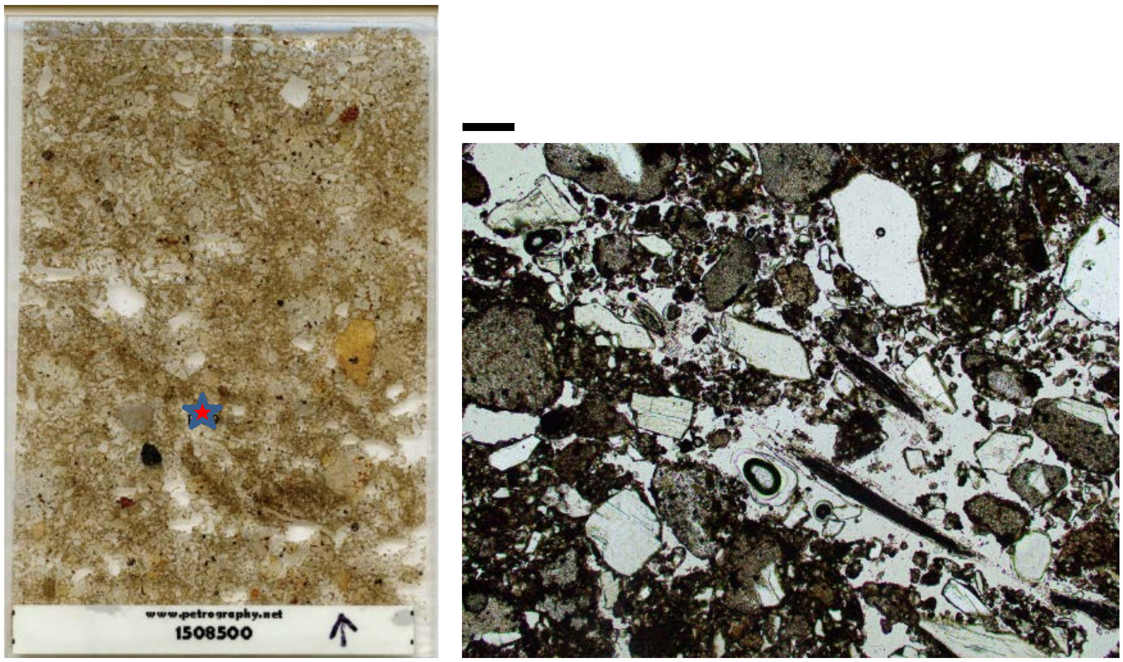


Figure 6.47: A flatbed scan of the thin section slide from SMS Sample 1508500 (left) and a closeup showing decayed plant material in the sedimentary matrix. No discrete beds were identified within this slide. Scale bar is equal to 400µm.

Sample 1508499 (Figure 6.48) is from the upper Contexts in the exterior of the fence line (the eastern, downslope side of the basalt stones). The sample is highly variable with microstructure from massive to crumbly with localized areas of horizontally-oriented fine fraction. Zones with more organic material in the fine fraction present as a more crumbly texture while the more sediment-dominated areas are massive in structure. The fabric is generally more compacted in the lower portion of the slide. Large vughy voids in dense packed areas are associated with decayed plant material and are more concentrated in the upper portion of the slide. There is no evidence for anthropogenic alterations and no anthropogenic material was identified. The variable composition of this slide is interpreted as the result of natural colluvial and aeolian accumulation along with plant activity.

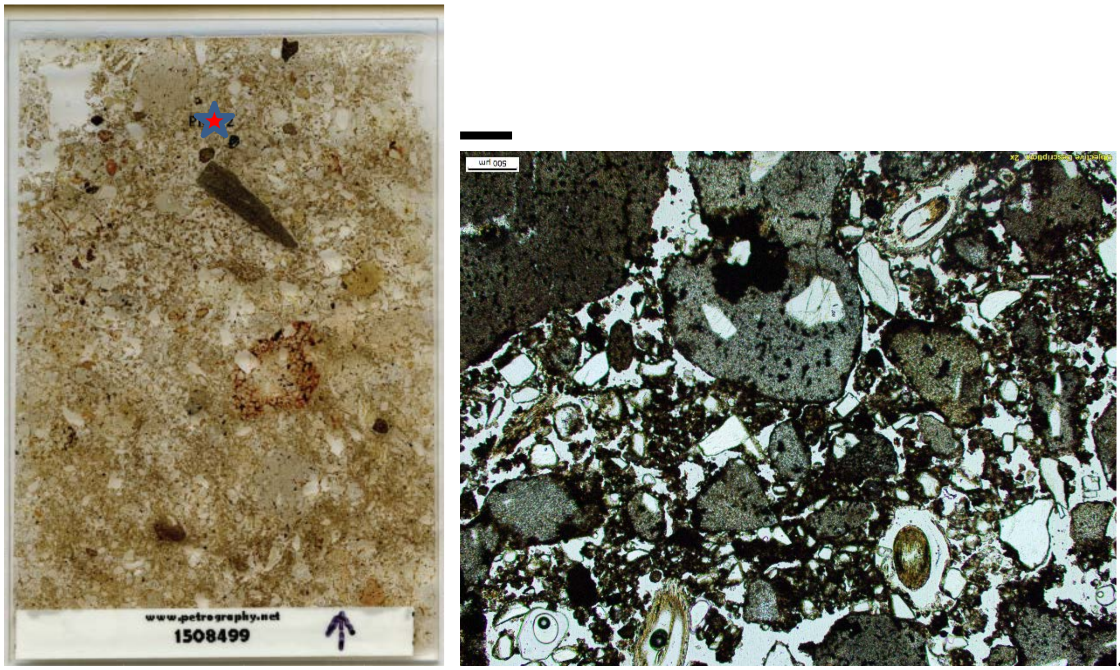


Figure 6.48: A flatbed scan of the thin section slide from SMS Sample 1508499 (left) and a closeup showing the sedimentary matrix with organic matter. No discrete beds were identified within this slide. Scale bar is equal to 400µm

Sample 1508498 (Figure 6.49) was taken directly below 1508499 in the area outside the fence line (on the eastern side of the basalt stones). Similar to 1508499, the sample shows no evidence of anthropogenic activity and no anthropogenic materials were identified. Organic matter is less apparent than in the overlying slide (1508498 has less than 2% organic matter, mostly in the upper portion of the slide). There is very light presence of fine fraction organic matter in the upper portion of the slide. The fabric is overall fine-grained, with variable compaction (from 5% to 20% void space). The slide is interpreted as natural sediment accumulation with sparse presence of organic matter from overlying vegetation.

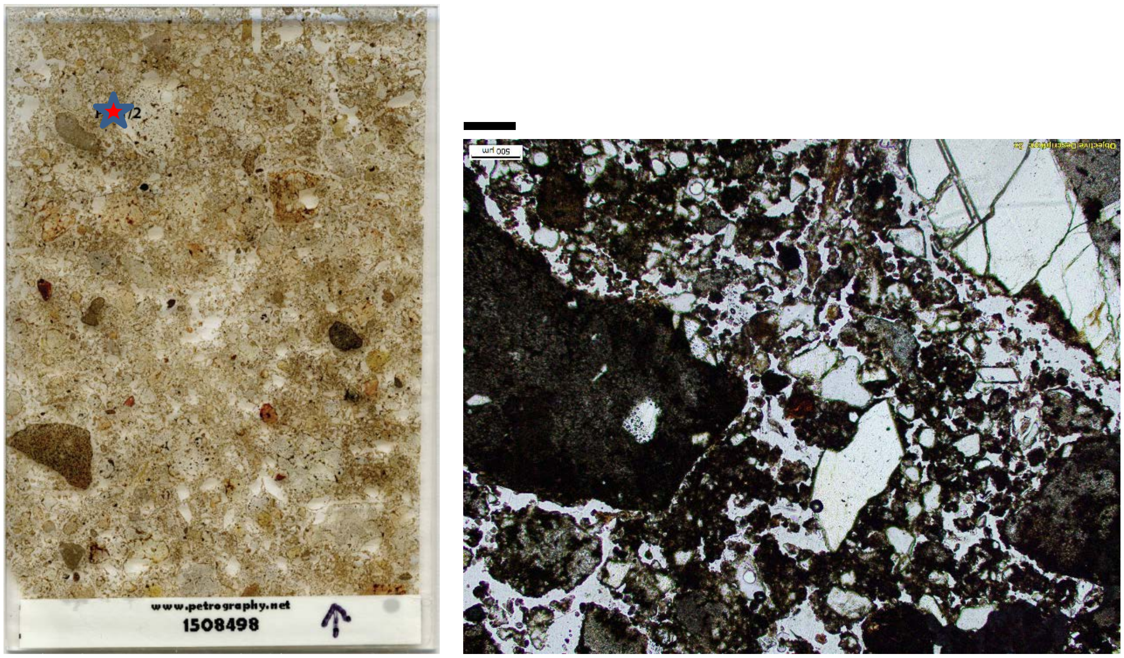


Figure 6.49: A flatbed scan of the thin section from SMS Sample 1508498 (left) and a closeup showing the sedimentary matrix. No discrete beds were identified within this slide. Scale bar is equal to 400µm.

Eastern Laundresses' Quarters: Unit 57

Two micromorphology samples were taken from Unit 57 in the eastern area of the Laundresses' Quarters (Figure 6.50). The uppermost of the two samples (1508585) split into two pieces during collection. Since the two pieces were intact and the gravelly sediment made sample collection difficult, the two pieces of 1508585 were retained and labeled 1508585A and 1508585B (Figure 6.51). The placement of samples in Unit 57 was intended to investigate what the excavator described as several thin layers of fine grained sediment in the upper part of the Unit. However, examination of thin sections did not show laminations or other indications of bedding, but instead showed unaltered sediment similar to that seen at other exterior contexts in the Laundresses' Quarters.

Figure 6.50: A photograph showing Unit 57 in the Laundresses' Quarters at FODA-NHS facing northwest.

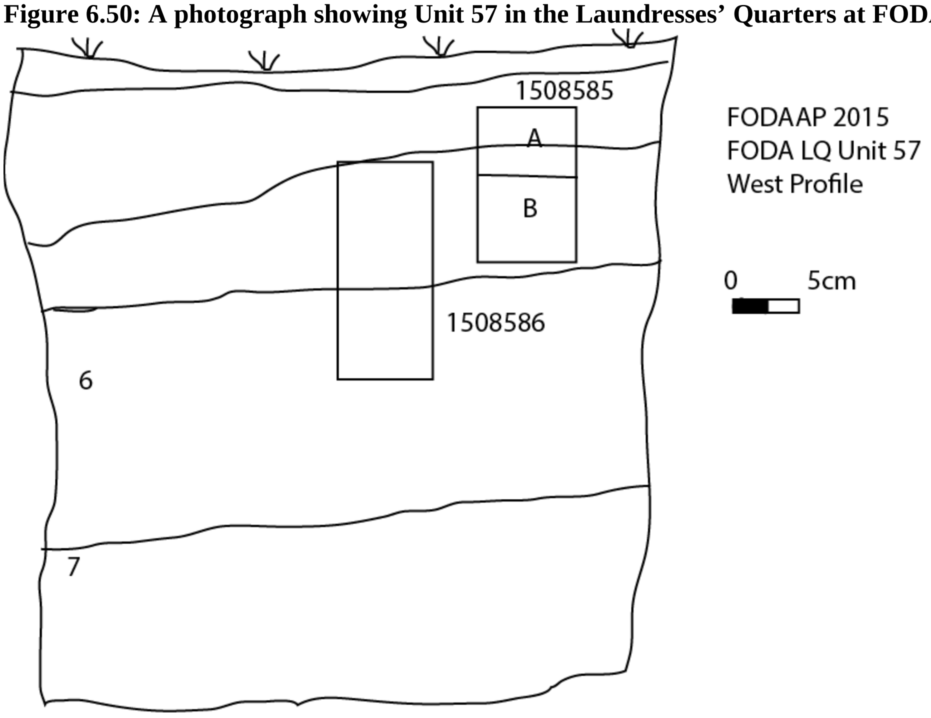


Figure 6.51: A stratigraphic drawing of the western profile of Unit 57 showing the locations of micromorphology samples.

Sample 1508585A (Figure 6.52) shows a well-sorted sediment dominated by coarse grains with a very weak horizontal orientation of sediment grains in the lower portion of the slide associated with increased compactness. There is some organic matter throughout along with a piece of fractured glass and small potential metal fragments. The domination of coarse fraction in this sample is likely due to aeolian erosion of the fine fraction. This unit is located on a small raised area to the east of the Laundresses' residences and therefore more exposed to Aeolian processes.

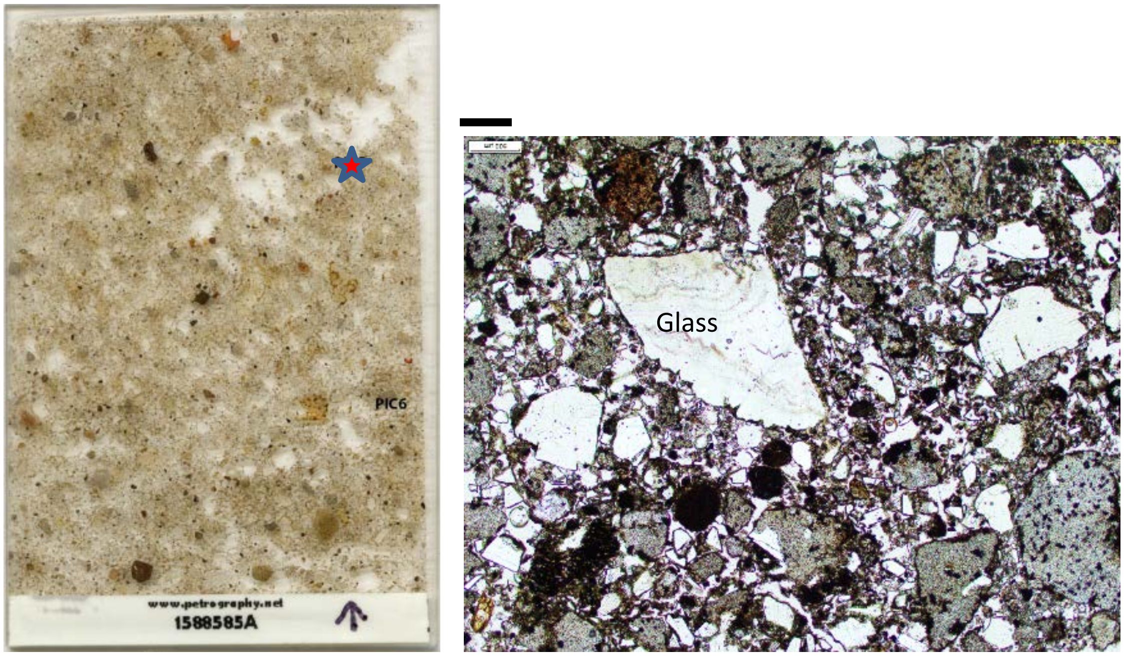


Figure 6.52: A flatbed scan of the thin section from SMS Sample 1508585A (left) and a closeup showing a glass fragment and sedimentary matrix. No discrete beds were identified within this slide. Scale bar is equal to 400µm.

Sample 1508585B (Figure 6.53) shows a compacted sediment with decayed organic matter in the fine fraction resulting in a darker color overall than the overlying slide (1508585A). There is some potential weak horizontal orientation of coarse particles, but not well-expressed enough to indicate trampling.

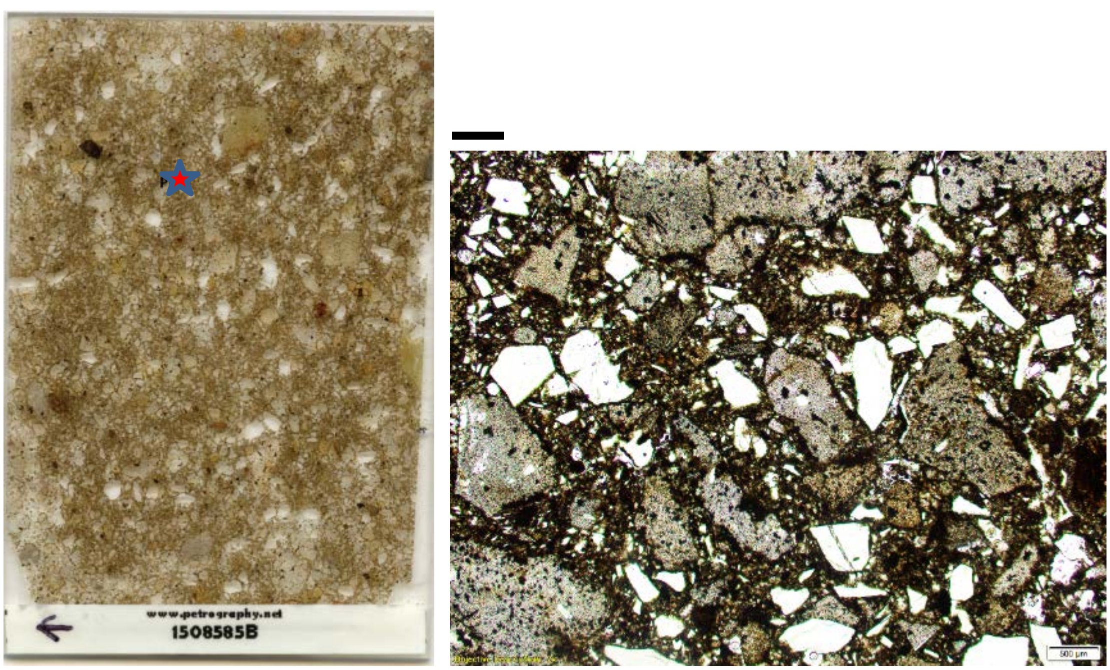


Figure 6.53: A flatbed scan of the thin seciton from SMS Sample 1508585B and a closeup showing the sedimentary matrix. No discrete beds were identifed within this sample. Scale bar is equal to 400µm.

Sample 1508586 (Figure 6.54) is taken from Contexts analogous to and below sample 1508585B. The slide shows a dark, compacted fabric similar to sample 1508585B. There is a carbonate nodule in the lower part of the slide, a rare feature in the Laundresses' Quarters.

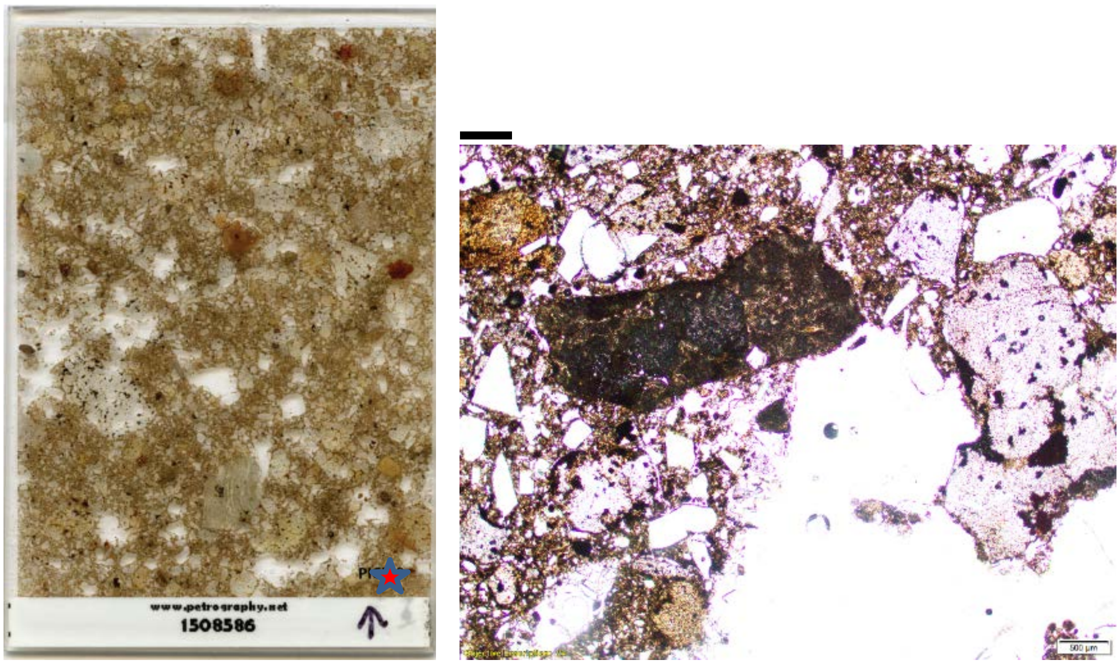


Figure 6.54: A flatbed scan of the thin section from SMS Sample 1508586 and a closeup showing a micritic carbonate nodule. No discrete beds were identified within this slide. Scale bar is equal to 400µm.

A summary of the results of the analyses at the Laundresses' Quarters is presented in Chapter 7.

ENLISTED MARRIED MEN'S QUARTERS GEOARCHAEOLOGICAL ANALYSES

Excavations

Excavations at the Enlisted Married Men's Quarters at FODA focused on structure HB 202 and the area around the associated privy (HB 224). The Enlisted Married Men's Quarters extended along the base of the northern hillslope abutting the parade ground at FODA (Figure 4.7). This slope includes large columnar exposures of trachyte (described as rhyolite in FODA records) and basalt, as well as many boulders. Based on a cultural resources survey by Greene (1986) HB 202 was the largest of the residences extending along the hillslope. A historic photograph of HB 202 shows a main structure, a northern addition, and a southwestern canvas-roofed addition grouped around a small boulder (Figure 4.3) To the east, the privy was located on the northern side of a larger boulder. While no foundations or other evidence of construction was recovered at surface level or during excavation, correlations between excavation Units and areas of HB202 was interpreted based on this historic photograph.

Thirteen excavation Units (a mixture of 1m x 0.5m unit and 0.5m x 0.5m units) were placed in the area of HB202 (Figure 4.13). None of these units contained architectural materials or intact archaeological stratigraphy. However, a large amount of archaeological debris, particularly food-related debris such as cans and faunal material, were recovered from downslope Units in the area of HB 202 (Units 65, 62 and 64). Additional concentrations of material were recovered in Unit 60 which was placed in a proposed 'gap' area between the northern addition to HB 202, and the canvas-roofed portion of the structure.

Three additional Units were placed in areas nearby HB 202. One Unit was placed upslope from the structure in a small scatter (Unit 63) and another Unit was placed in proposed yard space (Unit 71). Lastly, Unit 67 (a 1m x 0.5m Unit) was placed near the large boulder in an attempt to recover the entrance to the privy. However, upon excavation it was discovered that the Unit contained the main privy pit, along with part of the entryway.

Overall the soil from the married men's quarters was loose, organic-rich sandy soil with large rocky inclusions which increased with depth. In the field, most Contexts were distinguished through changes in the amount of rocky inclusions or artifact density, rather than sedimentological variation. Mineralogy is similar to other Contexts at FODA with large amounts of silicate tuff and small quartz crystals dominating the coarse fraction. Trachyte, basalt, feldspars, calcite crystals, and limestone occur as accessory rocks and minerals. The fine fraction is usually dark in color indicating substantial humic material. Additionally, most slides show a crumbly to blocky microstructure indicating a high degree of soil development than seen at the Laundresses' Quarters. Also, in contrast to the Laundresses' Quarters most slides show indications of carbonate development including micritic carbonate nodules containing soil fabric along with other organic matter, carbonate coatings, and one instance of dissolution of a silicate tuff nodule by a carbonate coating. Depletion features indicating short term water saturation are also present in several slides.

Bulk Soil Analyses

pH Analysis

pH Analysis was performed on 102 bulk samples taken from excavation Contexts in the Enlisted Married Men's Quarters. Overall mean pH was 7.24 with a standard deviation of 0.55. Only one excavation unit had an average pH more than two standard deviations beyond the overall mean (Figure 6.65). Unit 71 had an average pH of 6.05. Within this Unit, several Contexts (1, 2, 3, and 8) were exceptionally low in pH. Several Contexts in this Unit also had higher rates of organic matter content than expected (although within two standard deviations of the site average). As Unit 71 is located in yard space away from HB 202 and without evidence for anthropogenic activity, this difference may be related to differences in soil development processes based on anthropogenic inputs. Table 6.5 shows the average pH per excavation Unit. Recorded pH per Context can be found in Appendix II.

Focusing only on the excavation Units from HB 202 (excluding Units 71, 63, and 67) the mean pH is 7.37 with a standard deviation of 0.26. While no excavation Unit has a mean pH beyond two standard deviations from the mean, several individual Contexts have pH values more than two standard deviations below the mean. These include Contexts 1 and 2 from Unit 62 (abutting HB 202 to the north, exterior space), Contexts 1 and 4 from Unit 70 (north of the small boulder, exterior space), and Contexts 1, 3, and 4 from Unit 73 (west of the small bounder, exterior space). The other Unit from the main HB 202 area containing exterior space (Unit 72) did not have any Contexts with PH values significantly below the mean. This pattern suggests variation in soil PH based on exterior vs interior areas of the structure. Micromorphology samples from Unit 62 (discussed below) show substantially less carbonate development than seen in samples from interior spaces. As carbonate content would tend to increase soil PH, this corresponds to the pattern seen in the PH data. It is also important to note that within the small area of the FODAAP excavations pedogenic processes create a spatial dependence among the samples which limits the accuracy of any statistical test to establish statistical significance between samples.

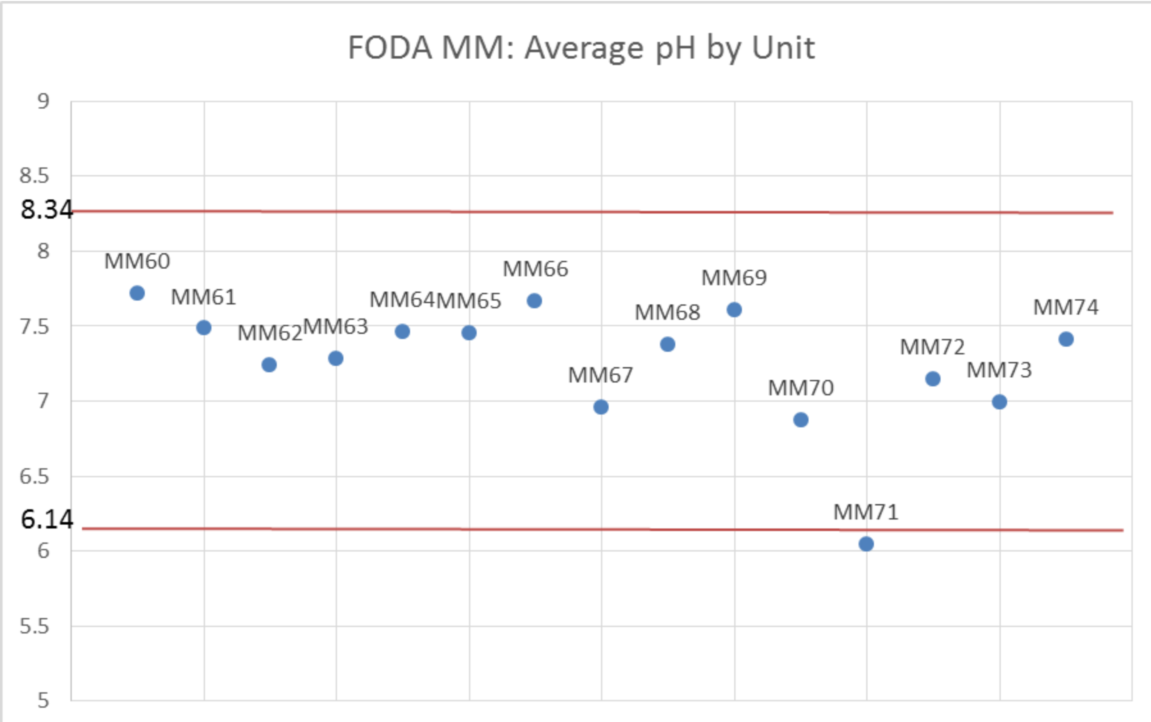


Figure 6.55: Scatterplot showing the mean pH by unit for the Enlisted Married Men's Quarters at FODA-NHS. The red lines show the boundaries of a two-standard deviation confidence interval.

UNIT	Average pH
MM60	7.71
MM61	7.48
MM62	7.23
MM63	7.28
MM64	7.46
MM65	7.45
MM66	7.66
MM67	6.95
MM68	7.37
MM69	7.61
MM70	6.87
MM71	6.04
MM72	7.14
MM73	6.99
MM74	7.41

Table 6.5: Mean pH by unit for the Enlisted Married Men's Quarters. pH by excavation context is presented in Appendix II.

Variables Compared	Correlation
%sand vs. Organic Matter	0.0047
%sand vs. pH	0.0369
%silt vs. Organic Matter	0.1569
%silt vs. pH	0.1710
%clay vs. Organic Matter	0.2785
%clay vs. pH	0.3274
%silt vs context	-0.0016
%sand vs context	0.0966
Organic Matter vs. pH	0.0144

Table 6.6: Correlation Coefficients for Comparisons between Bulk Soil Analyses at the Enlisted Married Men's Quarters at FODA – NHS

Unit 67 (the privy) has an overall PH of 6.96. When the contexts from the privy pit are separated from those from the entrance the mean for the pit is 7.11 with a standard deviation of 0.25 (based on 14 samples from the pit) and the mean for the entrance is 6.69 with a standard deviation of 0.38 (based on nine samples from the entryway). As these contexts are located within a 1m by 0.5 m space and pedogenic processes are not spatially discrete, the PH values are not independent observations and statistical comparison would be invalid. However, while it is not possible to establish a statistical difference between the privy pit and the entrance area, the entrance does display a slightly lower PH than the privy pit itself.

Organic Matter Analysis

Overall, the excavated contexts in the Enlisted Married Men's Quarters had an average organic matter content of 5.61% with a standard deviation of 2%. Only two excavated Contexts had percentages of organic matter beyond two standard deviations from the mean (Figure 6.56) The first was Unit 60 Context 1 (surface) which had an organic matter content of 14%, which was substantially higher than other surface contexts (see Appendix II). The second context was Unit 67 Context 13B (midden debris in the privy) with an organic matter content of 15%, likely due to increased organic content in the privy. Table 6.7 shows the average percentage of organic matter by excavation unit. Recorded percentage of organic matter by context can be found in Appendix II.

Considering only the Units from the main area of HB202 (excluding 63, 67, and 71), the mean organic matter content is 5.44% with a standard deviation of 1.34%. Four Contexts from this area have percentages of organic matter beyond two standard deviations from the mean. Unit 62 Context 4 (abutting the main structure to the north in an area of high artefactual content) had an organic matter content of 8.40%. Unit 72 Context 5 (west of the little boulder, exterior space, subsoil) had an organic matter content of 2.22%. Unit 73 (north of the small boulder, exterior space) had two Contexts with organic matter contents below two standard deviations from the mean: Context 4 with 2.76% and Context 7 with 2.58%. Nearby Contexts also had low percentages of organic matter, suggesting that the area near the boulder in general is low in organic matter input.

Analysis of the privy showed an overall mean organic matter content of 5.53%. Separating the privy pit from the privy entrance showed a mean organic matter content for the privy pit of 5.87 with a standard deviation of 3.00%. The privy entrance had a mean organic matter content of 4.99% with a standard deviation of 0.61%. Interestingly, the privy pit had much higher variation in organic matter content than the entrance. As previously mentioned, Context 13B had one of the highest rates of organic matter content seen at the Enlisted Married Men's Quarters excavations. This context is interpreted as midden debris fill deposited after the privy fell into disuse. Contexts 15, 18, and 19 also had relatively high rates of organic matter content (7.60%, 7.79% and 7.28%, respectively). These contexts were also described as midden debris by excavators. Interestingly, the lowest contexts (which smelled of feces during excavation) had overall low rates of organic matter content. Context 20, located just below a large plate capping the lower contexts, had an organic matter content of 5.61%. The lower Contexts, 21, 22, and 23, had organic matter contents of 2.87%, 3.83% and 2.75%, substantially lower than the overlying midden contexts. This suggests that these lowest Contexts were cleaned of remaining human waste before the privy was abandoned and that the higher rates of organic matter seen in the overly context are the result of the midden accumulation.

Organic matter content was plotted against pH to see if a significant correlation existed between the two soil characteristics. The correlation between the two variables was 0.014 indicating no correlation between the two variables (Table 6.6).

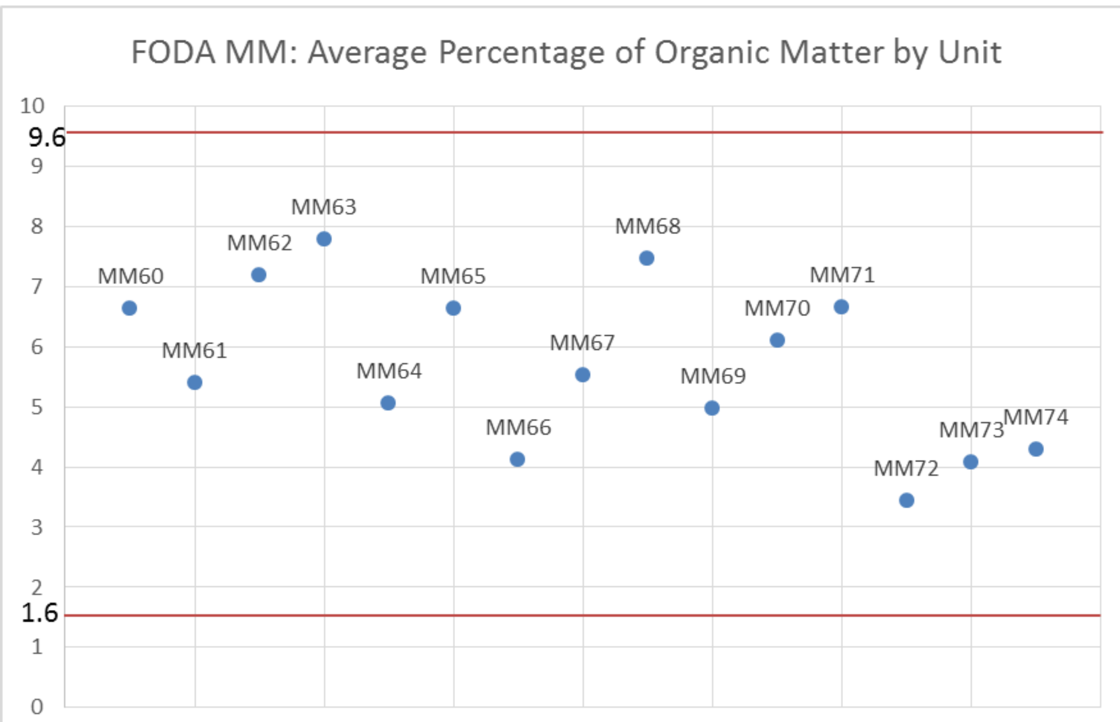


Figure 6.56: Scatterplot showing mean percentages of Organic Matter by Unit for the Enlisted Married Men's Quarters at FODA – NHS. Red lines show the boundaries of a 2 standard deviation confidence interval.

UNIT	Average % of Organic Matter
MM60	6.62

MM61	5.39
MM62	7.18
MM63	7.77
MM64	5.04
MM65	6.62
MM66	4.11
MM67	5.52
MM68	7.46
MM69	4.96
MM70	6.09
MM71	6.65
MM72	3.43
MM73	4.07
MM74	4.28

Table 6.7: Mean Percentages of Organic Matter for Excavation Units in the Enlisted Married Men's Quarters at FODA-NHS. Percentages of Organic Matter by excavation context are presented in Appendix II.

Particle Size Analysis

Thirty-five samples from the Enlisted Married Men's Quarters were analyzed by hydrometer for particle size (Figure 5.2). Samples were included from Unit 65 at the eastern edge of the excavation area, Unit 72 on the western side of the small boulder, Unit 71 in the yard space to the north of HB 202, and Unit 67 which was placed in the privy (HB 224) to the west of HB 202. Lower contexts in the Enlisted Married Men's Quarters contained very high amounts of rocky inclusions. Table 6.8 shows recorded percentages of clay (particle diameter less than 0.0055mm), silt (particle diameter between 0.0055mm and 0.063mm) and sand (particle diameter between 0.063 and 1mm) for each Context analyzed. Overall the samples from the Enlisted Married Men's Quarters had 69.99% (±7.90%) sand, 26.26% (±4.24%) silt, and 13.16% (±1.16%) clay.

Site	Unit	Context	ID	Clay	Silt	Sand
FODAMM	65	1	1508559	14.20	34.27	50.55
FODAMM	65	2	1508562	13.39	29.99	55.22
FODAMM	65	3	1508563	12.92	24.01	71.92
FODAMM	65	4A	1508567	14.21	24.59	76.79
FODAMM	65	4B	1508735	13.52	28.23	73.12
FODAMM	71	1	1021565	12.18	27.88	57.20
FODAMM	71	2	1021563	12.27	26.76	62.11
FODAMM	71	3	1021561	12.61	23.24	76.55
FODAMM	71	4	150810	12.89	20.91	81.51
FODAMM	71	5	1508704	13.99	24.83	77.01
FODAMM	71	6	1508705	12.79	21.55	79.77
FODAMM	72	2	1508755	15.01	26.93	68.26
FODAMM	72	3	1508756	11.74	22.05	79.87
FODAMM	72	4	1508776	11.48	21.46	76.48
FODAMM	72	5	1508773	12.20	20.52	79.96
FODAMM	67	1	1508570	16.43	31.15	64.73

FODAMM	67	2	1508608	12.54	27.91	64.33
FODAMM	67	3	1508646	14.96	30.30	63.50
FODAMM	67	4	1508648	14.85	28.82	71.44
FODAMM	67	6	1508647	12.86	29.02	69.89
FODAMM	67	7	1508738	13.23	31.63	66.16
FODAMM	67	9	1508643	12.92	26.46	67.27
FODAMM	67	10	1508861	12.33	23.82	67.19
FODAMM	67	11	1508875	12.48	28.12	61.56
FODAMM	67	12	1508748	12.63	21.57	76.25
FODAMM	67	13A	1508857	12.23	24.76	69.77
FODAMM	67	13B	1508919	12.85	25.30	72.35
FODAMM	67	14	1021675	12.59	27.79	70.14
FODAMM	67	15	1021679	12.85	26.93	71.57
FODAMM	67	17	1021685	11.99	23.38	71.99
FODAMM	67	18	1021668	13.54	24.68	71.98
FODAMM	67	19	1021665	15.83	40.25	53.72
FODAMM	67	20	1021662	13.24	26.73	72.23
FODAMM	67	21	1021717	11.67	19.57	77.81
FODAMM	67	22	1021719	12.97	23.55	79.42

Table 6.8: Relative Percentages of Clay, Silt, and Sand for analyzed contexts in the Enlisted Married Men's Quarters at FODA-MM.

Unit 65, in the eastern edge of the main excavation area, contained large amounts of artefactual remains including animal bone, metal, and other food related remains. Contexts from Unit 65 had on average 66% sand, 28% silt, and 14% clay. There was little variation between contexts, although higher contexts (1 and 2) had slightly higher percentages of silt than lower contexts (Table 6.8). Figure 6.57 shows the west excavation profile of Unit 65. Figure 6.58 shows the particle size distribution by context for analyzed contexts in Unit 65.

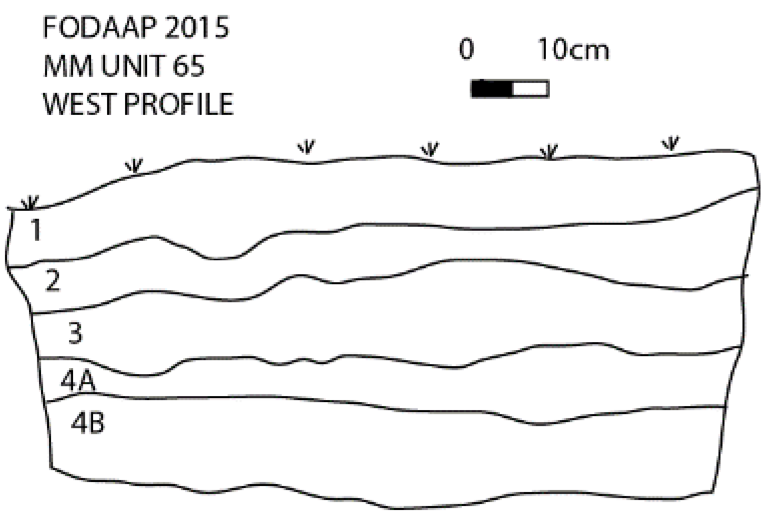


Figure 6.57: Stratigraphic Drawing of the western profile of Unit 65 in the Enlisted Married Men's Quarters at FODA-NHS.

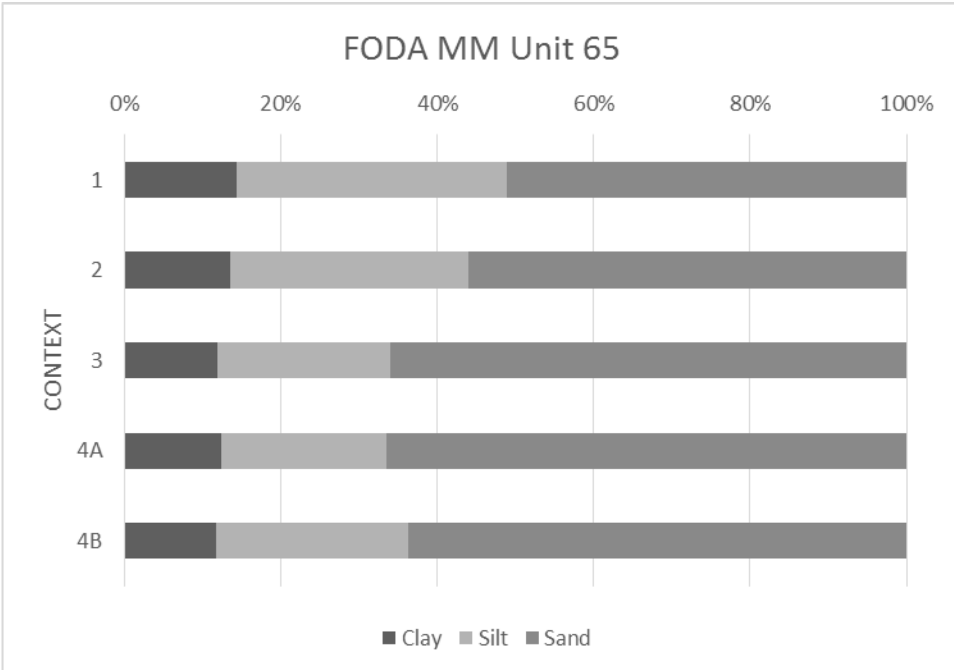


Figure 6.58: Bar Chart showing relative percentages of Clay, Silt, and Sand for analyzed contexts in Unit 65.

Unit 72, on the exterior of HB 202 on the west side of the small boulder, had on average 72% sand, 24% silt, and 13% clay. As with Unit 65 there was little variation between contexts, with Context 1 having a slightly higher percentage of silt. Figure 6.59 shows the south excavation profile of Unit 72. Figure 6.60 shows the particle size distribution by context for analyzed contexts in Unit 72.

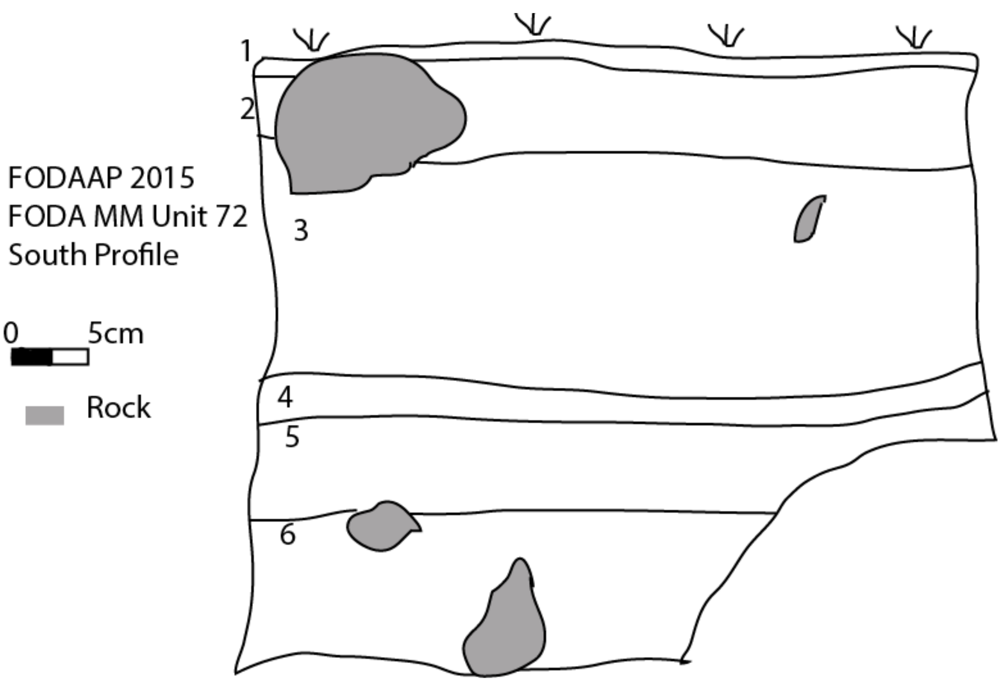


Figure 6.59: Stratigraphic drawing of the southern profile of Unit 72 in the Enlisted Married Men's Quarters at FODA-NHS.

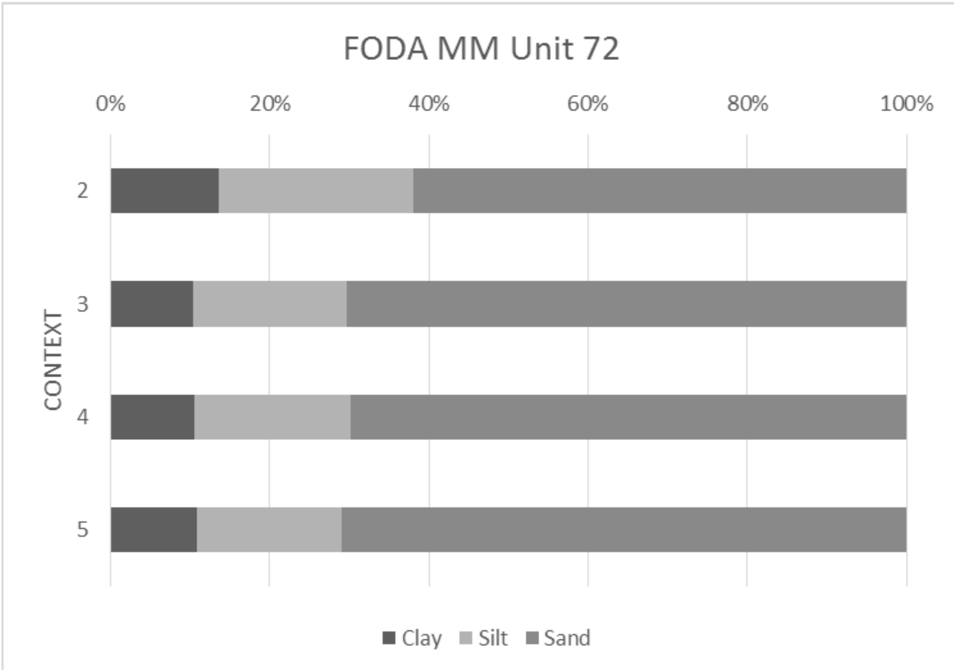


Figure 6.60: Bar Chart showing relative percentages of Clay, Silt, and Sand for analyzed contexts in Unit 72.

Unit 71 was placed in the yard space north of the structure and contained very little anthropogenic material. Contexts in Unit 71 had 76% sand, 23% silt, and 13% clay. While Unit 71 had slightly a higher amount of sand than Units from HB202, overall the profile showed a similar pattern. Figure 6.61 shows the south excavation profile of Unit 71. Figure 6.62 shows the particle size distribution by context for analyzed contexts in Unit 71.

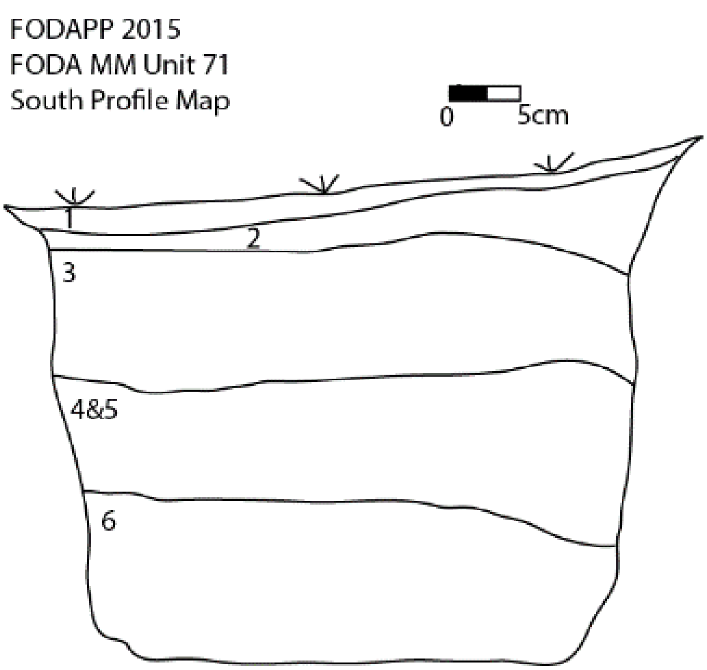


Figure 6.61: Stratigraphic Drawing showing the southern profile of Unit 71 in the Enlisted Married Men's Quarters at FODA-NHS.

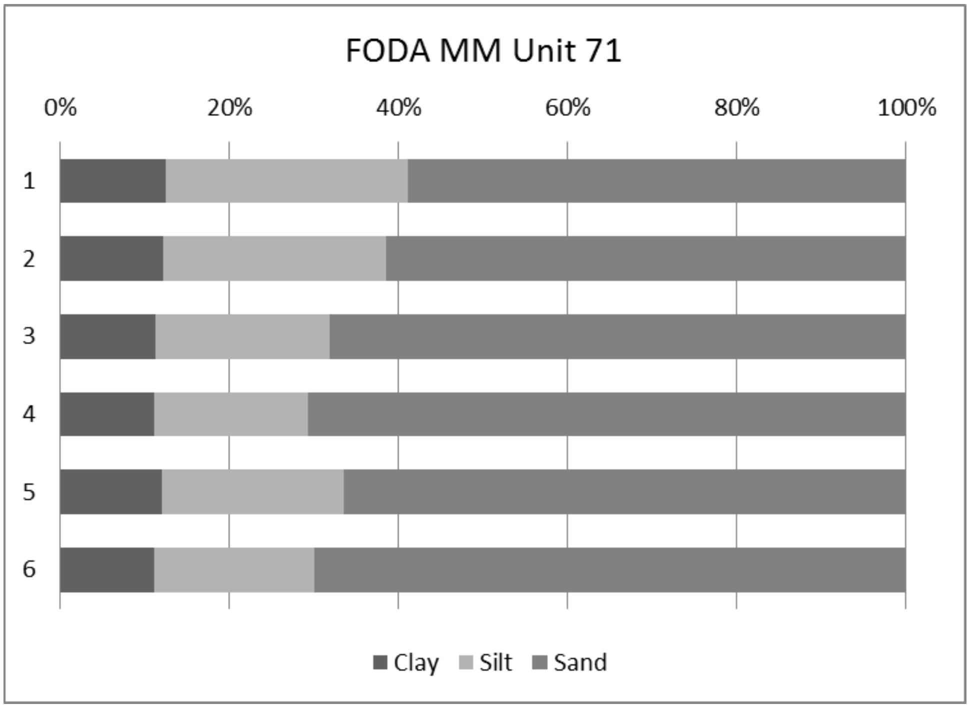


Figure 6.62: Bar Chart showing relative percentages of Clay, Silt, and Sand for analyzed contexts in Unit 71.

Unit 67 was placed in the midden to the north of the large boulder. Twenty samples from Unit 67 were processed including contexts from both within and outside the main privy pit. On average, Contexts had 69% sand, 27% silt, and 13% clay. There were no significant differences between samples from the entrance and samples from the privy pit. However, sample 19 had a much higher percentage of silt, as well as a slightly higher percentage of clay, than the other contexts. This context was a thin lens of ash, accounting for the different in particle size distribution. Figures 6.63 and 6.64 show the north and west excavation profiles of Unit 67. Figure 6.65 shows the particle size distribution by Context for analyzed Contexts in Unit 67.

Correlations were computed between percentages of clay, sand, and silt with percentage of organic matter and pH. No significant correlations were found (Table 6.6).

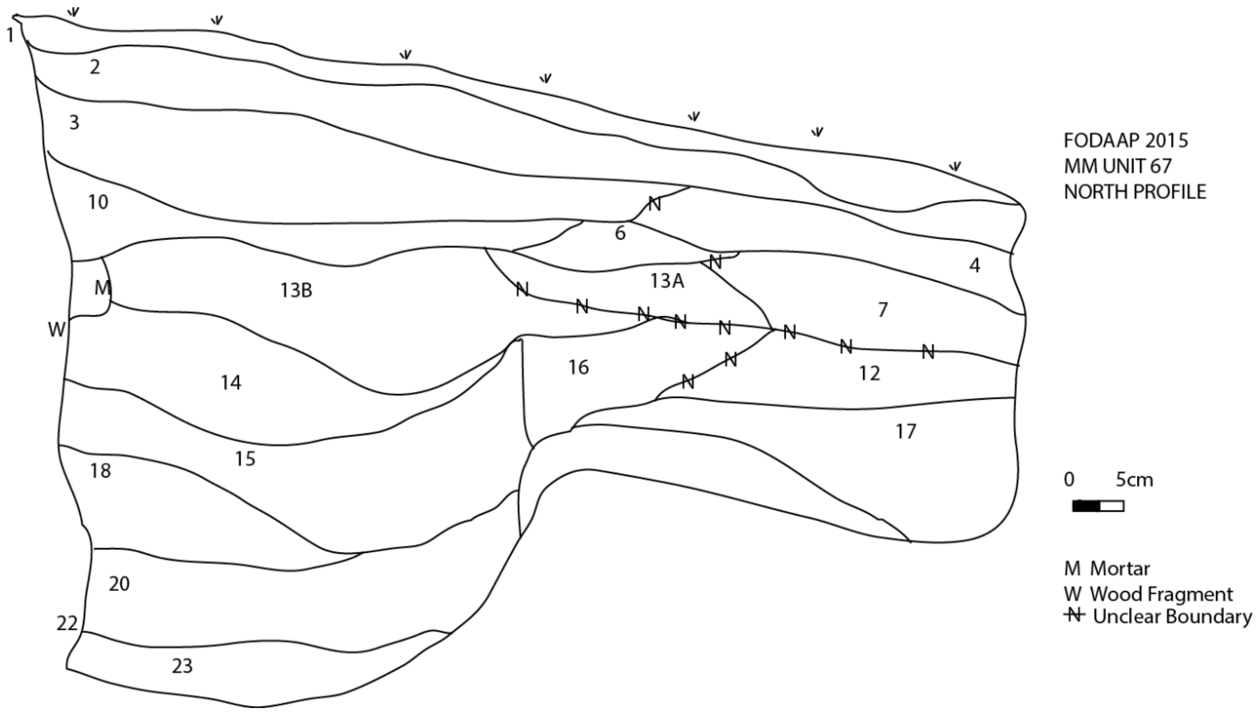


Figure 6.63: Stratigraphic drawing showing the northern profile of Unit 67 in HB 224 in the Enlisted Married Men's Quarters at FODA-NHS.

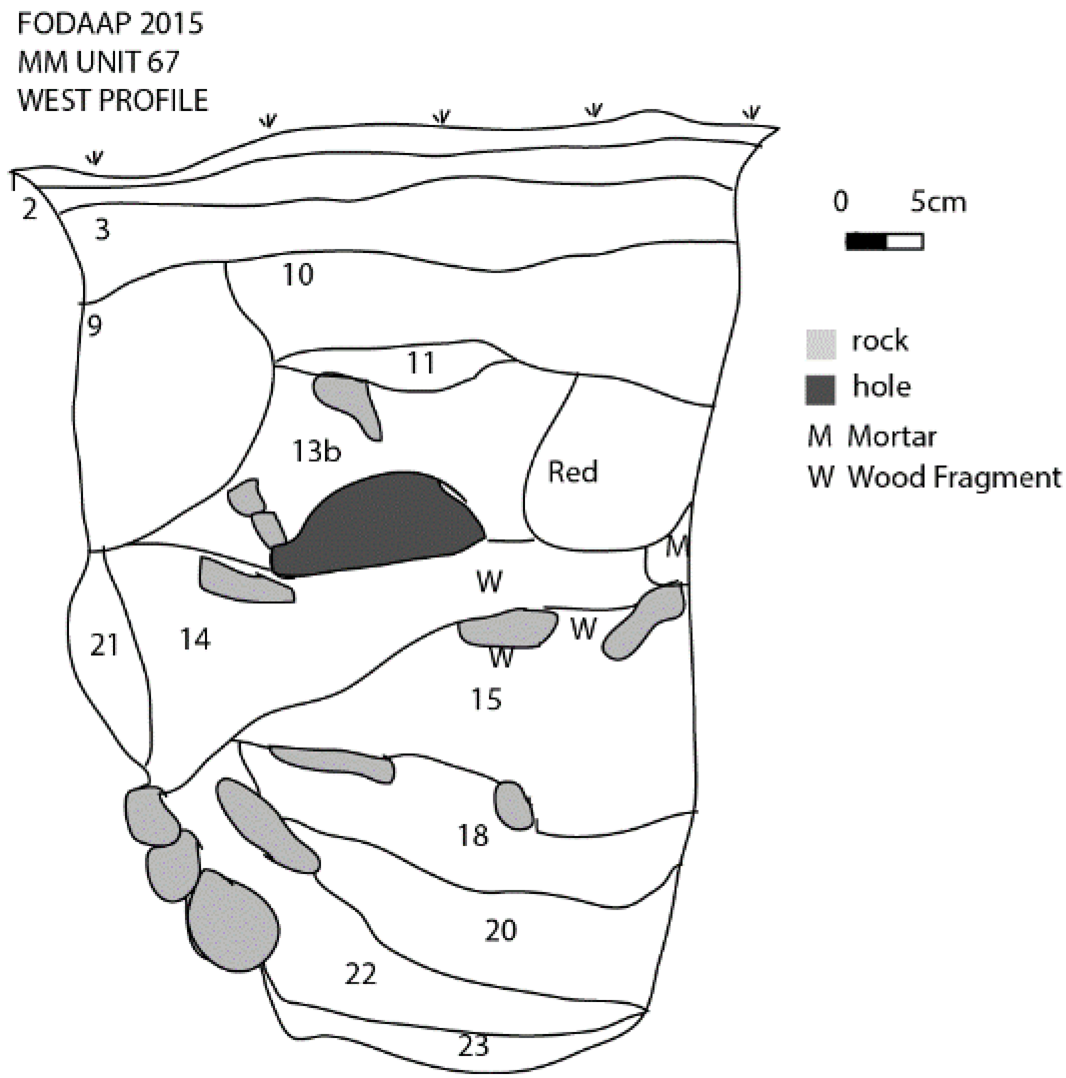


Figure 6.64: Stratigraphic Drawing showing the western profile of Unit 67 in HB 224 in the Enlisted Married Men's Quarters at FODA-NHS.

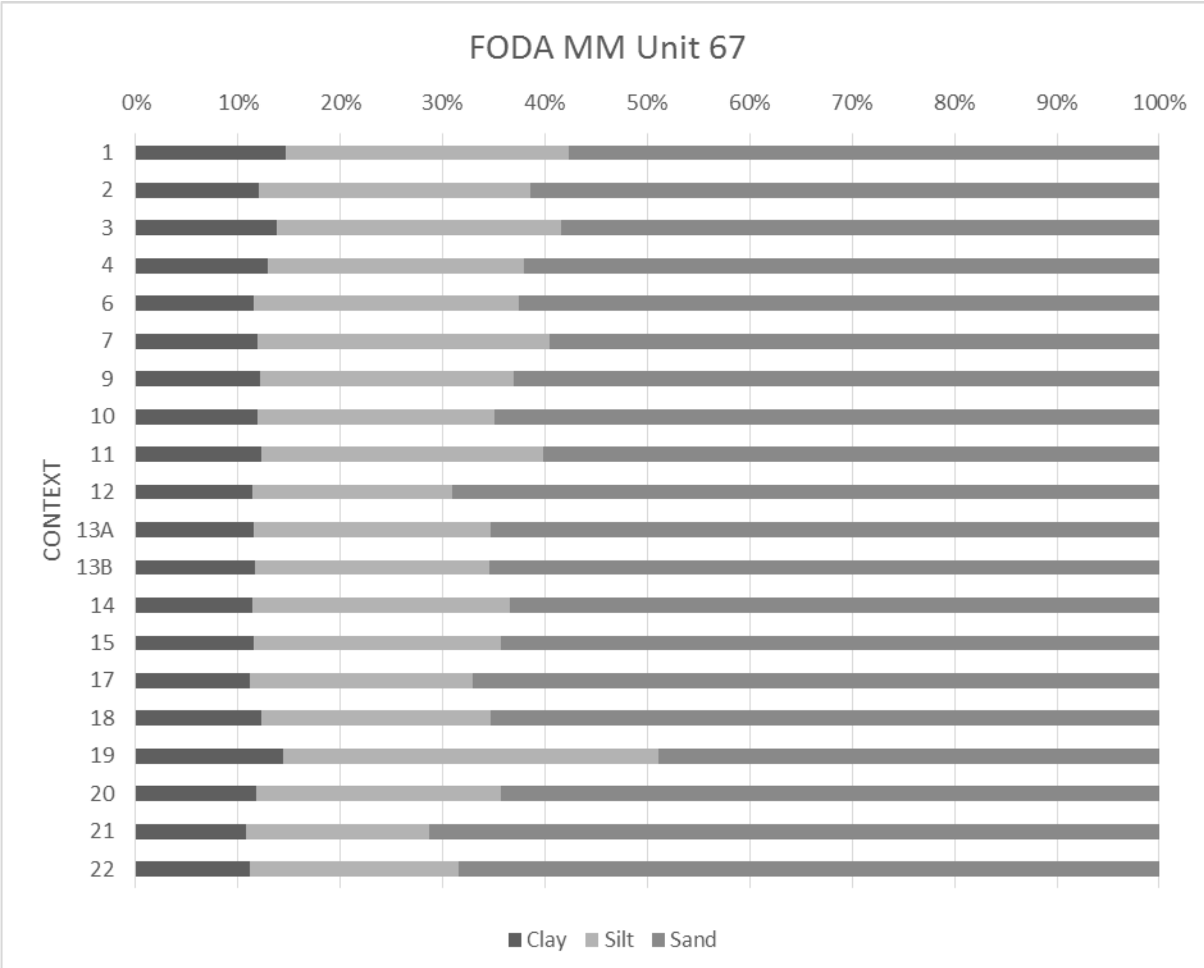


Figure 6.65: Bar Chart showing relative percentages of Clay, Silt, and Sand for analyzed context in Unit 67 (HB 224).

Micromorphology Analysis

Twelve micromorphology samples were analyzed from excavations in HB 202 and Unit 67 which was placed near an associated privy structure (Figure 5.2 and 6.66) Of the twelve samples, three were taken from Units which are interpreted as inside the main structure of HB 202 (Units 64 and 65), one sample is from a gap between the northern addition and canvas roofed structure (Unit 60), one is from inside the canvas-roofed addition (Unit 69), two samples are from outside the main structure directly to the north (Unit 62), and one is from a Unit placed just to the west of the northern addition (Unit 73). An additional four samples from Unit 67 (including the privy and its entrance) were also analyzed.

Figure 6.66: Photograph showing excavations areas in HB 202 in the Enlisted Married Men's Quarters, facing south.

HB202: Main Structure Interior, Units 64 and 65

Unit 64 was placed in the southern end of what would have been the main structure of HB202 (Figure 6.66 and 6.67). Two samples were taken from the northern profile of the unit (Figure 6.68) Sample 1021655 was taken from Context 2 and sample 1021656 was taken from Contexts 2 and 3.

Sample 1021655 indicates an active topsoil with a poorly expressed crumbly structure and large amounts of decayed organic matter. Several metal fragments were identified which likely relate to the dilapidation of the structure. Vughy voids in the lower part of the slide have hypocoatings and well-defined void boundaries which suggest they may be termite or other insect burrows (Figure 6.68 and 6.69) Features related to carbonate formation are much more well-defined here than were observed at the Laundresses' Quarters. Several micritic carbonate nodules also incorporate soil material and organic matter (including charcoal) into the fabric, supporting an interpretation of *in situ* development. There is also an instance of a large carbonate coating engulfing a silicate tuff nodule showing dissolution of the silicate material by the carbonate (Figure 6.68).

Figure 6.67: Photograph showing Units 62, 65, 64 (foreground to background) in the interior of HB 202 in the Enlisted Married Men's Quarters at FODA-NHS.

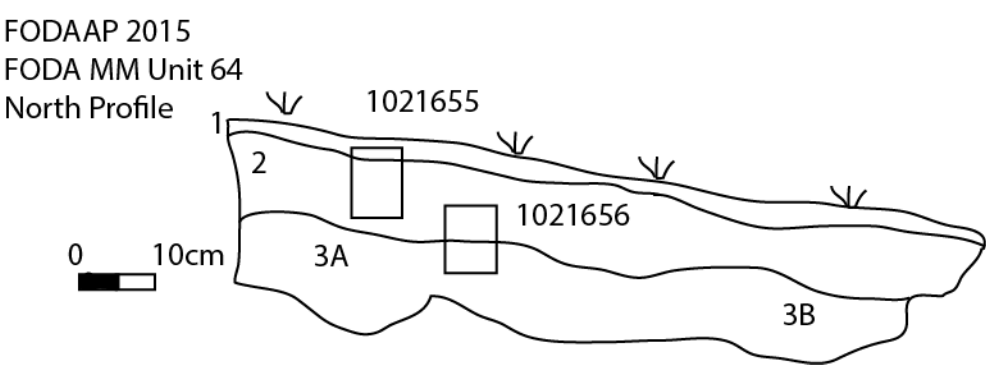


Figure 6.68: Stratigraphic Drawing showing the northern profile of Unit 64 with micromorphology samples indicated

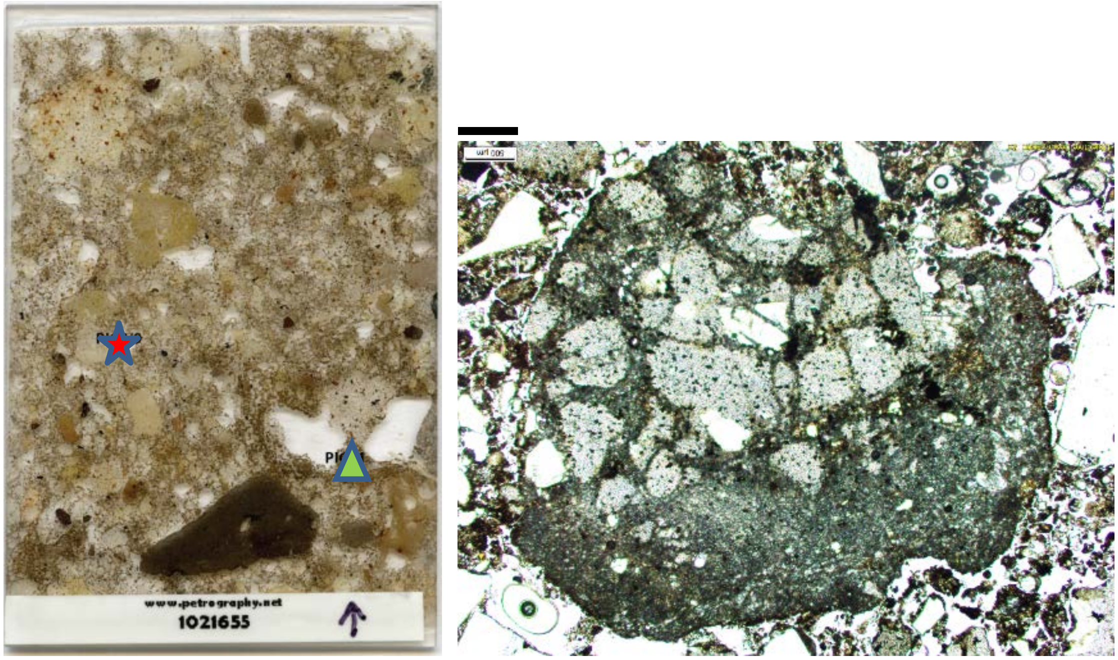


Figure 6.69: A flatbed scan of thin section slide from SMS Sample 1021655 (left) and a close up of a carbonate coating on a tuff fragment. No distinct beds were identified in this slide. Scale bar is equal to 400µm.

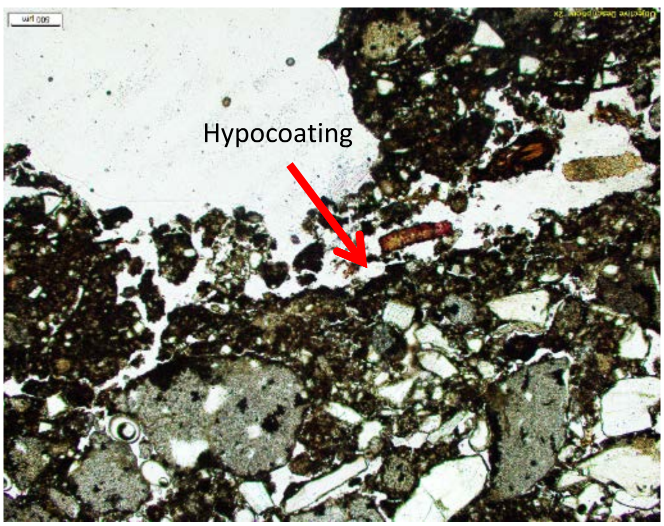


Figure 6.70: A close up from SMS Sample 1021655 (green triangle location) showing a void hypocoating interpreted as the result of insect activity.

Sample 1021656 (Figure 6.70 is from the lower Contexts of Unit 64 and shows a mixture of organic, crumbly soil showing localized orientation of fabric and loose, porous sediment. A piece of dung plaster similar to that seen in the Laundresses' Quarters is present in the upper part of the slide, along with a small fragment of possible adobe (with a similar appearance to adobe identified in Unit 67). These features likely relate to the construction of the structure. In HB 212 (Laundresses' Quarters) excavation uncovered a wood floor over an adobe subfloor. The adobe in this slide may indicate a similar construction technique used in HB 202, while the plaster was likely used for walls. Metal fragments found throughout the slide may relate to the dilapidation of the structure.

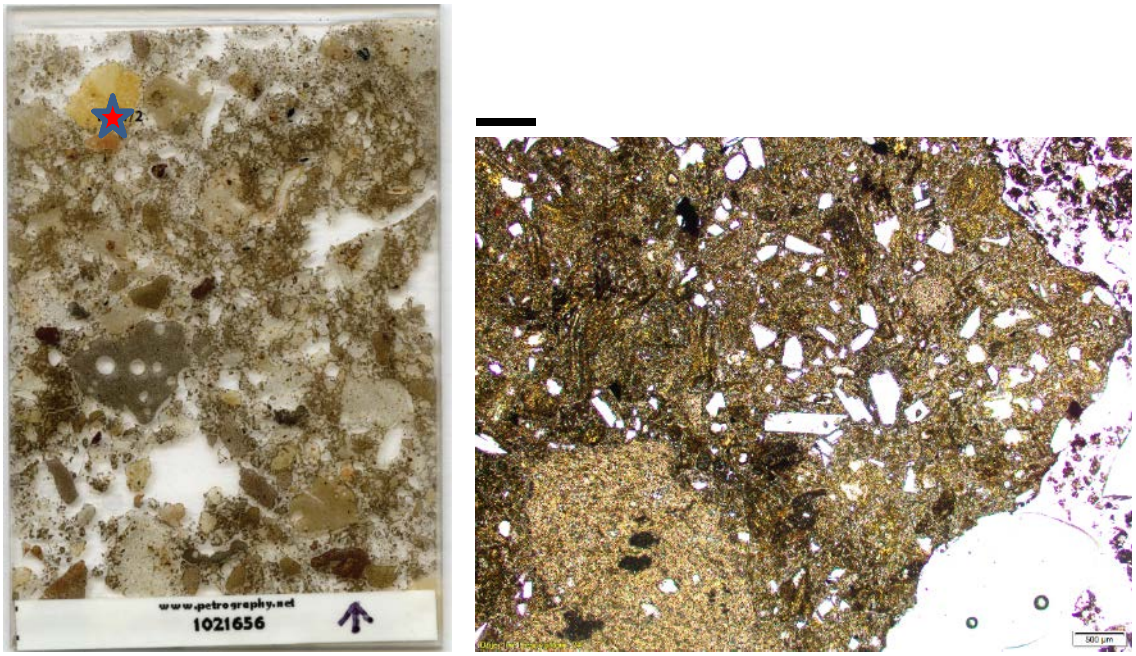


Figure 6.71: A flatbed scan of the thin section from SMS Sample 1021656 (left) and a close up showing a fragment of dun based plaster. No discrete beds were identified within this sample. Scale bar is equal to 400µm.

One sample (1021671) was taken from the western profile of Unit 65 (Figure 6.71) incorporating Contexts 2 and 3 where a high concentration of artefactual material was recovered during excavation. Two beds were apparent within sample 1021671 (Figure 6.72). The upper bed is composed of fine grained, loose, crumbly, organic soil with inclusions of bone and metal. There are otherwise no carbonate aggregates or other secondary features present. The lower bed is very loose, unconsolidated crumbly soil with large rocky inclusions and a single fragment of metal. The boundary between the two beds is marked only by a change in soil compaction without any evidence for distinct depositional episodes. In summary, the slide is interpreted as a soil formed around debris from the dilapidated structure.

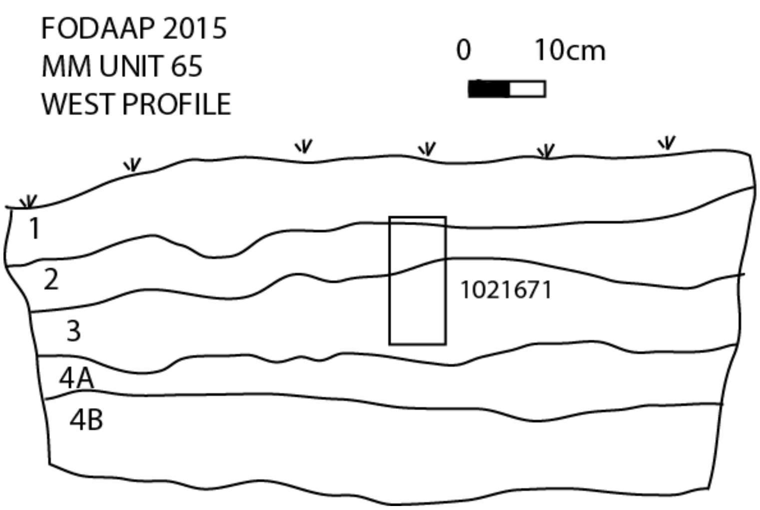
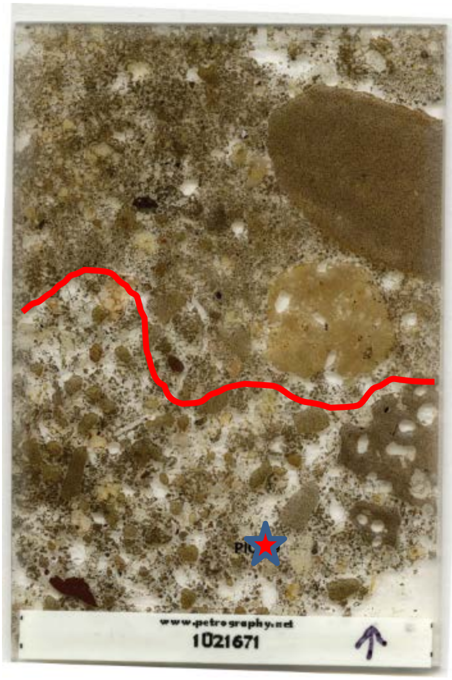


Figure 6.72: Stratigraphic Drawing of the western profile of Unit 65 indicating locations of micromorphology samples.



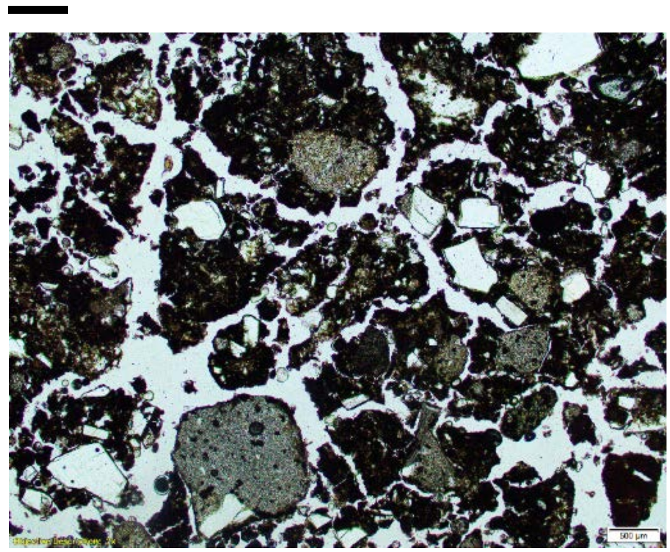


Figure 6.73: A flatbed scan of thin section from SMS Sample 1021671 (left) and a close up showing crumbly fabric. Red line shows the boundary between Bed 1 (upper) and Bed 2 (lower). Scale bar is equal to 400µm.

HB202: Canvas-Roofed Addition Interior, Unit 69

Sample 1021661 comes from the eastern profile of Unit 69 which was placed in the area interpreted as the interior of the canvas-roofed addition (Figure 6.73). The sample comes from Contexts 1 and 2 which were arbitrarily defined contexts as the excavator did not indicate changes in soil characteristics on their forms (Figure 6.74). Sample 1021661 (Figure 6.75) shows a well-expressed, blocky soil which is being intensively disrupted by carbonate nodules. Large carbonate nodules (2mm and larger) occur throughout the slide and disrupt the fine-grained fabric. These, along with smaller nodules, often incorporate soil fabric and organic matter. Some aggregates may be highly carbonized dung plaster similar to that seen in Unit 64. There are also some small depletion features (Figure 6.76) associated with vughy voids that suggest periodic water saturation. Finally, there is a small area in the upper portion of the slide displaying a horizontally-oriented fabric (Figure 6.75) that is likely the remnants of an earthen trampled surface. There is no additional archaeological or historical evidence to suggest whether the addition had a trampled or wooden floor.

Figure 6.74: Photograph showing Units 66, 69 and 60 in the Enlisted Married Men's Quarters. Photograph taken facing north.

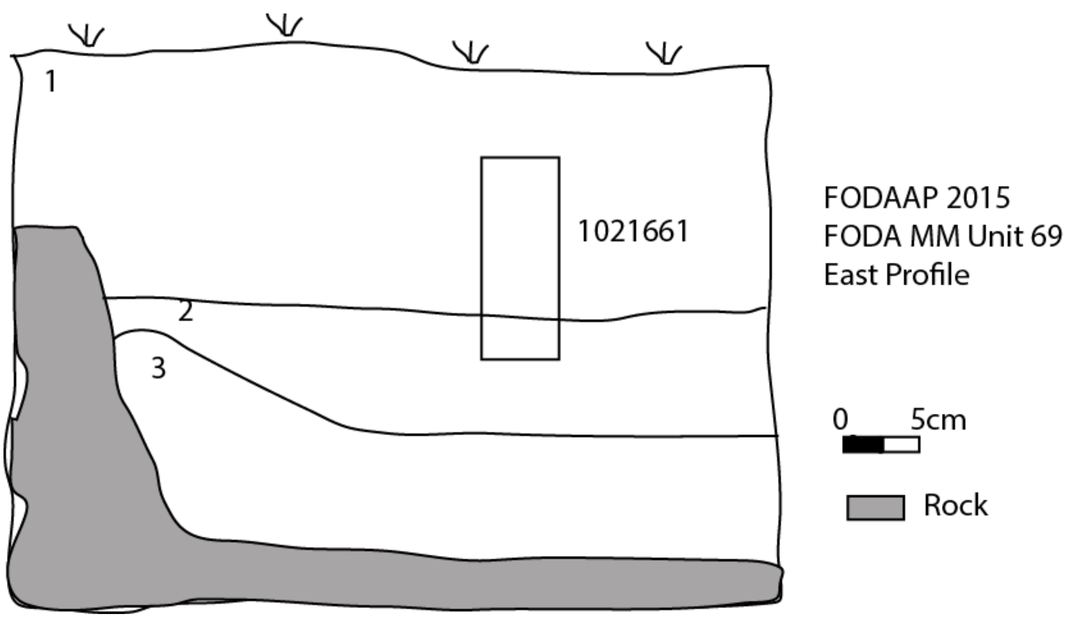


Figure 6.75: Stratigraphic drawing of the eastern profile of Unit 69 (HB 202) showing locations of micromorphology samples.

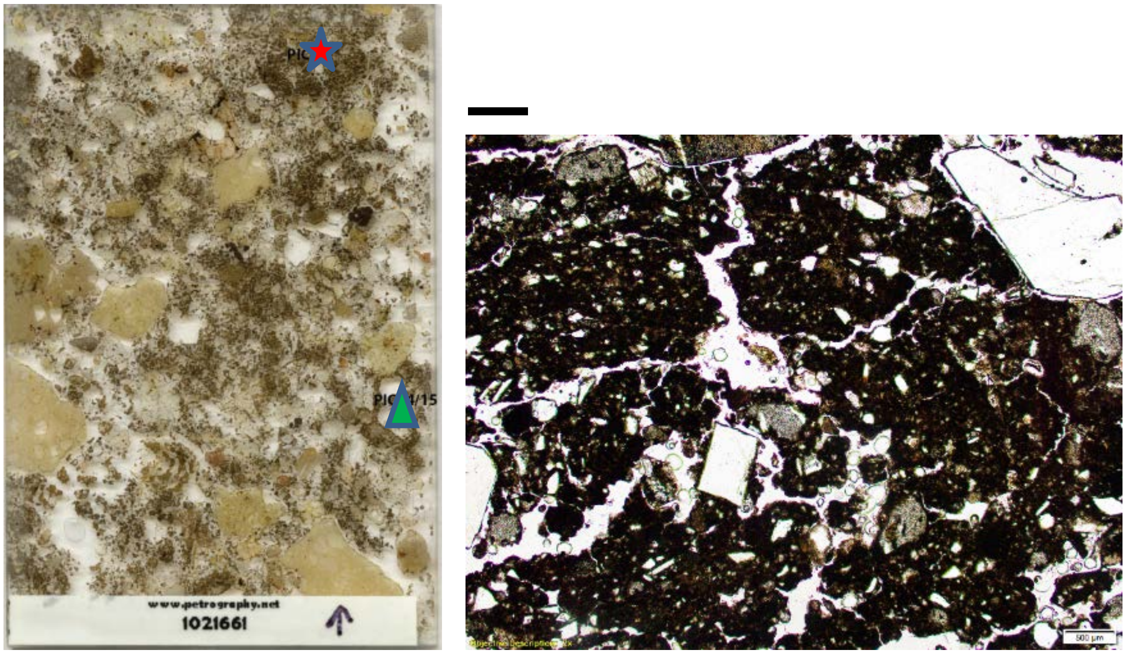


Figure 6.76: A flatbed scan of a thin section from SMS Sample 1021661 (left) and a close up show a fragment of parallel oriented, compacted fabric that may be disaggregated remains of a trampled occupational surface. No discrete beds were identified in this sample.

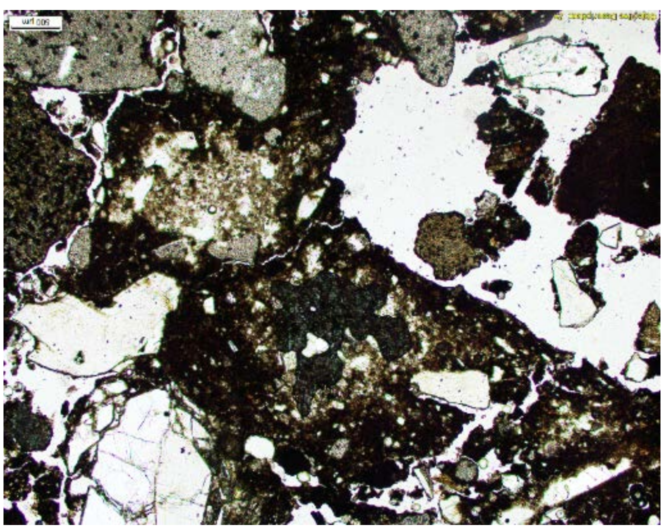


Figure 6.77: A close up from SMS Sample 1021661 (in the green triangle location), showing a depletion feature indicating short term waterlogging.

HB202: Outside Northern Addition, Unit 72

One sample (Figure 6.78 was taken from the south profile of Unit 72 which was placed to the northeast of the northern addition of HB 202 near a small boulder (Figure 6.77). The excavator suggested that the Unit may have contained an occupational trampled surface. Sample 1508582 was taken from Contexts 3, 4 and 5. The boundary between 3 and 4 was interpreted as this surface. Observation of the sample suggests that it has been disturbed either during collection or transportation. Intact peds within the slide suggest a crumbly soil with a substantial amount of organic matter and some evidence for carbonate development. A few pieces of metal and a fragment of highly weathered plaster are likely remains from the dilapidation of HB 202. There are potential depletion features in the lower part of the slide suggesting short-term water saturation.

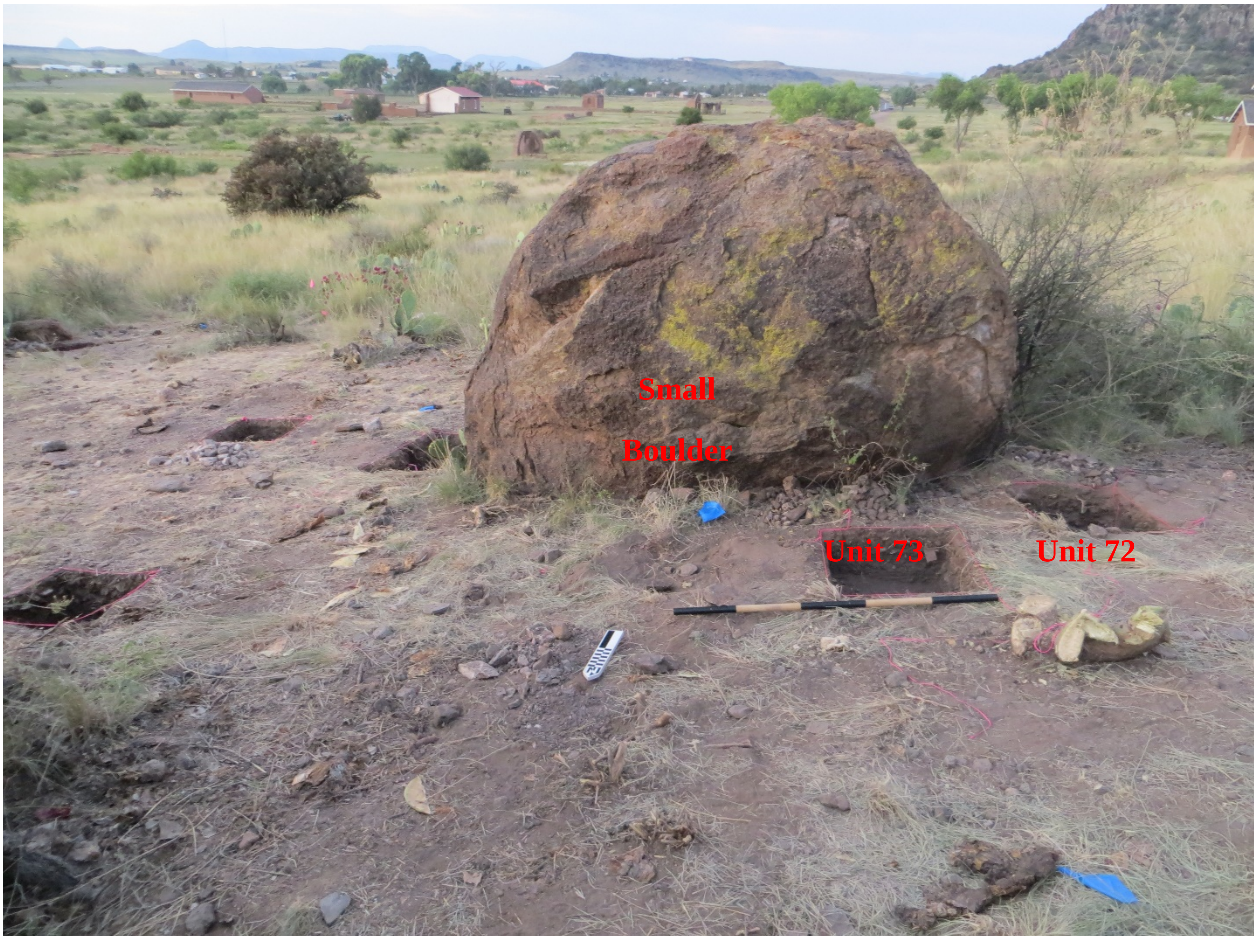


Figure 6.78: A photograph showing Enlisted Married Men's Quarters Units 72 and 73 on the northern side of the little boulder. Photograph was taken facing south.

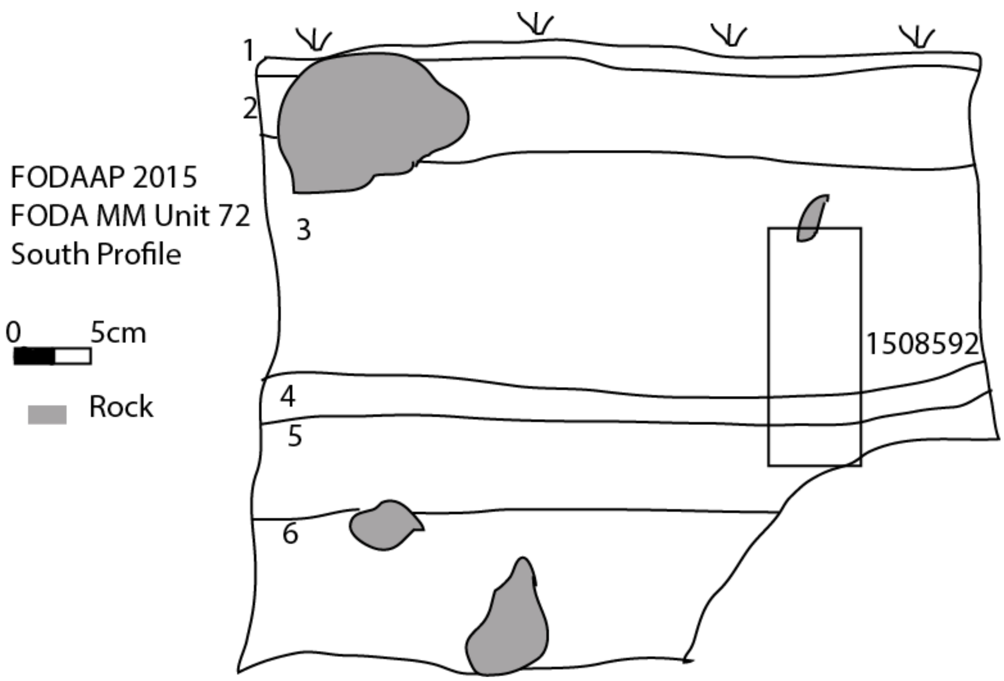


Figure 6.79: Stratigraphic drawing showing the southern profile of Unit 72 with micromorphology samples indicated.

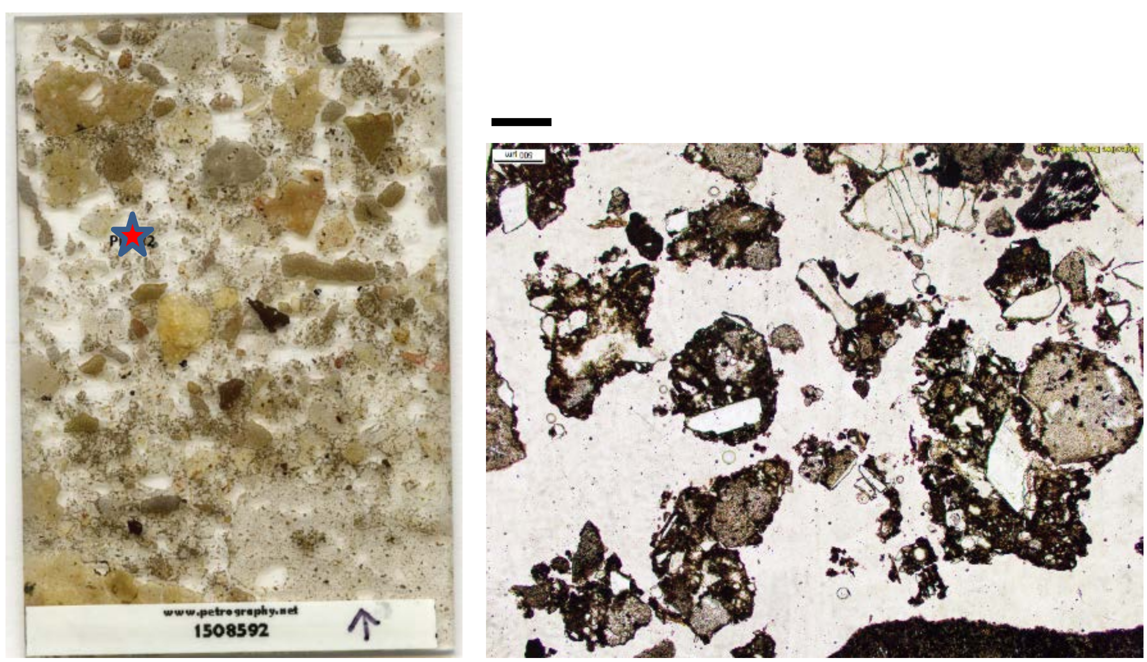


Figure 6.80: A flatbed scan of thin section from SMS Sample 1508592 (left) and a close up showing disturbed fabric. No discrete beds were identified in the slide. Scale bar is equal to 400µm).

HB202: North of Main Structure, Unit 62

Two samples were taken from the northern profile of Unit 62 which is located just north of the main structure of HB202 (Figure 6.66 and 6.80). Sample 1021659 was taken from the upper Contexts (2, 3, and 6) and contained large metal artifacts and faunal remains. Soil in Context 6 was described by excavators as “mottled” and “rubbery” with streaks of rust. No bedding was apparent in sample 1021659 (Figure 6.81 which showed an organic-rich soil with minimal carbonate development. Plant material is found throughout the slide and is often highly decayed with no remaining identifiable morphology. Void casts from plant material are also present. Two fragments of metal and a piece of eggshell were also identified. A large vughy void in the upper part of the slide is the remains of an insect burrow displaying orientation of fine particles around the void boundary as well as an organic hypocoating. The slide is interpreted as an organic-rich soil formed around decaying organic material from the occupation and dilapidation of HB 202.

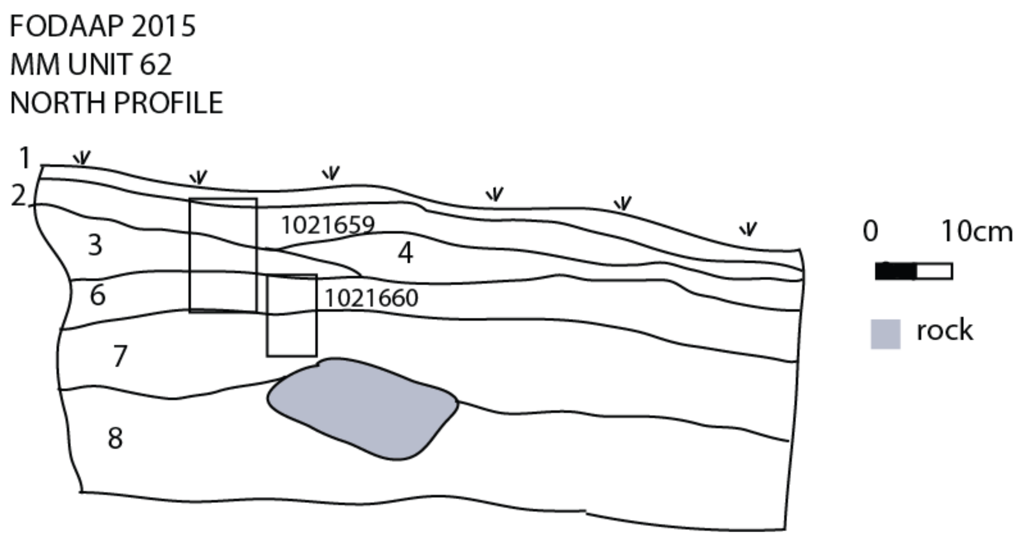


Figure 6.81: Stratigraphic drawing showing the northern profile of Unit 62 with locations of micromorphology samples indicated.

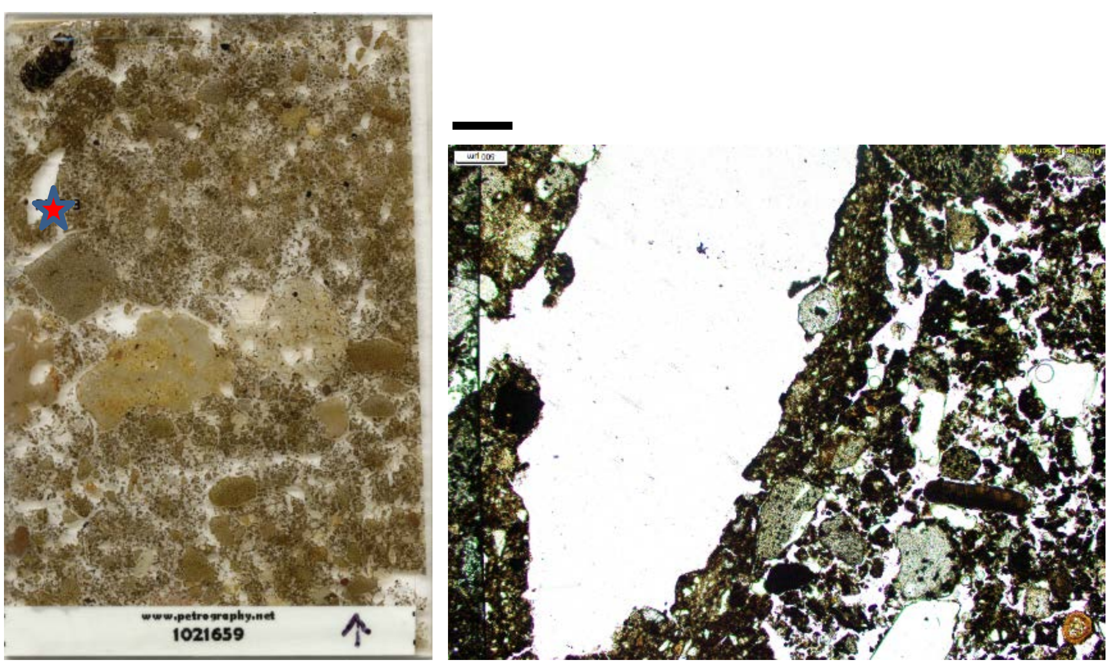


Figure 6.82: : Flatbed scan of thin section from SMS Sample 1021659 (left) and a close up a void related to insect activity. No discrete beds were identified within this slide. Scale bar is equal to 400µm.

Sample 1021660 (Figure 6.82) was taken from lower contexts (6 and 7) in Unit 62. The slide has less anthropogenic material than 1021659, but shows increased evidence for water saturation through depletion features in the lower part of the slide. The fabric is crumbly and contains substantial organic matter as well as visible plant material and insect excrement. Taken together, the amount of faunal material recovered macroscopically, the fragment of eggshell in 1021769, along with the substantial organic material and evidence for insect activity in both slides suggest that this may have been an area for disposal of food waste.

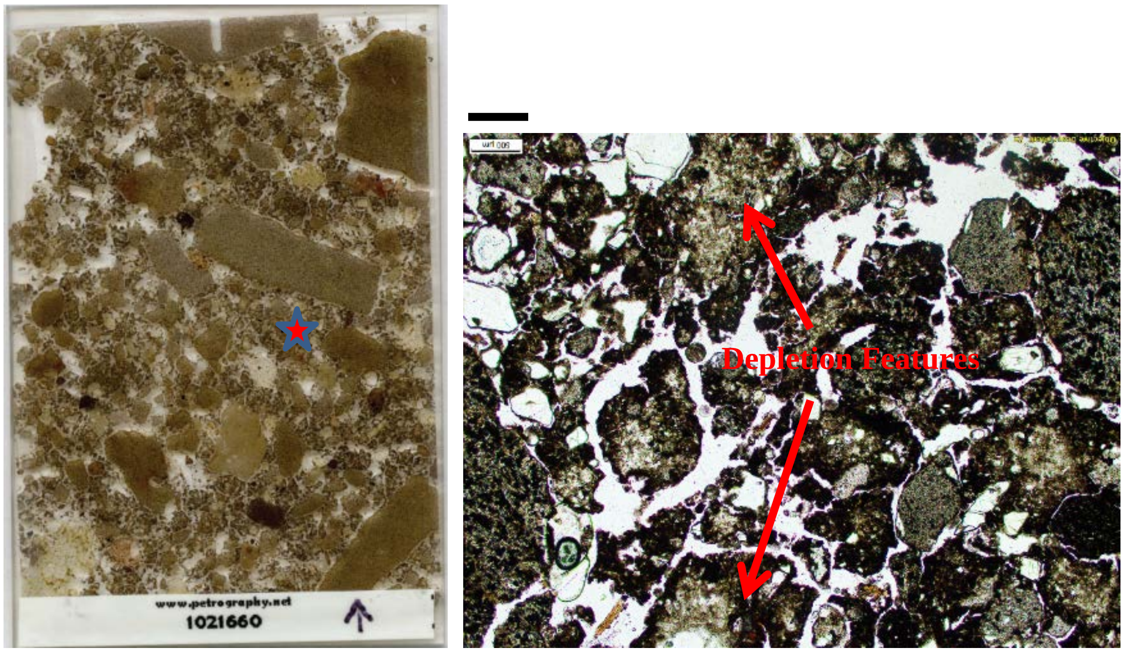


Figure 6.83: A flatbed scan of the thin section slide from SMS Sample 1021660 (left) and a close up showing crumbly fabric with depletion features. No distinct beds were identified in this slide. Scale bar is equal to 400µm.

HB202: Gap Area, Unit 60

Unit 60 was placed directly west of the small boulder in a space proposed to be a gap area between the northern addition and canvas-roofed structure of HB202 (Figure 6.83). Several large artifacts, including a key, were recovered from this Unit. One sample, 1021670 (Figure 6.84), was taken from the east profile overlapping Contexts 2 and 3. The slide shows a crumbly, organic soil with large rocky inclusions but no apparent bedding. An infilling in a vughy void at the base of the slide may indicate insect activity. Carbonate nodules found throughout incorporate soil fabric and organic matter. Carbonate coatings on rocky fragments are also present (Figure 6.85). Two metal fragments and a piece of plaster are likely remains from the dilapidation of HB 202.

Figure 6.84: Photograph showing Units 60, 70, and 74 facing east. Photograph was taken while standing on top of the Small Boulder.

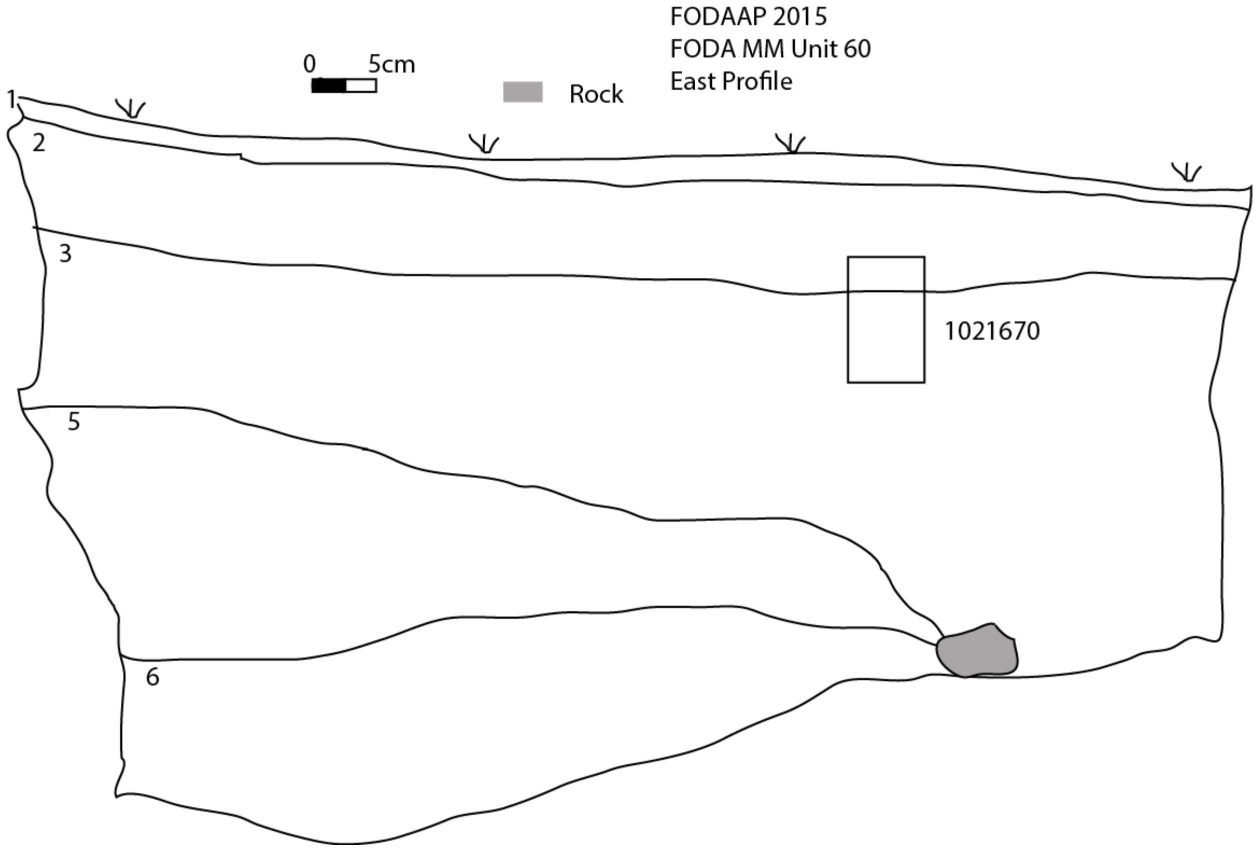


Figure 6.85: Stratigraphic drawing of the eastern profile of Unit 60 showing the location of micromorphology sample

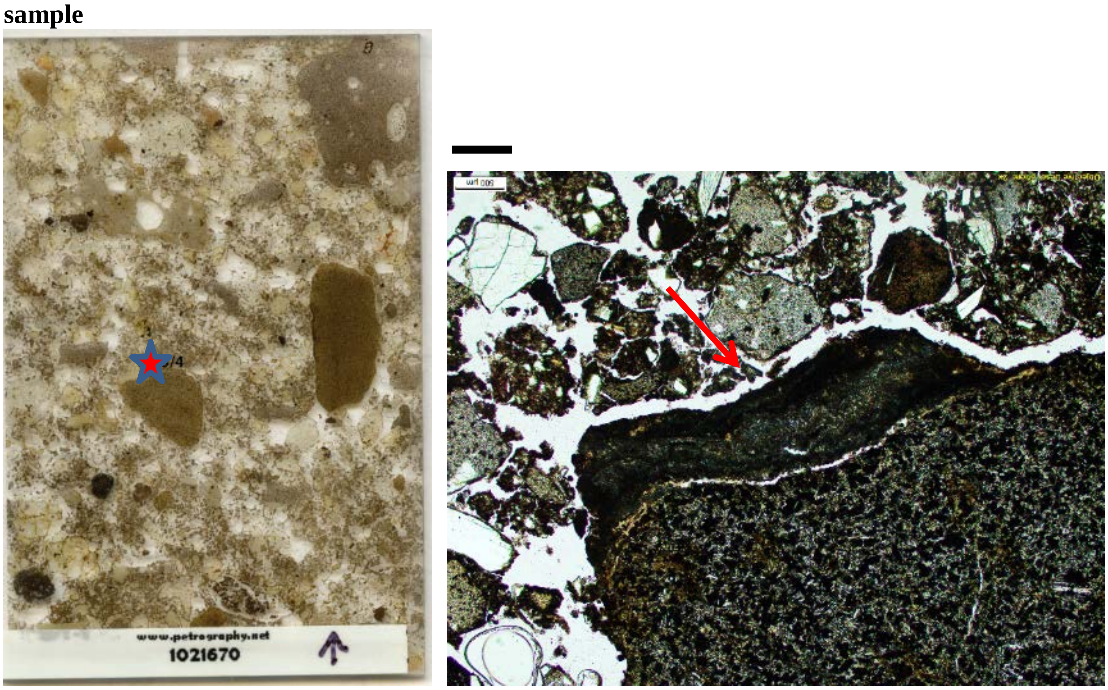


Figure 6.86: Flatbed scan of thin section from SMS Sample 1021670 (left) and a close up showing carbonate coating on trachyte fragment. No discrete beds were identified within this sample Scale bar is equal to 400µm.

Privy, Unit 67

Unit 67 was placed north of the large boulder in an attempt to investigate the entryway and exterior of HB 224. Instead, the unit recovered the privy pit itself as well as a portion of the entry way (Figure 6.86). Four micromorphology samples from the west and north profiles of Unit 67 were analyzed, including three from the privy pit and one from the entry.

Figure 6.87: Photograph showing the north and west profiles of Unit 67 (HB 224) from the Enlisted Married Men's Quarters. Photograph was taken while standing along the northern side of the large boulder.

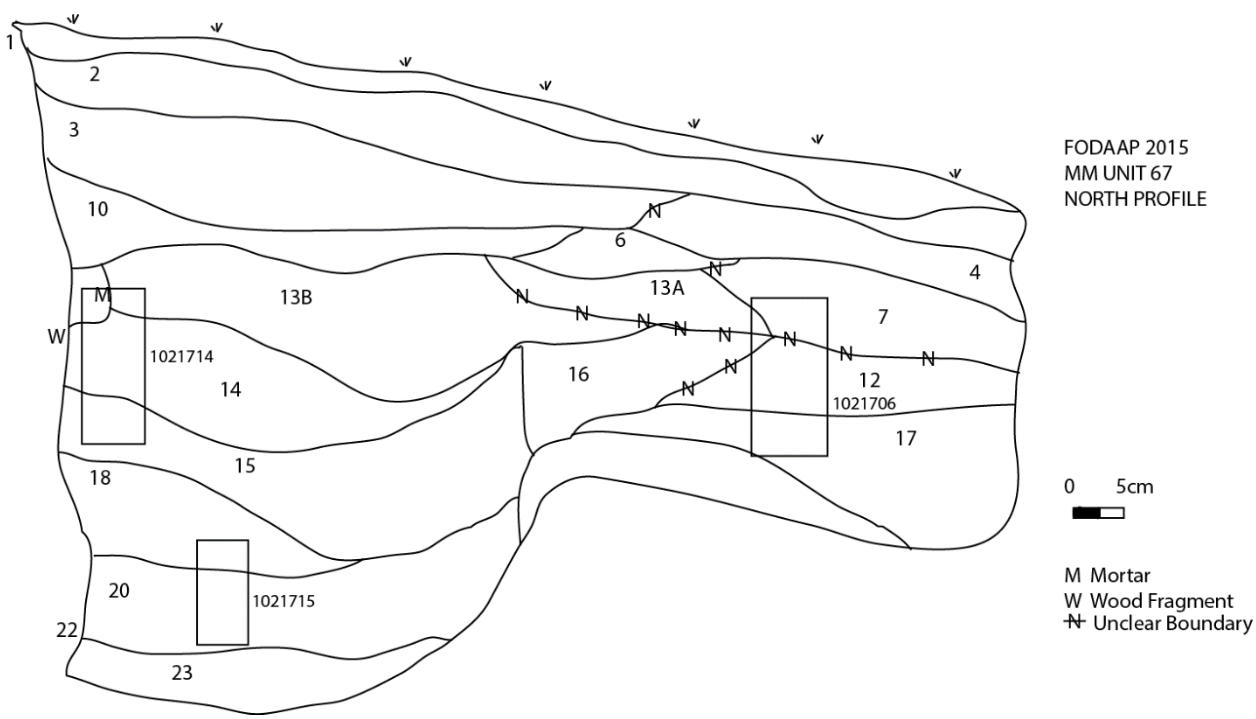


Figure 6.88: Stratigraphic Drawing of the northern profile of Unit 67 showing locations of micromorphology samples

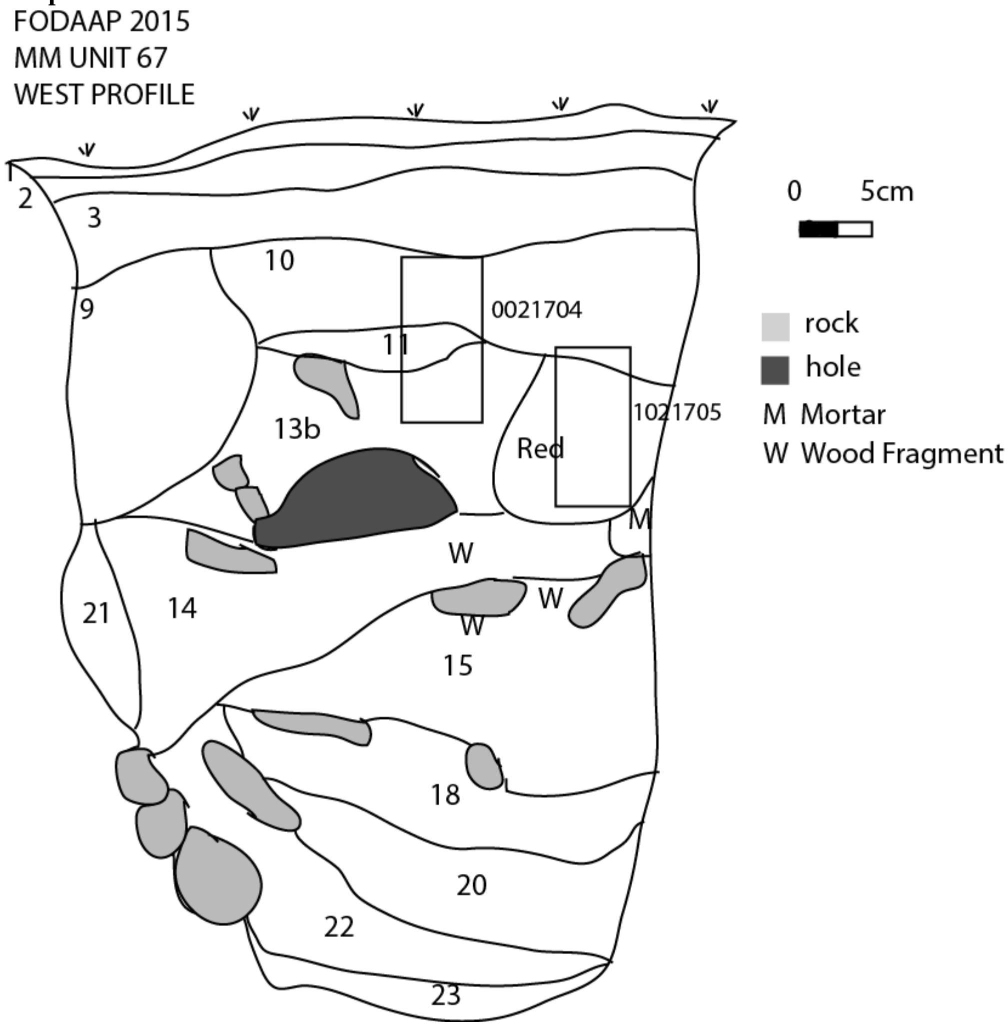


Figure 6.89: Stratigraphic drawing of the western profile of Unit 67 showing the locations of micromorphology samples.

Sample 0021704 (Figure 6.89) was taken from the upper part of the west profile of the privy pit and contains Contexts 10, 11, and 13B. Contexts 10 and 13B were mottled soil with artefactual remains. They were separated by Context 11 which was a very thin pocket of ash and charcoal. No bedding was apparent in the slide. The slide shows a compact, organic-rich sediment with a crumbly to blocky texture and an abundance of carbonate features seen as a thick (900um) carbonate coating on a tuff nodule, crystallitic calcite infillings a vughy void, and a higher density of micritic carbonate nodules than seen in HB 202 samples. Carbonate nodules are generally small, averaging around 800µm. The lower part of the slide also contains a few patches of carbonate-enriched groundmass which may be ash inputs from Context 11. Intact, but highly decayed plant matter is incorporated throughout the deposit, particularly in large void spaces also associated with depletion features.

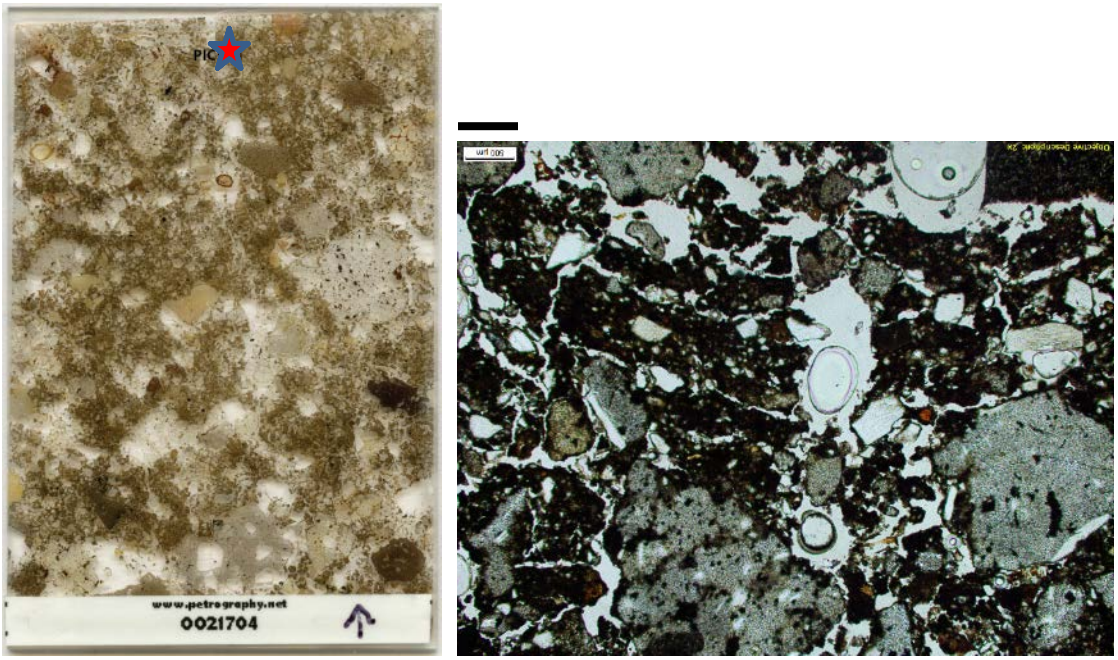


Figure 6.90: A flatbed scan of thin section from SMS Sample 0021704 (left) and a close up showing blocky fabric, likely due to the presence of organic matter in the privy. No discrete beds were identified within this slide. Scale bar is equal to 400µm.

Sample 0021714 (Figure 6.90) was taken from the north wall of Unit 67 and includes Contexts 13B, 14, and possibly 15. It is slightly lower in the profile than Sample 0021704. These Contexts were described in the field as mottled soil with increasingly larger artifacts and ash, charcoal, and woody inclusions. The slide is dominated by coarse-grained material with very little fine-grained microstructure. Packing voids make up 30% of the total area. Highly decayed plant remains are present in void spaces. Small fragments of faunal material and metal are found throughout, along with two patches of calcitic ash. There are fewer carbonate nodules and depletion features compared to 0021704, but this is likely related to the limited amount of fine material present and the compactness of the overlying Contexts seen in 0021704. The low frequency of depletion features is likely related to the very sparse fine fraction not providing a b-fabric for depletion features to develop. Similarly, while there is a lower number of carbonate nodules, they are larger in size (1.5mm on average) and this difference likely relates to the difference in compaction between 0021714 and the upper Contexts seen in 0021704. The anthropogenic material is interpreted as a dump of household debris filling in the privy pit after its use was discontinued.

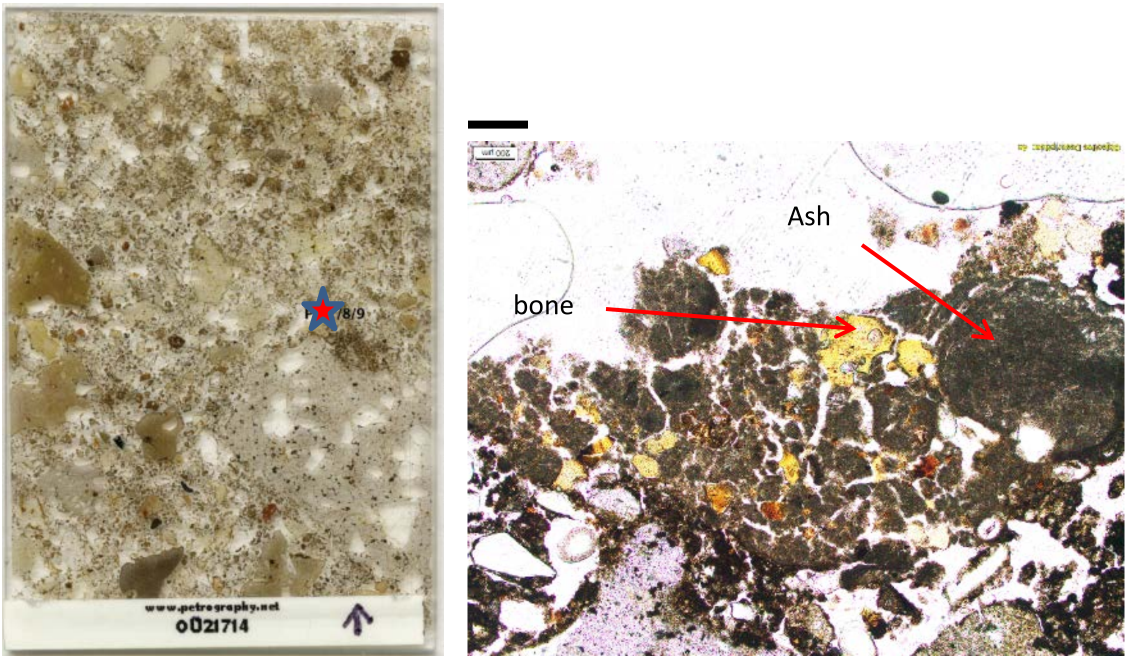


Figure 6.91: A flatbed scan of thin section from SMS Sample 0021714 (left) and a close up show a cluster of ash, bone, and phosphate accumulations

The third sample from the privy pit (1021715, Figure 6.91) was taken from the lowest Contexts (18, 20, 22) in the northern profile. Context 18 ended with a large plate capping Context 19: a thin ash lens which did not appear in the profile. Contexts 20 and 22 were blocky soil and smelled like feces. Sample 1021715 shows a very crumbly, organic-rich dark soil with phosphatic impregnations, faunal material, and very little plant matter. No intact coprolites were found. Three large (1400um) carbonate nodules were identified along with two fragmented nodules. These fragmented nodules were mixtures of laminated carbonate and organic soil oriented concentrically around a central void space (Figure 6.91). These may be remains of coatings on decayed or dissolved material or they may be indicator of liming, which was done regularly as part of privy maintenance. The organic rich blocky soil, phosphatic impregnations, and faunal remains are interpreted as evidence of accumulations of human waste.

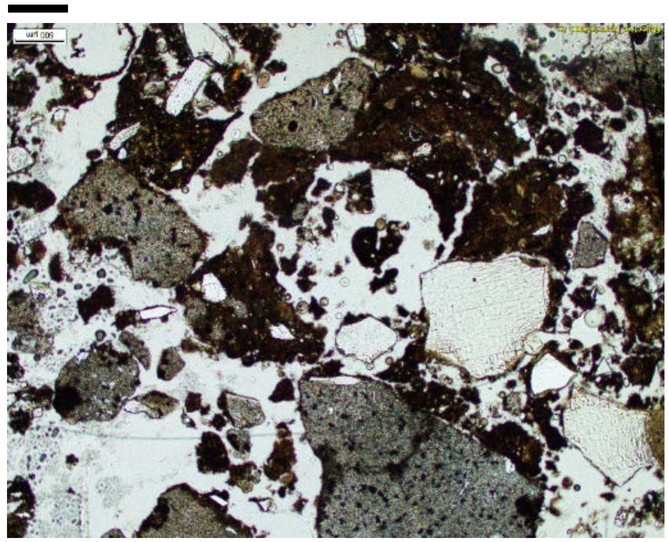


Figure 6.92: A flatbed scan of thin section from SMS Sample 1021715 a close up showing a laminated carbonate cluster. No discrete beds were identified within this sample. Scale bar is equal to 400µm.

Sample 1021706 (Figure 6.92) comes from the entry area to the privy rather than the main privy pit. The sample contains Contexts 7, 12, and 17 from the north profile. During excavation the boundary between Contexts 7 and 12 was marked by wood remains, but in profile this boundary was unclear. No bedding was apparent in Sample 1021706. The soil structure is massive and unconsolidated with some crumbly aggregates. Compacted regions in the lower part of the slide have a crumbly texture. Plant remains are found throughout and are highly degraded. An aggregate in the upper part of the slide appears to be a combination of ash, organic material, quartz and melted phytoliths. A large orange aggregate in the upper part of the slide is interpreted as adobe (Figure 6.92) It has a well-sorted, fine-grained, compacted texture with well-sorted larger inclusions and organic matter. It appears similar to ceramic, but slightly less well-sorted, without particle orientation, and the macroscopic shape is not consistent with historic ceramic recovered elsewhere at the site. Adobe may have been used in the construction of the privy either as a subfloor for the privy entrance or to line the main privy pit preventing leakage. Carbonate nodules are found throughout along with rare metal fragments.

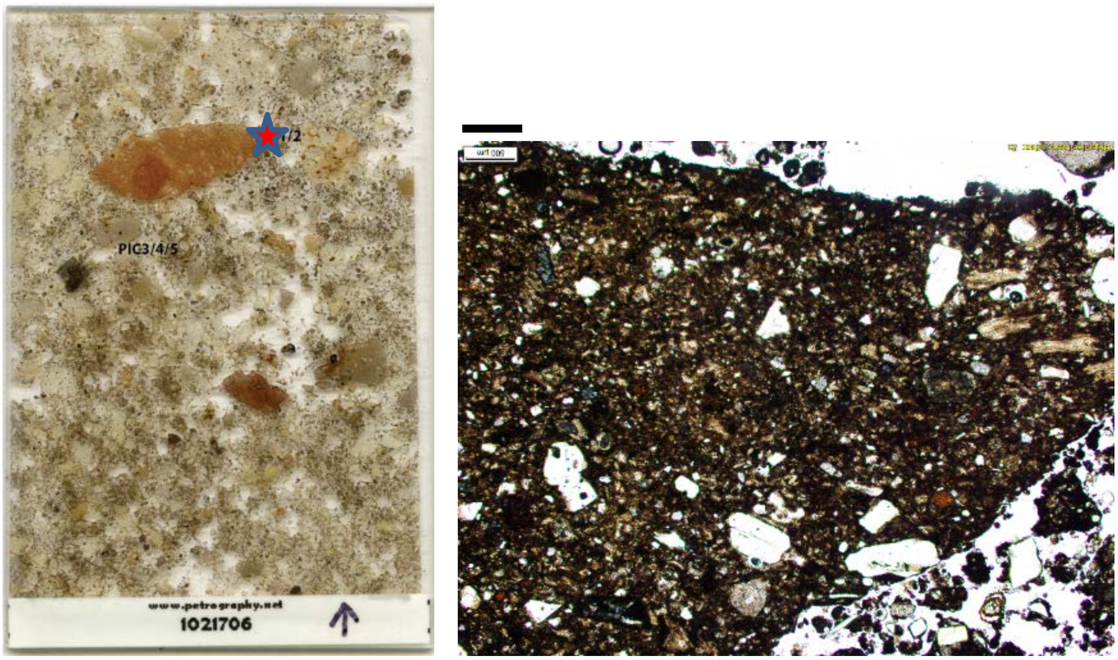


Figure 6.93: A flatbed scan of thin section slide from SMS Sample 1021706 and a close up showing the fabric of an adobe fragment. No distinct beds were identified within this slide. Scale bar is equal to 400µm.

THE FRANCELL-BYERLEY PROPERTY GEOARCHAEOLOGICAL ANALYSES

Excavations

FODAAP investigated three areas of the Francell-Byerley property: a dense midden deposit (Francell A), a set of stone foundations near the entrance to the property (Francell C), and a broad surface scatter of late 1800s material (Francell B). For the purposes of this dissertation only Francell A and C will be discussed. One excavation unit and several shovel test pits within the surface scatter in Francell B showed that it was not associated with any subsurface features.

Excavation in Francell A consisted of two 1m x 1m excavation units placed among the dense surface scatter of the midden on the side of a ridge. This scatter turned out to be a very dense midden deposit from around the 1920s. Three 50cm x 50cm shovel test pits were dug around the edge of the midden to determine its extent (Figure 5.3).

Three additional 1m x 1m Units were placed in nearby stone foundations of a structure. One of these Units (Francell C Unit 1) was placed in an interior room of the foundation. Francell C Unit 2 was placed to the south of the structure in what may have been either interior or exterior space. Francell C Unit 3 was placed north of the structure and uncovered a post, leading excavators to interpret the Units as beneath a porch.

Sediment at the Francell property shows a similar mineralogical makeup to other Fort Davis sites. Quartz and feldspar are common minerals and major rocky components include igneous rocks such as trachyte, felsic tuff, and basalt. A few fragments of limestone were also identified. Overall, the Francell property shows the highest number of carbonate nodules out of the analyzed Fort Davis sites.

Bulk Soil Analyses

pH Analysis

Thirty-eight bulk samples from the Francell property were processed for pH (Figure 6.93, Table 6.9). Overall, pH was relatively high with a site mean of 7.95 and a standard deviation of 0.57. The two units from the midden (Francell A Units 1 and 2) had mean pH values of 8.30 and 8.23, respectively. In both units pH generally increases with depth, although not uniformly. In both units, contexts in the center of the midden have pH values lower than the contexts overlying and underlying them. This suggests that the midden accumulation itself may be associated with a lower pH.

The three shovel test pits (STPs) placed around the midden have highly variable pH values. STP 1, placed south of the midden on the ridge line, had a mean pH value of 8.77. pH in middle and lower contexts of this STP had values over 9 which were beyond two standard deviations from the mean site pH. STP 2, placed downslope from the midden, had a mean PH of 7.47. As with STP 1, pH increases with depth, but the highest pH value for the STP was 7.52. STP 3 was placed northwest of midden in an area with more organic rich soil and dense rocky inclusions. Mean pH for this unit was 7.2. In all three STPs pH increased with depth and is likely related to carbonate precipitation in the soil. The mean pH for the three STPs varies, which is expected with natural variation in pedogenic processes, but is overall high (over 7).

The three units from the structure (Francell C Units 1, 2, and 3) have overall lower pH values than the midden, but not unusual for the site. Unit 1 had a mean pH of 7.77, Unit 2 had a mean pH of 7.53, and Unit 3 had a mean pH of 7.94. In all three units pH values are generally stable rather than increasing with depth.

Using context number as a proxy for depth, pH had a moderate correlation of 0.34 with depth, suggesting that precipitation of carbonate, which occurs at a specific depth based on soil characteristics, is a significant factor in association with soil pH (Table 6.10).

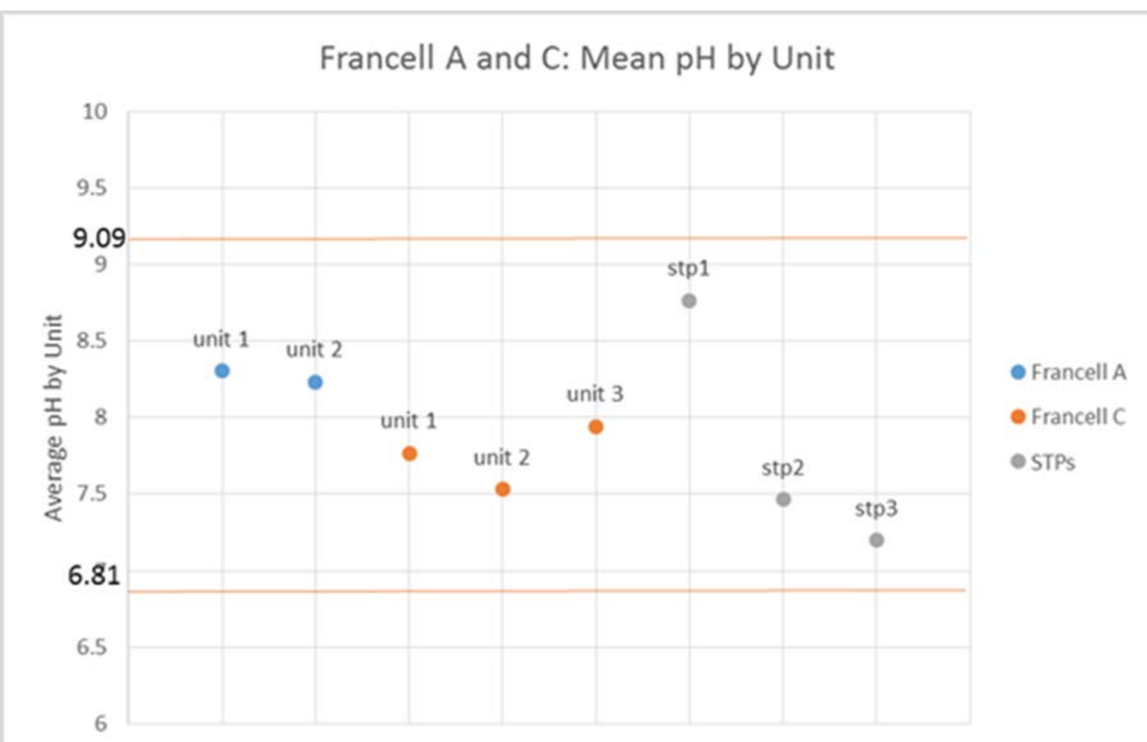


Figure 6.94: Scatterplot showing the mean pH by unit for the Francell-Byerley Property (Areas A and C only). Red lines show the boundaries of a 2-standard deviation confidence interval.

Site and Area	Unit	Mean pH
Francell A	Unit 1	8.30
Francell A	Unit 2	8.23
Francell C	Unit 1	7.76
Francell C	Unit 2	7.53
Francell C	Unit 3	7.94
Francell A	STP1	8.76
Francell A	STP2	7.46
Francell A	STP3	7.20

Table 6.9: Table showing mean pH for each unit at the Francell-Byerley Property. pH results by context are available in Appendix II.

Variables Compared	Correlation
pH vs. Organic Matter	-0.09001
pH vs. Context	0.33802
%sand vs. pH	-0.10078
%silt vs. pH	0.026671
%clay vs. pH	-0.01371
%sand vs. Organic Matter	-0.26149
%silt vs. Organic Matter	0.434833
%clay vs. Organic Matter	-0.04065

Table 6.10: Correlation Coefficients for Comparisons of Bulk Soil Analyses at the Francell-Byerley Property

Organic Matter Analysis

Fifty bulk samples were processed for organic matter, including duplicate samples from several of the shovel test pits. Mean percentage of organic matter for the site was 3.98% with a standard deviation of 2.49% (Figure 6.94 and Table 6.11). The midden units had generally higher mean percentages of organic matter (Francell A Unit 1 = 5%, Unit 2 = 5.63%) than the other Units with the exception of STP 3, which had a mean percentage of organic matter at 6.09%. Only one Context from the midden had a percentage of organic matter higher than two standard deviations from the mean: Francell A Unit 1 Context 4 had 13.20% organic matter. Other Contexts from both Units also had high percentages of organic matter in the six and seven percent range.

STP 1 had 2.97% organic matter while STP 2 had 4.57% organic matter. As previously mentioned, STP 3 had the highest rate of organic matter at 6.09%. During excavation STP 3 was observed to have darker soil than the other units excavated at the Francell-Byerley property, which supports these results.

The three units from the structure had generally low percentages of organic matter. Unit 1 had 2.66%, Unit 2 had 2.19% and Unit 3 (outside under the porch) had 3.37%. During excavation it was suggested that Unit 2 had more organic rich soil than the other Units and may have included a garden context. Based on the organic matter analysis no context within this Unit had a percentage of organic matter over 3%. Unit 3 however, had one context with a percentage of organic matter higher than two standard deviations from the mean. Unit 3 Context 6 (associated with an intact post, possibly from a porch, had 9.80% organic matter.

Percentage of organic matter was plotted against pH to see if a significant correlation existed between the two variables. The correlation coefficient for the two variables was -0.09, indicating no correlation (Table 6.10).

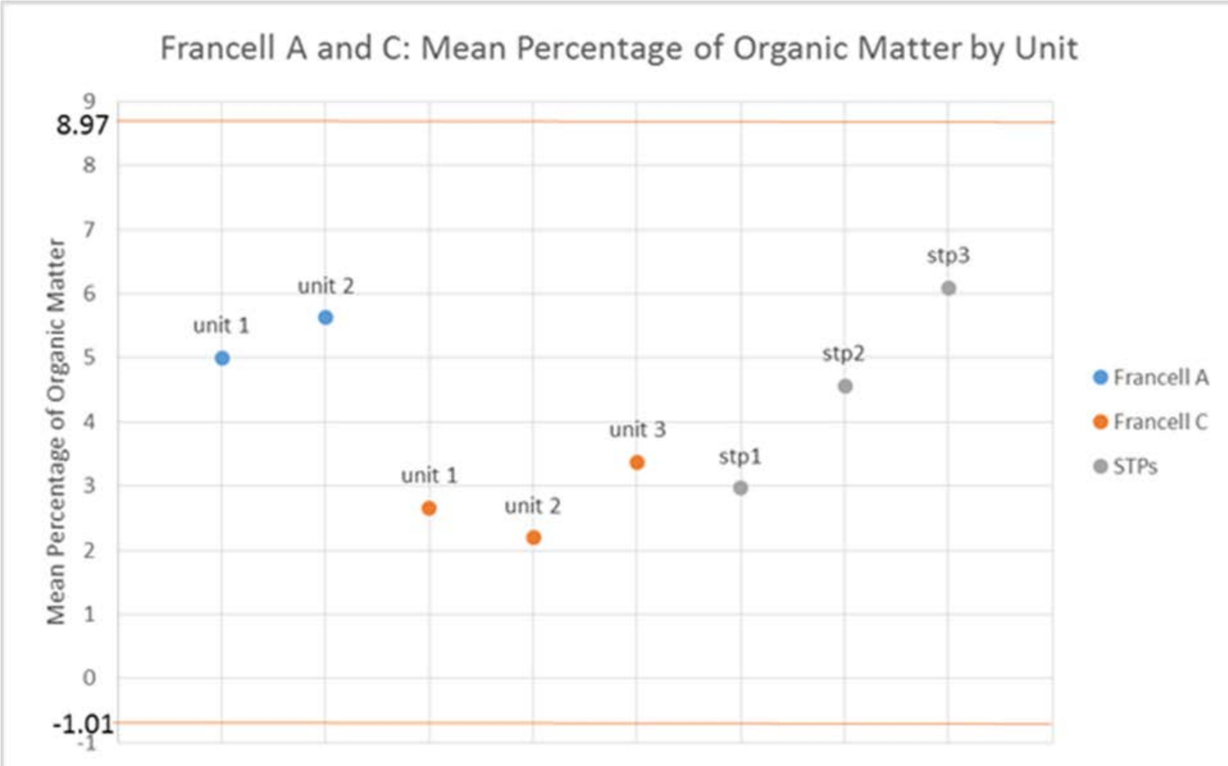


Figure 6.95: Scatterplot showing mean percentages of organic matter by unit at the Francell-Property (Areas A and C only). Red lines indicate the boundaries of a 2-standard deviation confidence interval

Site and Area	Unit	Mean % Organic Matter
Francell A	Unit 1	5.00
Francell A	Unit 2	5.62
Francell C	Unit 1	2.65
Francell C	Unit 2	2.19
Francell C	Unit 3	3.37
Francell A	stp1	2.96
Francell A	stp2	4.56
Francell A	stp3	6.09

Table 6.11: Mean Percentages of Organic Matter by Unit for the Francell-Byerley Property (Areas A and C only).

Particle Size Analysis

Twenty-three samples from the Francell-Byerley property were analyzed for particle size by hydrometer and shaker. These samples included contexts from both units in Francell A (the midden), three contexts from STP 1, and contexts from Units 1 and 3 in Francell C (the structure). Results are shown in Table 6.12.

Site	Unit	Context	ID	Clay%	Silt%	Sand%
Francell A	1	1	1020063	19.43	28.04	48.75
Francell A	1	2	1020076	18.36	25.31	56.31
Francell A	1	3	0020084	19.33	26.92	48.58
Francell A	1	4	1020091	17.74	32.35	51.09
Francell A	1	5	1020102	19.48	26.88	55.51
Francell A	1	6	1020115	16.76	22.20	54.18
Francell A	1	8	1020123	18.40	22.13	58.07
Francell A	2	1	1020066	18.31	33.91	52.22
Francell A	2	2	1020075	17.92	31.54	44.38
Francell A	2	3	1020081	18.19	30.48	52.32
Francell A	2	6	1020108	14.24	20.47	47.77
Francell A	STP1	1	1020031	26.87	32.54	41.84
Francell A	STP1	5	1020033	17.30	23.79	61.23
Francell A	STP1	6	1020032	15.99	18.49	59.44
Francell C	1	1	1020157	15.42	21.64	62.02
Francell C	1	2	0020164	14.43	20.06	65.76
Francell C	1	3	1020200	15.12	15.12	71.31
Francell C	1	4	0020264	13.60	16.46	63.29
Francell C	1	plaster	1020261	14.40	16.36	67.40
Francell C	3	2	1020181	15.88	19.60	60.64
Francell C	3	3	1020218	13.80	16.22	69.78
Francell C	3	5	1020277	15.42	17.16	60.83
Francell C	3	6	1020280	12.71	14.94	66.01

Table 6.12: Percentages of Clay, Silt, and Sand for each analyzed context at the Francell-Byerley Property

Contexts from Francell A (the midden) had means of 51.75% sand, 27.30% silt, and 18.02% clay. There is minimal variation in the profiles for Units 1 and 2 (Figures 6.96 and 6.98), although in general contexts higher in each unit have a higher percentage of finer particles (silt and clay) than the lower contexts. As these higher contexts are central to the midden itself while lower contexts relate to underlying sediment, this variation is likely a difference between the dumped debris contexts of the midden and the underlying sediment (Figure 6.95 and 6.97).

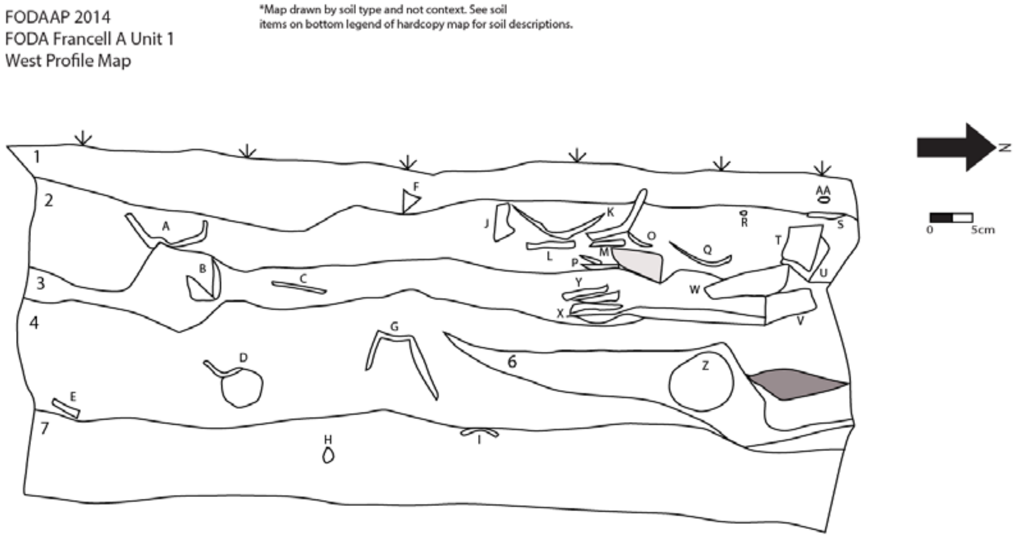


Figure 6.96: Stratigraphic drawing of the western profile of Francell A Unit 1.

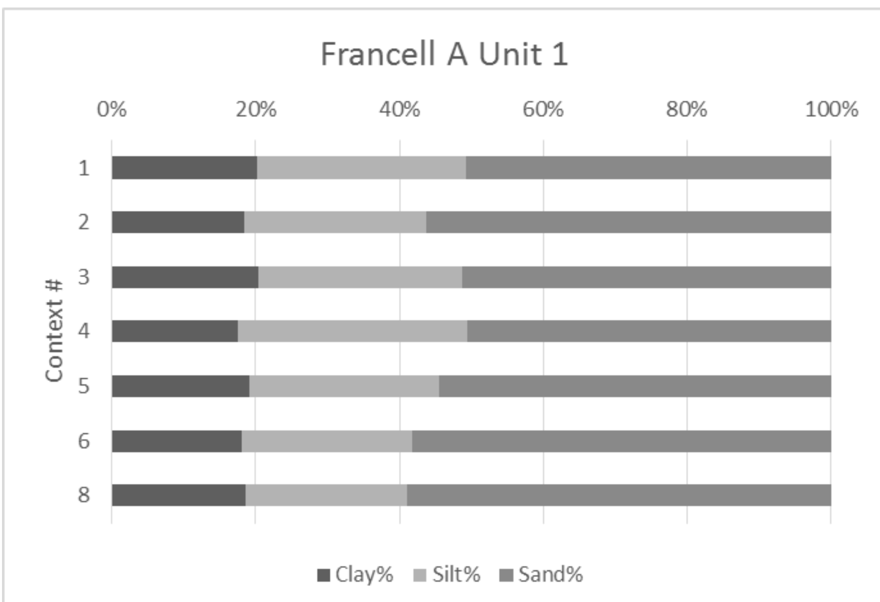


Figure 6.97: Bar Chart showing relative percentages of clay, silt, and sand for analyzed contexts in Francell A Unit 1.

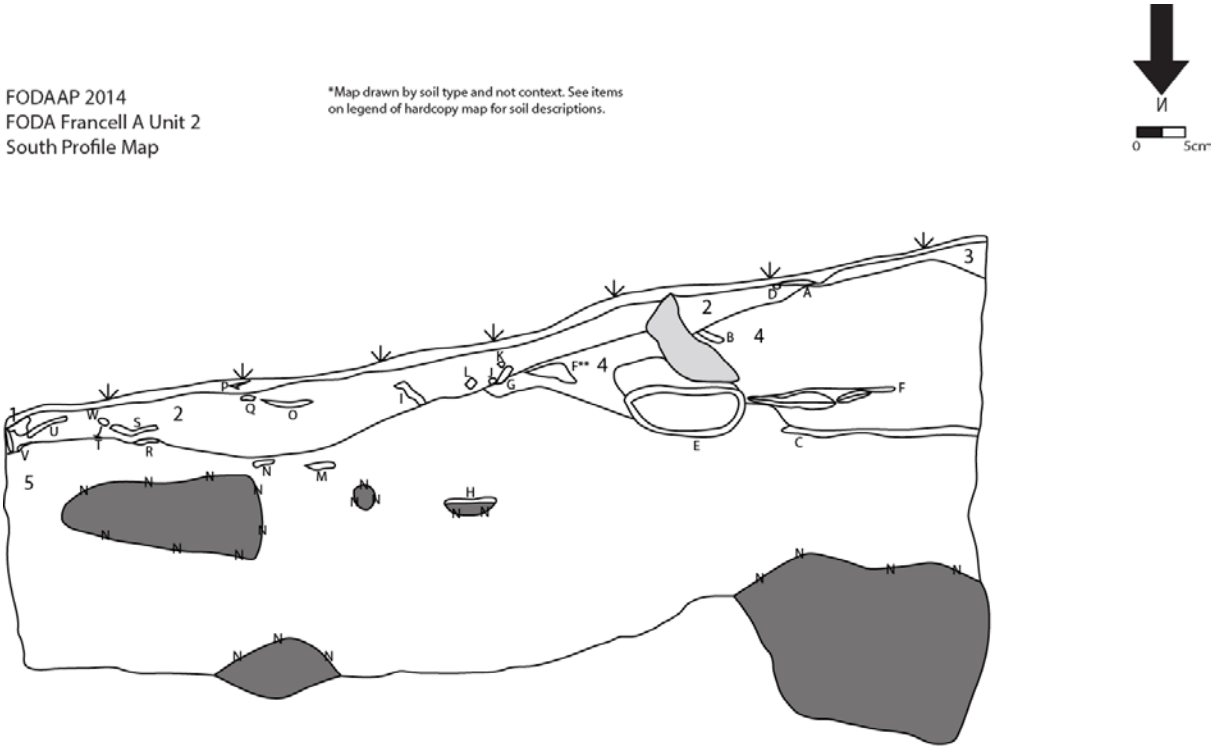


Figure 6.98: Stratigraphic Drawing of the southern profile of Francell A Unit 2

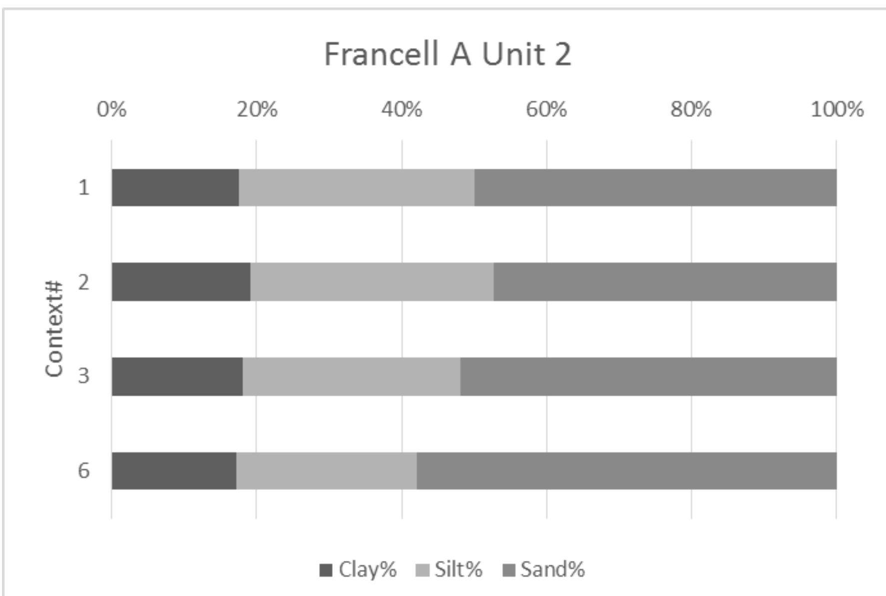


Figure 6.99: Bar Chart showing the relative percentages of clay, silt, and sandt in Francell A Unit 2.

The contexts from STP 1 had means of 54.18% sand, 24.95% silt, and 20.06% clay. Context 1 from near the surface had higher proportions of fine particles (26.87% clay and 32.54% silt) than the other two contexts (Figures 6.99 and 6.100).

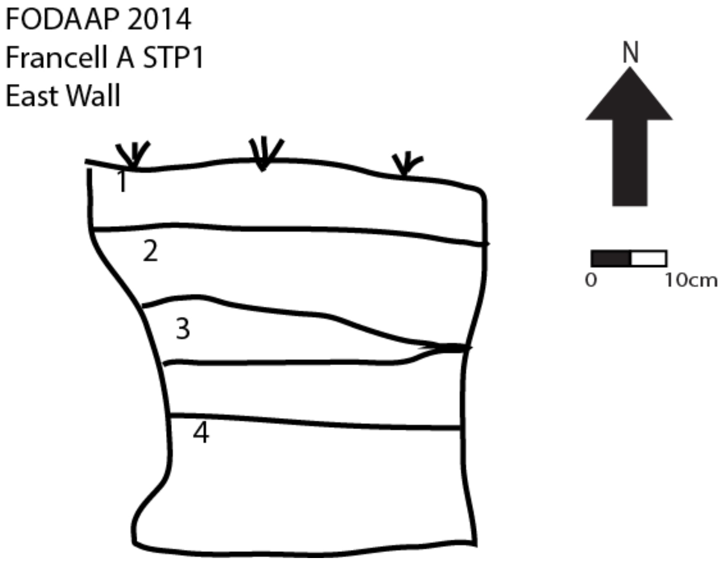


Figure 6.100: Stratigraphic Drawing of the eastern profile of Francell A STP 1

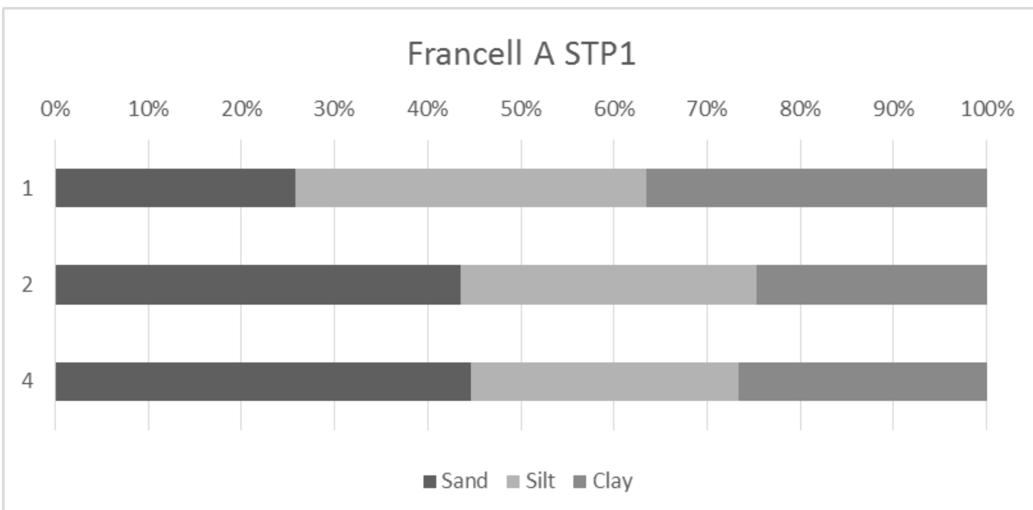


Figure 6.101: Bar Chart showing relative percentages of sand, silt, and clay for Francell A STP 1.

The two units from Francell C (the structure) had means of 65.23% sand, 17.51% silt, and 14.54% clay (Figures 6.102 and 6.104). Unit 1 is from the interior of the structure foundations while Unit 3 was taken from the yard in an area that was revealed during excavation to contain a post that was likely part of a porch (Figures 6.101 and 6.103). The two units are overall similar, with more sand than the units from the midden and STP 1 and little variation throughout the profile.

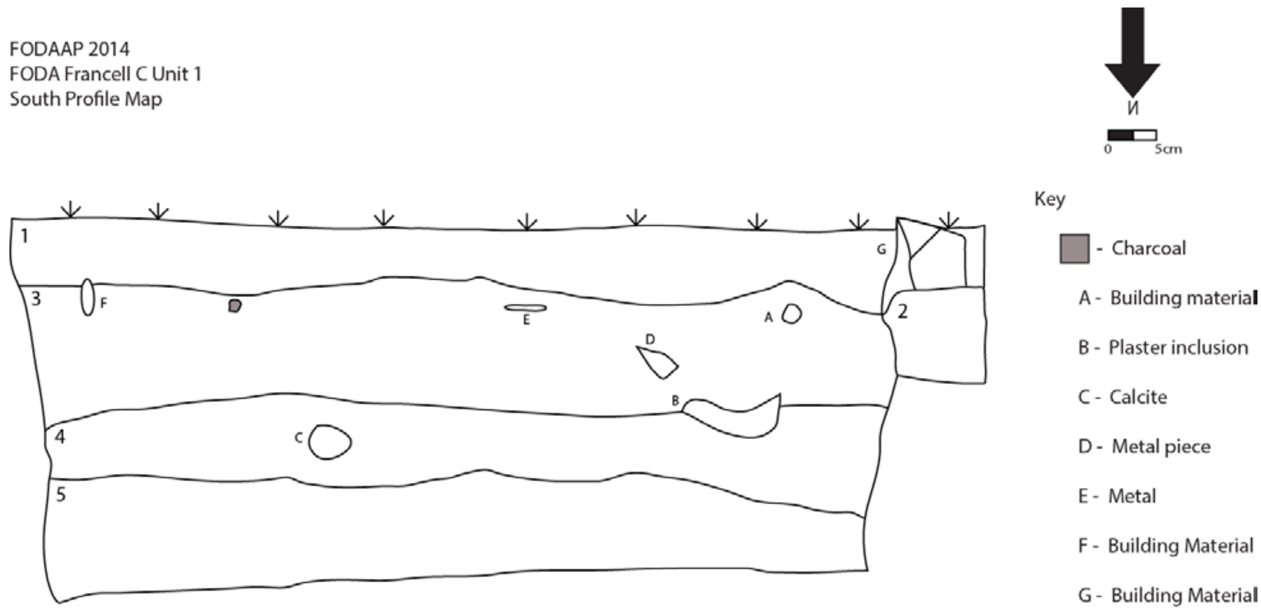


Figure 6.102: Stratigraphic drawing of the southern profile of Francell C Unit 1.

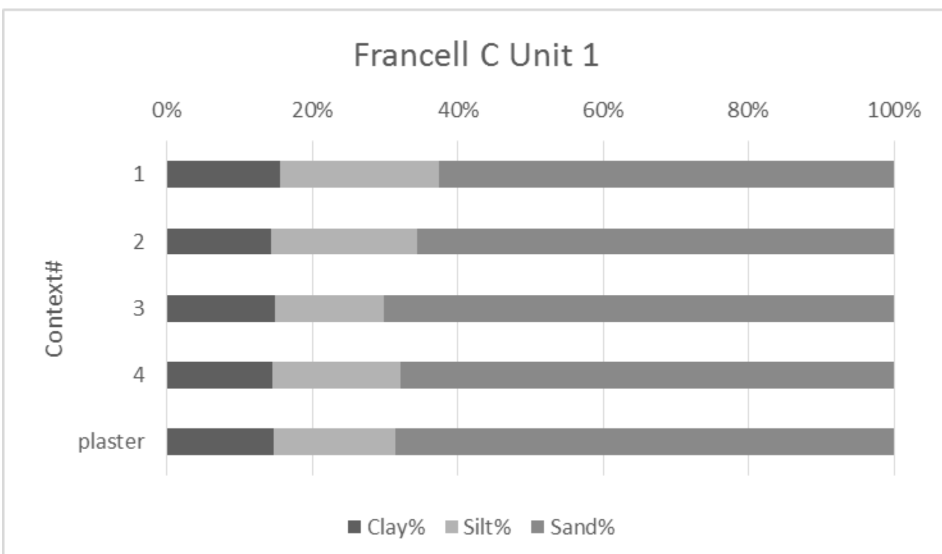


Figure 6.103:Bar Chart showing relative percentages of clay, silt, and sand for Francell C Unit 1.

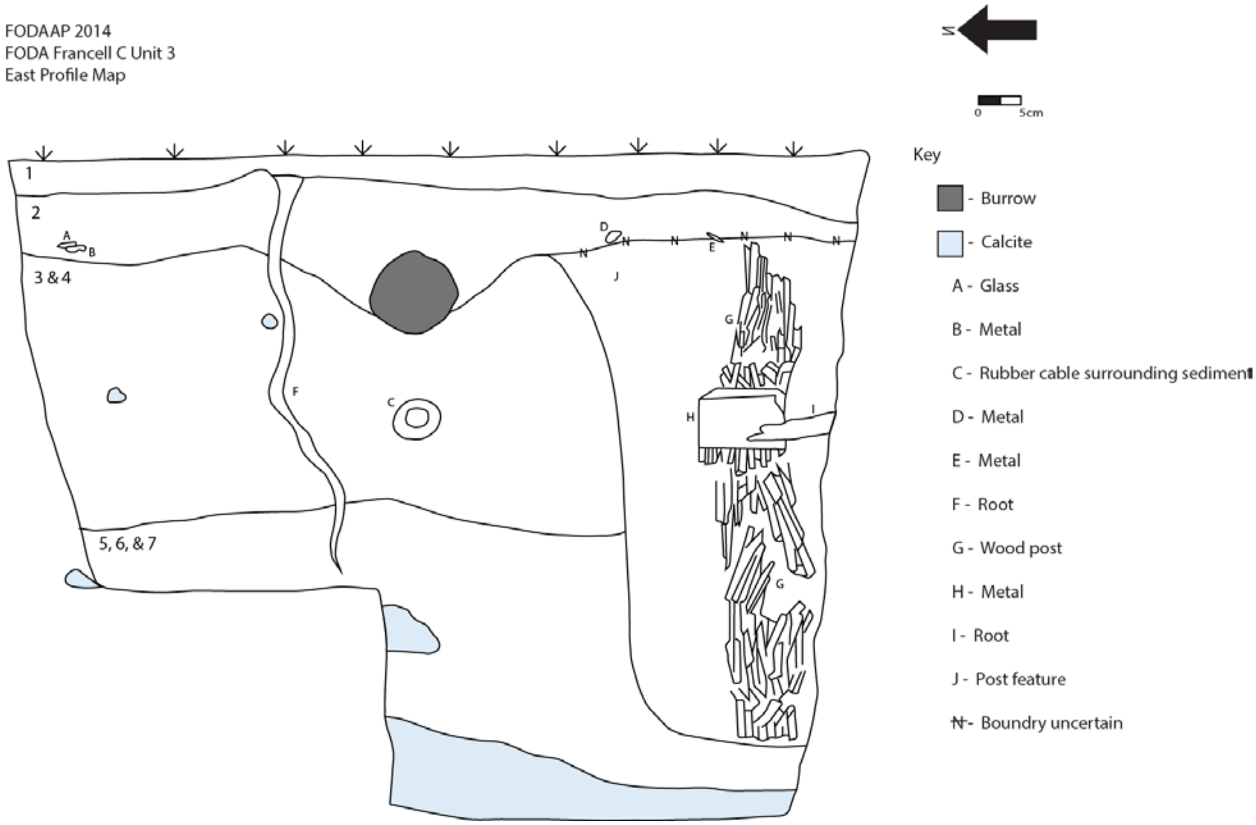


Figure 6.104: Figure 6.103: Stratigraphic drawing of the eastern profile of Francell C Unit 3.

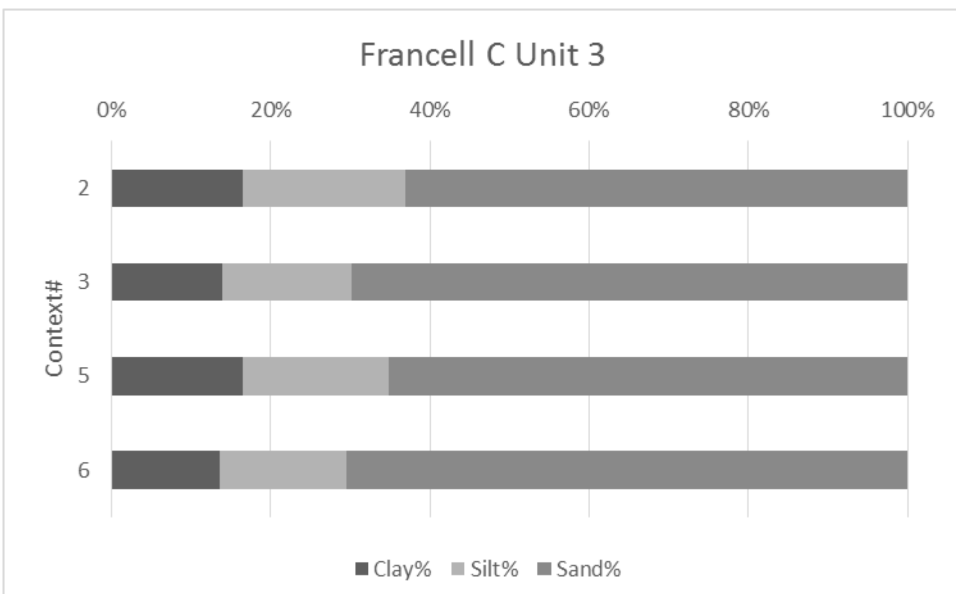


Figure 6.105: Bar Chart showing relative percentages of clay, silt, and sand for Francell C Unit 3.

Correlation coefficients were calculated between percentages of sand, silt and clay versus percentage of organic matter and pH. Of these coefficients, only one indicated a possible correlation. Percentage of organic matter and percentage of silt had a correlation coefficient of 0.43, indicating a moderate association. Inspection of the scatter plot for these two variables supports this interpretation as there are no extreme outliers in the dataset (Table 6.10). Further discussion is provided in Chapter 7.

Micromorphology

Francell A STP 1

Two micromorphology samples were taken from STP 1 in Francell A (south of the midden) to investigate pedological and geological processes at the site without the interference of the midden-related deposits (Figure 6.105 and 6.106). Sample 1020014 was taken from the upper contexts of the south profile while sample 1020012 was taken from lower contexts in the east profile (Figures 6.107 and 6.108). Minimal artifacts were encountered during excavation of the midden and only rare and small (<1cm) fragments of charcoal and metal were identified in thin-section, indicating that the midden itself was a contained deposit and that the STP can reasonably represent an off-site sample for Francell A (the midden) and Francell C (the structure). Excavators of the STP noted a compact silty sand with white nodules throughout the unit. There was some vertical variation in texture and compactness of this fabric but no discrete boundaries. The Unit's mineralogy was overall similar to most other Fort Davis Contexts and dominated by silicate minerals such as quartz and feldspar, and felsic volcanic rocks. There was generally a lower percentage of tuff than seen in samples taken from Fort Davis NHS.

Figure 6.106: Photograph showing the southern profile of STP 1 in Francell A. The STP was located south of the midden area analyzed in Francell A Units 1 and 2.

Figure 6.107: Photograph showing the eastern profile of STP 1 and locations of micromorphology samples.

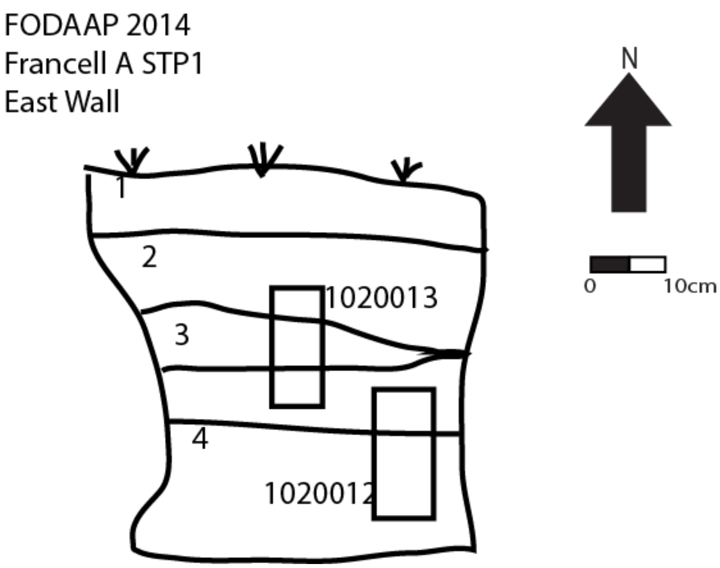


Figure 6.108: Stratigraphic drawing showing the eastern profile of STP 1 in Francell A along with locations of micromorphology samples.

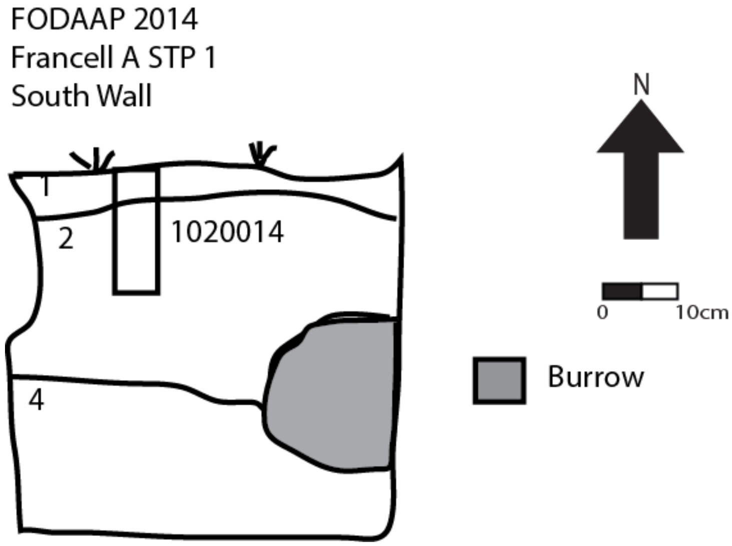


Figure 6.109: Stratigraphic drawing showing the southern profile of STP 1 and locations of micromorphology samples.

Sample 1020014 was taken from Contexts 1 and 2 (the surface and subsoil) in the south wall of the STP (6.109). Three beds were defined within the sample based on compactness and microstructure, but boundaries were very diffuse. The uppermost bed (about 20mm in width) was composed of a massive microstructure with some weak horizontal orientation of the coarse fraction. Charcoal, metal, bone, and insect excrement were identified in this bed along with a relatively high portion of plant tissue (5 to 10%). A brownish clay coating was present on a tuff fragment. Carbonate content was extremely high, with 29 micritic nodules (average diameter 412 µm) in the three subsampled locations, along with two sparry nodules, three mixed crystallization nodules, and a large (6mm) compound nodule. No other secondary features were noted. Details of the subsampling methodology can be found in Chapter 5 along with images of typical nodule types.

Bed 2 was composed of a loose, massive microstructure alternating with a weak blocky microstructure in areas with higher clay content. Decayed plant material was found throughout including both intact tissues and amorphous material incorporated into the fabric. Several clay coatings were identified on basalt, trachyte, and micritic carbonate nodules. Forty-six micritic nodules were present in the three subsampled locations (average diameter 178µm) along with five sparry nodules (average diameter 589µm) and one compound nodule. While some clay coatings were present on nodules, the fabric of the nodules themselves was primarily pure carbonate.

Bed 3 within sample 1020014 was medium brown in thin section (slightly darker in color than bed 2, with a poorly developed crumbly microstructure. The fabric contained more clay than overlying beds but with fewer discrete clay peds. Plant remains were rare and one piece of metal was identified. A few examples of clay and carbonate coatings were identified on trachyte and tuff nodules as well as clay hypocoating on a mixed crystallization carbonate nodule. As with overlying beds, carbonate content was very high with 37 micritic nodules identified in subsampled locations (average diameter 117µm) along with a total of 20 sparry nodules (average diameter 444µm), two mixed crystallization nodules (over 2500µm) and one compound nodules (635µm).

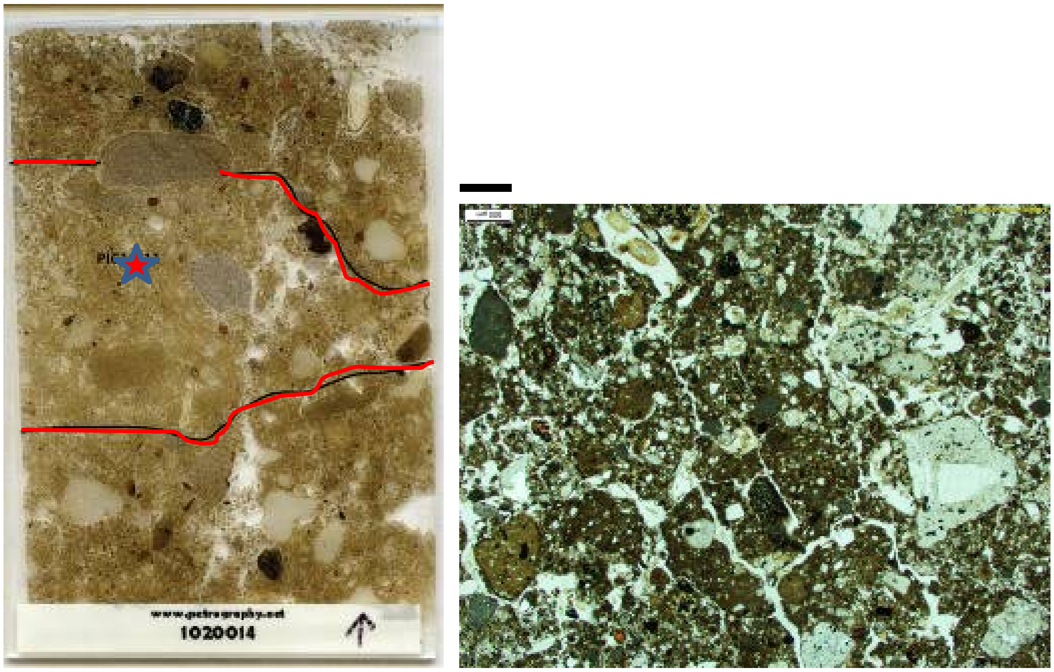


Figure 6.110: Flatbed scan of thin section from SMS Sample 1020014 (left) and a close up showing fabric in bed 2. Red lines indicate boundaries between beds. The uppermost is Bed 1, the central is Bed 2, and lower is Bed 3. Scale bar is equal to 400µm.

Sample 1020012 was taken from layer 2 and 3 within the east profile of STP 1 (lower in the profile than sample 1020014). Only one bed was identified in this slide and it was dominated by large carbonate nodules (Figure 6.110). The fabric was a mixture of massive, loose sand and clay-rich aggregates and crumbly patches. Plant material was rare and no anthropogenic materials were identified. Within subsampled areas 20 micritic nodules were identified (average diameter 730µm), along with a total of 13 sparry nodules (average diameter 1000µm), seven mixed crystallization nodules (average diameter 5308µm with an outlier at 15mm diameter), and one compound nodule (4757µm).

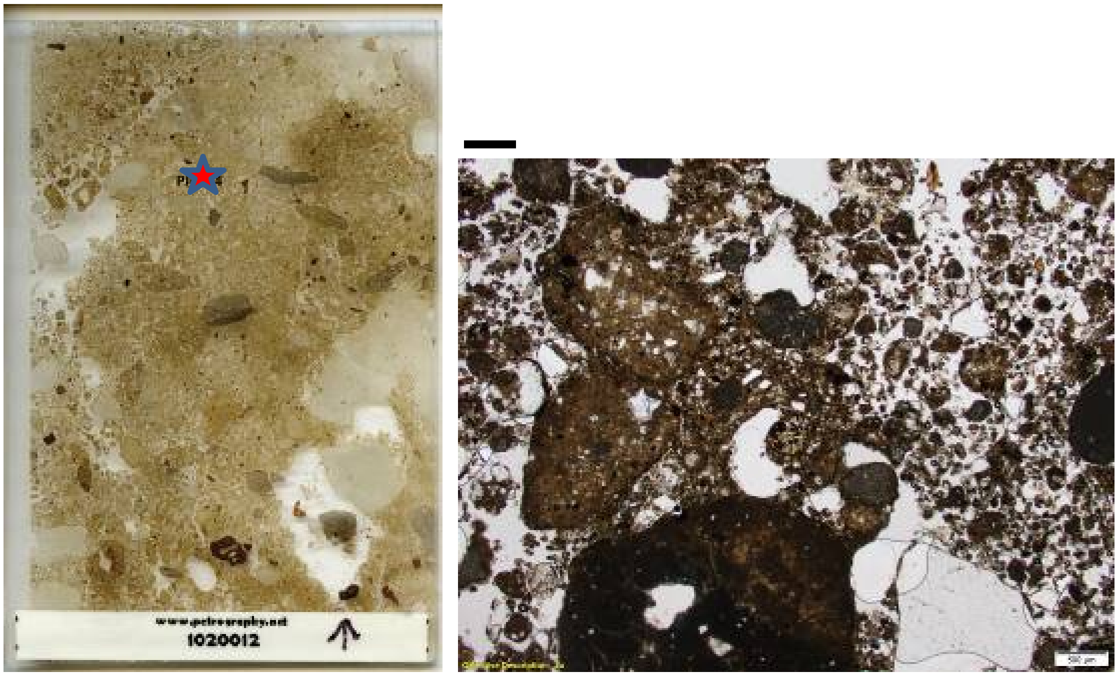


Figure 6.111: Flatbed scan of thin section slide from SMS Sample 1020012 (left) and a close up showing fabric with fine grained aggregates and carbonate nodule. No beds were identified in this slide. Scale bar is equal to 400µm.

Francell A Unit 1: Central Midden

The area designated Francell A included a very dense midden deposit at the top of a small hillslope. Artifact analysis by K. Eichner dated the material in the midden to the 1920s and 1930s. Two 1m x 1m excavation Units were placed in the midden. Unit 1 was placed at the top of the slope in the center of the midden scatter. Unit 2 was placed on the northward slope.

Three micromorphology samples were analyzed from Unit 1. Due to the extreme looseness of the midden matrix and the dense concentration of large artifacts, not all samples were ideally placed to capture boundaries and were easily disaggregated after collection.

Figure 6.112: Photograph showing Francell A Units 1 (background) and 2(foreground) at the Francell-Byerley Property. Photograph was taken facing south.

Figure 6.113: Photograph showing the western and south profiles of Francell A unit 1. Micromorphology samples are indicated by pink tags. Not all samples were processed and analyzed due to budget constraints.

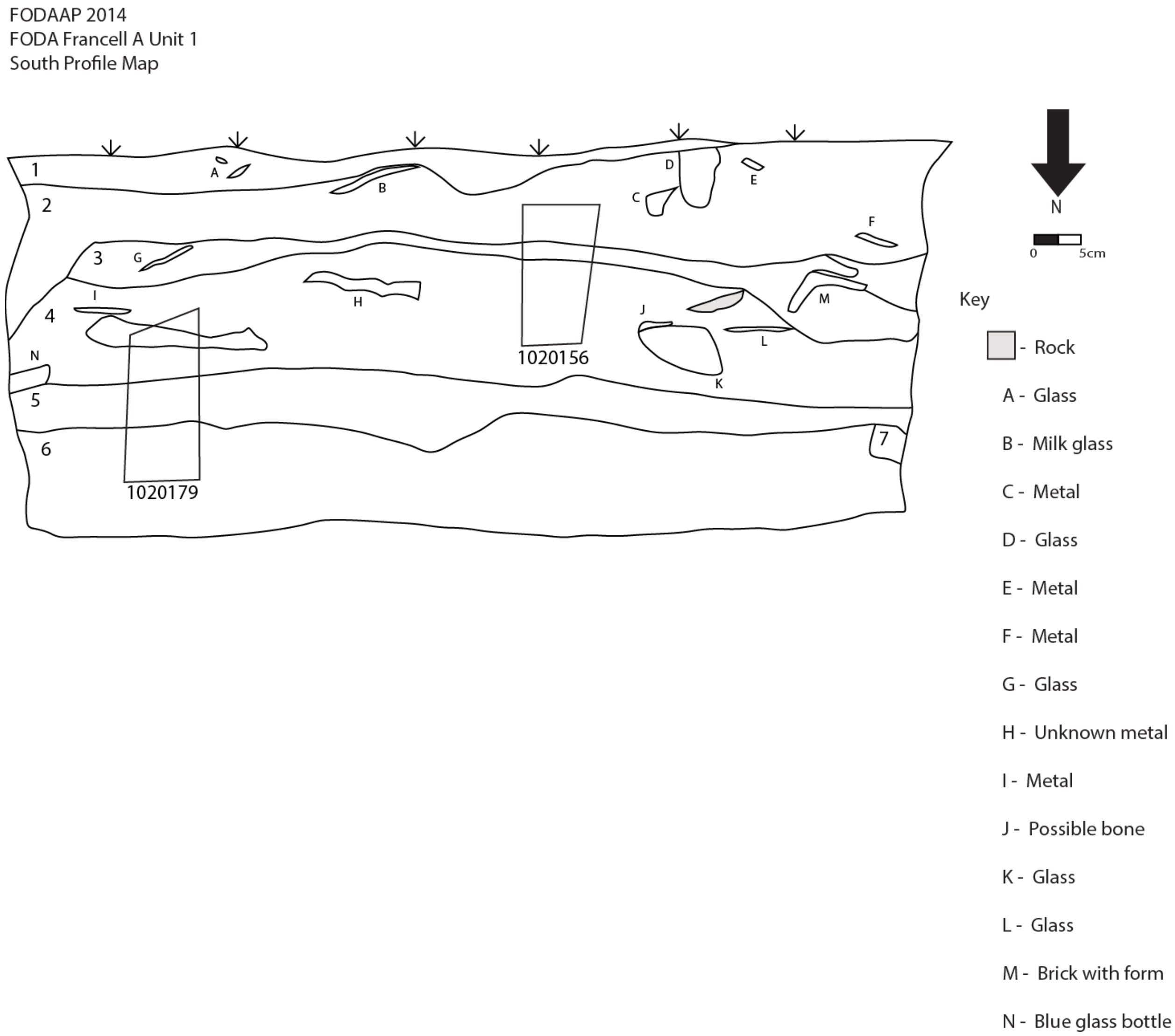


Figure 6.114: Stratigraphic drawing showing the southern profile of Francell A Unit 1. Locations of micromorphology samples are indicated.

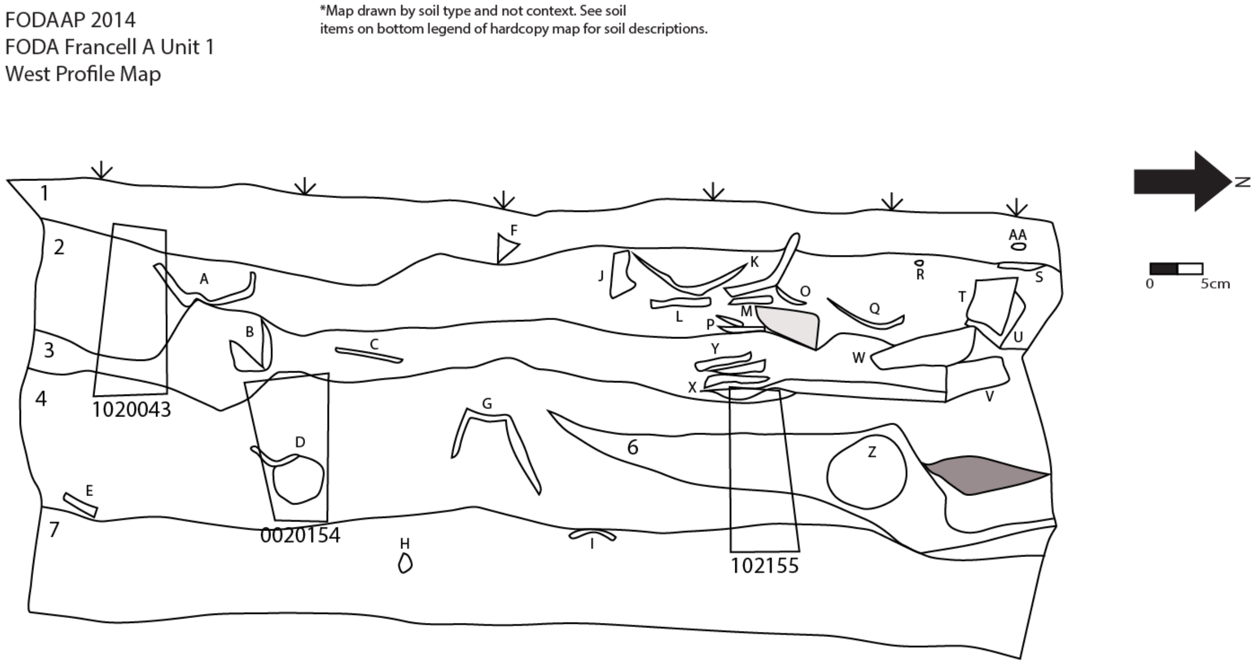


Figure 6.115: Stratigraphic drawing of the western profile of Francell A Unit 1. Locations of micromorphology samples are indicated.

Sample 1020043 was taken from Contexts 3, 4 and 5 in the west wall of Unit 1 (Figure 6.115). No boundaries are visible in this sample so it likely contains only Context 3, or is disaggregated. The sample contains large artifacts, including several pieces of elongate metal which is visibly leaching into the groundmass. The microstructure is overall massive and very loose, with no bedding or other orientation of coarse or fine fraction. Charcoal and ash are present throughout, along with small fragments of bone, one eggshell fragment, and a few small fragments of glass. Ash is mostly incorporated into the fine fabric, with areas of higher ash content having overall lower void space. Micritic carbonate nodules are present (eight nodules in subsampled areas averaging 1107um). Sparry nodules, compound nodules and mixed crystallization nodules were also present. Fragmented metal is present throughout at around 10% of overall composition.

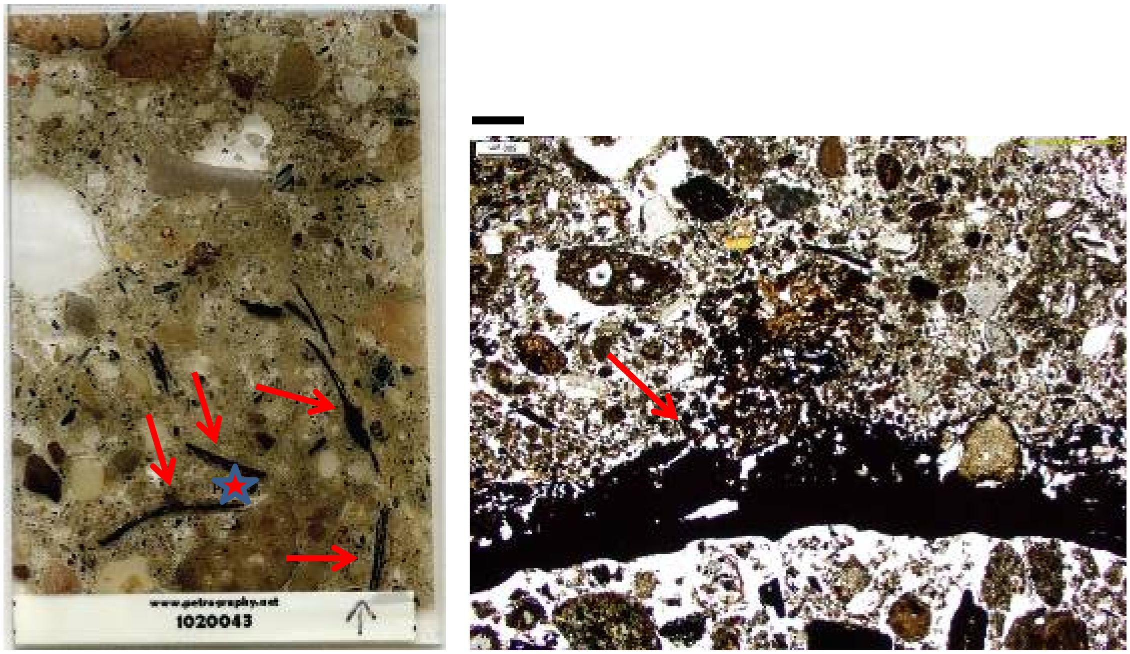


Figure 6.116: Flatbed scan of thin section slide from SMS Sample 1020043 and a close up showing metal leaching into sediment fabric. No distinct beds were identified in this slide. Scale bar is equal to 500µm. Red arrows indicate large metal fragments.

Sample 1020156 was taken from Contexts 3, 4 and 5 in the south profile (Figure 6.116) The three beds present in the slide correspond to the Contexts seen in excavation. Context 3 (sample 1020156 bed 1) was described as loose, grayish tan silty sand and charcoal inclusions. This is the same Context represented in sample 1020043. In slide 1020156 bed 1 has a massive microstructure with ash present in the fine fraction and no internal orientation. The bed includes a large metal fragment (in A1) along with smaller fragments of metal, charcoal, bone, and rare eggshell cluster near two pieces of highly burnt and altered glass. Carbonate development was similar to 1020043.

Bed 2 (Context 4) in sample 1020156 is a thin well-sorted ash lens with minimal inclusions. Similarly, Context 4 is described as a light gray ash with fine charcoal inclusions. Small pieces of bone (700um), charcoal, and eggshell are identified, but overall few anthropogenic inclusions are present in this bed compared to other beds within the midden.

The final bed in sample 1020156 was analogous to Context 5, a loose, ashy, silty sand with charcoal inclusions which is mottled in places. In sample 1020156 only the uppermost portion of this context is visible as Bed 3, which is cut off by the base of the slide. The bed is composed of poorly-sorted silt with very little ash content and minimal artifacts material. Carbonate development is also minimal with only three micritic nodules identified in subsampled locations.

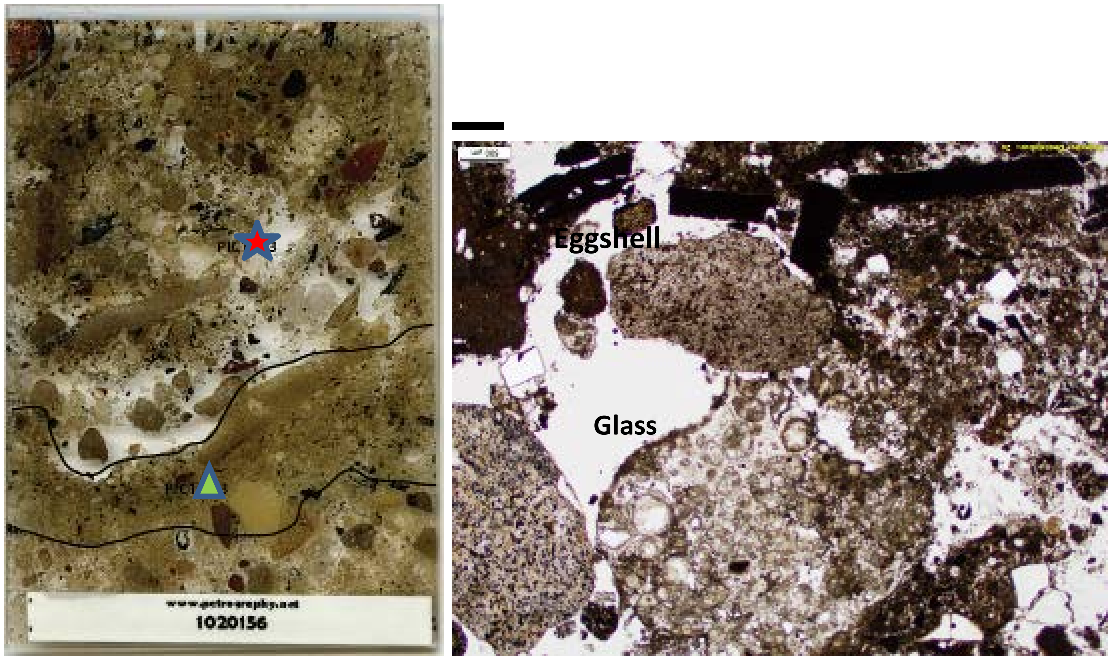


Figure 6.117: Flatbed scan of SMS Sample 1020156 (left) and a close up showing highly burnt glass and eggshell in Bed 1. Uppermost bed is bed 1, central is Bed 2, and lower is Bed 3. Scale bar is equal to 400µm.

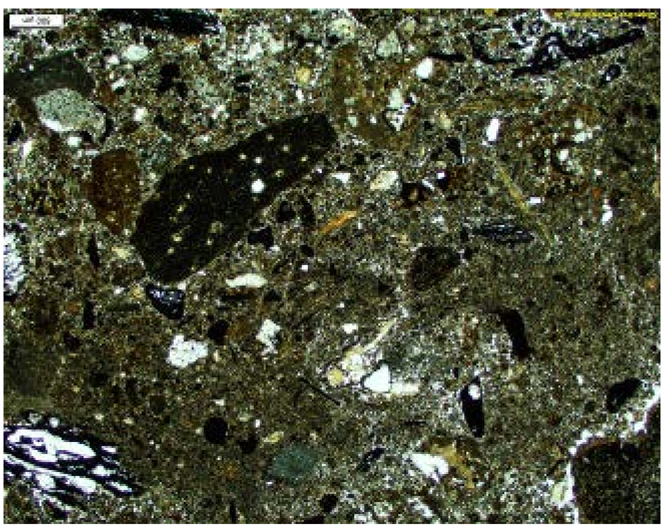


Figure 6.118: Close up from SMS Sample 1020156 (green triangle location) showing ashy fabric in Bed 2.

Sample 1020155 was taken from the west profile and includes Contexts 5 and 6 (a mottled, loose, light brown context with charcoal inclusions) as well as an overlying context identified by the excavation while drawing the Unit profile but which was not seen during excavation. Boundaries between beds were generally gradual with the boundary between bed 1 and beds 2/3 being moderately more defined (Figure 6.118). This uppermost context was visible in thin section as Bed 1 while Beds 2 and 3, which abut each other, are representative of the mottling in Contexts 5 and 6. Bed 1 is a well-sorted, fine-grained, ash-rich context with large (3mm+) charcoal inclusions. Unlike other midden contexts, the bed has NW-SE bands of darker, reddish fabric, as well as a moderately expressed blocky structure (Figure 6.119). Highly burned organic material is present throughout. One piece of metal and one fragment of plaster (also burnt) are

present. Minimal carbonate material was present. The sorting, orientation, banding and presence of microstructure suggests that this bed was altered during *in situ* burning.
Bed 2 in sample 1020155 is located to the left hand side of the slide (Figure 6.118). The bed is a light tan color with a low density of ash and organic material, small charcoal fragments, and several metal fragments. Leaching of metal is common and one fragment has an enameled porcelain coating similar to a fragment of porcelain from Francell A Unit 2 (see below). A long fragment of eggshell and a thin piece of clear glass (likely window glass) are also present. Bed 3 is to the right hand side of the slide and also incorporates the mottled texture of Contexts 5 and 6. Bed 3 is dark brown, with substantial burned organic content in the upper section of the bed near bed 1. The fabric is poorly sorted with a massive microstructure. The upper section has some banding of the fine fraction similar to Bed 1. Charcoal is denser in the upper portion of the bed. Artifacts are less dense than other midden deposits with some bone, one eggshell, rare metal fragments and two fragments of glass noted. Eleven micritic carbonate nodules were identified in subsampled locations, along with eight sparry calcite nodules.

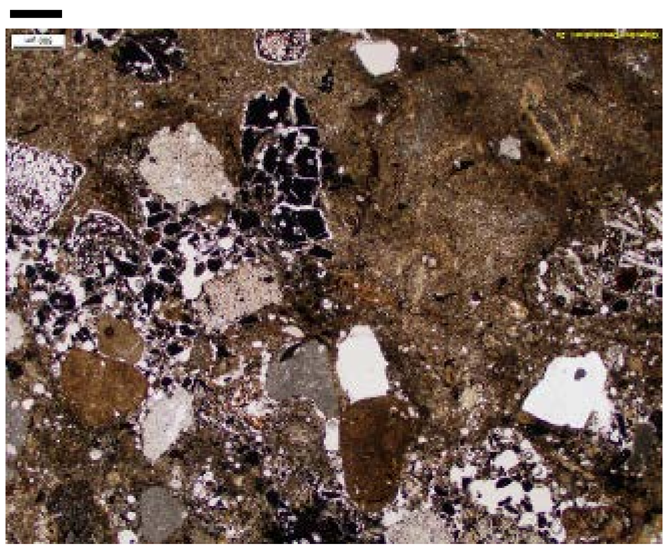


Figure 6.119: Flatbed scan of SMS Sample 1020155 and a closeup showing the boundary between Beds 1 and 2. Bed 1 is uppermost in flatbed image. Bed 2 is to the left. Bed 3 is to the right. Scale bar is equal to 400µm.

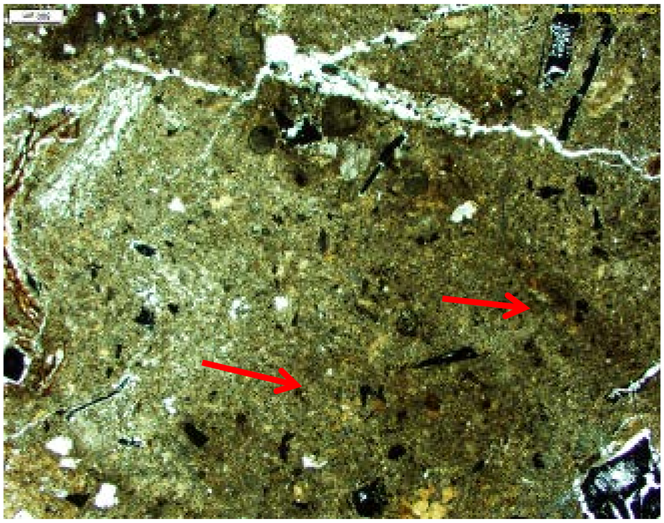


Figure 6.120: Close up from SMS 1020155 showing banding (red arrows) in fabric of Bed 1 (green triangle location on flatbed scan).

Francell A Unit 2: Midden Slope

Unit 2 in Francell A was placed on the northward downslope of the midden (Figure 6.111). Excavation showed thin, mixed midden deposits overlying sterile ground. Two samples were analyzed from Unit 2, including midden contexts and the underlying ground surface in the east and south profiles (Figure 6.120).

Figure 6.121: Photograph showing the eastern and southern profiles of Francell A Unit 2 with micromorpholoyg samples indicated.

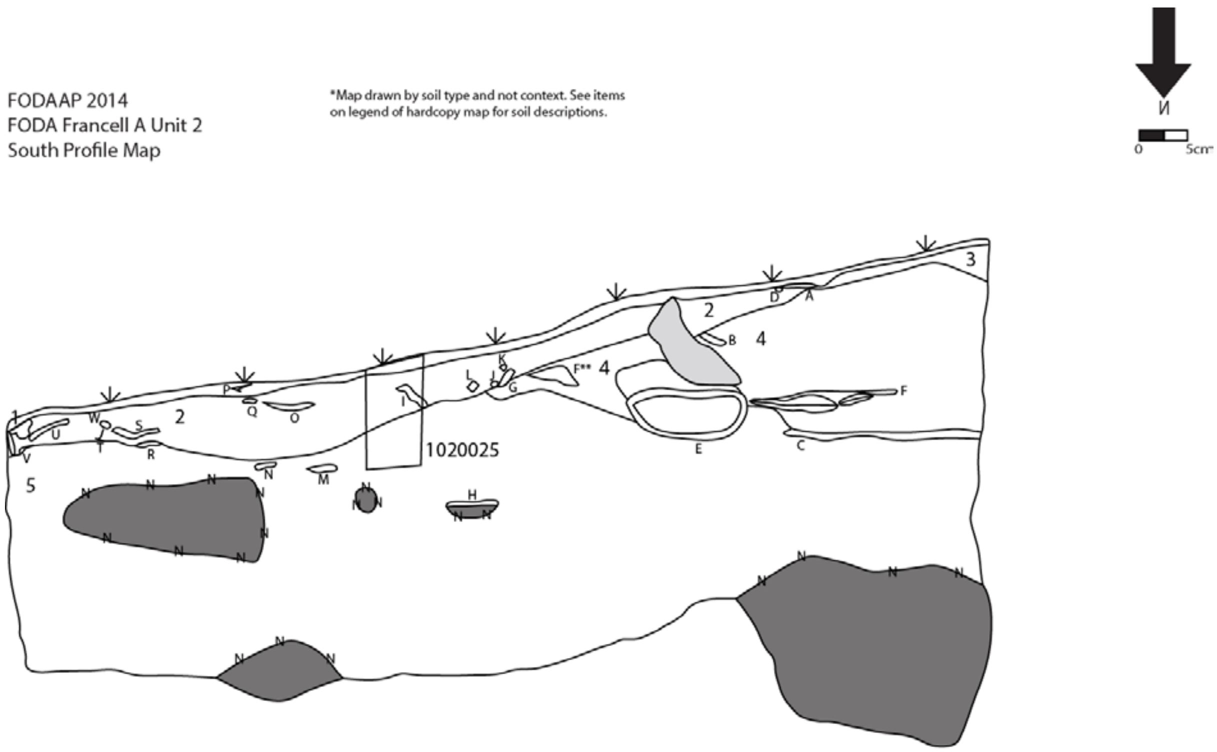


Figure 6.122: Stratigraphic drawing of the southern profile of Francell A Unit 2 showing location of micromorphology sample.

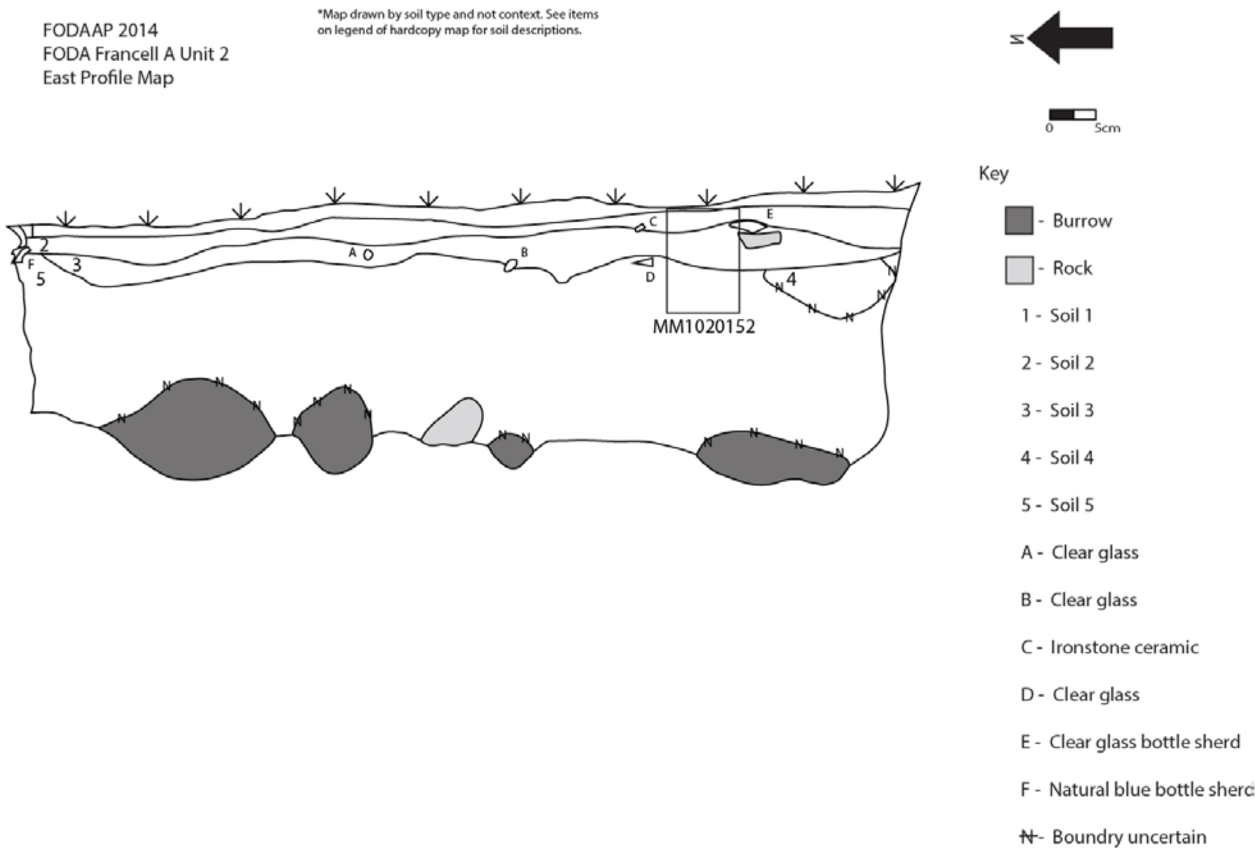


Figure 6.123: Stratigraphic drawing of the eastern profile of Francell A Unit 2 showing location of micromorphology samples.

Sample 1020152 was taken from the east profile of Unit 2 and includes the lowest contexts of midden debris as well as the underlying sediment (Figure 6.122, 6.123). The midden context (bed 1) is an unorganized jumble of silty sand with large anthropogenic inclusions including charcoal, metal, substantial bone and eggshell (both burnt) as well as a fragment of glass and a small piece of plaster. Animal bone is particularly concentrated near the boundary with bed 2. Substantial carbonate nodules are found throughout but some are mixed with the sediment fabric rather than precipitated in voids, suggesting that they may be translocated. Bed 2 includes the underlying sediment along with intermixed, sparse organic material from the midden. The bed has a moderately-developed, crumbly, compacted microstructure but no evidence for intentional preparation. Large anthropogenic inclusions (glass and metal) along with sparse bone and eggshell are from the overlying midden debris. Micritic and sparry carbonate nodules are present throughout.

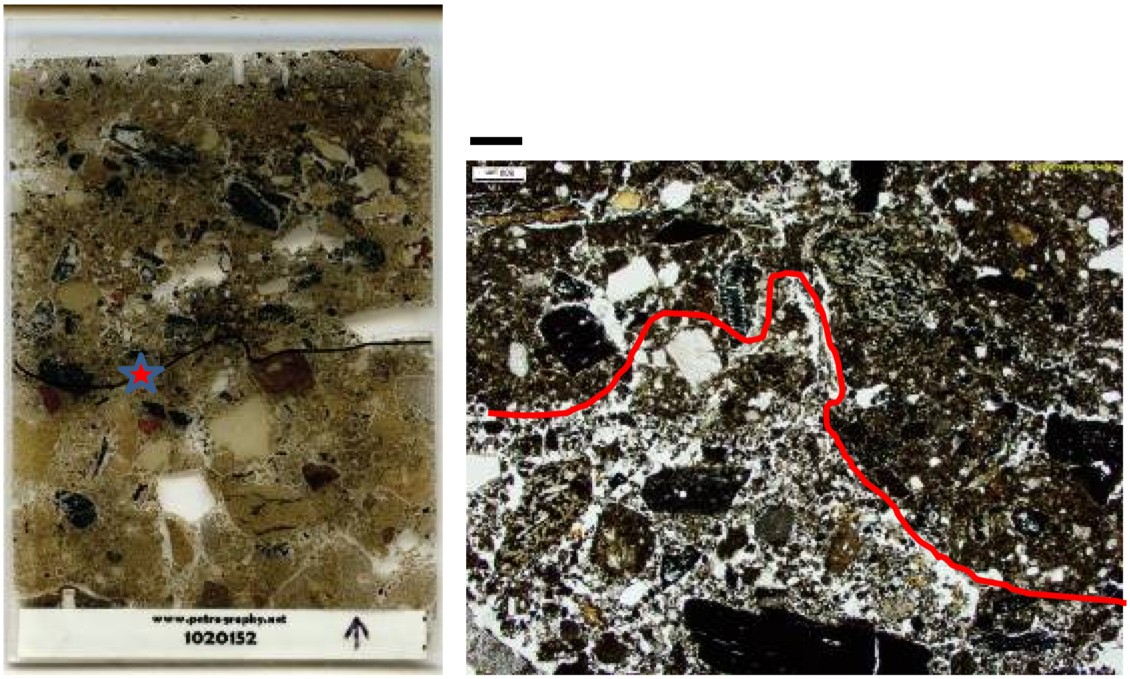


Figure 6.124: Flatbed scan of thin section from SMS Sample 1020152 and a close up showing the boundary between Bed 1 (upper) and Bed 2 (lower). Scale bar is equal to 400µm.

Sample 1020025 was taken from the south profile of Unit 2 (Figures 6.121 and 6.124) Similar to sample 1020152, sample 1020025 includes the lowest midden Contexts (bed 1) along with underlying sediment (Bed 2). Bed 1 is highly variable with no organization of the fabric. Ash is present in variable amounts within the fine fraction, along with fine-grained charcoal. Large fragments of charcoal and metal are present throughout (approximately 10% each). Small, burnt fragments of bone are common (5%) as are burnt pieces of eggshell (5%). A large fragment of porcelain with a lead glaze (as identified by K. Eichner) is present on the left hand side of the slide near a piece of brown glass. A small fragment of plaster is also present. Microsparitic and sparry carbonate nodules are common. Bed 2, the underlying sediment also shows minimal microstructure. Some small pieces of charcoal, eggshell, and metal are present. The boundary between beds 1 and 2 is diffuse, with no evidence of packing and no boundary voids.

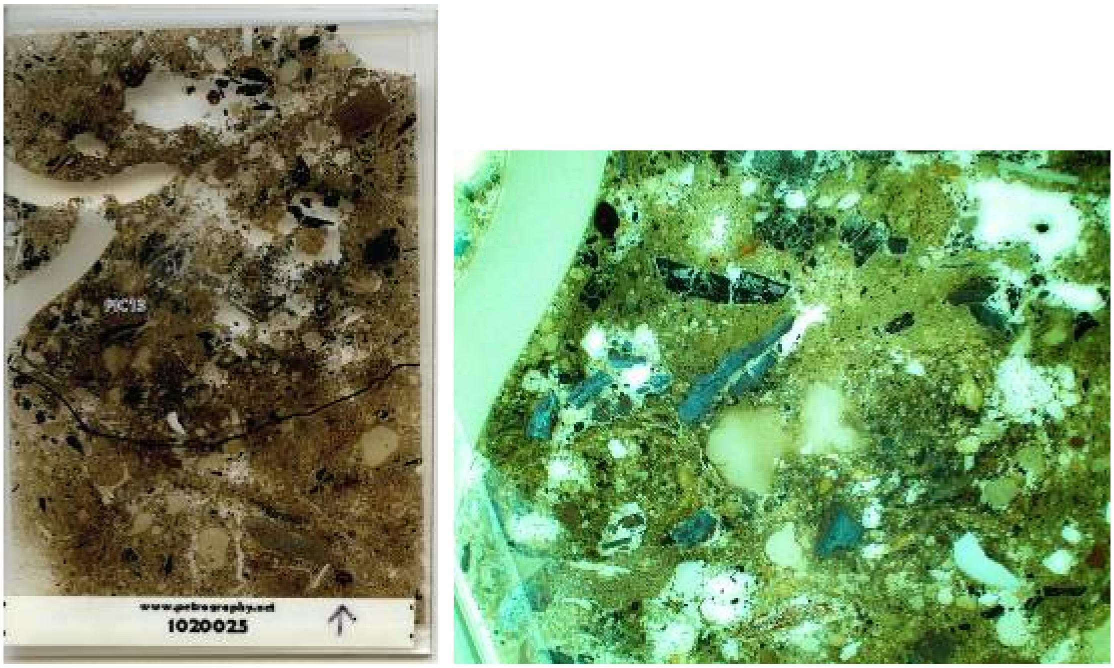


Figure 6.125: Flatbed scan of SMS Sample 1020025 and a closeup (magnification at 6.7X) in reflected light showing metal (steely blue fragments in image to right). Upper bed is Bed 1. Lower Bed is Bed 2.

Francell C: Structure

Excavations in Francell C included three 1m x 1m Units placed in the foundations of the structure (Figure 6.125). Unit 1 was placed in what appeared to be a central room, Unit 2 was placed at the southern end of the foundation at the edge of the modern service road on the property, and Unit 3 was placed a few meters north of the visible foundations.

Figure 6.126: Photograph showing locations of excavation units in Francell, facing north. The unit in the foreground is Unit 2, the central unit is Unit 1, and the furthest unit is Unit 3.

Francell C Unit 1

Unit 1 of Francell C was placed in an exterior room of the visible foundation. Artifacts recovered from this Unit included construction material (nails, window glass) as well as plaster in lower contexts. Two samples were analyzed from this Unit including one from the upper contexts of the north profile and one from lower contexts containing plaster in the south profile (Figures 6.126 through 6.129).

Figure 6.127: Photograph of the northern profile of Francell C Unit 1 showing location of micromorphology sample.

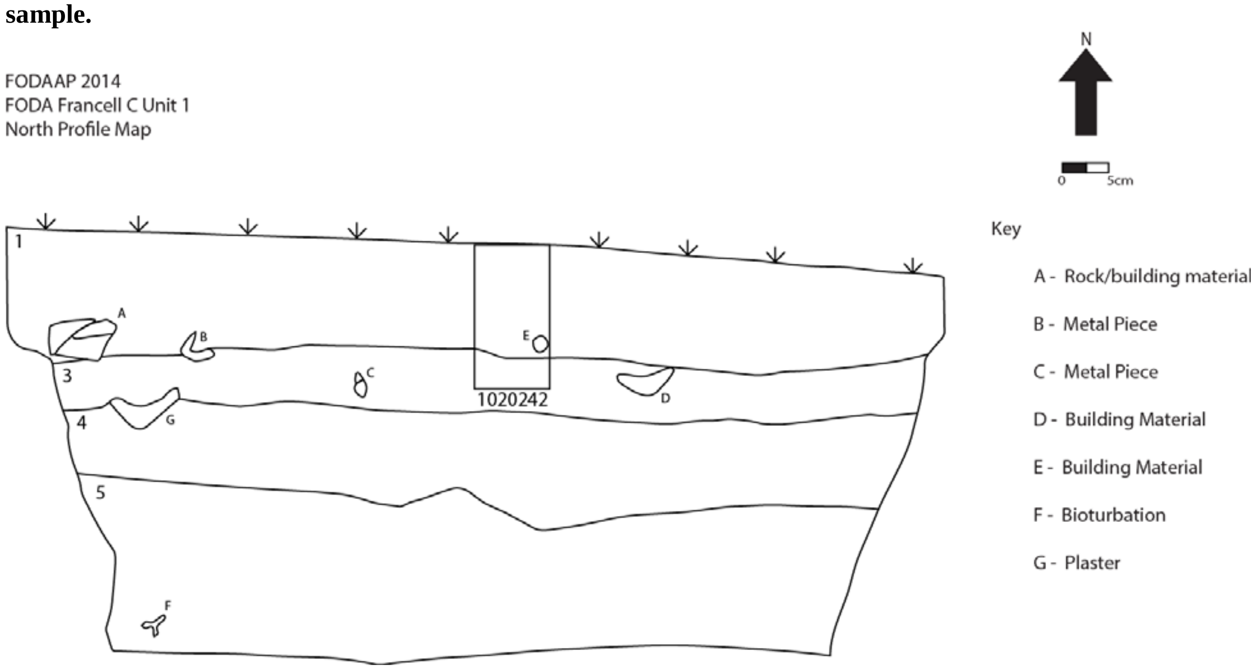


Figure 6.128: Stratigraphic drawing of the northern profile of Francell C Unit 1 showing locations of micromorphology samples.

Figure 6.129: Photograph of the southern profile of Francell C Unit 1 showing locations of micromorphology samples.

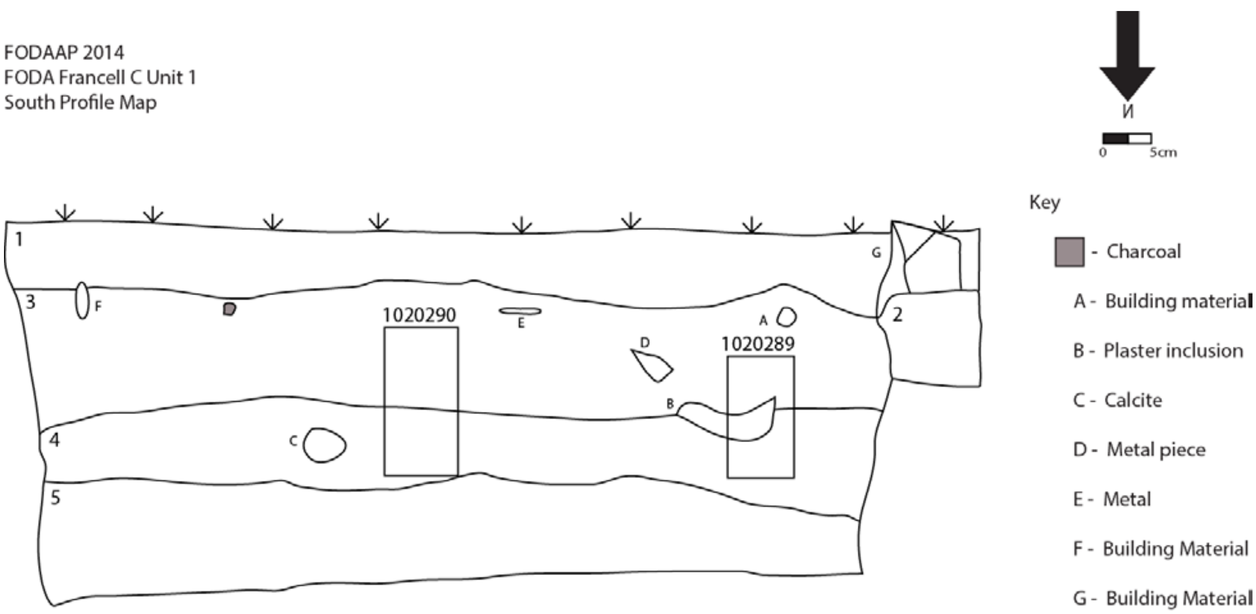


Figure 6.130: Stratigraphic drawing of the southern profile of Francell C Unit 1 showing locations of micromorphology samples.

Sample 1020292 was taken from Contexts 1 and 2 in the north profile of Unit 1 and contains primarily aeolian sediment along with plant material from the surface (Figure 6.130). Two beds were identified within the sample. Bed 1 was about 10mm in depth and likely relates to Context 1. This bed had a massive unconsolidated microstructure with some pockets of spongy structure and localized horizontal orientation of coarse particles. Organic material was substantial, including both plant tissue (10%) as well as amorphous material incorporated into the soil fabric (particularly in areas of spongy microstructure). Little clay development was present with a high frequency of carbonate nodules. Much of the plant material was burnt and some fragments of charcoal were identified.

Bed 2 in sample 1020292 included large disaggregated voids likely from rocky inclusions (visible in Figure 6.130). These voids, along with several large carbonate nodules, sufficiently disrupted the fabric that it was difficult to discern the structure of the bed. Overall structure was massive and poorly sorted and generally loose. Charcoal, burnt and unburnt plant remains, plaster, and metal fragments were identified. Metal and plaster likely relate to the collapsed structure itself, as does the burnt organic material. Carbonate development was generally sparse compared to other Francell Contexts, possibly because this sample is from near the ground surface.

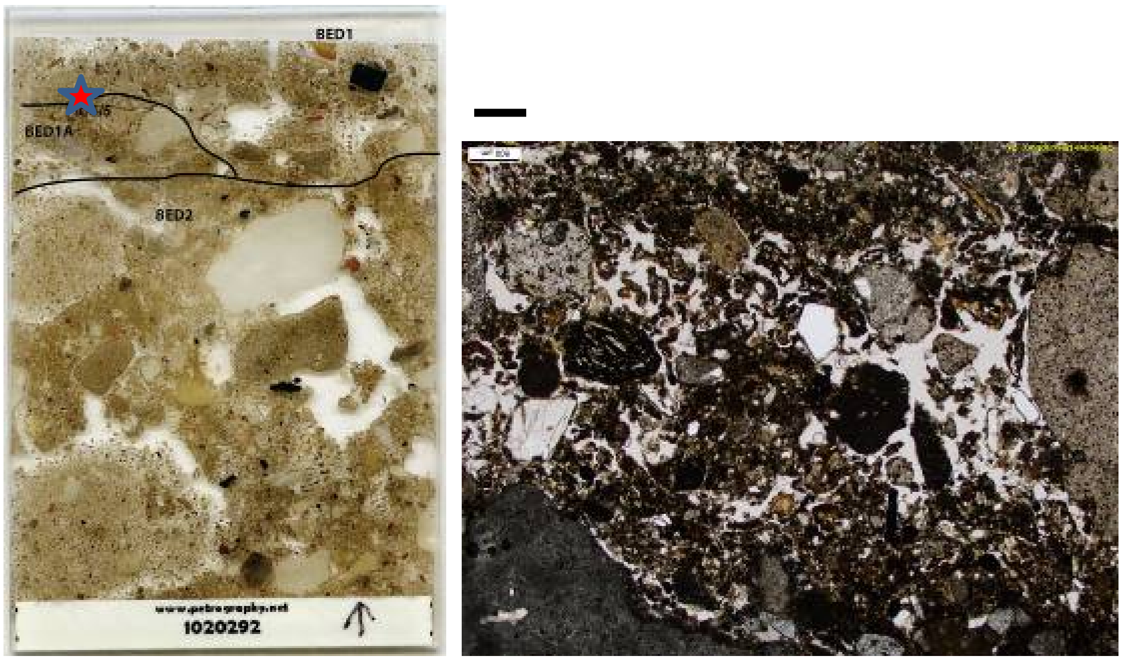


Figure 6.131: Flatbed scan of thin section from SMS Sample 1020292 (left) and a close up showing organic material and spongy fabric in Bed 2. Scale bar is equal to 400µm.

Sample 1020289 was taken from Contexts 3 and 4 in the south profile of Unit 1 near an accumulation of plaster uncovered during excavation (Figure 6.131). Two beds were identified in the slide. The beds were divided by a vertical boundary with Bed 1 to the left (east) and bed 2 to the right (west). The boundary itself is a vertical channel void approximately 5mm in width with substantial plaster inclusions oriented vertically. Bed 1 also includes several plaster inclusions along with bone, glass, and an unidentified red material. The bed is overall disaggregated but some intact aggregates have an internal vughy structure. Carbonate development is generally low with only four micritic nodules (in subsampled areas), two sparry nodules, one compound nodules and five mixed crystallization nodules.

Bed 2 in sample 1020289 appears undisturbed (in contrast to Bed 1) and contains two alternating fabrics. With no boundary apparent between the fabrics they were not categorized as separate beds. Fabric A is medium to dark brown, poorly sorted and has a weak blocky microstructure. Fabric A is concentrated closer to the boundary with Bed 1 and in the lower portion of the slide. Fabric B is well sorted, monic, and has a massive microstructure. Fabric B is generally located further from the boundary with Bed 1. No anthropogenic material and very little plant matter was identified. Similar to Bed 1 and sample 1020292, carbonate development is lower than in other samples from the Francell property. This may be a result of this area being interior space that was protected from water action for a certain period of time. The plaster is likely the remains of a highly disturbed plastered floor or subfloor. Some aggregates of plaster in Bed 1 are directly adhered to Bed 2 and more are oriented along the line of the boundary. Although the boundary between the beds is currently vertical, this is likely due to post-abandonment disturbance as no intact archaeological features were recovered in excavation. The variation between fabrics A and B in Bed 2 is likely due to their proximity to the floor/subfloor surface, with Fabric A being more compacted and exposed to water, while Fabric B remained unaltered.

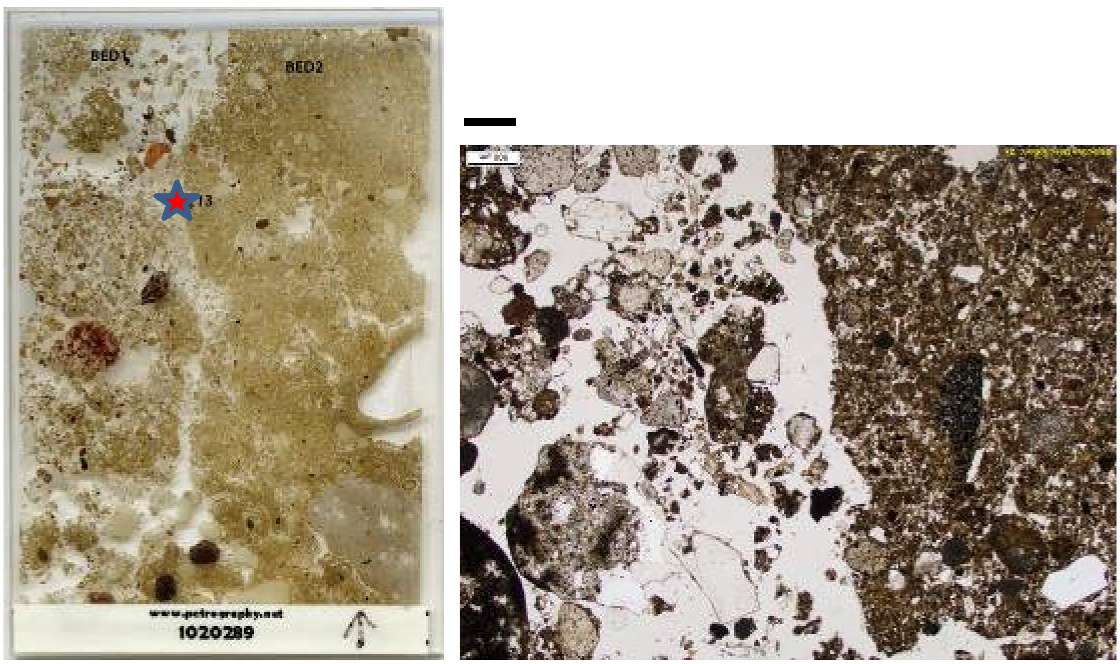


Figure 6.132: Flatbed scan of thin section from SMS Sample 1020289 (left) and a close up showing the boundary between Bed 1 (left) and Bed 2 (right). Scale bar is equal to 400µm.

Francell C Unit 2

Unit 2 was placed directly south of the visible foundations at the edge of the current service road for the Francell-Byerley property. Artifacts in this unit were very sparse even in comparison to the other Francell C Units which contained overall very few artifacts. Sediment was generally compact, with little variation until Contexts 4 and 5 (approximately 20cm below surface) in which the excavator recorded an increase in botanical remains (wood and other unburnt plant tissue). Two samples (1020241 and 1020242) were analyzed from the south profile of this Unit (Figures 6.132 and 6.133).

Figure 6.133: Photograph of the southern profile of Francell C Unit 2 South Profile showing Micromorphology Samples.

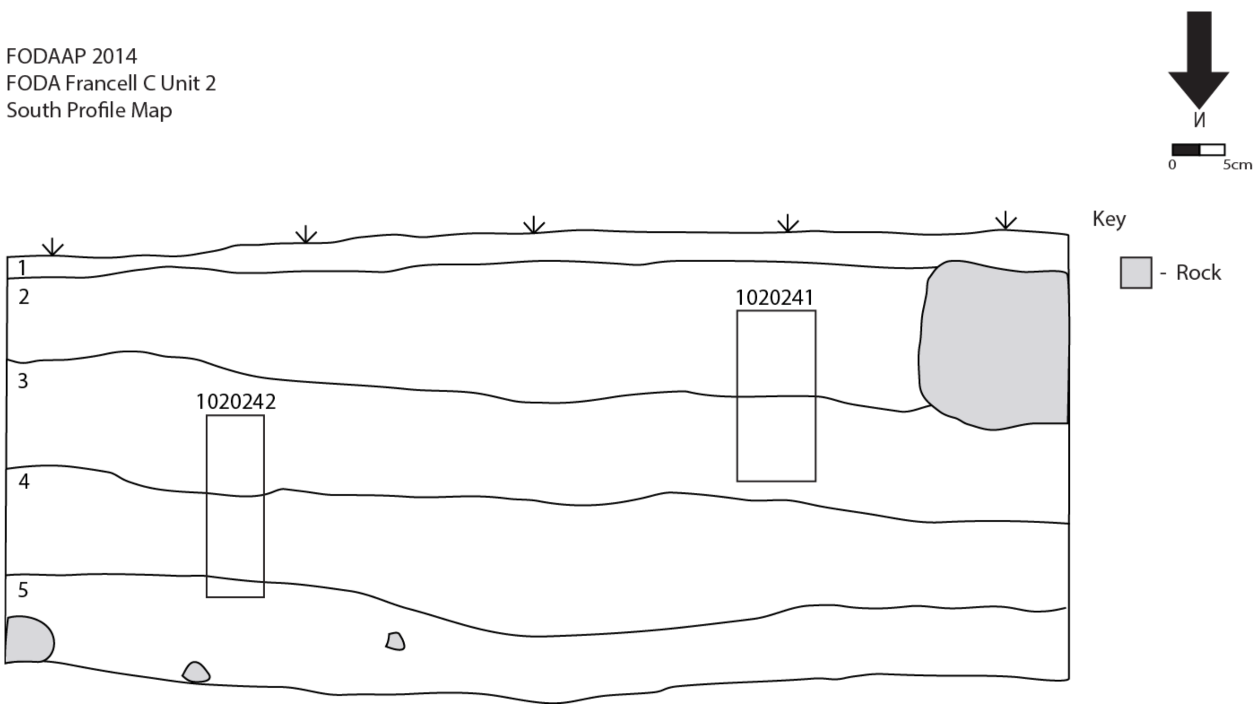


Figure 6.134: Stratigraphic drawing of the southern profile of Francell C Unit 2 showing locations of micromorphology samples.

Sample 1020241 was taken from Contexts 2 and 3 in the south profile, but only one bed was visible in the slide (Figure 6.134). The sample showed an alternative crumbly microstructure with fine-grained, well-sorted, massive sand. Plant remains were rare and the fabric did not appear to contain organic matter. No anthropogenic remains were recovered. Carbonate development was moderate, with 10 micritic nodules (in subsampled locations), two sparry nodules, eight mixed crystallization nodules, and one fragmented nodule.

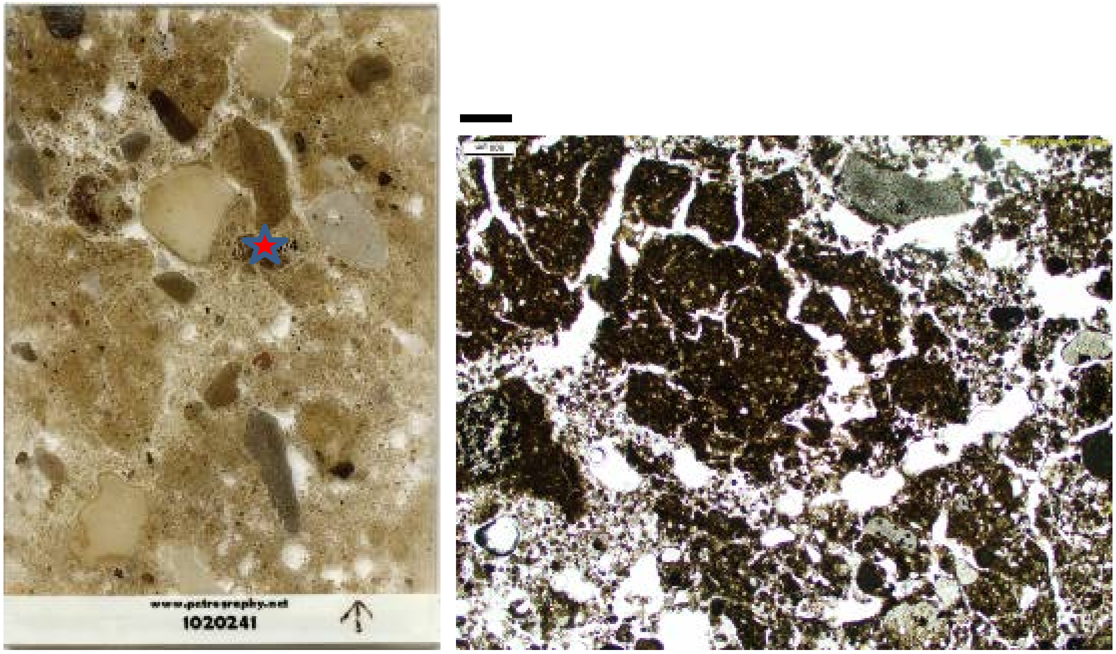


Figure 6.135: Flatbed scan of thin section from SMS Sample 1020241 (left) and a close up showing s crumbly ped within massive fabric in the upper left of the image. No distinct beds were identified in this slide. Scale bar is equal to 400µm.

Sample 1020242 was taken from Contexts 3, 4 and 5, in the south profile of Unit 2. Only one bed was visible in thin section (Figure 6.135). Overall, the sample showed a light-brown, fine-grained, silty sand with a massive microstructure and very little organic material. No anthropogenic material was identified. Several vughs suggest insect activity, but excrement infilling was not observed. Carbonate development was moderate with 15 micritic nodules (in subsampled locations), five sparry nodules, one compound nodule, and two mixed crystallization nodules.

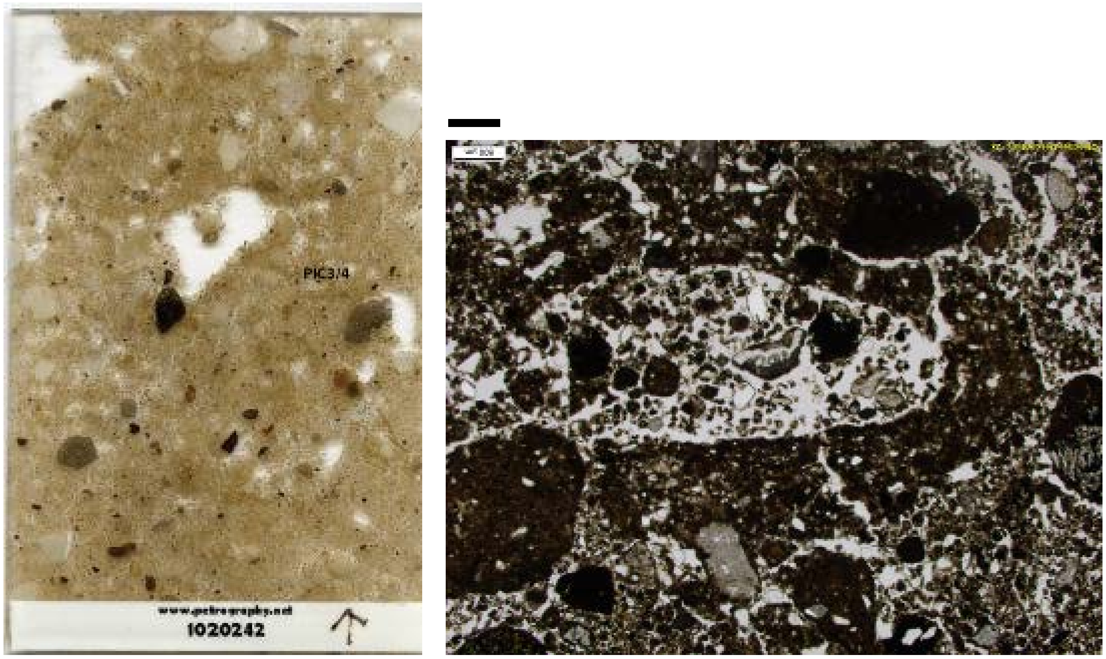


Figure 6.136: Flatbed scan of thin section from SMS Sample 1020242 (left) and a close up showing a void with hypocoating indicating insect activity (central to close up image). No distinct beds were identified within this slide. Scale bar is equal to 400µm.

Francell C Unit 3

Unit 3 in Francell C was placed roughly two meters north of the visible foundations in an attempt to characterize yard space. During excavation an intact wooden post with metal brackets was uncovered on the eastern side of the Unit. Based on this post, it was hypothesized that a porch extended out from the structure. The posthole associated with the post itself was very difficult to discern in excavation due to slaking and carbonate development in the sediment. Two samples (1020305 and 1020304) were placed at the boundary of the posthole with the sediment matrix to see if the boundary would be visible in thin section (Figures 6.136 and 6.138). Another sample (1020306) was placed in the western profile as a comparison (Figures 6.137 and 6.139).

Figure 6.137: Photograph showing the eastern profile of Francell C Unit 3 with the locations of micromorphology samples and an intact porch post.

Figure 6.138: Photograph showing the western profile of Francell C Unit 3.

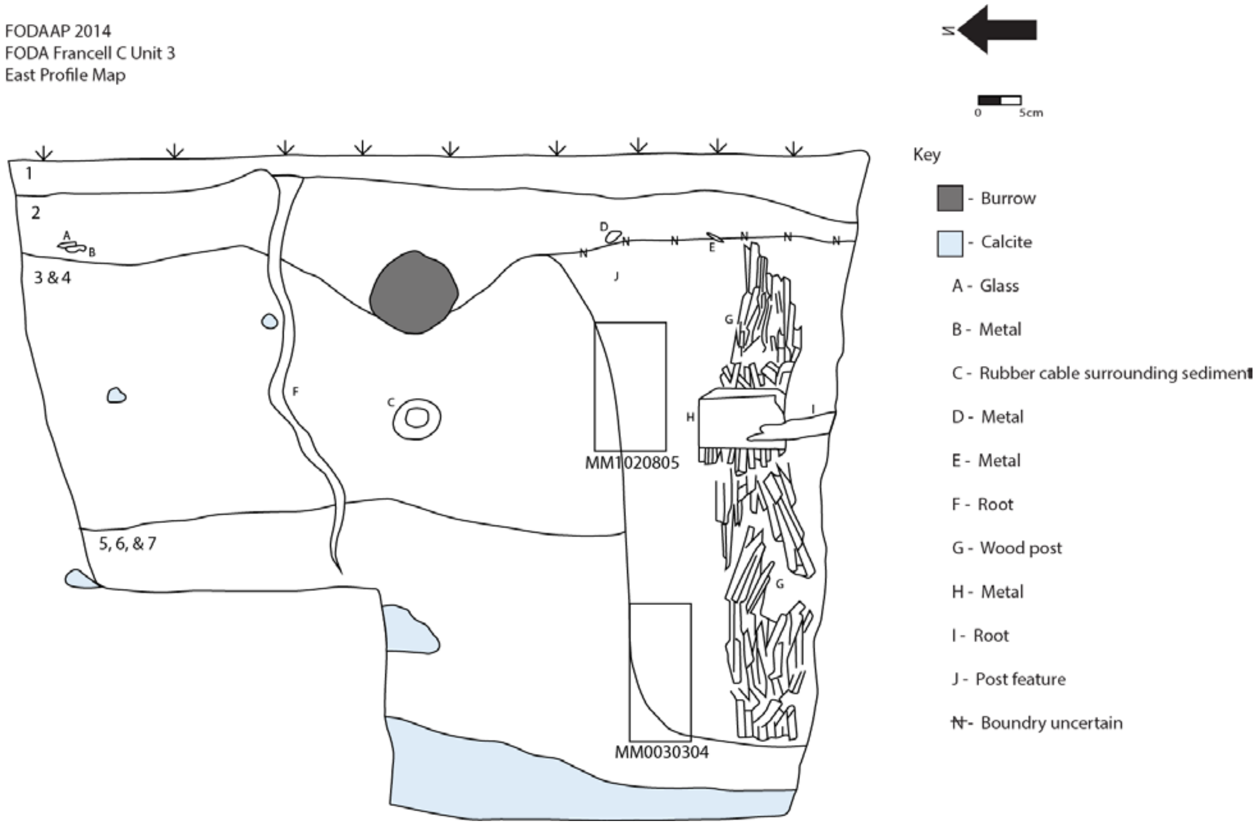


Figure 6.139: Stratigraphic drawing showing the eastern profile of Francell C Unit 3 and indicating locations of micromorphology samples

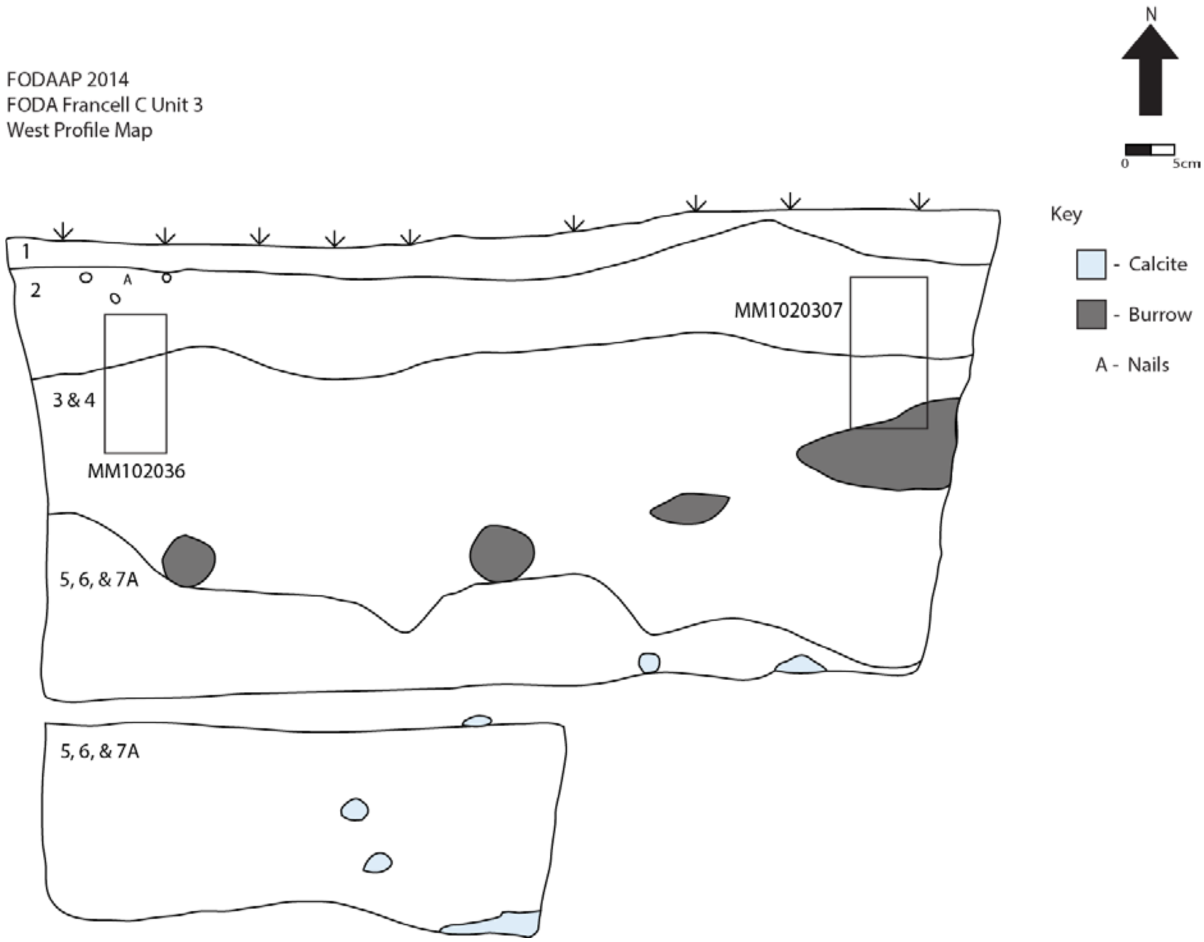


Figure 6.140: Stratigraphic Drawing showing the western profile of Francell C Unit 3 indicating locations micromorphology samples.

Sample 1020305 was placed about 15cm below surface in the boundary between the posthole and the surrounding matrix (Figure 6.140). However, in thin section only one bed was visible. The sample showed a poorly sorted, compacted sediment with a massive to crumbly microstructure and substantial clay and carbonate development. A few pieces of glass and a fragment of plaster were identified, likely relating to the structure. Clay coatings on rock fragments, pendants on carbonate nodules, and carbonate-rich clay infillings in void spaces were found throughout the slide. Carbonate nodules were also prevalent, with 29 micritic nodules (in subsampled areas), 32 sparry nodules, three compound nodules, and 10 mixed crystallization nodules identified.

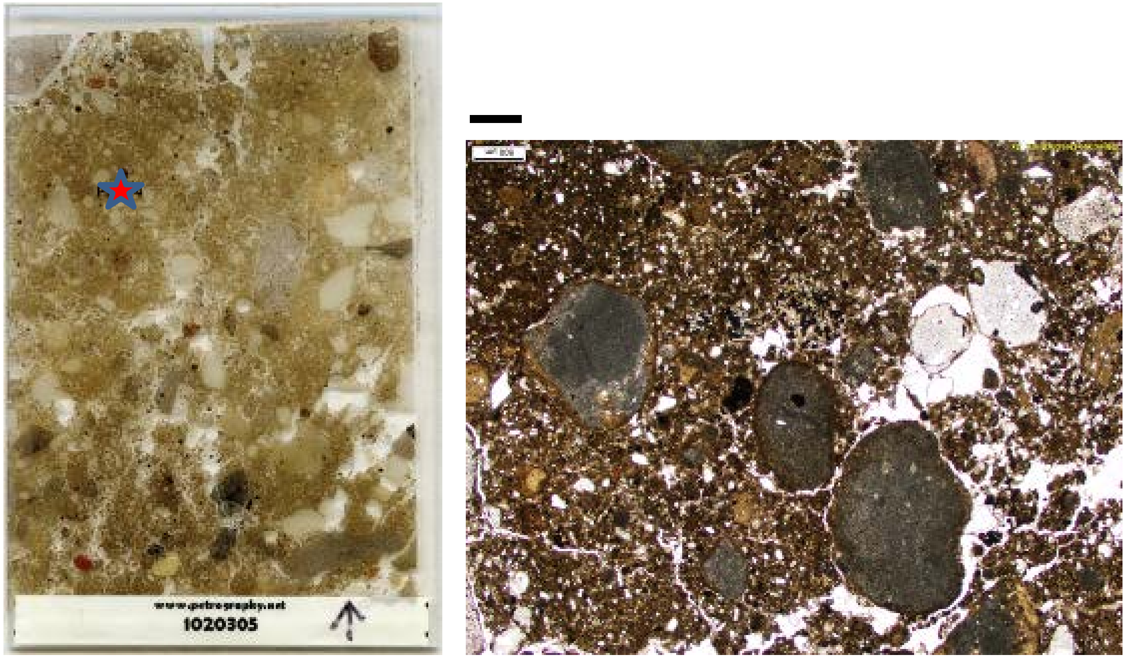


Figure 6.141: Flatbed scan of thin section from SMS Sample 1020305 and a closeup showing several micritic carbonte nodules. No distinct beds were identified in this slide. Scale bar is equal to 400µm.

Sample 1020304 was taken from about 65cm below surface in the eastern profile at a point where the posthole boundary was visible in the excavation profile. This sample appears to be partially disaggregated (Figure 6.141), but intact portions do not contain a boundary between the posthole Context (Context 5) and the matrix (Context 4). Intact portions of the slide show a weak crumbly microstructure with substantial clay nodules and carbonate development, similar to 1020305. A large vertical channel runs the length of the slide, likely from water action. Plant remains are rare and only one fragment of charcoal and one fragment of glass were identified. Clay coatings on trachyte fragments were observed, but no infillings and fewer carbonate nodules were present. Only two micritic nodules (in subsampled areas), nine sparry nodules, seven compound nodules, and 15 mixed crystallization nodules were identified. The density of clay in this area likely prevented water from penetrating deep into the profile, leading to greater precipitation of carbonate in the higher part of the profile. This would also explain why the posthole boundary was visible at lower depths, as water-related processed such as slaking and carbonate precipitation would have overprinted the boundary in the upper portions of the profile.

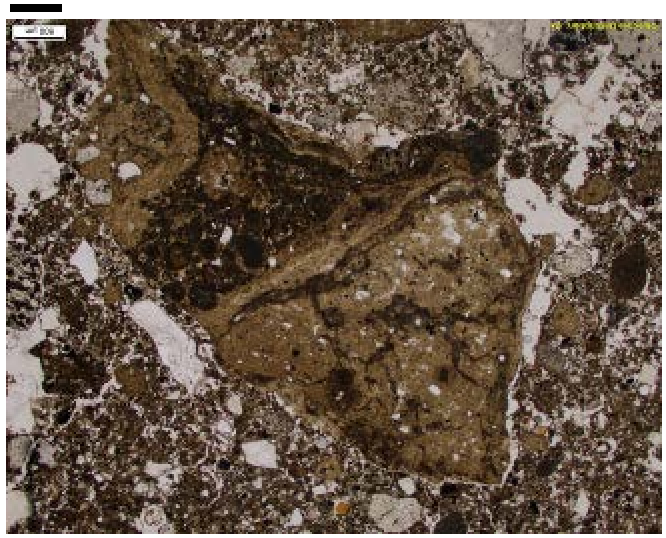


Figure 6.142: Flatbed scan of thin section from SMS Sample 1020304 (left) and a close up image showing a clay and carbonate nodule (central to the close up image). No distinct beds were identified in this sample. Scale bar is equal to 400µm.

Sample 1020306 (Figure 6.142) was taken from the western profile of Unit 3 as a comparison to sample 1020305. Similarly to the other two samples from this Unit 1020306 shows comparatively substantial clay development with a crumbly microstructure, compacted fabric, clay coatings and pendants, and carbonate-rich clay infillings in voids. Glass and eggshell fragments were identified. Carbonate development included 20 micritic carbonate nodules (in subsampled areas), 41 sparry nodules, one compound nodule, and 12 mixed crystallization nodules. Interestingly, both this sample and comparable 1020304 show increased clay development compared to samples from STP 1. This may be due to the effects of the porch. With a covering structure preventing as rapid evaporation of water, water saturation would have a longer duration, leading to increased clay translocation.

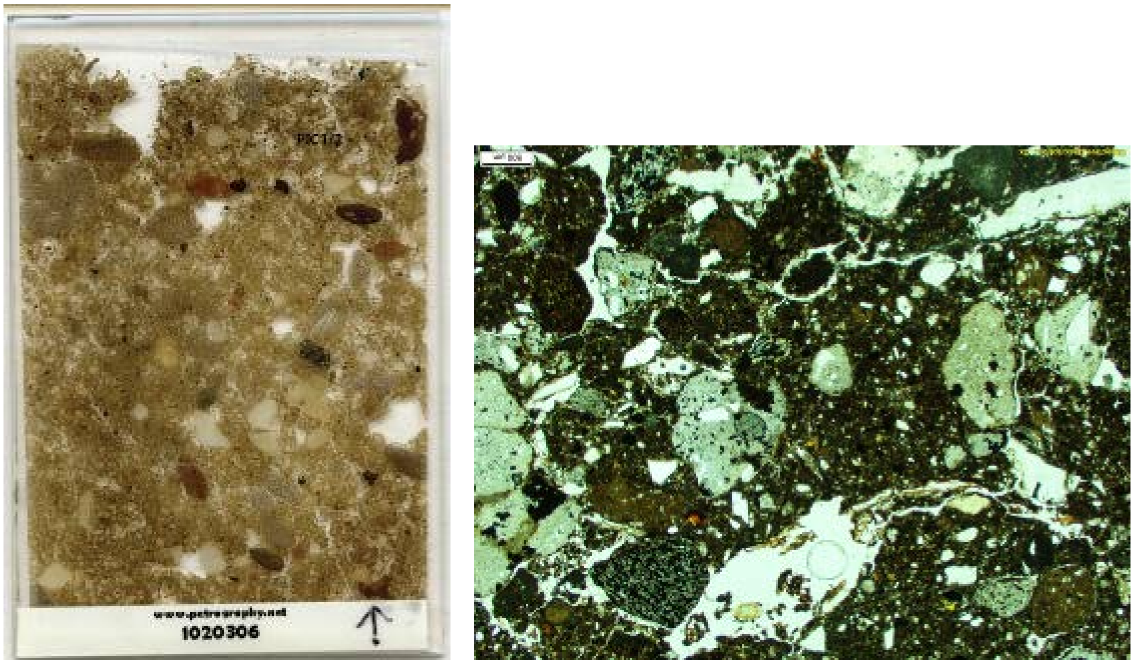


Figure 6.143: Flatbed scan of thin section from SMS Sample 1020306 and a close up showing compacted fabric and organic inclusions in the upper part of the slide. No distinct beds were identified in this slide. Scale bar is equal to 400µm.

SMITH-CARLTON CASA VIEJA GEOARCHAEOLOGICAL INVESTIGATIONS

Excavations

Excavations at the Smith-Carlton Casa Vieja were carried out in 2014 by invitation of the Carlton and Springer families, the current owners of the property. The single story adobe structure (called the "Casa Vieja" by the family) has been owned by the Carlton family since 1911. It sits on a property in the south part of town close to a modern structure known as the Big House by the family. The house is approached through a large yard, once an orchard, to the west of both houses (Figure 5.4). A line of evenly spaced trees in front of the structure is the remnants of a fence line, the posts of which are visible in some of the modern trees.

Four 1m x 1m excavation Units were excavated in 2014. Two Units (Units 1 and 2) were placed at either end of the northern addition to the structure which was once an open air chapel. Unit 1, in the rear yard, was heavily vegetated and also near a runoff pipe from the roof. Unit 2, in the front yard, was near the modern entryway to the residence. Two additional Units (3 and 4) were also excavated. Unit 3 was placed adjacent to the southwestern side of the structure in the front yard. A large root bisecting the Unit was encountered during excavation. Unit 4 was placed in the rear yard away from the Casa Vieja.

Units 1, 3, and 4 encountered little distinct stratigraphy during excavation and very few artifacts were recovered. Unit 1 was generally moister and more organic rich than the other three Units, with some observed variation in texture. Units 3 and 4 were generally compact, sandy silt with little organic matter. Excavations in Unit 2 encountered several distinct stratigraphic layers, but few artifacts. Overall, sediment at Casa Vieja is very compact, sandy silt with low levels of organic matter and variable carbonate development and evidence for water action. Mineral content is predominantly silicates such as quartz and feldspar, and fragments of volcanic tuff as seen throughout the Fort Davis samples (sometimes with iron staining).

Bulk Soil Analyses
Bulk soil samples from Casa Vieja include samples from each excavation context (less than 30 samples total) in Units 1 through 4 along with approximately twenty samples from a small surface sediment survey conducted in 2014. Samples from the sediment survey were taken from just below surface. In the case of charcoal and ash near surface (likely from the 2011 wild fire), the sample was taken from below the charcoal level. Complete data on bulk soil analyses in presented in Appendix II.

pH Analysis:
Twenty-seven bulk samples from excavation Contexts along with the twenty samples from surface sediment survey were analyzed for pH (Figure 6.143 and Table 6.13). The mean pH for samples from excavation contexts was 7.79 with a standard deviation of 0.54. No context had a pH value beyond two standard deviations from the mean. For the surface sediment survey the samples had a mean pH of 7.70 with a standard deviation of 0.22. No sample had a pH beyond two standard deviations from the mean.

Within each excavation Unit PH increases relative to depth with lower contexts having overall higher PH. This is likely related to precipitation of carbonate within the soil profile, causing lower contexts with higher amounts of carbonate to have higher PH. Using context number as a proxy for depth, a correlation coefficient of 0.56 was found between PH and context number. This is likely related to carbonate precipitation in the soil profile (Table 6.14).

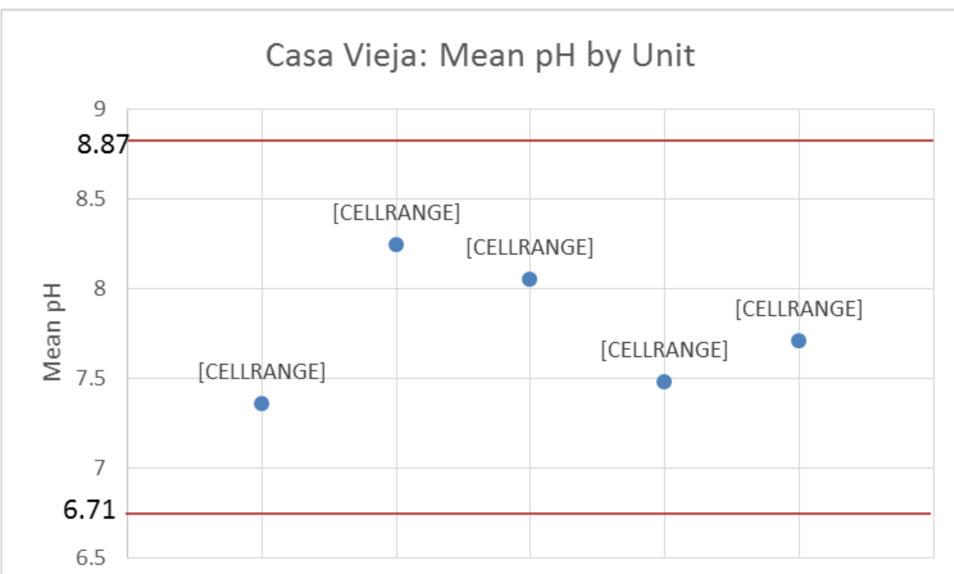


Figure 6.144: Scatterplot showing mean pH by Unit at the Smith-Carlton Casa Vieja. Red lines indicate the boundaries of a 2 standard deviation confidence interval.

Unit	Mean pH
CV1	7.35
CV2	8.24
CV3	8.04
CV4	7.47
Survey	7.70

Table 6.13: Mean pH by unit for Smith-Carlton Casa Vieja Investigations

Variables Compared	Correlation
Organic Matter vs. pH	-0.40
%clay vs. Organic Matter	-0.64
%clay vs. pH	0.260
%silt vs. Organic Matter	-0.15
%silt vs. pH	-0.09
%sand vs. Organic Matter	0.062
%sand vs. pH	0.22
pH vs. Context	0.55
Organic Matter vs. Context	-0.28

Table 6.14: Correlation Coefficients for Bulk Soil Analysis Variables at the Smith Carlton Casa Vieja.

Organic Matter Analysis:

Overall, samples from excavations at Casa Vieja exhibit a low percentage of organic matter with a mean of 4.23% and a standard deviation of 3.83% (Figure 6.144 and Table 6.15). Three contexts from excavation have percentages of organic matter higher than two standard deviations from the mean. Contexts 2 and 4 from Unit 1 have 12.40% and 17.07% organic matter, respectively. These contexts are from the upper levels of Unit 1, which is highly organic and located beneath a drain pipe from the structure roof. Additionally, excavation recovered remains of plant pots, which could also explain the high amount of organic matter in the contexts. Context 3 from Unit 4 also had a high percentage of organic matter (12.72%). This unit was placed in the rear yard and the context is from around 10cm below surface. This sample may be indicating accumulation of organic matter due to pedogenesis.

Samples from excavation show a slightly higher level of organic matter from the rear yard of the house (Unit 1 mean of 5.91% and Unit 4 mean of 6.91%) compared to those placed against the front of the house (Unit 2 mean of 2.78% and Unit 3 mean of 2.31%). There are several contributing factors to explain this pattern. The front of the house is a higher traffic area than the rear yard, limiting plant growth. Additionally, the two units in the front of the house are placed directly against the structure and near entryways that would also be high traffic. In contrast, Unit 4 of the rear yard is placed at a distance from the structure in the low traffic rear yard area. Unit 1, although it is against the structure foundation in the rear yard, contained several plant pots during excavation, and is located directly under a runoff pipe from the roof, increasing water flow to that location.

In all four units, there are slightly higher amounts of organic matter in the upper contexts, with lower percentages in lower contexts. In Units 1 and 4, which have slightly higher percentages of organic matter overall, there is an increase to around 10% organic matter in contexts just below surface and up to around 10cm below surface. This is consistent with weak soil horizonation. Additionally, there is a weak negative correlation (-0.39) between pH and the amount of organic matter (Table 6.14). This indicates that increasing amounts of organic matter correlate moderately with decreasing pH. Inspection of the scatterplot supports this result as there are no extreme outliers in the dataset.

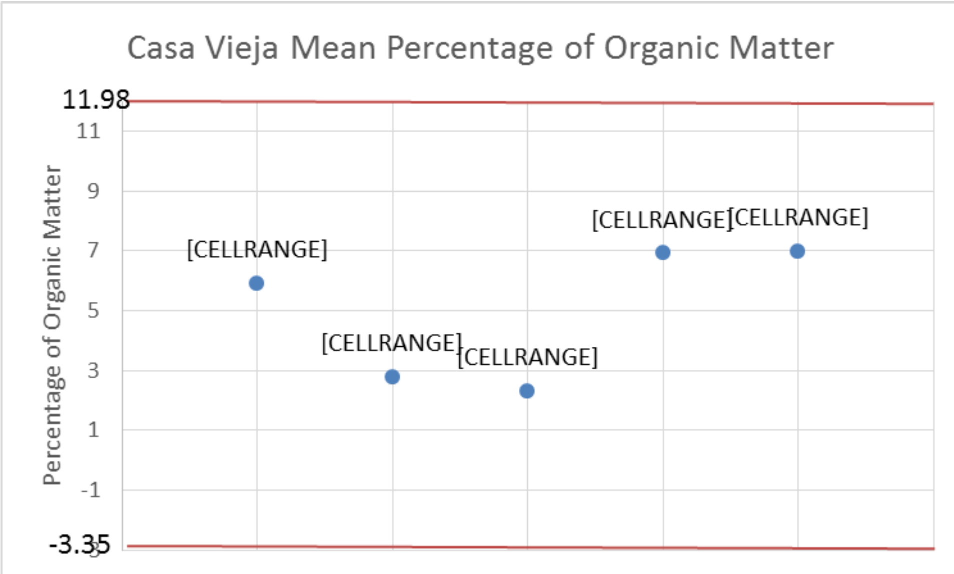


Figure 6.145: Scatterplot showing mean Percentage of Organic Matter for units from the Smith Carlton Casa Vieja. Red lines indicate boundaries of a 2 standard deviation confidence interval.

Unit	Percentage of Organic Matter
CV1	5.91
CV2	2.77
CV3	2.30
CV4	6.91
Survey	6.97

Table 6.15: Mean Percentages of Organic Matter for each unit from the Smith Carlton Casa Vieja

Particle Size Analysis:

Particle size analysis was conducted on 26 samples from excavation contexts in the four excavation units (Table 6.16). Overall sandy silt is the predominant texture, but Units 1 and 2 have much higher amounts of clay than Units 3 and 4. Particle size analysis results have a substantial margin of error. This is due to errors from combining two methods of analysis for sand (measured by shaker) and silt and clay (measured by hydrometer). Additionally, it is likely that not all clay was measured due to substantial carbonate in the soil.

site	Unit	Context/level	ID	Clay%	Silt%	Sand%
CV	1	1	1020368	16.98	33.88	56.29
CV	1	2	1020361	11.53	17.68	68.93
CV	1	3	1020360	15.97	27.58	70.31
CV	1	4	1020345	3.03	12.06	58.12
CV	1	5	1020343	14.72	16.60	50.77
CV	1	6	1020505	14.54	18.38	47.93
CV	1	7	1020548	16.88	22.09	44.86
CV	1	9a	1020579	15.04	19.75	42.47
CV	1	9b	1020589	16.74	23.23	42.01

CV	1	10	1020585	13.52	30.46	62.66
CV	1	11	1020598	5.47	13.51	55.24
CV	2	1	1020372	15.97	22.15	43.21
CV	2	2	1020331	21.71	30.20	57.69
CV	2	4	1020487	14.62	39.51	51.04
CV	2	5	0020494	19.26	27.73	58.33
CV	2	6	1020512	15.32	21.28	56.99
CV	2	7	1020582	17.81	23.20	53.16
CV	2	7b	1020597	15.78	21.43	56.79
CV	2	8	1020603	16.01	20.91	48.69
CV	3	1	1020370	15.22	36.11	59.41
CV	3	3	1020485	15.45	35.58	57.61
CV	3	3B	1020502	14.93	36.11	54.65
CV	3	4	1020340	14.48	32.68	61.93
CV	3	5	1020491	14.91	34.24	62.54
CV	3	6	1020508	14.52	35.08	61.16
CV	4	1	1020427	16.28	52.70	31.28
CV	4	2	20424	15.66	51.89	35.59
CV	4	3	1020501	15.39	40.48	42.71
CV	4	4		17.25	52.42	33.74
CV	4	4A	1020593	14.96	38.00	52.59

Table 6.16: Percentages of clay, silt, and sand for analyzed contexts from the Smith-Carlton Casa Vieja.

Contexts from Unit 1 have on average 55% sand, 21% silt and 13% clay (Figures 6.145 and 6.146). During excavation it was proposed that this unit included a clay floor around Context 7. However, continued excavation revealed a modern sewage pipe indicating that the Unit likely contains primarily modern fill. Particle size analysis shows that all contexts had less than 20% clay, although Contexts 6, 7, 9A and 9B had overall higher clay and silt contents than other contexts. Below this, the proportion of clay decreases. The distinction is not sufficient to be indicative of a clay floor without other lines of evidence to support that assertion.

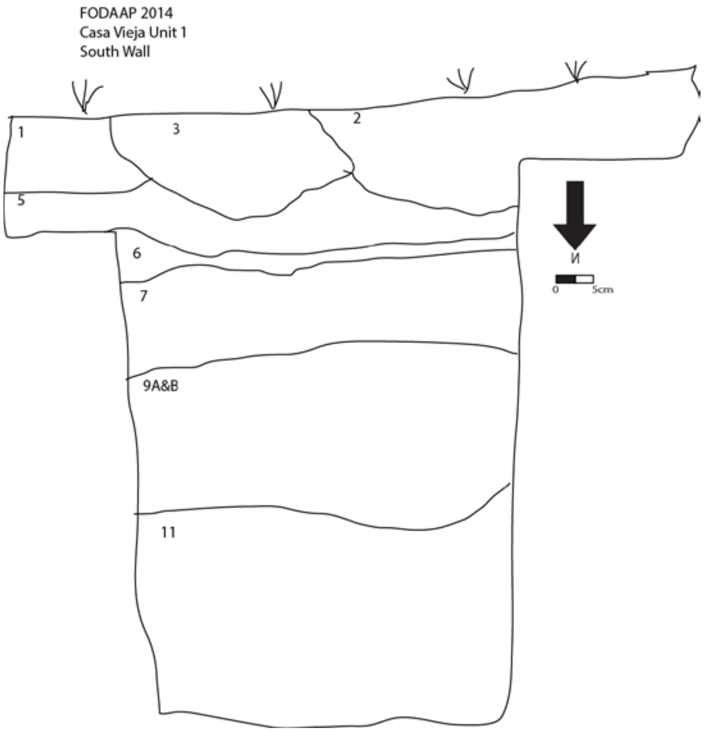


Figure 6.146: Stratigraphic Drawing of the southern profile of Unit 1, located in the rear of the Casa Vieja.

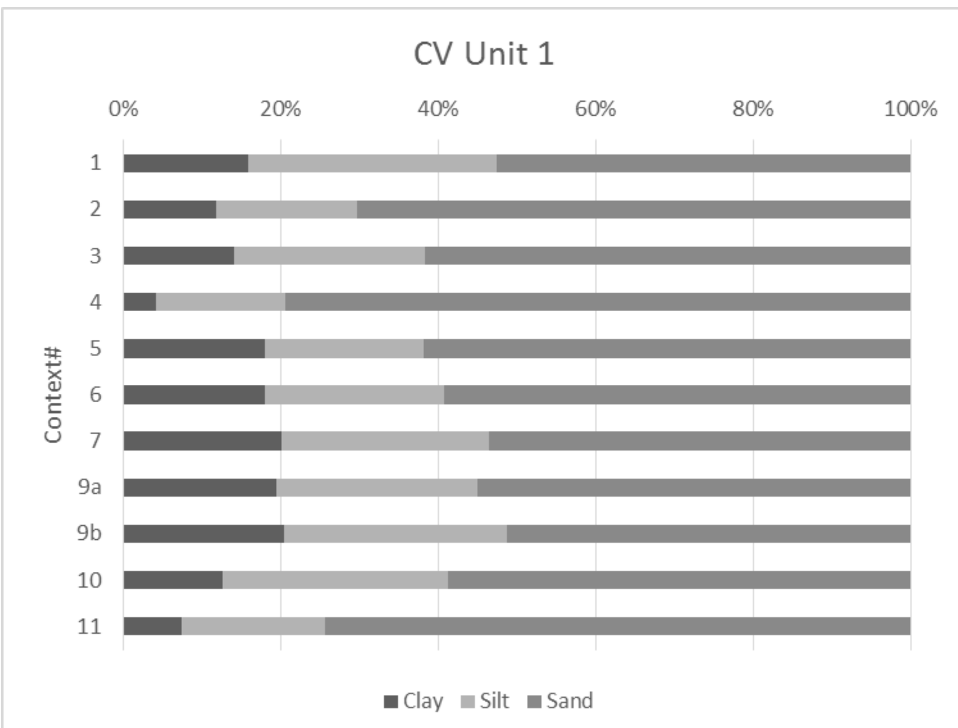


Figure 6.147: Bar Chart showing relative percentages of clay, silt, and sand for Casa Vieja Unit 1.

Unit 2 has on average 53% sand, 26% silt, and 17% clay. The amount of fine particles is similar throughout the unit profile with a slight increase in fine particles (clay and silt) in Context 4. As this Unit extended only 30cm in depth it would not include the entire soil profile, but only the zone of translocation of clay and upper horizons (Figures 6.147 and 6.148).

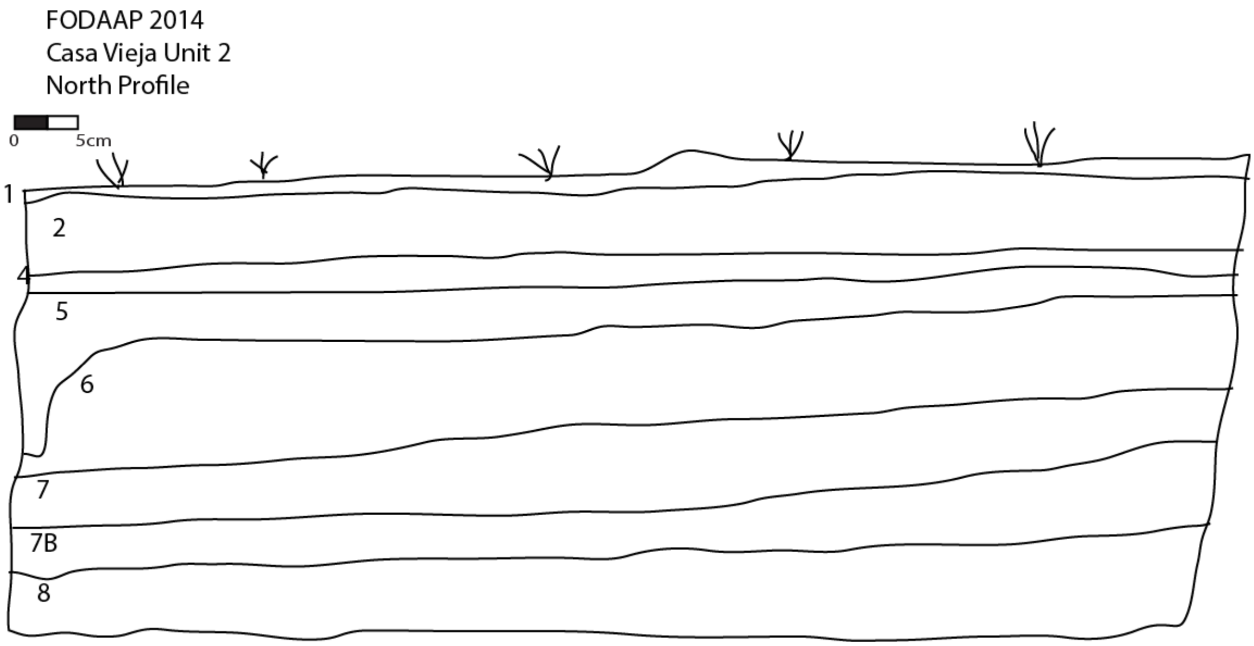


Figure 6.148: Stratigraphic drawing showing the northern profile of Casa Vieja Unit 2

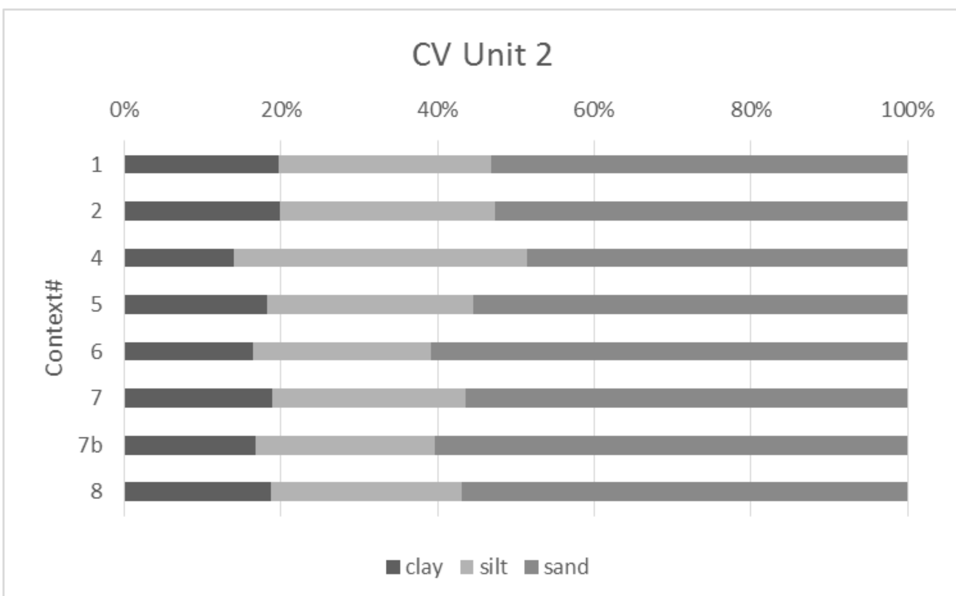


Figure 6.149: Bar Chart showing relative percentages of clay, silt and sand for Casa Vieja Unit 2.

Unit 3 has on average 60% sand, 35% silt, and 15% clay. The profile is broadly uniform with slightly higher proportions of fine particles in the highest contexts (Contexts 1 and 3). In contrast Unit 4 has an average of 39% sand, 47% silt, and 16% sand (Figure 6.149 and 6.150).

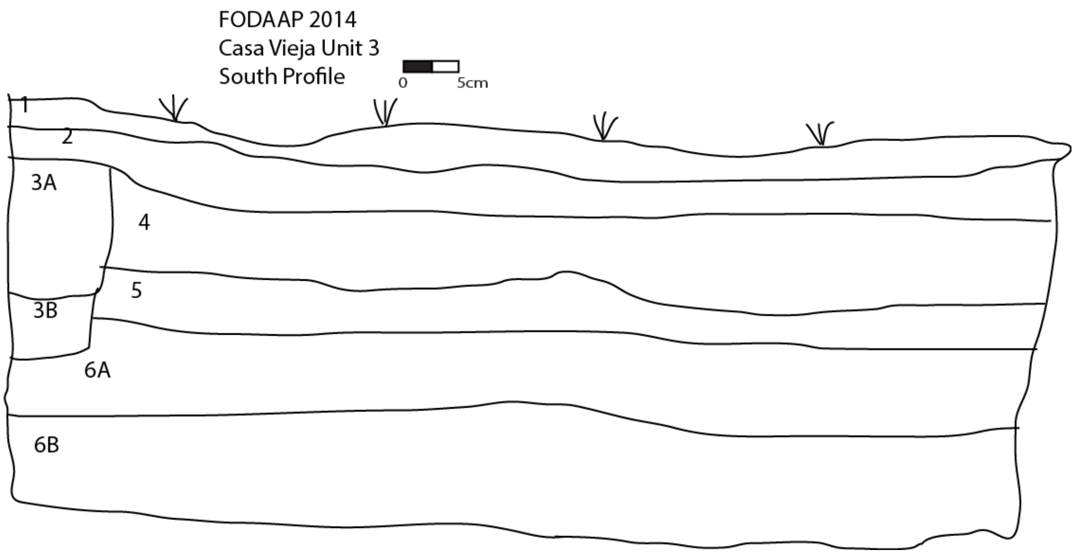


Figure 6.150: Stratigraphic drawing of the southern profile of Casa Vieja Unit 3.

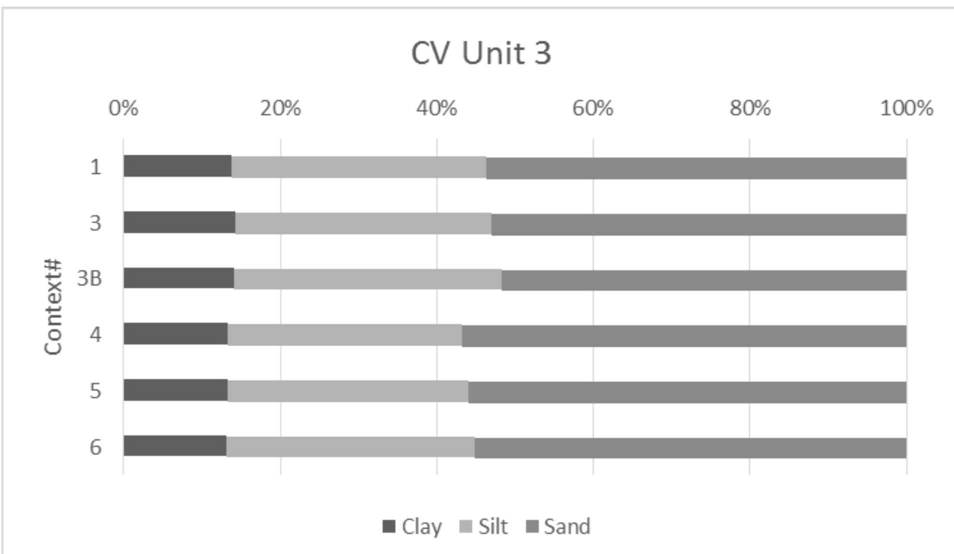


Figure 6.151: Bar Chart showing relative percentages of clay, silt, and sand for Casa Vieja Unit 3.

Comparatively, Unit 4 has a substantially higher percentage of silt and lower percentage of sand than the other Units. This is because this Unit is placed in the rear yard at some distance from the house. Higher amounts of vegetation in the yard compared to immediately adjacent to the structure would increase retention of finer particles, particularly silt, which would otherwise be subject to aeolian erosion (Figures 6.151 and 6.152).

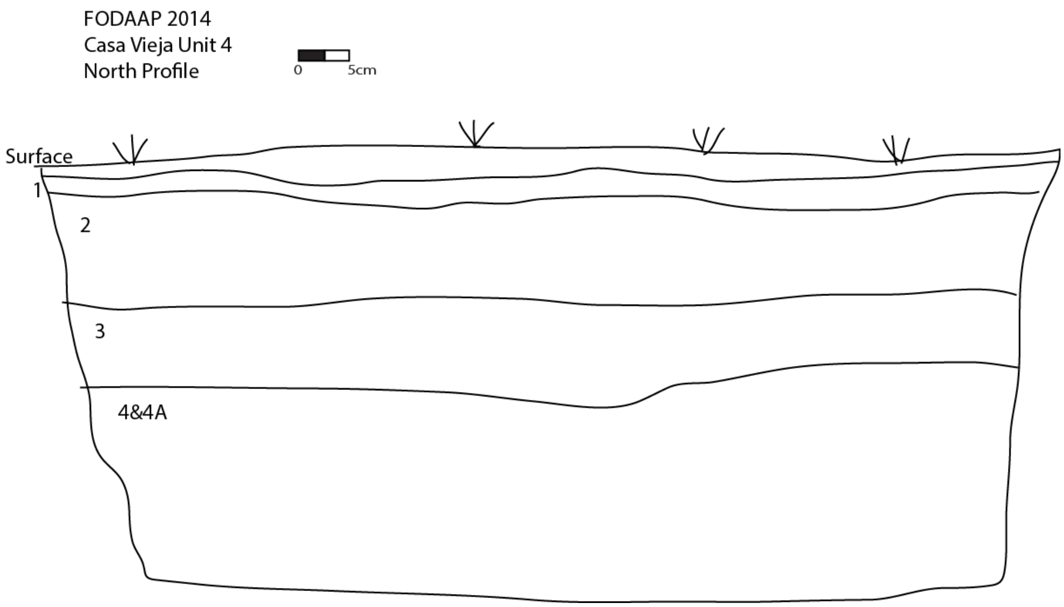


Figure 6.152: Stratigraphic drawing of the northern profile of Casa Vieja Unit 4.

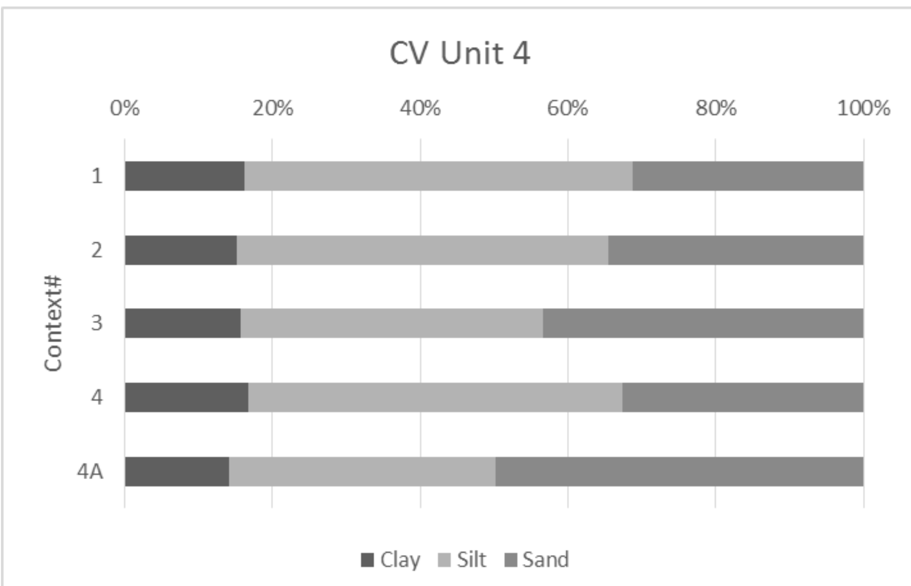


Figure 6.153: Bar Chart showing relative percentages of clay, silt, and sand for Casa Vieja Unit 4.

When calculating correlations between each percentages of each particle size and both pH and percentage of organic matter, only clay and percentage of organic matter had a significant correlation. The correlation coefficient between percentage of clay and percentage of organic matter was -0.64. However, upon inspection of the scatterplot it appears that several outliers are creating the strong coefficient. Without those outliers there is no significant correlation (Table 6.14).

Smith-Carlton Casa Vieja: Micromorphology Analysis

Northeast Addition/Chapel: Unit 1

Unit 1 was a 1m by 1m excavation Unit placed near the entrance to the rear yard from the modern house (Figure 6.153). This location would have been the open air chapel when the structure was initially built, but was later enclosed and used as a hay barn, and then later, a family home. During excavation a compact, fine-grained context, initially described as a surface, was encountered. However, a nearby drain pipe suggested that the Contexts were disturbed. Micromorphology samples aimed to confirm if a surface was present and whether remnants may have survived the addition of the pipe. Three samples (1020616, 1020621, and 1020622) were analyzed from the south profile of Unit 1 encompassing the surface context as well as underlying contexts (Figures 6.154 and 6.155)

Figure 6.154: Photograph showing the rear yard of the Smith-Carlton Casa Vieja with Unit 1 visible (facing west).

Figure 6.155: Photograph showing the south and east profiles of CV Unit 1 with micromorphology samples visible. A large ceramic pipe in the northern profile is visible in the foreground.

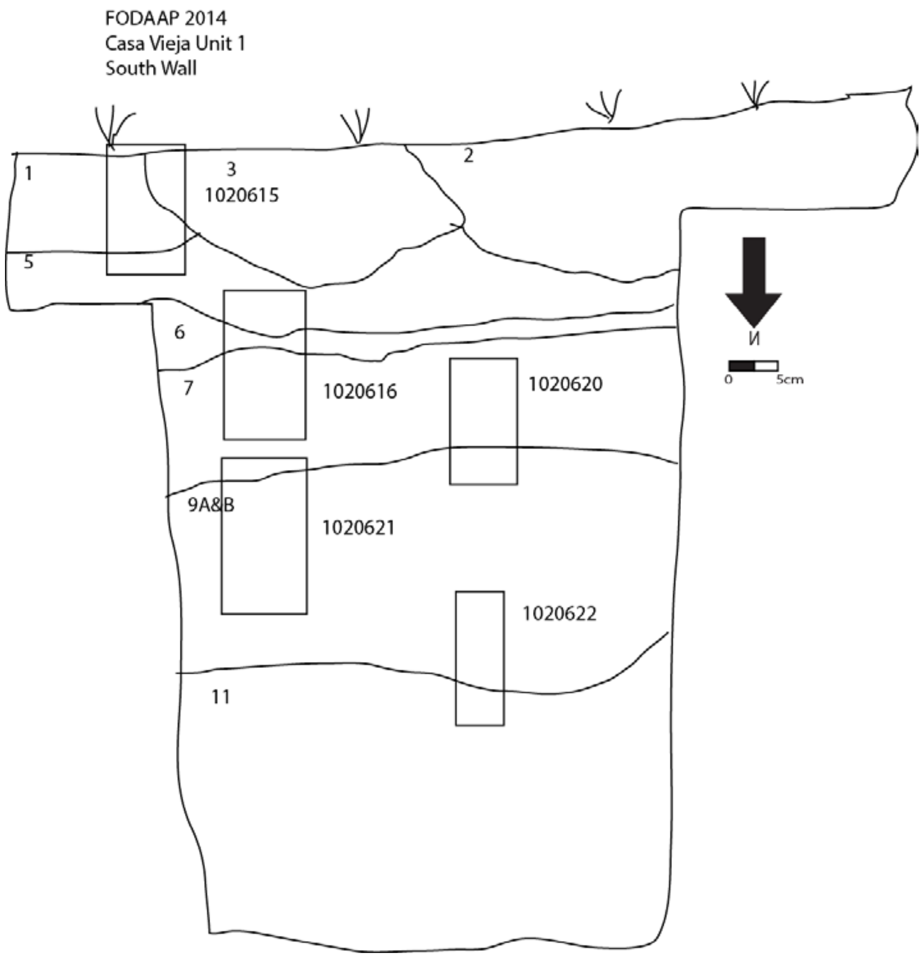


Figure 6.156: Stratigraphic drawing of the southern profile of Casa Vieja Unit 1 showing the locations of micromorphology samples.

Sample 1020616 was taken from Contexts 5, 6 and 7 and aimed to include the potential surface identified by excavators. No evidence for a surface or boundary was present in the slide (Figure 6.156). Additionally, although clay is present in the soil fabric, the groundmass is predominantly fine-grained silt and sand. Sample 1020616 showed a well-drained, compact, clayey/silty groundmass with visible plant material but little humic staining of the fabric. Inclusions of weathered bone and shell are present throughout. Some micritic carbonate, and mixed crystallization carbonate nodules are present in void spaces. Rare insect voids with organic hypocoatings were identified.

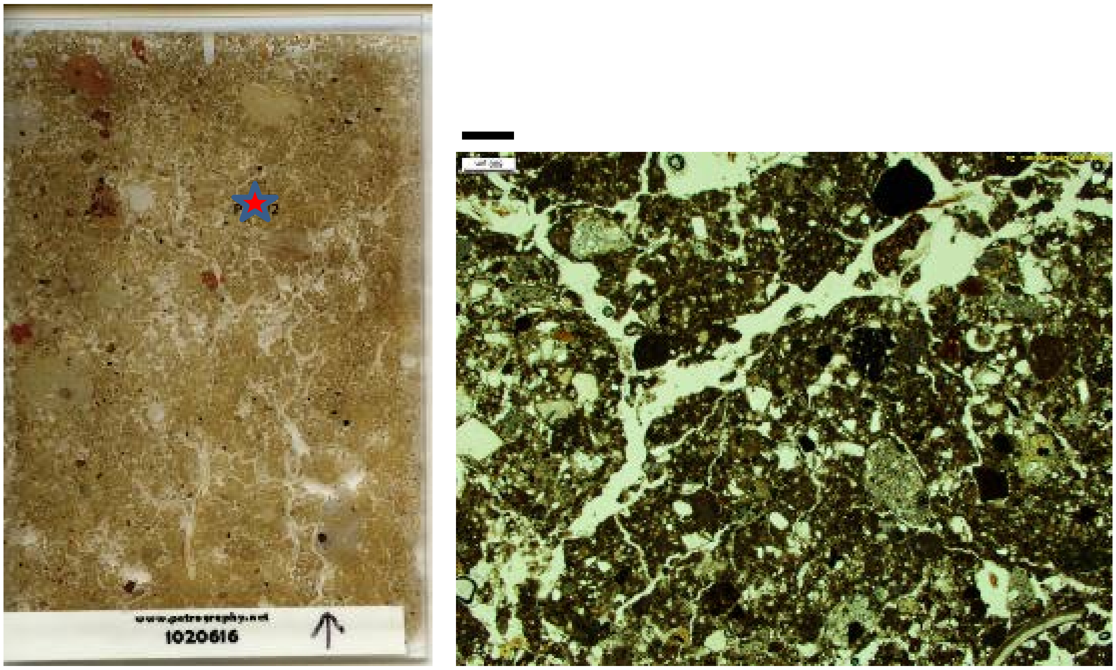


Figure 6.157: Flatbed scan of thin section slide from SMS Sample 1020616 (left) and a close up showing typical soil fabric. No distinct beds were identified in this slide. Scale bar is equal to 400µm.

Sample 1020621 was taken from the upper portions of Contexts 9A and 9B (Figure 6.157). The slide shows a compact, crumbly fabric similar to 1020616, but with some depletion of clay around channel voids which are likely associated with water action. There are no discrete depletion features associated with hypocoatings to indicate water saturation, so it is likely that the depletion is due to moving water along the voids rather than standing water. Micritic carbonate nodules are relatively rare, but carbonate-enriched groundmass patches occur in the lower portion of the slide.

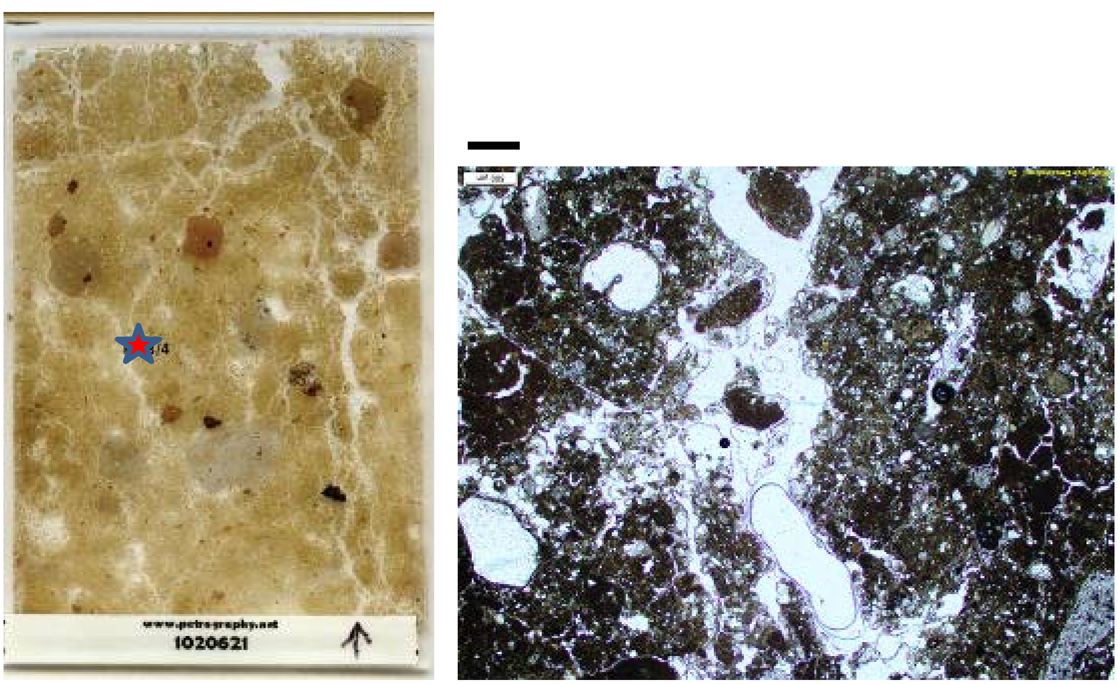


Figure 6.158: Flatbed scan of thin section slide from SMS Sample 1020621 (left) and a close up image showing depletion zone around a channel void (central to the close up image). No distinct beds were identified in this slide. Scale bar is equal to 400µm.

Sample 1020622 is taken from the lower portion of Contexts 9A and 9B (Figure 6.158). Overall, the fabric appears to be more clay depleted than the overlying slides and is similar in character to the depleted areas near channel voids in 1020621. There are a moderate number of discrete carbonate nodules present as well as locations where the groundmass appears to be substantially carbonate-enriched (Figure 6.159). However, there are no indications of water saturation.

Figure 6.159: Flatbed scan of thin section slide from SMS Sample 1020622. No beds were identified within this slide.

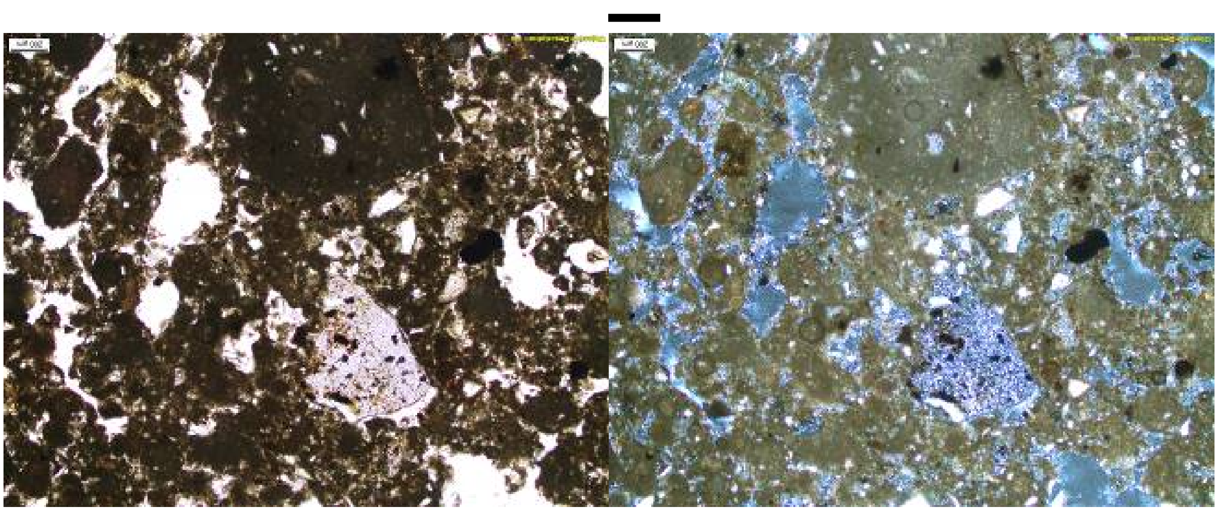


Figure 6.160: Close up image from SMS sample 1020622 (Figure 6.148) showing carbonate enriched groundmass as indicated by gray birefringence of microcrystalline calcite. Left image in PPL. Right image in XPL. Scale bar is equal to 400µm.

Southwest Sector of House: Unit 3

Unit 3 was placed against the southwestern side of the structure along the modern front of the house (Figure 6.160). This part of the structure was originally a residence (as opposed to the northeast addition that was once an open air chapel. Unit 3 contained very compact, sandy sediment with few artifacts. A large root bisected the Unit from north to south. Two samples were taken from the southern wall of the Unit (Figures 6.161 and 6.162).

Figure 6.161: Photograph of the front yard of the Smith-Carlton Casa Vieja with Unit 3 in the foreground at south end of the front side of the modern structure (Facing North).

Figure 6.162: Photograph showing the southern profile of Casa Vieja Unit 3 with micromorphology samples visible

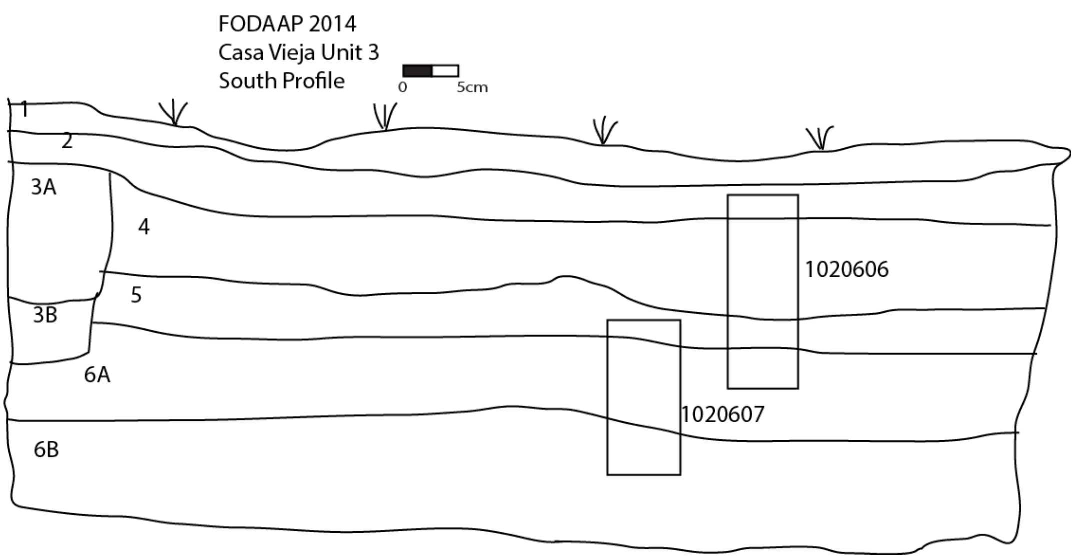


Figure 6.163: Stratigraphic drawing of the southern profile of CV Unit 2 with locations of micromorphology samples indicated.

Sample 1020606 was taken from the upper contexts of the Unit. The slide shows a compact, silty sand with small portions of clay (Figure 6.164). The fabric is well-sorted and shows some localized sorting of the coarse fraction, suggesting an aeolian origin of the sediment. A large channel void through the center of the slide is associated with depletion voids and clay hypocoatings, suggesting water saturation for short periods. Insect excrement in vughy voids is indicative of insect and plant activity.

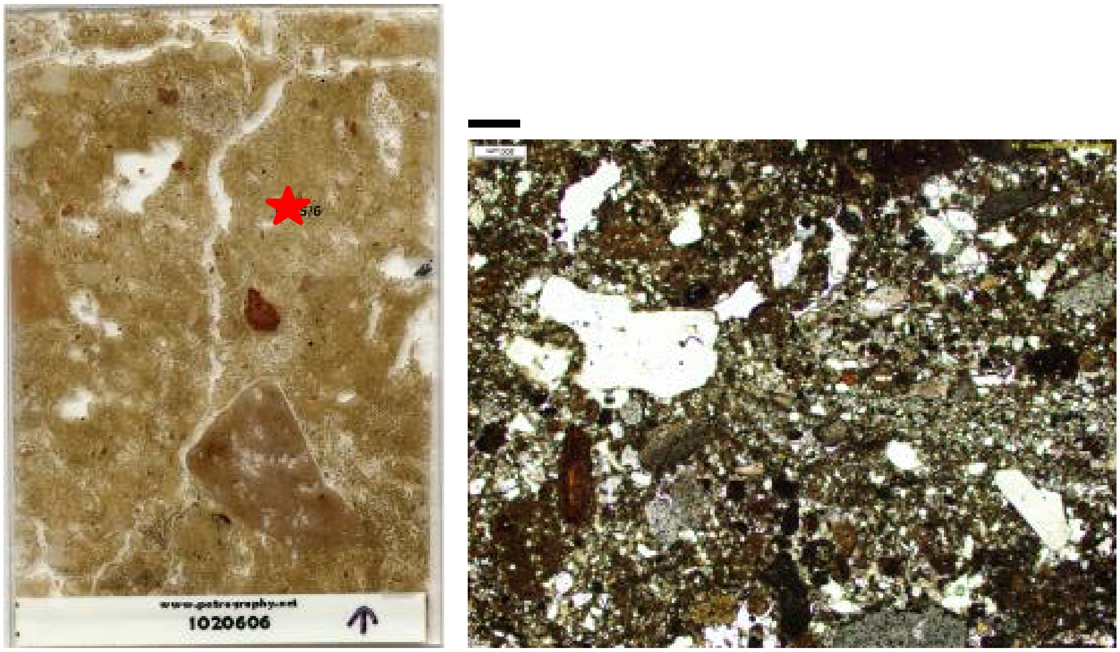


Figure 6.164: Flatbed scan of thin section slide from SMS Sample 1020606 (left) and a close up image showing localized orientation of the coarse fraction (central to the close up image). No distinct beds were identified within this sample. Scale bar is equal to 400µm

Sample 1020607 is taken from lower Contexts of Unit 3 than 1020606. The sample is potentially disturbed from collection or transportation but shows compact crumb-shaped aggregates with internal massive microstructure and planar voids (Figure 6.156). Clay hypocoatings are associated with interior voids, but the internal fabric of the peds is silty sand, potentially depleted (Figure 6.166). There is little carbonate development, but the pattern of clay hypocoatings and depletion features suggests water saturation.

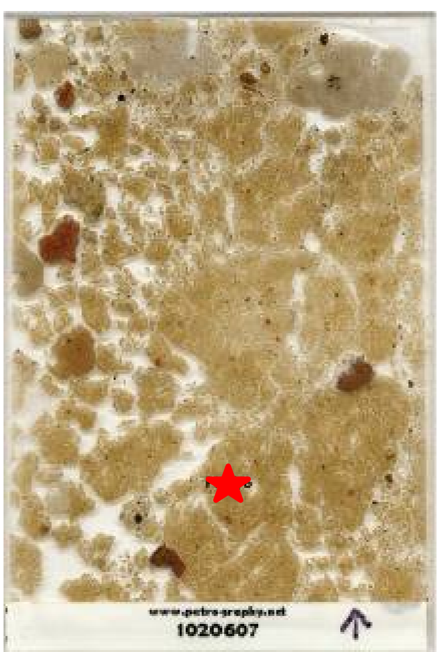


Figure 6.165: Flatbed scan of thin section from SMS Sample 1020607. No distinct beds were visible within this slide.

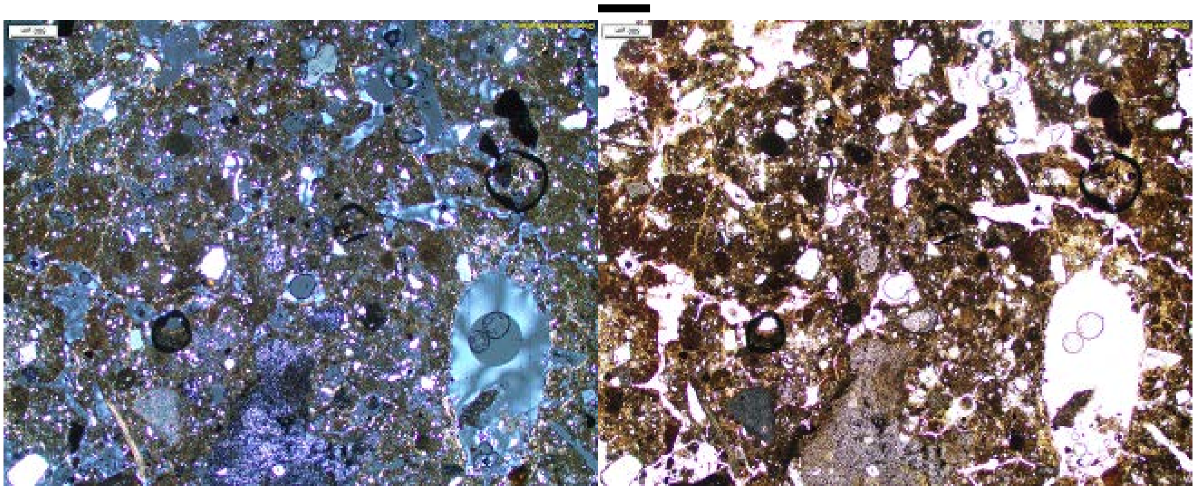


Figure 6.166: Close up images from SMS 1020607 (Figure 6.165) showing depleted fabric. Left image is in XPL. Right Images is in PPL. Scale bar is equal to 400µm.Figure 6.167

Main Entrance/Chapel: Unit 2

Unit 2 was placed just south of the modern main entrance to the Casa Vieja residence (Figure 6.167). When it was originally built this location would have been an open air chapel. It was later used as a barn before being enclosed in the renovations that included the northern addition to the house. Excavations in Unit 2 recovered very few artifacts, but micromorphological analysis showed a clear microstratigraphic sequence which reflects the occupation of the structure as related through oral history. Three micromorphology samples from the north profile were analyzed (Figure 6.168 and 6.169).

Figure 6.168: Photograph showing the front entrance to the Smith-Carlton Casa Vieja. Unit 2 is visible next to the Texas State Historic Marker. Photograph was taken facing east.

Figure 6.169: Photograph showing the northern profile of CV Unit 2 with micromorphology samples indicated.

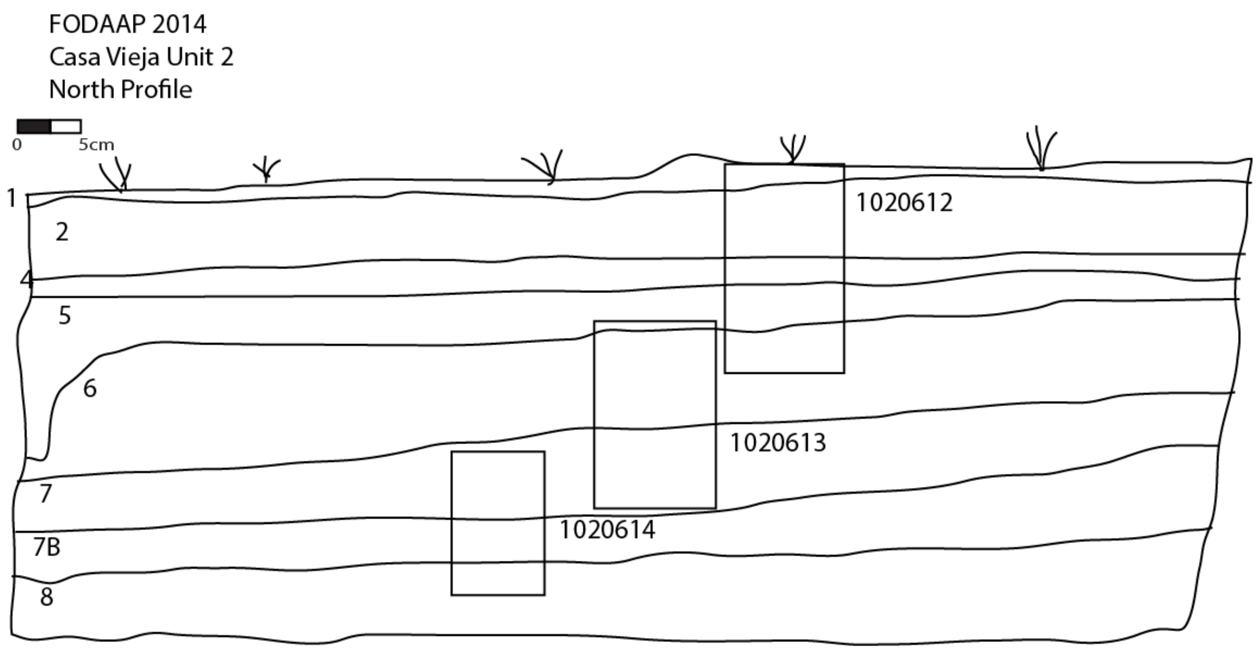


Figure 6.170: Stratigraphic drawing showing the northern profile of CV Unit 2 with locations of micromorphology samples indicated.

Sample 1020612 was taken from the uppermost contexts in Unit 1 (Contexts 2, 4, and 5). The sample shows 4 beds, the first two relate to Context 2 from excavation along with a charcoal lens uncovered within Bed 2 (Figure 6.170). Bed 3 is likely Context 4 and bed 4 is Context 5. The two uppermost beds are overall similar, with a brownish tan fabric, blocky microstructure, and moderate horizontal orientation of the fabric which is more pronounced in the top of Bed 1. While some charcoal remains are found in Bed 1, they dominate Bed 2 . However, no ash or evidence for *in situ* burning was identified in either bed. Carbonate development is also minimal. It is likely that the charcoal lens (Bed 2) is from the wildfire in 2011 which swept through Fort Davis and burned many nearby trees on the Casa Vieja property.

Bed 3 in sample 1020612 has an overall massive, compacted microstructure with only very weak horizontal orientation of the fabric and moderate carbonate development. This bed is interpreted as compacted aeolian sediment accumulating during seasonal disuse of the structure. The final bed, bed 4, is only minimally present in the slide and therefore difficult to characterize. However, it has a clear, sharp boundary with bed 3 including a boundary void with loose sediment and plant matter (Figure 6.171). It may be that bed 4 relates to a trampled surface associated with prolonged occupation of the residence, but there is an insufficient amount of the bed visible to firmly characterize it.

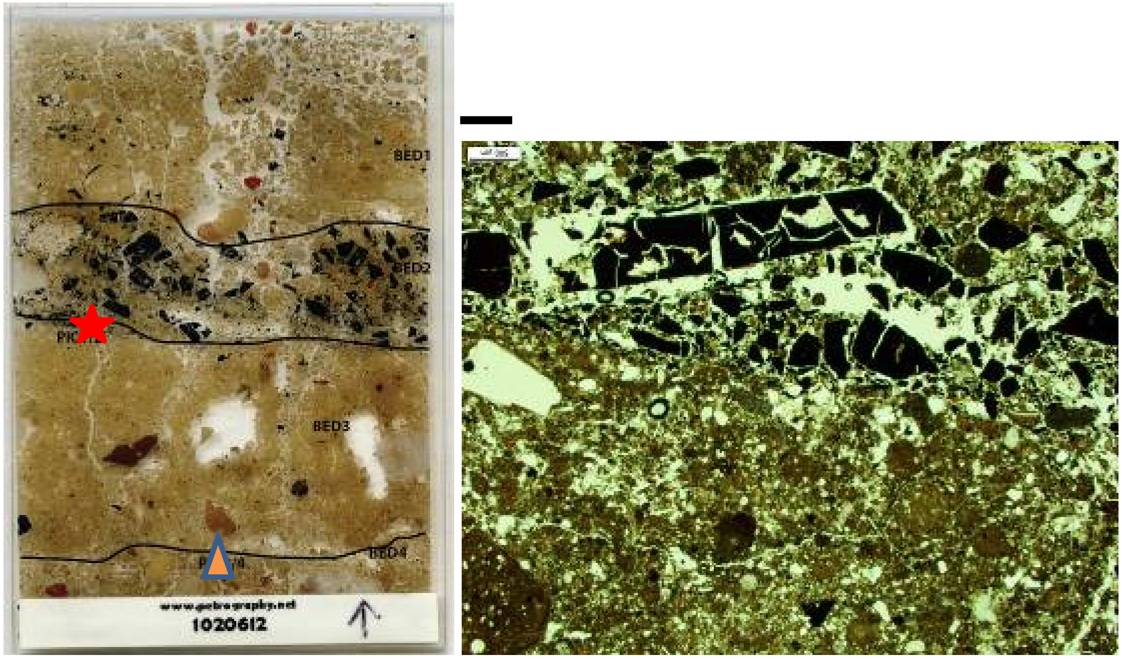


Figure 6.171: Flatbed scan of thin section from SMS Sample 1020612 and a close up showing the boundary between Bed 2 and Bed 3. Four distinct beds were identified in this slide. From top to bottom they are labeled as Bed 1, Bed 2, Bed 3, and Bed 4. Scale bar is equal to 400µm

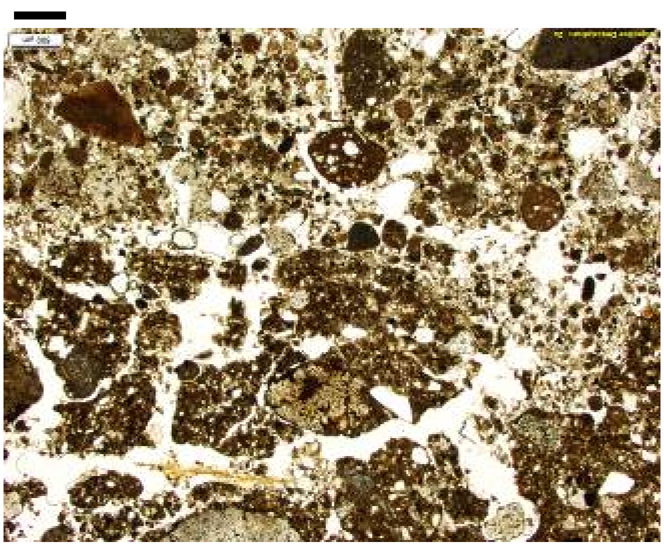


Figure 6.172: Close up (green triangle location) from SMS 1020612 (Figure 6.170) showing the boundary between Bed 3 in the upper part of the image and Bed 4 in the lower part of the image.

Sample 1020613 was taken from middle Contexts (6 and 7) in Unit 2. No bedding is visible in the sample, but the sandy/silty fabric has pronounced horizontal laminations throughout and a massive microstructure (Figure 6.172). Plant material is rare throughout and no charcoal, insect excrement, shell, or other inclusions were identified. Carbonate development is concentrated in the lower part of the slides, which has a more crumbly structure. This slide is interpreted as the result of sweeping and trampling during prolonged occupation of the structure. Sweeping would remove finer particles, leaving the silty sand which is observed in the slide, as well as keep the Context free of anthropogenic debris and plant material. Trampling would account for the layered horizontal laminations seen throughout the slide, which are more compacted than would be expected with only aeolian accumulation.

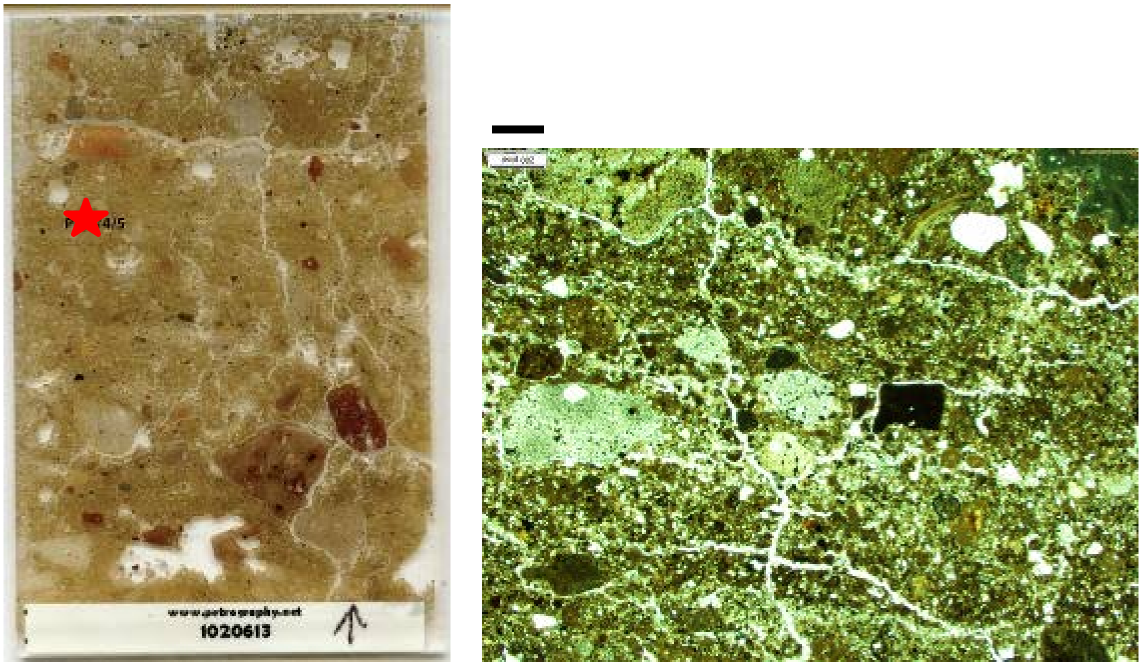


Figure 6.173: Flatbed scan of thin section from SMS 1020613 (left) and a close up showing horizontal laminations in the sedimentary fabric. No distinct beds were identified within this slide. Scale bar is equal to 400µm.

The final sample, 1020614, was taken from Contexts 7B and 8 in Unit 2. Bed 1 (likely corresponding to Context 7B) shows a high degree of cementation from carbonate development, particularly in the upper portion of the bed (Figure 6.173). The carbonate has altered the sediment fabric sufficiently to make it difficult to discern a depositional origin of the bed. In portions of the bed (particularly the lower section) the fabric is unconsolidated and unoriented, suggesting that this bed relates to the disuse of the structure. Bed 2, however, is likely a trampled surface relating to an earlier occupation of the structure, possibly the chapel. There is a clear boundary between Beds 1 and 2 including a boundary void with loose sand grains, plant matter, and insect excrement. The surface of Bed 2 shows weak horizontal orientation and is darker in color than the overlying beds, suggesting inclusion of organic matter in the sediment fabric. Bed 2 itself has a compacted, massive microstructure, little carbonate development, two fragments of plaster (Figure 6.174) and some inclusions of charcoal. Based on the overlying bed which may relate to a period of disuse (such as when the main portion of the structure was used as hay barn), Bed 2 is interpreted as the remnants of the chapel floor, likely a trampled dirt surface.

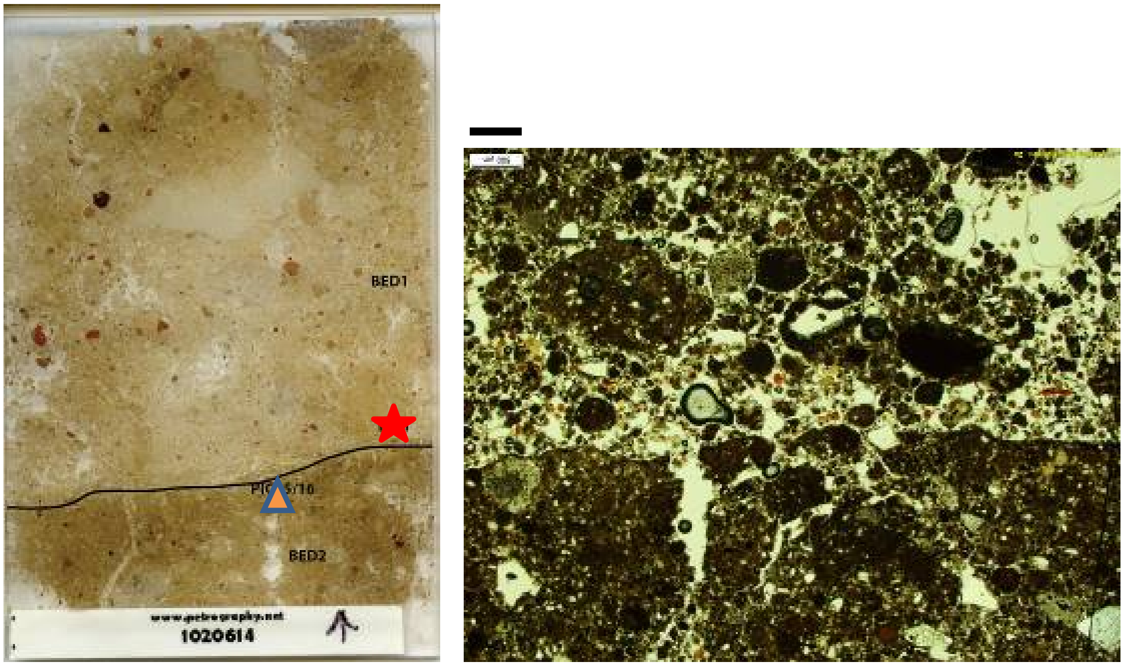


Figure 6.174: Flatbed scan of thin section from SMS 1020614 (left) and a close up showing the boundary between Bed 1 (upper) and Bed 2 (lower, propose occupational surface). Scale bar is equal to 400μm.

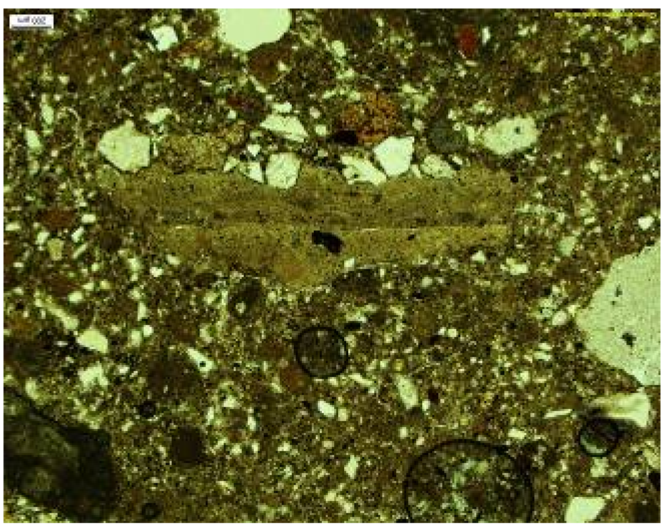


Figure 6.175: Close up image from SMS 1020614 (green triangle location in 6.173) showing a fragment of lime plaster in Bed 2.

CHAPTER 7 SUMMARY OF RESULTS

The results presented below summarize bulk soil analyses (pH analysis, organic matter analysis, and particle size analysis), along with micromorphological observations and interpretations from the four sites at Fort Davis: the Laundresses' Quarters, the Enlisted Married Men's Quarters, the Francell-Byerley Property, and the Smith-Carlton Casa Vieja.

The first section summarizes sequences of events for the unit profiles analyzed in Chapter 6. As not all units were analyzed as part of this analysis, only those pertinent to this dissertation are discussed. The following section summarizes the results of bulk analyses (pH analysis, organic matter analysis, and particle size analysis) for each of the four sites. The final section summarizes micromorphological data for each of the four sites. A full description of the results of each analysis along with a summary of which samples were selected for analysis can be found in Chapter 6, Appendix II (Bulk Analyses), and Appendix III (Micromorphology). Full excavation data for each site is presented in FODAAP site reports which are available upon request.

SUMMARY OF ANALYZED UNIT PROFILES

The following section describes analyzed unit profiles for each of the four sites by combining the results of excavation, bulk, and micromorphological analyses. It should be noted that many of the contexts drawn in stratigraphic profiles by excavators were arbitrary 10cm levels due to minimal variation in sedimentary characteristics. Because of this, the majority of excavation contexts do not indicate separate depositional events of geological or archaeological origin. Full details of the 424 contexts excavated can be found in FODAAP site reports on request to the National Parks Service. Furthermore, changes in environmental conditions (such as frequent afternoon thunderstorms) would regularly alter sediment characteristics in archaeological profiles by introducing additional water, leading some excavators to define new contexts based on perceived texture changes.

Laundresses' Quarters: Units 31, 32, and 19 (HB 211)

Excavation units 31 (1m by 50cm), 32 (50cm by 1m), and 19 (1m by 1m) were placed adjacent to each other overlying the eastern foundation of HB 211 without baulks to separate the units (Figure 6.13). The three units show both an interior and exterior profile of HB 211 and are discussed together (Figure 7.1).

The lowest contexts of each unit are composed of natural sediment, generally compact sand with pebbly inclusions. The units bisect a stone foundation. The presence of a builder's trench was disputed by excavators, but consensus by project directors was that no builder's trench was present as there was no evidence of change in the sediment. Micromorphology evidence from the interior of the structure shows a trampled dirt occupational surface, protected by rugs or other coverings. Micromorphology from near the foundation suggests accumulation of sweepings and small anthropogenic debris, but otherwise the occupational surface is generally clear of debris. The exterior of the structure, seen in Unit 31, contained a wooden floor. Excavation in this area revealed upright nails. Micromorphology analysis showed an organic-rich sediment without the traces of plant growth which are typical of other exterior space, suggesting the presence of decaying wooden boards. Eventually the structure collapsed, but debris from the collapse is not presence in this location, so it was likely cleared and deposited elsewhere, most likely in the debris feature in Units 16 and 23.

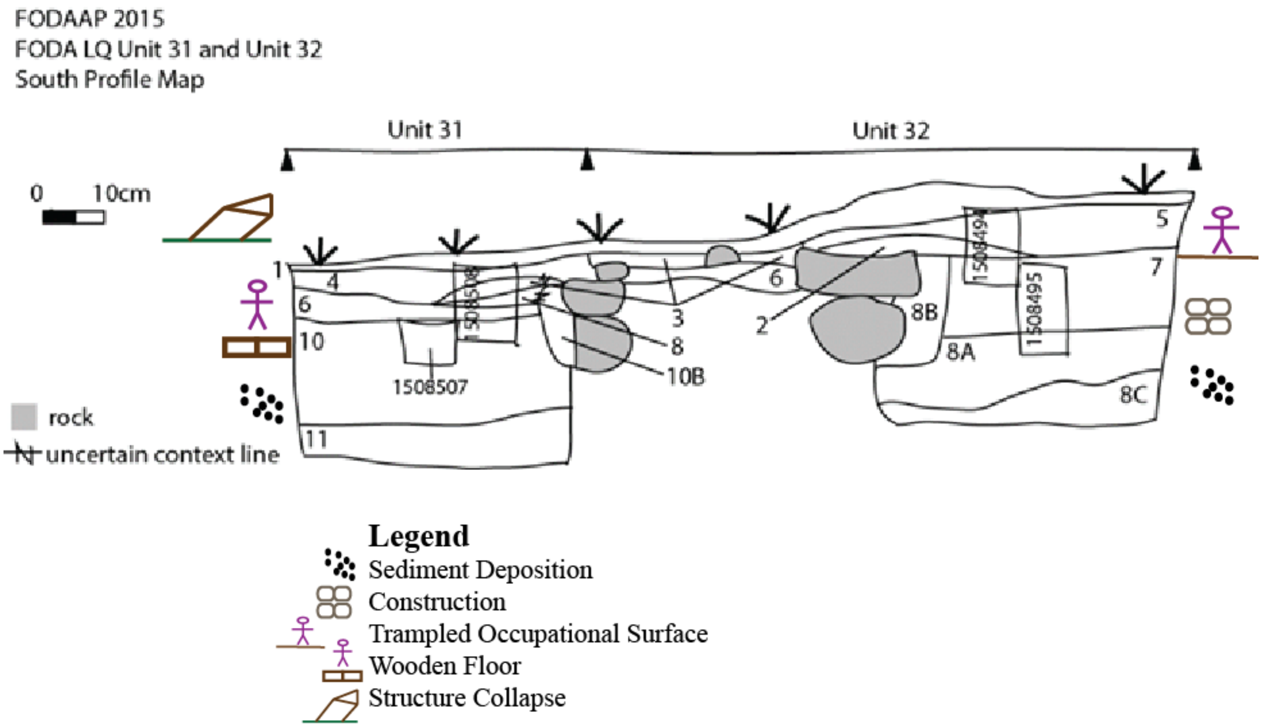


Figure 7.1: Illustrated stratigraphic drawing of the southern profiles of Units 31 and 32 which bisect the eastern foundation of HB 211.

Laundresses' Quarters: Units 16, 23, 52, and 17 (HB 211)

Similarly to Units 31, 32, and 19, Excavation units 16, 17, 23 and 52 were placed closely together in the southeastern corner of the HB 211 foundations (Figure 6.23). Unit 52 (50cm by 1m) included the southeastern corner of the structure along with exterior space. Unit 16 (1m by 1m) was placed inside the corner while Unit 23 (1m by 1m) was placed along the southern foundation. Unit 17 (1m by 1m) was placed outside the foundation. For the purposes of this discussion the profile from Unit 16 is used to discuss the excavation group as that profile was most clearly excavated and is central to the group of units (Figure 7.2).

The lowest contexts of each unit are composed of compact sand with pebbly inclusions which is typical of natural sediment at the Laundresses' Quarters. The units include the southeastern corner of the stone foundation of HB 211. Similarly to Units 31, 32 and 19, there is no evidence of a builder's trench associated with the foundation. Unlike Units 19, 31, and 32 there is no evidence of an occupational surface or other floor within these four units. This absence may be due to disturbance associated with the collapse and razing of the structure. After the collapse of the structure it appears that a large quantity of construction material was gathered together, burnt, and deposited in a large debris feature within Units 16 and 23. This feature (Context 3 in Unit 16 and Context 5 in Unit 23) contains a dense quantity of burnt anthropogenic material, but lacks internal organization or evidence for separate dumping events.

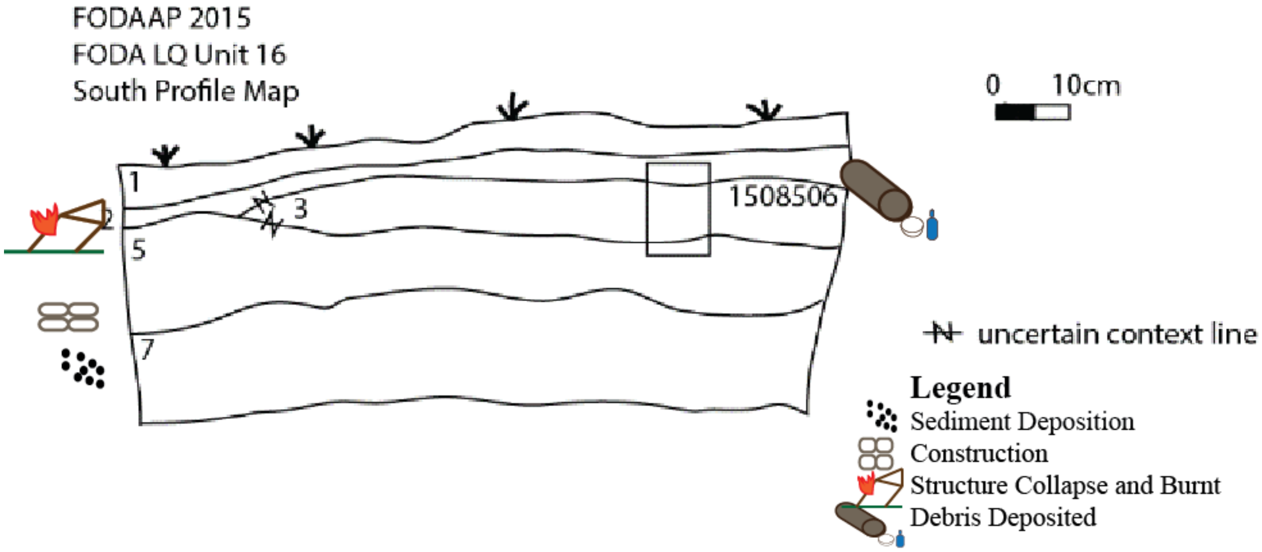


Figure 7.2: Illustrated stratigraphic drawing of the southern profile of Unit 16, placed in the interior of the southeastern corner of the HB 211 foundation.

Laundresses' Quarters: Units 59 and 10 (HB 212)

Unit 59, a 50cm by 50cm unit, was placed on the eastern side of the modern NPS service road and recovered the eastern foundation of HB 212 along with evidence of a wooden floor and adobe subfloor (Figure 6.40). Unit 10 (also 50cm by 50cm), was placed to the south of Unit 59, recovered additional evidence of the interior of HB 212 but was overall less well preserved than the portion of the foundation in Unit 59. For this discussion, the western profile of Unit 59 will be discussed as this was where a micromorphology sample was taken (Figure 7.3).

The lowest contexts are similar to other contexts across the Laundresses' Quarters: composed of compact sand with pebbly inclusions. The stone foundation recovered in Unit 59 indicates construction of the structure. Fragments of plaster and blue paint recovered during excavation suggest that the walls were plastered and painted. Context 7 in Unit 59 was interpreted by excavators as a coarse adobe subfloor. It was extremely compact and micromorphological analysis showed it to be internally homogeneous, unlike most natural sediments at the site. Above that was a loose, organicy context with fragments of wood and nails, interpreted as the remains of a wooden floor. Micromorphological analysis of this context showed an organic rich matrix similar in appearance to that in Unit 31 (the exterior wooden floor of HB 211), but with less organic material overall. This is consistent with an interior floor, which would have less decomposition than an exterior floor as seen in Unit 31. Eventually the structure collapsed, but little debris from the structure is present in Units 10 or 59, similar to Units 31, 32, and 19. The modern service road was subsequently built atop the collapsed structure.

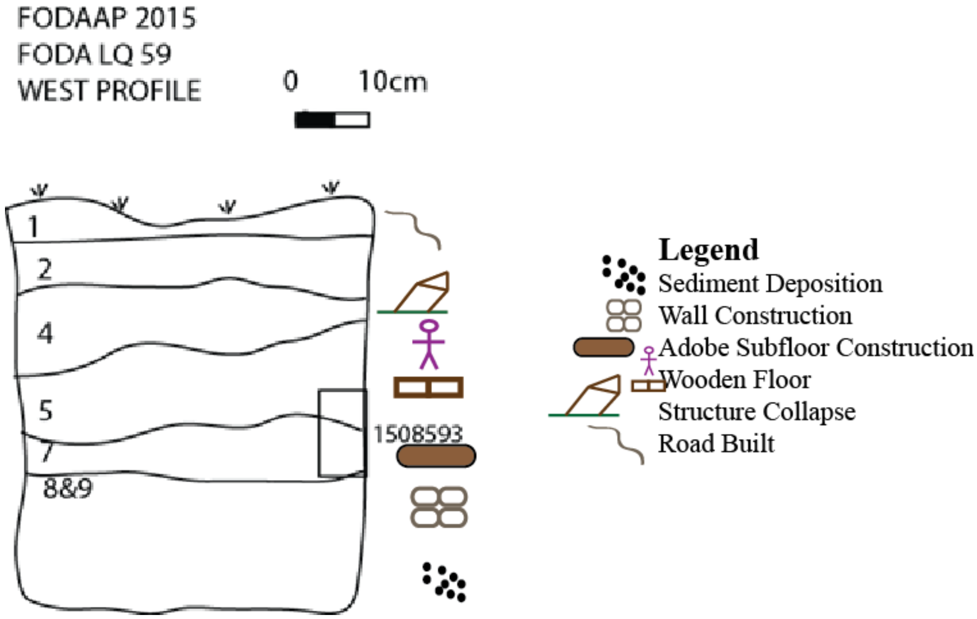


Figure 7.3: Illustrated stratigraphic drawing of the western profile of Unit 59, showing the interior profile of HB 212.

Laundresses' Quarters: Unit 25 (HB 212 yard)

Unit 25 was a 1m by 1m unit placed across a line of basalt stones east of the NPS service road in the yard space of HB 212 (Figure 6.44). Four micromorphology samples were taken from the southern profile of the unit (Figure 7.4).

The lowest contexts of the unit contain compact, pebbly sand similar to that seen across the Laundresses' Quarters. Upper contexts contain more evidence for contemporary plant growth. The upslope side of the unit (to the west and upslope of the basalt stones), shows a higher presence of organic matter (seen in organic matter content and micromorphology), than the downslope (eastern) side of the stones. This is likely due to water running downhill and pooling on the upslope side of the stones. Fragments of a dung based plaster identified on the upslope side on the stones support the excavators' suggestion that this location may have been a fence line for the yard of HB 212.

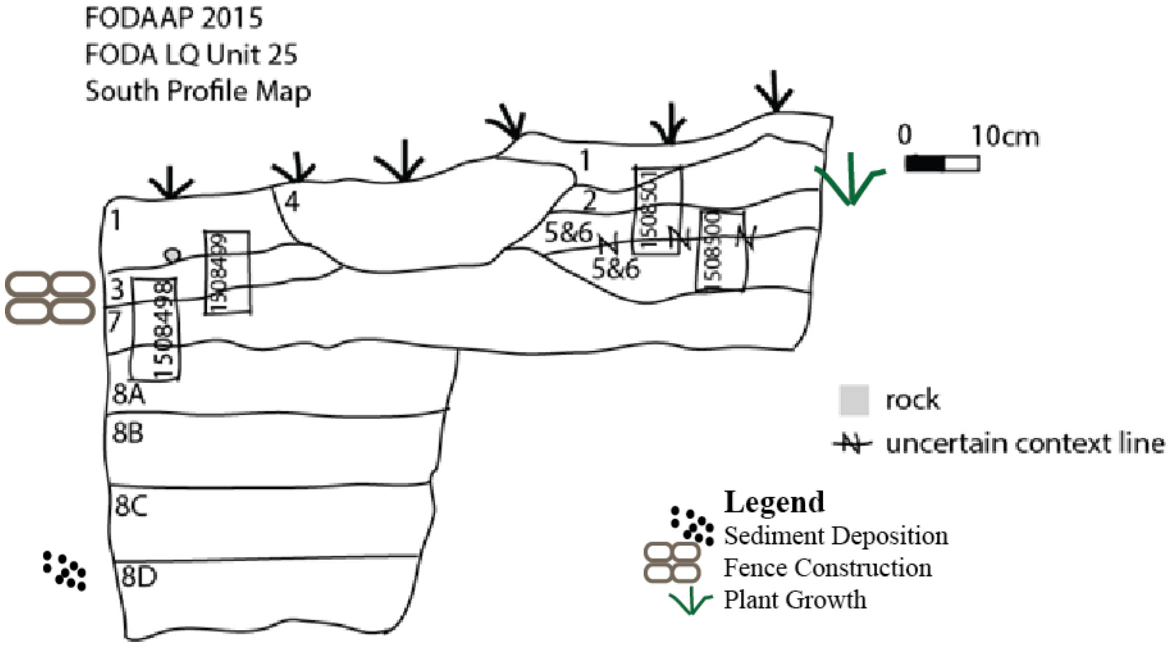


Figure 7.4: Illustrated stratigraphic drawing of the southern profile of Unit 25 (yard space of HB 212), where basalt stones may have been used to reinforce a fence line.

Enlisted Married Men's Quarters: Unit 65 (HB 202 main structure)

Two units (Units 65 and 64) from the interior of the main structure of HB 202 (Figure 4.3 and Figure 6.66) have been discussed in Chapter 6. Both are 1m by 50cm units and display a similar profile. For this discussion, the western profile of Unit 65 is shown below (Figure 7.5).

The lowest contexts of both units are extremely rocky, which is typical of the Enlisted Married Men's Quarters, which generally displays shallow soil profiles above bedrock. There is no architectural or geoarchaeological evidence for the construction of HB202 beyond remains of plaster and construction materials recovered in excavation. The subsurface contexts of the units (context 2 and 3 for Unit 65) contain dense quantities of anthropogenic material including large faunal remains, metal cans, and other artifactual remains which likely accumulated during the collapse of the structure. Micromorphological analysis showed the impacts of water logging in depletion features. Organic matter analysis indicates a higher organic matter content than at the other sites analyzed by FODAAP. Dense vegetation cover during excavation supports this.

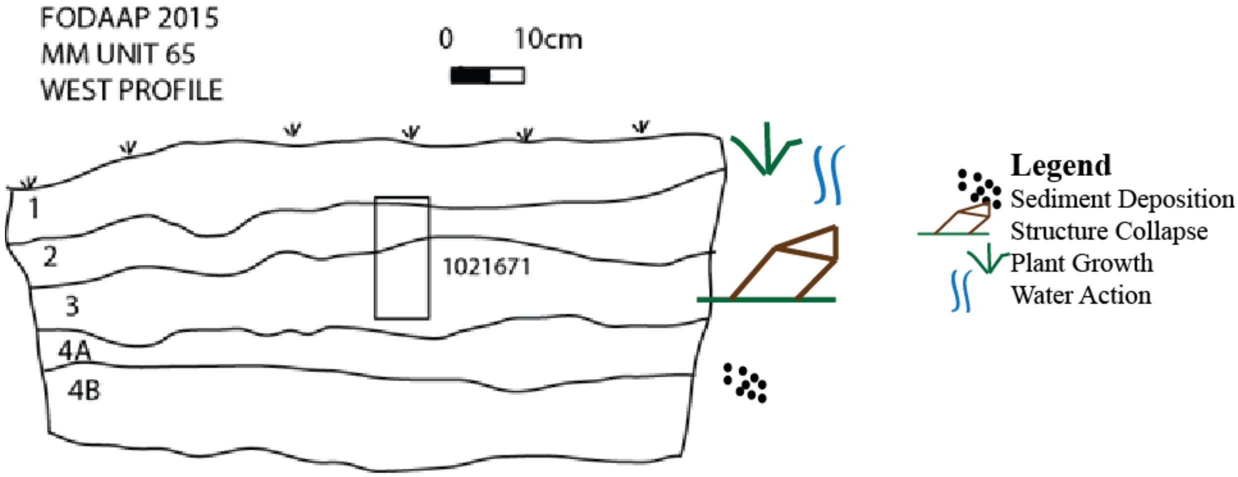


Figure 7.5: Illustrated stratigraphic drawing of the western profile of Unit 65 from the interior of the main structure of HB 202 in the Enlisted Married Men's Quarters.

Enlisted Married Men's Quarters: Unit 69 (HB 202 canvas roofed addition)

Unit 69 was a 50cm by 50cm unit which was excavated in arbitrary levels as the excavator did not notice sedimentary variation (Figure 6.73). Therefore, the context drawn in the stratigraphic unit do not correspond to those documented by the excavator. The unit was placed south of the small boulder in what would have been the interior of the canvas roofed addition to HB 202. The eastern profile is illustrated below (Figure 7.6).

The lowest context of Unit 69 is composed of bedrock with rocky sediment overlying it. Organic matter analysis of this unit showed a lower quantity of organic matter compared to the other units from the Enlisted Married Men's Quarters. Micromorphological analysis showed an isolated fragment of possible trampled occupation surface. However, this fragment was disturbed and there was not sufficient evidence to definitively identify a trampled occupational surface. Micromorphology also showed a high presence of carbonate development compared to other FODA-NHS samples. Carbonate material was also shown to have substantially disrupted the sedimentary matrix, possibly disrupting other evidence of anthropogenic activity such as occupational surfaces.

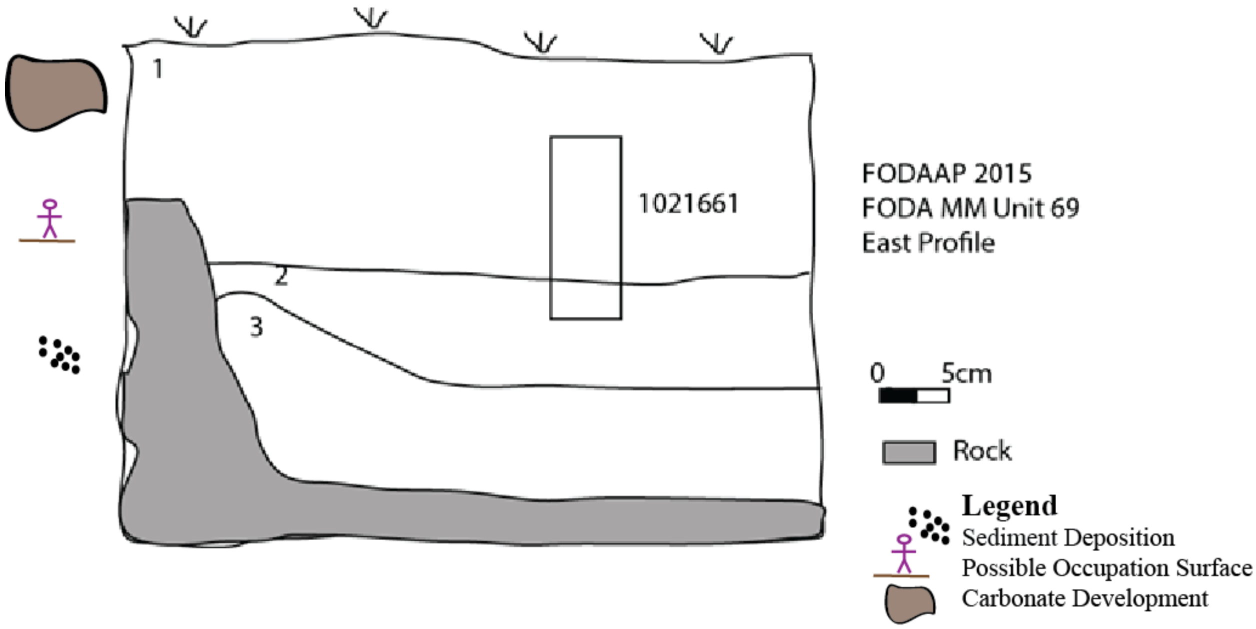


Figure 7.6: Illustrated stratigraphic drawing of the eastern profile of Unit 69 from the interior of the canvas roofed addition to HB 202 in the Enlisted Married Men's Quarters.

Enlisted Married Men's Quarters: Unit 62 (northern exterior of HB 202)

Unit 62 was a 50cm by 1m unit placed north of Units 65 and 64 (Figure 6.66). The unit was placed in the exterior side of HB202 (based on Figure 4.3) and would have been adjacent to the main structure of HB 202. The northern profile is illustrated below (Figure 7.7).

The lowest contexts (7 and 8) within unit 62 were composed of very rocky soil, similar to elsewhere at the Enlisted Married Men's Quarters. The middle contexts (2,3,4, and 6) contained substantial anthropogenic debris related to the collapse of HB 202, but without evidence related to its construction or occupation. The Enlisted Married Men's Quarters overall had high organic matter content compared to other FODAAP sites, which is further supported by the high vegetation cover present during excavation. Micromorphology also showed the presence of water logging seen in depletion features within the analyzed thin sections.

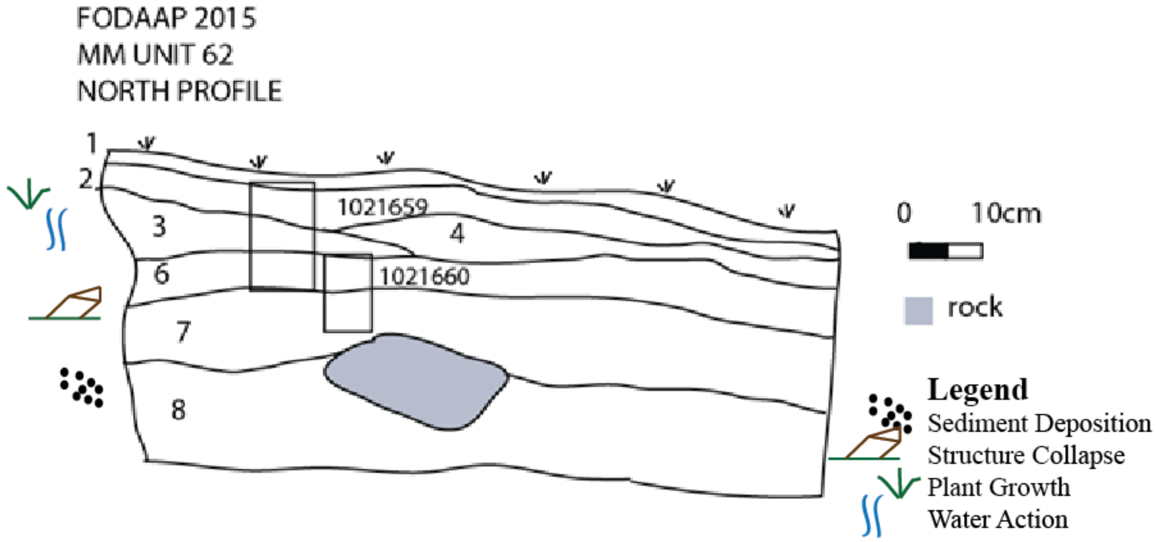


Figure 7.7: Illustrated stratigraphic profile from Unit 62 in the Enlisted Married Men's Quarters showing the northern exterior of the main structure of HB 202.

Enlisted Married Men's Quarters: Unit 67 (HB 224, the privy)

Unit 67 was a 50cm by 1m unit placed on the northern side of the large boulder (6.86) which recovered remains of HB 224, a privy associated with HB 202. The western end of the unit included the privy pit itself, while the eastern end of the unit included the entrance way. The northern profile is illustrated below (Figure 7.8).

The lowest contexts of the western side of Unit 67 include remains from the use of the privy. As no intact coprolites were encountered, and the majority of the privy pit did not include privy waste, it is likely that the pit was cleaned out recently before the privy fell into disuse. These lower contexts are capped by household debris, including a thin lens of ash (Context 19) and large ceramic remains in the overlying contexts. These remains suggest that after the privy fell into disuse, the pit was used as a disposal area for household debris. Eventually the remains of the privy were covered over with sediment deposition and vegetation. In contrast to other units from the Enlisted Married Men's Quarters, contexts from the privy show greater variation in particle size analysis, organic matter content, and pH, which relate to the quantity of anthropogenic material dumped in the privy pit, as well as alterations to the sediment from the privy itself.

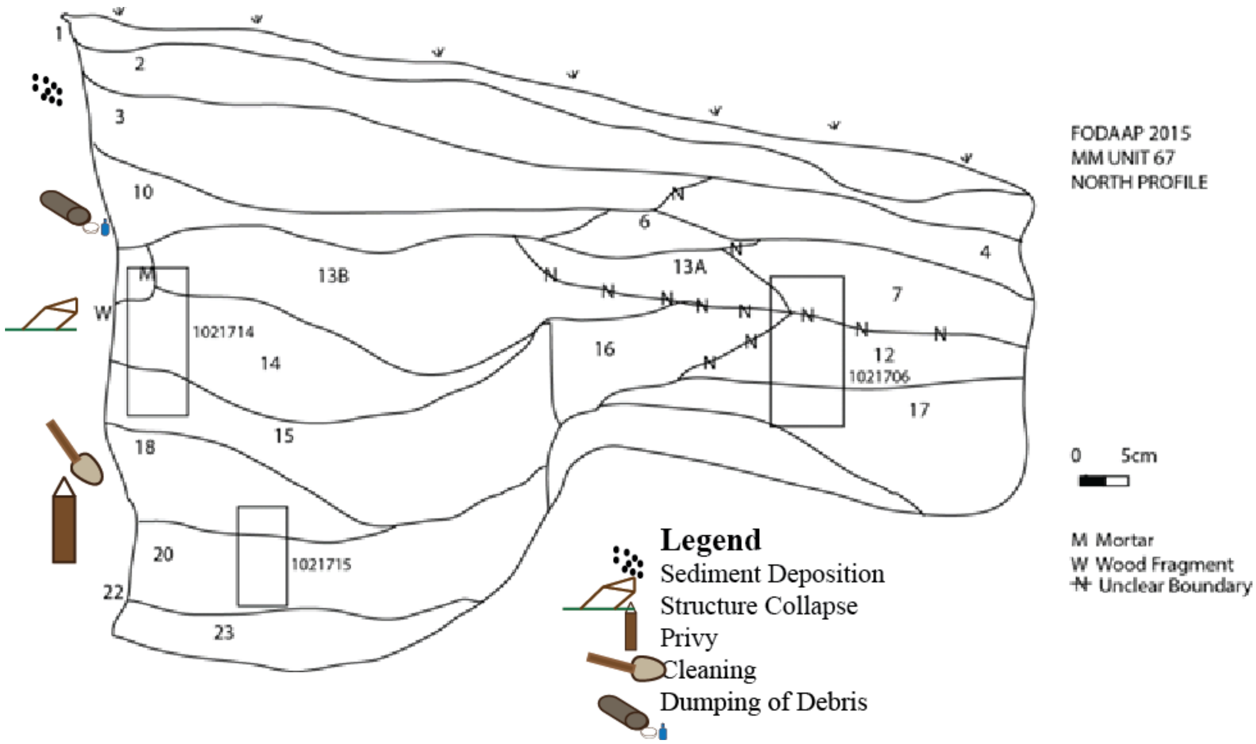


Figure 7.8: Illustrated stratigraphic drawing of the northern profile of Unit 67 (HB 224, the privy) from the Enlisted Married Men's Quarters.

The Francell-Byerley Property: Francell A Units 1 and 2 (Midden)

Two 1m by 1m units were placed in a dense midden scatter at the Francell-Byerley Property (Francell A) which sloped down a small hill. Unit 1 was placed atop the hill while Unit 2 was placed along the hillslope. The western profile of Unit 1 and the southern profile of Unit 2 are illustrated below (Figure 7.9)

The lowest contexts in both units (Context 7 in Unit 1 and Context 5 in Unit 2) are compact, sandy sediment beneath the midden deposit. Micromorphology from Unit 2 shows that this boundary is distinct, but that some anthropogenic material from the midden deposits is incorporated into the underlying sediment. The overlying layers are a complex, interweaving set of distinct stratigraphic layers relating to separate dumping events. The midden contexts contain large artifactual remains along with a high quantity of burnt material and dense quantities of fragmentary artifactual material including eggshell, charcoal, animal bone, ceramic, glass, and metal. The majority of the material appears to have been burnt prior to dumping, with the exception of the uppermost micromorphological bed in sample 1020155, which appears to have been burnt *in situ.* Midden contexts have variable relative percentages of sand, silt, and clay, as well as variable amounts of organic matter.

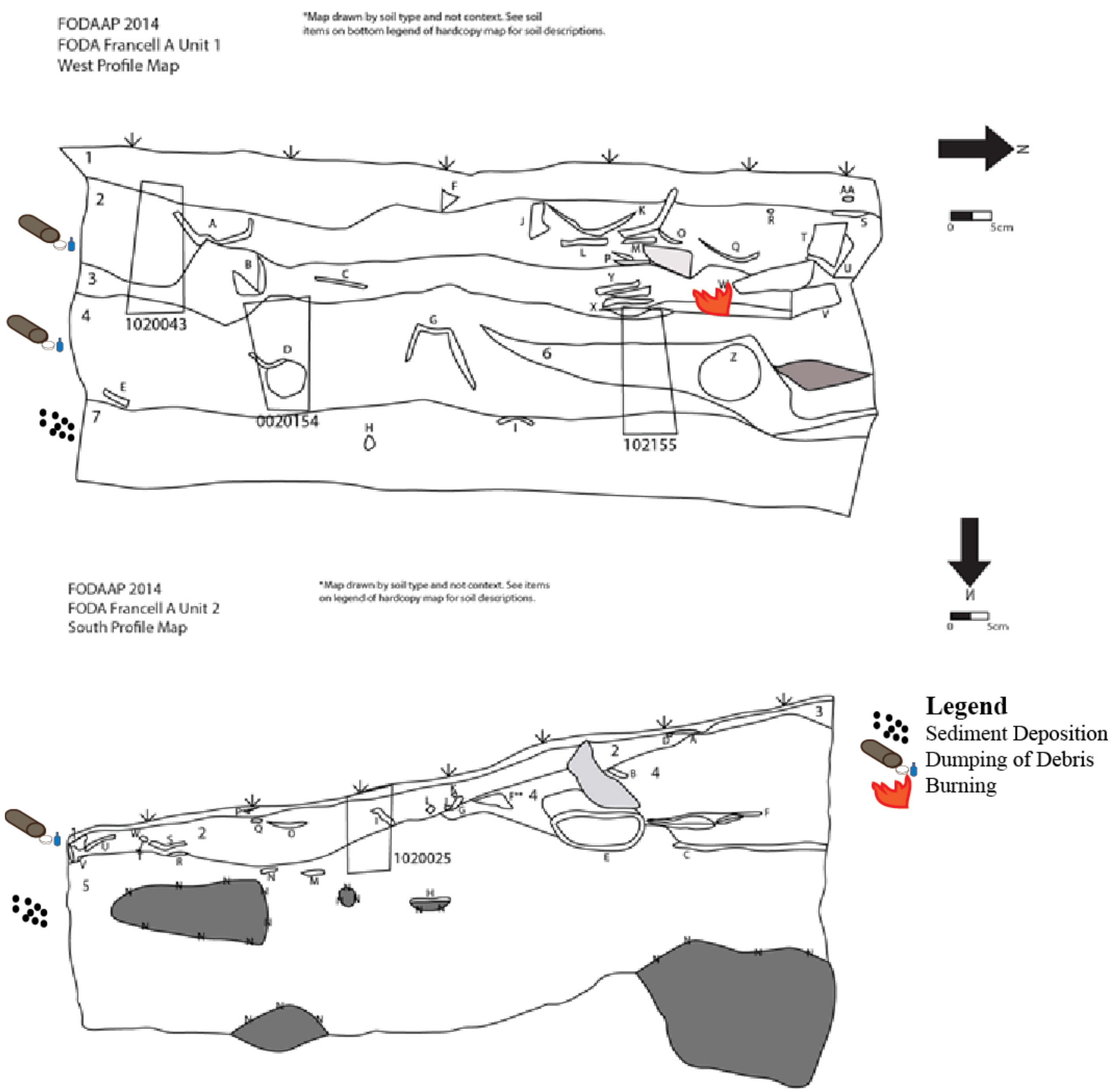


Figure 7.9: Illustrated stratigraphic profiles of the western profile of Francell A Unit 1 and the southern profile of Francell A Unit 2. Both units are from the midden deposit in Francell A.

The Francell-Byerley Property: Francell C Unit 1 (interior of structure)

Francell C Unit 1 was a 1m by 1m unit placed in the interior of the visible stone foundation of the structure at the Francell-Byerley Property (Figure 6.125). The southern profile is illustrated below (Figure 7.10).

The lowest context (Context 5) of Francell C Unit 1 was composed of compact, sandy sediment typical of the Francell-Byerley Property. There was little variation in sedimentary characteristics between contexts in Unit 1. The presence of stone foundations indicates the presence of a structure. Plaster recovered during excavation and analyzed in micromorphology suggests that walls were covered with a lime plaster. Upright nails recovered during excavation suggest the presence of a wooden floor. Micromorphology sample 1020289, which it appears disturbed, also suggests the presence of an adobe subfloor. Little debris related to the collapse of the structure was recovered and there was no evidence for fire.

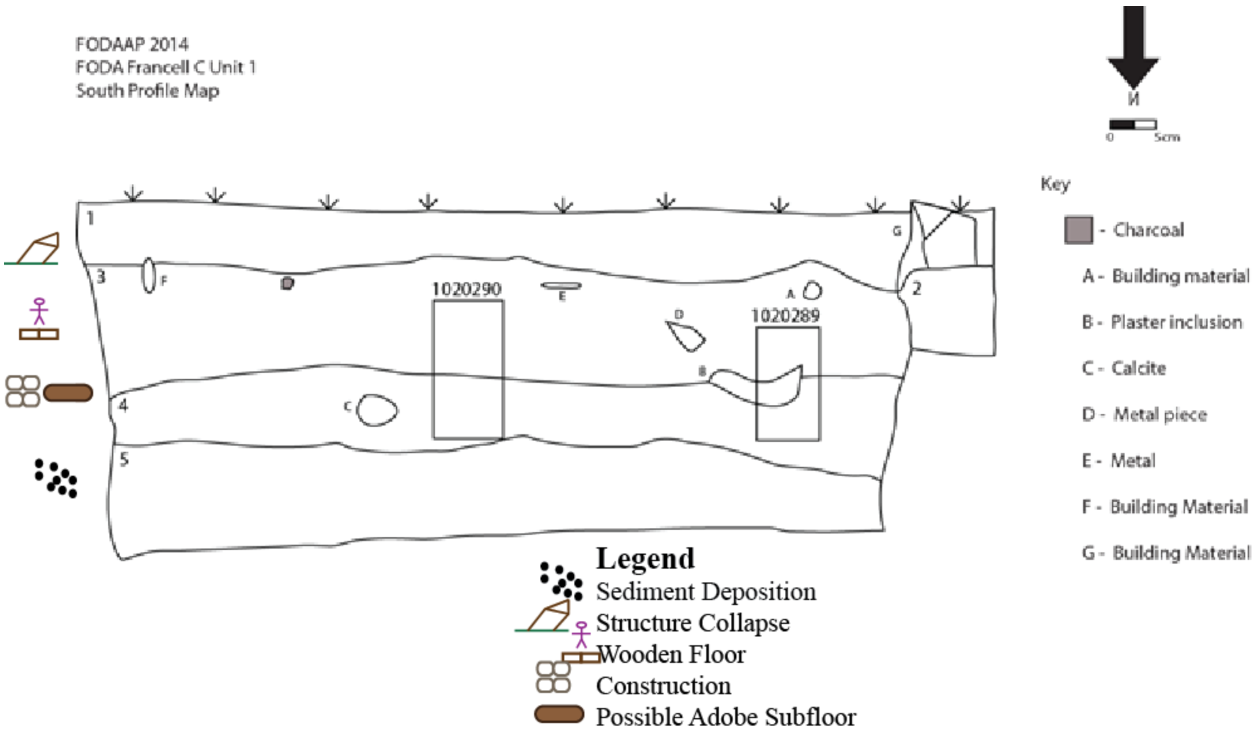


Figure 7.10: Illustrated stratigraphic drawing of the southern profile of Francell C Unit 1 from the interior of the stone foundations from the Francell-Byerley Property.

The Francell-Byerley Property: Francell C Unit 3 (exterior of structure and porch)

Francell C Unit 3 was a 1m by 1m unit placed to the north of the stone foundations in Francell C (Figure 6.125). The eastern profile is illustrated below (Figure 7.11).

Contexts 5, 6, and 7 from the lower, non-post associated portion of Francell C Unit 3 are compact, sandy sediment typical of the Francell-Byerley property. A pit dung into this sediment contains the remains of a wooden post with metal braces, likely from a porch connected to the Francell C structure. Micromorphological analysis from this profile indicates a higher degree of clay development, often incorporated into carbonate nodules, than elsewhere at the Francell-Byerley property. This may be due to retention of water beneath the porch. Eventually, the Francell C structure collapsed or was razed and the remains of the porch post were covered by sediment.

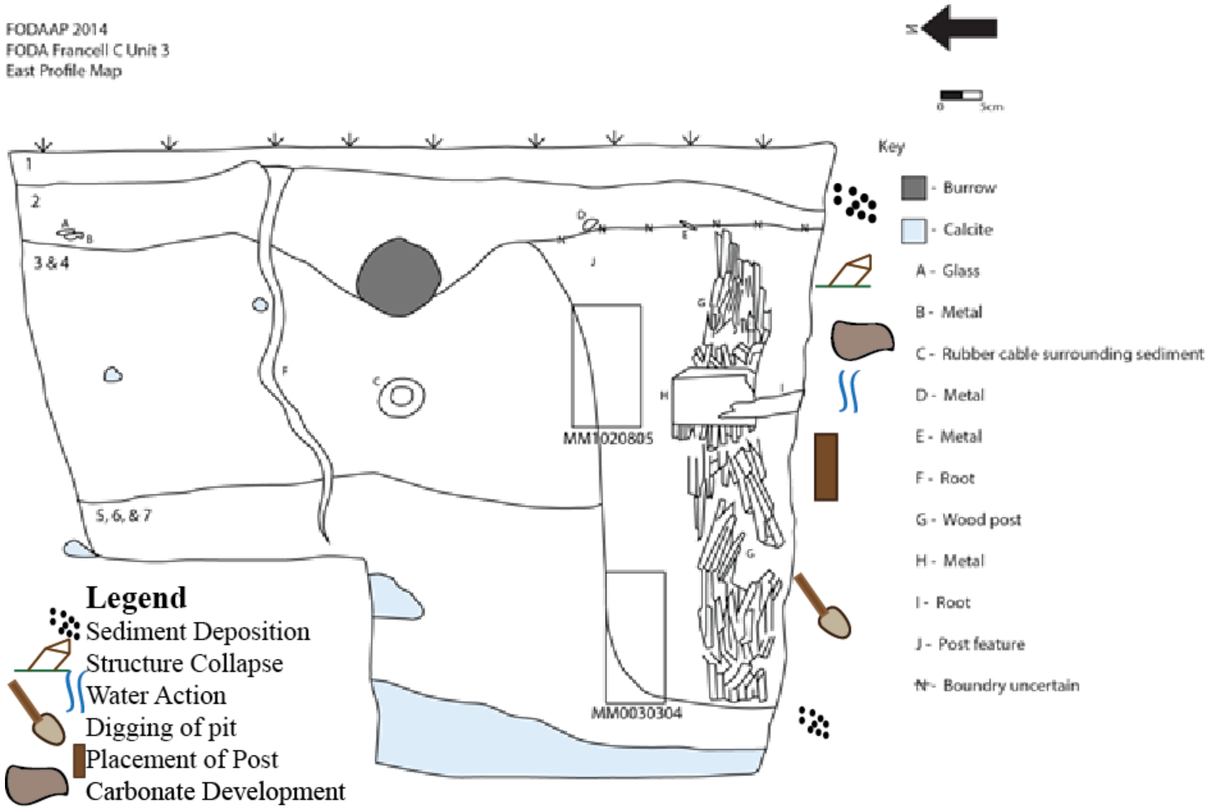


Figure 7.11: Illustrated stratigraphic drawing of the eastern profile of Francell C Unit 3 from the Francell-Byerley Property.

The Smith-Carlton Casa Vieja: CV Unit 1 (rear of structure)

CV Unit 1 was a 1m by 1m unit placed outside the rear door of the Smith-Carlton Casa Vieja in a location that would have been the open air breezeway chapel when the structure was first constructed (Figure 6.154). The southern profile is illustrated below (Figure 7.12).

Contexts from CV Unit 1 were substantially damper than other context from the Smith-Carlton Casa Vieja, likely due to the presence of a drainage pipe on the roof directly above the unit. Excavation recovered little material related to the use of the structure as a chapel, but did encounter a large ceramic pipe, likely a septic pipe, around Contexts 5 and 6. Carbonate development and water action are significant processes within the profile as indicated by micromorphological analysis. There was little sedimentary variation between contexts and most were defined arbitrary or by variation in texture.

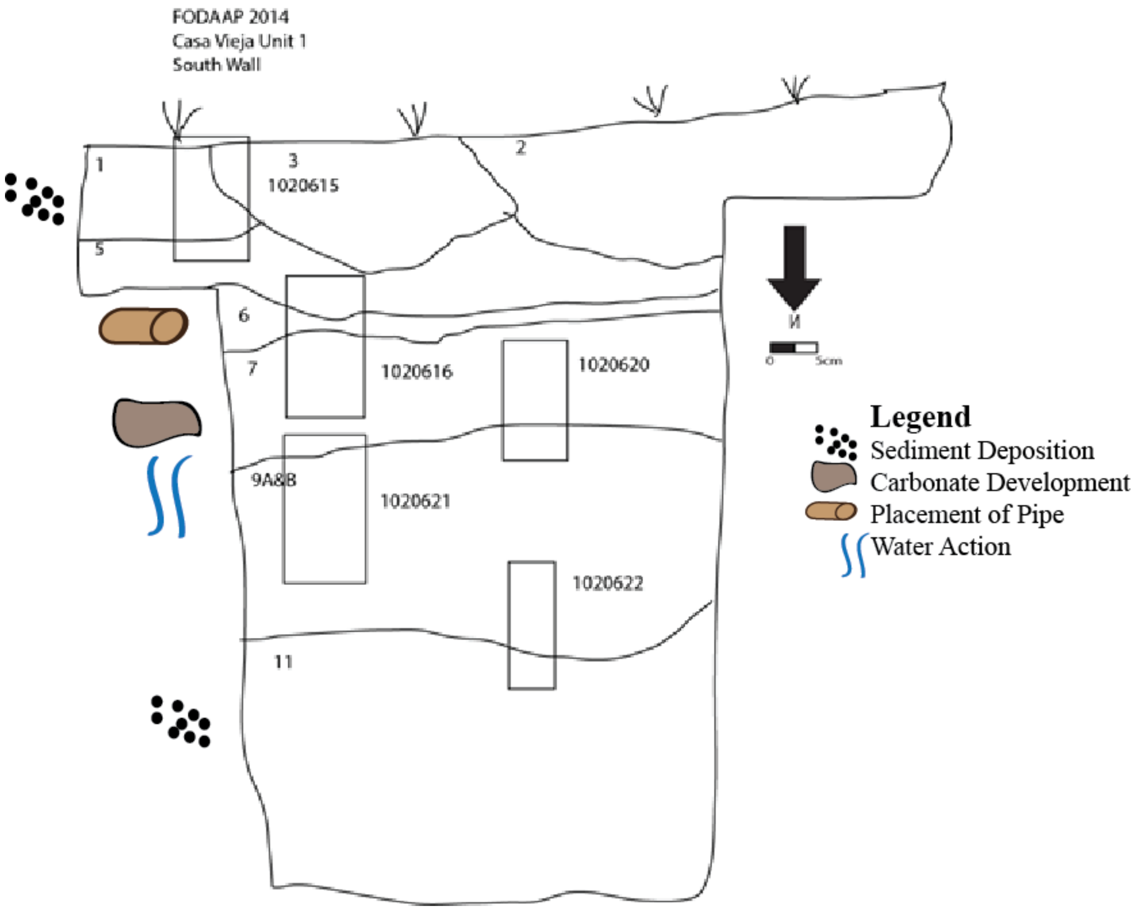


Figure 7.12: Illustrated stratigraphic drawing of the southern profile of CV Unit 1 from the Smith-Carlton Casa Vieja.

The Smith-Carlton Casa Vieja: CV Unit 2 (front entrance of structure)

CV Unit 2 was a 1m by 1m unit placed outside the modern front entrance to the Smith-Carlton Casa Vieja (Figure 6.168). When the building was first constructed this would have been an open air breeze way chapel. The northern profile of Unit 2 is illustrated below (Figure 7.13).

Micromorphological sample 1020614 shows a trampled occupational surface including small fragments of lime plaster and charcoal. The surface is well expressed and corresponds approximately to Context 7B. This is interpreted as the remains of a trampled dirt surface from the time period where the structure was used as a chapel. Overlying this is a dense layer of carbonate impacted sediment (Context 7). After the structure was purchased by the Carlton family the main part of the structure was used as a hay barn and the chapel breezeway fell into disuse. It is likely this period that is represented in Context 7 and which was later overprinted by carbonate development. Context 6, seen in sample 1020613 shows a heavily laminated context with minimal anthropogenic debris. This context is interpreted as relating to the occupation of the structure full time by Don and Vida Carlton, during which time this location was the main entrance of the house and would have experienced heavy traffic. The upper contexts (5, 4, and 2) indicate seasonal usage of the structure and also show the impact of a 2011 wildfire that burned through the property.

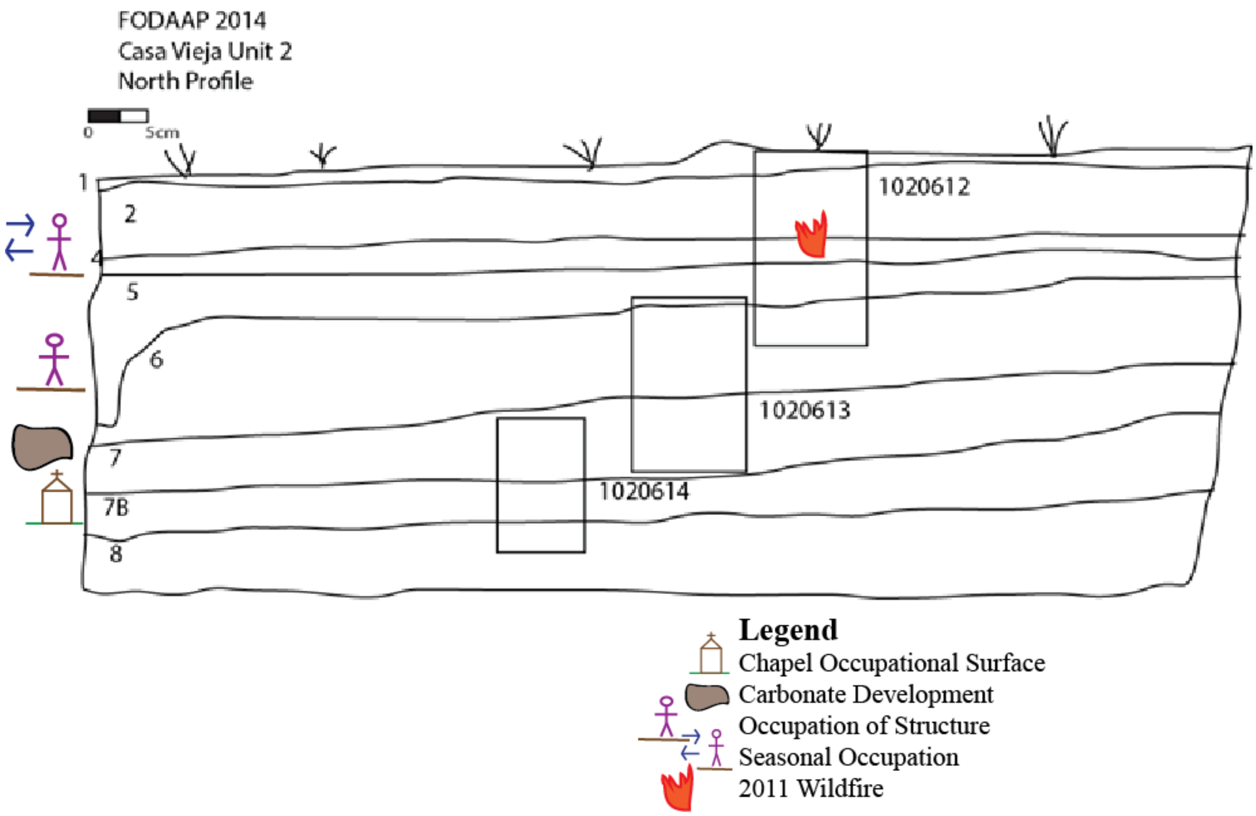


Figure 7.13: Illustrated stratigraphic drawing of the northern profile of CV Unit 2 from the Smith-Carlton Casa Vieja.

BULK SEDIMENT ANALYSIS RESULTS

The following section details the results of the bulk soil analyses (pH, organic matter analysis, and particle size analysis) for the four sites analyzed. Table 7.1 summarizes the results of these analyses for each site for the purposes of inter-site comparisons. Results of pH and organic matter analysis by unit are presented in Chapter 6 along with results of particle size analysis by context. Results of pH and organic matter analysis by context are presented in Appendix II.

Site	Mean pH	Mean %OM	Mean % Clay	Mean % Silt	Mean % Sand
FODA LQ	7.10	2.62%	11.85%	17.85%	75.36%
FODA MM	7.24	5.61%	13.16%	26.26%	69.99%
Francell	7.95	3.98%	16.92%	23.16%	57.34%
Casa Vieja	7.79	4.23%	15%	29.57%	52.63%

Table 7.1: Mean Results of Bulk Soil Analyses for each site

Laundresses' Quarters (FODA LQ)

Results from the bulk sediment analyses of the Laundresses' Quarters and Enlisted Married Men's Quarters at FODA NHS suggest a weakly developed arid land soil with varying degrees of carbonate development.

Samples from the Laundresses' Quarters show an overall neutral pH with a mean at 7.10, the lowest mean pH seen across the four sites. pH did not correlate with depth or other soil characteristics (Table 6.2). However, excavation units near archaeological structures (HB 211 and HB 212) had overall higher (more basic or alkaline) mean pH than units from elsewhere in the Laundresses' Quarters (Table 6.1, Figure 4.12). While this difference is not significant it is suggestive. While there was overall less carbonate identified in micromorphology samples from the Laundresses' Quarters compared to other Fort Davis sites, high pH values across Fort Davis are generally associated with an increase in carbonate as observed in micromorphological samples. As carbonate precipitates from soil water (Barudžija *et al.* 2010), the presence of stone foundations associated with Laundresses' Quarters residences (HB 211 and HB 212) may have acted to retain downslope flow of soil water allowing for increased precipitation of carbonate near structures. This would result in the higher pH observed near structures compared to areas east of the residences

The Laundresses' Quarters samples overall showed a low percentage of organic matter with a mean of 2.55%, the lowest seen at any of the four sites (Table 7.1). There was one outlier in the debris contexts in HB 211 associated with the razing of the structure, as well as two other contexts with high percentages of organic matter associated with construction material in HB 211 and HB 212 (Table 6.3). No variation was seen between units near structures and those in yard spaces or between interior and exterior spaces. Therefore it appears unlikely that the low rates of organic matter are associated with residential activities from the Laundresses'.

Particle size analysis of limited units from the Laundresses' Quarters showed a silty sand with slight increases in fine particles (particularly silt) at contexts below surface followed by a decrease in silt in lower contexts (Table 6.4). This is a pattern consistent with a weak soil horizon. Average percentages were 75.36% sand, 17.85% silt and 11.85% clay. This site had the highest percentage of sand of the four sites analyzed. There were no significant distinctions between structures and yard units or between interior and exterior spaces. The lowest contexts in unit 59 (Contexts 8 and 9) were identified as an adobe subfloor by excavators. While there are higher percentages of silt and clay in these contexts compared to the rest of Unit 59, they are within the range seen throughout the Laundresses' Quarters. As adobe would likely be made of local material this does not discount the excavators' interpretation.

Enlisted Married Men's Quarters (FODA-MM)

pH analysis of samples from the Enlisted Married Men's Quarters had an overall mean of 7.24, similar to the Laundresses' Quarters (Table 6.5). Unit 71, placed in yard space, had a significantly lower pH than the other units. This is similar to the pattern seen in the Laundresses' Quarters where units near structures had higher pH than those away from the structures. However, the other unit placed away from HB 202 (unit 63) did not have a significantly different pH than units from HB 202 and the privy. Contexts from the privy (HB 224, unit 67) did not have a significantly different pH from the rest of the Enlisted Married Men's Quarters samples. Similarly, comparing samples from within the privy pit with those from the entrance area did not produce a significant difference in pH values.

The samples from the Enlisted Married Men's Quarters had overall higher percentages of organic matter than samples from the other sites with a mean of 5.61% (Table 7.1, Table 6.7). This area also had very dense surface vegetation in contrast to other areas. Contexts with high rates of organic matter content included one surface context (from Unit 60), contexts 13B, 15, 18, and 19 from the privy (interpreted as midden debris) and context 4 in Unit 62 (interpreted as anthropogenic debris from HB 202, likely kitchen waste). Units near the small boulder at the western side of HB 202 were generally lower in organic matter than other Units from HB 202. Interestingly, the lowest contexts from the privy (Unit 67 Contexts 21, 22, and 23) had low percentages of organic matter in the 2% and 3% range. During excavation these contexts smelled like feces, but the low percentage of organic matter suggests that the privy pit itself was cleaned of coprolites, leaving only trace amounts. This is consistent with micromorphology results from these contexts which show the presence of phosphates and other soil alterations, but no coprolite material.

Particle size analysis from the Enlisted Married Men's Quarters (Table 6.8) also shows predominantly silty sand, but with a higher percentage of silt on average than seen in the Laundresses' Quarters. Average percentages were 69.99% sand, 26.26% silt, and 13.16% clay (Table 7.1). Profiles showed higher rates of silt in near-surface contexts, with decreasing percentages of fine-grained particles at depth. During excavation, lower contexts were generally very rocky, accounting for the very thin soil development seen at the Enlisted Married Men's Quarters. Unit 71 in the yard had a high mean percentage of sand than the other units, but not significantly different. There were no observable differences between the privy and other units or between the privy pit and entrance contexts.

Francell-Byerley Property (Francell)

Samples from the Francell-Byerley Property had a mean pH of 7.95, the highest of the four sites included in this study (Table 7.1). The samples showed a weak moderate correlation with depth using context number as a proxy for sample depth below surface (Table 6.10). This is because a high soil pH here is likely associated with the amount of precipitated carbonates in the soil. As carbonate tends to precipitate at specific depths determined by local soil factors (Barudžija *et al.* 2010), it is expected that depth and pH will be correlated. The units from Francell A (the midden) generally have higher pH than those from Francell C (the structure) (Table 6.9). This is in contrast to samples from the two areas of FODA where the highest pH samples were generally from units in or near structures. Samples from three shovel test pits (STPs) had both the highest and lowest mean pH per unit, showing that non-anthropogenic contexts have a wide variability in soil processes.

Units from the Francell-Byerley property had an average of 3.98% organic matter (Table 7.1). The highest mean percentage of organic matter by unit was STP 3 in Francell A to the west of the midden area (Table 6.11). The lowest mean percentage of organic matter by unit was from Francell C Unit 2, the unit placed at the south end of the structure. Several contexts from the midden had unusually high percentages of organic matter, although not significantly above the mean, which is not unexpected in midden contexts. Another context with an unusually high percentage of organic matter was Context 6 from Francell C unit 3. This context included an intact porch post, explaining the high presence of organic matter as decomposition from the wooden post.

Particle size analysis of samples from the Francell-Byerley property had an average of 16.92% clay, 23.16% silt, and 57.34% sand (Table 7.1, Table 6.12). Overall, midden contexts from Francell A had a higher percentage of finer-grained particles (silt and clay). The shovel test pits and units from Francell C had overall little variation in particle size distribution throughout the unit profiles. Comparison of all samples from the Francell-Byerley property showed a moderate correlation (0.43) between percentage of silt and percentage of organic matter. This is, at least in part, a result of the presence of midden deposits with both a higher percentage of organic matter and finer particles due to a high presence of ash.

Smith-Carlton Casa Vieja (CV)

Units from Casa Vieja had a mean pH of 7.79 (Table 7.1). There was little variation among the units (Table 6.12), but pH in general increases with depth. Using context number as a proxy for depth, pH and depth had a correlation coefficient of 0.56 (Table 6.13), which indicates a moderate correlation between the two variables. A similar pattern was seen at the Francell-Byerley property, but not at the Laundresses' Quarters and Enlisted Married Men's Quarters at FODA-NHS. These analyses observed very little carbonate at the Laundresses' Quarters, which is likely the driving factor for pH at Casa Vieja and the Francell property. The Enlisted Married Men's Quarters had very shallow deposits over very rocky subsoil, creating a shallow profile with little variation.

Percentages of organic matter at the Casa Vieja were generally low with an overall mean of 4.23% (Table 7.1, Table 6.14). Contexts 2 and 4 from Unit 1 in the rear of the house had unusually high percentages of organic matter, explained by the presence of a drain pipe as well as the remains of potted plants uncovered during excavation (Figure 7.12). Overall, units 1 and 4 from the rear of the house have higher percentages of organic matter, while units 2 and 3 from the front of the house had lower percentages of organic matter. The front of the house is a high-traffic area with continued trampling and disturbance and possible landscaping, which likely explains the lack of organic accumulation here. A weak negative correlation between pH and percentage of organic matter was found (-0.397) indicating that increased organic matter content is associated with decreased pH.

Particle size analysis showed a silty sand with more variation within soil profiles than seen at the other sites (Table 6.15). However, there was no common pattern between the units. No correlations were found between percentages of particles and other soil characteristics.

MICROMORPHOLOGY RESULTS

The following section summarizes micromorphology results for each of the four sites analyzed. Summaries of each micromorphology slide are presented in Chapter 6, and complete recording forms can be found in Appendix III. Additional images taken during analysis of thin section slides are available upon request.

Laundresses' Quarters (FODA LQ)

Samples taken from the interior spaces of HB 211 and 212, along with samples from Unit 31 in the exterior porch area of HB211 show evidence of wooden floors and trampled dirt surfaces in varying degrees of preservation (Figures 7.1 and 7.3). Units 19 and 32 from the interior of the threshold of HB 211 show a trampled dirt surface with very little anthropogenic inclusions (Figure 6.19). Samples from Unit 31 on the exterior of the threshold suggest a decayed wooden floor, possibly a porch (Figure 6.30). The sample taken from Unit 59 in the interior of HB 212 also suggests a wooden floor, but with less decay into the sedimentary material than seen in unit 31 (Figure 6.43).

Three major interpretations can be made from the micromorphological analysis of units 19 and 32:

1: The dirt surface in units 19 and 32 was an unprepared, trampled occupational surface

2: This dirt surface was likely covered with a rug or other floor covering

3. The space was kept generally clean and may have seen minimal use for household activities

That the surface recognized by excavators in units 19 and 32 (Figure 7.1) was an unprepared trampled surface, rather than an intentionally-prepared floor, is clear from the mineralogical makeup of the floor, as well as its horizontal extent. The mineralogy of sediment of the occupational surface context is compositionally and texturally indistinguishable from the overlying fill and underlying sediments. The surface is instead identified through compaction, void patterns, and orientation of particles near boundaries with overlying sediments.

Additionally, an intentionally-prepared floor would be best preserved near the stone foundation, as this location will see the least amount of wear-and-tear through daily activity or use. Instead, near the foundation the surface is only visible as fragmented soil aggregates that were likely dislodged after disuse of the floor. The best expression of this surface is away from the foundation in the interior of the structure where trampling would more effectively produce the compaction pattern observed in thin section.

While the surface of units 19 and 32 can be identified in thin section, both as preserved intact floor deposits and fragmented, reworked aggregates, it is not as compacted a surface as one would expect near an entranceway that saw heavy use (as compared to occupational surfaces observed in Casa Vieja Unit 2; see Figure 7.13 and Figure 6.173) or traffic. Furthermore, the boundary between the fragments of preserved trampled floor and overlying deposits is not as distinct as would be expected for a directly trampled surface and very little anthropogenic debris is present in the floor itself (i.e., no micro-debris). While some debris was recovered in overlying contexts (eggshell, metal), only a few tiny (600um) fragments of plaster were identified from within the surface context itself. Typically, trampled surfaces within residences would include more substantial microdebris related to usage of the space, even when cleaning practices prevent accumulation of macroscale artefactual remains (Matthews et. al. 1997). Based on these observations, the surface was likely covered with a thick rug or another type of floor covering. A rug would absorb impact from daily trampling, leading to a less compacted and well-defined floor than exposed dirt, except in the highest traffic areas. Additionally, a rug would catch some, if not most, of the microdebris associated with daily living, leaving the underlying dirt surface relatively clear of anthropogenic remains.

Finally, the micromorphology also suggests that the interior space associated with units 19 and 32 was generally kept clean. In addition to there being almost no anthropogenic debris identified in the trampled surface from unit 19, very little microdebris was identified from the layers directly overlying the surface. During excavation some macro-scale artifacts were recovered such as nails and glass, but it was not a dense deposit. Furthermore, the micromorphological samples from unit 32, which were located near the foundation itself, also contained very little debris. This location would generally be more likely to contain remnants of activity within the structure as sweeping would brush debris up against the walls of the house. Some horizontal orientation of particles from samples in this location also suggests that this may be sedimentary accumulations from sweeping. However, even in this location there is very little material associated with human activities aside from a few very small metal fragments. This lack of evidence for *in situ* accumulation of microartifacts suggests that either daily household and work activities took place elsewhere, probably in outdoor spaces, or indoor spaces were kept exceptionally clean, or both.

Samples from unit 31 on the exterior side of the threshold show a comparatively organic-rich soil with highly-decayed, amorphous organic material incorporated throughout the fine fraction, a darker color, and a spongy to crumbly texture (Figure 6.30). Significantly, these markers of high organic content are not associated with channel voids or remains of plant tissue from roots. Given that excavation recovered upright nails in the corresponding excavation context this micromorphological signature is interpreted as showing decay of wooded boards into the natural underlying sediment. The boards would have been held in place by the nails recovered during excavation and likely comprised a rear porch or steps leading up to HB211. The decayed remains of the boards themselves may have been torn out and burnt as part of the razing of the structure which produced the ash deposit in Unit 16.

Similarly, the slide from Unit 59 in HB 212 is also interpreted as the decayed remains from a wooden floor. The pattern of organic matter seen in the slide (amorphous organic material incorporated in the fine fraction is similar to that seen in Unit 31. The sample from Unit 59 has less organic matter than those from Unit 31. This is likely because the sample from Unit 59 would have been in the interior of the structure and therefore would have been buffered from the degree of decay seen in Unit 31, even once the structure became abandoned. The wood was likely eventually burned in the razing of the structures that produced the feature observed in Unit 16 and 23. In contrast, interior samples from HB211 which were interpreted as a trampled dirt floor, rather than a wooden floor, generally had very little to no organic matter in the fine fraction, although some large plant tissue was observed.

Comparisons between units 31 and 53, both in the exterior porch space of HB 211, suggest that Unit 53 did not include the wooden porch or steps seen in Unit 31, and was probably not a high traffic area (Figures 6.34 and 6.45). Organic matter in Unit 53 extends deeper into the profile and is associated with more void space (including channel voids) which suggests that organic matter was introduced as vegetation and other natural biological processes rather than decay of overlying wood boards. Further, the matrix of samples from Unit 53 is less compacted than Unit 31, showing that this area likely had less traffic to cause compaction of the sediment. Anthropogenic debris in the upper slide (1508502) is related to construction (plaster, metal, and a large tuff fragment) and was probably introduced in the collapse or razing of HB 211.

Additional samples from the interior of HB 211 were taken from Units 16 and 23 in an isolated deposit of ash and anthropogenic debris on the interior of the structure. Based on excavation and micromorphological data (Figure 7.2) it is apparent that this feature relates to the razing of HB 211 rather than the occupation. The two micromorphological samples analyzed from Units 16 and 23 demonstrate that the ash deposit and associated material were not burned *in situ* (Figure 6.26 and Figure 6.28). The beds underlying the ash show no evidence of heating and the ash deposit itself is predominately unoriented. Furthermore, excavation in Units 16 and 23 did not recover the dirt surface identified in Units 19 and 32, so it is likely that this area was disturbed after abandonment of the structure and that the ash dumping event is unrelated to the occupation of the residence. Finally, both the macroscopic artifacts recovered from the ash and debris contexts in Unit 16, along with the anthropogenic material identified in thin section, are primarily materials associated with construction, such as metal, plaster, glass, and wood. With this evidence we can interpret the dumping event as related to the razing of structure HB211, possibly as part of the construction of the road which overlies the majority of the structure. Material from the dilapidated structure was burned, possibly in a container to prevent wildfire, and then the resulting ash and debris were dumped into the remaining foundation of HB211 and covered over in the construction of the road.

Samples from unit 17 on the exterior side of HB 211 directly to the south of the structure show a profile of natural sediment with minimal anthropogenic alterations. Organic matter present in the upper slides is most likely introduced through vegetation as indicated by the decayed plant matter in channel and vughy voids. A fragment of limestone in the uppermost slide may relate to construction of either HB 211 or the road. Overall this area is more compacted than unit 53 (also exterior to and adjacent to HB 211), which could relate either to higher traffic during the use of HB 211 or trampling during construction of the road, but was clearly not an occupation area or the focus of repeated or long-term use.

Additional samples from exterior spaces in the Laundresses' Quarters were analyzed from Units 25 (Figure 7.4) and 57. In Unit 25, comparison between the samples on the upslope (western side, proposed interior of the fence line) and downslope (eastern side, proposed exterior of the fence line) sides of the basalt stones, shows that vegetation is more prevalent on the upslope side where water would be retained by the rocks. Some of the decayed material from upslope could also be from the decay of wooden fence posts, but there is no direct evidence to support this interpretation beyond the accumulation of decayed organic matter. More interestingly, two fragments of a dung-based adobe or plaster were identified in the samples from the upslope side (Figure 6.46). This is interpreted as evidence for a wattle and daub style wall.

Samples from unit 57 did not show evidence for anthropogenic deposits. Archaeological material, including glass and metal were identified, but these materials are found in a broad scatter area throughout the area east of the Laundresses' Quarters structures. Predominance of coarse sedimentary material likely relates to wind erosional processes dominating this area.

Enlisted Married Men's Quarters:

Micromorphology samples from the Enlisted Married Men's Quarters included samples from the interior areas of HB 202, several areas exterior and directly adjacent to the structure, as well as samples from HB 224 (Figure 4.13). Locations of units were determined based upon historic photographs (Figure 4.3). Little intact architectural evidence from HB 202 was recovered.

Samples from Units 64 and 65 (Figure 7.5) in the interior of the main area of HB 212 show a loose, organic-rich topsoil with evidence for carbonate development and insect activity. Carbonate nodules incorporate soil fabric along with other materials such as charcoal, indicating that they formed *in situ*. Sample 1021655 from Unit 64 also includes a carbonate coating around a nodule of tuff (Figure 6.68) indicating dissolution of silicate material through carbonate development. Fragments of metal, bone, dung, plaster, and possible adobe are also present, relating to the dilapidation of the structure.

An additional sample was taken from Unit 69 which was placed in the canvas-roofed addition to the west of the main structure of HB 202 (Figure 7.6). This sample showed a blocky soil with substantial carbonate development affecting the soil structure (Figure 6.75). Carbonate nodules incorporate soil fabric and organic matter. Some are potentially dung plaster similar to that observed in Unit 64. Depletion features observed in the micromorphology samples indicate periods of water saturation.

Samples from areas exterior to HB 202 were taken from Unit 72 to the northeast of the structure as well as Unit 62 (Figure 7.7), adjacent to the northern wall of the main structure. Unit 72 was placed near the little boulder and the excavator suggested that there may have been a dirt surface. However, the sample taken from these contexts was disturbed either during collection or transport. No evidence of an occupation surface was observed, but metal, highly weathered plaster, and depletion features were present. The samples taken from Unit 62 are similar to those from Units 64 and 65 which are located directly to the south in the interior of HB 202. They show an organic-rich soil with archaeological inclusions of metal and eggshell from the dilapidation of HB 202 (Figure 6.81).

Finally, a sample from Unit 60, in the area between the northern addition of HB 202, the canvas-roofed section, and the small boulder, showed pedogenic processes similar to other slides. The slide showed a crumbly, organic soil with rocky inclusions, carbonate development, and evidence for insect activity along with inclusions of metal and possible plaster.

Four samples taken from Unit 67 in HB 224 (the privy) show the profile of the privy pit as well as the entranceway (Figure 7.8). Samples from the pit itself indicate that it was cleaned prior to being used as a dump for other refuse. While the lowest contexts contain indicators of excrement seen in phosphatic impregnations, faunal material, and blocky sediment with little plant matter, there were no coprolites identified. Higher contexts in the profile contain anthropogenic material including ash, faunal remains, and metal, along with a high density of carbonate nodules and some evidence for water saturation through depletion features. However, as these features are found elsewhere in the Enlisted Married Men's Quarters, they are not necessarily indicative of the privy itself. As privies were often limed as part of regular maintenance it is interesting that there is not a significantly higher rate of carbonate development in the privy pit compared to the rest of the married men's quarters. The sample from the entry area outside the pit included a fragment of material interpreted as adobe. This may indicate that the structure included an adobe subfloor which was not encountered in excavation, or that adobe was otherwise used in the construction of the privy structure.

Taken together, the samples from the Enlisted Married Men's Quarters show substantial evidence of anthropogenic activity, but few *in situ* features to indicate activity areas or specific events related to constructionand dilapidation of the structure. Evidence for secondary soil processes include higher rates of organic inclusions than other FODAAP sites as well as water related depletion features and carbonate nodules incorporating soil fabric.

Francell-Byerley Property:

The micromorphology samples from STP1 show a sandy silt sediment with some vertical variation in texture due to pedogenic horizonation (Figures 6.109 and 6.110). Variable clay content by depth accounts for differences in microstructure with higher portions of clay leading to a more blocky structure in lower portions of the profile. The samples from the STPs have a very high degree of carbonate development, with increasingly larger nodules in lower portions of the profile. Nodules are primarily pure calcite with some instances of compound carbonate nodules with clay cement, and clay coatings or hypocoatings on micritic carbonate nodules (Examples of typical nodules of each type can be found in Chapter 3).

Samples from the midden (Francell A) also show a high frequency of carbonate nodules in comparison to the FODA-NHS sites, but not as concentrated as seen in the Francell A STPs. The samples from Francell A Unit 1 show the profile of the central midden, unaffected by slope wash. These samples show highly heterogeneous deposits with large concentrations of anthropogenic materials (specifically metal, eggshell, bone, and glass) along with very high concentrations of ash and charcoal (Figure 7.9). Interestingly, there is generally a distinction between beds dominated by large fragments of anthropogenic material and thin lenses primarily composed of fine ash particles. In beds containing large instances of anthropogenic material these materials are often burnt, including several instances of highly heated glass, and associated with fragments of charcoal. With the exception of Bed 1 in sample 1020155 (Figure 6.118) it appears that burning occurred elsewhere as there is generally little internal organization to each bed and no evidence for heating of the sediment fabric. In sample 1020155 Bed 1 however, parallel banding in the fine fraction along with compacted, heavily heated sediment suggest localized *in situ* non-intensive burning.

Samples from Francell A Unit 2 show the interface between the midden deposits and underlying sediments. There are no discrete beds within the midden deposits in the two analyzed samples from Unit 2. Anthropogenic material in these samples is generally large and unoriented (Figures 6.123 and 6.124). The boundary between midden contexts and underlying sediment is distinct macroscopically, but without a sharp transition or boundary void. There is some anthropogenic material mixed into the underlying sediment, which is predominantly mineralogical with a crumbly, compacted microstructure.

Secondary processes within the midden contexts include leaching of iron, carbonate development, and insect activity. In most contexts metal is observed to be leaching into the soil fabric itself, staining the fine fabric a reddish color (Figure 6.115). Carbonate development primarily includes the formation of small micritic nodules. In Unit 2 many of these are intermixed within the soil fabric, rather than precipitated in void spaces, suggesting that these may be translocated rather than only *in situ* developments. As Unit 2 is located on a slope and the deposits reflect this, being composed of downslope wash debris.

Samples from Francell C were analyzed from each of the three units excavated. Unit 1 (Figure 7.10) , placed in a central room of the visible foundations, showed loose, aeolian sediment mixed with plant material and sparse anthropogenic inclusions in the upper contexts of the unit, including charcoal, plaster, and metal fragments likely related to the collapse of the structure. Sample 1020289 was taken from visible plaster in Contexts 3 and 4 in Francell C Unit 1. This sample showed a sharp vertical boundary between a plastered, compacted, well-sorted, sediment and loose, highly disturbed material (Figure 6.131). Plaster remains were observed both attached to the compacted sediment and loosely incorporated into the disturbed bed. The compacted sediment is likely remains of a plastered subfloor which has been highly disturbed.

During excavation at Francell C Unit 2 was described as highly organic with loose, silty sediment. However, this interpretation is not supported by the micromorphological evidence. The samples from Unit 2 do not reflect the observation of the excavator that lower contexts had an increased amount of organic material (Figure 6.134 and Figure 6.135). The samples show a well-sorted silty sand with some incorporated soil aggregates as well as evidence for insect activity in the presence of insect-created vughs. The samples have a higher degree of carbonate development than samples from Unit 1, suggesting that this may be an exterior space. However, the well-sorted sedimentary material may be anthropogenically-introduced fill related to construction as it is much more well-sorted than the sterile units at the Francell-Byerley property. The material appears moderately similar to sample 1020289 bed 2 (Francell C Unit 1), but with increased secondary alterations.

Samples from Francell C Unit 3 show sedimentary processes underneath an exterior porch, although micromorphology was not able to differentiate between pit and non-pit sediments near an intact porch post uncovered during excavation (7.11). Samples from Unit 3 show substantial carbonate and clay development in comparison to other samples from Francell C. Secondary developments included carbonate nodules, carbonate-rich infillings in void spaces, clay coatings and pendants on carbonate nodules and rock fragments (Figure 6.140 and 6.141). The prevalence of clay accumulations is interesting and stands in contrast to samples from STP1 and the rest of Francell C. The increased clay accumulations can be explained by the porch covering (suggested by the post uncovered in Unit 3) which would have provided a sheltered environment for water to accumulate and pool (i.e., during rainstorms), and clay mobilized in this water to settle out. In contrast, the samples from Unit 1 would have been located in interior spaces and protected from exposure to elements like rainwater until the destruction of the structure.

Smith-Carlton Casa Vieja

In contrast to interpretations made during excavation, the samples from CV Unit 1 on the rear side of the (now enclosed) open air chapel, do not indicate the presence of a floor or any features associated with the chapel structure (Figure 7.12) Instead, the unit contains a well-drained, fine-grained sediment which is likely fill put in purposefully during renovations of the structure and installation of a drain pipe. Water movement has depleted clay components of the sediment near channel voids in lower parts of the unit (Figure 6.157), but there are no redox features to indicate standing water or water saturation. Plant material, insect voids, and weathered shell from landsnails are found throughout the profile. Carbonate features occur primarily as carbonate-enriched clay patches with few discrete nodules (Figure 6.159).

Unit 3 at Casa Vieja was placed on the front (west) side of the modern house. This unit contained few artifacts during excavation and little evidence of anthropogenic deposition in thin section. Samples showed a compact, silty sand, with channel voids associated with depletion features and clay hypocoatings suggesting water infiltration affecting the profile (Figure 6.165). The fine fabric is generally well-sorted with localized horizontal orientation suggesting an aeolian origin (Figure 6.164). Carbonate development is limited. Insect vughs and excrement suggest mild insect activity.

In contrast to the samples from units 1 and 3 the samples from CV Unit 2 show the clearest depositional microstratigraphic sequence from the FODAAP project (Figure 7.13). The uppermost sample (1020612) shows several cycles of seasonal usage. This is indicated by the accumulation of massive aeolian sediment with no internal bedding or horizontal laminations that is then trampled into a compact surface when the structure is reoccupied (Figure 6.170). The discrete accumulation of fine charcoal, probably windblown, with no evidence for *in situ* burning or ash most likely results from the 2011 wildfire that burned through the property. These beds can be correlated to the modern seasonal usage of the structure by the Carlton family. Carbonate development is minimal and does not substantially affect the sedimentary structure.

The middle sample (1020613) shows a period of constant use and occupation which is indicated by finely-laminated, horizontal bedding visible at low (40x) magnification with no inclusions of organic matter or other anthropogenic components (Figure 6.172). Comparison with oral history would suggest that this is the period of occupation by Don and Vida Carlton after the structure was renovated in the 1970s. The open air chapel room would have been enclosed and this location would now be the front door of the structure rather than a disused room. Constant trampling and sweeping would produce the fine laminations seen in thin section. Carbonate precipitation is minimal in this sample, as expected in a high-traffic, well-maintained area.

The lowest sample (1020514) is interpreted as a maintained dirt surface with an overlying accumulation of sterile sediment heavily altered by carbonate development (Figure 6.173). The lowest bed is interpreted as the result of trampling and likely represented a maintained occupation surface. There are sparse inclusions of anthropogenic components, such as fine charcoal and plaster, and a low amount of organic matter within the floor, with a higher degree of organic material (mostly insect excrement with some unburned plant tissue) in the void space between the surface and the overlying bed. The overlying bed is highly compacted by carbonate development and includes very little organic matter and no evidence of bedding. This low incidence of organic material within the lowest bed (the compacted surface) would suggest that this layer relates to the chapel rather than the hay barn. While the main enclosed portion of the structure was used to store hay after the property was purchased by Emmett Carlton, this area would still have been an open air breezeway and probably not ideal for storing hay against the weather. From the micromorphology it appears that this area may have fallen into disuse leading to the accumulation of sediment over the chapel surface.

CONCLUSION

This section summarized the results of the data analyses presented in Chapter 6. The first section summarized the depositional histories of excavation units investigated as part of this dissertation. The following section summarized the results of bulk soil analyses for each of the four sites. The final section summarized the results of micromorphological analyses for each of the four sites.

The following chapter (Chapter 8) will discuss these results as they relate to the research questions proposed by this project.

CHAPTER 8 DISCUSSION

INTRODUCTION

The following section will discuss the implications of this project for historical archaeological understandings of late 1800s and early 1900s Fort Davis, Texas. The major goal of the study is to demonstrate how geoarchaeological approaches can be used to reconstruct microhistories and taskscapes of the four sites analyzed: the Laundresses' Quarters at FODA-NHS, the Enlisted Married Men's Quarters at FODA-NHS, the Francell-Byerley Property, and the Smith-Carlton Casa Vieja. As a geoarchaeological study, attention is also given to a range of interpretative concerns including geological and pedological processes, the identification of historic materials in thin section, and describing typical microfacies of Fort Davis historic sites.

The first section discusses the identification of historic artifacts in soil micromorphological thin sections. As little micromorphological analysis has been done at historic archaeological sites in the 1800s and 1900s, comparative analysis of thin sections, trimmed blocks, and known historic artifacts was necessary to make several identifications. This section serves as a preliminary comparative reference collection for little documented historical materials. Identification of historic artifacts in thin section is important for the use of micromorphology within historic archaeology as it allows for microscale geoarchaeological analyses and macroscale historic artifact analysis to be connected.

The second section describes typical microfacies encountered in micromorphological analysis of Fort Davis thin sections. Microfacies are sedimentary units seen in thin section which are characteristic of particular contexts. This project has described microfacies associated with historic middens and dumping deposits, decayed wooden floors, trampled earthen floors, and a privy. All of these were excavated during 2014 and 2015 FODAAP investigations.

The third section focuses on sedimentary and pedological processes in Fort Davis as reconstructed through the various microscale analyses reported above. The local manifestations of these processes have specific implications for archaeological research at Fort Davis, particularly for explaining the nature and preservation of the archaeological record. Low rates of sediment deposition over time, for example, have resulted in deflated and eroded archaeological deposits, or palimpsests, throughout the town that create difficulties for establishing archaeological chronologies.

The last two sections apply the geoarchaeological analyses of this project to the central project questions. The fourth section describes life histories for each of the four sites based on the geoarchaeological data presented in this dissertation. Events related to constructions, occupation, abandonment, demolition, and post depositional alterations are discussed for each of the four sites where relevant and supported by the data. For instance, the Casa Vieja has been continuously occupied since its construction, so its life history is ongoing and does not include abandonment or subsequent events. At the opposing extreme, a scarcity of data for the Francell property structure leaves very little evidence for detailed interpretations about specific occupations and so only generalities can be made.

The fifth and final section will reconstruct taskscapes associated with specific activities from the Fort Davis Sites. The discussion centers on taskscapes of habitation and disposal of refuse as these activities are most clearly represented in the geoarchaeological materials from Fort Davis. Contrasting with the analysis of life histories, the taskscape approach is spatially extensive and considers routes of movement and the patterns of activities across sites rather than viewing each site in isolation.

The sixth section summarizes how geoarchaeological analyses provide a valuable approach for historic archaeology. Although geoarchaeology has been more commonly utilized within archaeological analyses of deep time, the tight time scales possible through microscale geoarchaeology, and micromorphology in particular, provide interpretations at a scale similar to that possible through historic archaeology.

PART I: HISTORICAL MATERIALS IN THIN SECTION

As micromorphological analysis has rarely been conducted on historic sites there are a range of materials and contexts for which reference material exists at the microscale. To this end, this project aimed to produce a catalog of identified historic materials in thin section. Identification of materials was carried out through a combination of microscale methods. In some cases (such as identifying metal), thin section analysis and knowledge of the optical properties of specific materials was sufficient to identify unknown materials. For others, use of trimmed blocks in addition to thin section slides, along with consultations with historic artifact specialists was necessary. For some materials discussed below the identifications presented are preliminary only and will need further comparative collections or slides made from known materials to confirm. This is particularly the case for the styrofoam and lime identifications.

Metal

Metal seen at the Fort Davis sites is primarily iron, and so is the focus of this discussion. The distinctiveness of iron makes it easy to identify macroscopically or in reflected light. Larger fragments are generally thin and elongated and are dark black to red macroscopically due to oxidation and rust (Figure 8.1). In reflected light iron will appear steely blue (Figure 8.1). In polarized light, however, metal will appear opaque as light cannot pass through the material. This can be problematic in contexts which also have a high density of charcoal as small fragments of iron and charcoal can be indistinguishable at first glance as both are black under both plane and cross polarized light. When iron fragments are large enough, the edges of iron will sometimes retain their reddish color. When the iron corrodes it may leach into the fabric groundmass lending it a reddish color due to iron staining (Figures 8.2)

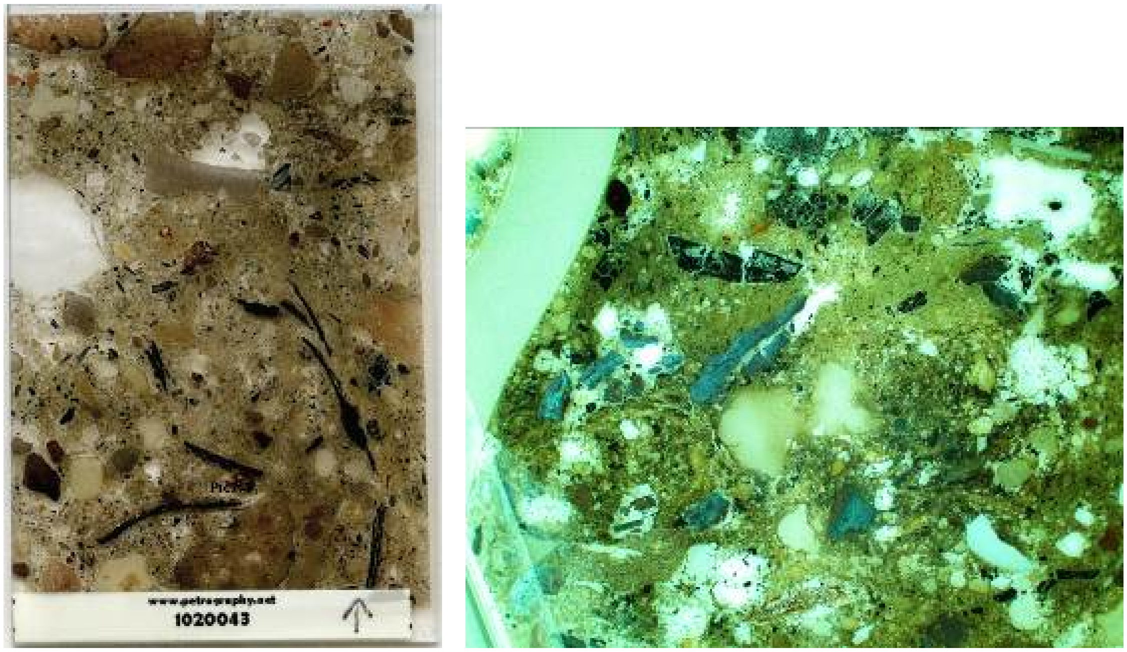


Figure 8.1: Left: flatbed scan of SMS Sample 1020043 with elongated iron fragments in the lower portion of the slide. Right a close up image (6.7X magnification) from SMS 1020025 (Francell A Unit 2) showing metal fragments in reflected light (the steely blue inclusions

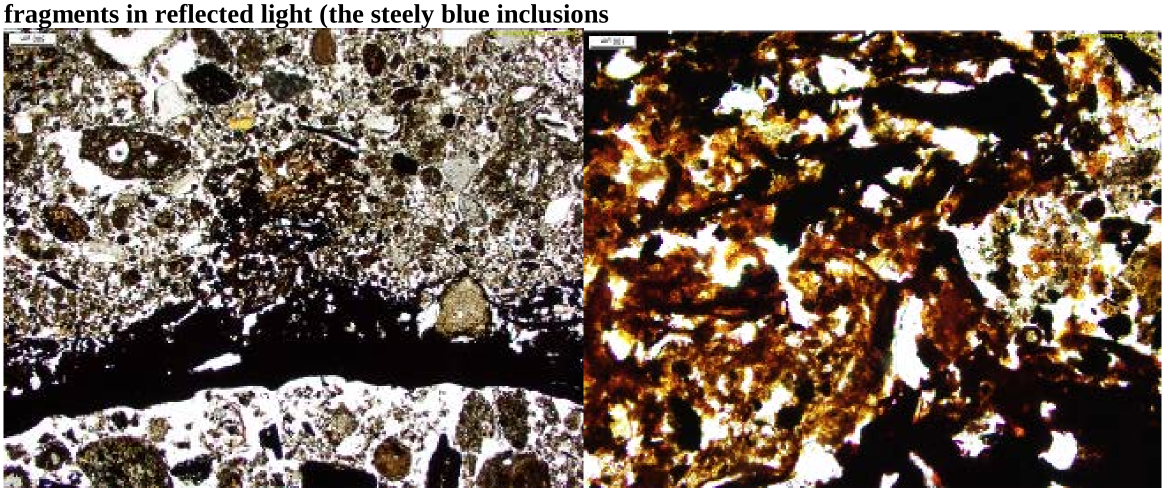


Figure 8.2: Left: close up from SMS 1020043 (Francell A Unit 1) showing elongate metal fragment leaching into the soil fabric (central opaque fragment). Right: Close up from SMS 1020043 (Francell A Unit 1) showing close up on leached iron (reddish portions).

Glass

Historic types of glass are indistinguishable in thin section as all appear clear. However, identifications of color of glass (brown glass, green glass, etc.) can be made using trimmed blocks when the fragment of glass is large enough. As thin section slides and cover slips are also made from glass, recognizing the presence of glass fragments within the thin section itself is done based on high relief boundaries as well as alterations to the glass itself. Edges of glass fragments appear highly distinct from the surrounding resin (high relief) and are at times chipped or fragmented (Figure 8.3). Particularly significant impacts can also result in concodial fracture patterns similar to that seen for high quality flint knapping materials such as obsidian or flint/chert (Figure 8.4). Alterations to the glass structure are particularly apparent in cross polarized light (Figure 8.4). Glass from the Francell A units also shows alterations due to high heat exposure. This results in a bubbled and mottled appearance of the glass (Figure 8.3)

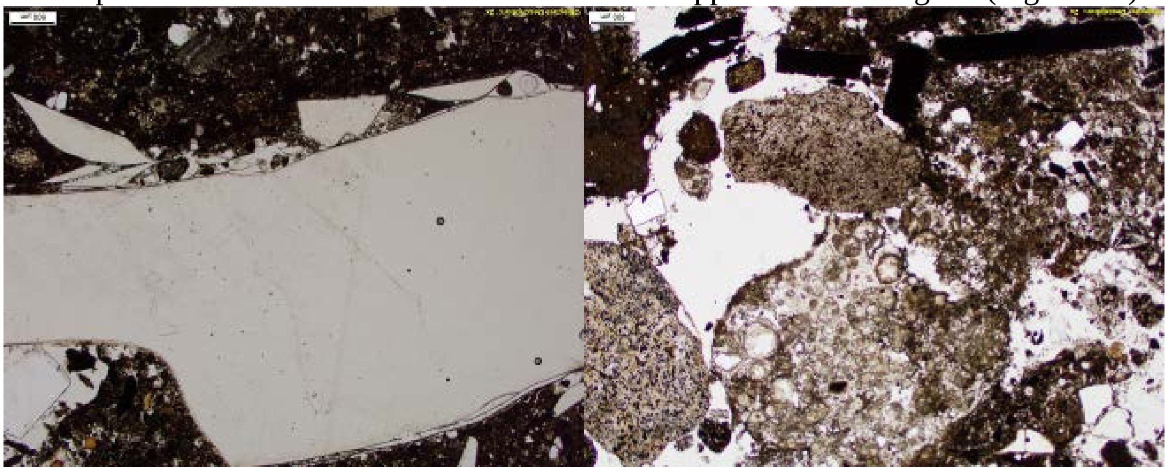


Figure 8.3: Left: Fragment of brown glass (identified using the trimmed block) showing fracturing at the upper boundary. Right: Close up from SMS 1020156 (Francell a Unit 1) showing heat altered glass

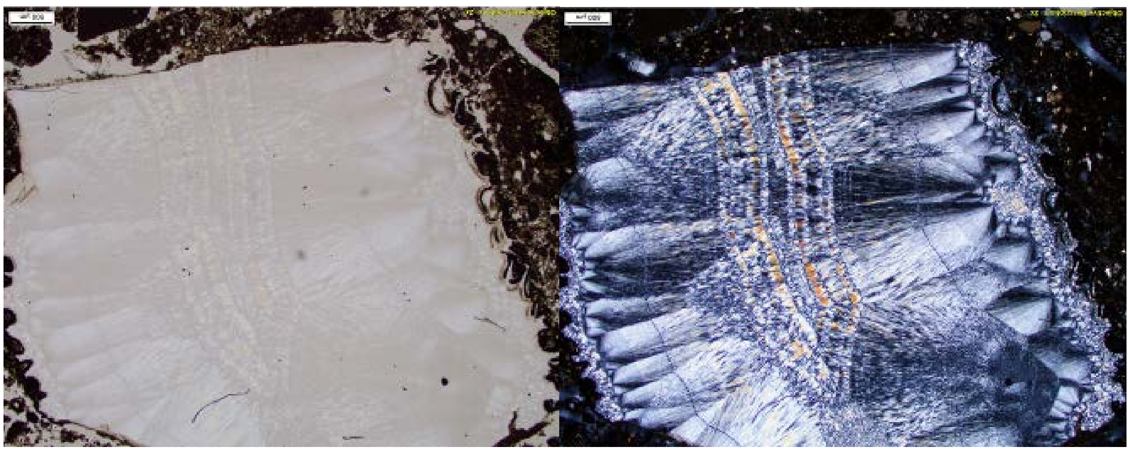


Figure 8.4: Close up from SMS 1020152 (Francell A Unit 2) showing fractured glass fragment in polarized (left) and cross polarized light (right)

Ceramic

Historic ceramics appear as extremely fine grained ceramic material. The only fragment of ceramic identified in the Fort Davis materials was a piece of lead-glazed porcelain from Francell A. The fragment was identified from the trimmed block by K. Eichner. As seen in Figure 8.5 the fine-grained silicate fabric shows some individual grains (more pronounced in cross polarized light) but with a more fused fabric than is generally expected for ceramic materials. The lead glaze is opaque in both plane polarized and cross polarized light.

An additional instance of ceramic as part of a composite material was observed within the Francell A midden. An iron fragment in Francell A unit 1 was observed adjacent to what appeared to be plaster or thin ceramic material. This was identified collaboratively as porcelain enameled iron, a material historically used in cookwares (K. Eichner, personal communication).

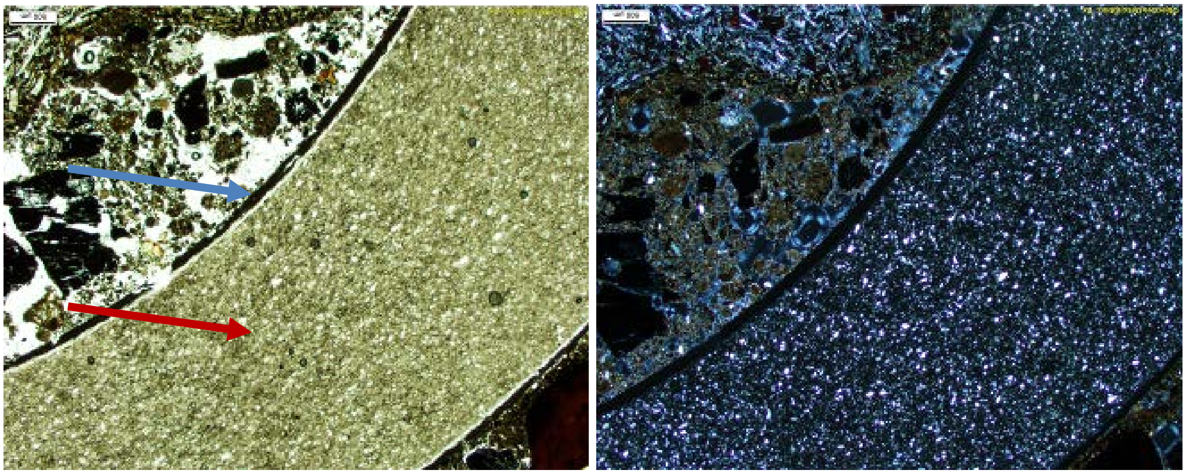


Figure 8.5: Close up from SMS 1020025 (Francell A Unit 2) showing porcelain (red arrow) with a lead glaze (blue arrow). Right image is the same material but in cross polarized light.

Plaster

Several types of plaster were identified at the Fort Davis sites, including a lime-based plaster seen at Francell A and C, Casa Vieja, and the Laundresses' Quarters, as well as a highly organic, probably dung-based plaster seen at the Laundresses' Quarters and Enlisted Married Men's Quarters.

Lime plaster, made from slaked lime, appears as fine-grained, gray or light-brown, calcitic material with variable inclusions. Most instances identified are disturbed, thin fragments incorporated into the groundmass of residential contexts (Figures 8.6). Lime plaster was observed in Units 1 and 3 of Francell C and in the lowest contexts of Unit 2 from the Casa Vieja. Burned lime plaster, in contrast, is a matte reddish color. It displays a birefringence like fine-grained calcite in cross polarized light (Figure 8.7). Burnt lime plaster was observed in Francell A Unit 1 as well as in Unit 53 in the Laundresses' Quarters.

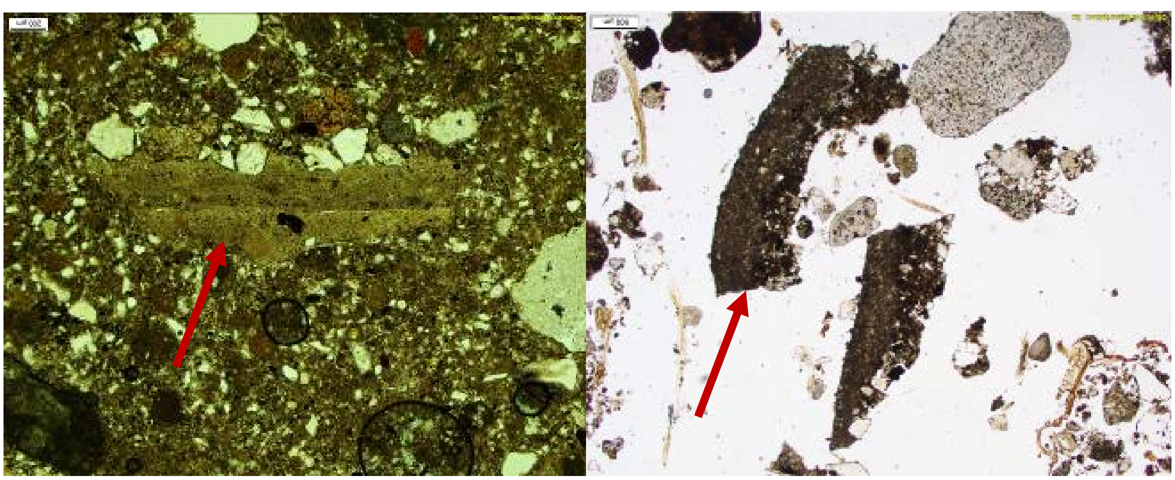


Figure 8.6:Left: Close up from SMS 1020613 (Casa Vieja Unit 2) showing lime plaster (red arrow). Right: Close up from SMS 1020289 (Francell C Unit 1) showing lime plaster (red arrow)

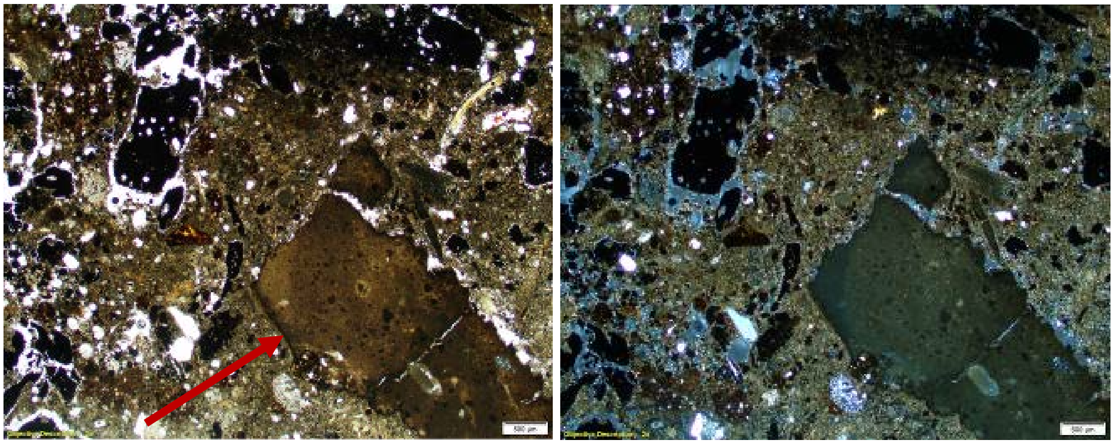


Figure 8.7: Close up from from SMS 1020156 (Francell A Unit 1) showing burnt lime plaster. Left image is in polarized light and right image is in cross polarized light.

An additional material identified as an organic, possible dung-based plaster, was noted at the Laundresses' Quarters Unit 25 and the Enlisted Married Men's Quarters Units 64 and 69. This material is highly variable but includes a blurred, fibrous, organic-y fabric with inclusions of sediment and possibly ash (Figures 8.8). It is generally yellowish in reflected light (Figure 8.8) and mostly opaque in cross polarized light (Figure 8.9) supporting the organic-based material interpretation. In the Enlisted Married Men's Quarters there were several instances of materials that could be either carbonate precipitations incorporating organic matter or organic plasters highly affected by carbonate processes (Figure 8.9).

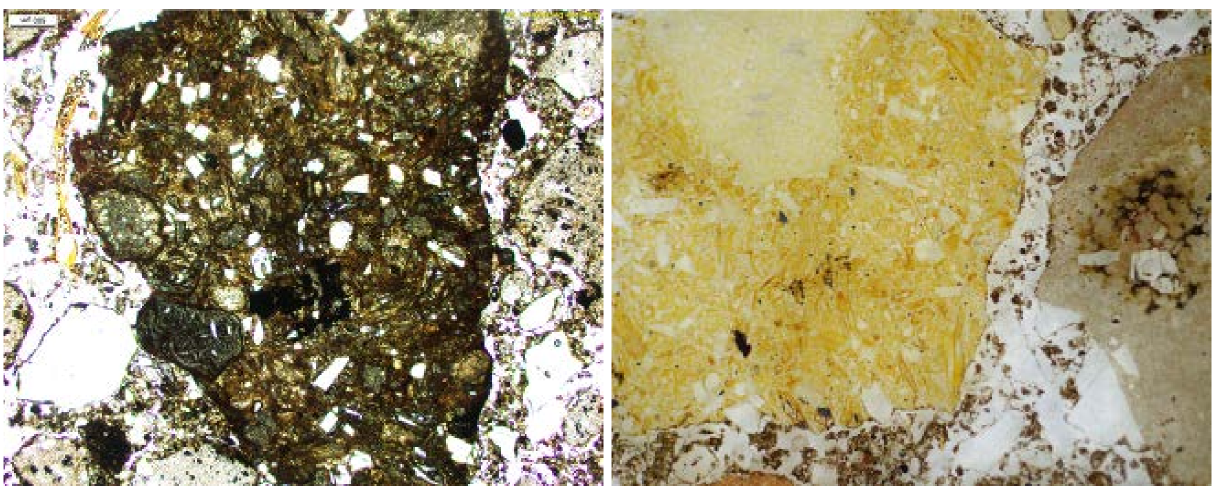


Figure 8.8: Left: Close up from SMS 1508500 (Laundresses' Quarters Unit 25) showing organic-rich plaster (central aggregate). Right: Close up on organic-rich plaster in reflected light (magnification approximately 6X), from SMS 1021656 in the Enlisted Married Men's Quarters, Unit 64

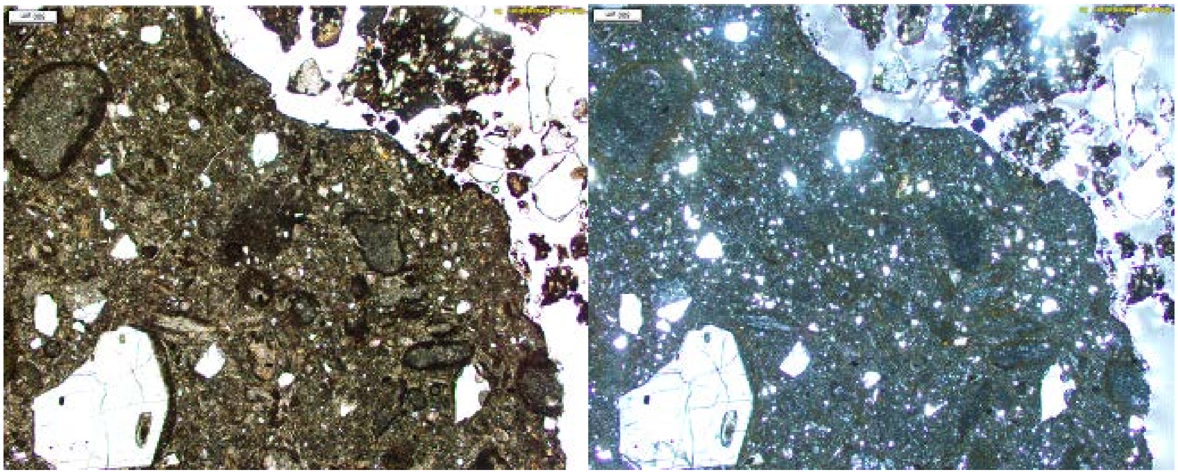


Figure 8.9: Close up from SMS 1021661 (the Enlisted Married Men's Quarters Unit 69) showing organo-carbonate nodules. Left is in plane polarized light. Right is in cross polarized light.

Adobe

Adobe, or a similar sediment-based material, was identified in samples from Units 67 and 64 at the Enlisted Married Men's Quarters. This material is composed of moderately-sorted, fine-grained local sediment with larger inclusions of mineral and organic material (Figure 8.10). There is limited localized parallel orientation of the groundmass and the material appears in blocky aggregates with irregular boundaries. In contrast to soil aggregates the material does not appear to contain organic matter in the fine fraction, although recognizable organic material is present in the coarse fraction, interpreted as an intentionally-added temper.

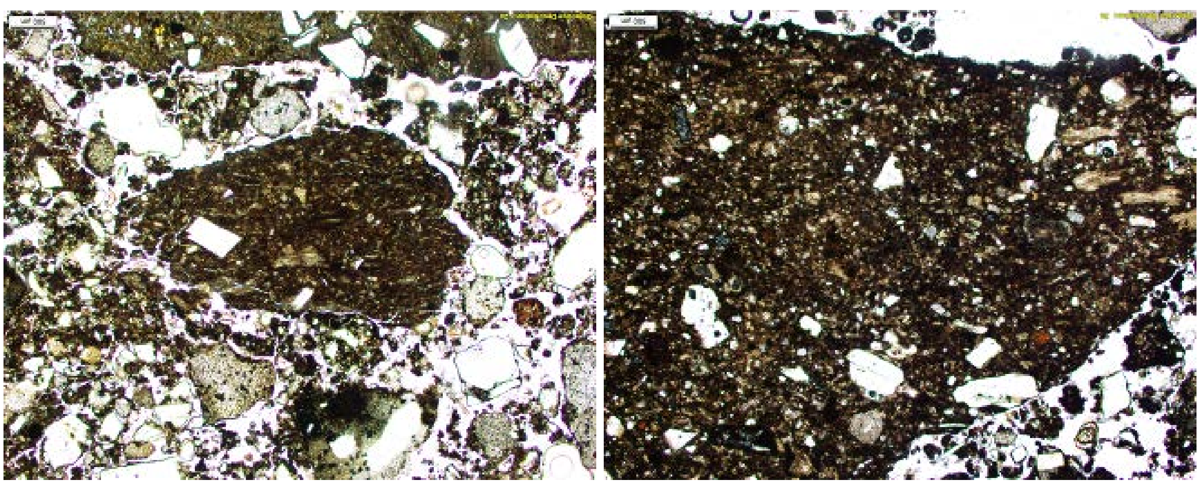


Figure 8.10: Left: Close up from SMS 1021656 (the Enlisted Married Men's Quarters Unit 64) showing possible adobe fragment (the central aggregate. Right: Close up from SMS 1021706 (the Enlisted Married Men's Quarters Unit 67) showing possible adobe fragment with fine grained sediment and small quartz inclusions).

PART II: MICROFACIES OF FORT DAVIS, TEXAS

Microfacies describe sedimentary units seen in thin section which are typical for particular contexts. At Fort Davis, typical microfacies were found associated with middens and dumping deposits, trampled dirt floors, decayed wooden floors, and the privy. The following section described each of the microfacies at the Fort Davis sites.

Middens

Several contexts of anthropogenic debris (generally described as middens) were identified during FODAAP excavations. Two of these were analyzed micromorphologically: the 1920s/1930s midden from the Francell-Byerley property (Francell A) and a deposit of highly burnt anthropogenic material in Units 23 and 16 of the Laundresses' Quarters at FODA. From these contexts it is possible to identify a number of the expected characteristics for midden deposits in historic Fort Davis.

Midden deposits are very internally heterogeneous with a high density of artifacts and related anthropogenic debris including metal, bone, eggshell, charcoal, glass, ash, and ceramic. Much of this material is often burnt or partially burnt, yet burning of the surrounding sediment is rare, suggesting that anthropogenic material was usually burnt prior to being dumped. Ash is often intermixed within the sediment fabric, or observed concentrated in discrete ash lenses. Iron from artifacts can also be observed leaching into the surrounding sediment matrix staining it a reddish color. Phosphate development appears limited and carbonate development varies but is similar to the surrounding sediments.

The fabric of midden contexts is generally loose with abundant void spaces and minimal compaction, giving it a spongy or crumbly appearance (8.11). Microscale organization of the deposits shows a massive and unoriented structure. Stratigraphic layers, likely corresponding to individual dumping episodes, are visible in the Francell-Byerley property midden in Francell A, but not in the debris features at the Laundresses' Quarters. It is likely that the Laundresses' Quarters feature was related to a specific event in the razing of HB 211, while the Francell-Byerley property midden developed due to many dumping episodes and continued disturbance over an extended period of time.

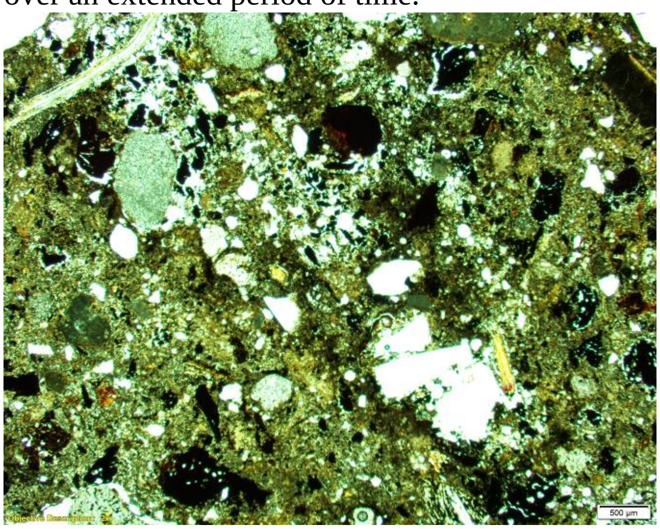


Figure 8.11: Close up from SMS 1020155 (Francell A Unit 1) showing heterogeneous, unoriented midden fabric with small charcoal and metal inclusions (opaque fragments), and an ashy matrix (gray flecks in fine fraction).

Floor (Dirt)

Several floors or surfaces were identified during excavation and micromorphological analysis of the FODAAP sites. Of these, two were instances of trampled dirt floors, including a surface from Unit 2 at the Smith-Carlton Casa Vieja which is interpreted as relating to the use of the structure as a chapel. Additionally, disturbed fragments from a dirt floor in the interior of HB

211 were identified at the Laundresses' Quarters at FODA. From these instances an overlying expectation for trampled dirt floors in historic Fort Davis can be presented.

Trampled dirt floors in Fort Davis are usually observed to have a sharp boundary between the context or bed of the floor and the overlying contexts (Figure 8.12). This boundary space often includes a small gap area with loose sediment and organic material below the overlying context. The context of the floor itself is compacted and significantly denser than the overlying context. The uppermost portion of the floor context may show mild to moderate orientation of coarse sediment particles from trampling, as well as dark staining from the decay of organic matter. The make-up of the floor deposit may contain fine-grained anthropogenic material, such as charcoal or plaster, or other material.

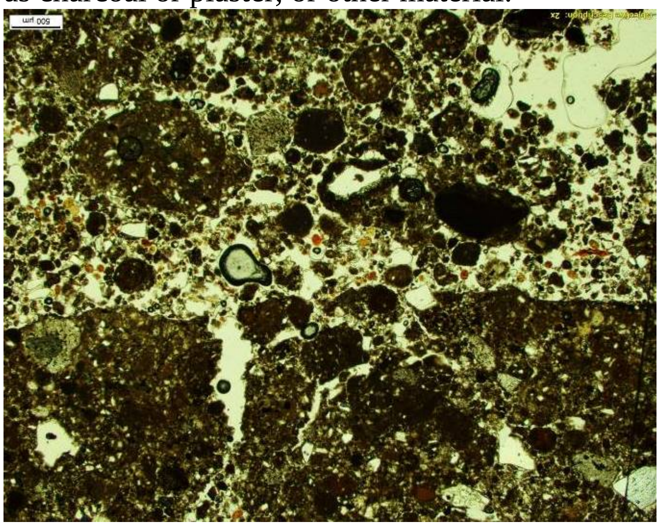


Figure 8.12: Close up from SMS 1020164 (CV Unit 2) showing an occupation surface (lower part of image) with an overlying boundary void containing organic matter and mixed deposits above. The occupation surface itself is darker in color due to organic staining and also contains small anthropogenic materials.

The chapel floor observed in micromorphological samples from Unit 2 at the Smith-Carlton Casa Vieja is the most well-preserved instance of a trampled dirt surface at the FODAAP sites (Figure 8.12). It has a pronounced boundary with the overlying sediment; a loose, compacted, dark-stained surface with mild parallel orientation of long axis of components in the coarse fabric; and small inclusions of charcoal and plaster within the floor deposit itself. The surface from HB 211 at the Laundresses' Quarters is only observed as small isolated fragments which have been reincorporated into the surrounding sediment matrix. These fragments show a compacted, dark, organic-rich surface with moderate orientation of coarse particles. However, as their context is disturbed, the relationship between the surface itself and the overlying sediment cannot be described.

Floor (Wood Interior/Exterior)

Two instances of decomposed wooden floors were observed at the Laundresses' Quarters at FODA. One was an exterior wood floor associated with HB 211, the second was an interior wood floor from HB 212. In both cases, wood fragments along with upright nails were observed during excavation, aiding the interpretation of both areas as wooden floors. No intact remains of the floors were observed in thin section. However, the decay of the wood into the underlying sediment produced distinct signatures in both contexts.

The defining feature of both decayed wooden floors was the presence of substantial amounts of organic matter but without features related to plant growth such as roots or plant tissue. In thin section, decayed wooden floors appear as highly organic layers with a spongy microstructure and little intact plant tissue (Figure 8.13). Channel voids in both cases were rare and were generally not associated with root remains as seen elsewhere at the Laundresses' Quarters. These features lead to the characterization of decayed wooden floors as highly organic, but not "rooty" as is seen in other highly organic contexts associated with surface vegetation.

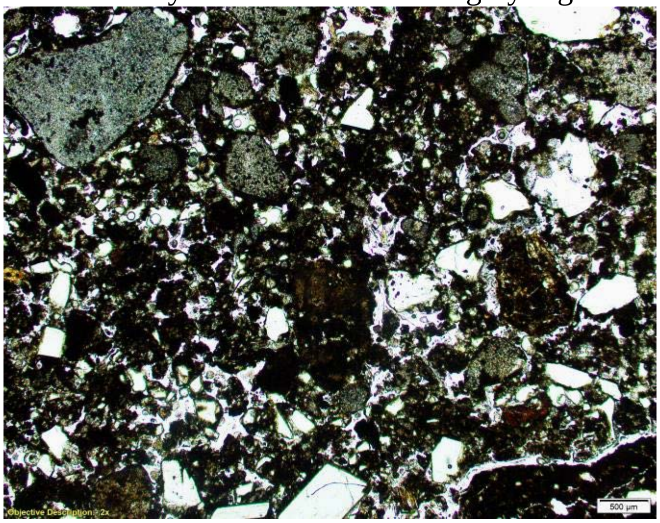


Figure 8.13: Close up from SMS 1508508 (LQ Unit 31) showing Organic-y soil from decomposition of a wooden exterior floor.

The decayed wooden floor from Unit 32 in HB 211 encompassed exterior space and is substantially more pronounced in the above features compared to the floor observed in HB 212. The floor from HB 212 was from interior space. Being in an interior space and protected from weathering would have minimized decay processes for the HB 212 floor. Even after the structure was abandoned, dilapidated remains of the roof and walls would have served to lessen the impact of 'outdoor' weathering processes on the floor compared to the exterior floor of HB 211.

Privy

Excavations in the privy (HB224 unit 67) associated with the Enlisted Married Men's Quarters residence (HB 202) offer an important opportunity to assess micromorphological features of a historic privy. From excavation and micromorphological analysis HB 224 appears to have been cleaned recently when it fell into disuse. The upper portion of the privy was then filled with domestic debris including metal, ceramic, and glass typical of what is found elsewhere at the Enlisted Married Men's Quarters.

The lowest contexts of the privy (below the domestic debris) are interpreted as containing remains from the privy itself, although probably recently cleaned prior to disuse. During excavation these contexts smelled of feces and they contained distinct features observed in micromorphology. These included small fragments of bone which can be observed in feces generally, as well as phosphatic features and calcitic features. Phosphatic features are generally rare across the FODAAP sites but several are present within the micromorphology samples from Unit 67. These include phosphate accumulations associated with ash and bone (Figure 8.14) as well as phosphatized organic aggregates that may be plaster. It is likely that this frequency of phosphatic features in the privy is due to the concentrated addition of excrement to the soil.

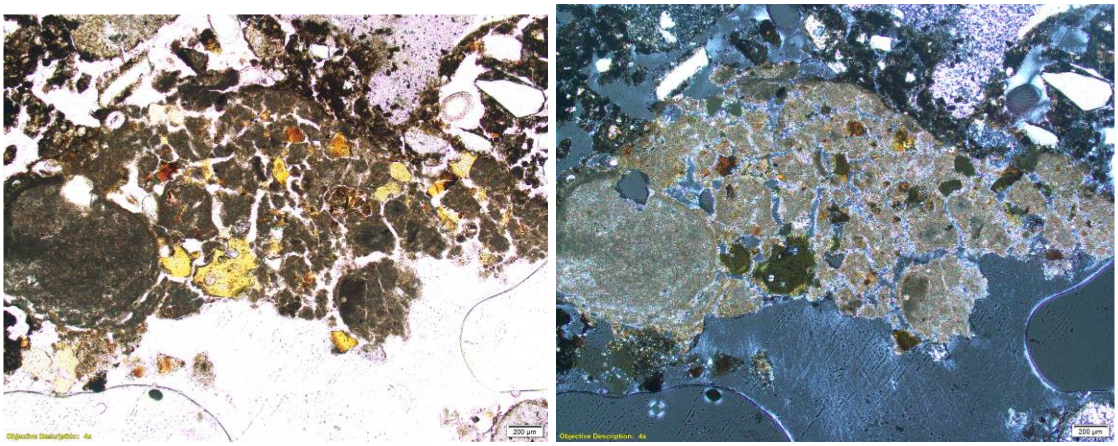


Figure 8.14: Close up from SMS 0021714 (MM Unit 67) showing phosphatic features (orange nodules) associated with ash (gray clusters) and bone (yellow fragments).

Calcitic features, particularly carbonate nodules, are also frequently observed throughout the FODAAP sites. The enlisted married men's quarters in particular has a high frequency of large carbonate nodules precipitated in void spaces within the soil fabric. Micromorphology from Unit 67, however, has several irregular calcitic features including an accumulation of gray calcitic material in slide 0021714 (Figure 8.15) and several diffuse carbonate patches and fragmented nodules in 0021714 and 1021715. As discussed above, the formation of diffuse carbonate patches are a typical pattern for carbonate development in calcareous sedimentary materials (Wieder and Yaalon 1982). However, none of these features were observed elsewhere in the Enlisted Married Men's Quarters at FODA, or in the Laundresses' Quarters at FODA. This suggests that the soil material within the privy has more calcareous content that the surrounding sediment which shows a pattern of low carbonate development typical of non-calcareous soils. This difference can be explained through the presence of lime, which was historically used to sanitize privies. Additions of lime would provide fine-grained calcareous material to intermix with the surrounding sediment, producing a more calcareous parent material for subsequent diagenesis in which carbonate patches could precipitate. The gray, high birefringence material observed in slide 0021714 may be unaltered lime.

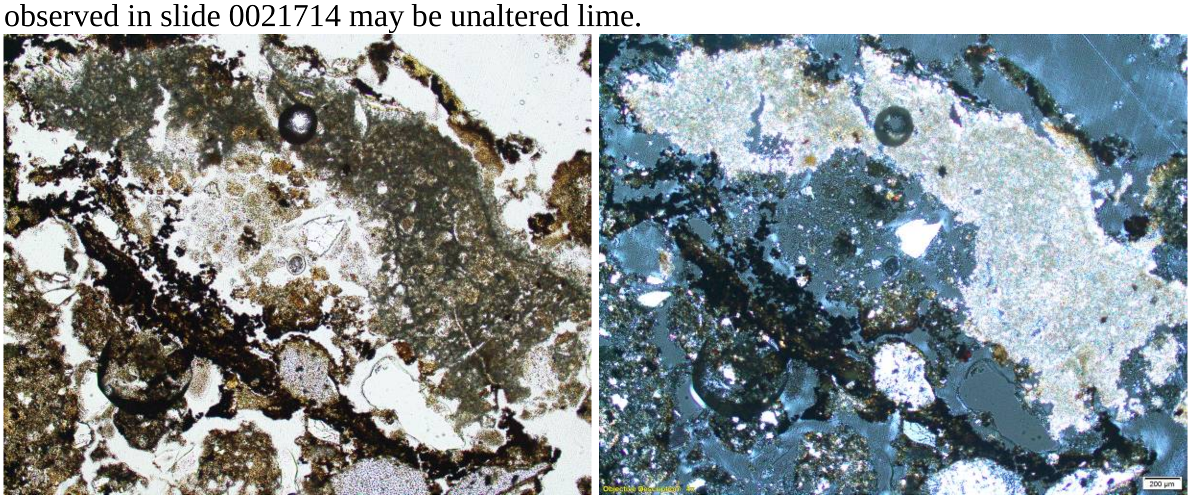


Figure 8.15: Close up from SMS 0021714 (MM Unit 67) showing phosphatic features (orange nodules) associated with ash (gray clusters) and bone (yellow fragments).

PART III: SEDIMENTARY AND PEDOGENIC PROCESSES IN FORT DAVIS TEXAS

Geoarchaeological analyses often serve to align archaeological research within geological and pedological processes as established by previous research and outlined previously in Chapter 3. Based on the field descriptions and lab analyses conducted through this study, the sediment across Fort Davis, Texas, is generally a silty sand with fragments of trachyte (a felsic volcanic rock, generally referred to as rhyolite in most geological maps of the area), tuff (very fine grained felsic volcanic rock composed of fragments of quartz and feldspar in a silicate matrix), small amounts of limestone and basalt, as well as inclusions of quartz, feldspar, micas and calcite crystals. This is expected due to the volcanic geological history of the region (Anderson 1968). Micromorphological analysis supports the results of particle size analysis. Thin sections show that sand-sized coarse material is generally between 30% and 40% of the overall sedimentary fabric, and particles are usually subrounded to rounded. The fine fraction is generally composed of silt-sized particles.

Secondary carbonates, primarily in the form of calcitic nodules and infillings, were observed throughout the deposits to varying degrees. These features are typical of arid and semi-arid soils and develop through the introduction of water to carbonate-rich sediments (Birkeland 1999, Machette 1985, Gile *et al.* 1966). As outlined in Chapter 3, carbonates can have a significant impact on archaeological remains. Salts from carbonate-rich sediments can impact archaeological materials, and carbonate impregnation of archaeological contexts can overprint archaeological stratigraphy, thereby erasing evidence of the depositional relationships between sedimentary units. The frequency of carbonate features varies across the four sites discussed here. These features are generally rare in the Laundresses' Quarters, more common in the Enlisted Married Men's Quarters and Casa Vieja, and are a dominant feature at the Francell-Byerley Property.

At the Laundresses' Quarters carbonate nodules are rare and were primarily identified on the upslope sides of stone foundations where water would be most likely to accumulate. Intact plant remains occur in varying proportions and degrees of decay in the micromorphology samples. There is overall very little to no evidence for secondary pedogenic processes, such as carbonate development or clay mobilization. There is also little evidence for redox, such manganese nodules, iron nodules, or depletion features, all of which occur in the presence of standing water. Based on field observations of landform-scale features in the surrounding area, wind erosion is likely a significant cause of deposition and erosion. Over the three years of FODAAP, the excavators have witnessed the gradual eroding of a hillslope which contains the foundations of HB 211 (excavated in 2015). Aeolian erosion accounts for the lower amount of fine particles in upper stratigraphic contexts. Bulk analysis shows the lowest mean pH, lowest mean percentage of organic matter, and high percentage of sand particles of the four sites. This suggests that Laundresses' Quarters has undergone the least pedogenesis of the four sites.

Soil from the Enlisted Married Men's Quarters differs significantly from the Laundresses' Quarters. Placed at the base of the cliff side to the west of the fort, this area has high vegetation cover stabilizing a thin organic-rich soil overlying rocky parent material. Overall the soil from this area is loose, organic-rich, sandy soil with large rocky inclusions that increase in size and frequency with depth. In the field most contexts were distinguished through changes in the amount of rocky inclusions or artifact density, rather than sedimentological variation. Micromorphological analysis showed that the mineralogy is similar to other contexts at FODA. Large amounts of silicate tuff and small quartz crystals dominate the coarse fraction while trachyte, basalt, feldspars, calcite crystals, and limestone occur as accessory rocks and minerals. The fine fraction is usually dark in color indicating substantial humic material. Additionally, most slides show a crumbly to blocky microstructure indicating a higher degree of soil development than seen at the Laundresses' Quarters. Also in contrast to the Laundresses' Quarters, most slides show indications of carbonate development. This includes micritic carbonate nodules containing soil fabric along with other organic matter, carbonate coatings, and one instance of dissolution of a silicate tuff nodule by a carbonate coating (Figure 8.16). Depletion features indicating short-term water saturation are present in several slides along with features related to insect activity (Figure 8.16).

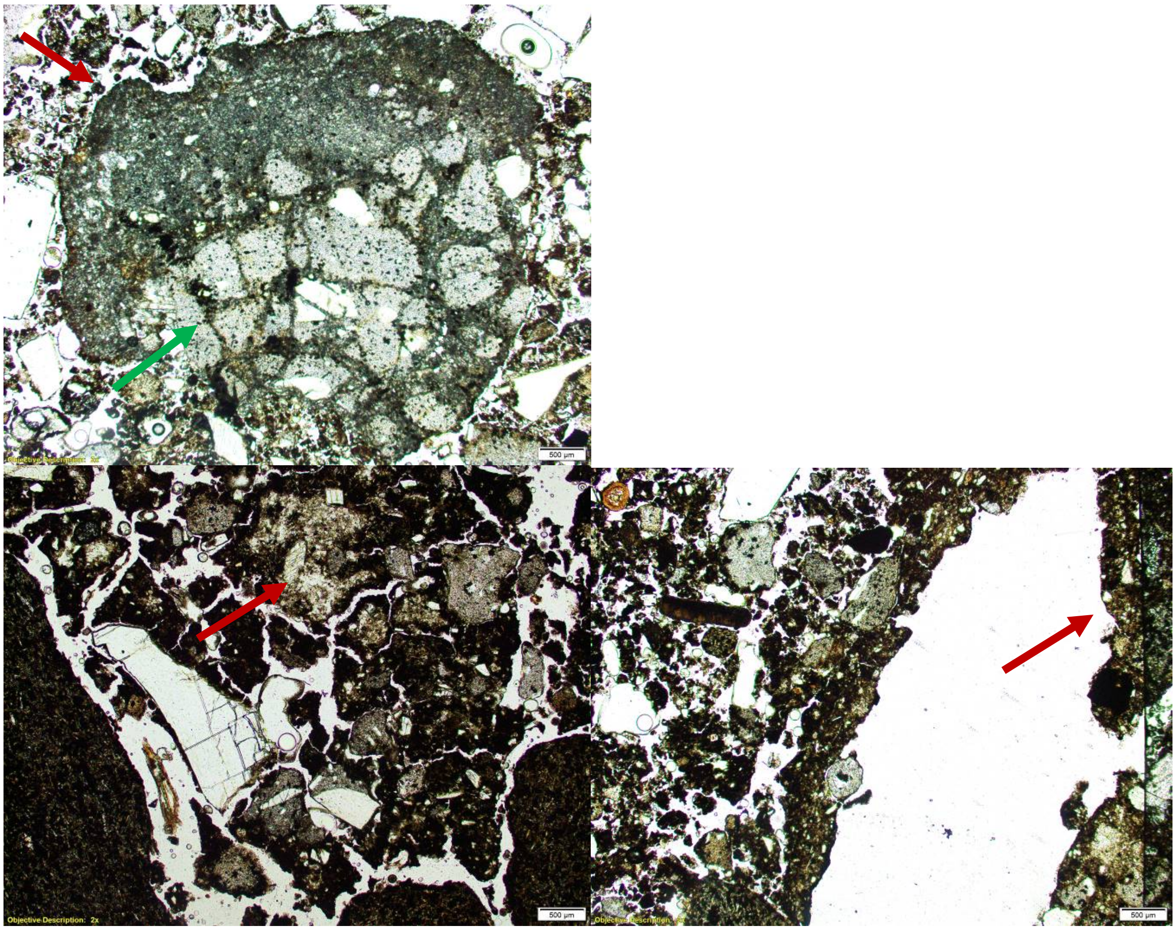


Figure 8.16: Top: Close up from SMS 10201655 (MM Unit 64) showing a carbonate coating (red arrow) engulfing a tuff nodule (green arrow). Left: Close up from SMS 1021660 (MM Unit 62) showing depletion features (red arrow) from water saturation. Right: Close up from SMS 1021629 (MM Unit 62) showing a void with organic hypocoating (red arrow) related to insect activity. Images are in PPl at 20X magnification.

The sediment from the Francell-Byerley property has similar mineralogical characteristics as the other sites from Fort Davis, but with a much higher incidence of carbonate development and a low rate of organic matter accumulation. This is seen in both the overall higher pH (more alkaline soils) from the Francell-Byerley Property samples, as well the high frequency of carbonate features present in the micromorphology slides. Given the highly alkaline nature of soil carbonate, overall soil pH is elevated. Samples from the Francell-Byerley Property were not only on average the highest of the Fort Davis sites, but also included samples with the individually highest pH of all the FODAAP samples.

Carbonate nodules identified in thin section include micritic nodules, sparry nodules, mixed crystallization nodules, compound nodules, and rare fractured nodules, but diffuse carbonate accumulations are rare. Overall, tuff fragments are less frequent at the Francell property while trachyte is more common, but both rock types are present in all samples along with accessory minerals such as quartz, feldspars, and micas. Limestone and basalt fragments are ubiquitous, but in low frequencies. Clay features, such as coatings and compound carbonate nodules (where several carbonate nodules are cemented together by clay), are also observed throughout the site (Figure 6.141). Clay development is most pronounced in Francell C Unit 3, which is interpreted as sediments underlying a porch. In this context, the overlying porch would have allowed the accumulation of runoff and settling of fine matter washed into the area promoted clay accumulation.

Sediment from the Smith-Carlton Casa Vieja is generally more clay-rich than sediments from other Fort Davis sites and has a higher degree of organic matter. Mineralogically, the sediment is similar to other Fort Davis sites, but with variable evidence for water action from rainfall and carbonate development. Interestingly, small landsnail shell fragments occur in most micromorphology samples from Casa Vieja, even where other anthropogenic components are absent, suggesting that this may be a natural soil inclusion. Samples with more evidence for water saturation (depletion features and channel voids) also show a higher frequency of localized carbonate-enriched clay compared to discrete carbonate nodules. This is in contrast to the Francell-Byerley Property and Enlisted Married Men's Quarters where carbonate development is seen primarily as discrete nodules.

Development of Carbonate Features in Fort Davis Soils

The major pedogenic process affecting the Fort Davis soils, and that which shows distinct variation between the four sites considered, is the nature and degree of expression of precipitated pedogenic carbonates in the soil profile. In most sites carbonate nodules are abundant and in a few cases (such as Unit 2 at Casa Vieja and Unit 64 at FODA MM) are observed to have substantially affected and overwritten preexisting soil profile characteristics. In contrast, samples from the Laundresses' Quarters have very few carbonate nodules. In general, the abundance of carbonate features correlates with the mean pH for each site, with carbonate being most abundant at the Francell Property, followed by Casa Vieja, with fewer features observed at Enlisted Married Men's Quarters and very few at the Laundresses' Quarters. As part of the micromorphological analysis of this project, a typology of carbonate features was developed in order to better characterize the range of factors affecting carbonate precipitation at sites in Fort Davis through reference to Weider and Yaalon (1987). Descriptions of each type of nodules recorded are presented in Chapter 5. The implications of variations in carbonate development as seen through this typology is discussed below.

Site	Micritic	Sparry	Mixed Crystallization	Compound	Diffuse Patched	Fragmented
Laundresses' Quarters	0.0038	NA	NA	0.0026	NA	NA
Enlisted Married Men's Quarters	0.2335	0.0055	NA	0.0082	0.0110	0.0055

Francell STP1	33.8462	0.7515	0.1979	0.0923	NA	NA
Francell A	8.4382	0.4136	0.0676	0.0563	NA	NA
Francell C	11.7379	1.6746	0.3272	0.0680	NA	0.0040
Casa Vieja	5.2845	NA	0.0030	NA	0.1274	0.0321

Table 8.1: Mean Frequency of Carbonate Nodules per cm2. Descriptions and images of nodules types can be found in Chapter 5.

Site	Micritic	Sparry	Mixed Crystallization	Compound	Diffuse Patched	Fragmented
Laundresses' Quarters	1852.00	NA	NA	1520.00	NA	NA
Enlisted Married Men's Quarters	1436.36	675.00	NA	10000.00	3000.00	2850.00
Francell STP1	359.35	976.78	3288.80	3309.31	NA	NA
Francell A	708.40	1269.16	1801.71	3737.62	NA	NA
Francell C	396.90	1117.00	1945.27	3079.67	NA	6058.50
Casa Vieja	772.09	NA	3058.60	NA	2561.10	5555.94

Table 8.2: Mean Size (um) of Carbonate Nodules. Descriptions and images of nodules types can be found in Chapter 5.

Particle size analysis of sediments from each of the four sites showed overall medium-textured sediments. Given this profile, it is expected that carbonate precipitation would follow the patterns expected for medium-textured soils as outlined by Weider and Yaalon (1982). This typology presents separate patterns for medium-textured soils based on the overall calcareous nature of the soil material. In calcareous, medium to fine textured soils, carbonates precipitate as microcalcites within the low to moderate density soil matrix, gradually becoming denser and eventually forming diffuse nodules. As microcalcite content increases, the amount of non-carbonate clay gradually decreases (Weider and Yaalon 1982). These features would be found under the "diffuse carbonate patches" within this study's typology.

In non-calcareous, medium-textured soils carbonate precipitates as sparry crystals in void spaces (defined in this study as sparitic or sparry nodules). These features then recrystallize into microsparry nodules (the micritic nodules defined in this study). The mixed crystallization nodules observed here can be seen as an intervening stage between sparry and micritic crystallization where the nodule has only partly recrystallized. Coarse-grained materials are seen to follow a similar pattern (Weider and Yaalon 1982). Images of each nodules type can be found in Chapter 5.

Additional carbonate types defined by this study which are not directly accounted for in by Weider and Yaalon (1982) are fragmented nodules and compound nodules. Fragmented nodules were generally larger (3000um to 6000um) carbonate formations with a micritic structure. These could be interpreted as either more mature, larger micritic nodules that have fragmented due to other post-formation disturbance, or as a later stage in carbonate precipitation for calcareous soils. In this second interpretation, fragmented nodules are mature, pure carbonate versions of diffuse carbonate patches where micritic calcite has entirely replaced non-carbonate clay. This second interpretation is supported by the micromorphological analyses. With the exception of an isolated fragmented nodule from Francell C, all other observations of fragmented nodules are in profiles which also contain diffuse carbonate patches (most commonly at Casa Vieja). Some fragmented nodules also have a similar morphology to associated carbonate patches, lending further support to this interpretation. For examples of the carbonate nodules types as defined by this study see Chapter 5.

Compound carbonate nodules usually appear as several small micritic nodules cemented by non-carbonate clay. They are usually between 1500um and 3000um with some much larger and observable macroscopically.

Patterns of carbonate development vary between the three sites depending on both variations in particle size and calcareous sedimentary material. FODA sediment has an overall higher percentage of sand than the Francell property or Casa Vieja (Table 7.1). The development of carbonate features there is generally lower than at the other sites (fewer nodules observed overall), but micritic nodules in particular are substantially larger (Tables 8.1 and 8.2). Micritic nodules are generally from 300 to 700 um at the Francell Property and the Casa Vieja but average around 1600um at the Laundresses' Quarters and the Enlisted Married Men's Quarters. As sandier sediment will contain larger pores and are better drained than fine-grained material, this variation in carbonate accumulation is likely due to variation in particle size.

The Francell-Byerley property has the highest degree of carbonate development of the four sites analyzed, as well as the highest mean pH (Table 7.1, Tables 8.1 and 8.2). Carbonate development is highest in the non-anthropogenic shovel test pit, and somewhat lower in the midden (Francell A) and abandoned structure (Francell C). The other three sites observed are at the base of steep hillslopes and have generally more vegetation cover than the Francell-Byerley Property (Figure 4.5). This topographic variation likely accounts for the high rate of carbonate development at Francell-Byerley Property as part of stable surface soil processes.

The two FODA sites and the Francell Property show a pattern of carbonate development similar to that described by Weider and Yaalon (1982) for non-calcareous, medium-textured soils. Carbonate nodules are generally observed in voids and at times incorporate soil fabric or other inclusions supporting their *in situ* origins. Types of carbonate nodules that fit the descriptions provided by Weider and Yaalon (1982) were observed in the micritic and sparry nodules at all three sites. Additionally, the mixed crystallization nodules show an intermediary stage where only part of the original sparry nodule has recrystallized. Compound nodules are interpreted as a combination of carbonate precipitation and concurrent clay development processes which act to bind together micritic nodules.

Carbonate processes at Casa Vieja, however, follow a pattern more similar to that described by Weider and Yaalon (1982) for calcareous, fine- to medium-textured soils. Rather than forming discrete nodules in void spaces (although these and mixed crystallization nodules are observed in some locations), the majority of carbonate precipitation appears to be occurring within the soil fabric resulting in the diffuse carbonate patches observed in thin section. As the amount of carbonate increases, non-carbonate clay gradually decreases, resulting in the "fragmented" nodules observed in thin section. As previously mentioned, with a single exception, fragmented nodules are observed within the sample profiles as diffuse carbonate patches, lending support to the interpretation of them as later stage versions of diffuse carbonate patches. The most developed occurrence of this pattern is observed within bed 1 of slide 1020614 of Casa Vieja Unit 2 where massive carbonate development has overprinted and disrupted the surrounding soil matrix.

The difference in carbonate patterns at Casa Vieja compared to the other three sites is likely due to a combination of particle size variation and sediment composition. Casa Vieja has the lowest percentage of sand of the four sites observed. The higher percentage of finer grained material leads to finer grained precipitation of carbonate with soil fabric rather than voids. Additionally, shell is observed as an accessory inclusion material within the Casa Vieja thin sections. While eggshell is commonly observed in midden deposits at Francell and the FODA sites, calcitic shell is not observed as an accessory soil material at any of the other sites. This suggests a slightly different mineralogical makeup of the Casa Vieja sedimentary material. The shell would also provide an additional source of calcareous material for Casa Vieja which is not present at the other sites. This could account for why Casa Vieja follows a pattern defined by Wieder and Yaalon (1982) as appearing within calcareous material while the other sites follow a pattern typical of non-calcareous material.

A second instance of associated diffuse carbonate patches and fragmented nodules is observed within Unit 67 at the Enlisted Married Men's Quarters. Unit 67 encompasses the entrance and pit of the privy (HB 224) associated with HB 202. While carbonate nodules similar to those seen throughout the Enlisted Married Men's Quarters are present (micritic and sparry nodules typical of the pattern for FODA sites and the Francell-Byerley property), slides from Unit 67 also show diffuse carbonate patches and fragmented nodules. In addition, there are several instances of unidentified calcitic features. One of these appeared similar to ash in PPL but have the birefringence of bright calcite in cross polarized light. Calcite-based lime was commonly used in historic privies to reduce smell and other side effects of concentrated waste. It is probable that these unidentified features are the result of lime introduced to the privy during maintenance. As described above, secondary carbonate developments include diffuse carbonate patches and fragmented nodules typical of carbonate precipitation in fine grained, calcareous soils. The addition of lime to the privy would act as additional fine-grained calcareous material within the soil fabric encouraging this pattern of carbonate precipitation.

Pedogenesis and Horizonation in Fort Davis Soils

Several observations from geoarchaeological analyses suggest that the vertical variation observed in most Fort Davis excavation profiles is due to pedogenic horizonation rather than geological or anthropogenic depositional stratigraphy. This interpretation is supported by the mineralogical similarity of sediment throughout each individual profile, the very diffuse boundaries between stratigraphic layers, *in situ* precipitation of carbonate features, and the pattern of vertical variation of particle size within the profiles with higher quantities of finer particles higher in the profile and sandier sediments lower in the profile.

While there is a small degree of mineralogical variation between the four sites investigated in this study, there is very little variation within each site. Generally, sediment within a site has a consistent percentage of major rocks and minerals observed in thin section (trachyte, tuff, basalt, limestone, quartz, feldspar, etc.). Thin sections also recorded observations on shape and orientation of coarse and fine fraction particles that were similar throughout the profile of each excavation unit. These characteristics indicate that sediments from throughout the site profiles have a similar mineralogical and geological origin.

With a few exceptions, the majority of excavation units at the FODAAP sites contained stratigraphy with very diffuse boundaries. Sediment in lower contexts within the profile was generally coarser, with finer material above. However, this change appears gradually rather than as a sharp boundary between stratigraphic units. In thin section, many samples did not show clear boundaries, but rather a diffuse change in sedimentary characteristics with depth. Soil horizons, in contrast to depositional stratigraphy, develop gradually through internal chemical and physical changes within the parent sediment. This creates diffuse boundaries between horizons which become more clearly defined over time. The pattern observed in thin sections and excavation profiles at Fort Davis indicates weakly-developed soil horizon variation rather than sediment deposition.

The patterns of carbonate development observed in various units also indicate *in situ* pedogenesis. Thin sections from all four sites include discrete carbonate nodules precipitating in voids within the soil fabric. Some of these nodules also incorporate fabric from the surrounding soil, including an example from Enlisted Married Men's Quarters where a carbonate nodule has incorporated soil fabric along with charcoal and other materials (Figure 8.4). Mixed crystallization nodules and diffuse carbonate patches also indicate *in situ* precipitation of carbonate within the profile. These observations indicate that carbonate features primarily precipitated *in situ* through local soil pedogenesis, rather than being introduced from elsewhere.

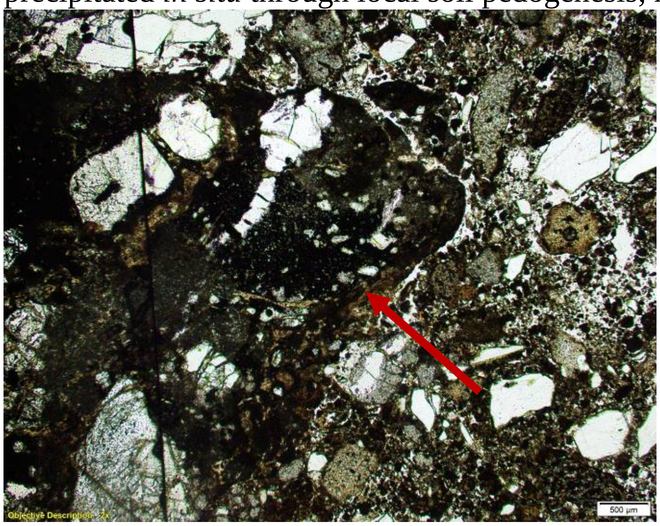


Figure 8.17: Close up from SMS 1021655 (MM Unit 64) showing a carbonate nodule with soil fabric and charcoal inclusions (aggregate at left hand side of slide).

Finally, organic matter and particle size analysis of profiles from each site show a pattern of particle size variation consistent with weak soil horizon development. In a soil profile organic matter accumulates in the uppermost horizons (O and A) as it decays at the surface. Fine-grained particles are translocated lower into the profile through water percolation and infiltration and accumulate in the B horizon, while the C horizon is primarily composed of minimally altered parent sediment. Most analyzed profiles from FODAAP have higher quantities of organic matter in the uppermost contexts, a very slight increase in fine-grained particles (silt and clay) in subsurface contexts, and generally low organic matter and higher percentages of coarse-grained particles (sand) in lower contexts. These observations, along with those outlined above, suggest that the mild vertical variation in sediment characteristics observed in Fort Davis profiles is due to pedogenesis.

While the majority of excavation units in Fort Davis follow the pattern indicated above, there are several instances where profiles demonstrate clear boundaries between stratigraphic layers which indicate sediment deposition. These instances are clearly associated with specific human activities and include the Francell A midden deposits, the dump deposit in unit 16 of the Laundresses' Quarters, the privy (HB 224) in the Enlisted Married Men's Quarters, and unit 2 of Casa Vieja that traces several episodes of the historical occupation of the structure. In each of these cases a clear boundary is apparent between the deposits, unlike the gradual change in characteristics typical of a soil profile. In the case of the Francell A midden and the Unit 16 feature at the Laundresses' Quarters, a clear, moderately diffuse boundary is apparent between the midden contexts and underlying sediment. The midden contexts are also compositionally distinct from the underlying sediment. Furthermore, stratigraphy within the midden deposits does not follow the pattern of particle size variation or organic matter content expected for a soil horizon. In the privy excavation and Unit 2 from Casa Vieja, observed contexts in thin section and excavation are associated with distinct events relating to changing use of the space. Similarly, profiles and thin sections from these locations show distinct vertical changes between stratigraphic units along with compositional variation in the material observed in each context.

LIFE HISTORIES OF FORT DAVIS, TEXAS

Combining geoarchaeological, excavation, and documentary datasets, and based on the interpretations presented in the previous sections, life histories can be constructed for each of the four sites investigated. These life histories show the ways in which the construction of place is interwoven with the mundane lives, actions, and events of the inhabitants. The actions and routines of the residents of the four homes created location-specific architectural and physical materialities which have varying remnants to the present day. With the exception of the Smith-Carlton Casa Vieja, none of the homes is currently occupied, or physically present beyond foundations or other trace signatures. Using geoarchaeological methods it is possible to assess and interpret the events and processes of abandonment, destruction, and continued impact on the landscape for each of the four homes. The degree of completeness of the archaeological and documentary records is different for each location, showing variation in permanence and impact of archaeological features.

LAUNDRESSES' QUARTERS:

According to historical sources the laundresses associated with the Fort Davis post lived in a variety of residences at different points in the Fort's history (Wooster 1990). These include residences provided by the army, jacales and other structures built outside the army's authority, as well as instances of laundresses living in abandoned fort structures, sometimes against the wishes of the authorities at the Fort (Greene 1986, Wooster 1990). A historical photograph from 1885 shows the four structures designated by Greene as HB 221, HB 222, HB 212, and HB 211 (Figure 4.4). The locations of these structures were recorded by Greene (1986) using reference to previous the Levy resource study, however, excavations by FODAAP revealed that the actual locations of the four laundresses' residences were several meters east of where the marker stakes were placed by Greene (1986). GPR survey in 2013 along with excavation in 2015 showed that structures HB 211 and HB 212 extend underneath the current NPS service road, a reconstruction of the historic San Antonio – El Paso Road. Using the historical photograph as a guide, HB 221 and HB 222 are likely also beneath and to the west of the modern road, beyond the limits of FODAAP excavation in 2015.

Historic photographs including the Laundresses' Quarters show three to four single-storey structures with low, slanting roofs and exterior walls or fences located in close proximity to the main structures. Excavations in HB 211 and 212 reveal stone foundations and a variety of flooring types. Micromorphological analysis of fragmented surface facies from near the rear door of HB 211 suggest the presence of rugs which acted to dampen the impact of trampling from routine activities. Excavation on the exterior eastern side of HB 211 revealed dark, organic-rich sediment with *in situ*, upright nails. Additionally, micromorphological analysis of this area suggests the presence of decaying organic matter, likely from an exterior wooden floor on the east side of the structure. A similar pattern seen in HB 212 is likely from an interior wooden floor where decay processes were less developed due to the structure. Excavation showed that this floor was placed above an underlying adobe subfloor.

Excavation and micromorphological data show the high level of investment put into the construction of the two laundresses' residences. While historical photographs show wooden walls and probable wooden roofs, excavation shows stone foundations (both HB 212 and HB 211), multi-stage floor construction (HB 212), and purposeful creation of exterior floor spaces (HB 211). These structures were not intended as transient shelters, but permanent residences where actions were taken to establish usable, comfortable spaces. The construction of a wooden floor over adobe subfloor may have been to mitigate the effects of flooding which was rampant in the parade ground at Fort Davis (Greene 1986). The use of rugs over a dirt floor in HB 211 may have been intended to create a sense of permanence, ownership, or "nesting" not associated with a bare dirt floor. The wooden exterior floor in HB 211 suggests deliberate use of outdoor space in close association with the house. The area may have been inside the exterior wall or fences seen in historical photographs, or may have been a type of porch or other exterior area. A wooden floor in this space suggests an incorporation of this space into the place understood to be the home and a distinction between this space and unfloored yard space.

The difference in interior floor construction between HB 212 and HB 211 is intriguing. It is currently unclear if the Laundresses' Quarters structures were built using army resources or by other means. If the laundresses were directly involved in or responsible for the construction of the floors then the difference in floor types between HB 212 and HB 211 may have been due to different access to resources by the women in the two structures or different preferences in housing type. However, if the structures were built by the army then the explanation for the different construction styles may be tied to variation over time in army construction approaches as well as available resources. Additionally, the architectural aspects of the Laundresses' Quarters structures as observed during excavation (foundations, floors, surfaces, and subfloors) were not built in a single construction episode. Wooden floors may have been added at a subsequent point in time and the construction of the subfloor in HB 212 may have removed any traces of a previous dirt floor. Additionally, it is possible that different floor types may have been used in different spaces within the home. While the interior space excavated in HB 211 was shown to have a dirt floor with probable rug coverings, exterior space adjacent to the same structure incorporated a wooden floor, suggesting that the women residing in or builders of HB 211 did have access to materials for wooden floors and that the decision to have a wooden floor in one space and a covered dirt floor in another may have been based on other criteria than access to resources.

In addition to the care taken in the construction of the laundresses' residences, further evidence from micromorphological analysis shows the deliberate maintenance of these structures and the actions through which the women residing in them made these spaces into homes. The previous section discussed the evidence for the use of rugs in HB 211. The use of rugs may have served to create a barrier between occupants and the dirt floor in order to define interior space and create a sense of residence and home. Additionally, micromorphological analysis of the sediments directly overlying the floor facies in HB 211 showed very little anthropogenic material. While a rug-covered dirt floor would not accumulate anthropogenic material within the fabric of the floor as would be expected in an uncovered floor, the material overlying the floor would still be expected to retain small anthropogenic material observable in thin section. However, slides from HB 211 show very little material in the sediment overlying occupational surface. While the floor is highly disrupted, the general lack of anthropogenic material is striking. It suggests that the area of HB 211 excavated in units 19 and 32 was sparse of general household debris. Given that this area is directly adjacent to a foundation where small debris would normally accumulate, it is likely that the space was kept generally clean.

Excavation in HB 212 recovered several fragments of rock coated in white plaster, a few of which also showed blue paint over the white plaster. Several of these fragments were recovered in close association with the interior side of the HB 212 foundation. No remains of plaster or paint were recovered in the HB 211 excavations, but small fragments of lime-based plaster, potentially burnt, were identified in thin sections from the interior of HB 211. Together with the low quantity of debris observed in thin sections from HB 211, this suggests that the women residing in these structures were taking actions to create a sense of place beyond the physical structure of the building. This is in contrast to historical accounts of the laundresses' residences as dirty and unkept (Greene 1986).

Given the limited stratigraphic deposition discussed previously, as well as the disturbance caused by subsequent events, it is impossible to differentiate individual events within the occupation of the Laundresses' Quarters by the laundresses. The presence of the current NPS service road overlying the archaeological foundations indicates that at some point the road was built over the foundations. Additionally, the feature in unit 16 within HB 211 contained a large quantity of burned architectural material (Wilkie, Eichner, and Rodriguez 2016) which micromorphological analysis showed to be a single depositional episode (rather than the accumulation of many dumping actions over time). While this location contained a large quantity of ash and burned material, charcoal and ash were not observed from thin section samples in other areas of HB 211, including nearby units. This suggests that the feature in unit 16 is not from actions of the laundresses' during their occupation of the structures. It is also unlikely that the entire structure burnt down as that would result in a wider expanse of burned material. Given that the burning feature is likely a single dumping episode and it contains quantities of construction materials, it was likely from a razing of the structure post-abandonment. This event may have been related to the construction of the road. Remaining structural material from the residence would have been torn down and probably burned (in a container to prevent forest fire in the dry Fort Davis environment). This burned material was then dumped into the foundation of HB 211 in the location that would be unit 16 before the construction of the adjacent road.

ENLISTED MARRIED MEN'S QUARTERS:

In contrast to the Laundresses' Quarters, no foundations or other architectural material were recovered during excavations at the Enlisted Married Men's Quarters, making construction of a life history for the residence difficult. The location of the structure was determined based upon surface scatter and comparison with historical photographs. The historical photograph (Figure 4.3) of structure HB 202 shows a three room structure. A main room oriented north-south appears to be built of wood, along with a smaller room attached to the northwestern side of the main structure. Additionally, another room to the southwest appears to have a canvas roof. These additions are also marked in the diagram of HB 202 in Greene's (1986) map. Other nearby structures do not have similar additions indicated on the map.

As the residence was designated for married enlisted men, it would have been the residence for a soldier, his wife and, probably, children. Given the multiple additions to the primary structure (additions that are not apparent at other nearby, comparable structures) it is likely that the family included several dependents (children or other individuals) resulting in the need for additional space. However, micromorphological analysis of samples from HB 202 showed no definitive evidence for dirt floors, decaying wooden floors, or other features related to events during the occupation of the structure. Rather, analysis of thin sections showed an organic soil with substantial carbonate development and a moderate frequency of anthropogenic input.

An interesting anthropogenic material identified in thin section was an organic-based plaster, possibly incorporating dung or ash. A similar material was observed in yard space at the Laundresses' Quarters, but other instances of plaster from Laundresses' Quarters were lime based. No lime plaster was observed in samples from HB 202. Production of lime plaster is an intensive process involving quantities of raw materials, high temperatures, and specific techniques (Boivin 2000). A non-lime, organic plaster, however, could be made using many different processes including less intensive methods. With limited associated architectural context for the plaster remains observed in thin section, little interpretation of the use of the material can be made.

While little can be said about the life history of HB 202, based on the amount and locations of artifacts it appears that the structure dilapidated in place rather than being razed. Wooden boards and other construction materials were likely removed for reuse elsewhere or otherwise relocated. Given the semi-arid climate, boards decaying *in situ* would have been observed in excavation if present. Sediment accumulated around and atop the debris as continued plant growth acted to stabilize the hillslope allowing for the pedogenic processes observed in thin section.

HB 224 was excavated partially in unit 67 which included part of the privy entrance as well as a portion of the pit. The lowest contexts within the privy pit itself appear to have been cleaned of substantial waste, but the sediment contains traces from its previous use. In addition to phosphate features from human waste, micromorphological analysis showed atypical carbonate features and a pattern of carbonate development distinct from the HB 202 samples which suggests additions of lime to the privy as part of regular maintenance. After use of the privy was discontinued it was filled with debris including ceramic, glass, metal, and other anthropogenic material typical of the enlisted married men's quarters. It is unclear when this occurred in relation to the abandonment of HB 202.

Francell-Byerley Property

The Francell-Byerley property includes three areas of investigation, two of which are included in this study; a midden of 1920s and 1930s household debris (dated by K. Eichner) and foundations of an abandoned structure. Oral accounts of the property vary. Some residents described it as a town dump, others as a convent associated with the nearby Catholic Church, others as a family home. The modern property, owned by the Byerley family, is used as a horse pasture.

The midden, designated as Francell A, is located along a small hillslope at the western edge of the property. It includes a dense surface scatter of household artifacts as well as subsurface contexts with a high concentration of artifacts, ash, and charcoal. The midden stratigraphy is complex. Micromorphological analysis showed varying layers of artifact-rich contexts and thin lenses of dense ash. Both excavation and micromorphological observations suggest that the deposit accumulated over an extended period of time through multiple dumping episodes. The majority of the material appears to have been burnt prior to dumping, with one instance suggesting light *in situ* burning. Modern Fort Davis residents suggest that household waste may have been collected in oil drums or other large containers and burnt down prior to disposal. This is consistent with the observations from both excavation and micromorphological evidence. The *in situ* burning may have been deliberate burning of the midden as part of maintenance, or potentially a product of wild fire.

Temporal dating of artifacts from the midden by K. Eichner show that the majority of material is from the 1920s and 1930s and that use of the midden as a disposal area was later discontinued. Micromorphological analysis shows a number of post-depositional processes which continued to affect the physical space of the midden itself, even as it ceased being used as a place of disposal. Leaching of iron from metal fragments stained the sedimentary fabric of several archaeologically-rich layers. Insect activity is apparent by the presence of excrement and vughy voids with hypocoatings typical of insect burrowing and subsequent post-depositional weathering.

The stone foundations designated Francell C by FODAAP excavators are located to the southwest of the midden. Even with evidence from excavations, the documentary record, artifact analysis, and geoarchaeological analysis, the temporal relationship between the two locations is unclear. Very little artifactual material was recovered from Francell C. The stone foundations outline several rooms of the structure, but no intact floors (wooden or dirt) were recovered in either excavation or micromorphological analysis. Thin section analysis showed loose sediment with small inclusions of artifactual material. Fragments of plaster were recovered in an interior room and microscopic analysis showed a lime-based plaster coating a well-sorted fine grained sediment. This is possibly the remains of a highly-disturbed plastered subfloor or wall. Excavation in the northern yard space revealed an intact wooden post while thin section analysis of surrounding sediment suggested that the space was partially covered (Matthews et. al. 1997). This is interpreted as a porch along the north side of the structure.

How the structure was used is unclear from the evidence available. Similarly, it is unclear how the structure came to be abandoned. A member of the family which administers the property recalled that the structure burnt down several decades ago and then was subsequently torn down. However, there was no evidence of a major fire in the micromorphological samples. The modern structure lies beneath and adjacent to the service road onto the property. Its location was unclear to the current property owners and was found by accident by FODAAP staff while moving the project cars. The structure was likely razed at some point prior to the use of the property as a horse pasture, possibly in order to make the area safer for the horses. However, without additional evidence it is impossible to establish a more precise life-history of the structure or midden.

SMITH-CARLTON CASA VIEJA

The Casa Vieja has the most complete life history of the four sites, which is reconstructed from a combination of geoarchaeological analysis and documentary/oral historical accounts. The original adobe structure was built by retired Buffalo Soldier Archie Smith and his Mexican-American wife in 1873. The family lived in the southern end of the structure, while the northern end was a covered, open air breezeway used as a community chapel before the Catholic Church in town was built. Micromorphological evidence of the chapel floor shows a compacted dirt floor with small inclusions of charcoal and lime plaster. The floor is well expressed and has little debris, indicating that the area was maintained and that household activities were performed elsewhere. As a community space, many people would have come in and out of the chapel creating a high level of traffic. But, as a ritual space, it would likely have been kept clear of debris from routine activities. It was also likely regularly cleaned and maintained by either the Smith family or other community members using the space.

After the property was purchased by Emmett Carlton in 1911, another house was built to the southwest of the Casa Vieja which housed the Carlton family while they used the older adobe structure was as a hay barn. Micromorphological evidence suggests the chapel area itself fell into disuse. Micromorphology samples of sediment which accumulated over the chapel floor does not contain organic matter which would be expected in a hay barn. Eventually, heavy carbonate development in this bed overprinted any original stratigraphy.

The Casa Vieja was later renovated by the Carltons in the early 1970s and the chapel area enclosed. Don and Vida Carlton, descendants of Emmett Carlton, began to occupy the structure full-time and other family members resided at the main residence to the southwest. During these or subsequent renovations, a septic tank was placed in the rear of the structure that removed any deposits from earlier time periods. Micromorphology from the front of the former chapel area, now the front door of Vida and Don Carlton's house, shows regular use of the outdoor area but without the deliberate maintenance which was seen in the chapel floor. These changes show the shift in the family's use of the space from an abandoned side of a barn to a home. Sediment accumulating near the front door was trampled by regular, routine passage of the house residents, guests, and family members resulting in the fine laminations seen in thin section. Plumbing and the roof top drain pipe added contemporary conveniences to the structure and created an organic rich, wet, and fine-grained soil in the rear of the structure.

After Vida and Don Carlton's occupancy of the structure it began to be used as a seasonal residence for the extended Carlton family who no longer lived in Fort Davis year-round. In 2011 a forest fire burned through the property, leaving fire scars on trees in the front yard and burning down several other structures on the property, including the "white house" to the north of the Casa Vieja. Micromorphological samples from near the front door of the residence show periods of sediment accumulation alternating with trampled surfaces showing the seasonal occupation of the structure by the Carltons. A quantity of charcoal in one of the uppermost beds is likely from the 2011 forest fire that burned through the property. Broken pottery shards and highly organic soil in the rear of the house may be remains of potted plants which were broken and covered by sediment.

TASKSCAPES OF FORT DAVIS, TEXAS:

To reconstruct taskscapes from the archaeological and geoarchaeological landscape of the Fort Davis sites it is first necessary to focus on particular tasks that are associated with the different Fort Davis sites discussed here. This study has focused on homes associated with the late 1800s and early 1900s in Fort Davis. As residential spaces, each home would have been a focal point for the many activities associated with dwelling, as well as expressing the varied approaches to constructing a home taken by each household. Disposal activities are also a major aspect of the FODAAP excavations, including the dense midden at the Francell-Byerley Property, the dumping event and surface scatter at the Laundresses' Quarters at FODA, and the artefactual debris concentration in the upper contexts of HB 224 at the Enlisted Married Men's Quarters at FODA.

Small portions of two homes from the Laundresses' Quarters at FODA were investigated by this study. These structures, along with an additional two structures that were not excavated during the 2015 field season, are located at a short distance from the FODA parade ground and other structures, as well as at some distance from nearby New Town (Figure 4.5). Historic photographs showing the houses reveal single storey wooden structures with low, slanting roofs and enclosed porch areas adajcent to the main structure. Geoarchaeological analysis shows clean, interior trampled dirt floors covered by rugs along with exterior wooden floors in HB 211. In contrast, HB 212 shows interior wooden floors as well as evidence for blue paint on interior wall plaster. These features (the well-kept, rug-covered floor and the use of blue paint on interior walls) are the remnants of the intential care taken by the laundresses in creating their homes.

Other physical traces of the laundresses' home taskscapes have been erased by subsequent actions impacting the landscape. The razing of HB 211 and the construction of the road over the laundresses' homes, seen in the ash and debris features in units 16 and 23, destroyed many of the physical remains of earlier events in the taskscape, overwriting them with physical traces of subsequent actions.

The landscape associated with the Enlisted Married Men's Quarters shows little evidence of the taskscape associated with the family that lived there in the late 1800s. Artifactual remains have sloped downhill and intermixed with the *in situ* soil. While it is likely that the routine activities of the family residing in HB 202 did create an impact on their landscape, any trace of it has been overwritten by the events of dilapidation and processes of pedogenesis at the site.

Similarly, the landscape at the Francell-Byerley property associated with the structure shows little evidence of the taskscape associated with its former residents. Stone foundations are visible at the surface (although it took several weeks for FODAAP staff to locate them) but are overrun by the current property access road. Excavation and geoarchaeological analysis revealed little evidence of the activities associated with habitation of the structure or of how it was destroyed down to its foundations.

Unlike the other sites, micromorphological analysis at the Casa Vieja showed a nearly complete life history of the site. However, this evidence is concentrated in one location (Unit 2), while other excavation units showed little trace of activities associated with the occupants, Archie Smith and his wife. Contexts in unit 1 in the rear of the chapel area show organic-rich sediment from renovations and installation of a septic tank, along with the impacts of an overlying roof drainage pipe.

The specific geological situation of Fort Davis (in particular the lack of deposition and integration of the historic and modern soil surface through deflation and erosion) has resulted in a situation in which the materialization of taskscapes into the landscape encompasses both the historic taskscape as well as subsequent and modern taskscapes. This deflation, in several instances, has resulted in the erasure of previous taskscapes by ongoing actions and events. This physical erasure in the landscape is also associated with an absence of memory associated with three of the four homes investigated. The laundresses' homes, despite the meanings and memory embedded through the careful attention of the women to their living spaces, were razed, filled in, and covered by a service road. Not only was their physical location covered over, but official survey' records of them place the structures in the wrong location (Greene 1986). FODAAP excavations showed that, with the exception of the HB 211 stake placed near visible foundations, the other HB stakes in the Laundresses' Quarters were not placed near the actual locations of the original structures. Excavation of a portion of HB 212 underneath the modern road, along with FODAAP GPR survey from 2013 showing the foundations of HB 211 underneath the road, suggest that the structures were located several meters further west than where they are marked by NPS HB stakes.

HB 202 in the Enlisted Married Men's Quarters was precisely marked by NPS HB stakes, but hidden under modern overgrowth of bushes, mesquite trees and cactus. While no architectural trace of the house was visible at the surface or through goearchaeological analysis, the location, as well as the presence of multiple additions, was preserved in survey maps (Greene 1986).

While the physical foundation of the Francell-Byerley property is clearly visible on the surface, local memory of the residents is limited and contradictory, similar to the lack of physical traces preserved in the landscape. Town residents alternatively told FODAAP personnel that the structure was the residence of Catholic nuns associated with the nearby church, that is may have been a school (also associated with the nuns), or that it was the home of a Mexican-American family. One account also suggested that the structure burnt before being torn down within the last 50 years. Archaeological and geoarchaeological analysis does not show evidence to support or refute any of these histories. Not only have previous taskscapes associated with the structure been forgotten by town residents, but any physical traces other than the stone foundations have been erased by subsequent activity on the landscape.

In contrast to the other sites, the Carlton family who currently own the Casa Vieja have preserved an extended history of their family's history on the property. Artefactual scatter throughout the rear yard of the house indicates the extended incoporaton of the Smith and Carlton taskscapes into the landscape. Micromorphological analysis from unit 2 shows a well-kept, trampled dirt surface associated with the use of the breezeway area as a chapel. During subsequent disuse sediment covered and preserved the remnants of these activities in the front of the house. As Archie Smith's adobe home was renovated for inhabitation by Vida and Don Carlton, the breezeway became the front door of the house, an area of high traffic and little artefactual material. Subsequent renovations and installation of a septic tank in the rear of the structure removed traces of earlier taskscapes from the chapel from that area. With the house recognized as a Texas State Historic Site, memory of the presence of these earlier taskscapes has been codified and memoralized. However, similarly to the other sites, lack of deposition means that more modern taskscapes have overprinted physical traces from earlier taskscapes, such as those associated with Archie-Smith.

In addition to locations associated with habitation, several midden and debris-centered areas were investigated by FODAAP in 2014 and 2015. These include the dense midden on the Francell-Byerley Property, the dump of debris with HB 211 at the FODA Laundresses' Quarters, the surface scatter of debris to the east of the Laundresses' Quarters, and HB 224 (the privy) at the FODA Enlisted Married Men's Quarters. While each of these contexts is a different discard situation, together they show a range of actions associated with discard practices in Fort Davis.

In 2013 FODAAP mapped a dense surface scatter of artifacts located on the arroyo ridgeline to the east of the structures at the FODA Laundresses' Quarters. Excavations in 2015 showed that this surface scatter is not indicative of subtantial archaeological material subsurface, but is instead a broad debris scatter throughout the area, with concentrations likely due to runoff. The lack of a concentrated midden (such as seen at the Francell-Byerley Property) suggests that the laundresses and their families did not concentrate their debris in a central location, but scattered it throughout the arroyo. Runoff from rainfall then moved the debris across the surface, providing shallow sediment cover in some locations and concentrating material at the ground surface in others.

Analysis of HB 224 (the privy) shows that it was cleaned out before it fell into disuse and then a large quantity of archaeological debris was deposited in the upper context. This focused deposit of debris was likely associated with the end of the structure's function as a privy. It may or may not have corresponded to the abandonment of HB 202 by the resident family. This is in some ways similar to the deposit of material in HB 211. In both cases, substantial anthropogenic material was deposited within an unused building after it fell into disuse. The abandoned structures may have provided a convenient, contained location for discarded material. Utilizing the space as a dump also reinforces the end of the structure's former use associated with home life and domestic activities.

The large, dense midden excavated at the Francell-Byerley property show a clearly distinct set of actions from the Laundresses' Quarters debris scatter or the privy at the Enlisted Married Men's Quarters The midden is a very dense, broad (approximatley 5 meter) accumulation of archaeological material dating to around the 1920s and 1930s. The midden is the long term accumulation of many individual dumping episodes of substantial quantities of material. With the exception of the nearby foundations excavated by FODAAP, there are no other known archaeological structures nearby. The relationships between the foundations and the midden is unclear. The midden may have been utilized by the residents of the structure, or may be the result of several different households bringing their trash to a communal area.

These varied disposal areas demonstrate several different approaches to discard by residents of Fort Davis. The surface scatter at the Laundresses' Quarters suggests that the laundresses were scattering their trash throughout the arroyo, where it was then transported by runoff and aeolian processes. The dump in HB 211 at the Laundresses' Quarters and the concentration of debris in HB 224 at the Enlisted Married Men's Quarters at FODA both show disused structures being repurposed to contain debris. In the case of the dump in HB 211 this was likely associated with the razing of the structure and the construction of the road. For HB 224 it is unclear if the closing of the privy was associated with the abandonment of HB 202, the associated residential structure. Finally, the Francell-Byerley property midden shows the purposeful use of a single location for debris disposal for many dumping episodes over an extended period of time, possibly by multiple households.

IMPLICATIONS OF MICROSCALE GEOARCHAEOLOGY FOR HISTORIC ARCHAEOLOGY

While more commonly used in archaeological analyses of deep time, microscale geoarchaeology also provides highly useful information for Historic Archaeology. Unlike archaeological analyses of deep time, Historic Archaeology is able to use documentary evidence and tightly controlled artifact dating to investigate the past in much tigher timescales. Similarly, microscale geoarchaeology, and particularly micromorphological analysis, can also provide tight temporal control in investigating human actions and events. Microscale geoarchaeological analysis also provides insight into routine activities not commonly recorded in historic documentation, such as home maintenance, disposal, construction and destruction of structures, and other activities surrounding daily life.

The analysis of taskscapes requires that the small, routine events and activities which form that taskscape be visible archaeologically. Microscale geoarchaeology provides direct evidence of these events such as sweeping, disposal events, and cleaning through the analysis of physical traces left by these activities in the landscape. Additionally, microscale geoarchaeology shows the impact of less frequent events such as construction and razing of structures, wildfires, and ongoing processes such as decay and dilapidation of structures. This project has shown how microscale geoarchaeology can document construction and destruction of structures at the Francell-Byerley Property, the Laundresses' Quarters and the Enlisted Married Men's Quarters. Variation in disposal practices was contrasted between the Francell-Byerley property midden, a disposal feature at the Laundresses' Quarters, and the privy at the Enlisted Married Men's Quarters. Traces of wildfire and impacts of modern reconstruction were visible at the Smith-Carlton Casa ViejaMicroscale geoarchaeology not only investigates the traces of these activities and events, but also reveals their impact within the landscape, which is not visible through other forms of archaeological and historic investigations.

In addition to providing information on events and activities forming the taskscape, microscale geoarchaeology also gives insight into homemaking actions not visible through other archaeological methods nor recorded in historic documentation. The investigations at Fort Davis detail several different approaches to home construction including interior and exterior wooden floors, trampled occupational surfaces (some with floor coverings and some without), variation in types of plaster used, as well as evidence for general cleanliness and care taken in home maintance. These actions are taken by residents to create a maintain a sense of home, but are invisible to standard excavation techniques and are unlikely to be recorded in historic documentation. Microscale geoarchaeological techniques provide information on these routine activities which are essential to homemaking and lifehistories of places, but which are invisible to standard excavation techniques.

Finally, microscale geoarchaeology provides the means to investigate the interrelationships between anthropogenic activities and natural processes which affect archaeological remains and produce the modern taskscape. This is particularly apparent in Fort Davis, where limited deposition and ongoing pedogenic processes have deflated archaeological remains, combining the physical traces of the historic taskscape and the modern taskscape into a single landscape. At Fort Davis, microscale geoarchaeological analysis has also shown the effects of other pedogenic and geological processes, such as carbonate impregnation and erosion, upon archaeological remains. Knowledge of these processes has an impact upon archaeological interpretations of these sites which would not be possible without insights from microscale geoarchaeology. For instance, carbonate impregnation can overwrite archaeological and sedimentary stratigraphy, such as seen at Casa Vieja Unit 2. Similarly, much of the variation between excavation contexts seen across FODAAP sites is due to pedogenic horizontation rather than separate depositional layers from sedimentary or anthropogenic events.

SUMMARY

The preceding chapter presented summaries of historical material identified in thin section, descriptions of typical micro-facies at Fort Davis sites, and interpretations about geological and soil processes at Fort Davis to establish a basis for the analysis of the central research questions of this study: the development of life histories for each of the four sites as well as an interpretation of taskscapes of habitation and disposal at Fort Davis. This discussion builds upon the results presented in previous chapters to show how microscale geoarchaeology provides useful insights in to anthropogenic activities and natural processes affecting archaeological remains which are not possible through other lines of investigation.

CHAPTER 9 CONCLUSION

This dissertation has shown how the use of microscale geoarchaeological analysis can be used to reconstruction lifehistories of places and interpret past taskscapes, thereby providing insights for historic archaeology not available through other lines of evidence. This study utilized several microscale geoarchaeological approaches, including soil pH analysis, organic matter analysis, particle size analysis, and micromorphological analysis to investigate four sites from the late 1800s to early 1900s in Fort Davis, Texas. Located in the high Chihuahua desert of Far West Texas, these sites provides insights into lifeways of civilian populations associated with the military post at Fort Davis during the Reconstruction period after the United States Civil War. The four sites investigated in this study were excavated by the Fort Davis Archaeological Project (FODAAP) between 2014 and 2015. Two sites are located at Fort Davis – NHS and relate to civilian residents of the fort during the late 1800s: the Laundresses's Quarters and the Enlisted Married Men's Quarters. The other two sites come from civilian portions of the town of Fort Davis. The Francell-Byerley property is located east of Fort Davis NHS. The two areas investigated here (a midden and stone foundations of a collapsed structure) relate to the early 1900s in Fort Davis after the fort itself was abandoned. The final site, the Smith-Carlton Casa Vieja, is the oldest standing adobe structure in town and is currently occupied by the Carlton family. Investigations at this site document the history of the structure from its construction by Archie Smith in the 1800s through its modern seasonal usage by descendants of the Carlton family.

Microscale geoarchaeological methods (pH analysis, organic matter analysis, particle size analysis, and micromorphological analysis) were used to detail sequences of events in analyzed excavation profiles to provide evidence of human activities and natural processes affecting archaeological contexts. These results were then used to describe typical microfacies for the Fort Davis sites as well as develop more detailed understandings of pedological and sedimentary processes affecting the sites. Using these interpretation, this dissertation then aimed to reconstruct lifehistories and taskscapes associated with each of the four sites.

The combined use of geological, historical, and archaeological evidence shows the interrelated ways in which life histories are recorded and taskscapes preserved in the landscape. Dominat processes of deflation, soil development, erosion, and carbonate development through Fort Davis act to limit the preservation of physical remnants of past taskscapes. Instead, ongoing activities and events continously overwrite previous taskscapes so that the modern landscape is a palimpsest of historical and modern taskscapes.

Additionally, the varied historical record and oral accounts provide contrasting degrees of comparative information for the different sites. The Casa Vieja, which has not only been continously occupied since construction, but is also celebrated as the oldest standing adobe structure in town (recently receiving recognition as a Texas State Historic Landmark), has an extensive oral record, as well as documentation preserved by the resident family which is one of the oldest and most influential families in town.

The Laundresses' Quarters residences and the structure on the Francell-Byerley property, in contrast, have varying and limited historical accounts. While historical photographs of the Laundresses' Quarters exist, army records are limited in specific references to the laundresses. These accounts also at times conflict with the archaeological evidence. For instance (Greene 1986) describes the laundresses' residences as dirty and unkept based on historical sources, while the geoarchaeological evidence suggests intentional care taken to maintain the structures and create a sense of home. As the laundresses were generally poor, single, women of color (Greene 1986, Wooster 1990) and the army records are written by white male officers it is likely that some of these descrepancies are due to intrisinic stereotypes of the time period (Wilkie, Eichner, and Rodriguez 2016). Subsequent actions at the site have served to erase evidence of previous taskscapes. Demolition of the structures, as well as the reconstruction of the San Antonio – El Paso road over top of them, both destroyed physical traces of previous taskscapes as well as hid the remaining traces from modern view. This is furthered by the incorrect placement of HB stakes during the Greene (1986) resource survey.

Similarly to the Laundresses' Quarters, limited and conflicting historical evidence is available for the Francell-Byerley property and Enlisted Married Men's Quarters. Modern town residents give contrasting accounts of the history of the structure and midden at the Francell-Byerley property and with limited archaeological stratigraphy there is little evidence to support or refute any of those accounts. Dating of artifacts places the structure and midden place them in the early 1900s, but a relationship between the two contexts cannot be established.

While substantial artifactual remains associated with the Enlisted Married Men's Quarters were recovered, little architectural evidence of the structure was identified in excavation or geoarchaeological analyses. Additionally, little other documentation associated with the structure exists and no intact archaeological stratigraphy or architectural evidence was recovered outside the privy. Soil development and carbonate processes in the area have also acted to erase any remaining traces of taskscapes from the resident family.

The above dissertation shows how the integration of geoarchaeological analysis with historical and archaeological data can provide detailed descriptions of past taskscapes and site life histories. As taskscapes are materialized in the physical landscape they are subject to a broad variety of geological, pedogenic, and anthropogenic processes. Use of a geoarchaeological approach to tease apart these many conflict processes and their effects on the landscape is necessary in order to understand the preservation of past taskscapes within the modern landscape. Even within the context of Historic Archaeology, which has access to documentation and tighter temporal controls than archaeology of deep time, microscale geoarchaeology provides insights into actions and processes not available to other lines of evidence.

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Appendix I: Excavation and Laboratory Forms

UCB FODAAP 2014
Excavation Context Form

Site/Area: ____________
Unit: ____________
Size: ____m x____m
Initials: ____________
Date Begin: ____________
Date Finish: ____________
Page ______ of ______

Context ID: ____

Subcontext: ____________ Natural ☐ Arbitrary ☐

Reason for new context: ______________________________________

____

____

Excavation Method: Trowel ☐ Handpick ☐ Shovel ☐ Brush ☐ Pickaxe ☐ Other ☐

Screen Size______________ Bucket Tally:

Final Volume:_______L

Depths:	NE	NW	SE	SW	C
Opening:	____	____	____	____	____
Closing:	____	____	____	____	____

Datum Location: ______________________

Datum height above surface: ______cm

Stratigraphy: Overlain by:____________________ Overlies: ________________________

Within:____________________ Abuts:________________________

Sediment Description: Munsell dry: ________________ Munsell Wet:________________

Texture: Sandy ☐ Silty Sand ☐ Silt ☐ Silty Clay ☐ Clay ☐

Loose ☐ Mix ☐ Compact ☐

Inclusions: Unburned organic ☐ Burned Organic ☐ Pebbles/Cobbles ☐ Other ☐

Other Observations:____

____

Context Artifacts

Ceramic: ________bags

Metal: ________bags

Glass: ________bags

Faunal: ________bags

Other: ________bags ____________

Context Samples:

Bulk Sediment ID: ____________________________

Float sample ID: ____________________________

Micrromorphology Sample IDs: ____________________

____

Additional Maps: Plan: ____________________ Profile: ____________________

Interpretation: Matrix ☐ Floor ☐ Pit ☐ Wall ☐ Midden ☐ Other:________________

Title:_______________________________________

N

Scale:_____________

Photograph Log: ID Description of Context

UCB FODAAP 2014
Shovel Test Pit Form

Site/Area: ______________
STP: ______________
Size: ____m x____m
Initials: ______________
Date Begin: ______________
Date Finish: ______________
Page _____ of ______

Level	Depth	Sediment *	#Artifact Bags

Trimble File:______________

____

Excavation Method: Trowel ☐ Handpick ☐ Shovel ☐ Brush ☐ Pickaxe ☐ Other ☐

Screen Size______________

Bucket Tally:

Final Volume:________L

Depths:	NE	NW	SE	SW	C
Opening:					
Closing:					

Datum Location: ______________

Datum height above surface: _______cm

Samples:

Bulk Sediment IDs: ______________

Float sample ID: ______________

Micrromorphology Sample IDs: ______________

Additional Maps: Plan: ______________ Profile: ______________

Photos (Camera/Number):______________

Notes: ______________

***Sediment Observations:** **Texture - Rocky / Sandy / Silty / Clay**
Compactness: Loose / Mixed / Compact
Inclusions: unburned organic / burned organic / pebbles or cobbles / other

STP Profile Map

Wall:____________

Scale:_____________

UCB FODAAP 2014
Micromorphology Sample Form

Site/Area: ________________
Unit: ________________
Size: ____m x____m
Initials: ________________
Date : ____________
Page _____ of ______

Sample ID: ________________ Profile/Floor: ________________

Purpose of Sample: ____

____

____

Contexts Included: ____

Provienence: X: ____________ Y: ____________ Z: ____________ Datum: ____________

Context Descriptions (include color, texture, inclusions, and width of each): ____________

____

____

____

____

____

____

Plan Map: ______________________ Profile Map: ______________________

Bulk Samples: ID	Context	Related MM Samples: ID	Description

Photograph Log: ID	Description

FODAAP Micromorph Analysis Recording Form   Date: Page 1

Site [ ]   Sample ID [ ]

1. SAMPLE INFORMATION AND ASSOCIATED INFO

Context and Deposition:

Association w/ other samples:

Size of Slide:

	A	B	C	D	E	F	G	H	I	J
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										

Micromorphology Observation Recording Form

FODALQ UNIT, SLIDE:

Contexts:

Boundaries:

MICROMORPH BED 1:
Estimated Area:

Fabric:
Color:
Sorting:
C/F ratio:
Related Distribution:

Matrix (Fabric Microstructure, carbonate/clay type, BFabric).

	Coarse	**Fine**
Grain Size		
Shape		
Orientation		
Composition		

Voids:
Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz				
Trachyte				
Tuff				
Basalt				

Organic:

	Size	Density	Distribution	Weathering
Charcoal				
Ash				
Plant Remains				
Insect Excrement				

Other:

	Size	Density	Distribution	Weathering

Bone				
Eggshell				
Metal				
Ceramic				
Glass				
Plaster				

Secondary Features:

Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**

Hypocoatings:

Clay/Carbonate	**Thickness**	**Location (+void type)**	**B Fabric**

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type).
Locations: voids, fabric, part of bed

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
Microsparites				
Sparites				
Compound Nodules				
Mixed Crystallization				
Diffuse Carbonate Patches				
Fragmented				

nodules				

*Microsparites (small crystals btn 8 to 20um) – recrystallization – measure all from 2x mag in top, center, and base of bed along central line. Marked as MSbed# on photo.
Sparites (pure crystals (larger than 20um) – precipitation - count and measure all
Compound – count and measure all

*Includes soil fabric? Similar or different than matrix?

Other carbonate features: (roots, etc. – location, size, type, density)

Gypsum crystallizations (location, size, type, density)

Phosphate (location, size, type, density)

Depletion Features: (location, size, relation to hypocoatings).

Manganese (location, size, type, density)

Iron Nodules (location, size, type, density)

Interpretation:

Appendix II: Sample Contextual Information and Bulk Analysis Results

Table II.1: Results of Bulk Analyses for All Analyzed Samples (pH, Percentage of Organic Matter (OM%) and Particle Size Analysis)

ID	Site	Unit	Context	pH	OM%	Clay%	Silt%	Sand%
1508793	FODALQ	LQ10	1	6.43	3%			
1508795	FODALQ	LQ10	2	6.50	2%			
1508796	FODALQ	LQ10	3	7.13	3%			
1508929	FODALQ	LQ10	3	7.34	3%			
1508922	FODALQ	LQ10	4	7.40	2%			
1508938	FODALQ	LQ10	5	7.27	2%			
1508801	FODALQ	LQ10	6	7.62	2%			
1508787	FODALQ	LQ10	7	7.53	2%			
1508803	FODALQ	LQ10	8	7.33	2%			
1508933	FODALQ	LQ10	10	7.41	2%			
1508930	FODALQ	LQ10	11	7.20	2%			
1508780	FODALQ	LQ10	12	7.25	3%			
1020741	FODALQ	LQ14	2	6.35	2%	12%	16%	75%
0020754	FODALQ	LQ14	3	6.35	3%	12%	20%	76%
1020837	FODALQ	LQ14	4	6.60	2%	12%	17%	75%
1020752	FODALQ	LQ15	2	7.32	3%			
1020766	FODALQ	LQ15	3	7.25	3%			
1020846	FODALQ	LQ15	4	7.38	3%			
1020743	FODALQ	LQ16	2	7.25	2%			
1020843	FODALQ	LQ16	3	7.67	5%			
1020756	FODALQ	LQ16	3	7.93	4%			
1020762	FODALQ	LQ16	3	7.95	5%			
1020836	FODALQ	LQ16	4	7.97	3%			
1020850	FODALQ	LQ16	5	8.02	3%			
1020853	FODALQ	LQ16	6	7.95	2%			
1020863	FODALQ	LQ16	7	7.80	2%			
1020887	FODALQ	LQ16	7B	7.67	1%			
1020739	FODALQ	LQ17	1	7.27	3%			
1020753	FODALQ	LQ17	2	7.70	3%			
1020765	FODALQ	LQ17	3	7.53	2%			
1020842	FODALQ	LQ17	3B	7.49	2%			
1020738	FODALQ	LQ18	2	6.66	2%			
1020749	FODALQ	LQ18	3	6.67	2%			
1020760	FODALQ	LQ18	4	6.95	2%			
0020844	FODALQ	LQ18	5	7.81	2%			
1020856	FODALQ	LQ18	6	7.83	2%			

1020585	FODALQ	LQ18	7	7.76	2%			
1020872	FODALQ	LQ18	7B	7.48	2%			
1020897	FODALQ	LQ19	1	6.83	2%			
1020920	FODALQ	LQ19	2	7.13	2%			
1020875	FODALQ	LQ19	3	7.36	3%			
1021116	FODALQ	LQ19	4	7.25	4%			
1021008	FODALQ	LQ19	5	7.34	3%			
0021124	FODALQ	LQ19	6	7.24	3%			
1021089	FODALQ	LQ19	7	7.64	3%			
1021042	FODALQ	LQ19	8	7.68	3%			
0021104	FODALQ	LQ19	9	7.42	3%			
1021213	FODALQ	LQ19	11	7.30	2%			
1021126	FODALQ	LQ19	12	7.35	2%			
0021214	FODALQ	LQ19	13	7.42	3%			
1021475	FODALQ	LQ19	17	7.54	3%			
1021392	FODALQ	LQ19	18	7.49	3%			
1021415	FODALQ	LQ19	11B	7.38	2%			
1021421	FODALQ	LQ19	11C	7.58	2%			
1021465	FODALQ	LQ19	13B	7.27	3%			
0020899	FODALQ	LQ20	1	7.97	3%			
1020903	FODALQ	LQ20	2	8.05	3%			
1020967	FODALQ	LQ20	3A	7.88	3%			
1020983	FODALQ	LQ20	3B	7.66	3%			
1020995	FODALQ	LQ20	3C	7.28	4%			
0021004	FODALQ	LQ20	3D	7.72	4%			
1020897	FODALQ	LQ21	1	7.46	3%			
0020904	FODALQ	LQ21	2	7.32	4%			
1020912	FODALQ	LQ21	3	6.69	5%			
1020976	FODALQ	LQ21	3B	6.60	6%			
1020876	FODALQ	LQ21	3C	6.41	5%			
1020993	FODALQ	LQ21	3D	6.58	5%			
1021003	FODALQ	LQ21	3E	6.43	4%			
1020899	FODALQ	LQ22	1	6.40	3%			
1020905	FODALQ	LQ22	2	6.20	3%			
1020917	FODALQ	LQ22	3	7.20	3%			
1020973	FODALQ	LQ22	4	6.90	5%			
1020890	FODALQ	LQ23	1	6.87	2%			
1020908	FODALQ	LQ23	2	7.74	2%			
0020914	FODALQ	LQ23	3	7.07	3%			
1020977	FODALQ	LQ23	4	7.73	2%			
1021095	FODALQ	LQ23	6	7.24	2%			

1021098	FODALQ	LQ23	6	7.49	2%			
1020998	FODALQ	LQ23	8	7.50	2%			
1020997	FODALQ	LQ23	8	7.65	2%			
1021036	FODALQ	LQ23	9	7.37	2%			
1020992	FODALQ	LQ23	7	7.68	2%			
1021192	FODALQ	LQ23	7C	7.51	2%			
1021128	FODALQ	LQ23	9B	7.41	3%			
1020978	FODALQ	LQ24	1	6.20	2%			
1020988	FODALQ	LQ24	2	6.25	1%			
1020883	FODALQ	LQ24	3	6.94	3%			
1020882	FODALQ	LQ24	4	7.13	2%			
1021072	FODALQ	LQ24	5	7.06	2%			
1021020	FODALQ	LQ24	3B	7.35	2%			
1020989	FODALQ	LQ25	1	7.65	3%	13%	17%	81%
1021001	FODALQ	LQ25	2	7.76	2%	10%	18%	75%
0021034	FODALQ	LQ25	3	7.26	3%			
0021014	FODALQ	LQ25	3	7.10	4%	13%	17%	81%
1508695	FODALQ	LQ25	3	6.02	2%			
0021094	FODALQ	LQ25	4	7.60	3%			
1021041	FODALQ	LQ25	5	7.75	2%	10%	16%	77%
1021060	FODALQ	LQ25	6	7.37	3%	12%	17%	77%
0021114	FODALQ	LQ25	7	7.64	2%	10%	17%	76%
1021181	FODALQ	LQ25	8A	7.61	2%	13%	18%	75%
1021188	FODALQ	LQ25	8B	7.73	2%			
1021196	FODALQ	LQ25	8C	7.82	2%	12%	16%	79%
1021207	FODALQ	LQ25	8D	7.75	2%			
1021006	FODALQ	LQ26	1	6.87	5%			
1021013	FODALQ	LQ26	2	6.86	5%			
1021045	FODALQ	LQ26	4	6.56	4%			
1021028	FODALQ	LQ27	1	7.35	4%			
1021026	FODALQ	LQ27	2	7.54	5%			
1021122	FODALQ	LQ27	3	7.42	4%			
1021050	FODALQ	LQ27	2B	7.00	4%			
1021048	FODALQ	LQ27	2C	6.78	5%			
1021047	FODALQ	LQ27	2C	6.70	4%			
1021029	FODALQ	LQ28	2	7.43	2%			
1021065	FODALQ	LQ28	3	7.55	3%			
1021087	FODALQ	LQ28	4	7.60	2%			
1021103	FODALQ	LQ28	5	7.63	3%			
1021067	FODALQ	LQ29	1	7.41	4%			
1021086	FODALQ	LQ29	2	7.34	3%			

1021179	FODALQ	LQ29	4	7.38	3%			
1021108	FODALQ	LQ29	3A	7.74	2%			
1021119	FODALQ	LQ29	3B	7.24	3%			
1021069	FODALQ	LQ30	2	7.58	2%			
1021091	FODALQ	LQ30	2B	7.39	2%			
1021111	FODALQ	LQ30	2C	7.12	3%			
1021223	FODALQ	LQ31	1	6.81	2%	12%	19%	75%
1021255	FODALQ	LQ31	2	7.31	2%			
1021242	FODALQ	LQ31	3	7.60	2%			
1021241	FODALQ	LQ31	4	7.38	2%	12%	23%	69%
1021253	FODALQ	LQ31	5	7.23	2%			
1021369	FODALQ	LQ31	6	7.66	2%	13%	20%	74%
1021350	FODALQ	LQ31	7	6.80	2%			
1021357	FODALQ	LQ31	8	7.31	2%			
1021433	FODALQ	LQ31	9	6.91	2%			
1021382	FODALQ	LQ31	10	7.11	4%	11%	21%	73%
1021466	FODALQ	LQ31	11	6.59	2%	11%	17%	77%
1021438	FODALQ	LQ31	12	6.82	2%			
1021429	FODALQ	LQ31	10B	6.80	2%			
1021121	FODALQ	LQ31	2D	6.79	4%			
1021508	FODALQ	LQ32	1	6.18	2%			
0021194	FODALQ	LQ32	1	6.71	1%	11%	16%	80%
1021272	FODALQ	LQ32	2	7.40	4%			
1021260	FODALQ	LQ32	3	6.73	3%			
1021269	FODALQ	LQ32	5	7.44	3%	12%	17%	69%
1021270	FODALQ	LQ32	6	7.17	3%			
1021362	FODALQ	LQ32	7	7.57	3%	12%	19%	69%
1021426	FODALQ	LQ32	8	7.31	3%	11%	18%	76%
1021469	FODALQ	LQ32	8C	7.42	3%	11%	15%	79%
1021183	FODALQ	LQ33	1	7.52	1%			
1021185	FODALQ	LQ33	2	7.44	1%			
1020663	FODALQ	LQ33	2	7.42	2%			
0020664	FODALQ	LQ33	3	7.41	2%			
1021190	FODALQ	LQ34	1	5.90	2%			
1021201	FODALQ	LQ34	2	6.08	2%			
0021234	FODALQ	LQ34	3	6.20	3%			
1021217	FODALQ	LQ34	2B	6.31	2%			
1021243	FODALQ	LQ34	2B	6.50	2%			
1021239	FODALQ	LQ34	4A	6.43	2%			
0021244	FODALQ	LQ34	4B	6.58	2%			
1021215	FODALQ	LQ34	4C	6.60	2%			

1021203	FODALQ	LQ35	1	7.32	2%			
1021212	FODALQ	LQ35	2	5.42	2%			
1021219	FODALQ	LQ35	3	5.02	2%			
1021233	FODALQ	LQ35	3b	4.85	2%			
1021248	FODALQ	LQ35	3c	4.86	2%			
1021225	FODALQ	LQ36	1	7.10	1%			
1021227	FODALQ	LQ36	2	6.15	2%			
1021228	FODALQ	LQ36	2b	7.12	2%			
1021235	FODALQ	LQ36	2c	7.51	2%			
1021388	FODALQ	LQ37	1	7.09	2%			
1021391	FODALQ	LQ37	2	7.37	2%			
1021401	FODALQ	LQ37	3	7.35	3%			
1021390	FODALQ	LQ37	4	7.32	3%			
1021353	FODALQ	LQ38	1	7.40	3%			
1021366	FODALQ	LQ38	2	7.68	2%			
1021377	FODALQ	LQ38	4	7.58	3%			
1021413	FODALQ	LQ38	5	7.34	3%			
1021436	FODALQ	LQ38	6	7.62	2%			
1021472	FODALQ	LQ38	7	7.72	2%			
1021446	FODALQ	LQ38	6b	7.64	2%			
0021484	FODALQ	LQ39	1	7.22	2%			
1021487	FODALQ	LQ39	2	7.96	2%			
1021497	FODALQ	LQ39	3A	7.71	2%			
1021502	FODALQ	LQ39	3B	7.28	4%			
1021528	FODALQ	LQ39	3C	7.31	2%			
1021268	FODALQ	LQ50	1	5.90	2%			
1021343	FODALQ	LQ50	2	6.37	2%			
0021344	FODALQ	LQ50	20	6.52	1%			
1021348	FODALQ	LQ50	2B	6.61	2%			
1021411	FODALQ	LQ50	2D	6.45	2%			
1021448	FODALQ	LQ51	1	6.53	4%			
1021450	FODALQ	LQ51	2	6.43	3%			
1021451	FODALQ	LQ51	3	6.69	3%			
1021459	FODALQ	LQ51	4	6.84	4%			
1021352	FODALQ	LQ52	1	5.30	3%			
1021359	FODALQ	LQ52	2A	5.99	2%			
1020138	FODALQ	LQ52	2B	6.44	1%			
1021428	FODALQ	LQ52	3A	6.33	2%			
1021435	FODALQ	LQ52	3B	6.37	1%			
1021441	FODALQ	LQ52	3C	6.31	1%			
0021464	FODALQ	LQ52	4A	6.18	2%			

1021462	FODALQ	LQ52	4B	6.10	1%			
1021376	FODALQ	LQ53	1	7.32	3%			
1021430	FODALQ	LQ53	2	7.33	3%			
0021444	FODALQ	LQ53	4	7.78	2%			
1021485	FODALQ	LQ53	5	7.47	2%			
1021526	FODALQ	LQ53	6	7.73	3%			
1021531	FODALQ	LQ53	7	7.41	3%			
1021611	FODALQ	LQ53	8	7.67	2%			
1021631	FODALQ	LQ53	9	7.55	2%			
1021476	FODALQ	LQ53	3A	7.52	2%			
1021478	FODALQ	LQ53	3C	7.46	4%			
1021598	FODALQ	LQ53	4C	7.85	3%			
1021601	FODALQ	LQ53	7A	7.45	3%			
1021506	FODALQ	LQ53	9B	7.47	2%			
1021542	FODALQ	LQ54	2	6.25	2%			
1021609	FODALQ	LQ54	3	6.14	3%			
1021630	FODALQ	LQ54	4	7.17	2%			
1021629	FODALQ	LQ54	5	6.70	2%			
1021628	FODALQ	LQ54	5B	7.10	4%			
1021492	FODALQ	LQ55	1	6.64	2%			
1021516	FODALQ	LQ55	2	6.62	2%			
1021515	FODALQ	LQ55	3	6.76	3%			
1021607	FODALQ	LQ55	4	6.93	3%			
1021616	FODALQ	LQ55	5	7.36	2%			
1021595	FODALQ	LQ55	3A	7.05	3%			
1021499	FODALQ	LQ56	1	7.10	3%			
0021504	FODALQ	LQ56	2	6.96	2%			
1021529	FODALQ	LQ56	3	6.88	3%			
1021532	FODALQ	LQ56	4	7.20	1%			
1021603	FODALQ	LQ56	5	7.27	2%			
1021622	FODALQ	LQ56	6	7.39	2%			
1021537	FODALQ	LQ57	2	6.90	1%			
1021605	FODALQ	LQ57	3	7.09	2%			
1021550	FODALQ	LQ57	4	6.51	2%			
0021614	FODALQ	LQ57	5	7.36	1%			
1021635	FODALQ	LQ57	6	7.69	2%			
1021638	FODALQ	LQ57	7	6.77	2%			
1021453	FODALQ	LQ58	1	6.67	1%			
1021455	FODALQ	LQ58	2	6.89	3%			
1021536	FODALQ	LQ58	3	7.59	2%			
0021594	FODALQ	LQ58	4	7.76	3%			

0021624	FODALQ	LQ58	5	7.82	3%			
1508719	FODALQ	LQ59	1	6.31	2%	12%	18%	76%
1508721	FODALQ	LQ59	2	6.79	2%	12%	20%	77%
1508729	FODALQ	LQ59	3	7.15	2%			
1508725	FODALQ	LQ59	4	7.02	2%	12%	16%	78%
1508727	FODALQ	LQ59	5	7.18	5%	12%	16%	82%
1508789	FODALQ	LQ59	7	7.46	2%	12%	14%	80%
1508926	FODALQ	LQ59	8	6.95	3%	12%	18%	71%
1508937	FODALQ	LQ59	9	7.07	3%	13%	19%	69%
1508792	FODALQ	LQ59	9C	7.20	2%			
1508680	FODALQ	LQ75	1	5.70	2%			
1508684	FODALQ	LQ75	2	6.20	2%			
1508693	FODALQ	LQ75	4	6.20	2%			
1508687	FODALQ	LQ75	5	6.25	2%			
1508688	FODALQ	LQ75	5B	6.26	2%			
1508523	FODAMM	MM60	1	7.59	14%			
1508543	FODAMM	MM60	2	7.61	5%			
1508530	FODAMM	MM60	3	7.61	5%			
1508528	FODAMM	MM60	4	7.86	4%			
1508526	FODAMM	MM60	5	7.75	5%			
1508655	FODAMM	MM60	6	7.74	6%			
1508665	FODAMM	MM60	7	7.84	8%			
1508535	FODAMM	MM61	1	7.20	7%			
1508545	FODAMM	MM61	2	7.55	5%			
1508612	FODAMM	MM61	3	7.66	5%			
1508627	FODAMM	MM61	4	7.25	6%			
1508637	FODAMM	MM61	5	7.63	5%			
1508657	FODAMM	MM61	6	7.60	5%			
1508662	FODAMM	MM61	7	7.49	5%			
1508515	FODAMM	MM62	1	6.61	7%			
1508537	FODAMM	MM62	2	6.81	7%			
1508548	FODAMM	MM62	3	7.38	8%			
1508554	FODAMM	MM62	4	7.19	8%			
1508580	FODAMM	MM62	5	7.28	7%			
1508583	FODAMM	MM62	6	7.48	7%			
1508621	FODAMM	MM62	7	7.54	6%			
1508636	FODAMM	MM62	8	7.60	6%			
1508518	FODAMM	MM63	1	7.03	8%			
1508553	FODAMM	MM63	2	7.30	8%			
1508555	FODAMM	MM63	3	7.29	8%			
1508615	FODAMM	MM63	3B	7.50	8%			

1508541	FODAMM	MM64	1	7.38	4%			
1508558	FODAMM	MM64	2	7.54	5%			
1508610	FODAMM	MM64	3	7.43	7%			
1508632	FODAMM	MM64	3B	7.50	6%			
1508559	FODAMM	MM65	1	7.29	7%	14%	34%	51%
1508562	FODAMM	MM65	2	7.40	7%	13%	30%	55%
1508563	FODAMM	MM65	3	7.42	6%	13%	24%	72%
1508567	FODAMM	MM65	4	7.45	7%	14%	25%	77%
1508735	FODAMM	MM65	4B	7.72	5%	14%	28%	73%
1508576	FODAMM	MM66	1	7.74	5%			
1508619	FODAMM	MM66	2	7.56	5%			
1508630	FODAMM	MM66	3	7.64	4%			
1508653	FODAMM	MM66	4	7.72	3%			
1508570	FODAMM	MM67	1	7.18	5%	16%	31%	65%
1508608	FODAMM	MM67	2	7.04	6%	13%	28%	64%
1508646	FODAMM	MM67	3	7.32	4%	15%	30%	64%
1508648	FODAMM	MM67	4	7.02	5%	15%	29%	71%
1508647	FODAMM	MM67	6	6.90	6%	13%	29%	70%
1508752	FODAMM	MM67	6	6.54	5%			
1508738	FODAMM	MM67	7	6.91	5%	13%	32%	66%
0021654	FODAMM	MM67	8	7.01	6%			
1508643	FODAMM	MM67	9	7.12	5%	13%	26%	67%
1508861	FODAMM	MM67	10	7.17	5%	12%	24%	67%
1508873	FODAMM	MM67	11	7.22	5%	12%	28%	62%
1508748	FODAMM	MM67	12	6.92	4%	13%	22%	76%
1021676	FODAMM	MM67	14	7.18	6%	13%	28%	70%
1021674	FODAMM	MM67	15	6.95	8%	13%	27%	72%
1021682	FODAMM	MM67	16	6.09	4%			
1021683	FODAMM	MM67	17	6.74	5%			
1021668	FODAMM	MM67	18	6.83	8%	12%	23%	72%
1021665	FODAMM	MM67	19	7.26	7%	14%	25%	72%
1021675	FODAMM	MM67	19	7.10	5%	16%	40%	54%
1021662	FODAMM	MM67	20	7.04	6%	13%	27%	72%
1021717	FODAMM	MM67	21	6.49	3%	12%	20%	78%
1021719	FODAMM	MM67	22	7.10	4%	13%	24%	79%
1021720	FODAMM	MM67	23	7.57	3%			
1508857	FODAMM	MM67	13A	6.05	5%	12%	25%	70%
1508919	FODAMM	MM67	13B	7.14	15%	13%	25%	72%
1508659	FODAMM	MM68	1	7.57	8%			
1508699	FODAMM	MM68	2	7.18	7%			
1508676	FODAMM	MM69	1	7.67	4%			

1508713	FODAMM	MM69	2	7.58	5%			
1508733	FODAMM	MM69	3	7.58	5%			
1508667	FODAMM	MM70	1	6.46	8%			
1508672	FODAMM	MM70	2	6.92	7%			
1508674	FODAMM	MM70	3	7.13	6%			
1508761	FODAMM	MM70	4	7.04	5%			
1508766	FODAMM	MM70	5	6.83	5%			
1021565	FODAMM	MM71	1	6.04	3%	12%	28%	57%
1508764	FODAMM	MM71	2	4.47	5%	12%	27%	62%
1021561	FODAMM	MM71	3	5.60	7%	13%	23%	77%
1508710	FODAMM	MM71	4	6.53	9%	13%	21%	82%
1508704	FODAMM	MM71	5	7.07	9%	14%	25%	77%
1508705	FODAMM	MM71	6	7.42	8%	13%	22%	80%
1021563	FODAMM	MM71	8	5.21	6%			
1508755	FODAMM	MM72	2	7.14	5%	15%	27%	68%
1508756	FODAMM	MM72	3	7.23	3%	12%	22%	80%
1508776	FODAMM	MM72	4	7.35	3%	11%	21%	76%
1508773	FODAMM	MM72	5	6.85	2%	12%	21%	80%
1508744	FODAMM	MM73	1	6.75	6%			
1508765	FODAMM	MM73	3	6.52	5%			
1508743	FODAMM	MM73	4	6.23	5%			
1508869	FODAMM	MM73	4	7.21	3%			
0021674	FODAMM	MM73	5	7.20	3%			
1021686	FODAMM	MM73	6	7.10	3%			
1021678	FODAMM	MM73	7	7.20	3%			
1508964	FODAMM	MM73	8	7.10	4%			
1508960	FODAMM	MM73	9	7.40	5%			
1508963	FODAMM	MM73	10	7.23	5%			
1508740	FODAMM	MM74	1	7.28	5%			
1508873	FODAMM	MM74	3	7.50	5%			
1508859	FODAMM	MM74	3	7.33	4%			
1508864	FODAMM	MM74	4	7.53	4%			
1508917	FODAMM	MM74	6	7.38	3%			
1508920	FODAMM	MM74	7	7.37	4%			
1508876	FODAMM	MM74	5B	7.49	4%			
1020063	Francell A	1	1	8.03	3%	49%	28%	19%
1020076	Francell A	1	2	8.17	3%	56%	25%	18%
00 20084	Francell A	1	3	8.42	3%	49%	27%	19%
1020091	Francell A	1	4	8.39	13%	51%	32%	18%
1020102	Francell A	1	5	7.87	4%	56%	27%	19%
1020115	Francell A	1	6	7.93	7%	54%	22%	17%

1020123	Francell A	1	8	9.32	2%	58%	22%	18%
1020066	Francell A	2	1	8.06	8%	52%	34%	18%
1020075	Francell A	2	2	7.97	7%	44%	32%	18%
1020081	Francell A	2	3	8.39	7%	52%	30%	18%
1020098	Francell A	2	4	7.78	5%			
1020092	Francell A	2	5	8.05	6%			
1020108	Francell A	2	6	8.88	3%	48%	20%	14%
1020117	Francell A	2	7	8.51	3%			
1020031	Francell A	STP1	1	7.58	2%	42%	33%	27%
1020033	Francell A	STP1	5	9.25	3%	61%	24%	17%
1020032	Francell A	STP1	6	9.47	2%	59%	18%	16%
1020051	Francell A	STP2	4	7.38	6%			
1020048	Francell A	STP2	5	7.50	4%			
1020047	Francell A	STP2	6	7.52	3%			
1020057	Francell A	STP3	1	7.14	6%			
1020037	Francell A	STP3	3	7.17	6%			
1020036	Francell A	STP3	5	7.29	6%			
1020157	Francell C	1	1	7.88	5%	62%	22%	15%
00 20164	Francell C	1	2	8.05	1%	66%	20%	14%
1020200	Francell C	1	3	7.85	2%	71%	15%	15%
00 20264	Francell C	1	4	7.71	2%	63%	16%	14%
1020268	Francell C	1	5	7.34	3%			
1020261	Francell C	1	4 (plaster feature)	7.77	2%	67%	16%	14%
1020161	Francell C	2	1	7.73	2%			
1020165	Francell C	2	2	7.58	3%			
1020192	Francell C	2	3	7.53	2%			
1020216	Francell C	2	4	7.61	2%			
1020221	Francell C	2	5	7.20	2%			
1020181	Francell C	3	2	8.18	2%	61%	20%	16%
1020218	Francell C	3	3	7.98	3%	70%	16%	14%
1020277	Francell C	3	5	7.90	2%	61%	17%	15%
1020280	Francell C	3	6	7.72	10%	66%	15%	13%
1020368	Casa Vieja	CV1	1	7.45	8%	17%	34%	56%
1020361	Casa Vieja	CV1	2	6.71	12%	12%	18%	69%
1020345	Casa Vieja	CV1	4	7.42	17%	3%	12%	58%
1020343	Casa Vieja	CV1	5	7.64	6%	15%	17%	51%
1020505	Casa Vieja	CV1	6	7.40	4%	15%	18%	48%
1020548	Casa Vieja	CV1	7	7.44	2%	17%	22%	45%
1020579	Casa Vieja	CV1	9a	7.31	2%	15%	20%	42%
1020589	Casa Vieja	CV1	9b	8.04	4%	17%	23%	42%

1020372	Casa Vieja	CV2	1	7.87	3%	16%	22%	43%
1020331	Casa Vieja	CV2	2	7.90	2%	22%	30%	58%
1020487	Casa Vieja	CV2	4	7.96	2%	15%	40%	51%
0020494	Casa Vieja	CV2	5	8.06	3%	19%	28%	58%
1020512	Casa Vieja	CV2	6	8.46	4%	15%	21%	57%
1020582	Casa Vieja	CV2	7	8.44	2%	18%	23%	53%
1020597	Casa Vieja	CV2	7B	8.66	3%	16%	21%	57%
1020603	Casa Vieja	CV2	8	8.59	3%	16%	21%	49%
1020370	Casa Vieja	CV3	1	7.63	3%	15%	36%	59%
1020363	Casa Vieja	CV3	2	7.29	5%	15%	36%	58%
1020485	Casa Vieja	CV3	3	8.30	2%	15%	36%	55%
1020340	Casa Vieja	CV3	4	8.18	3%	14%	33%	62%
1020491	Casa Vieja	CV3	5	8.38	1%	15%	34%	63%
1020508	Casa Vieja	CV3	6	8.50	1%	15%	35%	61%
1020427	Casa Vieja	CV4	1	7.33	3%	16%	53%	31%
0020424	Casa Vieja	CV4	2	7.17	9%	16%	52%	36%
1020501	Casa Vieja	CV4	3	7.72	13%	15%	40%	43%
NA	Casa Vieja	CV4	4	7.69	2%	17%	52%	34%

Table II.2: Contextual Information for All Analyzed Micromorphology Samples

Sample ID	Site	Unit	Profile	Contexts
1020621	Casa Vieja	CV1	South	7, 9A/B
1020616	Casa Vieja	CV1	South	5,6,7
1020622	Casa Vieja	CV1	South	9A/B, 11
1020612	Casa Vieja	CV2	North	1,2,4,5,6
1020613	Casa Vieja	CV2	North	5,6,7
1020614	Casa Vieja	CV2	North	7B, 8
1020607	Casa Vieja	CV3	South	5, 6A, 6B
1020606	Casa Vieja	CV3	South	2,4,5,6A
1508506	FODALQ	LQ16	South	2,3,5
1508493	FODALQ	LQ17	West	3A,4B
1508492	FODALQ	LQ17	West	2,3A
1508509	FODALQ	LQ17	West	1,2
1508496	FODALQ	LQ19	North	3,7,11
1021649	FODALQ	LQ19	West	11C,11B
1020650	FODALQ	LQ19	West	1B,7,11
1020651	FODALQ	LQ19	West	1,1B,5
1021648	FODALQ	LQ23	East	2,5,9A
1508500	FODALQ	LQ25	S	5,6
1508498	FODALQ	LQ25	S	3,7,8A
1508499	FODALQ	LQ25	S	1,3,7

1508501	FODALQ	LQ25	South	1,2,5
1508507	FODALQ	LQ31	South	10
1508508	FODALQ	LQ31	South	1,4,8,6,10
1508495	FODALQ	LQ32	South	7, 8A
1508494	FODALQ	LQ32	South	5,2,7
1508497	FODALQ	LQ53	East	5,6
1508502	FODALQ	LQ53	East	2,3A,5
1508585A	FODALQ	LQ57	West	2,3
1508585B	FODALQ	LQ57	West	3,4
1508586	FODALQ	LQ57	West	5,6
1508593	FODALQ	LQ59	West	5,7
1021659	FODAMM	MM62	North	1,2,3,6
1021660	FODAMM	MM62	North	6,7
1021655	FODAMM	MM64	North	2,3
1021656	FODAMM	MM64	North	2,3A
1021671	FODAMM	MM65	West	1,2,3
1021706	FODAMM	MM67	North	7,12,17
1021715	FODAMM	MM67	North	18,20
0021714	FODAMM	MM67	North	13B,14,15
1021705	FODAMM	MM67	West	10,13B
0021704	FODAMM	MM67	West	10,11,13B
1021661	FODAMM	MM69	East	1,2
1508592	FODAMM	MM72	West	3,4,5
1020179	Francell A	1	South	4,5,6
1020156	Francell A	1	South	2,3,4
1020043	Francell A	1	West	1,2,3,4
0020154	Francell A	1	West	4
1020155	Francell A	1	West	4,6,7
1020152	Francell A	2	East	2,3,5
1020025	Francell A	2	South	1,2,5
1020012	Francell A	STP1	East	2,4
1020013	Francell A	STP1	East	2,3
1020014	Francell A	STP1	South	5,6
1020289	Francell C	1	South	plaster
1020290	Francell C	1	South	3,4
1020242	Francell C	2	South	3,4
1020241	Francell C	2	South	2,3
1020305	Francell C	3	East	3,4,Post
1020304	Francell C	3	East	5,6,Post
1020306	Francell C	3	West	2,3,4
1020307	Francell C	3	West	2,3,4

Appendix III: Micromorphology

LAUNDRESSES' QUARTERS

FODALQ UNIT32, SLIDE: 1508494
Contexts: upper contexts inside structure hb 211, potentially including surface. Analogous to 1508496, 1020651. Contexts 4 and 7

Boundaries: no distinct boundaries dividing beds. Localized areas have horizontally oriented fine fraction associated with darker organic staining possibly indicative of disturbed facies from a trampled surface.

MICROMORPH BED 1:
Estimated Area: entire bed, 40mm x 70mm = $2800mm^2$

Fabric:
Color: light to medium yellowish brown
Sorting: moderately sorted fine fraction, overall poorly sorted.
C/F ratio: 20:80
Related Distribution: very open porphyric

Matrix (Fabric Microstructure, carbonate/clay type, BFabric). difficult to discern an overall microstructure, slide alternates between compacted areas of dark brown fabric with horizontal orientation of fine fraction silty grains (speckled bfabric) and areas of loose, uncompacted, light brown sediment with larger rocky inclusions.

	Coarse	**Fine**
Grain Size	Avg. 600um with some large rocky 3000um+	Avg 70um
Shape	subrounded	Subrounded to subangular
Orientation	Unoriented	Horizontal orientation (isolated patches)
Composition	Rocky fragments	Mineral grains, silt

Voids: packing voids in loose sections (20%), planar voids in compacted areas (5%, 100um in width, oriented with fine fraction orientation), large rounded vughy voids in lower section of slide associated with hypocoatings of darker sediment and loose sediment/organic material within (2 instances).

Composition:
Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	Avg 200um (both C and F fractions)	10%	Random	Some fracturing
Trachyte	1000um	Rare	Random	minimal

Tuff	Avg 1000um	2 to 5%	Mostly in loose sections	Variable Fe staining
Basalt	none			

Organic:

	Size	Density	Distribution	Weathering
Charcoal	None			
Ash	None			
Plant Remains	100um to 2000um+	2%	Throughout	Decayed. Cross sections, elongate, and amorphous OM visible
Insect Excrement	none			

Other:

	Size	Density	Distribution	Weathering
Bone	None			
Eggshell	None			
Metal	None			
Ceramic	None			
Glass	none			

Secondary Features:

Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
none			

Hypocoatings:

Clay/Carbonate	**Thickness**	**Location (+void type)**	**B Fabric**
Dark staining around vughy voids (likely Organic matter)	150um	Vughy voids containing loose organic and sediment	speckled

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**
none			

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type). Locations: voids, fabric, part of bed

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**

Microsparites	None			
Sparites	None			
Compound Nodules	None			
Mixed Crystallization	None			
Diffuse Carbonate Patches	None			
Fragmented nodules	none			

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation: This slide exhibits a mixture of loose (likely Aeolian or sweepings) sediment accumulation with highly disturbed remnant facies of a trampled surface, likely from the interior of HB211. Surface facies are not articulated and are very thin and highly disturbed, probably a combination of post-depositional disturbance and that the surface was not highly developed in the original. Comparison with other surface instances from HB211 suggest that this was a very informal surface, probably covered with a rug to account for both the lack of surface depth and the lack of anthropogenic material in the surface. Near the foundation where slide 1508494 was located would be even more poorly expressed as this location would see little direct trampling and would have had accumulations of debris from sweepings and Aeolian material getting trapped near the foundation.

FODALQ UNIT32, SLIDE: 1508495
Contexts: lower contexts in unit 32 (interior of HB211) near foundation, near depth of surface in unit 19. Contexts 7 and 8A.

Boundaries: no boundaries

MICROMORPH 1508495 BED 1:
Estimated Area: entire slide: 40mm x 70mm = 280mm^2

Fabric:
- Color: medium dark brown
- Sorting: fine fraction moderately sorted, overall poorly sorted
- C/F ratio: 20:80, more large rocky nodules in lower part of slide
- Related Distribution: porphyric

Matrix (Fabric Microstructure, carbonate/clay type, BFabric).

	Coarse	**Fine**
Grain Size	200um and up	50um and smaller
Shape	Subrounded	Subangular to subrounded
Orientation	Some horizontal orientation in lower regions	Localized horizontal orientation
Composition	Rocky fragments	Quartz and silt

Voids: planar voids oriented with fine fraction (mostly in areas of high compaction, 100 to 450um in width) 2%, packing voids (2%, in areas with less compaction). lentincular, poorly defined vughs (throughout 5%, sometimes associated with decayed organic matter, 500um to 1000um in width),

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	Avg 200um	5 to 10% C and F fractions	Random	Minimal
Trachyte	1000um	Rare	Random	Minimal
Tuff	1000um to 4000um	20%	More large fragments in lower areas	Fe staining, some coatings
Basalt	none			

Organic:

	Size	Density	Distribution	Weathering
Charcoal	None			
Ash	None			
Plant Remains	Avg 500um	2% or less	Mostly in void	Highly decayed

			spaces (vughs and planes)	
Insect Excrement	none			

Other:

	Size	Density	Distribution	Weathering
Bone				
Eggshell				
Metal	2000um	3 instances	E3, D7	Minimal leaching
Ceramic	None			
Glass	none			

Secondary Features:

Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
Dark reddish clay	100um	On tuff nodules (less than half)	Undifferentiated

Hypocoatings:

Clay/Carbonate	**Thickness**	**Location (+void type)**	**B Fabric**
none			

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**
none			

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type).
Locations: voids, fabric, part of bed

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
Microsparites	3000um	1 instance	Mixture of microsparitic calcite, sediment inclusions, and possibly bone	Subrounded, in void or associated with loose sediment (unclear)
Sparites	none			
Compound Nodules	2000um	1 instance	Concentric microsparitic calcite nodules in microsparry matrix	In void/loose sediment, subangular
Mixed	None			

Crystallization				
Diffuse Carbonate Patches	None			
Fragmented nodules	none			

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation: highly compacted sediment near foundation. Bed appears least disturbed of slides from unit 19, likely due to its location near the foundation. Isolated horizontal orientation of fine fraction is likely due to Aeolian/sweeping accumulation near foundation. There are no boundaries/surfaces to indicate this is the result of intentional flooring preserved near the foundation. Sorting and horizontal orientation is likewise not very well pronounced and therefore not the result of a maintained unintentional trampled surface either. Metal in bed likely household debris. Two carbonate nodules are the only evidence of carbonate development in the interior of HB211. The foundation would have served to trap water allowing for the precipitation of carbonate which did not occur elsewhere.

FODALQ UNIT19, SLIDE: 1020649
Contexts: layers underlying surface/compaction zone. Contexts 11, 11C, and 18.

Boundaries: none

MICROMORPH 1020649 BED 1:
Estimated Area: entire slide: 40 x 70mm = 2800mm^2

Fabric:

Color: medium to light yellowish brown
Sorting: poorly sorted
C/F ratio: 40: 60
Related Distribution: enaulic

Matrix (Fabric Microstructure, carbonate/clay type, BFabric). mostly massive, some poorly expressed crumbly. fabric is dominated by large nodules (greater than 1cm) with intergrain spaced a mixture of loose finer material and voids. Speckled b frabic. Crumbly fabric made up of fine grained accumulations around larger particles.

	Coarse	**Fine**
Grain Size	600um and up	200um and smaller
Shape	Rounded to subrounded	Subrounded to subangular
Orientation	Unoriented	Some vertical orientation
Composition	Tuff and quartz	Quartz and silt aggregates

Voids: total void space around 20 to 30% with overall larger voids with more % void space in lower part of slide. Voids are a mixture of packing voids (majority) and vertical channel voids (5 to 10%), most of which have loose sediment in them. Channel voids in upper parts of slide also contain organic material.

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	100um to 2000um	10% c fraction Majority of identifiable grain in F fraction	Random,	Some fracturing
Trachyte	2500UM	1		Fe staining
Tuff	600um to 8000um	Majority of C fraction	Random	Some fe staining

Organic:

	Size	Density	Distribution	Weathering
Charcoal	None			
Ash	None			
Plant Remains	600um	2% or less	In void spaces	Highly decayed

Insect Excrement	none			

Other:

	Size	Density	Distribution	Weathering
Bone	None			
Eggshell	None			
Metal	None			
Ceramic	None			
Glass	none			

Secondary Features:

Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
Dark reddish coatings on Tuff nodules	100um	Tuff nodules, not extensive (5% of nodules)	undifferentiated

Hypocoatings:

Clay/Carbonate	**Thickness**	**Location (+void type)**	**B Fabric**
none			

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**
none			

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type). Locations: voids, fabric, part of bed

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
Microsparites	None			
Sparites	none			
Compound Nodules	none			
Mixed Crystallization	None			

Diffuse Carbonate Patches	None			
Fragmented nodules	none			

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation: compacted natural sediment underlying surface. Increased void space with depth and distance from level of compaction. Vertical channel voids indicate water passage. Composition is generally similar to overlying: majority tuff with finer grained material in between. Very little indications for secondary processes. No carbonate. No anthropogenic material.

FODALQ UNIT19, SLIDE: 1020650
Contexts: Surface and underlying contexts (contexts 7 and 1B)

Boundaries: 1: very difficult to discern boundary between Beds 1 and 2. Some possible anthropogenic content (eggshell, organic) in bed 2 suggests that this is the surface level.

MICROMORPH 1020650 BED 1:
Estimated Area: 20mm x 40mm = 800mm^2

Fabric:
Color: light yellowish brown/tan
Sorting: poorly sorted. Smaller size fraction appears moderately well sorted, but there are a wide range of larger particles
C/F ratio: 30:70
Related Distribution: enaulic

Matrix (Fabric Microstructure, carbonate/clay type, BFabric). Massive microstructure (appears to be Aeolian, randomly distributed grains). Some areas with enaulic where finer particles connect/compact larger fragments.

	Coarse	**Fine**
Grain Size	1250um	200um and smaller
Shape	Rounded	Subrounded
Orientation	None	None
Composition	Tuff and quartz fragments	Quartz fragments, sediment aggregates

Voids: 30 to 40% void space. Primarily packing voids (20 to 30%) with the remainder 10% being larger channel voids and a large vugh near the boundary with bed2. No void coatings.

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	100um to 1250um	30% +	Random	Some fracturing
Trachyte	2000um	1fragment		Fe staining
Tuff	1000um	80% of coarse fraction	Random	Some fe staining
Limestone	2500um	1 fragment		minimal

Organic:

	Size	Density	Distribution	Weathering
Charcoal	None			
Ash	none			
Plant Remains	Average 500um	2%	Mostly in voids,	decayed

			denser near boundary with bed 2	
Insect Excrement	none			

Other:

	Size	Density	Distribution	Weathering
Bone	None			
Eggshell	None			
Metal	none			
Ceramic	None			
Glass	None			

Secondary Features:

Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
Reddish clay	150um	On tuff nodules	undifferentiated

Hypocoatings:

Clay/Carbonate	**Thickness**	**Location (+void type)**	**B Fabric**
none			

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**
none			

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type).
Locations: voids, fabric, part of bed

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
Microsparites	None			
Sparites	None			
Compound Nodules	None			
Mixed Crystallization	None			

Diffuse Carbonate Patches	None			
Fragmented nodules	None			

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation: Bed 1 appears to be Aeolian accumulation with some weathering over the surface of bed 2. Sediment and mineral grains are generally large and rounded and composed mostly of tuff and quartz. High void space indicates lack of compaction and fe coatings on tuff nodules are mostly likely from insitu weathering (As opposed to fe staining on tuff and trachyte.

MICROMORPH 1020650 BED 2:
Estimated Area: 50mm x 40mm = 2000mm^2

Fabric:

Color: Light yellowish tan, generally darker near the boundary with bed 1
Sorting: poorly sorted
C/F ratio: 25:75
Related Distribution: porphyric

Matrix (Fabric Microstructure, carbonate/clay type, BFabric). Fabric is massive with more compaction (less void space) than above. The upper parts of the bed have some small planar or channel voids (often with plant material). Bfabric is undifferentiated.

	Coarse	**Fine**
Grain Size	1000 +	200um and smaller (including silt/clay)
Shape	rounded	subrounded
Orientation	None	None
Composition	80% tuff	Quartz and sediment aggregates

Voids: 10% void space, mostly planar voids (100um) around large nodules. Some with organic material.

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	250um	5 to 10%	Random	Some fracturing
Trachyte	None			
Tuff	1000um+	80 to 90% of C fraction	Random	Heavy Fe staining
Basalt	1000um	Rare	random	

Organic:

	Size	Density	Distribution	Weathering
Charcoal	None			
Ash	None			
Plant Remains	200um+	2%	In voids in upper part of bed	decayed
Insect Excrement	None			

Other:

	Size	Density	Distribution	Weathering
Bone	none			
Eggshell	1000um	1 instance	Near boundary ½	Minimal
Metal	None			
Ceramic	None			
Glass	None			
Mystery	2000um	1 instance	Near base of slide	?

Secondary Features:
Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
Reddish clay (Fe)	50 to 75um	On tuff nodules	undifferentiated

Hypocoatings:

Clay/Carbonate	Thickness	Location (+void type)	B Fabric
none			

InFillings/Void coatings:

Clay/Carbonate	Thickness	Location (void type)	B Fabric
none			

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type).
Locations: voids, fabric, part of bed

Type	Avg. Diameter	Density	*Fabric	Location and Shape
Microsparites	None			
Sparites	None			
Compound Nodules	none			
Mixed Crystallization	None			
Diffuse Carbonate Patches	None			
Fragmented nodules	None			

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation: Bed 2 is a poorly expressed surface (dark – organic – staining near surface with some anthropogenic (eggshell) remains. Compaction is increased in lower layers with the upper part of the bed and the boundary very poorly developed. No indication of trampling or maintanence of surface (no orientation) so surface was likely covered/ protected from direct trampling.

SLIDE INTERPRETATION: Bed 2 is a poorly expressed "surface" or compaction zone beneath a surface, likely a rug for HB 211. Bed 2 is compacted and composed of naturally occurring sediment (similar to overlying layers with a majority of large tuff nodules and smaller quartz grains). The upper parts of bed2 have more void space with organic material in voids and 1 instance of eggshell. Bed 1 (overlying) has an open, uncompacted structure with more void space, indicative of Aeolian accumulation after the floor of HB211 was robbed out.

FODALQ19 1020651.
Contexts: contexts above surface. Possibly including surface. Contexts 1B, 5, and 7.

Boundaries: none

MICROMORPH 1020651 BED1:
Estimated Area: 40 x 70mm = 2800mm^2

Fabric:

Color: light yellowish brown/tan
Sorting: poorly sorted
C/F ratio: 40:60
Related Distribution: monic to enaulic. Majority is monic with variation in size particles. There are small patches with a compacted enaulic structure

Matrix (Fabric Microstructure, carbonate/clay type, BFabric): massive microstructure. Mostly packing voids. Overall mineralogy is predominantly silicates (quartz). Very poorly defined diagonal sorting

Lower part of slide has areas of compacted dark brown sediment underlying well sorted sand sized particles of quartz and tuff (averaging around 600um) with large packing voids with decaying plant material. One carbonate nodule with clay inclusions is present in the compacted section.

	Coarse	**Fine**
Grain Size	250um to 1500um	50um and smaller
Shape	Subrounded to rounded	Rounded, too small
Orientation	Some horizontal/diagonal orientation (weak)	Too small
Composition	Quartz (50%), rock fragments	Quartz, silt particles

Voids: primarily packing voids with some small channels <5%. (overall:10 to 20% void space)

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	50um to 1200um	30%	Random	Some fracturing/yellowing
Trachyte	1100um	Rare	random	none
Tuff	1300um and larger	10%	Random	Fe staining
Basalt	700um	2%	Random	none

Organic:

	Size	Density	Distribution	Weathering

Charcoal	None			
Ash	None			
Plant Remains	610um and larger	2%	Random, more in upper part of slide	Decayed, yellowing
Insect Excrement	Some possible	Rare	Upper part of slide	

Other:

	Size	Density	Distribution	Weathering
Bone	None			
Eggshell	None			
Metal	None			
Ceramic	None			
Glass	None			

Secondary Features:
Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
none			

Hypocoatings:

Clay/Carbonate	**Thickness**	**Location (+void type)**	**B Fabric**
none			

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**
none			

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type).
Locations: voids, fabric, part of bed

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
Microsparites	856um	1 instance	Mixture of microsparitic carbonate and reddish clay	Subangular, in compacted region that may be disturbed floor
Sparites	None			
Compound Nodules	none			

Mixed Crystallization	None			
Diffuse Carbonate Patches	None			
Fragmented nodules	None			

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation: Slide is interpreted as Aeolian accumulation above a surface layer in unit 19. Compacted areas in the lower part of the slide may be highly disturbed facies from this surface layer. They do not appear substantially different from surrounding sediment in composition, but are darker in color (organic staining) compacted, and associated with clear boundary between compacted region and overlying void space with large Aeolian mineral/rock grains and organic matter.

FODALQ UNIT19, SLIDE: 1508496
Contexts: Surface and overlying debris layer. Context 7 and 3.

Boundaries: 1 moderately well expressed boundary between Beds1 and 2. Bed 1 is also highly internally heterogeneous. Boundary of bed 2 is compacted, darker in color than bed 1 with a small void space directly overlying with contains loose fine grained sediment and some organic material. Bed is most clearly expressed in the center of slide, on either side it is less clear or there are multiple potential boundaries suggesting disruption of the surface and movement of aggregates from the surface

MICROMORPH BED 1:
Estimated Area: 35mm x 40mm: 1400mm^2

Fabric:

Color: light to medium tan. Areas of more compaction tend to be darker

Sorting: poorly sorted

C/F ratio: 30:70

Related Distribution: very variable. Open spaces with monic, loose sediment contrast with peds and aggregated areas with porphyric and enaulic structures.

Matrix (Fabric Microstructure, carbonate/clay type, BFabric). very variable. Monic areas with massive structure (at least 50%), alternating with peds with internal sorting and laminated structure, peds with crumbly structure and porphyric distribution.

	Coarse	**Fine**
Grain Size	500um and up	200um and smaller
Shape	rounded	Subrounded
Orientation	Mostly unoriented, some patches with horizontal orientation	Same as C fraction
Composition	Tuff, sediment aggregates	Quartz, silt/clay

Voids: mostly around 20% void space. Packing voids most common, channel voids (150um in width) rare, vughy voids in crumbly peds (350um), some planar voids (50um in width) near large nodules. Large vughs (800um) in massive areas between peds.

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	200um and smaller	10 to 20%	Random	Some fracturing
Trachyte	none			
Tuff	1500um	80% of C fraction	Random	minimal fe staining

Organic:

	Size	Density	Distribution	Weathering
Charcoal	None			
Ash	None			
Plant Remains	400um	2%	In voids	decayed
Insect Excrement	50um	1 patch in crumbly ped		

Other:

	Size	Density	Distribution	Weathering
Bone	None			
Eggshell	500um	1 instance	F7	minimal
Metal	3000um	1 instance	A9%10	Amorphous iron? accumulation
Ceramic	None			
Glass	None			

Secondary Features:
Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
none			

Hypocoatings:

Clay/Carbonate	**Thickness**	**Location (+void type)**	**B Fabric**
none			

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**
none			

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type).
Locations: voids, fabric, part of bed

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
Microsparites	None			
Sparites	None			
Compound Nodules	None			

Mixed Crystallization	None			
Diffuse Carbonate Patches	None			
Fragmented nodules	None			

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation: highly heterogeneous debris layer overlying compaction surface of HB 211. Variable fabrics likely include Aeolian deposits, soil peds, and potentially disturbed surface facies (the ped with horizontal orientation of particles).

MICROMORPH 1508496 BED 2:
Estimated Area: 25mm x 40mm = 1000mm^2

Fabric:
- Color: dark brown
- Sorting: poorly sorted
- C/F ratio: 40:60
- Related Distribution: porphyric

Matrix (Fabric Microstructure, carbonate/clay type, BFabric) Massive microstructure with dark fine grained matrix. Undifferentiated b fabric

	Coarse	**Fine**
Grain Size	500um and up (including large 1500um+)	200um and finer, including fine grained matrix
Shape	Rounded to subrounded	Subrounded to subangular
Orientation	None	Minimal orientation near edge of boundary
Composition	Large tuff and quartz nodules	Quartz, silt

Voids: 5 to 10% void space, mostly small planar voids (100um) near large nodules.

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	50um to 30000um	40% of C fraction 70% of identifiable grains in F fraction	Random	Some fracturing
Trachyte	None			
Tuff	400um to 7000um	60% of C fraction 5% of F faction	Random	Some Fe staining

Organic:

	Size	Density	Distribution	Weathering
Charcoal	None			
Ash	None			
Plant Remains	1000um	2%	In boundary void and void space around large nodules near boundary	decayed
Insect Excrement	50um	1 instance		

Other:

	Size	Density	Distribution	Weathering
Bone	None			
Eggshell	None			
Metal	none			
Ceramic	None			
Glass	none			
Plaster	600um	2 instances	A/B11	none

Secondary Features:
Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
None			

Hypocoatings:

Clay/Carbonate	**Thickness**	**Location (+void type)**	**B Fabric**
none			

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**
none			

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type).
Locations: voids, fabric, part of bed

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
Microsparites	None			
Sparites	none			
Compound Nodules	None			
Mixed Crystallization	None			
Diffuse Carbonate Patches	None			
Fragmented nodules	None			

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation: "surface" or compaction area beneath debris layer of bed 1. Bed 2 has a relatively clearly defined boundary with an intact boundary void with loose sediment and organic material. Some (very minimal) possible orientation of fine grained particles in the matrix of bed2. Overall, composition is similar to overlying but with darker color to the matrix likely from organic staining. Only two very small fragments of plaster were recovered from within the surface (around 600um each) and no anthropogenic other material or other debris was recovered within the surface suggesting it may have been covered rather than an exposed use surface.

Slide interpretation: 1508496 shows a relatively intact surface or compaction zone with overlying debris including Aeolian deposition, disturbed soil peds, and possibly disturbed surface facies. Bed 2 is the (relatively) intact compaction zone with a clear boundary void but also showing disruption of the surface boundary to the sides where multiple potential boundaries are visible. Limited anthropogenic debris (1 piece of eggshell in bed 1) suggest that this was not a use surface, but is more likely a compaction surface underneath a use-surface such as a wood floor or, more likely, a rug. Since the surface is relatively well developed in some sections it was probably closer to the level of trampling than would be the case with a wood floor, more indicative of a rug. Very little post-depositional soil development or weathering. Compaction surface appears to be made of the same material as the overlying deposit, rather than purposefully prepared.

FODALQ UNIT31, SLIDE: 1508507
Contexts: lower contexts in unit 31 near foundation, exterior of structure. Context 10.

Boundaries: none

MICROMORPH BED 1:
Estimated Area: entire slide 25mm x 40mm = 1000mm^2

Fabric:
- Color: medium brown
- Sorting: poorly sorted
- C/F ratio: 30:70
- Related Distribution: porphyric

Matrix (Fabric Microstructure, carbonate/clay type, BFabric). compact, massive microstructure, no bfabric

	Coarse	**Fine**
Grain Size	300um to 4000um	100um and smaller
Shape	Rounded	Subangular
Orientation	None	None
Composition	Tuff, quartz	Quartz, sediment grains

Voids: 2%, mostly planar voids (150um in width) associated with larger fragments or organic matter.

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	100um to 1500um	10 to 20%	Random	minimal
Trachyte	none			
Tuff	Avg 800um	20%	Random	Fe staining
Basalt	500um	rare		

Organic:

	Size	Density	Distribution	Weathering
Charcoal	None			
Ash	None			
Plant Remains	300um	Rare	Mostly in upper part	Very decayed
Insect Excrement	none			

Other:

	Size	Density	Distribution	Weathering

Bone	None			
Eggshell	None			
Metal	None			
Ceramic	None			
Glass	none			

Secondary Features:
Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
none			

Hypocoatings:

Clay/Carbonate	**Thickness**	**Location (+void type)**	**B Fabric**
none			

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**
none			

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type).
Locations: voids, fabric, part of bed

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
Microsparites	None			
Sparites	None			
Compound Nodules	None			
Mixed Crystallization	none			
Diffuse Carbonate Patches	None			
Fragmented	None			

nodules				

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation: sterile/natural lower sediment against foundation. Less organic matter and more compacted than upper contexts visible in 1508508. No evidence for carbonate development. Bed was mis-described in the field as a calcite due to the compactness.

FODALQ UNIT31, SLIDE: 1508508
Contexts: upper contexts in unit 31 near foundation, exterior of structure. Contexts 4 and 6.

Boundaries: none

MICROMORPH BED 1:
Estimated Area: 40mmm x 70mm (entire slide) = 2800mm^2

Fabric:

Color: medium brown fabric
Sorting: poorly sorted
C/F ratio: 40:60
Related Distribution: enaulic to loose porphryic

Matrix (Fabric Microstructure, carbonate/clay type, BFabric). massive overall microstructure with large rocky fragments and some fine grained sediment interlocking. Generally, low void space. Upper part of slide is slightly darker in color but there is no clear boundary to indicate separate beds. Crumbly to spongy texture in upper part of slide is likely related to higher presence of organic matter in the fine fraction.

	Coarse	**Fine**
Grain Size	200um to 3000um	100um and smaller
Shape	subrounded	Subrounded
Orientation	Unoriented	Unoriented
Composition	Tuff, quartz	Sediment grains, quartz, organic matter

Voids: primarily packing voids ranging from 5 to 10% , no obvious change with depth. Planar voids associated with some large fragments as well as plant material (100um, 2 to 5%). Rare large vughy voids (1000um)

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	100um to 2000um	10%	Random	minimal
Trachyte	None			
Tuff	500um to 2000um	20%	Random	Fe staining
Basalt	1000um	Rare	Random	minimal

Organic:

	Size	Density	Distribution	Weathering
Charcoal	None			
Ash	none			

Plant Remains	Avg 300um, amorphous organic throughout fine fraction	5%	Throughout, amorphous particles in fine fraction as well as large remains	decayed
Insect Excrement	none			

Other:

	Size	Density	Distribution	Weathering
Bone	None			
Eggshell	None			
Metal	4000	1 instance		
Ceramic	None			
Glass	none			

Secondary Features:
Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
none			

Hypocoatings:

Clay/Carbonate	**Thickness**	**Location (+void type)**	**B Fabric**
none			

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**
none			

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type). Locations: voids, fabric, part of bed

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
Microsparites	None			
Sparites	none			
Compound Nodules	None			

Mixed Crystallization	none			
Diffuse Carbonate Patches	None			
Fragmented nodules	none			

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation: compacted natural accumulation near foundation stones. Foundation likely retained moisture allowing for the increase in organic matter seen in this slide. No evidence for surface or flooring. Organic matter in the fine fraction of the upper section may be from decaying wood boards of the porch, as suggested by in situ nails recovered during excavation. Additionally, in contrast to other exterior samples with higher amounts of organic matter in the fabric, there does not appear to be a rooty texture characterized by channel voids with larger fragments of plant material. This further suggests that the organic matter in the fine fraction was introduced through decay of wooden boards rather than vegetation.

FODA LQ UNIT 23, SLIDE: 1020648

Contexts: upper layer above and including ash feature. Contexts 5 and 9A.

Boundaries: Boundary between beds 1 and 2 is not clearly defined (no compacted surface or boundary void) but is marked by the sharp increase in ash particles which comprise the matrix of bed 2

MICROMORPH BED 1:
Estimated Area: 25mm x 40mm = 1000mm^2

Fabric:
- Color: light brown
- Sorting: poorly sorted
- C/F ratio: 20:80
- Related Distribution: open porphyric

Matrix (Fabric Microstructure, carbonate/clay type, BFabric). microstructure is massive, loose aggregation of large nodules with smaller grains loosely packed between. No matrix

	Coarse	**Fine**
Grain Size	300um and up	100um and lower
Shape	Rounded to subrounded	Rounded aggregates
Orientation	None	None
Composition	Tuff and quartz nodules	Quartz and silty aggregates

Voids: 20 to 30% void space. Packing voids

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	700um and smaller	10%	Random	minimal
Trachyte	1400um	Rare	Random	minimal
Tuff	600um and up	Majority of C fraction	Random	Minimal
Basalt	1600um	Rare	Random	minimal

Organic:

	Size	Density	Distribution	Weathering
Charcoal	None			
Ash	F fraction	2 to 5%,	more near boundary	none
Plant Remains	500um	Rare	In voids	Decayed
Insect	none			

Excrement				

Other:

	Size	Density	Distribution	Weathering
Bone	800um	1 instance	Near boundary with bed 2	decayed
Eggshell	None			
Metal	None			
Ceramic	None			
Glass	none			

Secondary Features:

Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
none			

Hypocoatings:

Clay/Carbonate	**Thickness**	**Location (+void type)**	**B Fabric**
none			

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**
none			

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type).
Locations: voids, fabric, part of bed

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
Microsparites	None			
Sparites	None			
Compound Nodules	None			
Mixed Crystallization	none			
Diffuse	None			

Carbonate Patches				
Fragmented nodules	None			

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation: Aeolian and colluvial accumulation overlying ash feature in LQ16 and 23. Some incorporation of ash particles into the overlying layer.

1020648 MICROMORPH BED 2:
Estimated Area: 30mm x 40mm = 1200mm^2

Fabric:
- Color: medium to dark grayish brown.
- Sorting: well sorted fine fraction, un sorted C fraction
- C/F ratio: between 10:90 and 20:80
- Related Distribution: porphyric

Matrix (Fabric Microstructure, carbonate/clay type, BFabric). overall microstructure is massive. Fabric is composed predominantly of ash with a mostly speckled bfabric, some small localized zones of horizontal patterning in bfabric

	Coarse	**Fine**
Grain Size	200um and larger	ash
Shape	Rounded/subrounded	Too small
Orientation	Random	random
Composition	Tuff, charcoal	ash

Voids: 5 to 10% void space composed primarily of planar voids around large nodules (100 to 200um) and isolated patches with larger densities of vughy voids (particularly associated with large charcoal fragment in 12C.

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	200um and up	5 to 10% of total	Random	Minimal
Trachyte	600um	Rare	random	
Tuff	400um and up	5 to 10% of total	Random	Some fe staining

Organic:

	Size	Density	Distribution	Weathering
Charcoal	300um to 7000um	10%	Throughout, but more dense in lower part of slide. Some horizontal orientation	minimal
Ash	F fraction	Majority of f fraction	Some localized zones of horizontal/diagonal patterning	Yellow stains that might be phosphate
Plant Remains	Non unburnt			
Insect Excrement	none			

Other:

	Size	Density	Distribution	Weathering
Bone	700um	1 instance	Near metal	burnt
Eggshell	1700um	1 instance	Random	Burnt
Metal	3000um	2 connected fragments	Random	Possible Fe leaching nearby
Ceramic	None			
Glass	None			
Plaster	1000um	3 fragments	G10,D12, E13	

Secondary Features:

Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
none			

Hypocoatings:

Clay/Carbonate	**Thickness**	**Location (+void type)**	**B Fabric**

none			

InFillings/Void coatings:

Clay/Carbonate	Thickness	Location (void type)	B Fabric
none			

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type).
Locations: voids, fabric, part of bed

Type	Avg. Diameter	Density	*Fabric	Location and Shape
Microsparites	None			
Sparites	None			
Compound Nodules	None			
Mixed Crystallization	none			
Diffuse Carbonate Patches	None			
Fragmented nodules	None			

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
Possible – yellow stains in ash matrix

Manganese (location, size, type, density)

none

Iron Nodules (location, size, type, density)
none

Interpretation: highly burnt debris layer. Matrix is almost entirely ash with some rock and mineral grains indicating it was likely burnt or dumped at this location rather than windblown accumulation. Some anthropogenic materials – metal, eggshell (possibly bone) suggest that anthropogenic debris was burnt, possibly material from the structure.

Slide Interpretation: Slide includes a heavily burnt layer of anthropogenic debris and ash, either burnt in place or dumped there. Localized orientation of charcoal and ash suggests that it was burnt in place (but need to compare with underlying layer). Overlying context (Bed1) appears to be an Aeolian deposit.

FODALQ UNIT 16, SLIDE: 1508506

Contexts: burnt layer and underlying in interior of HB 211. Two beds underlying the burnt layer appear to be a mixed transition zone, and a bed without ash. Contexts 2 and 3.

Boundaries 1/2: clear boundary marked by decrease in concentration of ash in fine fraction and increase in stony coarse fraction

2/3: clearer in 2x than by eye. Marked by decrease in amount of ash (little to no ash in bed3).

MICROMORPH BED 1:
Estimated Area: 30mm x 40mm = 1200mm^2

Fabric:

Color: very dark brown
Sorting: moderately well sorted, especially fine fraction
C/F ratio: 20:80
Related Distribution: open porphyric

Matrix (Fabric Microstructure, carbonate/clay type, BFabric). Fabric is composed of finely paked ash with charcoal and some rocky inclusions. Bedding is generally massive with isolated channel voids and some packing voids. Increase in rocky inclusions in lower part of bed

	Coarse	**Fine**
Grain Size	150um and larger	Too small
Shape	Angular	Too small
Orientation	Unoriented	Too small
Composition	Charcoal, rock grains, bone	ash

Voids: Small packing voids in fine fraction throughout (5 to 10%), variable concentrations. Mostly vertical, thin channel voids (50um). Larger voids associated with bone fragments and other large particles.

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	Avg 250um	5%	Random	minimal
Trachyte	700um	1 instance	Random	minimal
Tuff	400 – 2000um	2%	More concentrated and larger in lower part of bed	minimal
Basalt	none			

Organic:

	Size	Density	Distribution	Weathering
Charcoal	Fine fraction to 5000um	Large 5% Fine 10 to 20%	Random	minimal
Ash	Fine fraction	70%+	Random	minimal
Plant Remains	Avg 500um	2 to 5%	random	charred
Insect Excrement	none			

Other:

	Size	Density	Distribution	Weathering
Bone	Avg 1000um	2 to 5%	Random,	minimal
Eggshell	None			
Metal	150um to 2500um	<2%, but found throughout	Random	Minimal leaching
Ceramic	None			
Glass	none			

Secondary Features:

Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
none			

Hypocoatings:

Clay/Carbonate	**Thickness**	**Location (+void type)**	**B Fabric**
none			

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**
none			

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type).
Locations: voids, fabric, part of bed

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
Microsparites	None			
Sparites	none			

Compound Nodules	None			
Mixed Crystallization	None			
Diffuse Carbonate Patches	None			
Fragmented nodules	none			

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation: highly burnt debris dumped into this location. Metal and (potentially) bone inclusions indicate burning of anthropogenic material, but lack of orientation, compaction, or evidence for burning indicates that the actual burning event took place elsewhere.

MICROMORPH 1508506 BED 2:
Estimated Area: 20mm x 40mm = 800mm^2

Fabric:
- Color: medium dark brown
- Sorting: poorly sorted
- C/F ratio: 40:60
- Related Distribution: porphryic

Matrix (Fabric Microstructure, carbonate/clay type, BFabric). matrix is predominantly ash with a mixture of fine grained sediment particles. Overall massive structure with few voids. Coarse fraction is overall larger and more dominated by rocky fragments than Bed1.

	Coarse	**Fine**
Grain Size	500um and up	Too small
Shape	Subangular	Too small
Orientation	Unoriented	Too small
Composition	Rocky and mineral grains	Too small

Voids: isolated vughy voids (2000um, <2%) with loose sediment fill. Vertical channel void (53um, 1 instance. Fine fraction packing voids vary from 2% up to 15% in columns H and I. larger channel void (may be a manufacturing crack) about 250um traces near boundary with bed 3 and initiates in bed1. Vertical channels may also be from slide manufacturing (one bisects a basalt fragment)

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	300um to 1000um	10%	Random	minimal
Trachyte	none			
Tuff	1000um	10%	Random	minimal
Basalt	1500um	1 fragment		

Organic:

	Size	Density	Distribution	Weathering
Charcoal	No large frags			
Ash	Fine fraction	20 to 30%	Throughout	minimal
Plant Remains	None			
Insect Excrement	none			

Other:

	Size	Density	Distribution	Weathering
Bone	None			
Eggshell	None			
Metal	None			
Ceramic	None			
Glass	none			
Plaster	5500um	1 large instance, other smaller possibilities in	Random	Cracked, fragmented Pic4

		both bed 1 and 2		

Secondary Features:

Coatings:

Clay/Carbonate	Thickness	Location/size	B Fabric
none			

Hypocoatings:

Clay/Carbonate	Thickness	Location (+void type)	B Fabric
none			

InFillings/Void coatings:

Clay/Carbonate	Thickness	Location (void type)	B Fabric
none			

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type).
Locations: voids, fabric, part of bed

Type	Avg. Diameter	Density	*Fabric	Location and Shape
Microsparites	none			
Sparites	none			
Compound Nodules	none			
Mixed Crystallization	none			
Diffuse Carbonate Patches	none			
Fragmented nodules	none			

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation:

Mixture of material from overlying ash/burnt layer and underlying bed of unburnt material. No evidence for burning indicates that the material was not burnt in situ.

MICROMORPH 1508506 BED3:
Estimated Area: 10mm x 40mm = 400mm^2

Fabric:
- Color: light to medium brown
- Sorting: poorly sorted
- C/F ratio: 40:60
- Related Distribution: enaulic

Matrix (Fabric Microstructure, carbonate/clay type, BFabric). fabric is loose fine material composed of fine grained sediment. No bfabric. massive microstructure

	Coarse	**Fine**
Grain Size	300um to 2000+um	100um and smaller
Shape	Subrounded	subangular
Orientation	Unoriented	Unoriented
Composition	Tuff, quartz	Quartz, sediment grains

Voids: packing voids 20%, mostly in fine fraction. Planar voids (250um in width) associated with some larger rock fragments.

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	Avg 500um	10%	Random	minimal
Trachyte	None			
Tuff	Avg 1000um	15%	Random	Fe staining and clay coatings
Basalt	1500um	1 instance	Random	minimal

Organic:

	Size	Density	Distribution	Weathering
Charcoal	None			
Ash	none			
Plant Remains	400um in width	2 in H12	Isolated	decayed
Insect Excrement	none			

Other:

	Size	Density	Distribution	Weathering
Bone	None			
Eggshell	None			
Metal	None			
Ceramic	None			
Glass	none			

Secondary Features:

Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
Reddish clay on some tuff nodules	70um	Rare on tuff	Too small

Hypocoatings:

Clay/Carbonate	**Thickness**	**Location (+void type)**	**B Fabric**
none			

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**
none			

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type). Locations: voids, fabric, part of bed

Type	Avg. Diameter	Density	*Fabric	Location and Shape
Microsparites	None			
Sparites	None			
Compound Nodules	None			
Mixed Crystallization	None			
Diffuse Carbonate Patches	None			
Fragmented nodules	None			

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation: sterile/natural sediment accumulation underneath burnt layers. No evidence for burning. No anthropogenic material. No evidence for surface.

Slide interpretation: Bed 1 is a dump of burnt anthropogenic material burnt elsewhere and then dumped in this location. Bed 2 is a transition zone incorporating some burnt material from bed 1 along with sterile sediment from bed 3. Increase in rocky inclusions at base of bed 1 further support interpretation of bed 2 as a transition zone. Bed 3 is a sterile Aeolian accumulation of sediment on which the burnt material was dumped. No evidence for insitu burnt (no heating, compaction, and no evidence for burnt material in bed 3).

FODALQ UNIT 17, SLIDE: 1508492
Contexts: Middle contexts in unit 17, exterior of HB211. Contexts 2 and 3A.

Boundaries: None

MICROMORPH BED 1:
Estimated Area: 40mm x 70mm = 2800mm^2

Fabric:

Color: medium dark brown
Sorting: bimodal, moderately sorted
C/F ratio: 30:70
Related Distribution: porphyric to enaulic

Matrix (Fabric Microstructure, carbonate/clay type, BFabric). spongy microstructyure, organic matter throughout fine fraction, undifferentiated bfrabric. Organic matter is most concentrated in upper part of slide. highest portion of slide is disaggregated.

	Coarse	**Fine**
Grain Size	Avg 800um	Too small
Shape	Rounded	Too small
Orientation	None	None
Composition	Rock fragments	Organic matter, fine silt

Voids: planar voids (2%) mostly associated with large rock fragments, some in fabric (50um in width). Small vughs and channels (400um width) associated with plant matter (<2%).

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	300um to 2000um	20%	Random	Fracturing, yellow
Trachyte	3000um	Rare	Random	Some staining
Tuff	Avg 800um	10%	Random	Some fe staining
Basalt	5000um	1 instance	Random	minimal

Organic:

	Size	Density	Distribution	Weathering
Charcoal	None			
Ash	None			
Plant Remains	300um	2 to 5%	Random, in vughs and channel voids. Also in fine	decayed

			fraction	
Insect Excrement	180um (cluster)	1 cluster	In vughy void	decayed

Other:

	Size	Density	Distribution	Weathering
Bone	None			
Eggshell	none			
Metal	None			
Ceramic	None			
Glass	none			

Secondary Features:
Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
none			

Hypocoatings:

Clay/Carbonate	**Thickness**	**Location (+void type)**	**B Fabric**
none			

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**
none			

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type).
Locations: voids, fabric, part of bed

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
Microsparites	None			
Sparites	None			
Compound Nodules	none			
Mixed Crystallization	None			
	None			

Diffuse Carbonate Patches				
Fragmented nodules	none			

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation: natural sediment from exterior of structure. Compared to overlying slide, this slide has more coarse fraction and more organic matter (both large pieces in and in fine fraction). No evidence for anthropogenic alterations. Organic matter is dense in upper part of slide.

FODALQ UNIT17 , SLIDE: 1508493
Contexts: Lower Contexts in unit 17, exterior of HB 211. Contexts 3A and 3B.

Boundaries: none

MICROMORPH BED 1:
Estimated Area: 40mm x 70mm = 28mm^2

Fabric:
Color: medium brown
Sorting: poorly sorted
C/F ratio: 30:70
Related Distribution: porphyric to enaulic

Matrix (Fabric Microstructure, carbonate/clay type, BFabric). massive to crumbly microstructure. Little organic matter in fine fraction. Undifferentiated bfabric.

	Coarse	**Fine**
Grain Size	200um to 2000um	100um and smaller
Shape	Subrounded	Mostly too small
Orientation	None	None
Composition	Rock fragments	Silty, quartz grains

Voids: thin planar voids (50um in width) – 2%, as well as vughy voids (300um across) about 2%. Lower section also has an overall looser fabric with large packing voids (300um across, 5 to 10%).

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	10oum to 1000um	10 to 20%	Random	Minimal fracturing
Trachyte	None			
Tuff	Avg 800um	10%	Random	Fe staining
Basalt	none			

Organic:

	Size	Density	Distribution	Weathering
Charcoal	None			
Ash	None			
Plant Remains	200um	<2%	Random	Highly decayed
Insect Excrement	none			

Other:

	Size	Density	Distribution	Weathering
Bone	none			
Eggshell	None			
Metal	None			
Ceramic	None			
Glass	none			

Secondary Features:

Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
none			

Hypocoatings:

Clay/Carbonate	**Thickness**	**Location (+void type)**	**B Fabric**
none			

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**
none			

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type).
Locations: voids, fabric, part of bed

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
Microsparites	None			
Sparites	None			
Compound Nodules	None			
Mixed Crystallization	none			
Diffuse Carbonate Patches	None			

Fragmented nodules	None			

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation: underlying parent sediment outside HB211. Minimal evidence for organic matter decay or humic material in fine fraction, minimal decay on quartz fragements.

FODALQ UNIT 17, SLIDE: 1508509
Contexts: upper contexts in unit 17, exterior of HB211. Contexts 1 and 2.

Boundaries: None

MICROMORPH BED 1:
Estimated Area: 40mm x 70mm = 2800mm^2

Fabric:
Color: medium yellowish brown
Sorting: bimodal, moderately well sorted
C/F ratio: 20:80
Related Distribution: mostly porphyric, upperpart is more open (possibly disaggregate)

Matrix (Fabric Microstructure, carbonate/clay type, BFabric). overall massive microstructure. More open structure in upper part of slide. Fine fraction appears to contain some amorphous organic matter, but not densely. Organic matter is more present in lower part of slide Bfabric is undifferentiated.

	Coarse	**Fine**
Grain Size	Avg 500um	Too small
Shape	Rounded	Too small
Orientation	None	None
Composition	Tuff and quartz, some basalt	Fine silt, organic matter

Voids: small planar voids (50um across) in fine fraction (2-5%). upper possibly disaggregated section has packing voids (10 to 20%).

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	300um to 1000um	10%	Random	Fractured, yellowed
Trachyte	600um	Rare	Random	Minimal
Tuff	1000um	5 to 10%	Random	Minimal Fe staining
Basalt	600um	<2%	Random	Minimal
Limestone	20mm	1 instance	lower part of slide	

Organic:

	Size	Density	Distribution	Weathering
Charcoal	None			
Ash	None			
Plant Remains	500um and	<2%	Random	Highly decayed

	larger			
Insect Excrement	none			

Other:

	Size	Density	Distribution	Weathering
Bone	None			
Eggshell	None			
Metal	None			
Ceramic	None			
Glass	none			
Rubber/Plastic? Mystery?	20mm	Upper part of slide		

Secondary Features:

Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
none			

Hypocoatings:

Clay/Carbonate	**Thickness**	**Location (+void type)**	**B Fabric**
none			

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**
none			

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type). Locations: voids, fabric, part of bed

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
Microsparites	None			
Sparites	None			
Compound Nodules	None			
Mixed Crystallization	none			

Diffuse Carbonate Patches	None			
Fragmented nodules	None			

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation: Upper exterior contexts, natural sediment with organic matter and no evidence of anthropogenic alterations. Large limestone fragment in lower part of slide (odd? Maybe from road construction? – limestone is very rare elsewhere in LQ). Mystery item in upper right corner - white in regular light, opaque in PP and XP – possibly plastic? No bedding or obvious boundaries.

FODALQ UNIT 53, SLIDE: 1508497
Contexts: lower contexts in exterior of HB211, directly below 1508502. Contexts 5, 6, and 8.

Boundaries: No boundaries

MICROMORPH 1508497 BED 1:
Estimated Area: 40mm x 70mm

Fabric:

Color: medium yellowish brown
Sorting: poorly sorted
C/F ratio: 30:70
Related Distribution: enaulic to porphyric

Matrix (Fabric Microstructure, carbonate/clay type, BFabric). spongy microstructure with no carbonate. Organic-rich matrix and undifferentiated bfabric.

	Coarse	**Fine**
Grain Size	200um to 2000um	Too small
Shape	Subrounded	Too small
Orientation	None	None
Composition	Tuff, quartz, organic	Organic, silt

Voids: planar and vughy voids assocated with decaying organic matter (50 to 300um in width), planar voids near large rock fragments (100um or less in width). 10% void space overall. Localized patches have large vughs or packing voids (matrix is less compacted), up to 20% void space) – these are less than 15% of total slide area.

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	200um to 2000um	20%	Random	Fracturing
Trachyte	500um	<2%	Random	Minimal
Tuff	Avg 1000um	10%	Random	Some Fe staining
Basalt	none			

Organic:

	Size	Density	Distribution	Weathering
Charcoal	None			
Ash	None			
Plant Remains	300um	C fraction 2%, also present in F fraction	In vughy voids	Highly decayed

Insect Excrement	none			

Other:

	Size	Density	Distribution	Weathering
Bone	None			
Eggshell	None			
Metal	None			
Ceramic	None			
Glass	none			

Secondary Features:

Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
none			

Hypocoatings:

Clay/Carbonate	**Thickness**	**Location (+void type)**	**B Fabric**
none			

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**
none			

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type).
Locations: voids, fabric, part of bed

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
Microsparites	None			
Sparites	None			
Compound Nodules	none			
Mixed Crystallization	none			
Diffuse	none			

Carbonate Patches				
Fragmented nodules	none			

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation: organic rich layer with natural sediment. No evidence for bedding or anthropogenic material. Similar matrix, but less compacted and more spongy compared to slides from unit 31 (exterior of HB211 where nails recovered, probably porch). This may indicate that this location was not as high traffic.

FODALQ53 UNIT53, SLIDE: 1508502
Contexts: Upper contexts in unit 53, exterior of HB211. Directly above 1508497. Contexts 2, 3A, and 5).

Boundaries: None

MICROMORPH BED 1:
Estimated Area: 40mm x 70mm = 2800mm^2

Fabric:
- Color: medium brown
- Sorting: poorly sorted
- C/F ratio: 30:70
- Related Distribution: top: monic to enaulic, lower: enaulic to porphyric

Matrix (Fabric Microstructure, carbonate/clay type, BFabric). overall massive microstructure. Slide is dominated by a large tuff fragment (30mm). more open fabric with packing voids in upper part of slide, lower part has some small planar voids but is more densely packed. Fabric is high in amorphous organic matter in lower sections. Zone in middle of slide has some spongy microstructure.

	Coarse	**Fine**
Grain Size	200um to 2000um	Avg 50um
Shape	Subrounded	Too small
Orientation	None	Too small
Composition	Tuff, quartz	Organic, silty

Voids: 10% to 20% voids in upper part of slide, mostly packing voids with some vughs and channels associated with large plant fragments. Lower part of slide 5% or less void space (no boundary), mostly small planar void (50um in width) around large fragments.

Composition:
Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	200um to 2000um	20%	Random	Some fracturing
Trachyte	900um	2% or less	Random	Minimal
Tuff	400um to 2000um	10%	Random	Fe staining

Organic:

	Size	Density	Distribution	Weathering
Charcoal	None			
Ash	None			
Plant Remains	500um	2%	In voids/matrix. Also amorphous	decayed

			organic throughout fabric (too small to measure)	
Insect Excrement	none			

Other:

	Size	Density	Distribution	Weathering
Bone	None			
Eggshell	None			
Metal	2600um	1 instance	Upper part of slide near plaster?	Mottled, leached
Ceramic	None			
Glass	None			
Plaster	2600um	1 instance	Upper part of slide	White in regular light, red in Polarized(burnt?), sparkly gray (calcite) in XP.

Secondary Features:

Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
Fe coatings on Tuff	50um	Tuff fragments	undifferentiated

Hypocoatings:

Clay/Carbonate	**Thickness**	**Location (+void type)**	**B Fabric**
none			

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**
none			

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type).
Locations: voids, fabric, part of bed

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
Microsparites	None			
Sparites	None			

Compound Nodules	None			
Mixed Crystallization	None			
Diffuse Carbonate Patches	None			
Fragmented nodules	None			

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation: natural, organicy sediment in exterior of structure. Spongy texture and organic remains may be remnant of decayed porch, but are not as pronounced as in unit 31, therefore may just be the result of exterior exposure. Metal and plaster/mortar (possibly burnt) are anthropogenic remnants from the structure. Mortar is reddish in thin section, unlike the lime plaster seen in structure interiors at CV and FrancellA.

FODALQ UNIT59, SLIDE: 1508593
Contexts: Context associated with fragment from possible wood floor in unit 59, HB212. Contexts 5 and 7.

Boundaries: none. Slide is slightly disaggregated on right hand side (columns I and J), description concerns the intact portion.

MICROMORPH 1508593 BED 1:
Estimated Area: 40mm x 70mm = 2800mm^2

Fabric:
 Color: mottled light brown
 Sorting: moderately well sorted
 C/F ratio:15:85
 Distribution: porphyric

Matrix (Fabric Microstructure, carbonate/clay type, BFabric). overall massive microstructure. Fabric is a mixture of silt and amorphous organic material, but does not produce a crumbly/spongy texture as in unit 31 (fabric is also overall lighter colored – more mineral material – than unit 31).

	Coarse	**Fine**
Grain Size	200um to 1000um	100um and lower
Shape	Subrounded, some subangular	Subangular, too small
Orientation	None	None
Composition	Tuff, quartz	Silt, quartz, organic matter

Voids: vertical channel voids (<2%, 250um in width), vughs (300um in width, <2%), some rare packing voids. Overall very little void space.

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	100um to 1000um	20%	Random	Minimal
Trachyte	None			
Tuff	Avg 800um	5 to 10%%	Random	Some fe staining
Basalt	600um	Rare	Random	Minimal

Organic:

	Size	Density	Distribution	Weathering
Charcoal	None			
Ash	None			
Plant Remains	300um	2% - recognizable		

		remains, also present as amorphous organic matter in Fine fraction		
Insect Excrement	none			

Other:

	Size	Density	Distribution	Weathering
Bone	None			
Eggshell	None			
Metal	None			
Ceramic	None			
Glass	none			

Secondary Features:
Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
none			

Hypocoatings:

Clay/Carbonate	**Thickness**	**Location (+void type)**	**B Fabric**
none			

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**
none			

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type).
Locations: voids, fabric, part of bed

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
Microsparites	1700um	1 instance	Micritic calcite	Rounded, in fabric (unclear if precipitated in void)
Sparites	None			
Compound Nodules	None			
	None			

Mixed Crystallization				
Diffuse Carbonate Patches	None			
Fragmented nodules	none			

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation: compact, fine grained sediment with a moderate amount of decayed organic matter including both intact plant materials, amorphous organic matter, and humic material in fine fraction. Microstructure is massive (not crumbly/spongy as in unit 31) and fabric is also not as dark in color as in unit 31. No anthropogenic materials recovered. No evidence for a surface. This context also included fragments of wood from what was hypothetzied as a wooded floor. It is potential that this sediment is from beneath the floor, which was more likely removed rather than decaying in place. Some decay is suggested by the presence of amorphous organic material and humic material in the fine fraction, but this accumulation is much less dense than in unit 31. It is also possible that the difference is because this context was indoors and would therefore have received less direct contact with weather. If the context was either buried soon after occupation or the wood floor was removed, this may have prevented extensive decay. A single carbonate nodule can be explained by the nearby foundation, which would have assisted water retention to allow for carbonate precipitation.

FODALQ UNIT25, SLIDE: 1508498
Contexts: Lower contexts outside of fence(?) line of HB212 in unit 25. Below 1508498. Contexts 7 and 8.

Boundaries: None

MICROMORPH BED 1:
Estimated Area: 40mm x 70mm = $2800mm^2$

Fabric:

Color: light yellowish brown to medium brown
Sorting: poorly sorted
C/F ratio: 20:80
Related Distribution: enaulic to monic

Matrix (Fabric Microstructure, carbonate/clay type, BFabric). overall microstructure between massive and crumbly (in areas with more dense fine fraction and light humic staining). Some organic matter in fine fraction, mostly in upper sections of slide, but not as prevalent as in overlying slide (1508499).

	Coarse	**Fine**
Grain Size	200 to 2000um+	100um and smaller
Shape	Subrounded to subangular	Subrounded to subangular
Orientation	None	None
Composition	Tuff, quartz	Quartz, silt, some organic matter

Voids: packing voids between 5 and 20% (very variable compaction of partibles). A limited amount of planar voids (100um or less in width) are present in areas of more compaction (5% or less of total area).

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	200um to 2000um	20%	Random	Minimal
Trachyte	2000um+	1 instance		Minimal
Tuff	1000um	5 to 10%	Random	Fe staining
Basalt	800um	Rare	Random	minimal

Organic:

	Size	Density	Distribution	Weathering
Charcoal	None			
Ash	None			
Plant Remains	400um	2% or less	Mostly in upper part of slide	Decayed

Insect Excrement	none			

Other:

	Size	Density	Distribution	Weathering
Bone	None			
Eggshell	None			
Metal	None			
Ceramic	None			
Glass	none			

Secondary Features:
Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
none			

Hypocoatings:

Clay/Carbonate	**Thickness**	**Location (+void type)**	**B Fabric**
none			

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**
none			

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type).
Locations: voids, fabric, part of bed

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
Microsparites	None			
Sparites	None			
Compound Nodules	None			
Mixed Crystallization	none			
Diffuse	None			

Carbonate Patches				
Fragmented nodules	None			

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation: natural underlying sedimentary material with small amount of organic matter and humus incorporated into fine fraction. No evidence for anthropogenic action.

FODALQ UNIT25, SLIDE: 1508499
Contexts: upper contexts outside of fence(?) line of HB212 in unit 25. Above 1508598. Contexts 1, 3 and 7.

Boundaries: none

MICROMORPH BED 1:
Estimated Area: 40mm x 70mm = 2800mm^2

Fabric:

Color: light yellowish to medium brown
Sorting: poorly sorted. Fine fraction is moderately sorted in some locations.
C/F ratio: 20:80
Related Distribution: enaulic to very loose porphyric

Matrix (Fabric Microstructure, carbonate/clay type, BFabric). Overall microstructure highly varied from massive to crumbly. There are isolated locations of horizontally oriented fine fraction and planar voids as well as overall increased compaction in lower part of slide. However, there is no clear boundary and no overall change in composition to indicate different beds. Fabric varies between light colored mineral sediment to darker, moderately humic rich fabric (more crumbly texture).

	Coarse	**Fine**
Grain Size	200um and up	50um and smaller
Shape	Subangular	Subrounded
Orientation	None	Some locations of horizontal orientation where Fine Fraction is more densely packed
Composition	Tuff, quartz	Quartz, silt, organic

Voids: smaller planar (100um to 200um) and vughy voids (400um) in areas where fabric is more densely packed. Planar voids usually either associated with large rocky fragments, or oriented to fine fraction (horizontal orientation). Overall void space in compacted areas – 5 to 10%.
Large vughs present in less densely packed areas (up to 1000um in width), some associated with plant matter (5%). Packing voids also dominate void space in less compacted areas – up to 20%.

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	100um to 1000um	20 to 30% (including both C and F fractions)	Random	Yellowed, fracturing rare
Trachyte	None			
Tuff	Avg 800um	5 to 10%	Random	Fe staining
Basalt	500um, also	Rare	Random	minimal

	large flake from E4 to H6			

Organic:

	Size	Density	Distribution	Weathering
Charcoal	None			
Ash	None			
Plant Remains	300um, fine fraction	2% in C fraction	More present in upper part of slide, F fraction throughout	Decayed
Insect Excrement	none			

Other:

	Size	Density	Distribution	Weathering
Bone	None			
Eggshell	None			
Metal	None			
Ceramic	None			
Glass	none			

Secondary Features:
Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
none			

Hypocoatings:

Clay/Carbonate	**Thickness**	**Location (+void type)**	**B Fabric**
none			

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**
none			

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type).
Locations: voids, fabric, part of bed

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
Microsparites	None			
	None			

Sparites				
Compound Nodules	None			
Mixed Crystallization	None			
Diffuse Carbonate Patches	None			
Fragmented nodules	none			

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation: naturally Aeolian accumulation with some humic staining and a moderate amount of organic matter, mostly decayed. Mixed texture and composition likely due to an active surface and ongoing pedogenesis, along with activity from plant and soil fauna.

FODALQ UNIT25, SLIDE: 1508500
Contexts: Lower contexts in unit 25 (possible interior of porch – west/uphill of basalt rock line). Below 1508501. Contexts 5 and 6.

Boundaries: none. Midway down the slide (columns 7 through 10, there is a dark, organic stained channel with loose sediment fill that is probably a decayed root channel).

MICROMORPH BED 1:
Estimated Area: 40mm X 70mm = 2800mm^2

Fabric:

Color: medium brown
Sorting: fine fraction moderately sorted, C fraction poorly sorted
C/F ratio: 20:80
Related Distribution: enaulic

Matrix (Fabric Microstructure, carbonate/clay type, BFabric). Massive microstructure. Some localized horizontal orientation, particularly near decayed root void. Variable organic matter in fabric – some locations (near decayed organic matter) are substaintially darker with more organic material in fabric.

	Coarse	**Fine**
Grain Size	200um to 2000+um	100um and smaller
Shape	Subrounded to subangular	angular
Orientation	Some localized horizontal orientation (rare)	Some localized horizontal orientation (rare)
Composition	Tuff, quartz	Quartz, silt, organic

Voids: small planar and vughy voids in fine fraction (2 to 5%, 100um in width). Larger channel voids (700um in width) associated with decayed plant material (2 to 5%). Packing voids (variable -2% in compacted fabric, up to 10% or 20% in loose fill associated with larger channels).

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	100um to 2000um	10%	Random	Fracturing, yellowed
Trachyte	700um	1 instance	Random	Minimal
Tuff	1000um	5% to 10%	Random	Fe staining
Basalt	700um	Rare	Random	minimal

Organic:

	Size	Density	Distribution	Weathering
Charcoal	None			

Ash	None			
Plant Remains	200um and larger	2%	In channel voids	Highly decayed
Insect Excrement	50um	Rare	In plant matter	

Other:

	Size	Density	Distribution	Weathering
Bone	None			
Eggshell	None			
Metal	None			
Ceramic	None			
Glass	none			
Adobe mortar?	6000um	1 instance	Organo-mineral fragment, yellowish in regular light.	Same material as mystery in 1508501

Secondary Features:

Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
none			

Hypocoatings:

Clay/Carbonate	**Thickness**	**Location (+void type)**	**B Fabric**
none			

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**
none			

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type).
Locations: voids, fabric, part of bed

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
Microsparites	none			
Sparites	None			
Compound Nodules	None			

Mixed Crystallization	None			
Diffuse Carbonate Patches	None			
Fragmented nodules	None			

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation:
Organic-rich sediment (roots) near line of basalt stones, which likely retained moisture allowing for plant growth. No evidence for anthropogenic alterations or high amounts of wood decay such as under (wood) porch as seen in HB211. Decayed plant material present in channel voids, large organic stained partially collapsed void with loose fill is interpreted as an old root channel (some decayed plant remains present). Another instance of mystery material from 1508501 – organo-mineral material which is yellow-ish orange in regular light and appears highly organic in PP, opaque in XP. This is interpreted as a highly organic (probably including dung) adobe mortar.

FODALQ UNIT25, SLIDE: 1508501
**PHOTOS WERE TAKEN WITH SLIDE UPSIDE DOWN

Contexts: upper contexts in interior of porch lines of HB212, above 1508500. Contexts 2 and 5/6.

Boundaries: No boundaries. Upper part of slide appears to be slightly disaggregated.

MICROMORPH BED 1:
Estimated Area: 40mm x 70mm = $2800mm^2$

Fabric:
- Color: medium dark to medium brown
- Sorting: poorly sorted
- C/F ratio: 30:70
- Related Distribution: enaulic

Matrix (Fabric Microstructure, carbonate/clay type, BFabric). variable compaction (dense to moderately loose), poorly expressed spongy microstructure likely indicating some organic material in fabric. No bfabric.

	Coarse	**Fine**
Grain Size	200um and up	50um and smaller
Shape	Subrounded	Subrounded
Orientation	None	Some horizontal orientation in isolated locations
Composition	Tuff, quartz,	Quartz, silt, organic

Voids: packing voids in loose sections (10% to 30% in potentially disaggregated section). Small planar voids (100um in width) associated with large rock fragments (2 to 5%). Vughy voids with decayed plant material (500um in width, <2%).

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	Avg 300um	30% including fine and coarse fraction	Random	Fracturing
Trachyte	300um	Rare	Random	minimal
Tuff	Avg 700um	10%	Random	Some fe staining
Basalt	600um	<2%	Random	minimal

Organic:

	Size	Density	Distribution	Weathering

Charcoal	None			
Ash	none			
Plant Remains	200um	<2% C fraction, also present in F fraction	More present in upper part of slide	Highly decayed
Insect Excrement	none			
Dung	500um, void is 1300um	1 instance	In lower part of slide	Some decay

Other:

	Size	Density	Distribution	Weathering
Bone	None			
Eggshell	None			
Metal	None			
Ceramic	None			
Glass	none			
Paint/Plaster?	3000um	1 instance	Reddish conglomerate, yellowed in PP, opaque in XP	Unknown.

Secondary Features:

Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
none			

Hypocoatings:

Clay/Carbonate	**Thickness**	**Location (+void type)**	**B Fabric**
none			

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**
none			

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type).
Locations: voids, fabric, part of bed

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
Microsparites	None			
	None			

Sparites				
Compound Nodules	None			
Mixed Crystallization	None			
Diffuse Carbonate Patches	None			
Fragmented nodules	none			

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation: moderately organic, somewhat compacted material with no evidence for surface or direction anthropogenic alteration. One piece of possible dung, but is likely too small for rodents. Visible, but decayed macroscopic organic material throughout. Large red mystery material in I7 may be paint or organic/dung-rich plaster? Unclear.

FODALQ UNIT 57 SLIDE: 1508585A
Contexts: Uppermost contexts in unit 57 (possible exterior surface/pathway/chicken area east of LQ structures). Context "rooty" on profile map.

Boundaries: none

MICROMORPH 1508585A BED 1:
Estimated Area: 40mm x 70mm = 2800mm^2

Fabric:
Color: light yellowish brown/tan
Sorting: moderately well sorted C fraction
C/F ratio: 40:60
Related Distribution: loose enaulic to porphyric

Matrix (Fabric Microstructure, carbonate/clay type, BFabric). Massive fabric dominated by coarse fraction which is moderately well sorted, particularly at the 1mm size range. No bfabric. fine fraction fabric is a combination of fine silt and minimally decayed organic material. In the lower part of the slide there is some very weak horizontal orientation of the coarse fraction

	Coarse	**Fine**
Grain Size	250um to 1000um	100um and smaller
Shape	Rounded	Subangular or too small
Orientation	Some very poorly expressed horizontal orientation in lower part of slide	None
Composition	Tuff, quartz, rhyolite, basalt	Silt, quartz organic

Voids: Packing voids. Density of voids varies by compactness of the fabric from 20% to 2%.

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	100 to 1000um	20%	Random	Minimal
Trachyte	1000um	2%	Random	Minimal
Tuff	500 to 1000um	10%	Random	Minimal
Basalt	700um	2%	Random	minimal

Organic:

	Size	Density	Distribution	Weathering
Charcoal	None			
Ash	None			
Plant Remains	400um in width, also in fine fraction	5%	Random	Minimal

Insect Excrement	none			

Other:

	Size	Density	Distribution	Weathering
Bone	None			
Eggshell	None			
Metal	600um to 1500um	Rare, E7, 13D	Random	Minimal (no leaching)
Ceramic	None			
Glass	1600um	I4	Random	Fragmented
Plaster	none			

Secondary Features:

Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
none			

Hypocoatings:

Clay/Carbonate	**Thickness**	**Location (+void type)**	**B Fabric**
none			

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**	
none				

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type). Locations: voids, fabric, part of bed

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
Microsparites	none			
Sparites	none			
Compound Nodules	none			
Mixed Crystallization	none			
	none			

Diffuse Carbonate Patches				
Fragmented nodules	none			

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation: 1508585A shows a moderately well sorted sediment dominated by coarse fraction, rounded grains about 1000um in diameter. Organic matter is found throughout, both in coarse fraction and fabric. There is some very weak horizontal orientation of particles in the lower part of the slide. This slide is interpreted as a combination of Aeolian processes (the unit is located at the height of a bluff) which would remove finer grained material, as well as create horizontal laminations. There is also the possibility for anthropogenic trampling producing the horizontal orientations as they are mostly associated with more compact regions of the slide. Additionally, a piece of fractured glass and a few potential metal fragments are present in the slide.

FODALQ UNIT57 SLIDE: 1508585B
Contexts: Upper contexts in unit 57 (directly below sample 1508585A – originally 1 sample that broke in field). Context " mortar" on profile map

Boundaries: none

MICROMORPH BED 1:
Estimated Area: 40mm x 70mm = 2800mm^2

Fabric:
- Color: medium brown
- Sorting: poorly sorted
- C/F ratio: 30:70
- Related Distribution: porphyric

Matrix (Fabric Microstructure, carbonate/clay type, BFabric). massive microstructure, fabric is combination of silt and organic matter. No bfabric. some very weak horizontal orientation of coarse fraction possible

	Coarse	**Fine**
Grain Size	200um to 3000um	100um and smaller
Shape	Subrounded	Subangular
Orientation	Some very weak horizontal orientation	None
Composition	Quartz, tuff	Quartz, silt, organic

Voids: vughy voids (<2%) , about 500um in width. Very rare.

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	Avg 400um	20 to 30%	Random	Minimal
Trachyte	Avg 600um	Rare	Random	minimal
Tuff	Avg 1000um	10 to 20%	Random	minimal
Basalt	None			
Limestone	none			

Organic:

	Size	Density	Distribution	Weathering
Charcoal	None			
Ash	None			
Plant Remains	Fine fraction	Maybe 5%	Throughout fine fraction	decayed
Insect Excrement	none			

Other:

	Size	Density	Distribution	Weathering
Bone	None			
Eggshell	None			
Metal	1700um (possible)	1 fragment,	C3	No leaching
Ceramic	None			
Glass	None			
Plaster	none			
dung?	700um in width	1 instance	E10	minimal

Secondary Features:

Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
none			

Hypocoatings:

Clay/Carbonate	**Thickness**	**Location (+void type)**	**B Fabric**
none			

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**	
none				

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type).
Locations: voids, fabric, part of bed

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
Microsparites	none			
Sparites	none			
Compound Nodules	none			
Mixed Crystallization	none			
Diffuse	none			

Carbonate Patches				
Fragmented nodules	none			

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation: compacted sediment with decayed organic material throughout the fine fraction. This slide is significantly darker in color than the above slide (1508585A), indicating a higher presence of organic matter. There is some (possible) very weak horizontal orientation which could indicate trampling, but it is not well expressed enough to make a definite interpretation. There is one possible fragment of metal, as well as a possible organic aggregate (possibly dung?)

FODALQ UNIT 57 SLIDE: 1508586
Contexts: middle contexts in unit 57 (open area to east of LQ structures). Below 1508585A and 1508585B. Contexts " mortar" and context 6 on profile map.

Boundaries: none

MICROMORPH BED 1:
Estimated Area: 40mm x 70mm = 2800mm2

Fabric:
- Color: Medium dark brown
- Sorting: poorly sorted
- C/F ratio: 30:70
- Related Distribution: porphyric

Matrix (Fabric Microstructure, carbonate/clay type, BFabric). massive microstructure. Dark (organic/humic) fabric.

	Coarse	**Fine**
Grain Size	200um to 3000um	100um and smaller
Shape	Subrounded	Subangular
Orientation	None	None
Composition	Tuff, quartz	Quartz, silt, organic

Voids: small packing and planar voids (around large nodules), 50um in width, 2%. Larger vughs (4000um+), rare. One horizontalish channel void in upper section of slide may be from transport/manufacturing.

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	50um to 2500um	10 to 20%	Random	Minimal
Trachyte	700um	<2%	Random	Minimal
Tuff	Avg1000um	10%	Random	Fe staining – one large nodule I6
Basalt	None			
Limestone	none			

Organic:

	Size	Density	Distribution	Weathering
Charcoal	None			
Ash	None			
Plant Remains	None in coarse fraction			

Insect Excrement	none			

Other:

	Size	Density	Distribution	Weathering
Bone	None			
Eggshell	None			
Metal	1000um	1 possible	C6	Minimal
Ceramic	None			
Glass	None			
Plaster	none			

Secondary Features:

Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
none			

Hypocoatings:

Clay/Carbonate	**Thickness**	**Location (+void type)**	**B Fabric**
none			

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**	
none				

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type). Locations: voids, fabric, part of bed

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
Microsparites	none			
Sparites	none			
Compound Nodules	1040um in width	1 instance, I13	Micritic calcite with clay fabric joining nodules	I13, rectangular, near vughy void
Mixed Crystallization	none			
Diffuse	none			

Carbonate Patches				
Fragmented nodules	none			

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation:
Compacted, organic-rich sediment with some possible metal (or impregnative fe nodules). Presence of a carbonate nodule in lower part of slide, along with possible fe nodules may indicate short term water saturation, but there is no depletion of the fabric apparent. Several mystery materials.

FODAMM UNIT 60 SLIDE: 1021670

Contexts: contexts 2 and 3 in "gap" space between northern addition of the MM structure and tent portion.

Boundaries: none

MICROMORPH BED 1:
Estimated Area: 40mm x 70mm = 2800mm^2

Fabric:

Color: dark brown
Sorting: poorly sorted
C/F ratio: 30:70
Related Distribution: enaulic to porphyric

Matrix (Fabric Microstructure, carbonate/clay type, BFabric). crumbly microstructure with large rocky inclusions. Fabric is highly organic, no bfabric.

	Coarse	**Fine**
Grain Size	Avg 600um	Too small
Shape	Subangular	Too small
Orientation	None	None
Composition	Quartz, trachyte, tuff	Organic, silt

Voids: mostly large packing voids in between crumbly peds (20 to 30% void space total). Some voids vughy or planar shaped voids within well expressed crumbly sections. Large vughy void in lower part of slide has dark hypocoating and organic infilling and is likely the result of insect action.

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	300um	15%	Random	minimal
Trachyte	700um, also large rocky cobbles	2%	Random	Carbonate coatings/pore fillings
Tuff	800um	5%	Random	minimal
Basalt	None			
Limestone	none			

Organic:

	Size	Density	Distribution	Weathering
Charcoal	None			
Ash	none			
Plant Remains	250um	5%	Random	Highly decayed
Insect Excrement	none			

Other:

	Size	Density	Distribution	Weathering
Bone	none			
Eggshell	none			
Metal	3000um	2 fragments	B10, A13	Minimal
Ceramic	None			
Glass	None			
Plaster	3000um	1 possible	E2	Burnt? Weathered?

Secondary Features:

Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
Carbonate	860um	On upperside of rhyolite nodule	Laminated
Carbonate	600um	On underside of rhyolite nodule	laminated

Hypocoatings:

Clay/Carbonate	**Thickness**	**Location (+void type)**	**B Fabric**
none			

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**
Organic	3000um	Vughy void at base of slide	Speckled
Carbonate	930um	Pore in rhyolite	speckled

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type). Locations: voids, fabric, part of bed

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
Microsparites	Avg 2000um	8 (total)	Micritic calcite including soil fabric and organic material	Subrounded, voids
	none			

Sparites				
Compound Nodules	None			
Mixed Crystallization	none			
Diffuse Carbonate Patches	none			
Fragmented nodules	none			

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation:
Highly organic, active soil with archaeological materials (metal, plaster) likely from the MM structure. A void infilling at the base of the slide may indicate insect activity in the soil, which could be related to the occupation of the structure or to soil activity post-abandonment. Several carbonate nodules, carbonate coatings on rhyolite nodules, and carbonate void infillings in rhyolite pores indicate precipitations of salts. Carbonate nodules incorporate soil fabric, including organic material, supporting an insitu development rather than being introduced.

FODAMM UNIT 62 SLIDE: 1021659
Contexts: Upper contexts (2, 3, and 6) in unit 62 – just north of MM structure.

Boundaries: none

MICROMORPH BED 1:
Estimated Area: 40mm x 70mm = 2800mm^2

Fabric:

Color: light medium brown
Sorting: poorly sorted
C/F ratio: 20:80
Related Distribution: monic in open area, porphyric in blocky/crumbly areas.

Matrix (Fabric Microstructure, carbonate/clay type, BFabric). fabric ranges from massive, in open, unconsolidated areas to crumbly/blocky in isolated patches. Fabric is generally darker (more organic) in crumbly/blocky areas and voids between peds contain organic matter, which is also present in unconsolidated areas.

	Coarse	**Fine**
Grain Size	300um and larger	100um and smaller
Shape	Subrounded	Subrounded, too small
Orientation	None	none
Composition	Quartz, tuff, trachyte, plant	Organic, silt, quartz

Voids: planar voids throughout (100um to 200um in width, 5% to 10% void space). Higher void space with less well developed void space in open patches (monic, massive structure). Voids often contain decayed plant material. Vughy voids (from 300um to 3000um) are present throughout (2 to 5%), with smaller voids being more common. Most are associated with decaying plant material. Large vugh in A4/5 is associated with an organic hypocoating and orientation of fine particles around the void. This vugh is likely related to insect activity.

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	Avg 400um	10%	Random	Minimal
Trachyte	Avg 1000um	5%	Random	Minimal
Tuff	Avg 700um	5%	Random	Minimal
Basalt	None			
Limestone	none			

Organic:

	Size	Density	Distribution	Weathering
Charcoal	None			
Ash	none			

Plant Remains	300um in width	5% (C fraction)	Throughout void spaces, also present in fine fraction, particularly in crumbly/blocky sections	decayed
Insect Excrement	none			

Other:

	Size	Density	Distribution	Weathering
Bone	none			
Eggshell	300um	1 instance	In fabric	Minimal
Metal	5000um	2 fragments	A2, A12	corroded
Ceramic	None			
Glass	None			
Plaster	none			

Secondary Features:
Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
Possible carbonate	Around 800um	Upperside of tuff nodule, possible dissolution of tuff by precipitating carbonate	speckled

Hypocoatings:

Clay/Carbonate	**Thickness**	**Location (+void type)**	**B Fabric**
organic	Minimum 600um (cut off by coverslip)	Around large vugh in A4/5	laminated

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**	
none				

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type). Locations: voids, fabric, part of bed

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
Microsparites	1000um	2 Instances	Mixed micritic calcite and organic/soil fabric	Subrounded, voids
	1150um	1	Pure calcite, laminated	Rectangular, void in

Sparites		instance	around central micritic nucleus	C13
Compound Nodules	none			
Mixed Crystallization	none			
Diffuse Carbonate Patches	none			
Fragmented nodules	none			

Other carbonate features: (roots, etc. – location, size, type, density)
None

Depletion Features: there are several possible depletion features throughout the soil fabric, but most are not clear enough to definitively identify. Clearest are in F10 (Pics 13 an 14), but they are not associated with distinct hypocoatings of nearby voids.

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation: active, organic-rich soil with minimal carbonate development but with evidence for possible water saturation through depletion features. Organic matter is found throughout and is decayed, but visible, also leaving void casts. A large void in A4/5 is likely remains of insect activity. 2 pieces of metal and fragment of eggshell likely relate to the dilapidation of the structure. There is no evidence for anthropogenically-influenced bedding.

FODAMM UNIT 62 SLIDE: 1021660
Contexts: mid-lower contexts in unit 62 (just north of MM structure). Contexts 6 and 7.

Boundaries: none

MICROMORPH 1021660 BED 1:
Estimated Area: 40mm x 70mm = 2800mm^2

Fabric:
Color: medium dark brown
Sorting: moderately sorted
C/F ratio: 20:80
Related Distribution: porphyric

Matrix (Fabric Microstructure, carbonate/clay type, BFabric). crumbly microstructure with organic matter in planar voids between small peds. Dark color is likely from decayed organic material incorporated into the fabric.

	Coarse	**Fine**
Grain Size	200um and larger	50um and smaller
Shape	Subangular	Subangular
Orientation	None	None
Composition	Quartz, trachyte, tuff	Silt, organic, quartz

Voids: planar voids within crumbly texture (200um in width 20%).

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	100um to 1500um	10%	Random	Minimal
Trachyte	1000um	2%	Random	Minimal
Tuff	700um	5%	Random	minimal
Basalt	None			
Limestone	none			

Organic:

	Size	Density	Distribution	Weathering
Charcoal	None			
Ash	none			
Plant Remains	200um in width	2 to 5%	Concentrated in void space	Highly decayed
Insect Excrement	50um	Rare	J5, associated with plant material	minimal

Other:

	Size	Density	Distribution	Weathering
Bone	None			
Eggshell	None			
Metal	1500um	Rare	Random	Some small possible corroded fragments
Ceramic	None			
Glass	None			
Plaster	none			

Secondary Features:
Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
none			

Hypocoatings:

Clay/Carbonate	**Thickness**	**Location (+void type)**	**B Fabric**
none			

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**	
none				

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type). Locations: voids, fabric, part of bed

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
Microsparites	800um	1 instance	Micritic calcite	subrounded
Sparites	200um (width)	1 instance	Calcite	elongated
Compound Nodules	none			
Mixed Crystallization	none			
	none			

Diffuse Carbonate Patches				
Fragmented nodules	none			

Other carbonate features: (roots, etc. – location, size, type, density)
None

Depletion features: depletion of crumbly peds is relatively common in the lower part of the slide.

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation:
The slide shows a crumbly subsoil with substantial organic matter and depletion features in the lower part of the slide. Carbonate nodules are rare, but the depletion features indicate short periods of water saturation. No evidence of anthropogenic alterations or bedding.

FODAMM UNIT 64 SLIDE: 1021655
Contexts: context 2 in north profile. Upper context of unit including dark, silty soil and archaeological material. Interior of structure. Above sample 1021656

Boundaries: none

MICROMORPH BED 1:
Estimated Area: 40mm x 70mm

Fabric:
Color: medium dark brown
Sorting: poorly sorted
C/F ratio: 30:70
Related Distribution: enaulic

Matrix (Fabric Microstructure, carbonate/clay type, BFabric). microstructure varies between massive and poorly expressed crumbly (in areas of greater compaction and high amounts of organic matter). Fabric appears to be a mixture of silt and organic matter. There is some orientation of the fabric on the boundaries of the large vughy voids in the lower part of the slide.

	Coarse	**Fine**
Grain Size	250um an dup	100um and smaller
Shape	Subrounded	Subangular
Orientation	Near voids – orientation to void boundary	Same
Composition	Tuff, trachyte, carbonate	Silt, organic

Voids: voids are a combination of packing voids (5 to 20%) and vughy voids in varying sizes from small (300um, 5%) to large (10mm, <2%). Large vughy voids in lower part of slide have some loose fill along with dark organic hypocoatings with orientation of particles in the void boundary (probably root voids).

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	100um to 1000um	10 to 15%%	Random	Minimal
Trachyte	600um	2%	Random	minimal
Tuff	450um to 3 cm	5 to 10%.	random	Minimal fe staining
Basalt	none			
Limestone	700um	Rare	Random	minimal

Organic:

	Size	Density	Distribution	Weathering

Charcoal	1500um	1 instance	J2, within carbonate nodule	minmal
Ash	none			
Plant Remains	300um and fine fraction	2% coarse, throughout fine fraction	Random	decayed
Insect Excrement	none			

Other:

	Size	Density	Distribution	Weathering
Bone	None			
Eggshell	none			
Metal	1500um	2 definitive fragments	Upper, lose section of slide	Minimal
Ceramic	None			
Glass	None			
Plaster	none			

Secondary Features:

Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
Carbonate coating/pendant	1700um	Underside of fragmented tuff nodule	speckled

Hypocoatings:

Clay/Carbonate	**Thickness**	**Location (+void type)**	**B Fabric**
Organic hypocoating	3000um in widest point (F10)	Around large vughy voids in lower part of slide	none

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**	
none				

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type). Locations: voids, fabric, part of bed

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
Microsparites	Average approximately 2000um	10 (entire slide)	Mixture of micritic calcite and soil fabric. Also inclusions from soil fabric, including organic matter and charcoal.	Subrounded, in loose fabric/voids

Sparites	none			
Compound Nodules	none			
Mixed Crystallization	none			
Diffuse Carbonate Patches	none			
Fragmented nodules	none			

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation: This slide is a highly variable, active topsoil with substantial decayed organic material and vughy voids that are likely remainders of root activity. Metal inclusions are likely anthropogenic inputs from the structure. Additionally, carbonate nodules throughout the slide indicate the presence of standing and evaporating water. Additionally, a large carbonate coating on a fragmented tuff nodule is evidence that carbonate is replacing silicate materials in Fort Davis soils. Also, another carbonate nodule not incorporates soil fabric, but also organic material and charcoal, lending supporting to the interpretation that these are insitu carbonate formations. The large vughy voids at the base of the slide with hypocoating on the well defined void boundaries may be termite or other insect burrows.

FODAMM UNIT 64 SLIDE: 1021656
Contexts: contexts 2 and 3 in unit 64 (interior of the structure). Contexts 2 and 3 were differentiated based on an increase in large cobbles.

Boundaries: none

MICROMORPH BED 1:
Estimated Area: 40mm x 70mm = 2800mm^2

Fabric:
Color: medium brown
Sorting: unsorted
C/F ratio: 40:60
Related Distribution: enaulic

Matrix (Fabric Microstructure, carbonate/clay type, BFabric). microstructure varies from massive in areas of loose sediment to crumbly in areas with more compacted, organic-rich sediment. No bfabric.

	Coarse	**Fine**
Grain Size	250um and larger	100um and smaller
Shape	Subrounded	Subrounded or too small
Orientation	None	None
Composition	Tuff, trachyte	Silt, organic

Voids: packing voids in looser areas (30%) with planar voids (5%) in crumbly areas. Large vughy voids (10mm) throughout (2%).

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	100um to 1000um	15%	Random	Minimal
Trachyte	700um	5%	Random	Minimal
Tuff	700um	10%	Random	Minimal
Basalt	None			
Limestone	none			

Organic:

	Size	Density	Distribution	Weathering
Charcoal	1400um	1 instance	I2	decayed
Ash	None			
Plant Remains	1 large (1000um in width), also in fine fraction	Fine fraction	Crumbly areas	Decayed

Insect Excrement	none			

Other:

	Size	Density	Distribution	Weathering
Bone	none			
Eggshell	none			
Metal	600um	Rare	G3, G4, A7, E6	minimal
Ceramic	None			
Glass	none			
Plaster (dung based plaster similar to unit LQ25)	10mm	1 instance (some smaller possible fragments)	C2/3	Minimal
Adobe	2000um	1 fragment	C3	minimal

Secondary Features:

Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
none			

Hypocoatings:

Clay/Carbonate	**Thickness**	**Location (+void type)**	**B Fabric**
none			

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**	
none				

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type). Locations: voids, fabric, part of bed

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
Microsparites	1800um	2 nodules (total)	Micritic calcite mixed with soil fabric	Subrounded, near voids
Sparites	none			
Compound Nodules	none			
Mixed	none			

Crystallization				
Diffuse Carbonate Patches	none			
Fragmented nodules	none			

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation:
This slide shows a mixtures of highly organic, crumbly soil with loose, porous sediment. It is unclear if the uncompacted areas are from transportation or simply unconsolidated sediment. Within the crumbly areas the soil shows localized horizontal and concentric orientation but without broader patterns to define separate bedding episodes. Significantly, a pieces of dung-based plaster is present in the upper part of the slide, along with several smaller possible plaster fragments throughout. This plaster is similar to that seen in unit25 of the laundresses' quarters in a location which was hypothesized to be a fence line. Two carbonate nodules are present, significantly lower than in the overlying slide.

FODAMM UNIT 65 SLIDE: 1021671

Contexts: context 2 and 3 in unit 65 (interior of structure). These contexts were loose, rocky soil with large amount of archaeological materials.

Boundaries: Beds 1 and 2 differentiated by degree of compaction and fabric texture.

MICROMORPH BED 1:
Estimated Area: 35mm x 40mm = 1400mm^2

Fabric:
Color: Dark brown
Sorting: moderately well sorted
C/F ratio: 20:80
Related Distribution: enaulic

Matrix (Fabric Microstructure, carbonate/clay type, BFabric). crumbly microstructure of very dark brown aggregates of organic-rich soil interspersed with mineral grains and rocks. No bfabric.

	Coarse	**Fine**
Grain Size	Avg 300um. Also large rocky inclusions	Too small
Shape	Subangular	Too small
Orientation	None	None
Composition	Quartz, trachyte	Organic, silt

Voids: packing voids, 10 to 20%

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	Avg 300um	10%	Random	Minimal
Trachyte	Avg 450um	2%	Random	Minimal
Tuff	Avg 400um	5%	Random	Minimal
Basalt	None			
Limestone	none			

Organic:

	Size	Density	Distribution	Weathering
Charcoal	None			
Ash	none			
Plant Remains	100um, and fine fraction	2%	In void spaces	decayed
Insect	none			

Excrement				

Other:

	Size	Density	Distribution	Weathering
Bone	60um	2%	Random	Minimal
Eggshell	None			
Metal	1000um	1 instance	D5	Minimal leaching
Ceramic	None			
Glass	None			
Plaster	none			
Mystery	1000um	3 instances	Pic3/4	

Secondary Features:

Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
none			

Hypocoatings:

Clay/Carbonate	**Thickness**	**Location (+void type)**	**B Fabric**
none			

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**	
none				

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type).
Locations: voids, fabric, part of bed

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
Microsparites	None			
Sparites	None			
Compound Nodules	none			
Mixed Crystallization	none			

Diffuse Carbonate Patches	none			
Fragmented nodules	none			

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation: highly organic, fine grained silt with anthropogenic inclusions (bone, metal)

MICROMORPH BED 2:
Estimated Area: 35mm x 40mm = 1400mm^2

Fabric:
- Color: dark brown
- Sorting: poorly sorted
- C/F ratio: 30:70
- Related Distribution: monic

Matrix (Fabric Microstructure, carbonate/clay type, BFabric). very loose, open crumbly microstructure. Aggregates of dark brown, organic-rich soil alternate with larger rocky grains.

	Coarse	**Fine**
Grain Size	Avg 800um	50um and smaller
Shape	Subrounded	Too small

Orientation	None	None
Composition	Trachyte, tuff, quartz	Organic, silt

Voids: packing voids (20 to 30%). Planar voids in areas of more pronounced crumbly texture (200um in width, 20%).

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	150um	10%	Random	Minimal
Trachyte	900um	2 to 5%	Random	Minimal
Tuff	700um	5%	Random	Minimal
Basalt	None			
Limestone	none			

Organic:

	Size	Density	Distribution	Weathering
Charcoal	None			
Ash	None			
Plant Remains	100um	Rare	In voids	Highly decayed
Insect Excrement	none			

Other:

	Size	Density	Distribution	Weathering
Bone	None			
Eggshell	None			
Metal	6000um	1 instance	B13	Minimal
Ceramic	None			
Glass	None			
Plaster	none			

Secondary Features:

Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
none			

Hypocoatings:

Clay/Carbonate	**Thickness**	**Location (+void type)**	**B Fabric**
none			

InFillings/Void coatings:

Clay/Carbonate	Thickness	Location (void type)	B Fabric	
carbonate	1000um	Pore in rhyolite nodule	Sparry calicite	

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type).
Locations: voids, fabric, part of bed

Type	Avg. Diameter	Density	*Fabric	Location and Shape
Microsparites	none			
Sparites	none			
Compound Nodules	none			
Mixed Crystallization	none			
Diffuse Carbonate Patches	none			
Fragmented nodules	none			

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation: very loose, organic rich soil with some archaeological inclusions and minimal evidence for carbonate development. While there is a sparry calcite infilling in a rhyolite pore, there are no carbonate nodules in the soil fabric so this instance is likely not an insitu precipitation.

Slide Interpretation: the slide is interpreted as highly organic soil likely formed around debris from the structure. The high organic content, presence of bone and metal, are in accordance with the macroscopic excavation materials. There is no evidence of a surface or other anthropogenically influenced bedding.

FODAMM UNIT 62 SLIDE: 1021661
Contexts: contexts 1 and 2, mid-upper part of profile. Excavator did not indicate changes in soil characteristics on their forms. Sample is from the interior of the tent addition to the MM structure.

Boundaries: none

MICROMORPH BED 1:
Estimated Area: 40mm x 70mm

Fabric:
- Color: dark brown
- Sorting: moderately sorted
- C/F ratio: 20:80
- Related Distribution: porphyric

Matrix (Fabric Microstructure, carbonate/clay type, BFabric). blocky microstructure with large carbonate nodules throughout which disrupt the fabric. There are patches of oriented fabric including parallel, horizontally oriented patch in G1 through I2. This may be the remains of a highly disturbed trampled surface. There are also additional areas with concentric orientation of fabric around voids (E11 and J9). Fabric is highly organic.

	Coarse	**Fine**
Grain Size	250um and larger	100um and smaller
Shape	Subrounded	Too small
Orientation	Localized oriented (described above) generally unoriented	Same as C fraction
Composition	Carbonate, tuff, trachyte, organic	Organic, silt, quartz

Voids: thin planar voids within regions of well expressed blocky structure (120um in width, 10% void space). Packing voids in less compacted areas (also associated with large carbonate nodules with have disrupted the soil fabric), up to 20% void space. Some isolated vughy voids within blocky structure (2%, 1000um in width) particularly in I9, I3, E11. Void in I9 is associated with a depletion feature, carbonate nodule, and void hypocoating. Void in I3 is associated with carbonate nodule. Some void spaces in more open areas may be disrupted channel voids based on their morphology, but no elongate channels are present.

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	Avg 200um	10%	Random	Minimal
Trachyte	1500um	2%	Random	Minimal
Tuff	800um	5%	Random	Minimal
Basalt	None			
Limestone	none			

Organic:

	Size	Density	Distribution	Weathering
Charcoal	None			
Ash	none			
Plant Remains	100um to 1000um	2%	Void spaces – mostly in vughys and vertical planes/channels	
Insect Excrement	none			

Other:

	Size	Density	Distribution	Weathering
Bone	None			
Eggshell	None			
Metal	4000um	1 instance	I5	minimal
Ceramic	None			
Glass	None			
Plaster	10mm	1 possible instance	F4	May be carbonate enriched

Secondary Features:

Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
none			

Hypocoatings:

Clay/Carbonate	**Thickness**	**Location (+void type)**	**B Fabric**
Organic/clay	300um	Near vughy void in I9, associated with depletion feature	No bfabric

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**	
none				

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type). Locations: voids, fabric, part of bed

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
Microsparites	2000um	17 nodules total	Smaller nodules (2000um and less) generally composed of	Void spaces.

			micritic calcite. Larger nodules appear to incorporate soil fabric and organic matter.	
Sparites	none			
Compound Nodules	10mm or larger	3 nodules	Micritic carbonate nodules (generally 2000um or smaller) aggregated in a mixed carbonate and organic/soil fabric matrix	In void spaces, they appear to be disrupting the soil fabric structure and create zones of higher void space
Mixed Crystallization	none			
Diffuse Carbonate Patches	none			
Fragmented nodules	none			

Other carbonate features: (roots, etc. – location, size, type, density)

Depletion feature: Evidence for depletion of the clay fabric in I9, associated with a vughy void, carbonate nodule, and organic hypocoatings of the void.

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation: This slide shows a well expressed, blocky structured soil that is being intensively disrupted by precipitation of carbonate nodules. Blocky structure with highly organic fabric is present in areas without large compound carbonate nodules, including a zone in the upper part of the slide (G1 through I2) which has a parallel, horizontal orientation and could potentially be remains of a trampled surface, but there is no additional evidence to support this. Other areas show concentric orientation around vughy voids, some of which have been disrupted by carbonates (I3, E11) and one of which contains depletion features (I9). Micritic carbonate occurs throughout the slide, with larger nodules (2000um +) being composed of both micritic calcite and organic matter/soil fabric. Three large compound nodules dominate the slide and are composed of micritic nodules joined by a fabric of mixed carbonate and organic matter. F4 contains a nodule that may be either a highly organic carbonate nodule or a carbonate dung plaster. It is similar in composition to other fragment identified as dung plaster, but appears to contain more carbonate.

Overall, this slide is interpreted as a compact, organic rich soil, possibly containing a trampled surface related to the tent addition, which has been highly disrupted by carbonate precipitation. Both the high presence of carbonate and the depletion feature in I9 suggest that this location has seen short periods of water saturation, but not sufficient to form manganese or iron nodules.

FODAMM UNIT 72 SLIDE: 1508592
Contexts: Middle contexts in unit 72 near what the excavator described as a possible surface (4). Sample contains contexts 3, 4, and 5. Sample most likely contains exterior space.

Sample appears disturbed.

Boundaries: none

MICROMORPH BED 1:
Estimated Area: 40mm x 70mm

Fabric:
- Color: medium brown
- Sorting: poorly sorted
- C/F ratio: 60:40
- Related Distribution: porphyric within fabric peds

Matrix (Fabric Microstructure, carbonate/clay type, BFabric). slide appears disturbed. In lower section there are some patches of crumbly peds which may be intact soil fragments. Overall very open, loose texture dominated by large particles.

	Coarse	**Fine**
Grain Size	Avg 1200um	100um and smaller
Shape	Subrounded	Subangular or too small
Orientation	None	None
Composition	Trachyte, tuff, quartz	Quartz, silt, organic

Voids: packing voids dominate in the open, loose areas of the slide which are likely the result of disaggregate (up to 50% void space). Within intact crumbly peds, small planes (100um) and vughs (300 to 800um, containing plant material) take up around 10% void space.

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	300um	10%	Random	fracturing
Trachyte	1500um	5%	Random	Minimal
Tuff	1000um	10%	Random	minimal
Basalt	none			
Limestone	10mm	1 instance	G5	Highly weathered silicates

Organic:

	Size	Density	Distribution	Weathering
Charcoal	None			

Ash	none			
Plant Remains	100um	2%	Voids	Decayed
Insect Excrement	none			

Other:

	Size	Density	Distribution	Weathering
Bone	None			
Eggshell	None			
Metal	1620um, several smaller fragments	rare	G7, C12, F9	corroded
Ceramic	None			
Glass	None			
Plaster	10mm	1 instance	E7/8	Highly weathered

Secondary Features:
Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
none			

Hypocoatings:

Clay/Carbonate	**Thickness**	**Location (+void type)**	**B Fabric**
none			

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**	
none				

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type). Locations: voids, fabric, part of bed

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
Microsparites	1500um	6 total	Micritic calcite incorporate mineral inclusions	Subrounded, mostly in disturbed portion of slide
Sparites	none			
Compound Nodules	none			
	none			

Mixed Crystallization				
Diffuse Carbonate Patches	none			
Fragmented nodules	none			

Other carbonate features: (roots, etc. – location, size, type, density)
None

Depletion Features
Some possible depletion features in the lower part of the slide.

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation:
Disturbed slide from the west exterior of the structure near the north addition. Intact peds suggest a crumbly soil with a substantial amount of organic matter and some carbonate development. Depletion features in the lower part of the slide suggest short periods of water saturation. Minerals are highly weathered and organic matter is decayed.

FODAMM UNIT 67 SLIDE: 0021704
Contexts: context 10, 11, and 13B. 10 and 13B are mottled silt with some artefactual remains. 11 was a pockets of ash and charcoal. The sample is from the upper levels of the main privy pit in unit 67.

Boundaries: none

MICROMORPH 0021704 BED 1:
Estimated Area: 40mm x 70mm = 2800mm^2

Fabric:
Color: dark brown
Sorting: poorly sorted
C/F ratio: 20:80
Related Distribution: porphyric

Matrix (Fabric Microstructure, carbonate/clay type, BFabric). blocky (upper) to crumbly (lower) microstructure, but without boundary or distinction between the two types. There are also loose open areas dominated by large rocky particles. The groundmass is highly organic and in some patches impregnated with carbonate giving it a bright speckled bfabric. intact plant matter is incorporated in fabric.

	Coarse	**Fine**
Grain Size	600um and up	100um and smaller
Shape	Subrounded	Subangular
Orientation	None	Some very localized horizontal orientation
Composition	Tuff, rhyolite, organic, quartz, calcite?	Silt, organic, carbonate

Voids: packing voids in open areas with large nodules. (20% void space), sometimes containing plant material. In fabric – 5% void space composed of small (100um in width) planar and vughy voids.

Composition:
Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	Avg 500um, also very large crystals	20%	Random	Highly weathered
Trachyte	5000um	2%	Random	Minimal
Tuff	1000um	10%	Random	Minimal
Basalt	None			
Limestone	none			

Organic:

	Size	Density	Distribution	Weathering
Charcoal	200um	1 patch	C11	Decayed
Ash	None – but carbonate enriched matrix may be ash remains reworked			
Plant Remains	Avg 400um	5%	Throughout fabric. Large plant matter in voids	Highly decayed
Insect Excrement	none			

Other:

	Size	Density	Distribution	Weathering
Bone	None			
Eggshell	None			
Metal	None			
Ceramic	None			
Glass	None			
Plaster	none			

Secondary Features:

Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
Carbonate	900um	Tuff nodule, B2	speckled

Hypocoatings:

Clay/Carbonate	**Thickness**	**Location (+void type)**	**B Fabric**
none			

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**
Calcite crystals	250um	Vughy void, C1, may be plant cast	Speckled - calcite

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type). Locations: voids, fabric, part of bed

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
Microsparites	800um	20 total	Micritic calcite, sometimes incorporating fabric	Subrounded, mostly in fabric. More concentrated in upper part of slide

Sparites	none			
Compound Nodules	none			
Mixed Crystallization	none			
Diffuse Carbonate Patches	Approximately 3000um	<5	Carbonate enriched soil fabric	In lower part of slide
Fragmented nodules	none			

Other carbonate features: (roots, etc. – location, size, type, density)
Nodule in E7 – maybe organic rich carbonate, limestone, or carbonate enriched plaster

Depletion features:
Small (600um across) peds with depletion zones found throughout, especially near large open voids space which may be remains of vertical channel voids.

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation:
Slide shows compact, organic rich sediment with a crumbly to blocky texture and a high presence of carbonate. Carbonate nodules are present throughout the fabric in the upper section of the slide. The lower section has both nodules and carbonate enriched fabric, which may be related to context 11, which was described in the field as ashy. Decayed plant material is present throughout, particularly in large void spaces which are also associated with depletion zones.

While these are not well defined voids, in some locations the orientation of plant matter, along with the depletion zones, suggests that they may be remnants of vertical channel voids from water drainage.

FODAMM UNIT 67 SLIDE: 0021714
Contexts: contexts 13B, 14, and 15 in north wall of privy pit. Contexts contain mottled soil, increasingly larger artifacts, and ash, charcoal, and woody inclusions.

Boundaries: none

MICROMORPH BED 1:
Estimated Area: 40mm x 70mm = $2800mm^2$

Fabric:
Color: dark brown
Sorting: poorly sorted
C/F ratio: 70:30
Related Distribution: slide is dominated by large coarse grained fabric. Overall monic related distribution

Matrix (Fabric Microstructure, carbonate/clay type, BFabric). very little fine grained material. What fabric exists is aggregated in small crumbly peds. Internal ped structure is massive/porphyric.

	Coarse	**Fine**
Grain Size	800um and up	100um and smaller
Shape	Subrounded	Mostly too small
Orientation	None	None
Composition	Tuff, quartz, rhyolite	Quartz, silt, carbonate, organic

Voids: primarily packing voids (30%). Large vughs (1000um across) and plant channels make up 5% of total void space.

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	Avg 600um	15%	Random	Fracturing
Trachyte	Avg 1600um	2%	Random	Fe staining
Tuff	Avg 1000um	10%	Random	minimal
Basalt	None			
Limestone	none			

Organic:

	Size	Density	Distribution	Weathering
Charcoal	none			
Ash	600um width patches	2 patches	C1, H7	Some yellowed material – may be phosphate
Plant Remains	200um	2%	In voids	Highly decayed

Insect Excrement	none			

Other:

	Size	Density	Distribution	Weathering
Bone	600um	Rare	Random	Highly weathered, burnt
Eggshell	None			
Metal	Avg 700um	Rare	Random	Corroded, some leaching in C1
Ceramic	None			
Glass	None			
Plaster	None			

Secondary Features:

Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
none			

Hypocoatings:

Clay/Carbonate	**Thickness**	**Location (+void type)**	**B Fabric**
none			

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**	
none				

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type). Locations: voids, fabric, part of bed

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
Microsparites	1500um	8 total	Micritic calcite, sometimes with incorporation of soil fabric	Subrounded, voids
Sparites	none			
Compound Nodules	None			
Mixed	None			

Crystallization				
Diffuse Carbonate Patches	None			
Fragmented nodules	none			

Other carbonate features: (roots, etc. – location, size, type, density)
None

Depletion features: some rare possible depletion features in fine fraction aggregates, but there is so little fine fraction it is difficult to confirm

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation:
Loose, open very coarse grained sediment with inclusions of ash patches, burned bone, and metal. No bedding or orientation, Carbonate nodules occur throughout, as does intact plant material. This slide contains material from the middeny dump above the privy, likely deposited during or after disuse of the privy.

FODAMM UNIT 67 SLIDE: 1021706
Contexts: lower contexts outside of privy pit in unit 67. Contexts 7, 12, and 17. Dense sediment with little to no artifacts. Context 7 and 12 boundary marked by wood remains.

Boundaries: none

MICROMORPH 1021706 BED 1:
Estimated Area: 40mm x 70mm = 2800mm^2

Fabric:

Color: medium to dark brown
Sorting: poorly sorted
C/F ratio: 20:80
Related Distribution: monic with porphyric aggregates

Matrix (Fabric Microstructure, carbonate/clay type, BFabric). mostly massive, uncompacted structure with crumbly aggregates. Lower, compacted areas have crumbly texture.

	Coarse	**Fine**
Grain Size	300um and larger	100um and smaller
Shape	Subrounded	Subrounded
Orientation	None	Very localized horizontal orientation in lower part of slide AB/12&13
Composition	Tuff, basalt, organic	Silt, organic

Voids: mostly packing voids (up to 20%) with a vertical, poorly defined water channel through the center of the slide. Planar voids (100um in width) in compacted, crumbly areas).

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	300um	15%	Random	Fractured
Trachyte	None			
Tuff	1000um	10%	Random	Fe staining
Basalt	1600um	Rare	Random	Corroded?
Limestone	none			

Organic:

	Size	Density	Distribution	Weathering
Charcoal	none			
Ash*	1500um	1aggregate	B4	none
Plant Remains	300um	2 to 5%	Random	Decayed
Insect Excrement	none			

*ash aggregate appears to be a mixture of ash, organic material, quartz crystals, and melted phytoliths. Maybe lye used in privy?

Other:

	Size	Density	Distribution	Weathering
Bone	See phosphate			
Eggshell	none			
Metal	700um	Rare	Random	Minimal corrosion
Ceramic	None			
Glass	None			
Adobe*	3cm	1 fragment	C4 to G3	Minimal –

*adobe material is compact, well sorted sediment with some larger inclusions and organic material. Appears similar to ceramic but less well sorted and without orientation of particles

Secondary Features:

Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
none			

Hypocoatings:

Clay/Carbonate	**Thickness**	**Location (+void type)**	**B Fabric**
none			

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**	
none				

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type). Locations: voids, fabric, part of bed

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
Microsparites	1000um	8 total	Carbonate with soil fabric and organic matter inclusion	Rounded, voids, more dense in lower part of slide
Sparites	none			
Compound Nodules	none			
Mixed Crystallization	none			

Diffuse Carbonate Patches	none			
Fragmented nodules	1700um	1 possible – may also be lime	Mixture of carbonate and brownish sediment, carbonate appears melted.	C6. Pic3/4/5. Might be lime

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
Possible in H6. May be highly phosphatized bone

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation:
Slide relates to the construction and use of the privy outside the main privy pit. A high presence of organic matter both in intact plant remains and dark, crumbly fabric may be from decaying wood from the structure. A large aggregate interpreted as adobe may also be from construction, possibly an adobe subfloor or retaining material to contain the privy or allow for drainage during rain. Carbonate development is more pronounced in the lower part of the slide, where the groundmass is also more compact and crumbly. A fragmented carbonate cluster of small nodules which appear melted in texture may be lime used in the privy. Similarly a clump of ash, melted phytoliths, and quartz grains may be the remains of lye used for a similar purpose.

FODAMM UNIT 67 SLIDE: 1021715
Contexts: lowest contexts (18,20,22) in privy pit. 18 ended in a plate capping context 19 (a very thin ash lens) over context 20 (smelled like poo).

Boundaries: none

MICROMORPH BED 1:
Estimated Area: 40mm x 70mm = 2800mm^2

Fabric:
Color: dark brown
Sorting: moderately sorted
C/F ratio: 30:70
Related Distribution: porphyric within aggregates

Matrix (Fabric Microstructure, carbonate/clay type, BFabric). well developed crumbly microstructure with some blocky structure in lower part of slide. Rounded, crumbly peds around 600um in width. Highly organic (generally undifferentatied bfabric).

	Coarse	**Fine**
Grain Size	300um and larger	100um and smaller
Shape	Subrounded	Too small
Orientation	None	None
Composition	Quartz, tuff, limestone	Organic, silt

Voids: small planar voids (100um in width) and medium vughy voids (400um in width) define spaces between aggregates (20% voids). Packing voids are dominant in loose areas with more large rocky nodules (30% voids). Total void space is between 20 and 30% in most locations.

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	400um	10%	Random	Fracturing
Trachyte	None			
Tuff	700um	5%	Random	minimal
Basalt	None			
Limestone	10mm	2 fragments	B5, F5	Highly weathered

Organic:

	Size	Density	Distribution	Weathering
Charcoal	None			
Ash	None			
Plant Remains	200um	Rare	Void spaces	Decayed
Insect	none			

Excrement				

Other:

	Size	Density	Distribution	Weathering
Bone	150um	Rare	Lower part of slide	Decayed/phosphatized
Eggshell	None			
Metal	None			
Ceramic	None			
Glass	None			
Plaster	3000um	1 fragment	D6	phosphatized

Secondary Features:

Coatings:

Clay/Carbonate	Thickness	Location/size	B Fabric
none			

Hypocoatings:

Clay/Carbonate	Thickness	Location (+void type)	B Fabric
none			

InFillings/Void coatings:

Clay/Carbonate	Thickness	Location (void type)	B Fabric	
none				

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type). Locations: voids, fabric, part of bed

Type	Avg. Diameter	Density	*Fabric	Location and Shape
Microsparites	1400um	3 nodules	Micritic calcite, sometimes mixed with organic soil material. Either undifferentiated or laminated	Subrounded or subangular, in voids
Sparites	none			
Compound Nodules	none			
Mixed Crystallization	none			

Diffuse Carbonate Patches	none			
Fragmented nodules	4000um	2 instances, J1, B7	Mixtures of laminated carbonate and soil/silt. Fragments are oriented concentrically around an interior rounded vughy void	laminated

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Depletion Features: Some possible, but not well developed.

Phosphate (location, size, type, density)
Yellowed phosphatic alteration material staining soil material (example in Pic3/4).

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation:
Highly crumbly, organic rich dark fabric with phosphatic impregnations and very little plant material indicates influence of (human) waste material on sediments. No intact coprolites, but as the privies were cleaned regularly these would not be expected. Carbonate nodules are rare and small. Two concentrically oriented a nodules of laminated carbonate/clay aggregates around central voids may remnants of coatings on decayed material. Alternatively, as some of the carbonate nodules are also laminated, these may be remnants of lime material introduced into the privy as part of regular maintenance. This explanation can also account for the presence of weathered/altered limestone which is rarely seen at FODA (this could also be a natural occurrence). A fragment of highly phosphatized plaster may relate to construction and maintenance of the privy as well.

UNIT FRANCELL A STP1, SLIDE: 1020014

Contexts: topsoil and sub soils – 3 beds identified in thin section

Boundaries: Bed1/Bed2: gradual/diffuse
Bed2/Bed3: gradual diffuse
Boundaries primarily defined by change in fabric color and possible changes in compaction

MICROMORPH BED #:
Estimated Area: 20mm x 40mm = 800mm^2

Fabric:
Color: medium reddish brown
Sorting: unsorted
C/F ratio: 30:70
Related Distribution: close porphyric

Matrix (Fabric Microstructure, carbonate/clay type, BFabric)
Open, simple packing microstructure. Some clay peds throughout (not as common as microspars, but similar in size) – similar brownish clay hypocoatings and inclusion in carbonate nodules. Some may have some carbonate mixed with clay. Overall matrix is low carbonate content.

	Coarse	**Fine**
Grain Size	0.25 mm	Fine silt/ clay
Shape	Subrounded	Round
Orientation	Unoriented	Unoriented
Composition	Mineral grains, charcoal	Silt some clay

Voids: packing voids, larger near large inclusions (2%)
Channel voids (2 to 5%), 0.2mm

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	0.5mm	10 to 20%	Random	None
Trachyte	1mm to 10mm	2%	Random	None
Tuff	1mm	5%	Random	none
Feldspar	0.3mm	3%	Random	None
Muscovite	0.13mm	2%	Random	None
Biotite	0.18mm	Rare	Random	None

Limestone	3mm	1 fragment	Random	Unburnt - none

Organic:

	Size	Density	Distribution	Weathering
Charcoal	0.3mm, one large (5mm)	5%	Random	
Ash	None			
Plant Remains	0.6mm to 5mm	5 to 510%	Concentrated in voids	
Insect Excrement	none			

Other:

	Size	Density	Distribution	Weathering
Bone	None			
Eggshell	None			
Metal	None			
Ceramic	None			
Glass	none			

Secondary Features:

Coatings: (also location rock/ped and location of coating – underside, topside)

Clay/Carbonate type	**Thickness**	**Location/size**	**B Fabric**
NONE			

Hypocoatings:

Clay/Carbonate type	**Thickness**	**Location (+void type)**	**B Fabric**
Brownish clay w/ dark ring	0.7mm, 0.2mm	On underside of carbonate nodules/compound nodules. 2 instances	undifferentaited

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**
Brownish clay w/ carbonate	1mm in long direction	Attached to tuff fragment in packing void	

Carbonate Nodules:

Type	Avg. Diameter	count	*Fabric	Location and Shape
Microsparites*	412.01um	29	Gray microcalcite. Some larger crystals (rare) in central portions. Some brown clay thin hypocoatings/inclusions	More dense at base of bed. Mostly in void spaces
Sparites	1872.66um (bimodal – one substantially larger)	2	Pure calcite	1, near base of bed
Compound Nodules	6958.22um	1	Microsparry carbonate nodules cemented by brownish, carbonate rich clay. Quartz inclusions, brownish clay similar to other places. No bfabric.	Near top of bed.
Mixed Crystallization	Rare – 2 instances in microspars. One larger with clay inclusions. Large: 1857.73um	3	Mixed microspars, sparry crystals and brownish clay	Random.

*Microsparites (small crystals btn 8 to 20um) – recrystallization – measure all from 2x mag in top, center, and base of bed along central line. Mark as MSbed# on photo.
Sparites (pure crystals (larger than 20um) – precipitation - count and measure all
Compound – count and measure all

Other carbonate features: (roots, etc. – location, size, type, density)
None

Gypsum crystallizations (location, size, type, density)
gypsum crystallization in channel void near top of bed in right hand corner – water.

Phosphate (location, size, type, density)
NA

Manganese (location, size, type, density)
NA

Iron Nodules (location, size, type, density)
NA

Interpretation: Sterile surface. Base mineralology of trachyte, tuff, and silicates with silty/clayey groundmass. Channel voids contain plant matter and a patch of gypsum crystallization near the top of the bed relates to water action.

1020014 MICROMORPH BED 2:
Estimated Area: 20mm x 40mm = 800mm^2

Fabric:
Color: light brown
Sorting: none
C/F ratio: 30:70
Related Distribution: Gefuric – fine fraction is packed connecting larger grains.

Matrix (Fabric Microstructure, carbonate/clay type, BFabric)
Massive with patches of weakly expressed crumbly microstructure. Brownish clay aggregate throughout. No carbonate in groundmass.

	Coarse	**Fine**
Grain Size	0.2mm	Fine silt
Shape	Subrounded	Rounded
Orientation	Unoriented	Unoriented
Composition	Minerals, plant material	Silt and clayey material

Voids: Channel voids – larger around larger aggregates (2 to 5%).
Planar voids in groundmass (5%) – fine fraction
Packing voids, 10% in fine fraction

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	0.5mm	20%	Random	minimal
Trachyte	1 to 5mm	5%	Random	Minimal
Tuff	1mm	5%	Random	Minimal

Organic:

	Size	Density	Distribution	Weathering
Charcoal	0.5mm	2%	Random	
Ash	None			
Plant Remains	0.2mm to 0.6mm	5 to 10%	Concentrated in	Decayed

			voids	
Insect Excrement	none			
Phytolith	0.6mm	One instance	In void near large trachyte nodule	

Other:

	Size	Density	Distribution	Weathering
Bone	4mm and smaller	3 to 5%	random	
Eggshell	None			
Metal	None			
Ceramic	None			
Glass	None			

Secondary Features:

Coatings: (also location rock/ped and location of coating – underside, topside)

Clay/Carbonate type	**Thickness**	**Location/size**	**B Fabric**
Brownish clay with possible carbonate content, quartz and opaque mineral inclusion	1.733.68 on topside; 0.219.05 on underside	Bed 2/3 boundary. On basalt fragment	Primarily undifferentiated with some laminations towards outer part of coating.
Brownish clay coatings with small mineral inclusions	0.1 to 0.2mm	Trachyte fragments near 2/3 boundary	Undifferentiated.

Hypocoatings:

Clay/Carbonate type	**Thickness**	**Location (+void type)**	**B Fabric**
Brownish clay with possible carbonate inclusions	0.425um. less than 5 instances	On microsparitic calcite nodules	Undifferentiated.

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**
NONE			

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type). Locations: voids, fabric, part of bed

Type	Avg. Diameter	Density	*Fabric	Location and Shape
Microsparites	178.4213um	46	Mixed microsparitic calcite with brown clay hypocoatings and some inclusions	Primarily in packing voids. Rounded.
Sparites	589.2079um	5	Pure calcite	In voids, about half near large channel void. - subangular
Compound Nodules	886.57	1 – possible, mixed carbonate and clay	Mixed microsparitic carbonate and brownish clay	Subrounded.
Mixed Crystallization	Some microspars have slightly larger crystals (closer to 20uym, but not large enough to be sparry		Pure calcite	subrounded

*Microsparites (small crystals btn 8 to 20um) – recrystallization – measure all from 2x mag in top, center, and base of bed along central line. Mark as MSbed# on photo.
Sparites (pure crystals (larger than 20um) – precipitation - count and measure all
Compound – count and measure all

Other carbonate features: (roots, etc. – location, size, type, density)
One possible biogenic feature – carbonate crystals in void space near large channel void.

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)

none

Interpretation: Lower bed of sterile surface. Groundmass is less compacted that at surface. Clay and carbonate development throughout. Organic remains in voids.

1020014 MICROMORPH BED 3:
Estimated Area: 30mm x 40mm = 1200mm^2

Fabric:
Color: medium reddish brown
Sorting: poorly sorted
C/F ratio: 20:80
Related Distribution: close porphyric.

Matrix (Fabric Microstructure, carbonate/clay type, BFabric)
Poorly developed crumb texture. More clay in fabric than overlying units. Fewer clay peds.

	Coarse	**Fine**
Grain Size	0.2mm+	Fine silt
Shape	Subrounded	Rounded
Orientation	Unoriented	Unoriented
Composition	Mineral grains, charcoal, plant	Silt/clay

Voids: complex packing voids 15%, fine fraction
Channel voids throughout (5%)
Small planar voids (2%)

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz				
Trachyte	1.5mm+	5 to 10%	Random	minimal
Tuff	1.2mm	2 to 5%	Random	Minimal
Feldspar	none			

Organic:

	Size	Density	Distribution	Weathering
Charcoal	0.5mm	3%	Random	
Ash	None			
Plant Remains	0.25mm	2%	In voids	decayed
Insect	none			

Excrement				

Other:

	Size	Density	Distribution	Weathering
Bone	None			
Eggshell	None			
Metal	None			
Ceramic	None			
Glass	None			

Secondary Features:

Coatings: (also location rock/ped and location of coating – underside, topside)

Clay/Carbonate type	**Thickness**	**Location/size**	**B Fabric**
Clay coatings	0.15mm and less	On some trachyte and tuff fragments	undifferentaited
Carbonate coating	0.15mm	1 instance on tuff	

Hypocoatings:

Clay/Carbonate type	**Thickness**	**Location (+void type)**	**B Fabric**
Rare clay hypocoatings on carbonates	0.115mm	Mixed crystallization carbonate nodules	undifferentiated

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**
None			

Carbonate Nodules:

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
Microsparites	177.4115UM	37	Mostly micritic calcite, some inclusions of brownish clay	Subrounded, rounded. Mostly in voids. Concentration near large channel void (MS3 location)
Sparites	444.7356um	20	Pure calcite	Subangular to subrounded.

Compound Nodules	635um	1	Brownish carbonate clay linking small sparry calcite nodules	subrounded
Mixed Crystallization	2860.44um; 2652.49um	2	Larger is mixed crystallization of pure calcite. Smaller has mixed crystallization plus carbonate clay hypocoating	Subrounded. Near large channel void

*Microsparites (small crystals btn 8 to 20um) – recrystallization – measure all from 2x mag in top, center, and base of bed along central line. Mark as MSbed# on photo.
Sparites (pure crystals (larger than 20um) – precipitation - count and measure all
Compound – count and measure all

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
None

Iron Nodules (location, size, type, density)
None

Interpretation: Sterile subsurface bed with weak crumb microstructure due to clay development. Voids indicative of plant and water action.

Slide interpretation:
Sterile surface sediment. Mineralogical makeup is felsic igneous rocks (tuff and trachyte) as well as sedimentary minerals – quartz, feldspar, muscovite, biotite. Secondary processes of carbonate development and clay development throughout. Sparry calcite likely precipitate from Aeolian dust and then recrystallize to microsparites. Clay development during recrystallization results in clay inclusions in some microspars. Clay also acts to bind together microspars creating compound nodules.

FRANCELL A STP1, SLIDE: 1020012

Contexts: lower subsurface layer

Boundaries: only one bed visible.

MICROMORPH BED #:
Estimated Area: 40 x 70mm = $2800mm^2$

Fabric:
Color: light to medium brown
Sorting: moderately sorted
C/F ratio: 30:70
Related Distribution: Monic/chitonic – packing of C fraction with little linking by fine fraction particles

Matrix (Fabric Microstructure, carbonate/clay type, BFabric)
Crumbly/packing structure with patches of higher clay content and some discrete clay peds.

	Coarse	**Fine**
Grain Size	0.1mm	Silt
Shape	Subrounded	Rounded
Orientation	Unoriented	Unoriented
Composition	Mineral grains, rocks	Silt, clay

Voids: Packing voids – 20 to 30%, C and F fraction
Large vughs (5mm+) around carbonate nodules

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	0.2mm to 1mm	5 to 10%	Random	
Trachyte	1.5mm to 4mm	5 to 10%	Random	Clay coatings
Tuff	2 to 5mm	Rare	Random	Clay coatings
Muscovite	0.2mm	Rare	random	

Organic:

	Size	Density	Distribution	Weathering
Charcoal	None			
Ash	None			
Plant Remains	<1mm	Rare	Random	
Insect	none			

Excrement				

Other:

	Size	Density	Distribution	Weathering
Bone	None			
Eggshell	None			
Metal	None			
Ceramic	None			
Glass	none			

Secondary Features:

Coatings: (also location rock/ped and location of coating – underside, topside)

Clay/Carbonate type	**Thickness**	**Location/size**	**B Fabric**
Brownish clay	174.48um	Underside of trachyte and tuff – less than 4 instances	undifferentiated

Hypocoatings:

Clay/Carbonate type	**Thickness**	**Location (+void type)**	**B Fabric**
Clay hypocoatings	Variable: 100 to 900um	On carbonate nodules – mostly on microsparitic. Less than 10 instances	Undifferentatied.

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**
NONE			

Carbonate Nodules:

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
Microsparites	729.5638um	20	Micritic calcite, brownish clay inclusions and hypocoatings	Rounded, voids
Sparites	1000.52um	13	Pure calcite.	Throughout. Subangualr to subrounded.
Compound Nodules	4757.45um	1	Brownish clay linking small micritic carbonate	blocky
	5308.66um.	7	Mostly pure calcite.	subrounded

Mixed Crystallization	(one nodule is large outlier – 15mm)		Some have brown clay inclusions/ hypocoatings	
Diffuse Carbonate Patches		1 – possible (covered by air bubble)		

*Microsparites (small crystals btn 8 to 20um) – recrystallization – measure all from 2x mag in top, center, and base of bed along central line. Mark as MSbed# on photo.
Sparites (pure crystals (larger than 20um) – precipitation - count and measure all
Compound – count and measure all

Other carbonate features: (roots, etc. – location, size, type, density)
None

Gypsum crystallizations (location, size, type, density)
None

Phosphate (location, size, type, density)
None

Manganese (location, size, type, density)
None

Iron Nodules (location, size, type, density)
NA

Interpretation: Sterile sediment dominated by carbonate and clay development. See notes for slide 1020012.

UNIT 1, SLIDE: 1020043, WEST WALL

Contexts: 3, 4 and 5 disaggregated. Or entirely context 3. There is some difference in composition (specifically amount of charcoal and metal) between the upper and lower parts of the slide, but no clear boundary or significant difference in fabric.

Boundaries: No Visible Boundaries

1020043 MICROMORPH BED 1:
Fabric:

Color: Grayish Brown
Soring: unsorted
C/F ratio: 30:70
Related Distribution: monic

Matrix (Fabric Microstructure, carbonate/clay type, Color, BFabric)
Open massive structure. Minimal clay binding silt and sand particles. Patches with higher ash content in fabric, overall loose structure.

	Coarse	**Fine**
Grain Size	0.1mm	0.02mm
Shape	Dependent on material	Rounded/globular
Orientation	Unoriented	Unoriented
Composition	Mineral grains, charcoal, carbonate, other	Small carbonate clay aggregates, mineral grains, charcoal

Voids: Upper part of slide has small (fine fraction) complex packing (10%) and larger (1mm+) vughy voids (5%). Lower part of slide has (fine fraction and larger) complex packing voids (10%) and larger (1mm) vughy voids (5 to 10%).

Composition:

Mineralogy:

	Size	**Density**	**Distribution**	**Weathering/other**
Quartz grains	0.3 to 0.09mm	5 – 10%	Random	
Trachyte	2.5mm to 10mm	10%	Random	Thin clay coatings
tuff	2mm to 10mm	10%	Random	Fe staining, some with banding
Feldspar	1mm	Rare		
Large Quartz Frag	100mm	1 fragment		
Calcite	4mm	<2%	Lower part of slide	Large, sparry calcite crystalizations, also individual crystals
Basalt	5mm and smaller	rare		

Organic:

	Size	Density	Distribution	Weathering
Charcoal	3mm to 0.2mm	10 to 20%	Denser in upper part of slide	
Ash	In fabric	10% to 20% in isolated areas	Denser in loser part of slide	
Plant Remains	0.7mm	Rare	Random	
Insect Excrement	None			

Other:

	Size	Density	Distribution	Weathering/other
Bone	1.5mm	2 to 5%	Random	burnt
Eggshell	1.5mm	1 fragment	Lower part of slide	
Metal	5 to 15mm, elongate fragments	10%	Concentrated in lower part of slide	Long thin (sometimes) curved fragments, leaching
Ceramic	None			
Glass	Small fragments	rare		

Secondary Features:
Slide: 1020043, Francell A Unit 1 (only one bed visible)

Coatings:

Clay/Carbonate type	**Thickness**	**Location/size**	**B Fabric**
Thin fe coatings	303um	On trachyte nodules (mostly topsides)	

Hypocoatings:

Clay/Carbonate type	**Thickness**	**Location (+void type)**	**B Fabric**
Fe hypocoatings	303um	On trachyte nodules (variable, but most of the nodules have some amount of hypocoating	undifferentiated

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**
NA			

Carbonate Nodules:

Type	Avg. Diameter	Density	*Fabric	Location and Shape
Microsparites	1107.109 (bimodal – (5000um, or less than 1000um)	8 in MS areas	Micritic calcite, some with brownish clay inclusions	rounded
Sparites	1892.79um	7	Pure calcite	subrounded
Compound Nodules	2093.51um	1	Small calciate nodules (250um) bonded by dark brown clay	subroundded
Mixed Crystallization	1280.25	1	Calcite	rounded
Diffuse Carbonate Patches	None			
Fragmented nodules	None			

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
Fe leaching near metal fragments (no nodules)

Interpretation: Slide appears to be somewhat disaggregated but not completely disturbed based on the variable concentrations of coarse fraction materials in the upper and lower parts of the slide. Fabric and void space is variable in both upper and lower parts and not significantly distinct to define separate beds. There is no clear boundary. Lower part of slide has larger amount of metal, while upper part has a larger charcoal content. There are no observed glass or ceramic fragments and only one instance of eggshell (which is very low compared to other slides from the midden). There are several instances of Fe leaching near metal fragments, as well as an isolated patch of mystery reddish material that may also be from leached iron.

Slide Interpretation (1020043): This slide should overlap contexts 3 (high organic content, yellowish-brown), 4 (ashy with fine charcoal and larger metal artifacts), and 5 (light brown with charcoal and large metal artifacts). However, it appears to be a mixture of these contexts with more charcoal and organic remains in the upper part of the slide and more metal artifacts in the lower part. Compared to other midden slides there is less eggshell, less ash, and no ceramic or glass remains. Compared to the sterile slides from STP1 there is substaintially less carbonate development than present in the sterile STP1. The metal in this slide is generally long and thing, rather than angular fragments seen in other slides. Leaching of iron into the matrix is common. Clay development is minimal.

Comparable Slides: 1020156 Bed 1 (Francell A unit 1, context 3)

UNIT 1, SLIDE: 1020156, SOUTH WALL

Contexts: 3, 4, and 5.

3: yellowish/organic silty sand with charcoal and organic inclusions (Micromorph Bed 1), may be slightly disaggregated.

4: thin layer of very loose, fine gay ash with charcoal (Micromorph Bed 2)

5: loose gray-brown silty sand with large metal artifacts (Micromorph Bed 3)

Boundaries:

3/4: Defined by large void space and Trachyte nodule. Clear at macroscale.

4/5: Gradual – 2.5mm

1020156 MICROMORPH BED 1 (CONTEXT 3):
Thickness: 30mm of slide (extends beyond top of slide)
Area = 30 x 40mm = 1200mm^2

Fabric:

Color: grayish-brown
Sorting: well sorted fine fraction
C/F ratio: 30:70
Related Distribution: Open Porphyric (F1) and Enaulic (F2)

Matrix (Fabric Microstructure, carbonate/clay type, Color, BFabric)

Massive microstructure with loose silt and sand particles with no internal structure and minimal clay development. Ash is present in matrix. Mixture between more dense fabric with ashy matrix and open, loose fabric with little to no fine fraction.

F1 and F2	**Coarse**	**Fine**
Grain Size	0.1mm and larger	0.05mm
Shape	Dependent on material	Rounded
Orientation	Unoriented	Unoriented
Composition	Mineral grain, rocks, Other	Calcitic clay and ash (10%)

Voids: F1: packing voids (fine fraction) and larger (0.2) voids around large particles. 5%
F2: packing voids (0.2mm), 30-40%

Large void (10-15mm) defines boundary with bed 2.

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	0.3 to 0.09mm	5 – 10%	Random	

Trachyte	2mm to 20mm	5%	Random	Thin clay coatings
tuff	0.2 to 1mm	10%	Random	Fe staining and calcite replacements
Basalt	2mm	rare		
Calcite	2mm	rare		

Organic:

	Size	Density	Distribution	Weathering
Charcoal	1 to 2mm	5 to 10%	Larger particles near top of bed	
Ash	In fine fraction	10%		
Plant Remains	2mm	Rare		Burned
Insect Excrement	none			

Other:

	Size	Density	Distribution	Weathering
Bone	3mm	<5%	Random	Burnt and highly weathered
Eggshell	1 to 2mm	Rare	Near (possible) glass fragments, E5	
Metal	4mm and smaller	<5%	Lower part of bed 1 with one large pieces (and associated fragments) in upper left A1	
Ceramic	none			
Glass	3mm	2 small fragments	E6, F6	Burnt/ vitrified?

Secondary Features:

Coatings:

Clay/Carbonate type	**Thickness**	**Location/size**	**B Fabric**
1 brown coating on micritic carbonate	86.62um	Upper part of bed 1	undifferentiated

Hypocoatings:

Clay/Carbonate type	**Thickness**	**Location (+void type)**	**B Fabric**

none			

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**
none			

Carbonate Nodules:

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
Microsparites	897.1022	7 in MS locations	Carbonate, some brown clay streaks	Rounded, voids
Sparites	1191.438	5	Pure calcite	subrounded
Compound Nodules	none			
Mixed Crystallization	2346.93	1	Calcite with clay streaks and clay hypocoating.	Upper left of slide, subrounded
Diffuse Carbonate Patches	none			
Fragmented nodules	none			

Other carbonate features: (roots, etc. – location, size, type, density)
None

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation: Slightly disaggregated context 3 from bed 1. Small inclusions of metal, eggshell, possible glass, and charcoal and ash in fine fraction. No evidence for insitu burning or water action. In contrast to other midden contexts there is less artifact content (and especially large artifact content and eggshell). There is also substantially less carbonate and clay development than in sterile.

Might be comparable to slide 1020043.

1020156 MICROMORPH BED 2 (CONTEXT 4):
Area: 10mm x 40mm = $400mm^2$

Fabric:

Color: grayish brown
Sorting: Moderately well sorted
C/F ratio: 10:90
Related Distribution: open porphyric
Microstructure: Massive

Matrix (Fabric Microstructure, carbonate/clay type, Color, BFabric)
Silty ash groundmass. Massive microstructure

	Coarse	**Fine**
Grain Size	0.3mm and larger	Fine silt
Shape	Dependent on material	Rounded
Orientation	Unoriented	Unoriented
Composition	Mineral grains, charcoal	Silt and ash (20-30%)

Voids: Packing voids in fine fraction (2%)

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	0.1mm	< 5%	Random	
Trachyte	3mm	<5%	Random	
tuff	1mm	<5%	Random	

Organic:

	Size	Density	Distribution	Weathering
Charcoal	0.2 to 0.8mm	10%	Random	
Ash	Fine fraction	20 to 30%		
Plant Remains	None			
Insect Excrement	none			

Other:

	Size	Density	Distribution	Weathering
Bone	0.7mm and smaller	5%	Random	
Eggshell	0.7mm	1 fragment		
Metal	none			
Ceramic	None			

Glass	None			

Secondary Features:

Coatings:

Clay/Carbonate type	**Thickness**	**Location/size**	**B Fabric**
Some on carbonates	57um	On some microsparite carbonate	undifferentiated

Hypocoatings:

Clay/Carbonate type	**Thickness**	**Location (+void type)**	**B Fabric**
none			

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**
none			

Carbonate Nodules:

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
Microsparites	597.4474um	3 in MS locations	Carbonate, some with thin clay coatings	rounded
Sparites	596.8118um	2	Pure calcite	Subrounded, angular, in ash groundmass
Compound Nodules	5810.66um	1 very large overlaps with bed3	Banded carbonate and clay with one discrete carbonate nodule included	subangular
Mixed Crystallization	none			
Diffuse Carbonate Patches	none			
	none			

Fragmented nodules				

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
Some possible phosphate replacement in ash groundmass

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation: Thin layer of dense ash matrix with a fine grained coarse fraction consisting mostly of charcoal with some rocks, bone, and eggshell. There is no evidence for insitu burning so this layer was likely intensely burned before deposition and covered by layer 3 soon after which would prevent the fine ashy silt from being blow away. Minimal carbonate and clay development, some phosphate replacement within ash matrix.

1020156 MICROMORPH BED 3 (CONTEXT 5):
Thickness: lower 10 to 15mm of slide, continues beyond extent of slide. Area = 40mm x 10mm = 400mm^2

Fabric:

Color: light brown
Sorting: poorly sorted
C/F ratio: 20:80
Related Distribution: Enaulic
Microstructure: Massive

Matrix (Fabric Microstructure, carbonate/clay type, Color, BFabric)

Loose silt sized particles, mostly packing (no internal structure). Massive microstructure.

	Coarse	**Fine**
Grain Size	0.4mm	0.1mm

Shape	Rounded, dependent on material	Rounded
Orientation	Unoriented	Unoriented
Composition	Minerals, rock fragments, other	Sediment grains. No/little ash

Voids: Complex packing voids, vughy voids (0.5mm and slightly larger). 10%

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	0.3 to 0.09mm	5 – 10%	Random	
Trachyte	5mm	5%	Random	Clay coatings
tuff	2 to 3mm	5%	Random	Fe staining
Basalt	2mm	Rare		

Organic:

	Size	Density	Distribution	Weathering
Charcoal	2.2mm	Rare	Little to none in fine fraction	
Ash	None			
Plant Remains	None			
Insect Excrement	None			

Other:

	Size	Density	Distribution	Weathering
Bone	1.7mm	rare		
Eggshell	None			
Metal	None			
Ceramic	None			
Glass	None			

Secondary Features:

Coatings: (also location rock/ped and location of coating – underside, topside)

Clay/Carbonate type	**Thickness**	**Location/size**	**B Fabric**
Brownish clay	92.58	On trachyte nodule	undifferentiated

Hypocoatings:

Clay/Carbonate type	**Thickness**	**Location (+void type)**	**B Fabric**

none			

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**
none			

Carbonate Nodules:

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
Microsparites	418.2739	3	Calcite	rounded
Sparites	none			
Compound Nodules	none			
Mixed Crystallization	none			
Diffuse Carbonate Patches	none			
Fragmented nodules	none			

Other Secondary Feature:

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)

none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation: Very uppermost part of context 5 and likely does not give a representative look at the entire context. Larger void space than context 4 indicates less packing as well as less fine fraction present. There are some larger pieces of charcoal but little to no charcoal or ash in fine fraction suggesting that this context was not burnt or was only lightly burned. Clay coatings and fe staining are present but there is not substantial carbonate development.

SLIDE INTERPRETATION (1020156): The loose fabric of beds 1 and 3 suggests that they might be slightly disturbed (along the large void space at the boundary of beds 1 and 2). However, the internal compositions of the 3 beds are sufficiently intact to distinguish the 3 contexts. Bed 1 (context 3) indicates some burning prior to deposition and includes organic artifact fragments as well as metal and glass. Bed 2 is a very thin, fine layer of ash and charcoal that was likely intensively burned before deposition. Bed 3 has little ash or charcoal content suggesting that it was not burned (or only lightly burned) and has few artifactual remains (this context is mostly cut off by the slide so it is probably not representative. The excavation data for these beds indicates that bed 1 (context 3) was highly organic while bed 3 (context 5) contained large (30m+) chunks of charcoal as well as large metal artifacts (cans). In excavation it was highly mottled and variable throughout the bed. Together the 3 beds suggest variable burning practices with trash remains. The highly organic bed 1 (context 3) is also substantially burned. Bed 2 (context 4) is burned to the extent that only ash and charcoal remain, and bed 3 (context 5) does not appear to indicate burning in this part of the context.

Comparable slides:

Bed 1 (Francell A, unit 1 context 3): slide 1020043
Bed 3 (Francell A, unit 1 context 5): slide 1020155 beds 2 and 3

Francell A Micromorphology

UNIT 1, SLIDE: 1020155, WEST WALL

Contexts:
Contexts 5 and 6: lose, light brown context with large charcoal and metal artifacts but otherwise low artifact content. Patches of yellowish/organic material (context 6). (Micromorph beds 2/3)
Context 8: boundary with sterile sediment beneath midden. More compact, higher carbonate content.
Micromorph bed 1 is a context drawn on the profile map between contexts 4 and 5 which was not identified during excavation.

Boundaries:

Bed1/Beds 2 and 3: gradual (4mm) marked by increased and horizontally oriented coarse inclusions of mineral, rock, and charcoal fragments, as well as a large ash clump on the right. Difficult to capture in 2x because boundary is too gradual

Beds 2/3: gradual (2 to 3mm).

1020155 MICROMORPH BED 1:
Area: 15mm x 40mm = 600mm^2

Fabric:

Color: reddish brown with patches of lighter and darker fabric
Sorting: well sorted
C/F ratio: 5 to 10 : 95 to 90 (not including very large (10mm+) charcoal remains
Related Distribution: loose porphyric

Matrix (Fabric Microstructure, carbonate/clay type, Color, BFabric)

Massive, some blocky patches, full of ash and burned plant matter. Speckled, some banding in XP. Bands are very large and difficult to capture in photographs, but are arranged NW/SE in the densely packed areas (H2 and H3 most pronounced).

	Coarse	**Fine**
Grain Size	0.5mm	Silt/clay
Shape	Dependent on material	Too small
Orientation	60% horizontal	NW-SE darker bands
Composition	Charcoal/quartz	Burned clay/silt, ash (10%)

Voids:
Channel voids (horizontal 2-5% and vertical <2%), 0.2mm and smaller
Larger voids near large charcoal fragments (up to 2mm, 2%)

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	0.5mm	rare	Random	
Trachyte	2mm	1 fragment		
tuff	none			

Organic:

	Size	Density	Distribution	Weathering
Charcoal	0.6mm and smaller	10-20%	random	
Ash	Fine fraction	10%		
Plant Remains	0.1mm	5-10%	Random	Burned, possibly burned phytoliths
Insect Excrement	0.05mm	1 cluster	Near plant remains	
Large Charcoal	3mm to 15mm	30% (70% of C fraction)	Concentrated on left side	

Other:

	Size	Density	Distribution	Weathering
Bone	None			
Eggshell	None			
Metal	2mm elongate	1 instance		
Ceramic	None			
Glass	none			
Plaster	2000um	1 instance	A1	Burnt/unreacted? lime plaster

Other Secondary Features:

Coatings:

Clay/Carbonate type	**Thickness**	**Location/size**	**B Fabric**
none			

Hypocoatings:

Clay/Carbonate type	**Thickness**	**Location (+void type)**	**B Fabric**
none			

InFillings/Void coatings:

Clay/Carbonate	Thickness	Location (void type)	B Fabric
none			

Carbonate Nodules:

Type	Avg. Diameter	Density	*Fabric	Location and Shape
Microsparites	945.3483	3 in 2 MS locations	Microsparitic calcite with some clay inclusions	rounded
Sparites	922.81um	3	Pure calcite	Rounded, at boundary with bed 3
Compound Nodules	none			
Mixed Crystallization	none			
Diffuse Carbonate Patches	none			
Fragmented nodules	none			

Other Secondary Features:

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)

none

Interpretation: Possibly mild insitu burning of sediment and midden remains. High ash content (and ash clumps) along with charcoal suggest wood and ash fuel. Reddening, compaction, and blocky structure in fine fabric show insitu burning of sediment. Large clump of planty material to right hand side is likely highly burnt plant matter with some melted phytoliths. Minimal carbonate and clay development. Plaster fragment in A1.

1020155 MICROMORPH BED 2:
Area: 30mm (high) x 20mm (wide) = 600mm^2. Bounded on top by Bed 1. Bounded on right and below by Bed 3.

Fabric:
- Color: light tan
- Sorting: medium sorted
- C/F ratio: 30:70
- Related Distribution: close porphyric
- Microstructure: massive

Matrix (Fabric Microstructure, carbonate/clay type, Color, BFabric)
Open, massive fabric with ash inclusions and lots of insection excrement.

	Coarse	**Fine**
Grain Size	0.2mm and larger	Fine silt
Shape	subrounded/subangular	Rounded
Orientation	Unoriented	Speckled
Composition	Charcoal, mineral grains, ash clumps	Charcoal (5%), ash (5-10%), Carbonate/clay

Voids: Complex packing voids (mostly in fine fraction). 5 to 10%.

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	0.3 to 0.09mm	5 – 10%	Random	
Trachyte	2mm and large 20mm nodule	5%	Random	No coatings
tuff	2mm and larger	<5%	Random	

Organic:

	Size	Density	Distribution	Weathering
Charcoal	0.3 and smaller	10% fine fraction	Random	

Ash	0.8mm clumps	<5%	Random	
Plant Remains	1mm	Rare		Burned
Insect Excrement	0.03mm	1 instance	Near eggshell	
Large Charcoal	1mm	5%	random	

Other:

	Size	Density	Distribution	Weathering
Bone	0.2mm	Rare	Random	
Eggshell	4mm and 10mm	2 instances		4mm is burnt
Metal	2mm	Several fragments	Near glass	One piece has an enamel porcelain coating (compared with ID'd porcelain).
Ceramic	none			
Glass	30m, thin	1 fragment		Fragmented on upper side

Other Secondary Features:

Coatings:

Clay/Carbonate type	**Thickness**	**Location/size**	**B Fabric**
carbonate	236um	On metal fragment	speckled

Hypocoatings:

Clay/Carbonate type	**Thickness**	**Location (+void type)**	**B Fabric**
Thin Fe hypocoating	53um	Large trachyte nodule	undifferentiated

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**
none			

Carbonate Nodules:

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
Microsparites	401.4909	5 in MS locations	Cacite	Rounded.
Sparites	938.6563	5	Pure calcite	Subrounded to rounded

Compound Nodules	none			
Mixed Crystallization	none			
Diffuse Carbonate Patches	none			
Fragmented nodules	none			

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
Minimal metal leaching

Interpretation: Most likely part of mottling of context 6. Unburned or lightly burned patch with little secondary development, little organic staining, patches of calcitic ash and charcoal. Evidence for insect action associated with eggshell fragments. Long, thin glass fragment overlaps with bed 3. Little carbonate and clay development (consistent with other midden contexts). Porcelain enameled metal.

1020155 MICROMORPH BED 3:
Thickness: Lower 15mm of slide along with most of the right hand side. Bounded by Bed 1 (ash clump) at top and surrounds Bed 2. Total area approximately 1000mm^2

Fabric:
Color: Dark brown

Sorting: bimodal, poorly sorted
C/F ratio: Upper portion - 30:70; Lower portion – 10:90
Related Distribution: upper portion – close porphyric; Lower portion – loose porphyric

Matrix (Fabric Microstructure, carbonate/clay type, Color, BFabric)
Dense matrix of silt sized particles with no/minimal clay development. Massive microstructure. Lots of amorphous plant matter and ash.

Upper Portion	**Coarse**	**Fine**
Grain Size	0.4mm	Fine silt
Shape	Rounded, elongate	Rounded
Orientation	Unoriented	Some NW-SE banding in PP
Composition	Charcoal, mineral grains, bone, carbonate	Ash 10%, sediment

Lower Portion	**Coarse**	**Fine**
Grain Size	0.3mm	Fine silt
Shape	Rounded	Rounded
Orientation	Unoriented	Unoriented
Composition	Carbonate, mineral grains	Ash 10 to 20%, sediment

Voids: Upper portion: complex packing voids in fine fraction, <5%
Lower portion: complex packing voids in fine fraction, 5 to 10%. Larger voids (2mm), 2 to 5%.

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	0.3 to 0.09mm	5 – 10%	Random	
Trachyte	1 to 10mm	5%	Random	Some clay coatings
tuff	0.5mm	5%	Random	Limited Fe staining

Organic:

	Size	Density	Distribution	Weathering
Charcoal	0.4mm	5 – 20%	20% in upper portion, 5% in lower	
Ash	In fine fraction			
Plant Remains	1.4mm	2-5%		Burned and unburned
aggregate	1mm	1 Possible	Near glass	

Other:

	Size	Density	Distribution	Weathering

Bone	0.1mm	Rare	Random	
Eggshell	0.9mm	1 instance		
Metal	3mm	Rare		
Ceramic	none			
Glass	0.9mm	2 fragments	Random	1 fragment with curved refraction and orange tint

Other Secondary Features:

Coatings:

Clay/Carbonate type	**Thickness**	**Location/size**	**B Fabric**
none			

Hypocoatings:

Clay/Carbonate type	**Thickness**	**Location (+void type)**	**B Fabric**
none			

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**
none			

Carbonate Nodules:

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
Microsparites	600.637	11 in MS locations	Calcite, some brownish clay inclusions	rounded
Sparites	970.1361	8	Pure cacite	subrounded
Compound Nodules	none			
Mixed Crystallization	none			

Diffuse Carbonate Patches	none			
Fragmented nodules	Counted in microsparites (2383.39um and 1170.59 um)	1	calcite	rounded

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation: This bed (along with bed 2) likely represents the mottling seen in context 6. The variable burning and compaction across the bed (specifically - more compaction and charcoal in the upper portion) is likely related to the insitu burning evidence by Bed 1. Loose distribution of artifactual remains throughout, along with ash and charcoal. Some evidence for carbonate development as well as banding in the fine fraction. Higher organic content indicated by presence of burned and unburned plant remains.

SLIDE INTERPRETATION (1020155): Compaction, reddening, and high charcoal and ash content in bed 1 (unidentified context) suggests in situ burning of the midden. The lower beds (2 and 3) were likely compacted by this burning, leading to the denser fabric than found in other slides from this bed. Oriented coarse grains mark the boundary between beds 1 and 2, which likely prevented that bed from being altered by the burning event, leading to the distinction between beds 2 and 3. Bed 3 is more high compacted, darker colored (with some evidence of banding similar to bed 1), and has a higher charcoal content closer to bed 1. Artifactual remains (metal, eggshell, and glass, as well as possible anthropogenic inclusions such as charcoal, ash, and bone, are found throughout beds 2 and 3 but are rarer in bed 1. There is a slightly higher carbonate content in the lower part of bed 3. There is evidence for insect action in beds 1 and 2.

Comparable Slides: 1020156 Bed 3 (Francell A, unit 1 context 5)

Francell A Micromorphology

UNIT 2, SLIDE: 1020152 EAST WALL

Contexts: Profile Map and Context forms do not agree
Context 6: yellow gray sediment with burnt organic material (Micromorph Bed 1)
Context 7: interface with sterile (Micromorph Bed 2)

Boundaries:
Bed 1/2 : gradual, 2 to 3mm. More clearly visible on left side of slide.

1020152 MICROMORPH BED 1:
Thickness: 30mm x 40mm=1200

Fabric:
Color: Dark Brown
Sorting: poorly sorted
C/F ratio: 30:70
Related Distribution: close porphyric

Matrix (Fabric Microstructure, carbonate/clay type, Color, BFabric)
Loose matrix with limited internal structure. Some areas are distinguished by denser packing and possible clay development. Some areas are more densely packing with large amounts of amorphous organic matter in matrix. Some (<5) concentric brown clay nodules (some with dark rings).

	Coarse	**Fine**
Grain Size	0.3mm and larger	0.05mm and smaller
Shape	Rounded or material dependent	Rounded
Orientation	Unoriented	Unoriented
Composition	Charcoal, rocks, mineral grains, eggshell, bone	Clay, carbonate, silt, ash (5% or less)

Voids: complex packing voids in fine fraction (5%). Channel voids, 0.8mm, 2%, poorly developed and contain loose fine material.

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	0.3 to 0.09mm	5 – 10%	Random	
Trachyte	3mm	5%	Random	Clay coatings
tuff	3mm	5%	Random	Fe staining

Calcite	3mm	rare		

Organic:

	Size	Density	Distribution	Weathering
Charcoal	0.5 to 1mm	5 to 10%	random	
Ash	In fine fraction			
Plant Remains	0.8mm	2 to 5%	Random	Burned
Insect Excrement	none			
Large Charcoal	10mm +	5%	random	

Other:

	Size	Density	Distribution	Weathering
Bone	1mm	5%	Random, denser near boundary	
Eggshell	1.5mm	5%	Random	
Metal	1 to 5mm	<5%	Random	
Ceramic				
Glass	10mm	1 large fragment	Right side, I7	
Plaster	600um width	1 fragment	Near glass	

Other Secondary Features:

Coatings:

Clay/Carbonate type	**Thickness**	**Location/size**	**B Fabric**
carboante	170.96um	On underside of eggshell fragment	speckled

Hypocoatings:

Clay/Carbonate type	**Thickness**	**Location (+void type)**	**B Fabric**
none			

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**
none			

Carbonate Nodules:

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
Microsparites	686.4602	11	Micritic calcite with some brownish clay inclusions/streaks	Rounded, subrounded, in voids. Smaller ones in

				matrix
Sparites	2721.53	2	Pure calcite, one stained from fe leaching	Voids, subrounded
Compound Nodules	3306.07um	1	Rounded MS calcite nodules bounded by brown clay and micrtici calcite	In void space – crescent shaped filling void.
Mixed Crystallization	none			
Diffuse Carbonate Patches	none			
Fragmented nodules	none			

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
Fe staining (probably from metal leaching) on sparry carbonate nodule near boundary with bed 2.

Interpretation: Accumulation of midden debris, probably wash as Francell A unit 2 is located on the slope away from the central midden. High degree of burning, but no evidence for in situ burning. High density of artifactual remains (eggshell, metal, plaster) as well as possible anthropogenic inclusions (charcoal, plant remains, bone). Channel voids and overall compaction may indicate water drainage down slope from main midden. More microsparite carbonate nodules than in primary midden, but some appear to be mixed with the fabric rather than precipitated in voids and thereby may be translocated.

1020152 MICROMORPH BED 2:
Thickness: 30mm

Fabric:
Color: light brown/tan
Sorting: unsorted
C/F ratio: 20:80 (not including 20% large – 5mm+ nodules)
Related Distribution: close porphyric

Matrix (Fabric Microstructure, carbonate/clay type, Color, BFabric)
Loose, poorly aggregated silt sized particles with zones of higher clay development, packing, and blocky structure. Poorly developed crumbly microstructure

	Coarse	**Fine**
Grain Size	0.1mm and larger	Fine silt/clay
Shape	Rounded	Rounded
Orientation	Unoriented	Unoriented
Composition	Mineral grains, rocks, charcoal, plant	Carbonate clay

Voids: Packing voids in fine fraction (5%)
Channel voids (10-20%), 0.8mm

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	0.3 to 0.09mm	5 – 10%	Random	
Trachyte	2mm to 5mm	5 to 10% of C fraction	Random	Clay carbonate coatings and Fe staining on quartz inclusions
tuff	1mm	2%	Random	Carbonate hypocoatings, fe staining
Basalt	1mm	rare		

Organic:

	Size	Density	Distribution	Weathering
Charcoal	0.2mm	5%	Random. Some large 10mm frags	
Ash	None/very little			
Plant Remains	0.5mm	5%	Random	Burned
Insect	0.1mm	2%	Throughout	

Excrement				

Other:

	Size	Density	Distribution	Weathering
Bone	0.5mm	Rare	Random	
Eggshell	1.5mm	Rare	Near bed 1 boundary	
Metal	1.5mm	Rare	Near bed 1 boundary	
Ceramic				
Glass	Large 6mm and smaller fragments	<2%	Near bed 1 boundary	Large fragment is strained and orange stained

Other Secondary Features:

Coatings:

Clay/Carbonate type	Thickness	Location/size	B Fabric
Carbonate coating	127.54um	Underside of large trachyte nodule	speckled
Brown clay	584.55um	Around large compound carbonate nodule	Speckled, includes carbonate in clay matrix

Hypocoatings:

Clay/Carbonate type	Thickness	Location (+void type)	B Fabric
none			

InFillings/Void coatings:

Clay/Carbonate	Thickness	Location (void type)	B Fabric
none			

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type). Locations: voids, fabric, part of bed

Type	Avg. Diameter	Density	*Fabric	Location and Shape
Microsparites	511.5363	13	Micritic calcite.	Rounded, voids (filling voids. Some may be in matrix)
Sparites	805.6967 (bimodal)	2	Pure calcite – larger one may be recrystallized	Small is subrounded. Larger is rectangular

			biogenic carbonate	
Compound Nodules	3740.236	3	Mixed micritic calcite and brown clay	subangular
Mixed Crystallization	None – one of sparites has mixed size sparry crystals (larger)			
Diffuse Carbonate Patches	none			
Fragmented nodules	none			

Other carbonate features: (roots, etc. – location, size, type, density)
See note on larger sparry nodule

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation: Interface between Bed 1 (context 5) and sterile sediment (context 6). Artifactual material is clustered near boundary with bed 2. Darker color of the bed compared to sterile STP1) is likely due to organic staining from the midden deposits. Channel voids and carbonate development are more similar to sterile soil structure than the central midden deposits. Insect action indicated by excrement. Higher rate of carbonate and clay development compared to central midden.

SLIDE INTERPRETATION (1020152):
Interface of wash from midden down slope and sterile sediment underlying midden. No evidence for preparation of midden surface. The debris from the midden is generally unoriented with a

high artifact density and presence of channel voids which may indicate drainage on the slope. Bed 2 (the sterile) has larger carbonate nodules, carbonate clay coatings, and soil structure similar to sterile but with organic staining and some artifact content from the overlying midden. While there is a higher number of microsparite carbonate nodules and clay development in bed 2 than in beds from Unit 1, some of the nodules appear to be translocated. Due to the position of the unit on a slope it is possible that some of the secondary features may be translocated rather than precipitated in situ.

Comparable Beds:

1020025 bed 1 (Francell A unit 2 context 5)
1020025 bed 2 (Francell A unit 2 context 6)

FRANCELL A UNIT 2, SLIDE: 1020025 SOUTH WALL

Contexts: Context 5: light gray silt, artifact rich (Bed 1).
Overlies context 6 – interface with sterile sediment. Lower artifact content, compact (Bed 2).

Boundaries:
1/2 : gradual to diffuse (5mm and more). Boundary is more clear in some areas (particularly near rock fragments) and very diffuse in others.

MICROMORPH UNIT 1:
Thickness: 30 to 40mm

Fabric: Fabric is highly variable across bed.
Color: dark brown
Sorting: unsorted
C/F ratio: 20 to 30: 70 to 80
Related Distribution: close porphyric

Matrix (Fabric Microstructure, carbonate/clay type, Color, BFabric)
Loose, silt sized matrix with areas of high ash content or denser packing with minimal clay development. No obvious internal structure. Concentrically oriented soil ped near boundary with bed 2.

	Coarse	**Fine**
Grain Size	0.2mm and larger	0.03mm
Shape	Dependent on material	Rounded
Orientation	Unoriented	Unoriented
Composition	Mineral grains, rock, metal, charcoal, etc.	Silt, fine grained charcoal, ash

Voids: Complex packing voids (fine fraction), 5 to 10% - very variable throughout bed.
Small (0.2mm) channel voids (2%), especially near large particles and large vughy voids. Mostly horizontal or unoriented.
Large vugh, 5 to 10mm, 10%

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	0.3 to 0.09mm	5 – 10%	Random	
Trachyte	5mm	<2%	Random	No prominent coatings
tuff	3mm	<5%	Random	No prominent Fe staining

Organic:

	Size	Density	Distribution	Weathering
Charcoal	0.4mm, 5mm rare	5 to 10% (less than metal)	random	
Ash	Variable in fine fraction,	concentration near soil ped		
Plant Remains	2mm and smaller	2%	Random	Burned
Insect Excrement	0.04mm pellets	Concentrated in plant matter	Near boundary with bed 2	
Sediment aggregate	20mm	1 defined pellet near bed 2	Eggshell, organic staining, no spherulites	

Other:

	Size	Density	Distribution	Weathering
Bone	0.5mm to 1mm	5%	Random	burnt
Eggshell	2mm and smaller	5%	Random	burnt
Metal	5mm	10%	Random	Some leaching
Ceramic	15mm	1 large piece		Porcelain with lead glaze
Glass	2mm, large fragment in upper right	<2%	Small fragments throughout	
Large brown glass	15mm	1 fragment	Near ceramic	
Plaster	600um	1 fragment		

Other Secondary Features:

Coatings:

Clay/Carbonate type	**Thickness**	**Location/size**	**B Fabric**
Thin brown clay	44.32um	Trachyte nodule, underside	Too small

Hypocoatings:

Clay/Carbonate type	**Thickness**	**Location (+void type)**	**B Fabric**
none			

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**
none			

Carbonate Nodules:

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
Microsparites	910.5509	11	Micritic calcite, some with brown clay inclusions. Some with internal dark rims.	Rounded, subrounded, voids and matrix
Sparites	1382.552	11	Pure calcite	Mostly subangular. One rectangular with banding of varying sized sparry crystals. Mostly in matrix (may have filled void spaces?)
Compound Nodules	none			
Mixed Crystallization	none			
Diffuse Carbonate Patches	none			
Fragmented nodules	none			

Other carbonate features: (roots, etc. – location, size, type, density)
See note in sparry nodules – banded rectangular nodule is at interface with bed 2

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)

none

Iron Nodules (location, size, type, density)
none

Interpretation: Wash of material from central midden. No orientation, no insitu burning. Large vugh voids and channels indicate lack of compaction and possible water drainage. High density of artifactual and potential anthropogenic materials compared to central midden. Insect action indicated by excrement. Increased carbonate content near boundary with bed two but few coatings or Fe staining on rock fragments. Some carbonate nodules may be translocate rather than precipitated in voids. Fabric is highly variable with patches of higher ash content, variable density and void structure, and artifact clusters.

1020025 MICROMORPH BED 2:
Thickness: 15 to 20mm

Fabric:
- Color: dark brown
- Sorting: moderately sorted
- C/F ratio: 15:85
- Related Distribution: porphyric

Matrix (Fabric Microstructure, carbonate/clay type, Color, BFabric)
Mostly unoriented silt sized packing matrix with some areas with non-discrete soil peds with concentric organization.

	Coarse	**Fine**
Grain Size	0.1mm and smaller	0.04mm
Shape	Rounded or material dependent	Rounded
Orientation	Unoriented	Unoriented
Composition	Rock, mineral grains, charcoal, other	Clay/silt. Little to no ash.

Voids: complex packing voids in fine fraction (10%)
Channel voids (0.2mm width), 5%. Vertical and horiztonal. Some with relict plant matter and insect excrement.
Larger vughs and channels (1mm and larger), 2%

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	0.3 to 0.09mm	5 – 10%	Random	

Trachyte	3mm	5%	Random	Small clay coatings
tuff				

Organic:

	Size	Density	Distribution	Weathering
Charcoal	2mm	<2%	Random	
Ash	None			
Plant Remains	0.5mm		In channel voids	
Insect Excrement	0.04mm		In channel voids	

Other:

	Size	Density	Distribution	Weathering
Bone	None			
Eggshell	1 to 2mm	<2%		
Metal	2mm and smaller	2%	random	
Ceramic				
Glass				

Other Secondary Features:

Coatings:

Clay/Carbonate type	**Thickness**	**Location/size**	**B Fabric**
Brown clay	78.74um	On several trachyte nodules – top and undersides	Undifferentiated
Mixed carbonate and brown clay	339um and smaller	On several MS carbonate nodules	speckled

Hypocoatings:

Clay/Carbonate type	**Thickness**	**Location (+void type)**	**B Fabric**
none			

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**
none			

Carbonate Nodules:

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**

Microsparites	716.4329	14	Micritic calcite, some with brown clay inclusiohns/ coatings	Rounded, subrounded, voids
Sparites	none			
Compound Nodules				
Mixed Crystallization	1777.94um	5	Calcite – most have concentric ringed or unoriented recrystallization. One has bands	Subrounded, voids
Diffuse Carbonate Patches	none			
Fragmented nodules	none			

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
Mystery at P5 might be phosphate development

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation: Interface between sterile and midden beds. Dark brown color (in contrast to lighter color of sterile beds in STP1) likely due to organic staining from the midden contexts. Channel voids indicate water drainage as well as plant growth (relict plant remains and insect excrement). Carbonate development is generally higher than in midden, and packing is overall less dense than in bed 1.

SLIDE INTERPRETATION (1020025):
The diffuse boundary between beds 1 and 2 indicates a lack of prepared surface for the midden. Bed 1 is likely midden wash from the central midden (Francell A unit 1). Artifact and potential anthropogenic materials are generally larger and denser than in the central midden. However, bed 1 is highly variable and so probably represents a mixture of wash from several dumping episodes rather than single context disposal. Bed 2 is the “sterile” interface between the underlying sediment and the midden jumble. The dark color is due to organic staining from the midden units and channel voids with plant matter and insect excrement indicate plant growth. Channel voids in both bed 1 and 2 probably relate to drainage from the slope.

Comparable Beds:

1020152 Bed 1 (Francell A Unit 2 context 5)
1020152 Bed 2 (Francell A Unit 2 context 6).

UNIT, SLIDE: FRANCELL C UNIT 1 1020292

Contexts: Bed 1/1a: Context 1
Bed 2: Context 2

Boundaries: Beds 1/2: Unit 2 is diverse and the boundary is inconsistent. Mostly sharp – unit 1 is less compacted and boundary is marked by larger stones, voids, phytoliths, and organic material.

MICROMORPH 1020292 BED 1:
Thickness: 10 to 15mm x 40mm = 400mm^2

Fabric:
Color: light brown
Sorting: well sorted fine fraction (sand)
C/F ratio: 20:80; 30:70 in 1A
Related Distribution: monic

Matrix (Fabric Microstructure, carbonate/clay type, BFabric)
Microstructure: massive, monic microstructure of sand sized grains and organic material. spongy microstructure in 1A.

	Coarse	**Fine**
Grain Size	0.5mm	0.05mm
Shape	Subrounded	Subrounded
Orientation	Some horizontal	Some horizontal banding
Composition	Rocks, plant material	Quartz, silt, aggregates

Voids: Complex packing: fine fraction 30%
Vughs (1A): 0.3 to 1mm, 15%

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	0.2mm	10 to 15%	Random	
Trachyte		1		
Tuff	1mm	2 to 5%		
Basalt	1mm	1 fragment		

Organic:

	Size	Density	Distribution	Weathering
Charcoal	Fine fraction	5%		
Plant Remains	1mm+	10%	Horizontally oriented	Some burnt
Plant Remains	0.5mm	2 to 5%		

1A				
Organo-Mineral pellets (rodent dung?)	2mm+	Clustered in uppermost part	Uppermost part of bed	

Secondary Features:

Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
Clay carbonate coating	70.12um	On tuff nodule	speckled

Hypocoatings:

Clay/Carbonate	**Thickness**	**Location (+void type)**	**B Fabric**
none			

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**
none			

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type).
Locations: voids, fabric, part of bed

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
Microsparites	442.90	7	Microsparry calcite	Subangular, in fabric
Sparites	445.54	3	Pure calcite	In fabric
Compound Nodules	none			
Mixed Crystallization	none			
Diffuse Carbonate Patches	none			

Fragmented nodules	none			

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation: Aeolian deposit with high amount of burnt and unburnt organic material and some potential rodent dung. Probably a wind-blown topsoil deposit over structure collapse. Carbonate nodules are small, sand sized and mixed in with sand sized fabric (likely additions not in-situ development). Some moderate horizontal orientation of particles indicating Aeolian origin.

MICROMORPH 1020292 BED 2:
Thickness: 50mm x40mm = 2000mm^2

Fabric:

Color: medium brown
Sorting: poorly sorted
C/F ratio: 30:70
Related Distribution: porphyric
Microstructure: massive? Large disaggregation pockets make structure difficult to discern. Larger carbonate nodules are also present, possibly disrupting structure of the fabric. Carbonate does not appear to impregnate the groundmass.

	Coarse	**Fine**
Grain Size	0.1mm+	Silt
Shape	Angular/mineral	Rounded

Orientation	None	None
Composition	Rocks, quartz, plant	Low carbonate content

Voids: Several large (20 to 30mm) voids filled with loose sand probably from dissagregation/disturbance of large stones.

Complex packing voids: 0.1mm, 20%

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	0.2mm	5 to 10%		
Trachyte	1mm	2%	Also one large stone	
Tuff	1 to 2mm	2 to 5%	Random	Fe/Mn staining
Conglomerate	7mm+	2 fragments		
Calcite	1 large 20mm 2mm	1 fragment Rare	random	
Limestone	1mm	1 fragment		Fe stained

Organic:

	Size	Density	Distribution	Weathering
Charcoal	0.5 to 1mm	2%	random	
Plant Remains	0.5 to 1mm	5%	Through fabric with larger pieces in voids	Burned and unburnt
Insect Excrement	0.02mm	Rare	In plant matter	

Other:

	Size	Density	Distribution	Weathering
Plaster	2mm	1 fragment	Near boundary, H4	
Metal	1mm to 3mm	2 instances	1 at 1/2 boundary G9	

Secondary Features:

Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
none			

Hypocoatings:

Clay/Carbonate	Thickness	Location (+void type)	B Fabric
none			

InFillings/Void coatings:

Clay/Carbonate	Thickness	Location (void type)	B Fabric
none			

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type). Locations: voids, fabric, part of bed

Type	Avg. Diameter	Density	*Fabric	Location and Shape
Microsparites	219.65um	4	Microsparry calcite	Rounded, in matrix and voids
Sparites	1235.472um	13	Sparry calcite, some have fabric inclusions	In voids
Compound Nodules	4050.05, 5000um	2	One is pure calcite but appears to be fractured or the result of several nodules connecting. Other is microsparry and mixed crystallization nodules cemented by brown clay.	
Mixed Crystallization	2874.054	7	Mixed micro and sparry, some banded, most concentric. Some include fabric.	In voids, concentrated near top of bed
Diffuse Carbonate Patches	none			
Fragmented nodules	One of compound nodules may be better described as fragmented			

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation: Bed is partially disturbed probably due to large stones that disaggregated during sample collection or transportation. Low carbonate content in groundmass (large carbonate nodules may be inherited or have precipitated in voids). Plaster and metal material is probably from house collapse. Carbonate is primarily composed of large sparry and mixed crystallization nodules in void spaces. There is no apparent bedding or anthropogenic organization of materials. Plant material and charcoal is more present in upper part of bed with less anthropogenic material in lower portion.

Slide Interpretation: Aeolioan deposits and topsoil development over house collapse. Plaster and metal may be inherited from structure while organic content and rodent/insect dung are from subsequent processes after collapse. No remains indicating wooden flooring/roofing was left (it may have been scavenged) and no indication of intensive burning of the structure. Burning remains (charcoal and burnt plant material) appear to be windowblown and may be from more recent burning (possibly 2011 wild fire) rather than burning of the structure. Carbonate development appears to be in early stages.

UNIT, SLIDE: FRANCELL C UNIT 1 1020289

Contexts: Both beds are from context 2/3.
Bed 1: East of plaster, disaggregated
Bed 2: West of plaster, contains possible subfloor facies attached to plaster

Boundaries: Beds 1/2: Sharp boundary define by void lined with plaster on west side (and attached in places to bed 2.

MICROMORPH 1020289 BED 1:
Thickness: 20 mm x 60mm = 1200mm^2

Fabric:
Color: medium brown
Sorting: poorly sorted
C/F ratio: 50:50 in aggregates. Disturbed portions are entirely C fraction
Related Distribution: Monic
Microstructure: vughy microstructure in aggregates

	Coarse	**Fine**
Grain Size	0.2 to 1mm	Silt
Shape	Rounded	NA
Orientation	Unoriented	Speckled
Composition	Mineral, rocky	Calcitic clay. No void linings

Voids: Packing voids: 10 to 20%. Highly variable, mostly C fraction. Indicating disturbance. Large channgel void defined boundary with Bed 2.

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	0.1mm	10 to 20%	Random	
Tuff	1mm	15%		
Carbonate	1mm	2 to 5%		
Basalt	1mm	<2%		

Organic:

	Size	Density	Distribution	Weathering
Plant Remains	1mm	2%	Voids near top of slide	

Other:

	Size	Density	Distribution	Weathering
Bone	1mm	1 fragment		

Mystery Red	7mm	Near unreacted plaster, C8		Possible Fe accumulation?
Plaster	1mm	Along void boundary with bed 2	Denser in lower part of slide	
Glass	1mm	1 fragment		
Shell	0.5mm	rare		

Secondary Features:

Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
none			

Hypocoatings:

Clay/Carbonate	**Thickness**	**Location (+void type)**	**B Fabric**
none			

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**
none			

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type).
Locations: voids, fabric, part of bed

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
Microsparites	287.5052	4	Microsparry calcite	Voids (fabric is loose and probably disturbed so difficult to say)
Sparites	2105.93, 532.80	2		
Compound Nodules	2577.19um	1	Calcite nodules with mineral inclusions cemented by brownish clay	void
Mixed Crystallization	1692.062	5	Mostly pure calcite, some have very small amount of fabric inclusions	voids
Diffuse	none			

Carbonate Patches				
Fragmented nodules	none			

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
Possible – mystery red thing may be melted/heated iron or glass?

Plaster: thin fragments of micritic reacted lime plaster with variable inclusions. Some are almost entirely reacted lime, some have rocky temper. Clear boundaries on the Bed 1 side of fragments in the boundary void, some fragments articulate with Bed 2 directly. Other fragments are entirely disturbed with no orientation. One patch of unreacted plaster near mystery red (FE?) nodule.

Interpretation: Disturbed sediment and plaster from house collapse and sample collection. Plaster context likely originally disturbed by house collapse (or other event prior to collection), dissagregation of Bed 1 likely due to disturbance during sample collection. Minimal carbonate development. No clay development.

MICROMORPH 1020289 BED 2:
Thickness: 20 x 60mm =1200mm^2

Fabric:

Color: FA: medium to dark brown; FB: light brown
Sorting: FA: poorly sorted ; FB: well sorted
C/F ratio: FA: 20:80 ; FB: 10:90.

Related Distribution: FA: open porphyric ; FB: Monic
Microstructure: FA: weak blocky ; FB: Massive

Fabric A	**Coarse**	**Fine**
Grain Size	0.3 to 1mm	Silt/clay
Shape	Subrounded	NA
Orientation	None	Rare banding
Composition	Mineral	Calcitic clay

Fabric B	**Coarse**	**Fine**
Grain Size	0.06 to 0.3mm	Silt/clay
Shape	Subrounded	NA
Orientation	None	Speckled
Composition	Mineral	Calcitic clay

Voids: Fabric A: vertical/horizontal planar voids, 2 to 5%, 0.1mm
Vughy voids: 2 to 5%, 0.5mm+

Fabric B: Packing voids, 20%. Channel voids, <2%, 0.2mm, no orientation. probably from plant or water action.

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	0.1mm+	5 to 10%	random	
Basalt	1mm	<2%	Random	
Tuff	1mm	2%	random	
Carbonate	0.5mm, 2 to 3mm in lower	2 to 5%	Dense in lower part of bed	Some sparry recrystalizations

Organic:

	Size	Density	Distribution	Weathering
Plant Remains	1mm	<2%	Amorphous near top. Two intact cross sections near base	

Other:

	Size	Density	Distribution	Weathering
Phytoliths	05mm	Rare	In voids	

Secondary Features:

Coatings:

Clay/Carbonate	Thickness	Location/size	B Fabric
Clay coatings on carbonate nodules	300um	2	
Carbonate coating attached to trachyte	950um	1 instance – small trachyte nodule (750um)	

Hypocoatings:

Clay/Carbonate	Thickness	Location (+void type)	B Fabric
none			

InFillings/Void coatings:

Clay/Carbonate	Thickness	Location (void type)	B Fabric
none			

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type). Locations: voids, fabric, part of bed

Type	Avg. Diameter	Density	*Fabric	Location and Shape
Microsparites	366.9022	8	Microsparry calcite, some with clay coatings	Rounded, voids
Sparites	1402.122um	17	Pure calcite	voids
Compound Nodules	none			
Mixed Crystallization	1442.54um	6	Pure calcite	voids
Diffuse Carbonate Patches	none			
Fragmented nodules	none			

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation: mixed fabrics are likely disturbed subfloor compacted associated with plaster in bed 1. Compacted and weakly banded fabric (FA) with darker color is probably remains of a highly disturbed subfloor while FB (light colored, loose, with no orientation) is sediment either below compaction layers or post depositional Aeolian deposit introduced after collapse. Early stage carbonate development with minimal clay development. Thin lime plaster may have been used on top of subfloor to seal. The connection of plaster to subfloor material suggests that is was originally a coating.

Slide Interpretation: Highly disturbed plastered subfloor facies with Aeolian post-collapse sediment. Sediment is likely not an active floor due to limited compaction and orientation of particles at floor boundary. Also, given that this structure is likely 1900s+, it most likely had a wooden floor and the adobe/plaster was a subfloor for drainage.

FRANCELL C UNIT 3, SLIDE 1020304:

Contexts: 4 and 5, but only one context is visible and is likely disturbed

Boundaries: none

MICROMORPH BED #:
Estimated Area: entire slide: 40 x 60 = 2400mm^2

Fabric:
Color: light brown/tan
Sorting: poorly sorted
C/F ratio: 30:70
Related Distribution: chitonic

Matrix (Fabric Microstructure, carbonate/clay type, BFabric)
Loose blocky microstructure in areas where fabric is most consolidated. Other areas are massive or vughy depending on amount of pore space. Undifferentiated bfabric. Concentric clay nodules throughout fabric.

	Coarse	**Fine**
Grain Size	50um and larger	Fine silt/clay
Shape	Rounded to subangular	NA
Orientation	None	None
Composition	Mineral grains, rocks, some charcoal and plant matter	Light brown silt/clay with patches of carbonate

Voids: Large vertical channel voids run the length of the slide (430um in width). Smaller planar and vughy voids are present throughout the fabric (50 to 100um, 10% void space in consolidated areas).

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	200 to 300um	5 to 10%	Random	Some highly weathered, some not
Trachyte	500 to 2000um	<5%	Random	
Tuff	500 to 4000um	5%	Random	Fe staining
Basalt	2052.40um	rare	Lower part of slide	

Larger rock and mineral fragments in lower part of slide

Organic:

	Size	Density	Distribution	Weathering
Charcoal	None			
Ash	None			
Plant Remains	220um	Rare (2 instances)	random	
Insect Excrement	1 instance	20um pellents in void	Near top of slide	

Other:

	Size	Density	Distribution	Weathering
Bone	None			
Eggshell	none			
Metal	none			
Ceramic	None			
Glass	3606.04um	1 fragment	Lowest right hand corner of slide	fractured

Secondary Features:

Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
Clay coating on trachyte	138um	Side of trachyte nodule	undifferentiated

Hypocoatings:

Clay/Carbonate	**Thickness**	**Location (+void type)**	**B Fabric**
On large sparry carbonate	258um	Underside of carbonate nodule	Carbonate rich clay

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**
none			

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type).
Locations: voids, fabric, part of bed

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
Microsparites	432.4961	6	Micritic carbonate, sometimes with clay coating	Rounded, voids

Sparites* (measured in MS method)	733.4695	9	Pure calcite	Rounded, subrounded
Compound Nodules	2393.278um	7	Some pure calcite with separate nodules within, most are combination of calcite nodules and clay cement	subrounded
Mixed Crystallization	1221.362	15	Mixed calcite and fabric	Subrounded/subangular
Diffuse Carbonate Patches	none			
Fragmented nodules	None – 1 of the large compound nodules might also be described as fragmented			

*Microsparites (small crystals btn 8 to 20um) – recrystallization – measure all from 2x mag in top, center, and base of bed along central line. Marked as MSbed# on photo.
Sparites (pure crystals (larger than 20um) – precipitation - count and measure all
Compound – count and measure all

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
Possible phosphatic crystallization in lower part of slide (p3)

Manganese (location, size, type, density)
Possible manganese in top right corner

Iron Nodules (location, size, type, density)

Possible iron nodule in lower part of slide (491

Slide Interpretation:
Slightly disaggregated fill from near post hole with very little anthropogenic material. Fabric has little to no organic material although channel may indicate some water action. High level of carbonate development throughout but appears to be primarily in early stages. No clear distinction between post hole and surrounding matrix (it is possible that the slide does not include that interface). Clay development throughout the matrix as well as in rare clay coatings and incorporated into recrystallizing carbonate nodules.

UNIT FRANCELL C UNIT 3, SLIDE 1020305:

Contexts: Context 5: post hole fill. Sample was intended to catch posthole interface but it does not appear to be in the slide.

Boundaries: none visible.

MICROMORPH BED 1:
Estimated Area: entire slide: 2400mm^2

Fabric:

Color: dark brown
Sorting: poorly sorted
C/F ratio: 30:70
Related Distribution: porphyric

Matrix (Fabric Microstructure, carbonate/clay type, BFabric)
Massive to crumbly microstructure. Sand sized minerals and larger rock fragments in matrix of dark brown silt/clay. Undifferentiated b fabric. Clay nodules throughout. Fabric has variable degrees of compaction from areas with well developed crumbly microstructure and 2 to 5% void space to open, unconsolidated patches with up to 20% void space.

	Coarse	**Fine**
Grain Size	50um and larger	Too small
Shape	Angular to subangular	NA
Orientation	none	none
Composition	Mineral grains, rock frags	Dark brown silt/clay

Voids: Channel voids throughout: 5% to 10% depending on location, 500um
Vughy voids: 5% in medium compacted areas. 130um. Large vughs (200um) 2%
Small planar voids (100um), 5% in compacted areas.
Packing voids: 2 to 10% depending on compaction.

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	50um and larger	5 to 10%	Random	minimal
Trachyte	500um to 10mm	5%	Random	Some with clay coatings
Tuff	500um to 5mm	5%	Random	Some with Fe staining

Organic:

	Size	Density	Distribution	Weathering
Charcoal	1200um	Rare	Near base of slide	Minimal
Ash	None			
Plant Remains	500um	2%	In void spaces	Possibly burnt
Insect Excrement	46um	1 instance	In void with plant matter	
Dung	2500um	2 instances (one w/ spherulites)		

Other:

	Size	Density	Distribution	Weathering
Bone	None			
Eggshell	None			
Metal	None			
Ceramic	None			
Glass	1000um possible fragments	Rare	Random	Might also be weathered fractured quartz
Plaster	600um	1 instance	In loose fabric	

Secondary Features:

Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
Clay coatings on rock fragments	60um	Various rock fragments in less consolidated loci	Undifferentiated.
Pendants on carbonate nodules	300um	Clay carbonate	

Hypocoatings:

Clay/Carbonate	**Thickness**	**Location (+void type)**	**B Fabric**
none			

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**
Carbonate void linings	137um	1 instance, vughy void	calcite

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type). Locations: voids, fabric, part of bed

Type	Avg. Diameter	Density	*Fabric	Location and Shape
Microsparites	356.2424, also several 2500um+ nodules	29	Pure calcite, sometimes with clay pendants or coatings	Rounded, voids
Sparites	1413.951	32	Pure calcite	Subrounded, voids, sometimes with clay coatings
Compound Nodules	1076.07, 3617.95, 3747.91		Micritic and sparry calcite cemented by carbonate-clay	voids
Mixed Crystallization	1750.818	10	Pure calcite	voids
Diffuse Carbonate Patches	none			
Fragmented nodules	none			

*Microsparites (small crystals btn 8 to 20um) – recrystallization – measure all from 2x mag in top, center, and base of bed along central line. Marked as MSbed# on photo.
Sparites (pure crystals (larger than 20um) – precipitation - count and measure all
Compound – count and measure all

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Slide Interpretation: Densely compacted dark fabric suggests higher presence of organic matter than lower layers represented in 1020304 or in comparable 1020306. Plant tissue is present in voids and sometimes in fabric along with insect excrement and possible dung. The presence of the post likely increased humic staining of these layers as well as attrachet insect and other soil fauna. It is unclear if the possible dung is part of the fill or post-depositional. Possible plaster and glass maybe from house debris before or after collapse. High degree of carbonate and clay development present in large crystals, clay coatings, and clay pendants. Large size of crystals may be due to overlying porch preventing quick dryout of sediment after rain fall allowing for growth of larger crystals.

UNIT FRANCELL C UNIT 3, SLIDE 1020306:

Contexts: should be contexts 2 and 3 of west profile, but only one context is visible.

Boundaries: none visible

MICROMORPH BED 1:
Estimated Area: entire slide: 2400mm^2

Fabric:
- Color: medium brown
- Sorting: moderately sorted
- C/F ratio: 20:80
- Related Distribution: porphryci

Matrix (Fabric Microstructure, carbonate/clay type, BFabric)
Crumbly/vughy microstructure with clay nodules and infillings connecting sand sized grains and larger rock fragments. Organic matter throughout voids and insect excrement throughout.

	Coarse	**Fine**
Grain Size	30um and large	Clay
Shape	Subangular	NA
Orientation	Some horizontal orientation near top of slide	NA
Composition	Mineral grains, rocks, plant material	Clay, carbonate

Voids: vughs: (500um) 5%
Small channels: (100um) 2%

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	30um	5%	Random	Minimal
Trachyte	400 to 4000um	2%	Random	Clay coatings
Tuff	500 to 2000um	5%	Random	
Basalt	5000um	<2%	random	

Organic:

	Size	Density	Distribution	Weathering
Charcoal	None			

Ash	None			
Plant Remains	200um	5%	In void spaces, concentrated in top of slide	
Insect Excrement	50um pellents	2%	In void spaces, near plant matter	

Other:

	Size	Density	Distribution	Weathering
Bone	None			
Eggshell	1000um	1 instance		
Metal	None			
Ceramic	None			
Glass	400um	rare	Near top of slide	fractured
Red mystery (possible organic matter? Or weathered iron?)	4000um	1 instance	Near base of slide	

Secondary Features:

Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
Clay coatings	300um	On trachyte and basalt nodules -common	speckled
Clay coatings and pendants on carbonate	300um	Common on sparry and micritic carbonate	speckled

Hypocoatings:

Clay/Carbonate	**Thickness**	**Location (+void type)**	**B Fabric**
none			

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**
Clay infillings	Common in large voids	Large vughs (4000um)	Speckled or undifferentiated, incorporates soil fabric
Sparry Carbonate growths	117um	Lining vughy voids (rare)	calcite

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type).
Locations: voids, fabric, part of bed

Type	Avg. Diameter	Density	*Fabric	Location and Shape
Microsparites	218.1706	20	Micritic calcite, some with clay coatings, some incorporate soil fabric	Voids, more concentrated in lower part of slide
Sparites	1076.157	41	Pure calcite	Voids, more prevalent in lower part of slide
Compound Nodules	4451.80	1	Micritic and sparry calcite cemented by carbonate rich clay	
Mixed Crystallization	1023.11	12		
Diffuse Carbonate Patches	none			
Fragmented nodules	none			

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
Gypsum growths in voids spaces at very top of slide

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Slide Interpretation:

1020306 likely represents a slightly higher stratigraphic position than 1020305 (which contains comparable contexts from the posthole. The presence of gypsum growth (only seen in uppermost part of sterile STP contexts) and the high degree of organic matter both support a near-surface context. The gypsum growths in particularly are likely post-collapse as they would not persist in the soil for substantial time. The slide shows a high degree of carbonate and clay development – the clay in particular appears to be more pronounced than in other context including not only coating and pendants but also infillings. Several carbonate nodules also incorporate clay and soil fabric. Anthropogenic remains (glass, eggshell) are present in the highest part of the slide and likely relate to use/collapse of the house. It is unclear if this loci is in open air or underneath the porch that is hypothetized from the post hole in the east wall of unit 3. An under-porch location may explain the higher degree of clay development seen in this slide in comparison to sterile units as well as 1020305.

FRANCELL C UNIT 2 SLIDE: 1020241

Contexts: 2 and 3, only one bed visible in slide

Boundaries: none

MICROMORPH BED 1:
Estimated Area: 40mm x 70mm = $2800mm^2$

Fabric:
Color: Medium to light brown
Sorting: moderately well sorted
C/F ratio: 10:90
Related Distribution: monic

Matrix (Fabric Microstructure, carbonate/clay type, BFabric: Alternating crumbly mictostructure in peds in upper portion of slide with massive, well sorted fine grained sand (throughout, but dominating lower part of slide). No boundary between fabric types, the crumbly peds are more common in the upper portion

	Coarse	**Fine**
Grain Size	180um	50um
Shape	Subangular, subrounded	Rounded
Orientation	None	Some concentric orientation in peds
Composition	Rock fragments, quartz	silt

Voids: planar voids within crumbly peds (5% of peds), packing voids throughout massive fabric (5%) with vertical channel voids (540um, 2%) throughout the entire slide.

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	150um	5%	Random	Strained
Trachyte	4000um and larger	<2%	Random	Some coatings
Tuff	600 to 3000um and larger	<2%	Random	Coatings
Basalt	2000um	rare	Random	none

Organic:

	Size	Density	Distribution	Weathering
Charcoal	None			
Ash	None			

Plant Remains	200um	Rare	Random	Decayed
Insect Excrement	none			

Other:

	Size	Density	Distribution	Weathering
Bone	None			
Eggshell	None			
Metal	None			
Ceramic	None			
Glass	None			
Plaster	none			

Secondary Features:

Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
Clay	200um	On trachyte nodule	speckled

Hypocoatings:

Clay/Carbonate	**Thickness**	**Location (+void type)**	**B Fabric**
none			

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**	
none				

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type). Locations: voids, fabric, part of bed

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
Microsparites	331.93	10 (subsample)	Micrtic calcite, some with clay coating	Rounded, in fabric, more concentrated in upper part of slide
Sparites	739.36 and 473.35	2 (entire slide)	Pure calcite	Rounded, open fabric near middle of slide
Compound Nodules	none			
Mixed Crystallization	2556.25	8 (entire slide)	Mixture of calcite with some clay coatings	Voids, blocky

Diffuse Carbonate Patches	none			
Fragmented nodules	6058.5um	1 instance	Micritic calcite	E13

Other carbonate features: (roots, etc. – location, size, type, density)
None

Depletion features:
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation:
Well sorted, fine grained sediment with incorporated soil peds (darker color, increased clay content and organic matter). Carbonate development is overall less than other known exterior samples. No anthropogenic material recovered.

FRANCELL C UNIT 2 SLIDE: 1020242

Contexts: contexts 3, 4, 5 in south profile of Unit 2. Contexts 4 and 5 described as organic-rich by excavator

Boundaries: none

MICROMORPH BED 1:
Estimated Area: 40mm x 70mm = 2800mm^2

Fabric:
Color: light brown
Sorting: moderately well sorted
C/F ratio: 10:90
Related Distribution: monic

Matrix (Fabric Microstructure, carbonate/clay type, BFabric Massive microstructure with variation between areas of pure fine sand and areas with some silt/clay connecting fine sand particles.

	Coarse	**Fine**
Grain Size	180um	50um
Shape	Subrounded, subangular	Rounded
Orientation	None	None
Composition	Rock fragments, quartz	Silt, fine sand

Voids: packing voids (10%) with some channels (2%) and insect vughs (<2%)

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	150um	5%	Random	minimal
Trachyte	1300um	Rare	random	
Tuff	800um	2%	Random	
Basalt	None			
Limestone	none			

Organic:

	Size	Density	Distribution	Weathering
Charcoal	None			
Ash	None			
Plant Remains	100um	Rare	In voids	decaed
Insect Excrement	none			

Other:

	Size	Density	Distribution	Weathering
Bone	None			
Eggshell	None			
Metal	None			
Ceramic	None			
Glass	None			
Plaster	None			

Secondary Features:

Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
Clay	100um	On carbonate nodules	undifferentiated

Hypocoatings:

Clay/Carbonate	**Thickness**	**Location (+void type)**	**B Fabric**
Clay			

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**	
none	500um	Vughy voids	Undifferentiated	

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type). Locations: voids, fabric, part of bed

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
Microsparites	916.332um	15 (subsampled)	Micritic calcite with some clay coatings, some incorporate mineral grains from fabric	Rounded, voids
Sparites	1996.272um	5 (total slide)	Pure calcite	Subangular, voids
Compound Nodules	2555.72	1 instance	Micritic calcite bound by clay	rounded
Mixed Crystallization	4394.16um, 2035.96um	2 instances	Pure calcite	voids

Diffuse Carbonate Patches	none			
Fragmented nodules	none			

Other carbonate features: (roots, etc. – location, size, type, density)
None

Depletion features:
None

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation:
Well sorted, fine grained sediment with evidence for insect activity (vughy insect voids with hypocoatings). There is a moderate degree of carbonate development, but lower than other exterior space. Very little evidence for organic matter in both inclusions (Very little plant material) and fabric (no evidence of humic material in fabric structure).

UNIT, SLIDE: CV UNIT 1 1020616

Contexts: 7

Boundaries: None

MICROMORPH BED 1:
Estimated Area: 70mm x 40mm = 2800mm^2

Fabric:
Color: Dark/Medium brown
Sorting: moderately sorted
C/F ratio: 20:80
Related Distribution: porphyric

Matrix (Fabric Microstructure, carbonate/clay type, BFabric)
Crumbly textures with channel voids and packing between crumb aggregates.

	Coarse	**Fine**
Grain Size	100um to 600um, rare large nodules	Clay
Shape	Subrounded	NA
Orientation	None	None
Composition	Quartz, rocks, organic	Clay, minimal organic matter

Voids: channel voids: 10%. Large: 0.3mm+, small 0.1mm planar voids. Larger vertical channel voids along with smaller planar voids within and connecting crumbs
Packing: 0.07mm, 2%
Vughs: 0.6mm to 1mm, 5%. One vughy void in lower portion has insect excrement, maybe insect cast.

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	0.2mm+	5%	Random	
Tuff	1mm	5%		Fe/Mn staining
Carbonate	0.5 to 1mm	2%		

Organic:

	Size	Density	Distribution	Weathering
Plant Remains	0.5 to 1mm	5%	Pore spaces, channel voids	Unburned, minimally

				weathered

Other:

	Size	Density	Distribution	Weathering
Shell	0.3 to 1mm	<2%		Unburned
bone	1700um	rare	G1, rare elsewhere	Burnt, possibly phosphatized
Insect excrement	50um	One cluster	C13	minimal

Secondary Features:

Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
none			

Hypocoatings:

Clay/Carbonate	**Thickness**	**Location (+void type)**	**B Fabric**
none			

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**
none			

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type). Locations: voids, fabric, part of bed

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
Microsparites	838.1594	4 (in MS locations at 2X)	Micritic carbonate. Minimal incorporation of groundmass.	
Sparites	None			
Compound Nodules	none			
Mixed Crystallization	3058.60um	1 total	Pure calcite mixed sparry and microspar	Void, subangular, G7
	none			

Diffuse Carbonate Patches				
Fragmented nodules	none			

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Depletion features: none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation: well drained, compact clayey/silty fill with low carbonate development with moderate organic content underlying drain pipe. Fill is likely from renonvations and putting in the pipe uncovered during excavations. Sediment is well drained. Carbonate precipated in void spaces (likely as sparry nodules) and reprecipated to micritici nodules. Most carbonate nodules are in void/channel spaces and there is a high likelihood of translocation downward due to water action.

Casa Vieja Micromorphology

UNIT, SLIDE: CASA VEJIA UNIT 1 1020621

Contexts: 9A/B

Boundaries: none

MICROMORPH BED 1:
Thickness: entire slide

Fabric:

Color: medium brown (80%), light tan (20%)
Sorting: well sorted
C/F ratio: 10:90 or 15:85
Related Distribution: porphyric

Matrix (Fabric Microstructure, carbonate/clay type, BFabric)
Upper portion of slide has well defined crumbly blocky microstructure with light brown groundmass and some carbonate development in fabric. Lower portion of slide has poorly expressed crumb microstructure with smaller voids and less void space overall. Fabric is overall darker in upper portion of the slide.

	Coarse	**Fine**
Grain Size	100um	Clay
Shape	Subrounded	NA
Orientation	Some vertical banding	None
Composition	Quartz, organic, shell	Clay, little carbonate, minimal organic matter

Voids: Channel: 10 to 20%, larger channels mostly vertical (0.5 to 2mm) with smaller connecting horizontal channels (0.3mm, 2 to 5%).

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	0.2mm+	5%	Random	
Tuff	0.8 to 5mm+	Small (2 to 5%) Large (<2%)		Fe/Mn staining
Carbonate	0.5mm	2 to 5%	Concentrated in upper sections	

Organic:

	Size	Density	Distribution	Weathering
Plant Remains	0.5 to 1mm+	2%	voids	

Other:

	Size	Density	Distribution	Weathering
Shell	0.3 to 1mm	2 to 5%	random	

Secondary Features:

Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
Carbonate coating	140.73um	Underside of tuff nodules (3 instances)	undifferentiated

Hypocoatings:

Clay/Carbonate	**Thickness**	**Location (+void type)**	**B Fabric**
none			

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**
Carbonate void lining	79.95um	Channel voids throughout slide	Speckled.
none			

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type).
Locations: voids, fabric, part of bed

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
Microsparites	1157.524	3 (in MS locations)	Micritic calcite with inclusions of groundmass fabric	Rounded, voids
Sparites	none			
Compound Nodules	none			
Mixed Crystallization	none			

Diffuse Carbonate Patches	2561.101	9 total	Carbonate rich groundmass – incorporates fabric	Concentric, fragmented, concentrated in lower portion of slide
Fragmented nodules	none			

*Microsparites (small crystals btn 8 to 20um) – recrystallization – measure all from 2x mag in top, center, and base of bed along central line. Marked as MSbed# on photo.
Sparites (pure crystals (larger than 20um) – precipitation - count and measure all
Compound – count and measure all

*Includes soil fabric? Similar or different than matrix?

Other carbonate features: (roots, etc. – location, size, type, density)
None

Depletion Features: depletion of clay is apparently around vertical channel voids producing the lighter color as well as the lighter color of the matrix in the lower part of the slide.

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
Small manganese (379.42um) in middle of right hand side (confirmed in reflected light). Other small manganese nodules possible

Iron Nodules (location, size, type, density)
Fe/Mn impregnation in tuff on upper left side (871.23um)

Interpretation: Well drained high organic clayey/silt with small inclusions (including shell). Fill under drain pipe. Fabric of the slide is more compacted toward the lower portion of slide, which is also where more diffuse carbonate nodules are present incorporating the sediment fabric. Channel voids predominate and are likely due to water movement through the soil. Channel voids also show depletion of nearby clay, but no depletion features associated with hypocoatings (indicating saturation) are present).

Casa Vieja Micromorphology

UNIT, SLIDE: CV UNIT 1 1020622

Contexts: 9A/9B

Boundaries: None (one bed)

MICROMORPH BED 1:
Estimated Area: 70mm x 40mm = 2800mm^2

Fabric:
Color: Dark/medium brown
Sorting: well sorted
C/F ratio: 10:90
Related Distribution: Gefuric

Matrix (Fabric Microstructure, carbonate/clay type, BFabric)
Vughy microstructure, medium brown with small, loose aggregantes in comparison to crumb texture of overlying beds.

	Coarse	**Fine**
Grain Size	100um	Clay
Shape	Subrounded	NA
Orientation	None	None
Composition	Mineral/quartz	Clay, carbonate

Voids: Channel voids: most vertical, 0.5mm, 2 %.
Vughs: 0.5 to 1mm, 5%
Packing voids: 0.2mm, 5%

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	200um	5%	Random	
Tuff	0.5mm	2 to 5%	random	
Carbonate	1 to 2mm	2%		

Organic:

	Size	Density	Distribution	Weathering
Plant Remains	1mm	2 to 5%	Voids and matrix	
Insect Excrement	0.05mm	rare		

Other:

	Size	Density	Distribution	Weathering
Shell	0.5 to 1mm	2%	random	

Secondary Features:

Coatings:

Clay/Carbonate	Thickness	Location/size	B Fabric
none			

Hypocoatings:

Clay/Carbonate	Thickness	Location (+void type)	B Fabric
none			

InFillings/Void coatings:

Clay/Carbonate	Thickness	Location (void type)	B Fabric
none			

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type).
Locations: voids, fabric, part of bed

Type	Avg. Diameter	Density	*Fabric	Location and Shape
Microsparites	569.724	7 (in MS locations)	Micritic carbonate incorporating soil fabric	Voids, rounded
Sparites	none			
Compound Nodules	none			
Mixed Crystallization	none			
****Diffuse Carbonate Patches**	See note			
Fragmented	See note			

nodules				

*Microsparites (small crystals btn 8 to 20um) – recrystallization – measure all from 2x mag in top, center, and base of bed along central line. Marked as MSbed# on photo.
Sparites (pure crystals (larger than 20um) – precipitation - count and measure all
Compound – count and measure all

*Includes soil fabric? Similar or different than matrix?

**Fabric includes many patches which may have increased carbonate development in the clay matrix, but nodular formations are difficult to define. Some patches have fragmented structure.

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Depletion features: the fabric appears to be more clay depleted than the overlying slides, particularly near void areas. But there are no associated depletion features and hypocoatings to indicate saturation.

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
One possible at base of slide near edge of cover slip

Iron Nodules (location, size, type, density)
none

Interpretation: Lower portion of well drained clayey/silty soil below drain pipe. Less organic matter than above with depletion of clay portion of fabric by water action. Fabric of unit is not reduced and there are no other indicators of water saturation.. Microstructure of slide does not show crumb structure common in overlying layers but reflects vughy void structure with some large channel voids. Carbonate development is present in microspars in voids (possibly translocated) as well as diffuse patches within the groundmass.

Casa Vieja Micromorphology

UNIT, SLIDE: CASA VEJIA UNIT 2 1020612

Contexts: Bed 1 = Context 2
Bed 2 = Context 2 Charcoal Lens
Bed 3 = Context 4
Bed 4 = Context 5

Boundaries:
1/2: Boundary marked by increased charcoal content. No change in groundmass
2/3: Clear, sharp boundary. Small (fine sand) mineral grains loosely settled over sharp compacted surface of 3. Some organic content horizontally oriented in boundary void.
3/4: Clear, sharp boundary. Horizontally oriented loose accumulation of fine sand grains over compacted boundary of bed 4. Plant matter concentrated in boundary (horizontally oriented).

MICROMORPH 1020612 BED 1:
Estimated area: 20mm x 40mm = 800mm^2

Fabric:
Color: orange browny tan
Sorting: moderately sorted
C/F ratio: 20:80
Related Distribution: porphyric

Matrix (Fabric Microstructure, carbonate/clay type, BFabric)
Blocky microstructure with weak horizontal banding in fine fraction. Minimal carbonate in fine fraction. Undifferentiated bfabric.

	Coarse	**Fine**
Grain Size	200um to 1000um	silt
Shape	subrounded	NA
Orientation	None	horizontal banding (more pronounced in upper sections)
Composition	Quartz, rocks, charcoal	silt

Voids: Channels: 0.2mm, 2 – 5%
Planar voids (horizontal) 0.05mm, 2%
Vughs 1.5mm, <2%

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering

Quartz	200um	5 to 10%	Random	
Tuff	500um	2 to 5%	random	
Basalt	None			

Organic:

	Size	Density	Distribution	Weathering
Charcoal	500um	5%	Clustered, more common at base of bed	
Ash	none			
Plant Remains	0.5 to 1mm	Rare/<2%	In voids, concentrated near top of Bed	

Other:

	Size	Density	Distribution	Weathering
Bone	600um	rare		
Shell	700um	rare		
Metal	None			
Plaster	none			

Secondary Features:

Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
Carbonate coating	120.69um	Topside of tuff nodule	Speckled
Iron coating	270.29um	Topside of tuff nodule	undifferentaited

Hypocoatings:

Clay/Carbonate	**Thickness**	**Location (+void type)**	**B Fabric**
none			

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**
carbonate	1000um	Central channel void	speckled

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type). Locations: voids, fabric, part of bed

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
	None			

Microsparites				
Sparites	None			
Compound Nodules	None			
Mixed Crystallization	None			
Diffuse Carbonate Patches	None			
Fragmented nodules	none			

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
Some yellow-orange nodules might be phosphate accumulations

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
None

Interpretation: Compacted Aeolian sediment with horizontal orientation, blocky structure and minimal carbonate development (one hypocoating/nodule in the central channel void may be introduced rather than precipitated insitu. Clay present in matrix but coatings are rare. Bone and shell inclusions in matrix.

MICROMORPH 1020612 BED 2:
Estimate area: 10mm x 40mm = $400mm^2$

Fabric:

Color: light yellowy brown
Sorting: moderately sorted
C/F ratio: 20% large charcoal. Fabric 20:80
Related Distribution: Porphyric

Matrix (Fabric Microstructure, carbonate/clay type, BFabric)
Similar to bed 1 but with large charcoal inclusions throughout. No horizontal orientation except near boundary with bed 3

	Coarse	**Fine**
Grain Size	0.2mm and larger	Silt
Shape	Rounded	NA
Orientation	Weak horizontal orientation near boundary with Bed 3	None
Composition	Charcoal, quartz, tuff	Silt, no ash

Voids: Large (partially filled) vertical channel from bed 1. Other: up to 1mm, 2 to 5%.
Horizontal planar voids near boundary with Bed 3, 0.3mm and smaller. 5%
Packing voids: 20% (C and F fractions)

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	200um	5 to 10%	Random	
Tuff	1000um	<2%		
Trachyte	None			
Basalt	none			

Organic:

	Size	Density	Distribution	Weathering
Charcoal	2000um	20%	Random	
Plant Remains	2000um	Rare	Concentrated in void near 2/3 boundary	Weathered
Ash	none			

Other:

	Size	Density	Distribution	Weathering
Plaster	none			
Bone	None			

Shell	200um	Rare		
Metal	none			

Secondary Features:

Coatings:

Clay/Carbonate	Thickness	Location/size	B Fabric
none			

Hypocoatings:

Clay/Carbonate	Thickness	Location (+void type)	B Fabric
none			

InFillings/Void coatings:

Clay/Carbonate	Thickness	Location (void type)	B Fabric
none			

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type).
Locations: voids, fabric, part of bed

Type	Avg. Diameter	Density	*Fabric	Location and Shape
Microsparites	1328.07um	1 (total bed)	Micritic calcite and brownish clay (similar to groundmass)	Subangular at base of bed 2 in groundmass of central void passage
Sparites	none			
Compound Nodules	none			
Mixed Crystallization	none			
Diffuse Carbonate Patches	none			
Fragmented	none			

nodules				

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation: Aeolian accumulation over surface 3. Likely related to big fire from Marfa in 2011. Limited carbonate development, the one micritic nodule is located close to the void infilling in bed1. No ash, indicating that the charcoal concentration is not from an insitu burning or a dump, but is likely Aeolian.

MICROMORPH 1020613 BED 3:
Estimated area: 25mm x 40mm = 1000mm^2

Fabric:
- Color: medium yellowy brown
- Sorting: well sorted
- C/F ratio: 15:85
- Related Distribution: Porphyric

Matrix (Fabric Microstructure, carbonate/clay type, BFabric)
Massive microstructure with patches of high clay development (no carbonate) such as to the right hand side of the slide. Speckled bfrabric with clay nodules throughout, groundmass is primarily silt.

	Coarse	**Fine**
Grain Size	300um and larger	silt
Shape	Rounded	NA
Orientation	Very weak horizontal orientation possible	Speckled

Composition	Quartz, aggregates, tuff	silt

Voids:
Channel Voids – Horizontal: 0.3mm, <2% mostly near boundary.
Channel voids – Vertical: 0.5mm, 5%. Also larger channels connecting to Bed 2.
Planar voids: <0.1mm, 2 -5 %, horizontal, vertical, and diagonal.
Packing: mostly fine fraction. 2% variable.

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	300um	5 to 10%	Random	
Rhyolite	1000um	<2%		
Tuff	1500um	<2%		Speckled and banded coatings
Basalt	1000um	1 instance		

Organic:

	Size	Density	Distribution	Weathering
Plant Remains	0.3 to 1mm	Rare, concentrated in ¾ boundary		Unburned, weathered

Secondary Features:

Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
Carbonate	240.89um	On top and undersides of tuff nodules on righthand of slide	Undifferentiated
Clay coating	200um	Around microspar carbonate	speckled

Hypocoatings:

Clay/Carbonate	**Thickness**	**Location (+void type)**	**B Fabric**
clay	230um	Along channel void on lefthand side of slide. Incorporates groundmass	undifferenіated

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**
Sparry calcite	40um	On internal void in diffuse carbonate clay patch on righthand side	calcitic

		of slide	

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type).
Locations: voids, fabric, part of bed

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
Microsparites	779.3185	6 (total bed)	Micrtic carbonate mixed with groundmass	Rounded, in groundmass
Sparites	none			
Compound Nodules	none			
Mixed Crystallization	none			
Diffuse Carbonate Patches	Large 15mm patch with some sub concentric nodules	1	Similar to groundmass with incipient carbonate	Rounded, righthand side of slide
Fragmented nodules	none			

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none
Iron Nodules (location, size, type, density)
none

Interpretation: compacted Aeolian sediment with minor carbonate development above surface/bed 4. Carbonate precipitates in groundmass and incorporates fabric leading to clayey appearance. Weak horizontal orientation of fabric. No evidence for substantial water action.

MICROMORPH 1020612 BED 4:
Estimated Area: 5mm x 40mm = $200mm^2$

Fabric:

Color: dark brown
Sorting: poorly
C/F ratio: 30:70
Related Distribution: porphyric

Matrix (Fabric Microstructure, carbonate/clay type, BFabric)
Blocky/crumb microstructure. Only a small portion of the bed is visible before slide cuts it off.

	Coarse	**Fine**
Grain Size	500um	Clay
Shape	Rounded	NA
Orientation	None	None
Composition	Quartz/rocks	clay

Voids: Packing: around clay aggregates, 0.5mm, 5 to 10%

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	0.3mm	2 to 5%	random	
Tuff	0.5mm	Rare	random	
Trachyte	None			

Organic:

	Size	Density	Distribution	Weathering
Plant Remains	0.3 to 1mm	5%	Horizontally oriented in voids.	
Ash	None			
Shell	None			

Secondary Features:

Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
	184.52um	Topside of tuff	speckled

Clay			

Hypocoatings:

Clay/Carbonate	Thickness	Location (+void type)	B Fabric
none			

InFillings/Void coatings:

Clay/Carbonate	Thickness	Location (void type)	B Fabric
none			

Carbonate Nodules:

Type	Avg. Diameter	Density	*Fabric	Location and Shape
Microsparites	None			
Sparites	none			
Compound Nodules	none			
Mixed Crystallization	none			
Diffuse Carbonate Patches	none			
Fragmented nodules	none			

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation: Surface of Bed 4. Majority of unit is cut off by end of slide and is too small to characterize.

Slide Interpretation: Uppermost beds of Unit 2 near entrance to CV which was originally the chapel of the archie smith house. Repeated beds of compacted Aeolian sediment with horizontal orientation pronounced at top of each bed indicate seasonal/non-continuous usage allowing for the accumulation of Aeolian sediment which is then compacted when the house is again occupied. Beds 1 and 2 are likely 2011 onward with the aeolian charcoal the result of the forest fire than hit the area in 2011. Lower layers probably relate to earlier seasonal/periodic occupations of the house. None of these beds clearly relate to the barn usage of the house (Bed 4 is too small to characterize, but does appear to have a higher organic content in the upper parts of the bed which are visible). Groundmass is highly compacted and contains some clay. Carbonate appears to be precipitating in the groundmass in diffuse patches rather than sparry nodules in void spaces.

Casa Vieja Micromorphology

UNIT, SLIDE: CASA VIEJA UNIT 2 1020613

Contexts: 6 and 7 (one visible bed)

Boundaries: None

MICROMORPH BED 1:
Estimated Area: 70mm x 40mm =

Fabric:
- Color: medium brown, darker brown towards base
- Sorting: well sorted
- C/F ratio: 30:70 plus 5 to 10% larger rounded inclusions (0.5mm and larger)
- Related Distribution: porphyric

Matrix (Fabric Microstructure, carbonate/clay type, BFabric)
Blocky/ Massive microstructure. microlaminations of well sorted fine sand in thin horizontal bands. Some associate with less fine fraction material. Lower section has crumbly microstructure. Carbonate development is more pronounced in lower part of slide

	Coarse	**Fine**
Grain Size	0.1mm+	Fine silt/clay
Shape	Rounded	NA
Orientation	horizontal banding	Horizontal banding (localized)
Composition	Quartz, TUFF	Silt, minimal carbonate

Voids: Channels – vertical, 0.7mm, <2%
- Planar voids (primarily horizontal): 0.8mm, 2 to 5%
- Packing voids: <2%
- Both packing and planar voids are 5 to 10% in laminations

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	100um	30%	Random, banded	
Rhyolite	500um	rare		
Tuff	1 to 10mm	5%		
Trachyte	none			
Limestone	1mm, 4mm	rare	B3	

Organic:

	Size	Density	Distribution	Weathering
Charcoal	None			
Ash	None			
Plant Remains	None			
Insect Excrement	none			

Other:

	Size	Density	Distribution	Weathering
Bone	none			
Eggshell	200um	rare		
Metal	none			
Ceramic	none			
Glass	none			
Plaster	none			

Secondary Features:

Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
none			

Hypocoatings:

Clay/Carbonate	**Thickness**	**Location (+void type)**	**B Fabric**
none			

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**
none			

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type).
Locations: voids, fabric, part of bed

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
Microsparites	1173.449	5	Micritic calcite. Some incorporating minor amounts of fabric	Subrounded,in voids and groundmass. More dense towards base of slide
Sparites	None			

Compound Nodules	None			
Mixed Crystallization	none			
Diffuse Carbonate Patches	none			
Fragmented nodules	5437.13um	1	Pure micritic carbonate	Base of bed

*Microsparites (small crystals btn 8 to 20um) – recrystallization – measure all from 2x mag in top, center, and base of bed along central line. Marked as MSbed# on photo.
Sparites (pure crystals (larger than 20um) – precipitation - count and measure all
Compound – count and measure all

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
None

Iron Nodules (location, size, type, density)
none

Interpretation: No organic and very little carbonate development throughout although the lowest section has slightly higher carbonate development and a crumbly microstructure with more concentrated planar voids. Slide likely shows a continuously maintained surface of Aeolian sediment continuously trampled and swept during continuous usage of the structure. Laminations may be from sweeping as well as trampling producing well sorted horizontal orientation. Compaction of entire bed is likely from continuous trampling rather than periodic usage thus allowing aeolian sediment to accumulate before being trampled. This would also account for the lack of organic matter. The fabric is generally sandy and silty rather than clayey, which could also be the influence of sweeping as that would remove smaller particles.

Carbonate development consists of micritic nodules (some incorporating groundmass) primarily in voids, some in groundmass. Bed is less compacted than those above which may account for the variation in carbonate development – precipitation of carbonate in voids rather than as patches in groundmass. Alternatively, as this bed is deeper/older the micritic carbonate which is visible may be recrystallized diffuse patches which have had more time to mature.

UNIT, SLIDE: CASA VIEJA UNIT 2 1020614

Contexts: Bed 1: 7/7B
Bed 2: 8

Boundaries:
Beds 1/2: Sharp boundary marked by loose, well sorted sand grains, plant matter, and insect excrement.

MICROMORPH 1020614 BED 1:
Estimated Area: 50mm x 40mm = 2000mm^2

Fabric:
Color: dark brown with light tan patches
Sorting: unsorted
C/F ratio: 20 to 80
Related Distribution: monic to enaulic

Matrix (Fabric Microstructure, carbonate/clay type, BFabric)
Massive, uncompacted microstructure with abundant clay aggregates (0.9 to 1mm). diffuse carbonate patches and many micritic carbonate nodules dominate the upper portion of the bed. Speckled fabric

	Coarse	**Fine**
Grain Size	300um	Silt
Shape	Rounded	NA
Orientation	None	None
Composition	Quartz, tuff	Carbonate clay with carbonate lining voids

Voids: Upper: complex packing voids, fine fraction 5%.
Planar voids, 0.8mm, 2%
Vughs 0.5 to 1mm, <2%

Lower: complex packing, 0.9mm, 10 to 15%
Vughs, 2mm, 5%

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	0.2mm	5%	Random	
Rhyolite	none			
Tuff	1.5mm	2 to 5%		
Basalt	none			

Organic:

	Size	Density	Distribution	Weathering
Plant Remains	0.5 to 1mm	Rare	2 instances outside of 1/2 boundary	
Insect Excrement	0.02mm	1 instance outside of 1/2 boundary		
Ash	None			
Charcoal	None			

Other:

	Size	Density	Distribution	Weathering
Bone	None			
Eggshell	None			
Metal	None			
Ceramic	None			
Glass	None			
Plaster	none			

Secondary Features:

Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
Brown clay coatings	105.48	On undersides of clay aggregates and tuff. Common throughout bed	Speckled with some banding

Hypocoatings:

Clay/Carbonate	**Thickness**	**Location (+void type)**	**B Fabric**
none			

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**
none			

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type). Locations: voids, fabric, part of bed

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
Microsparites	596.7146	23	Micritic calcite incorporationg surrounding fabric	Subrounded. Concentrated in upper part of bed. Appear to bed near/in

				voids but incorporating groundmass
Sparites	none			
Compound Nodules	none			
Mixed Crystallization	none			
****Diffuse Carbonate Patches**	See note			
Fragmented nodules	5674.753	7	Micritic calcite incorporating groundmass	In groundmass surrounding and incorporating void spaces. Concentrated in upper part of bed.

*Microsparites (small crystals btn 8 to 20um) – recrystallization – measure all from 2x mag in top, center, and base of bed along central line. Marked as MSbed# on photo.
Sparites (pure crystals (larger than 20um) – precipitation - count and measure all
Compound – count and measure all
Fragmented – count and measure all

**diffuse carbonate areas dominate the upper portion of the bed but are difficult to distinguish from each other in order to count. Most of the lower portion of the bed (20mm down) has fewer carbonate patches (and fewer microspars), with the exception of a 10mm patch near the lower right hand corner of the bed.

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation: sediment layer with no internal organization, heavily altered by carbonate development. Clay aggregates and carbonate matrix have compacted the upper portion of the bed while the lower part is somewhat uncemented. Carbonate precipitates in groundmass incorporating surrounding fabric as diffuse carbonate clayey patches. Recrystalization of these patches forms micritic and fragmented-appearing nodules of micrtic carbonate incorporating soil fabric.

MICROMORPH 1020614 BED 2:
Estimated Area: 10mm x 40mm = 400mm^2

Fabric:
- Color: dark brown (especially near boundary)
- Sorting: moderately sorted
- C/F ratio: 15:85
- Related Distribution: porphyric

Matrix (Fabric Microstructure, carbonate/clay type, BFabric)
Massive microstructure

	Coarse	**Fine**
Grain Size	100um	silt
Shape	Subangular/subrounded	NA
Orientation	Some weak horizontal zoning near boundary with bed 1	None
Composition	Quartz, aggregates, shell	silt

Voids:
Planar voids: 0.8mm, 2%
Complex packing voids: fine fraction, 5%
Vughs and channels (associated with disaggregation): 0.6mm, 2%

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	200um	5%	random	
Tuff	500um	2%		
Trachyte	None			
Basalt	none			

Organic:

	Size	Density	Distribution	Weathering
Charcoal	0.1mm	<2%	Random	
Ash	None			
Plant matter	100um	5%	In void boundary with bed 1	Decayed
Insect excrement	50um	2%	In void boundary with bed 1	decayed

Other:

	Size	Density	Distribution	Weathering
Shell	0.5mm	2%	random	
Plaster	0.2 and 0.4 thickness	2 fragments	Approximately parallel to surface	Fine grained plaster with inclusions
Bone	None			
Metal	None			
glass	none			

Secondary Features:

Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
Brown clay coating	72.87	On trachyte nodules (1 instance)	speckled

Hypocoatings:

Clay/Carbonate	**Thickness**	**Location (+void type)**	**B Fabric**
none			

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**
none			

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type). Locations: voids, fabric, part of bed

Type	Avg. Diameter	Density	*Fabric	Location and Shape
Microsparites	327.8988	4	Micritic carbonate incorporating fabric	In voids and groundmass
Sparites	none			
Compound Nodules	none			
Mixed Crystallization	none			
Diffuse Carbonate Patches	10mm	1	Fabric in groundmass	Righthand portion of bed
Fragmented nodules	none			

*Microsparites (small crystals btn 8 to 20um) – recrystallization – measure all from 2x mag in top, center, and base of bed along central line. Marked as MSbed# on photo.
Sparites (pure crystals (larger than 20um) – precipitation - count and measure all
Compound – count and measure all

*Includes soil fabric? Similar or different than matrix?

Other carbonate features: (roots, etc. – location, size, type, density)
none

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation: Compacted layer with sharp boundary with bed 1 above. Boundary has organic remains and insect excrement. Surface of bed 2 shows weak horizontal orientation. Some inclusions of fine grained plaster (not oriented or in context) are present in the bed. Little carbonate development. The bed appears to be a compacted surface, possibly relating to the chapel occupation based on depth.

Slide Interpretation: Compact clayey layer of bed 2 is possibly from the chapel occupation of the structure. It is generally clean for a use surface, but is clearly trampled and includes organic matter and plaster. Compacted surface of bed 2 allowed for increased carbonate development in bed 1, which may also have been fill, or potentially Aeolian accumulation above construction fill while the structure was under disuse/barn. Deposition of bed 1 is unclear – the dominant process is cementation of the groundmass through carbonate precipitation. In Bed 1 carbonate appears to be precipitating in the groundmass as diffuse patches recrystallizing to form microspars and larged fragmented-appearing nodules. Nodules incorporate fabric from the surrounding groundmass rather than precipitating as pure calcite.

CV UNIT 3 SLIDE: 1020606

Contexts: 2, 4, 5: upper context in unit 3 on southwest side of CV house.

Boundaries: none

MICROMORPH BED 1:
Estimated Area: 40mm x 70mm = 2800mm^2

Fabric:

Color: light to medium tan/brown
Sorting: well sorted
C/F ratio: 20:80
Related Distribution: coarse porphyric

Matrix (Fabric Microstructure, carbonate/clay type, BFabric). mostly massive fabric with some internal crumbs which appear to be carbonate enriched in the upper part. A small section of poorly expressed crumbly fabric in the lower part of the slide may have small portions of clay. Overall appears to be well sorted silty sand with minimal clay. Localized areas of orientation of the coarse fraction. Overall very compact

	Coarse	**Fine**
Grain Size	100um	30um
Shape	Subrounded	Subrounded
Orientation	Mostly unoriented but localized areas of parallel orientation	None
Composition	Sand	Silt, carbonate

Voids: a large channel void and tributaries dominates the center of the slide (3mm in width) it is associated with depletion features in the fabric and is mostly likely due to water transport. Vughy voids of varying sizes 1000um to 10mm are likely decayed plant casts. Some are associated with decaying plant matter or insect excrement.

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	50um to 200um	10%	Random	Minimal,
Trachyte	None			
Tuff	800um	2%	Random	Minimal, fe staining
Basalt	None			
Limestone	none			

Organic:

	Size	Density	Distribution	Weathering

Charcoal	1200um	1 instance	J6, outside of cover slip	Minimal
Ash	None			
Plant Remains	200 to 400um	Rare	In void spaces	Decayed
Insect Excrement	9um	rare	H4, in void	minimal

Other:

	Size	Density	Distribution	Weathering
Bone	150um	rare		
Eggshell	None			
Metal	None			
Ceramic	None			
Glass	None			
Plaster	none			

Secondary Features:

Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
none			

Hypocoatings:

Clay/Carbonate	**Thickness**	**Location (+void type)**	**B Fabric**
Clay, possibly organic	180um	Surrounding depletion features near voids	speckled

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**	
none				

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type). Locations: voids, fabric, part of bed

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
Microsparites	500um	11 (in MS locations)	Micritic calcite mixed with soil fabric. Some are dominantly soil fabric	Rounded, in fabric, concentrated in upper part of slide
Sparites	none			
Compound	none			

Nodules				
Mixed Crystallization	none			
Diffuse Carbonate Patches	none			
Fragmented nodules	none			

Other carbonate features: (roots, etc. – location, size, type, density)
None

Depletion features: Depletion features are associated with the central vertical channel void and associated tributaries. They present along with thin hypocoatings, suggesting water saturation.

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation:
The slide shows a very compacted silty sand, likely of Aeolian origin due to the sorting and some localized orientation particles. Carbonate development is pronounced in the upper part of the slide. Depletion features are associated with a large central channel void and tributaries which suggests water saturation. Insect excrement suggests insect activity.

CV UNIT 3 SLIDE: 1020607

Contexts: 6A and 6B, lower contexts in unit 3

Boundaries: none

MICROMORPH BED 1:
Estimated Area: 40mm x 70mm = 2800mm^2

Fabric:

Color: Light to medium tan/brown
Sorting: moderately sorted
C/F ratio: 20:80
Related Distribution: porphyric within peds

Matrix (Fabric Microstructure, carbonate/clay type, BFabric. compact crumbly peds/aggregates within internal massive or planar structure. Fabric appears to contain some clay (more than 1020606) but is predominantly silty sand. What clay is present in concentrated around voids.

	Coarse	**Fine**
Grain Size	100um	40um
Shape	Subrounded	Subrounded
Orientation	None	None
Composition	Quartz	silt

Voids: large packing voids between aggregates (up to 30% of total slide area). Within aggregates there are planar voids (100um in width) at about 10% of aggregate space. Vughy voids (300um to 1000um) also occur rarely (<2%).

Composition:

Mineralogy:

	Size	Density	Distribution	Weathering
Quartz	100um	10%	Random	Minimal
Trachyte	None			
Tuff	450um	5%	Random	Minimal
Basalt	None			
Limestone	none			

Organic:

	Size	Density	Distribution	Weathering
Charcoal	None			
Ash	None			
Plant Remains	150um	Rare	In void spaces	Decayed
Insect	none			

Excrement				

Other:

	Size	Density	Distribution	Weathering
Bone	none			
Eggshell	70um	Rare	Fabric	Minimal
Metal	None			
Ceramic	None			
Glass	None			
Plaster	none			

Secondary Features:

Coatings:

Clay/Carbonate	**Thickness**	**Location/size**	**B Fabric**
none			

Hypocoatings:

Clay/Carbonate	**Thickness**	**Location (+void type)**	**B Fabric**
clay	140um	Around void boundaries (planar voids interior to aggregates)	speckled

InFillings/Void coatings:

Clay/Carbonate	**Thickness**	**Location (void type)**	**B Fabric**	
none				

Carbonate Nodules: - record largest diameter by subtype (make table for all nodules by type). Locations: voids, fabric, part of bed

Type	**Avg. Diameter**	**Density**	***Fabric**	**Location and Shape**
Microsparites	450um	4 (in MS areas)	Micrtic calcite with soil fabric	Rounded, in fabric
Sparites	none			
Compound Nodules	none			
Mixed Crystallization	none			

Diffuse Carbonate Patches	none			
Fragmented nodules	none			

Other carbonate features: (roots, etc. – location, size, type, density)
None

Depletion features: interior areas of peds (away from planar voids) have generally less clay content, with clay concentrated around voids.

Gypsum crystallizations (location, size, type, density)
none

Phosphate (location, size, type, density)
none

Manganese (location, size, type, density)
none

Iron Nodules (location, size, type, density)
none

Interpretation: compact (possibly disturbed) crumbly sediment with minimal carbonate development. Peds generally show clay hypocoatings around interior voids with depleted zones interior to the peds. This is likely indicative of water saturation.