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They Used to Make Bricks Here: Brick Manufacturing at The Grove Plantation and the Rise of the Cooper River Gray Brick

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THEY USED TO MAKE BRICKS HERE: BRICK MANUFACTURING AT THE GROVE PLANTATION AND THE RISE OF THE COOPER RIVER GRAY BRICK

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by
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ABSTRACT

Surviving brick clamps at Grove Creek Plantation provide exceptional information about the brick industry that flourished in the antebellum era along the Cooper River. Both the topography and natural resources necessary for brick making supported the industrial production of brick along the Cooper River and its tributaries from the colonial period into the post-bellum era. At the Grove Plantation, the arrangement of clay and sand pits, work yards, wells, and clamps are still intact provide a unique opportunity to explore the brick production process as it evolved to met growing demand for building materials from nearby Charleston. Most brick clamps were temporary structures, dismantled after each burning, leaving behind only scorched earth and fragments of brick. The surviving Grove Plantation clamps offer an exceptional research opportunity. This thesis analyzes the brick making processes employed at the Grove, from clay and sand mining to molding to firing and shipping. Results of physical and chemical analysis of brick, sand, and clay specimens taken from the site are compared to brick samples from Charleston. The results of this comparison link the production of brick at the Grove to buildings in Charleston and provide initial results in the application of XRF technology as a diagnostic tool in architectural investigation.

DEDICATION

This thesis is dedicated to the people at BP Chemical Cooper River Plant who gave me access to the Grove and to my family who gave me Charleston.

ACKNOWLEDGMENTS

This thesis could not have been completed without the people of the BP Chemical Cooper River Plant. I would like to thank the Biodiversity Team, especially Judy Lesslie, and Mark Fitts, for all their help and support. Thanks also to Ernie Nelson who kept every document he ever saw pertaining to the Grove, and without whom I would never have learned to tell a loblolly from a long leaf pine.

My special thanks to all those at Clemson / the College of Charleston. I thank my advisor, Carter Hudgins, and the rest of my thesis committee, Richard Marks, Grant Gilmore, and especially Frances Ford. I would never have completed my XRF testing without the help of everyone at Warren Lasch Conservation Laboratory.

And finally, this thesis would never have been started without the support of my family; Melanie Weston who was always ready to dive head first into a clamp with me, my brother who was always ready at the first sign of late night writer's block to ask the all important question "why should I care about some old bricks;" my father who spent two years stomping through the woods with me; and my mother who knew I could do it.

TABLE OF CONTENTS

Table of Contents (Continued)

Page

LIST OF TABLES

List of Tables (Continued)

LIST OF FIGURES

List of Figures (Continued)

List of Figures (Continued)

Figure Page

List of Figures (Continued)

Figure Page

List of Figures (Continued)

Figure | Page

List of Figures (Continued)

Figure Page

List of Figures (Continued)

Figure Page

List of Figures (Continued)

Figure Page

CHAPTER ONE

INTRODUCTION

On September 22, 1989 Hurricane Hugo decimated the South Carolina Lowcountry. Residents listened to tornados tear through neighborhoods while winds roared up to 140 miles per hour. In some areas, the storm surge rose up to twenty feet. The storm caused an estimated $7 billion damage and took 49 lives.[1] Not all the damage resulted in misfortune. The winds that knocked forests to their knees also uprooted an oak tree growing along Grove Creek. When it fell, the tree unearthed the remains of a brick clamp. Due to the extent of the forest surrounding the clamp, and its location inside a 6,000 acre tract of land owned by BP Chemical, its existence was virtually unnoted until ten years later when an Eagle Scout project, the clearing of a nature trail, discovered brick rubble and wall fragments.

This thesis explores brickmaking at the Grove Plantation, one of approximately thirty plantations in the Cooper River region that turned to brick production in the post-Revolutionary era. The convergence of several factors supported the emergence of brickmaking as an important plantation industry at the Grove. First, the natural materials necessary for brick production, clay and sand, were present in abundant quantities and easily accessible. Second, the site, adjacent to a tributary of the Cooper River provided water access to Charleston where a voracious appetite for brick accompanied an antebellum building boom. Third,

[1] "Historical Hurricanes in South Carolina," *NOAA.* http://www.weather.gov/.

overseers of brick making operations could rely on enslaved Africans for the labor required in a process that while organized on an industrial scale still depended on human labor. This thesis evaluates brick making at Grove Plantation, presenting it as a case study of the brick industry in the South Carolina Lowcountry, particularly the brick plantations that flourished along the east branch of the Cooper River. This thesis addresses several questions pertaining to the history of brickmaking at the Grove, the first of which are architectural, historical and technological in character:

- How and why did a brick industry develop east of the Cooper River?
- What natural resources and what landscape features made the site ~~it~~ conducive to brick production?
- What evidence survives of brick making at the Grove?
- What does surviving physical evidence reveal about the brick making process at the Grove?

This thesis has a second technological purpose, the evaluation of the application of geophysical analysis to historic bricks. While historical information makes it clear that bricks produced along the Cooper River were shipped to buildings sites in Charleston, XRF technology was used to (1) Describe the properties of the sands and clays used in Grove Plantation bricks, and (2) Compare the geophysical properties of Grove Plantation brick to brick used in the construction of antebellum buildings in Charleston. With that evidence in hand, the thesis asked this question:

- Can XRF analysis be used as a diagnostic tool to identify sources of bricks used in Charleston?

"They used to make bricks here." Herb Fraiser, formerly a reporter with the Charleston *Post & Courier* newspaper and more recently a chronicler of Lowcountry history, recorded these words a small boy remembered about things his father told him.[2] It has long been known that bricks were produced on some portion of the property which exists as 6,000 property BP now owns along the Cooper River between Grove and Flagg Creeks. Through this project, proposals were made for the future of this site. The objective is to not only interpret the Grove's history, but to use that knowledge to create an educational tool. The conclusions reached in this thesis will be used as the basis for interpretive elements to be added to the site.

Location

The location for this study is along a creek off the Cooper River, in Cainhoy, South Carolina. The following maps are to orient the reader (See Figures 1.1 – 1.2). The BP Chemical, Cooper River Plant is situated thirteen miles north east of Charleston, on the eastern bank of the Cooper River, between Flagg Creek and Grove Creek. The site of this study is nine and one-half acres of woodland, positioned three quarters of a mile from the Cooper River, just north of the plant.

[2] Herb Frazier, *Behind God's Back: Gullah Memories Cainhoy, Wando, Huger, Daniel Island, St. Thomas Island, South Carolina* (Charleston, S.C: Evening Post Books, 2011), 24.

Figure 1.1: The Grove Location on the Cooper River (USGS Melgrove 1919).

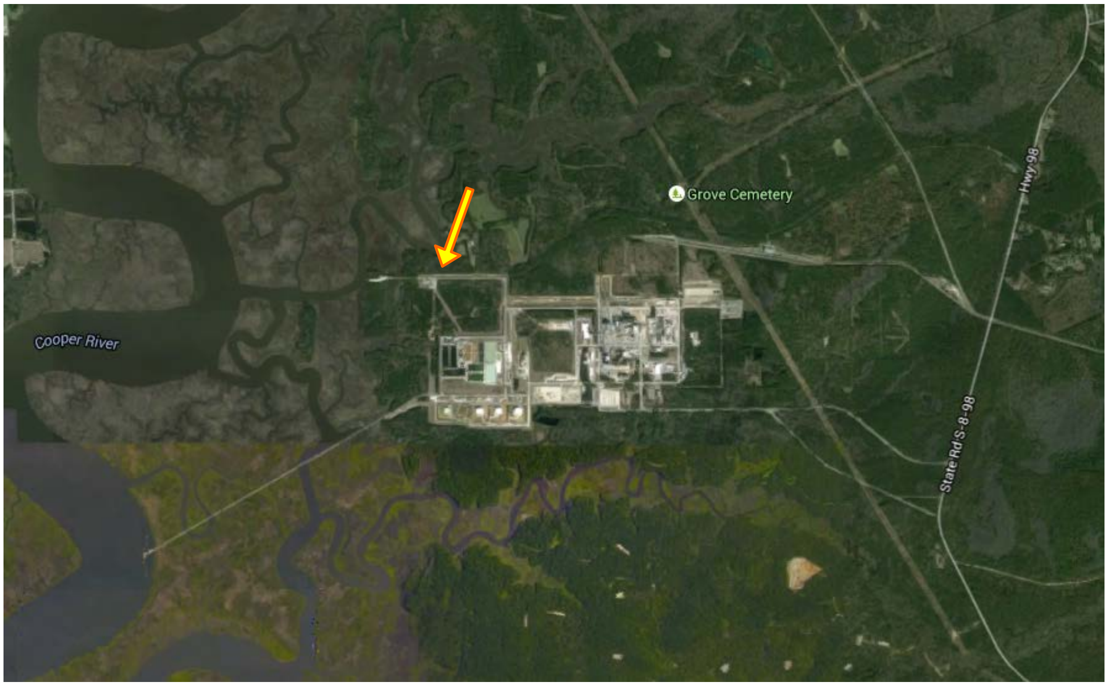

Figure 1.2: BP Chemical Cooper River Plant with Site Location (Google Map 2015).

An archaeological study of several areas of the property conducted in the 1978 uncovered the evidence of brickmaking such as buried ruins of structures and other evidence of plantation life.[3] The intention of that study was to locate and document historical sites on portions of the tract slated for development. A survey explored select locations within the tract but did not explore the historical function of the sites it discovered. This project focuses on one of the sites identified by the 1978 survey. Since construction of the Eagle scout project nature trail which winds

[3] Elaine B. Herold, Stanley G. Knick III, and Allen Liss, *An Archaeological Survey of the Grove Plantation Site (Boswell Track)* (Charleston: Charleston Museum, 1978).;
Elaine B. Herold and Kay R. Scruggs, *An Historical Survey of the Grove and Flagg Plantation Sites (Boswell and Hendricks Tracks)* (Charleston: Charleston Museum, 1975).;
Michael O. Hartley and Robert L. Stephenson, *An Archaeological Survey of the Flagg Plantation Site (Hendricks Track)* (Charleston: Charleston Museum, 1975).

through a nine and one half-acre segment of the forest that surrounds BP's industrial operations, plant managers, employees and visitors of a nearby recreation area have known that some brick making activity was conducted in the study area. Brick fragments litter the ground, paving the forest floor in some places, forming mounds in others (See Appendix Figure B–1). But as the focus and purpose of the nature trail was to draw attention to local flora and fauna, no further effort beyond noting the location of these buried structures and brick formations was conducted. This thesis picks up the unfinished project of fully recording and explaining the significance of the buried industrial buildings and structures at the Grove.

In many ways, anonymity protected the integrity of the site. Few indications remained above ground that attracted unwanted notice. Even in the short span during which this study was been conducted, vandalism followed new attention brought to the site. While curiosity brought a desire to understand the site and protect its significance, it has also brought an increase traffic which threatened the fragile nature of these cultural resources. Bringing new attention to the Grove Plantation's brick clamps, one of the goals of this project, will, it is hoped, inspire new appreciation for the site. That, in turn, encourages the formulation of new policies that will protect it for future generations.

The purpose of this thesis is multifaceted. The site on Grove Creek is a self-contained example of brick production on the Cooper River and has been used as a case study in understanding the brick making process in the Lowcountry. This thesis discusses the Grove's history in the context of the Cainhoy area, the process of brick making employed there, physical analysis of the site, its soil, and bricks. Analysis focused on the physical description of the site, brick samples taken from the site, as well as clay and sand samples from the surrounding area. The features of the site were interpreted as to their connections to each other and their purpose in the production process.

Field research and later laboratory analysis identified two distinct molding methods at the site. By comparing brick size and patterns found on the brick, it was determined that the bricks produced at Grove Plantation were hand molded and cast molded. Hand molded bricks were formed in wooden molds and varied slightly in size. Cast molded bricks were formed in cast iron molds that left markings on the bricks' stretcher face and produced bricks identical in size. Geophysical analysis of brick samples taken from the clamp site confirmed them as being produced from local source material. Additional brick samples from the Lowcountry were compared to Grove brick identify similarities which indicated they can be associated with an adjacent site. The presence of these two types of brick, one associated generally with production in the antebellum period and earlier, the second generally associated with production in the past bellum era, indicate that brick production at the Grove extended use over a period of time.

Methodology

To explain the brick production at the Grove, this thesis discusses investigates the history of the plantation and its relationship to other brick making plantation in and around the historical communities of Cainhoy and Huger, the process of brick making, and the industrial ruins associated with brick production. The thesis also presents a physical and chemical analysis of brick produced at the site. The history of the Grove was established through the investigation of primary and secondary source material. A chain of title established the owners of the plantation. From that list, biographical information about owners of the site were compiled. Primary sources such as wills, maps, deeds, and city directories established a timeline for brick making at the plantation.

Knowledge of the brick making process was indispensable to understanding why brick production at the Grove. The proximity of necessary raw material, primarily sand and clay, a location for molding and burning, and access to transportation are determinates for site choice. The types of kilns used, the process of these kiln types, the function of a work yard, and the purpose of any associated structures revealed how this site may have been used and why it would have been better suited to brickmaking than other locations on the property. A site plan, based on field recording, depicts how this property functioned as a production center.

A methodical survey identified features associated with brick making across the site. Relevant features of the landscape were mapped and recorded with GPS tags. These points combined with measurements of all structures were compiled to create a plan of the existing structure and site plan of the production area. The site plan predicted the location of additional unknown elements of the production site, such as other fragments of the structure and additional clamp features.

Multiple brick samples were taken from the building and within the clamp for analysis. Samples were labeled designating the structure of origin. Each sample was representative of the structure. By evaluating the surrounding area clay and sandy areas were discovered adjacent to the production area. Seventeen samples were tested; fourteen bricks, two clay, and one sand. Of the brick samples four were from Structure A, seven were from the clamp, and three were fragments from the trail and an adjacent.

Clay and sand samples were taken from source pits located adjacent to the molding yard. Four clay pits and one sand pit have been identified. Samples were obtained from two of the clay pits and the sand pit. Each sample was taken six inches below the starting depth of the desired source. The sample was labeled with the source pit designation and recorded with GPS coordinates.

The samples of brick, clay, and sand were evaluated by their physical and chemical characteristic. Physical analysis of brick samples and soil resources revealed the extent of the Grove's brick industry. By inspecting of a collection of brick samples from the kiln; the variations in size, form, and color illustrated the range of production and methods of forming and firing the bricks. The variations in brick size and styles were evaluated to determine the date of production and production technology of the brickmaking operation at the Grove.

Analyzing by size sorted the brick samples into two groups. While Group A fluctuated in size, they were normally larger than Group B. This variation in size was the first process of sorting the samples. Each following process further defined these groups and was used to determine the production method. Molding methods were determined by the size comparison. Hand made wooden molds were not typically consistent in size, varying up to half an inch in dimensions at a given production site. Cast molds were much more standard in size as the molds themselves were cast from a fixed mold.

The color range and inclusions were analyzed for variations. Color was determined by visual confirmation of Munsell Soil Colors. Each brick was examined under varied lighting conditions to determine the most accurate color designation. The Munsell Soil Colors chart characterizes colors into groups determined by hue, value and chroma. This color description provides a comparable standard by which the samples were grouped.

Microscopic analysis was conducted on a Leica Mz95 stereomicroscope. This analysis considered sand content within the brick and compared against the sand samples from the sand pit. Particulates are compared first for their size. In soil classification, particulates are defined as sand when they range between 0.003 and 0.190 inches in diameter, with fine sand ranging from 0.017 to 0.017 inches. Samples are then sorted by the consistency of particulates, described from poorly sorted to well sorted. Roundness is described as angular, subangular, subrounded, rounded, or well rounded. And finally, the sphericity is categorized as low, medium, or highly spherical.

Chemical analysis provided a variety of insights. Analysis was conducted Bruker Tracer Series Portable XRF Analyzer. Samples were dry brushed with a soft nylon brush, then cleaned with low-pressure compressed air. Each sample tested in three locations to achieve an accurate result. The sand and clay located in the vicinity of the kilns was compared to bricks fired in the kilns. The correlation of trace elements demonstrated that the bricks were produced from resources located on site. Brick samples were then compared to samples from other locations to demonstrate the differences in trace elements between sites and the correlation between bricks produced at the Grove and bricks found in Charleston.

Minor clearing of the site was necessary to determine the layout of the kilns as well as the function of the surrounding structures. Assessment of other artifacts found at the site, such as nails and hardware, were used to establish eras of usage at the kiln site. Samples from the older trees are used to postulate when the work yard ceased to function and was overgrown by the surrounding forest.

As an addendum to this study, a plan for the documentation and treatment of metal artifacts found at the site was created. Artifacts used in this study have been documented and treated in accordance to this plan. A report is included in Appendix C. Moreover, a preservation plan for the site as a whole has been prepared to guide the process of transitioning the site into an educational tool for future generations. This plan will be necessary in developing the area to accommodate visitors without injuring its significance.

Through this project, proposals were made for the future of this site. The objective is to not only interpret the Grove's history, but to use that knowledge to create an educational tool. The conclusions reached in this thesis will be used as the basis for interpretive elements to be added to the site.

CHAPTER TWO

GROVE HISTORY

The Grove's history is crucial to the understanding of how the site developed. Wills, land grants, records of conveyance, and maps depict changes in ownership and property size. Some owners bought adjacent properties, increasing the size of the plantation. Changes in ownership often indicated alterations on the property and potentially in brick production methods. This history was used to determine the development of the Grove's brick production.

The property belonging to BP Chemical is now part of a 6,000 acre tract, but it once was a plantation of varying size known as The Grove. A brief survey of the property's history was compiled in 1975 to aid an archaeological study. This study focused on the portion of the property which was acquired by Amoco after their purchase of the property, which is south of the study area for this thesis. Of that 6,000 acre property, approximately 500 acres is built upon. The rest has remained natural.

The fragmented history of The Grove began with parcels of land belonging to multiple people. No land grant for the property has been found. As early as 1767 the property directly north of Flagg Plantation, part of what would eventually be the Grove, was owned by John Correar.[4] In 1772 King George III granted Robert Rowand

[4] Charleston County Register of Mesne Conveyance, H3-504.

an adjacent property in what was then Craven County.[5] This land grant lists his neighbor to the south as Clement Lamprier, owner of Grove Plantation (See Appendix Figure A-2). How Lamprier procured the property is unknown. Lamprier's 1776 will left the property to his wife Sarah (See Appendix Figure A-3).[6]

Sarah in turn left Clement Lamprier's estate to their grandson Clement Prince to be managed by executors until he came of age. The will, dating 1784, named Sarah's nephews Jacob Read, William Read, and Jacob I'On as executors (See Appendix Figures A-4 – A-8). [7] Though Prince would not sell him the property until 1812, Thomas Karwon began buying adjacent properties from Robert Smith in 1810. One of these was purchased from Isaac Edwards after he bought it from Robert Smith (See Table 2.1). [8] Karwon began the process of uniting neighboring parcels.

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[5] South Carolina. Secretary of State; South Carolina. Department of Archives and History, *South Carolina Land Grant, Colonial Series, 1699-1788* (Columbia: South Carolina Secretary of State) Vol. 34, 16.
[6] Charleston County Will Book, 1780 – 1783, 45.
[7] Will Book A: 1783-86, 351.
[8] Charleston County Deed Book C8-239.
Charleston County Deed Book C8-409.

Date	Grantor	Grantee
July 28, 1810	Robert Smith	Thomas Karwon
November 7, 1810	Robert Smith	Isaac Edwards
November 7, 1810	Robert Smith	Thomas Karwon

Table 2.1: Robert Smith Tract. Several sections of property joined to create the property that eventually compromised the Grove.

Like other holders, Karwon's possession was short. Within fourteen years he relinquished the land to another owner. The property had a surprisingly high rate of turnover, seldom passed down to an heir after the initial owner and his wife. Thomas Karwon united adjacent tracts to increase the property's size and would hold the united property until his death. Shortly after, his executors sold the property to John Gordon according to Karwon's wishes.[9] Gordon's ownership was even shorter than Karwon's at only nine years. It was during Gordon's ownership that a notable shift occurred. In 1829 Charleston directory, the only John Gordon named is a bricklayer with a residence at 218 Meeting Street. Two years later at the same address, John Gordon's profession was that of planter. This change occurs just a few short years after his procurement of the Grove property. Some change occurred during Gordon's tenure increasing the value of the plantation. The Mills Atlas, published in 1825, is a collection of South Carolina's political districts.[10] The Charleston District of the Mills Atlas showed J. Gordon as the owner, though it

9 Charleston RMC. H8-121.

10 "Atlas of the State of South Carolina by Robert Mills," *South Carolina Department of Archives and History,* Library.sc.edu/digital.collections.millsabout.html.

named the adjacent creek as Moreland Creek, rather than Grove Creek (See Figures 2.1 & 2.2).[11] Gordon's ownership of the property did not last long however. In 1835 he sold the property to Edmund Ravenel. Unlike other owners, Edmund maintained ownership for almost forty years (See Table 2.2). Ravenel saw the end of the plantation's brick production following the Civil War.

Figure 2.1: Mills Atlas 1825, Charleston District.

[11] Charleston County Deed Book H8-121.
Charleston City Directory 1829, 48.
Charleston City Directory 1831, 77.

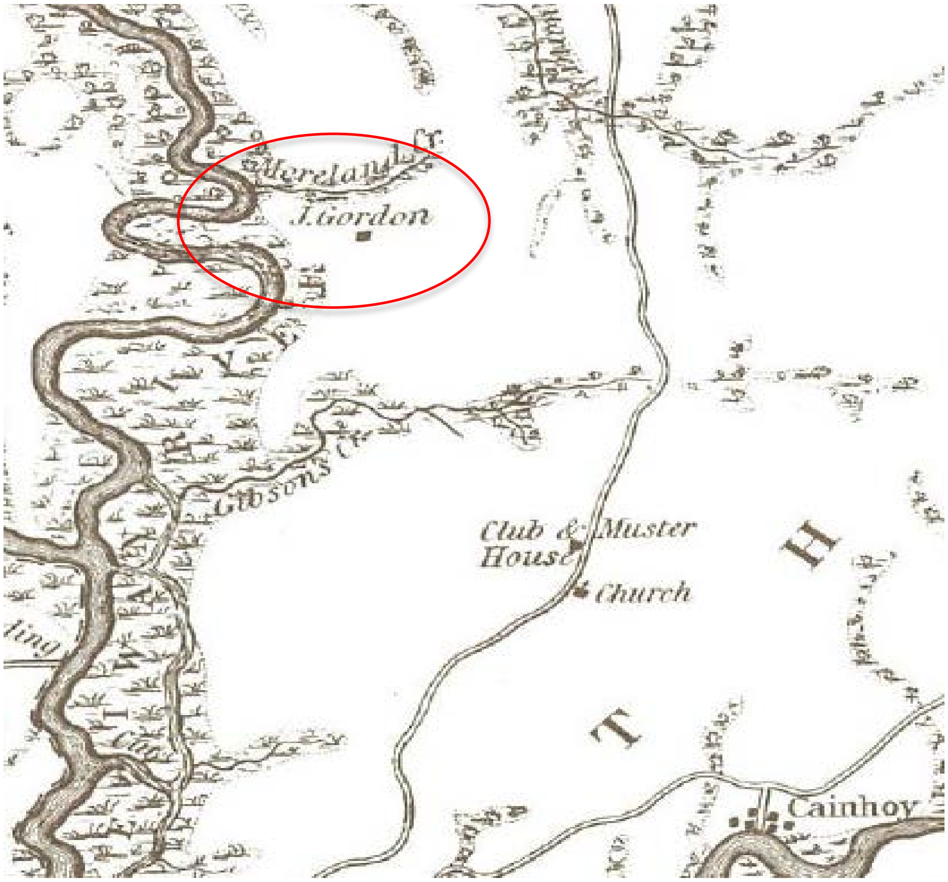

Figure 2.2: Charleston District, Mills Atlas 1825. Shows the property of John Gordon adjacent to Moreland (later Grove) Creek.

Date	Grantor	Grantee
January 10, 1767	-	John Correar
September 8, 1772	-	Clement Lampriere
June 8, 1776	Clement Lampriere	Sarah Lampriere
April 21, 1810	Sarah Lampriere	Clement Prince
April 27, 1812	Clement L. Prince	Thomas Karwon
March 10, 1826	Thomas Karwon	John Gordon
May 25, 1835	John Gordon	Edmund Ravenel
	Edmund Ravenel	William Ravenel
November 21, 1885		William & Edwin Welling
1893		Sanders Family
April 21, 1893	J. Samuel Sanders	Thomas J. Samuels & John S. Sanders
- 1899	Samuel Sanders	
1904	J. L. Sanders	
1904 - 1908	Mary S. Barnes & Edward C. Sanders	
1899 - 1904	Thomas J. Sanders	

(1899 – 1921	John S. Sanders	
1921 – 1928	Lula Sanders	
1938 – December 31, 1941	T P. O. Mead A. N. Manucy	Theodore E. Bowers
1956	Elizabeth Bowers	

Table 2.2: Clement Lamprier Tract. Combined Properties Forming the Grove (Herold, *An Historical Survey of the Grove and Flagg Plantation Sites).*

In the decade leading up to the Civil War, the Daniel Island-Cainhoy brickyards were producing in excess of four million bricks a year.[12] The Civil War would bring that to an end, and no further documents would connect owners of the Grove with brick. The 1860 census described an extensive family residing at The Grove. The owner of the tract was sixty-three year old Edmund Ravenel, a planter, owned real estate worth $18,000, with a personal estate valued at $64,000. His family was composed of two women in their thirties, two women in their twenties, a nineteen year old student of medicine (Edmund), and a teenage girl (See Appendix Figure A-17) (See Appendix Figure A-19). Ten years after the war, the property was sold to William Ravenel. The frequent turnover of ownership resumes at this point, William Ravenel's occupancy lasting just over a decade. With the forfeiture of its workforce, the plantation was no longer as valuable as its pre-war era. Unlike other owners William Ravenel had other businesses within the city. The *Charleston City and General Business Directory* for 1855 lists, William Ravanel, at 16 East Bay Street

[12] Frazier, *Behind God's Back*, 58.

operated Ravenel & Company, factors and commission merchants. This was a potential venue for the sale of merchandise from The Grove.[13] Shortly after, from 1856 through 1860, merchant, William Ravenel, operated Ravenel & Company from his residence at 5 East Bay Street.[14]

Notations on the various grants, maps, and other documents display the tumultuous history of the surrounding. Boundaries constantly fluctuated, the Cainhoy area was in a state of constant flux. While the limits of St. Thomas Parish was constant, most of the surrounding landmarks for this site have undergone several name changes. Alterations through the 1900s can explain many of the features seen on the site today. These maps track the many changes on the property. The U. S. Geological Survey from 1919, Melgrove Quadrangle, showed manipulations of the land in the study area. As seen on USGS 1919 and Mills Atlas, Flagg Creek was then called Simons or Gibson Creek. Grove Creek was at one point Moreland Creek, and another portion of it was called Elevenmile Creek (See Figure 2.3). The boundaries of the Grove were clearly defined. Though shown as part of the Grove property, there appears to be little activity on the study site (See Figure 2.4) (See Appendix Figure B–2 for entire map).

[13] *Charleston City Directory 1855,* 87.
[14] *Charleston City Directory 1856,* 149.

Figure 2.3: Mills Atlas, Charleston District.

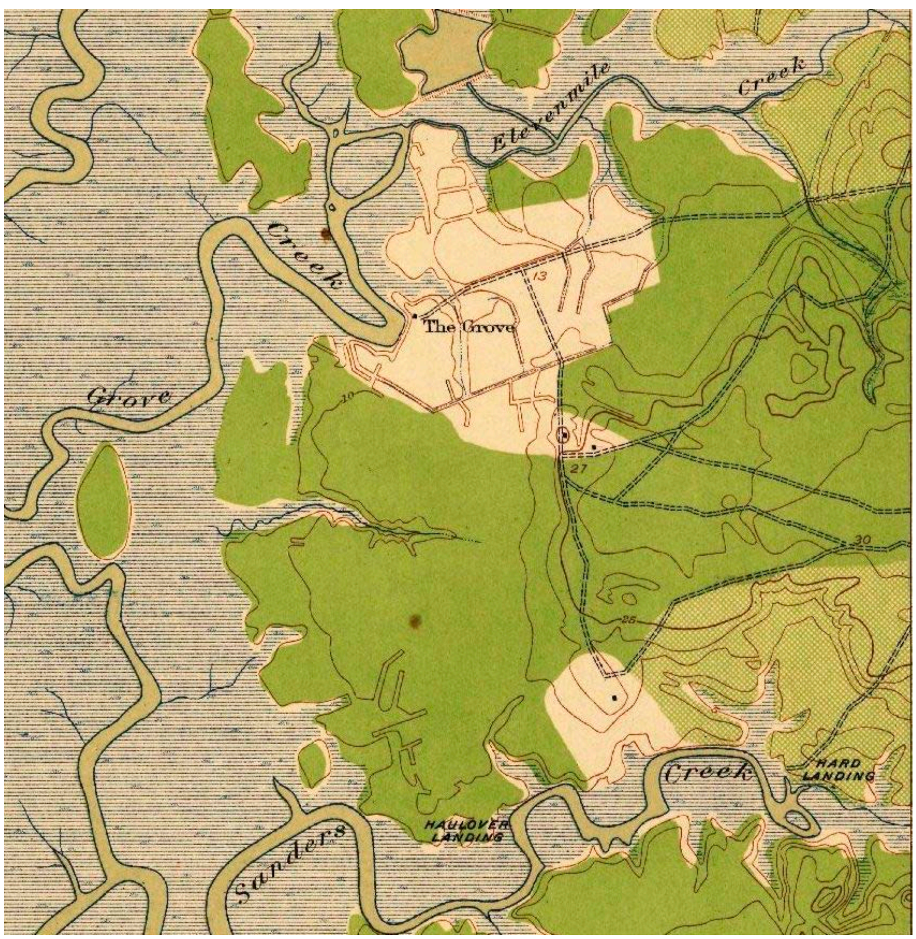

Figure 2.4: USGS 1919.

Just over twenty years later, in 1940, the U. S. Geological Survey, Melgrove Quadrangle displayed alterations throughout the rest of the property, while the study area saw little modification. While a road adjacent to the site was developed in the interim, indications in the topography lines in the 1919 map indicate some sort of path may have already been in place. This road, though segregating the area, does not traverse the site (See Figure 2.5) (See Figure B-3 for entire map).

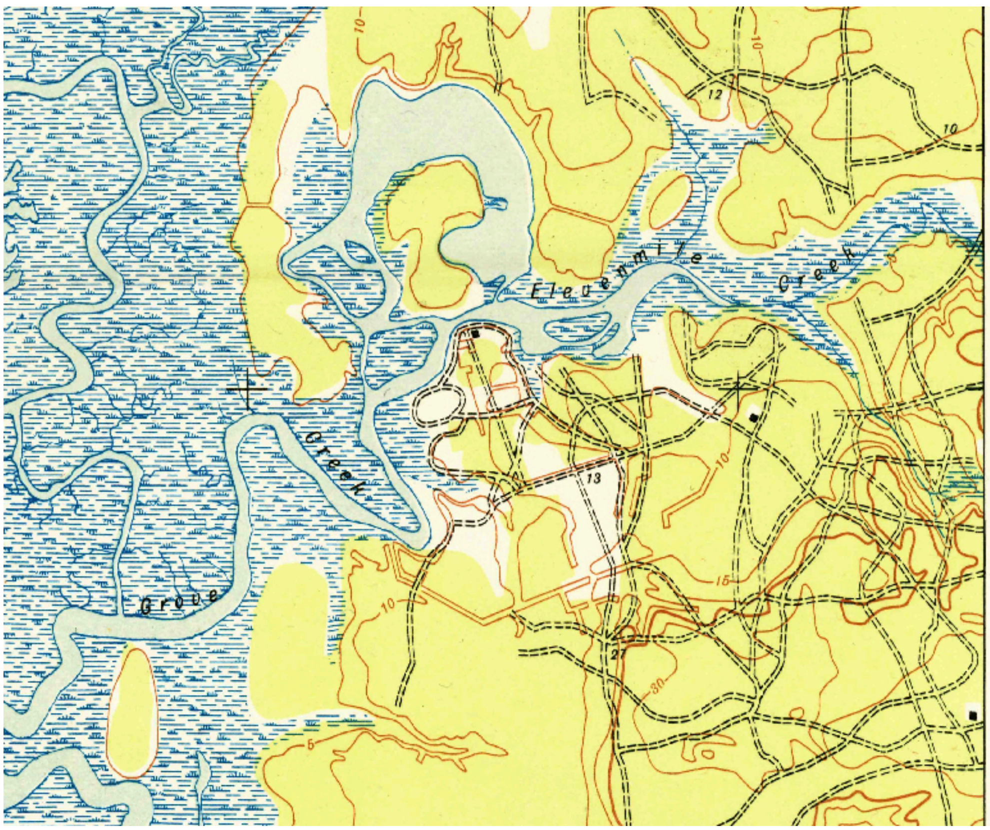

Figure 2.5: USGS 1940.

The USGS 1958 map shows the staging for what would eventually become the Amoco Chemical plant. The area between Grove Creek and Flagg Creek had undergone extensive alteration, but due to the isolated location of the study area, adjacent to a bend in Grove Creek, there is little impression on the study site (See

Figure 2.6). This aspect of the site is still seen today and has attributed to the protection of the area. The house that once sat on the property, moved as part of the Amoco purchase, is nothing but a memory of what was (See Figure 2.7) (See Appendix Figure B–4 for entire map).

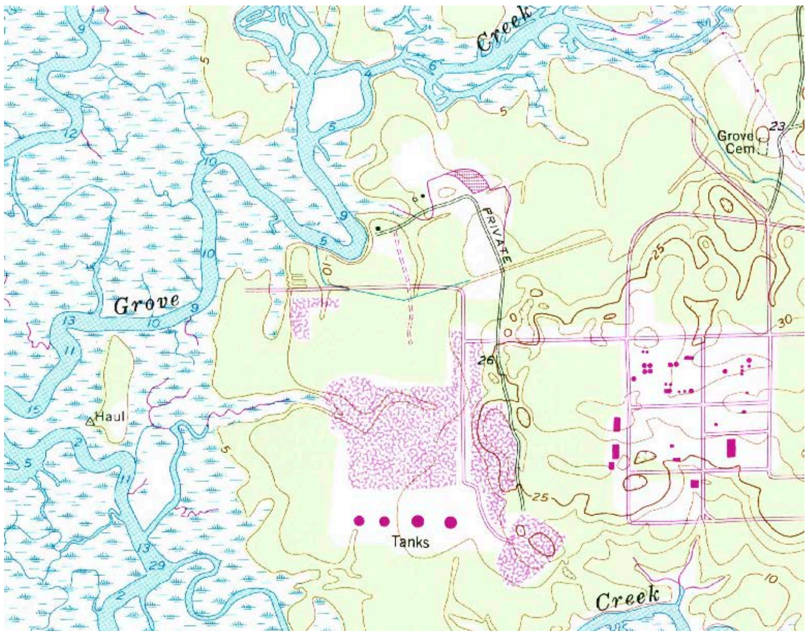

Figure 2.6: USGS 1958.

Figure 2.7: Grove House (Courtesy of Ernie Nelson).

CHAPTER THREE

CAINHOY, BRICKS, AND CHARLESTON

Brick was integral to Charleston. With the danger of fire and the destruction caused by the earthquake of 1886, producing brick was a profitable enterprise for many of the Lowcountry's plantations. In the history of Charleston brick making there were in excess of eighty brick production sites in the Charleston area. Of these, more than fifty were found to the east of the Cooper River, approximately two-thirds were along the river itself and its tributaries. Though brick was made since the colony's creation, the industry reached its height from the time of the Great Fire of 1740 to the start of the Civil War.[15]

Like many colonial towns the proximity of structures, extensive use of wood construction, and cooking and heating fires increased the risk of fire in Charleston. Over the course of its history, much of Charleston south of present day Calhoun Street has been devastated by fire (See Figure 3.1) (See Appendix Figure B–6 for entire map). [16] Through the mid 1700s and early 1800s Charleston was plagued by a series of fires which would eventually lead to laws requiring structures be built of

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[15] Linda F Stine, *Carolinas Historical Landscapes: Archaeological Perspectives,* (Knoxville: Univ Tennessee Press, 1997), 97, 99.;
Miles, *East Cooper Gazetteer*, 30, 15.

[16] Alfred O. Halsey, Halsey Map of Charleston 1949. South Carolina Room, Charleston County Library.

brick or masonry.[17] Brick proved indispensible to Charleston, as it was for many cities, a way to minimize the risk of fire.

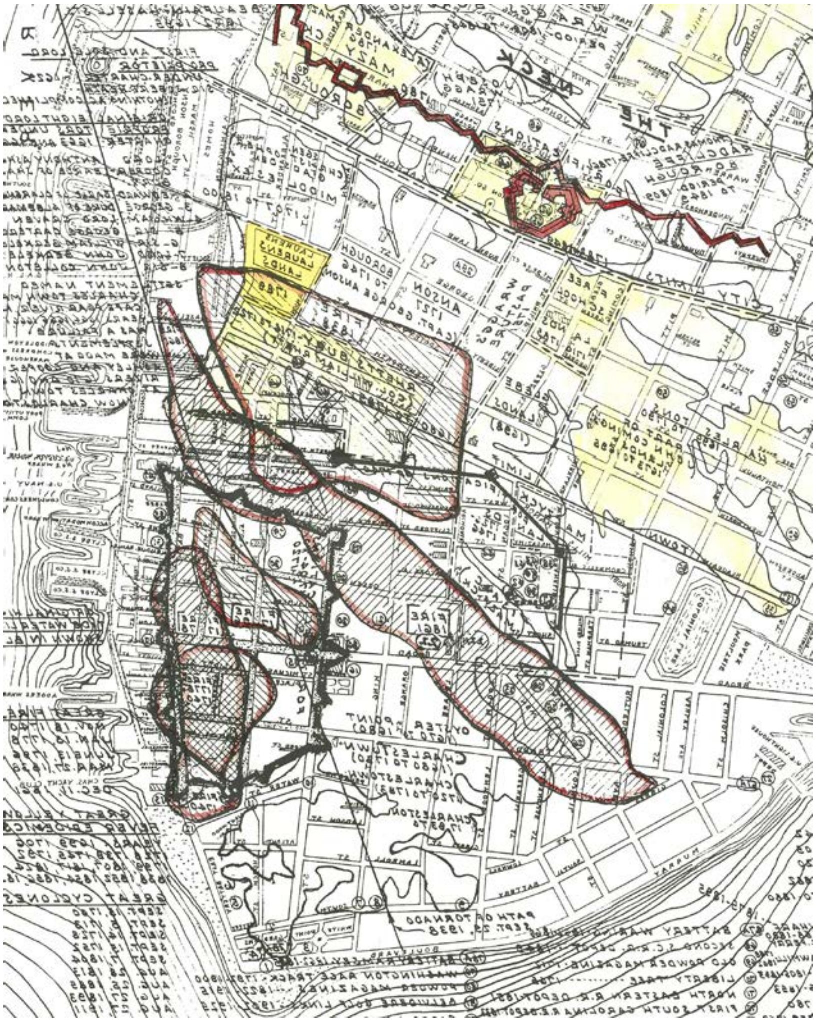

Figure 3.1: Halsey Map of Charleston. Fires on the Lower Peninsula.

Though the city made numerous adaptions to deal with the after effects of fire, the more significant actions were the preventative ones. The frequency and extent of fires in colonial cities lead many to create policies to limit the chances of fire and the degree of damage it could cause. Charleston and many of her contemporaries

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[17] Emma Hart. *Building Charleston: Town and Society in the Eighteenth-Century British Atlantic World* (Charlottesville: University of Virginia Press, 2009), 69.

regulated construction at this time, limiting the use of wood and encouraging brick or masonry construction. Laws such as Portsmouth, New Hampshire's Brick Act of 1814 required all new construction within the city to be of masonry construction.[18] Among the first of these laws was the Charleston Fire Act which created the demand for brick through two statements, first it stated that:

> And forasmuch as the Building with Brick or Stone is not entirely more comely and durable, but is also more safe against the future Perils of Fire…all Buildings hereafter to be erected or built in Charles Town be henceforth made of Brick or Stone, or of Brick and Stone together; and be covered with Tile, Slate, Stone or Bricks, except Doors, Door Cases, and Window Frames and Window Shutters.[19]

The act created a need for brick and stone. The Act also regulated prices for brick and masonry. It stipulated that no seller could:

> make the late Calamity a Pretense to extort unreasonable or excessive Prices or Wages…That no Person or Persons whatsoever, shall for the Space of Ten Years from the Passing of this Act demand, have, receive, or take any greater Sum or Sums that the several Rates and Prices hereafter appointed.[20]

The list of controlled prices described the brick choices available in Charleston. Of three brick types, those from Charleston were given the best advantage. Charleston brick were allowed to be sold for £5 per thousand. English brick, which had to be imported, was only permitted a price of £6 per thousand. New England bricks, which also required extensive transport, sold at £3 10s per thousand and marked

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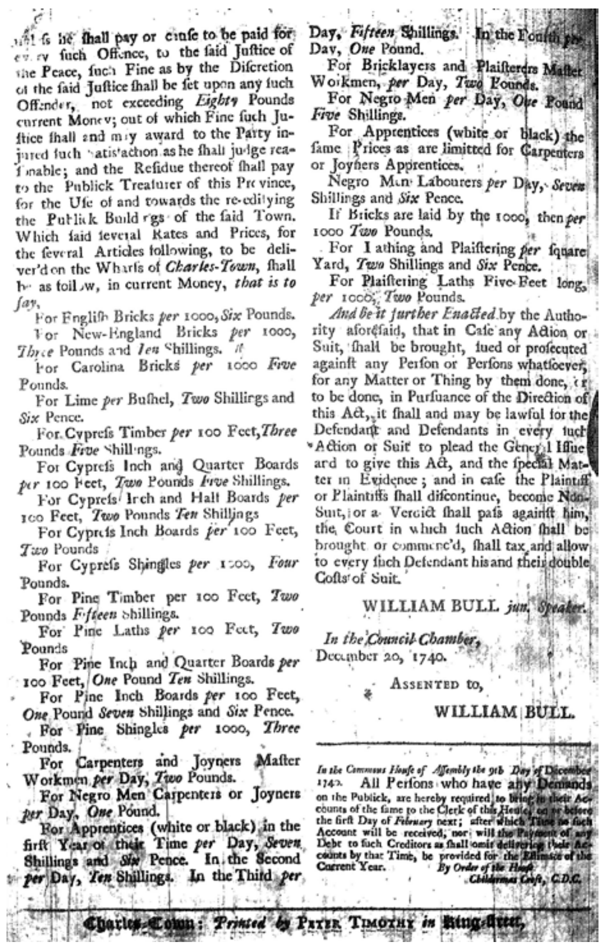
[18] Bernard L. Herma, *Town House: Architecture and Material Life in the Early American City, 1780-1830* (Chapel Hill: The University of North Carolina Press, 2005), 110.
[19] "Charleston Fire Act," South-Carolina Gazette Number 357, December 18, 1740.
[20] Ibid.

the lowest end of the price range (See Figure 3.2) (See Appendix Figures A-42 – A-45 for entire Act). These prices created a definite advantage for Lowcountry brick makers. With the shortest distance to transport their wares and at the upper end of the price range, local brick makers could achieve the greatest profits and discouraged the import from other locations.



...he ſhall pay or cauſe to be paid for every ſuch Offence, to the ſaid Juſtice of the Peace, ſuch Fine as by the Diſcretion of the ſaid Juſtice ſhall be ſet upon any ſuch Offender, not exceeding *Eighty* Pounds current Money; out of which Fine ſuch Juſtice ſhall and may award to the Party injured ſuch Satisfaction as he ſhall judge reaſonable; and the Reſidue thereof ſhall pay to the Publick Treaſurer of this Province, for the Uſe of and towards the re-edifying the Publick Buildings of the ſaid Town. Which ſaid ſeveral Rates and Prices, for the ſeveral Articles following, to be deliver'd on the Wharfs of *Charles-Town*, ſhall be as follow, in current Money, *that is to ſay*,

For Engliſh Bricks *per* 1000, *Six* Pounds.

For New-England Bricks *per* 1000, *Three* Pounds and *Ten* Shillings.

For Carolina Bricks *per* 1000 *Five* Pounds.

For Lime *per* Buſhel, *Two* Shillings and *Six* Pence.

For Cypreſs Timber *per* 100 Feet, *Three* Pounds *Five* Shillings.

For Cypreſs Inch and Quarter Boards *per* 100 Feet, *Two* Pounds *Five* Shillings.

For Cypreſs Inch and Half Boards *per* 100 Feet, *Two* Pounds *Ten* Shillings.

For Cypreſs Inch Boards *per* 100 Feet, *Two* Pounds.

For Cypreſs Shingles *per* 1000, *Four* Pounds.

For Pine Timber per 100 Feet, *Two* Pounds *Fifteen* Shillings.

For Pine Laths *per* 100 Feet, *Two* Pounds.

For Pine Inch and Quarter Boards *per* 100 Feet, *One* Pound *Ten* Shillings.

For Pine Inch Boards *per* 100 Feet, *One* Pound *Seven* Shillings and *Six* Pence.

For Pine Shingles *per* 1000, *Three* Pounds.

For Carpenters and Joyners Maſter Workmen *per* Day, *Two* Pounds.

For Negro Men Carpenters or Joyners *per* Day, *One* Pound.

For Apprentices (white or black) in the firſt Year of their Time *per* Day, *Seven* Shillings and *Six* Pence. In the Second *per* Day, *Ten* Shillings. In the Third *per* Day, *Fifteen* Shillings. In the Fourth *per* Day, *One* Pound.

For Bricklayers and Plaiſterers Maſter Workmen, *per* Day, *Two* Pounds.

For Negro Men *per* Day, *One* Pound *Five* Shillings.

For Apprentices (white or black) the ſame Prices as are limitted for Carpenters or Joyners Apprentices.

Negro Men Labourers *per* Day, *Seven* Shillings and *Six* Pence.

If Bricks are laid by the 1000, then *per* 1000 *Two* Pounds.

For Lathing and Plaiſtering *per* ſquare Yard, *Two* Shillings and *Six* Pence.

For Plaiſtering Laths Five Feet long, *per* 1000, *Two* Pounds.

And be it further Enacted by the Authority aforeſaid, that in Caſe any Action or Suit, ſhall be brought, ſued or proſecuted againſt any Perſon or Perſons whatſoever, for any Matter or Thing by them done, or to be done, in Purſuance of the Direction of this Act, it ſhall and may be lawful for the Defendant and Defendants in every ſuch Action or Suit to plead the General Iſſue and to give this Act, and the ſpecial Matter in Evidence; and in caſe the Plaintiff or Plaintiffs ſhall diſcontinue, become Non-Suit, or a Verdict ſhall paſs againſt him, the Court in which ſuch Action ſhall be brought or commenc'd, ſhall tax and allow to every ſuch Defendant his and their double Coſts of Suit.

WILLIAM BULL *jun. Speaker.*

In the Council Chamber,
December 20, 1740.

ASSENTED to,

WILLIAM BULL.

In the Commons House of Aſſembly the 9th Day of December 1740. All Perſons who have any Demands on the Publick, are hereby required to bring in their Accounts of the ſame to the Clerk of this Houſe, on or before the firſt Day of *February* next; after which Time no ſuch Account will be received, nor will the Payment of any Debt to ſuch Creditors as ſhall omit delivering their Accounts by that Time, be provided for the Eſtimate of the Current Year. *By Order of the House*
Childermas Croft, C.D.C.

Charles-Town: *Printed by* PETER TIMOTHY *in* King-ſtreet.

Figure 3.2: South-Carolina Gazette Number 357. December 18, 1740. Rates Dictated by the Charleston Fire Act.

While these values were to enable builders to comply with the new regulations, they also created a definite advantage for the brick makers of the surrounding Lowcountry. With the shortest transported distance and at the upper end of the price range, this allowed the local brick makers to achieve the greatest profits and discouraged the import from other locations. Furthering this disparity, the city's rates of wharfage, determined by state law in 1778, excused coastal vessels from some of the docking fees.[21] The same rates of wharfage list bricks among the common items brought to the city, whether from upriver or abroad, and charge the remarkably low price of 15.5 cents per thousand bricks (See Appendix Figure A–46). All of these factors furthered use of brick in Charleston and improved the prominence brick produced in the Lowcountry.

While the Charleston Fire Act regulated brick prices for a time, eventually the price of brick began to rise. By the late 1700s prices ranged from $4.00 to $7.00 per thousand depending on quality.[22] At the height of its operation, in 1854, Boone Hall Plantation would reach prices of over $8.00 per thousand bricks but this was with a mechanized molding process, not hand molding as was employed at the Grove.[23] These rates allowed many plantations to amass a fortune producing brick.[24]

"Rice was the money crop… for over two hundred years its characteristics and requirements molded Low Country life as nothing else did."[25] Though rice ruled, brick was an additional source of income for many plantations. King George's War,

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[21] R. S. Purse, *Charleston City Directory and Strangers Guide for 1856* (New York: J.F. Trow, 1856), 238.
[22] Lucy Wayne, *Burning Brick : A Study of a Lowcountry Industry* (Gainesville: University of Florida, 1992), 63.
[23] Ibid*.,* 69.
[24] Irving, *A Day on Cooper River,* 23
[25] Samuel Gaillard Stoney, *Plantations of the Carolina Low Country*. Edited by Albert Simons and Samuel Lapham (New York: Dover Publications, 1990).

1744-1748, created a decline in the rice industry, lowering demand and increasing shipping costs.[26] While the drop in rice prices spurred the planting of indigo on some plantations, others were not suited to indigo as a crop.[27] Brabant Plantation, which would later become part of the Grove, and the Grove were both rice plantations. Brickmaking was compatible with the rice crop as they were both seasonal productions, brick typically being burned in the winter and spring.[28] Plantations that produced both "enjoyed a sound economic mixture of agriculture and industry by making rice while the weather was hot and brick when it was cold."[29] Unlike rice, brick required little investment from the plantation as brickmaking did not require seed or similar purchases, as did crops and needed few hands to operate.[30] Rice remained the principal industry in St. Thomas & St. Denis Parish until the Civil War. In 1850, rice earned $119, 040 while brick produced considerably less income, $29,960. Comparatively, production at plantations on the Wando River in Christ Church Parish were more balanced with an income of $32,803 from rice and $34,160 from bricks.[31]

In the Cainhoy area, each brickmaking planter produced anywhere from 300,000 to 1,500,000 bricks annually, depending on the size of their enterprise.

[26] Hart, *Building Charleston*, 36.
[27] Wayne, *Burning Brick,* 35.
[28] Ibid*.,* 46.
[29] Samuel Gaillard Stoney, *Plantations of the Carolina Low Country,* 48.
[30] Wayne, *Burning Brick,* 65, 69.
[31] U.S. Census 1850.

Together these plantations produced more than 4.25 million bricks a year[32] (See Table 3.1). John Gordon, owner of the Grove from 1826 until 1835, fell in the middle of this range, producing 600,000 bricks yearly across his three plantations. This number may represents the lower range of his brick production capacity. By this time he had sold one of his brickmaking plantations.

Name	Capital Invested	Hands Employed		Wages/ Labor		Annual Products: Brick	
		Male	Female	Male	Female	Quantity	Value
John Sanders	$28,000	15	15	$105	$75	700,000	$4,900
John L. O'Hear	$20,000	11	11	$77	$55	580,000	$4,060
John Marshall	$45,000	30	20	$210	$100	1,500,000	$10,500
J.B. Gordon	$30,000	15	12	$105	$60	600,000	$4,200
J. Venning	$30,000	13	10	$91	$50	600,000	$4,200
G. Thompson	$10,000	7	-	$49	-	300,000	$2,100

Table 3.1: Brick Makers of St. Thomas & St. Denis Parish (Compiled from U.S. Census 1850. Brickmakers, Charleston).

The process of brick making was quite consistent across the Lowcountry with variations of clamp kilns found at most production sites. There is little evidence of progressions in technology at production sites. Though there were improvements throughout the 1800s in the mixing and molding processes of brick making, it is probable that brick makers in the Charleston area continued to use "the traditional

32 Ibid.

hand process" workforce of slaves.[33] Given that the industry did not survive the emancipation, there was no need to supplement the loss of workforce. "Of the many brickyards on the Wando and Cooper Rivers, only the one at Boone Hall was strong enough to survive the post-war depression."[34]

An archaeological survey evaluated brick making sites found along Horlbeck and Boone Hall Creek, once Palmetto Grove Plantation, using Andrew Ure's 1840 definition of a brick clamp:

> [The clamps are] made of the bricks themselves, and generally of an oblong form. The foundation is laid with the place brick, or the driest of those just made, and then the bricks to be burnt are built up, tier upon tier, as high as the clamp is meant to be, with two or three inches of breeze or cinders strewed between each layer of bricks, and the whole covered with a thick stratum of breeze. The fireplace is perpendicular, about three fee high, and generally placed at the west end; and the flues are formed by gathering or arching the bricks over, so as to leave a space between each of nearly a brick wide. The flues run straight through the clamp, and are filled with wood, coals, and breeze, pressed closely together. If the bricks are to be burnt off quickly, which may be done in 20 or 30 days, according as the weather may suit, the flues should be only at about six feet distance; but if there be no immediate hurry, they may be placed nine feet asunder, and the clamp left to burn off slowly.[35]

The kilns found at Palmetto Grove are this type of clamp kiln. Previous research has shown that it is often difficult to determine the extent to which the clamp kiln is used as they were typically dismantled and all of the produced bricks sold.[36]

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33 Eric C. Poplin, Kara Bridgman Sweeney, and Michael Patrick Hendrix, *Cultural Resources Survey and Testing at the Harper Tract, Berkeley County, South Carolina*, 38.
34 Suzannah Smith Miles, *East Cooper Gazetteer: People, Places, and Events in History*, (Charleston, S.C: History Press), 15.
35 Ure, *A Dictionary of Arts, Manufactures, and Mines,* 185.
36 Wayne, *Burning Brick,* 25.

Therefore the single-use clamp may have been more common in the Lowcountry. Lucy Wayne discusses this type of kiln and its relationship to the Wando River in her study, *Burning Brick*. Most of the clamps she discusses are of the semi permanent type found at the Grove. Two of these clamps were found on the Harper Tract on Beresford Creek in Berkeley Country. This property, which once belonged to Thomas Elfe, produced bricks in the late eighteenth and early nineteenth century. Further up the Cooper River, on the East Branch, lay Limrick Plantation. A 1755 inventory listed brick making tools including brick molds. It is not known how the hand-molded brick were burned at Limrick Plantation, but from the lack of evidence it is assumed they employed some type of temporary kiln or clamp. One of the best examples of the variations among these kilns is the site found at the Charleston Naval Weapons Station. This location contains examples of a semi-permanent clamp kiln, a brick and tile manufacturing kiln, and a scove kiln. [37]

Down the river from the Grove, above Daniel Island was Moreland, owned by John Moore. Suzannah Smith Miles cited a November 20, 1760 *Gazette* advertisement, "Bricks to be Sold, in any Quantity from 6,000 to several hundred thousand, by JOHN MOORE of St. Thomas Parish."[38] Given the timeline of brick production at the surrounding plantations it is feasible that brick production began at the Grove concurrently to its neighbors in the mid 1700s, but there is little evidence to substantiate this.

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[37] Poplin, *Cultural Resources Survey,* 177, 65, 50.
[38] Miles, *East Cooper Gazetteer*, 80.

The earliest record of brick making at the Grove is the 1829 Charleston City Directory which named John Gordon as a brick layer. Under John Gordon, the Grove's brick industry flourished. It was said that:

> The extensive brick-making on Cooper River was sometimes a very profitable second string to rice. One old lady, said to have been Mrs. Frost, advised by three successive dreams, turned to it as an industry, and like [John] Gordon, made a fortune.[39]

It is likely at this time that the change in molds occurred to compensate for the increase in production. Listings in the local directory showed a change in Gordon's social standing between 1829 and 1831 from that of bricklayer to that of planter indicating a significant increase in income. However, Gordon's enterprises were not limited to the Grove. He eventually owned Brickyard Plantation and Moreland, also along the Cooper River, and produced bricks on them as well. The Grove's neighbors likewise flourished (See Figure 3.3).

[39] Irving, *A Day on Cooper River,* 23.

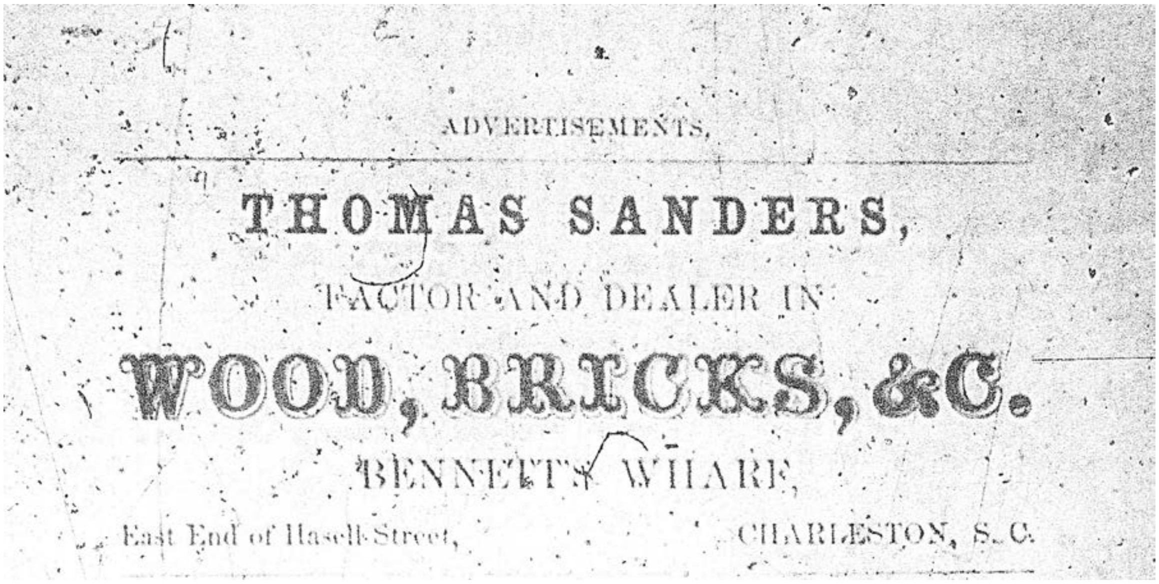

Figure 3.3:Brick Advertisement (Charleston City Directory 1856).

None, however, produced bricks on the scale of John Horlbeck of Boone Hall Plantation. Conflicting from the pattern set forth by other Lowcountry brick makers, the Horlbecks procured a brickmaking machine. Though there are records that some plantations along the Cooper River were considering mechanization as well, only Horlbeck produced a quantity that indicated such a purchase (See Table 3.2).[40] In the decade leading up to the Civil War Horlbeck averaged 2,510,885 bricks produced annually.

[40] Wayne, *Burning Brick,* 59.

Name	Capital Invested	Raw Material			Hand Employed		Wages/ Labor		Annual Products: Brick	
		Kind	Quantity	Value	Male	Female	Male	Female	Quanty	Value
Daniel Legare	$7,000	Pine	70 cords	$135	7	7	$7	$5	70,000	$500
John Horlbeck	$75,000	Wood	3,500 cords	$5,250	50	35	$50	$75	4,000,000	$28,000
	-	Coal	200 tons	$1,400	-	-	-	-	-	-
T.H.I. White	$17,500	Wood	600 cords	$900	13	17	$91	$60	700,000	$5,600

Table 3.2: Brick Makers of Christ Church Parish. (Compiled from U.S. Census 1850. Brickmakers, Charleston).

The disparity in production output suggests that brick making process at John Gordon’s properties never included that of any steam powered machinery (See Table 3.3). This is corroborated by evidence found at the site. Few metal have been found in the layout of the production area or in the surrounding vicinity. This indicated that little, if any, forms of mechanization were used. While Gordon’s production output is comparable to similar hand molding operations in both Christ Church and St. Thomas & St. Denis Parishes, it does not achieve the yield of known steam powered operations such as that of John Horlbeck.

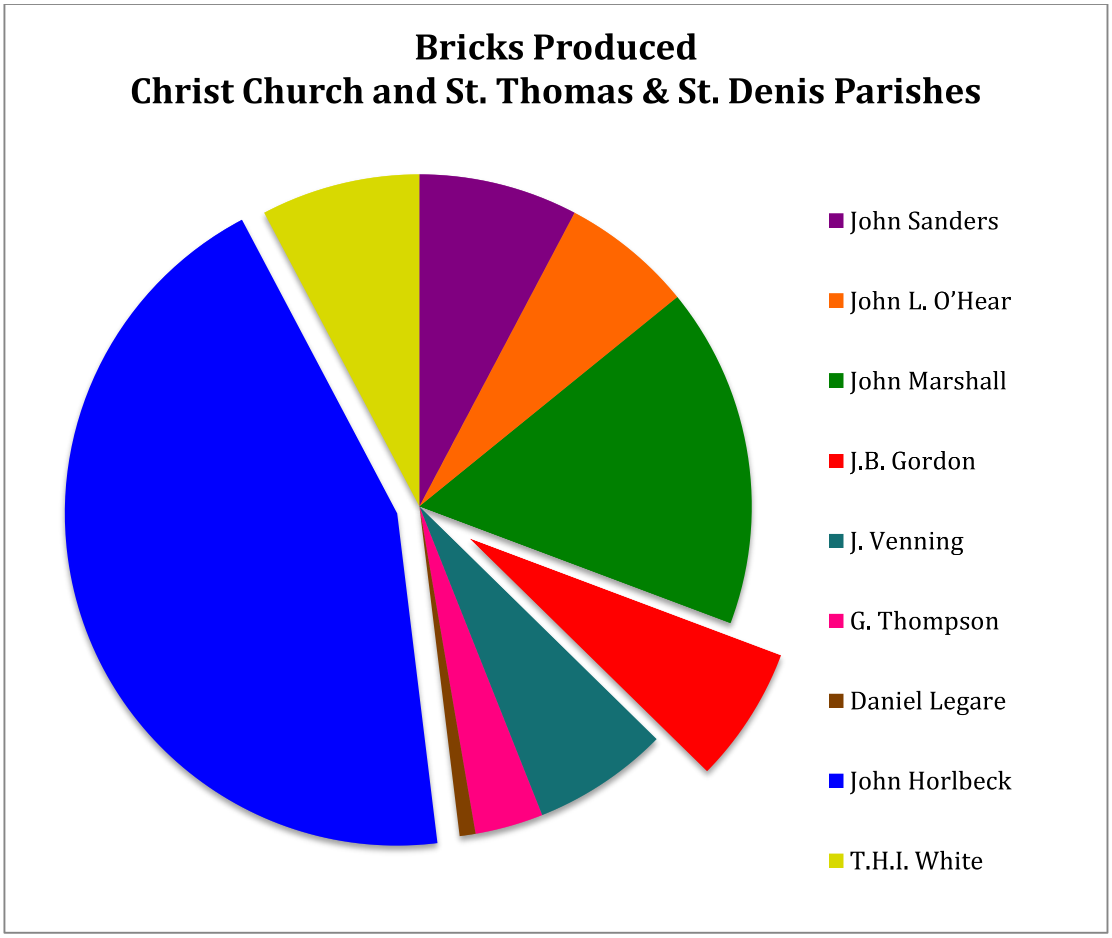

Table 3.3: Bricks Produced- Christ Church and St. Thomas & St. Denis Parishes (U.S. Census 1850).

Though the brick industry would become crucial to Charleston and the Lowcountry, with the exception of Boone Hall Plantation, it would not survive the depression following the Civil War. With the loss of slaves as a workforce and the lack of mechanization to supplement that force the majority of brick making sites could no longer function. The industrialization of the brick industry outside of Charleston produced better brick at a lower price that the Lowcountry brick makers could no longer match.[41] Since Boone Hall Plantation had supplemented its

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[41] Ibid., 60.

production with machinery its production was able to continue for a time. Other sites, such as the Grove, would be left to ruin.

CHAPTER FOUR

BRICKMAKING PROCESS

The process of brickmaking employed at the Grove is known as clamping. In this method, the bricks are not placed into a kiln but into a clamp or scove kiln[42] (See Figure 4.1). This method is where there the bricks themselves form the structure where they are burned. The clamp may be located at ground level or below grade to contain the heat. The entire structure is usually temporary, though in some cases the passages which form the firebox and the depression in the ground where the bricks are place remain as permanent structures. The production process discussed here is limited to that used at the Grove (See Figure 4.2).

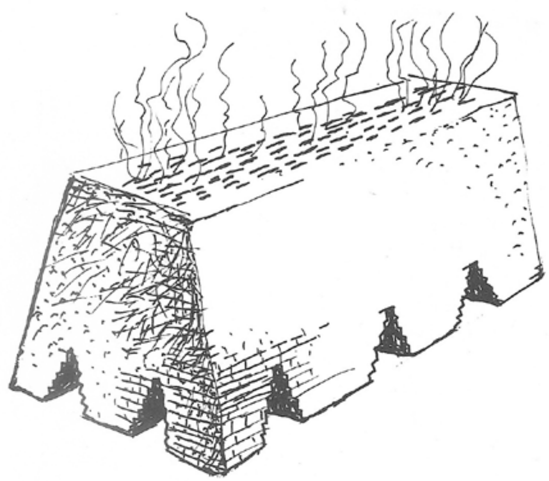

Figure 4.1: Scove Kiln (Rhodes, *Kilns*, 44.)

[42] D. Rhodes, *Kilns: Design, Construction, and Operation* (Philadelphia: Chilton Book, 1968), 44.

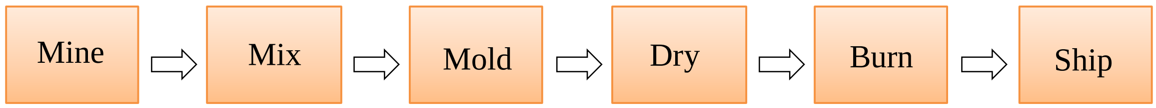

Figure 4.2: Brick Production Process

There are several types of clay used in brick making. These are distinguished by their physical characteristics and are found at varying depths. Surface clay is the most easily available due to its shallow depth. While all clays have a similar chemical makeup, this clay has a high oxide content at 10 to 25%. Shale clay is a harder, denser variety which makes mining more difficult. Its oxide content is similar to surface clay. Fire clay is most difficult to excavate as it is found at greater depths than the others. This clay's oxide content is considerably less at 2 to 10%, and it typically includes fewer impurities.[43] Surface clay is the focus of this study as it is the variety of clay most commonly used due to its accessibility. This source of clay can be mined by hand in long, shallow pits known as borrow pits and would match the evidence found at the Grove (See Figure 4.3). Much of the knowledge of the clay used for brickmaking in the Lowcountry is derived from the thesis of Lucy Wayne.

There are five distinct types of clay in the Carolina Lowcountry: sandy clays, clayey sands, rich clays, marls, and vitreous clays. Sandy clay has a low shrinkage rate and high bonding strength due to the sand content. It is an excellent source for brickmaking. Rich clays produce a strong brick, but have a higher rate of shrinkage caused by the high clay, low sand content. Marls contents are variable and therefore not used alone but are used as an additive to other clays to strengthen and change

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[43] Christine Beall, *Masonry Design and Detailing Sixth Edition* (New York: McGraw-Hill Professional, 2012), 10.

the final color.[44] These different types of clays are typically found at different elevations. Wayne states that typically:

> The sandy clays and clayey sands are found at elevations above 10 feet on sandy knolls and ridges in the pine flatwoods. They range in color from a mottled orange- yellow-brown-white sandy clay to a cream-colored to brown clay. Rich clays and marls are found below 10 feet in elevation in the flat swamplands and bottomlands along the rivers and creeks. These clays are generally dark brown to olive-green in color, grading down to marls. [45]

Microscopic analysis showed that the clay found at the Grove is primarily sandy clay with some rich clay. The sandy clay and rich clay was evaluated in the physical analysis of the clay samples, discussed in Chapter Six. A combination of these types on site explains the chaotic mining patterns found at the site. The terrain around the production area varied to include lower swamplands and higher sandy knolls making mining difficult. Since the sandy clay was more desirable, extraction had to be careful to retrieve the preferred material.

Figure 4.3: Clay Pit (Carson, *The Chesapeake House: Architectural investigation by Colonial Williamsburg.* 242).

[44] Wayne, *Burning Brick*, 72.
[45] Wayne, *Burning Brick*, 73.

Historically, clay could be tempered in one of three ways, by hand, by pug mill, and in a ring pit.[46] Pug mills and ring pits could be either horse or steam driven, but as no evidence of a steam engine has been recovered, only the horse driven mechanisms are discussed here. When mixing clay by hand, clay and water would be alternatingly be added into a pile until enough clay to produce two thousand three hundred and thirty-three bricks has been tempered, this is referred to as a "soak heap."[47] The clay is then mixed with water and hoed until homogeneous. Unlike when tempered in pug mills or ring pits, no pressure is applied to the clay when mixed by hand, which results in more porous bricks.

Pug mills were used by the Dutch as early as the seventeenth century. A pug mill or hopper consists of a wood or iron tub which fed into a shaft with rotating blades and is typically horse driven. The blades turn within the shaft, mixing and extruding the clay through the shaft (See Figure 4.4). The extruded mass of clay could then be cut and molded into brick.[48] Clay would be run through the mill several times before being properly tempered. When powered by horses, the pit around the mill can be large enough to hold enough clay for seven thousand bricks. This pit would be semicircular, approximately eight feet in diameter from the mill

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[46] Charles Davis, *Practical Treatise on the Manufacture of Brick, Tiles and Terra-Cotta,* (Philadelphia: H.C. Baird &. Co. 1895), 106.
[47] Ibid., 107.
[48] Martin Hammond, *Bricks and brickmaking,* (England: Shire Publications, 1981), 5.; Davis, *Practical Treatise,* 109.

shaft, and four feet in depth. It should be enclosed by a brick wall and have a wooden base.[49]

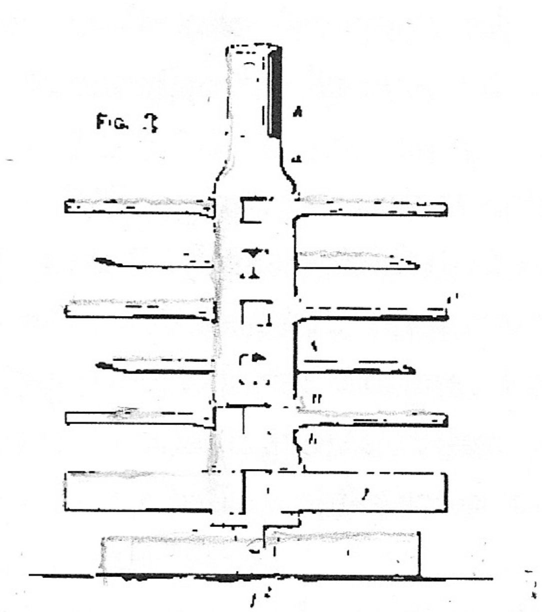

Figure 4.4: Shaft Section of Pug Mill (Davis, *A Practical Treatise,* 110).

An extruder functioned as an extension of the pug mill. Clay from the mill was fed through a die and extruded as a bar of clay. This bar was then sliced into bricks by blades or wire cutters. These machines could vary in size and function. Earlier models had a manually operated blade that the operator used to slice the individual bricks. Later machines could simultaneously cut multiple bricks at once using wire cutters. Eventually, models became a much larger scale and were steam powered (See Figure 4.5).[50]

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[49] Ibid., 112.
[50] James Campbell and William Pryce, *Brick: A World History* (London: Thames & Hudson, 2003), 208.

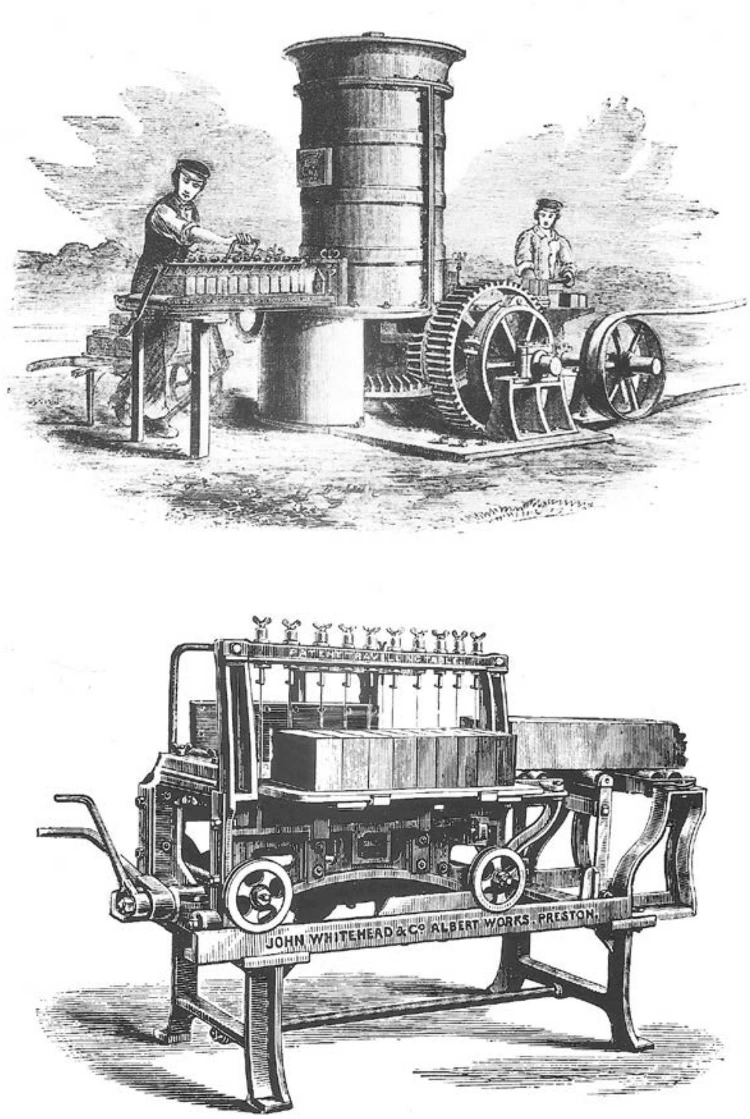

Figure 4.5: Clay Extruder (Campbell, *Brick: A World History*, 208).

A ring pits were "about twenty feet in diameter, two feet deep, and hold clay sufficient to make fourteen thousand bricks; they are cased around with hard-burned bricks, and the bottom is usually covered with oak planks."[51] A wheel is attached to a pole, projecting from a center shaft (See Figure 4.6). As the pole is rotated around the shaft, the wheel mixes and tempers the clay.

[51] Davis, *A Practical Treatise,* 115.

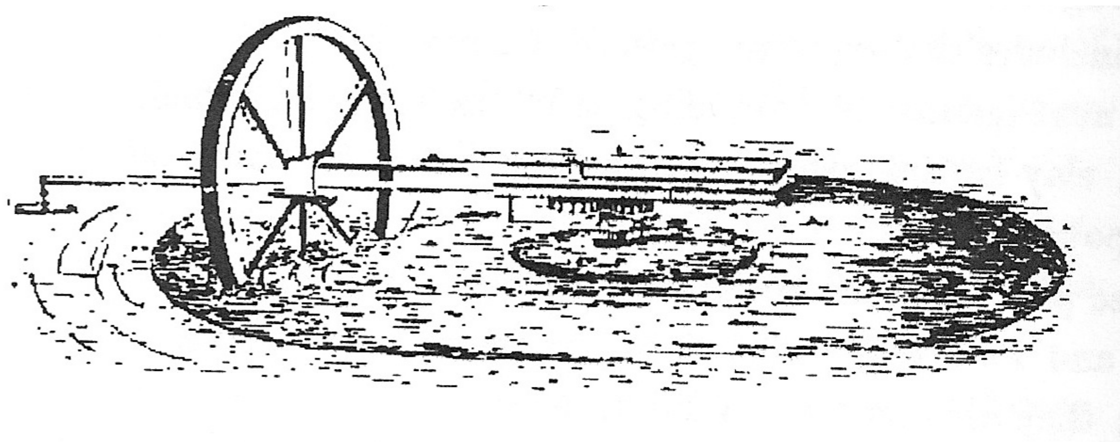

Figure 4.6: Ring Pit (Davis, A *Practical Treatise,* 116).

Hand molding bricks can be done by a variety of methods. Those made at the Grove are believed to be slop molded. A wooden mold is dusted with sand. The clay is kneaded with sand to form a warp which is then thrown into the mold (See Figure 4.7). The excess is cut off. The mold is then overturned and the formed brick is removed and taken to dry.[52] Later cast-iron molds were developed which made the process slightly easier. The molds were open at the top and bottom which assisted in the removal of the formed brick (See Figure 4.8).

[52] Hammond, *Bricks and Brickmaking,* 11.

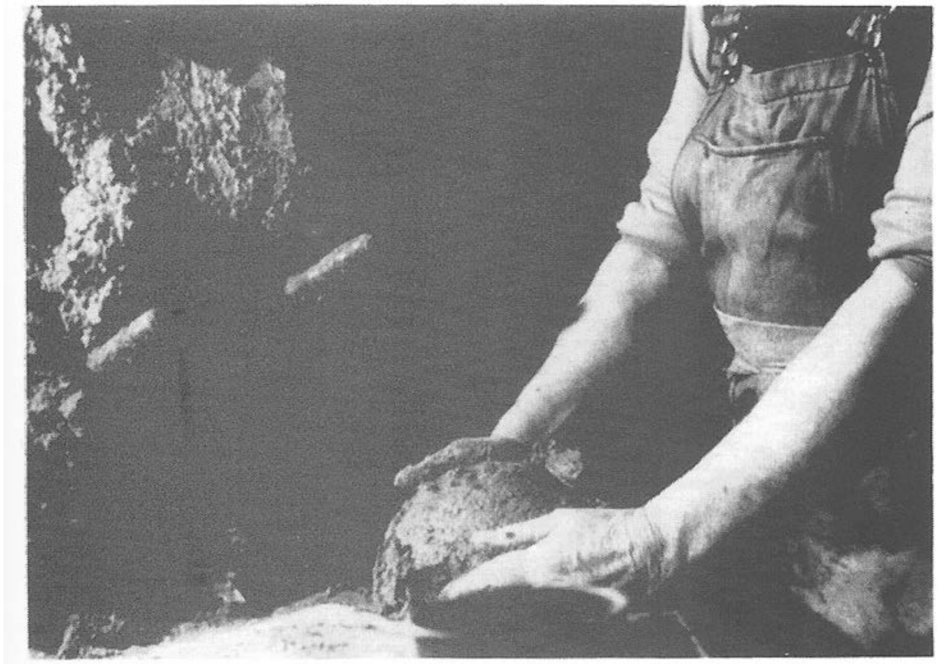

Figure 4.7: Hand Molding (Hammound, *Bricks and Brickmaking,* 11).

Figure 4.8: Molding Shed (Gerard Lynch. *Brickwork: History, Technology and Practice: v.1&2*. (London: Routledge, 2013) 18).

Bricks must first air dry before being placed into the clamp for two reasons. First, this drying prevents the bricks from fracturing when the excess moisture turns into steam. Secondly, since the construct is made of the bricks themselves, they must be able to support themselves. Each layer must carry the layers above. "All brickmakers will admit that the brick must be dry enough to stand the pressure of about fifty brick, or about three hundred pounds to the brick on edge."[53] Previously, bricks had been laid out in the sun and air dried, but this was an extensive process and left the bricks vulnerable until dried (See Figure 4.9). This lead to the use of drying sheds, or hacks, a covered structure that allowed the bricks to air-dry while protected from the weather.[54] Bricks would be placed on a framework that would allow air to circulate without the bricks being damaged.[55] The implementation of drying sheds allowed the bricks to dry slower and on each side equally, which would produce a stronger brick.[56] Despite the protection from the elements, drying in the hack was still dependent on the weather and could range from seven days to six weeks.[57]

[53] J.W. Crary, *Sixty Years a Brickmaker a Practical Treatise on Brickmaking and Burning and the Management and Use of Different Kinds of Clays and Kilns for Burning Brick : With a Supplement for New Beginners in Brickmaking, and Hints to Bricklayers and Builders* (Indianapolis: T.A. Randall, 1890), 54.
[54] Cary Carson and Carl R. Lounsbury, *The Chesapeake House: Architectural Investigation by Colonial Williamsburg* (Chapel Hill: The University of North Carolina Press, 2013), 242.
[55] Davis, *Practical Treatise,* 129.
[56] Crary, *Sixty Years a Brickmaker*, 7.
[57] Beall, *Masonry Design and Detailing*, 14.

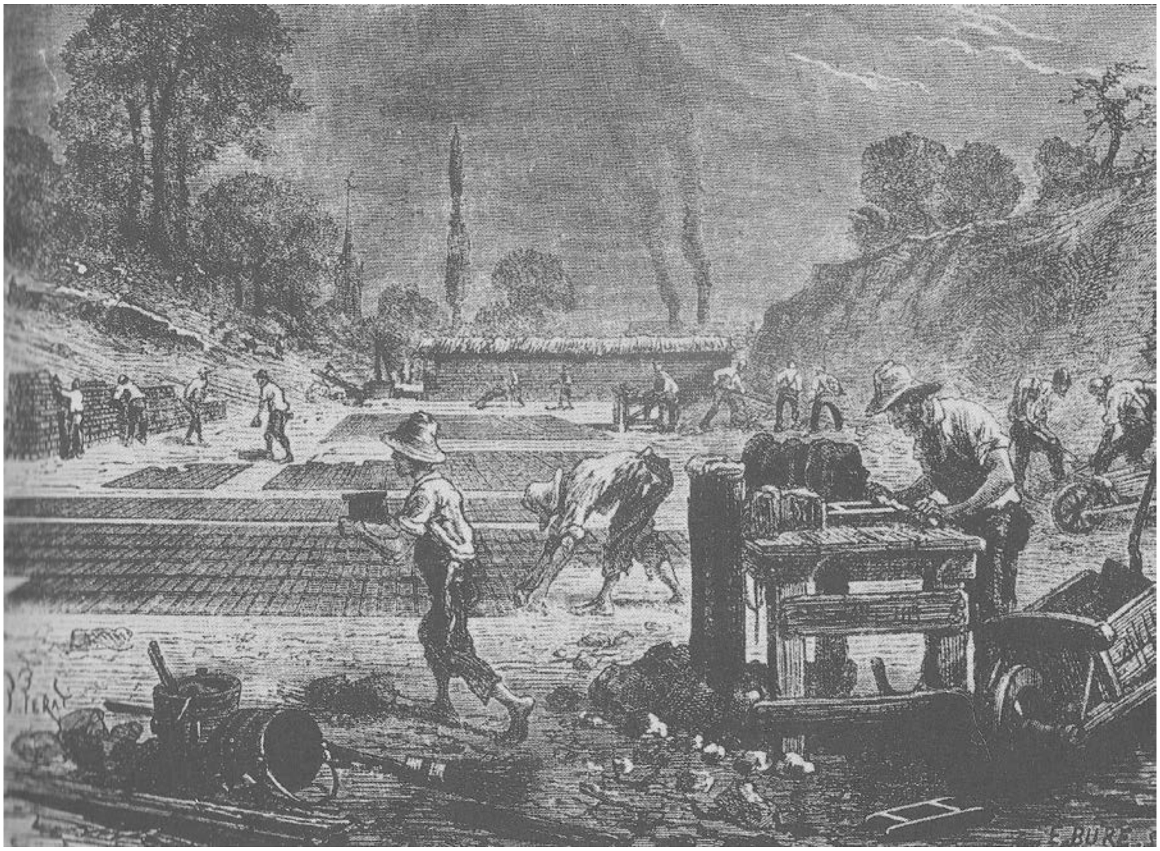

Figure 4.9: Work Yard (Beall, *Masonry Design and Detailing,* 15).

Bricks are then placed into the clamp, which is a method of firing bricks without a kiln structure.[58] A clamp is a long rectangular construct crossed by parallel passages which contain the fuel for the fires. The green bricks are stacked leaving parallel passages for the fires. Some operations comprised the entire structure of green brick, which is stacked into the form, burned, and disassembled to be shipped and stored. In some sites however, a thin framework of burned bricks is left after the process, these are the passages or fireboxes. These passages are left after each use and reused with each subsequent burn cycle. In this case the interior arch of the firebox is glazed to protect the bricks being fired. Gaps are left between the stacks of

[58] Rhodes, *Kilns*, 44.

green bricks to allow air and heat to circulation (See Figure 4.10). The clamp can be at ground level or below grade. When located at ground level, the outer layer is covered with clay and straw to contain the heat.[59] With clamps located below grade, the earth itself is used to retain the heat of the burning process, and the green bricks that are above ground level are similarly covered with clay and straw. By reusing the firebox passages, the number of clinker bricks is reduced. “Clinker” bricks occur when uneven firing hard-burns those bricks closest to the fire.[60] Uneven firing causes multiple problems in the production of bricks. While excessive heat creates clinker bricks, underburned bricks are know as “salmon” bricks due to their light color. Salmon bricks occur at the top of the clamp stack where the heat from the fire does not reach. Though clinker bricks can be used for decorative purposes, most salmon bricks are often unusable due to their softness.

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[59] Rhodes, *Kilns*, 44.
[60] Beall, *Masonry Design and Detailing*, 16.

Figure 4.10: Clamp, Below Ground Example. Jamestown, Virginia (Lucy B. Wayne, Burning Brick, 89).

Once the green bricks are stacked, the fires are lit from either end and built up until the entire firebox is lit. Bricks can be burned using either coal or wood for fuel. Coal is preferred in urban areas because of the scarcity of wood.[61] In an area such as Cainhoy wood was more accessible, therefore preferred over coal. The fires are maintained for five days until the smoke changes in color, and the fire is seen through the top of the bricks. At this point the bricks begin to shrink or "settle." The fire is increased to raise the temperature. This is when the iron oxide is converted to peroxide and is referred to as when "the bricks are to be painted red."[62] After the

[61] Davis, *A Practical Treatise*, 144.
[62] Davis, *A Practical Treatise,* 146.

fires are “burned off” the bricks remain as they are for another five days to cool and finishing settling (See Figure 4.11).

Figure 4.11: Clamp, Above Ground Example (“Trading Secrets: A Different Kind of Baking Project Bricks”).

The temperatures reached by the fires and the bricks they burn determines the outcome of the finished brick. Vitrification occurs when the temperatures are high enough to liquefy the silicates in the brick, fusing it together (See Table 4.1).[63] A larger range for vitrification is preferred as it makes the firing process more easily controlled. Clays that include high quantities of iron, alkalies, and alkaline earths will suffer from extensive shrinking during the firing process, these elements also

[63] Beall, *Masonry Design and Detailing,* 512.

cause a smaller vitrification range.[64] In order to combat this shrinkage, large amounts of sand are added to the mixture. Typically, the percentage of sand can range anywhere from 20-60%, depending on the amount needed to combat shrinkage. Higher quantities of sand require higher temperatures to vitrify and can result in more "clinker" bricks.

Dehydration, removal of remaining moisture	300 - 1,800˚F
Oxidation	1,000 - 1,800˚F
Vitrification	1,600 - 2,400˚F

Table 4.1: Burning Temperatures (Beall, *Masonry Design and Detailing*).

This process will be used to interpret the site at Grove Creek and determine what features of the landscape are relevant to the brick making process. Many of these elements can be clearly seen on the landscape, while others are inferred from what is still in existence. To understand the site, it must first be determined what features of the landscape are relevant.

[64] Haydn H. Murray, *Applied Clay Mineralogy: Occurrences, Processing and Applications of Kaolins, Bentonites, Palygorskitesepiolite, and Common Clays* (Oxford: Elsevier, 2006), 152.

CHAPTER FIVE

SITE ANALYSIS: DESCRIPTION

The site of the brick clamps on Grove Creek provided easy access to the resources needed for brick production. Sand, clay, and water were present within the nine and one-half acres site located along a bend of Grove Creek approximately three quarters of a mile from the Cooper River. The site is bounded by Grove Creek on the north. On the west, an inlet of marshland runs from the creek and terminates in low-lying topography prone to ponding. The south boundary is an access road, constructed in the 1970s. The east boundary is another low-lying area, usually retaining water.

Within the study area is a clearing along the northern boundary (See Figure 5.1). The clearing contains a series of ruins. This space is composed of the remains of a structure, approximately fifty feet by forty feet. Only portions of walls remain, the tallest reaching no more than three feet in height. Within this area are eight foundations, a twelve feet by twenty-four feet depression, a two and one-half feet by six feet depression, and a well approximately three feet in diameter. Several large trees including magnolias, with a diameter exceeding three feet at ground level, are located within the wall fragments. Core samples taken from loblolly pines adjacent to the wall fragments disclose its age to be approximately eighty-three years (See Appendix Figure A–32). Outside of the structure to the south is a large depression. A second well sits to the north.

Figure 5.1: Boundaries with Clearing Area (Trimble Outdoor Navigator)

This ruin, labeled Structure A, is composed of several forms both above and below grade. A grid has been overlaid for the purpose of this study to aid in the description of the structure. This grid is based on the orientation of the structure, not a north-south orientation, which is approximately 40° east from true north (See Figure 5.2). The most prominent section of the structure, A-A, is an exterior, above grade form. It ranges from three feet high to grade level, with a width of one foot, ten inches. Both ends are finished with closer bricks, creating a section seven feet, two inches in length (See Figures 5.3). As seen in other sections of the building, the mortar is soft with oyster shell as aggregate (See Appendix Figures A-51 – A-52). The section has extensive vegetation growing on its surface and within eroded mortar joints.

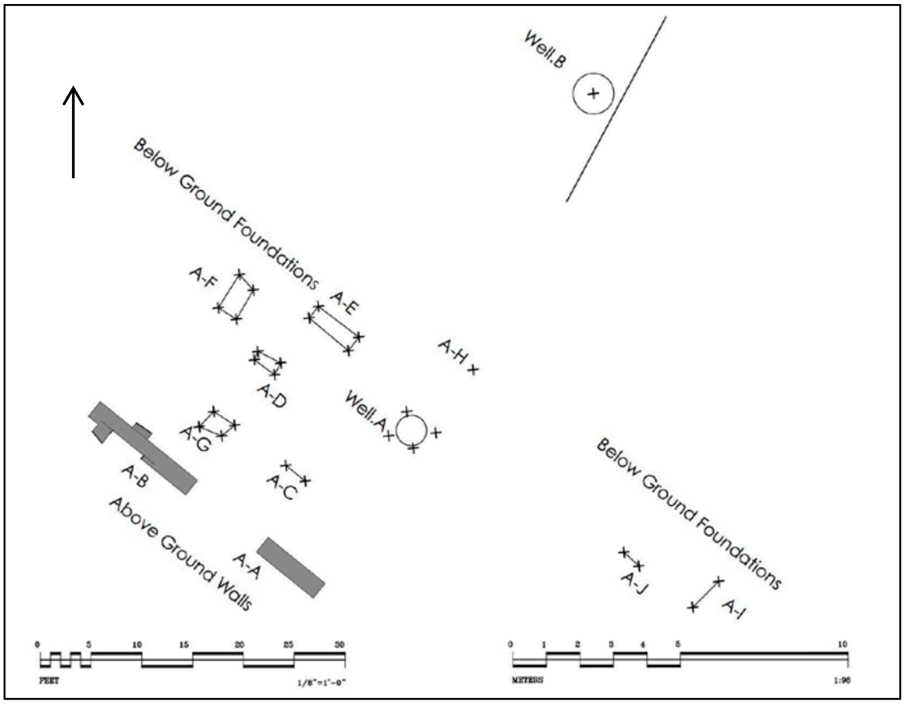

Figure 5.2: Building Layout, Sections of Structure A.

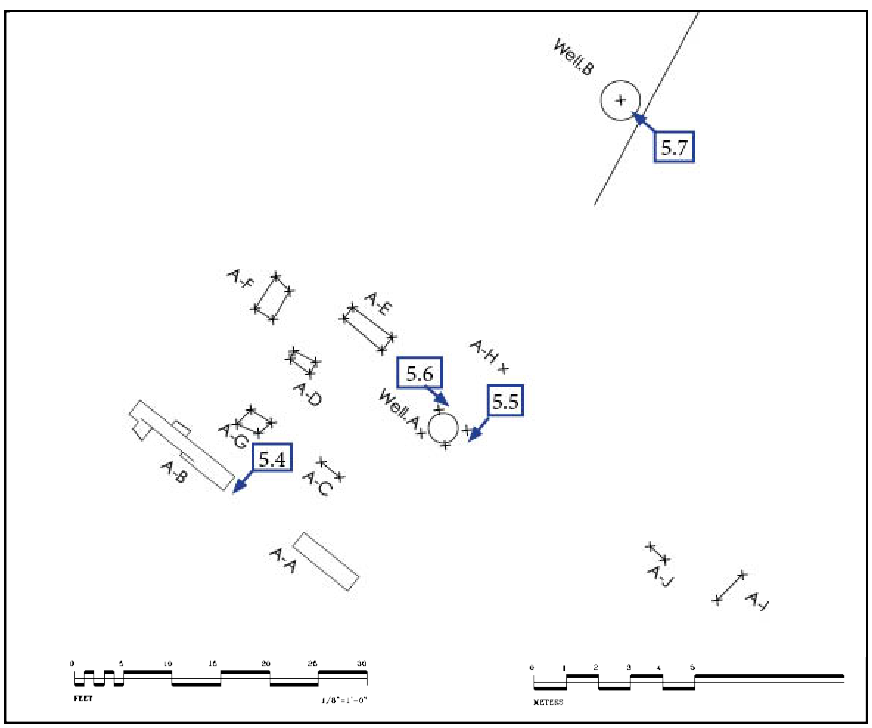

Figure 5.3: Key to Photographs in Figures 5.4 – 5.7.

To the west of A-A, after an opening of approximately nine feet is section A-B, which is barely visible above grade. This section is similar in width, averaging one foot, ten inches. Unlike the previous section, A-B is finished on one end only, that facing A-A (See Figure 5.4). Its length stretches visibly twelve feet, three inches before disappearing below grade. At two points bricks protrude from the main section, one to the north, the other to the south. But these branches extend no more than two courses away from the main section.

Figure 5.4: A-B (Photo Frances Pinto).

Inline with the north protuberance of A-B is section A-F. It is postulated that this section is part of another exterior wall. Only a small fragment, three feet, six inches in length is visible before returning below grade. Unlike A-B however, A-F averages two feet in width and all edges are poorly defined. Under the postulated plan for Structure A, this section forms the western most wall of the structure. Within the area of the structure are four more sections, all at or below grade. Section A-C begins parallel to the west most end of A-A. It is below grade and has large roots from an adjacent tree growing over its top so that only one edge is visible. Two feet, four inches of that edge are visible before receding below ground. Section A-G is at grade level and lays in line with the edge of A-G and parallel to A-B. This form is approximately one foot, ten inches in width and two feet, six inches in length. Also parallel to A-B are sections A-D and A-E. These forms are both at grade. The visible area of A-D is one foot, five inches in width and two feet, six inches in length. Section A-E is slightly larger at one foot, seven in width and five feet in length. Only fragments of the remaining elements to the structure have been located and currently exist as single points on the site plan. Sections A-H, A-I, and A-J are pieces of wall segments currently beneath earth mounds and tree roots and are scarcely visible (See Appendix Figure A - 53).

Southwest of the structure is a large depression. This is approximately seven feet deep and averages twenty feet in diameter. The base of the pit is clay and typically holds water even when the rest of the site is dry. To the north of A-J is another shallower depression, approximately four feet deep. This depression is at approximately fifteen feet wide and twenty feet in length.

Well A lies within the boundaries of Structure A (See Figures 5.5 & 5.6). The opening is three feet in diameter and is bordered with one course of bricks, now below grade. Currently the well has filled in with dirt and debris, its depth reaching less than three feet. The interior walls retain most of their original integrity and exhibit little damage. The well has suffered some mortar loss which has allowed for the growth of vegetation within the mortar joints.

Figure 5.5: Ruins of Structure A, Section A-A, and Well A (Photo Frances Pinto).

Figure 5.6: Well A (Photo Frances Pinto).

Well B is situated outside the margins of Structure A. Unlike Well A, Well B suffered damage from a fallen tree which is positioned over the well's opening. This tree, presumably felled during Hurricane Hugo, still grows from its horizontal situation, its branches now growing vertically (See Figure 5.7). This well is also quite shallow, due to the south wall caving in as well as from other dirt and debris. Recently it has also suffered brick loss from the north wall.


Figure 5.7: Well B (Photo Frances Pinto).

Adjacent to the same tree situated over Well A is Clamp A. The fireboxes, which are now seen as passages, are well below ground, their base sitting approximately four feet below grade. All that is seen above ground is a narrow hole in the terrain, four feet in width, and four feet four inches in length. Due to their depth, little of the passages can be seen without the use of a borescope (See Appendix Figure A - 54).

Within the clearing as well as on the surrounding trails are several trees which have fallen over. These trees were unearthed during Hurricane Hugo in 1989. Most of these trees are still alive, their branches now growing upward from horizontal trunks. The roots of the trees hold masses of clay and bricks which have been relocated when the trees fell. This displacement has exposed voids in the earth and the openings of passages which run underground. The passages run parallel to each other and the adjacent creek. At present three passages have been identified with two other possible that have yet to be confirmed.

One of these fallen trees unearthed the top of Clamp B, now the most visible element of the clamps. The gap between the passage openings is four feet wide and five feet lone. Set below ground, the base of the passage is two and a half feet below grade. This clamp has been subjected to some excavation to better study the area. The top arch and sides of the passage are formed by bricks which are glazed green. This glazing vitrified and is dripping down from the brick surface (See Figures 5.8 & 5.9). The majority of the passage is blocked with dirt and rubble.

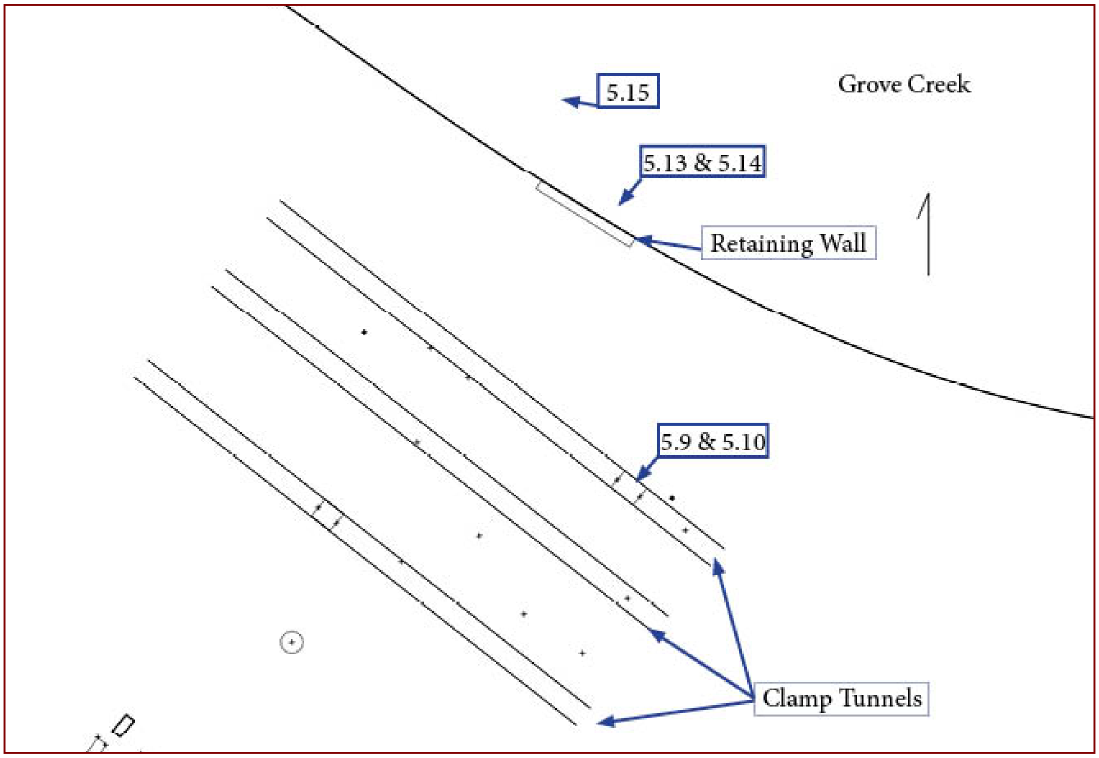

Figure 5.8: Key to Photographs in Figures 5.9 – 5.15.

Figure 5.9: Clamp B Passage Interior (Photo Frances Pinto).

Between the two passage opening, stacks of bricks are positioned perpendicular to the passages. These bricks are not mortared and gaps remain between the stacks of bricks (See Figures 5.10). Each stack is two bricks wide and extends away from the passage for an undetermined distance. The stacks are also below grade, at the same depth as the passages.

Figure 5.10: Gaps Between Stacks of Bricks (Photo Frances Pinto).

At this point along the creek the bank is rather distinct, abruptly dropping roughly ten feet to the creek below (at low tide). Directly north of the clamp, the bank is formed by a "sea" wall, labeled as Structure B for the purposes of this study (See Figures 5.11 & 5.12). This substantial structure has an observed height of five feet, and stretches at least twenty feet along the creek (See Figure 5.13). Portions of the wall have caved into the creek below, the outer layers collapsing as the clay below has eroded (See Figure 5.14). Around the wall, tree roots have grown around the brick courses and occasional roots have grown straight through the wall, piercing the mortar joints. These roots have caused the bricks to shift and are separating many of the brick courses, exacerbating the collapse of the structure.

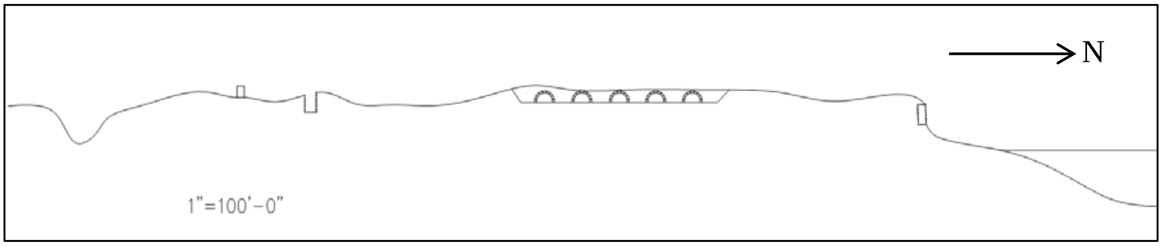

Figure 5.11: Site Section.

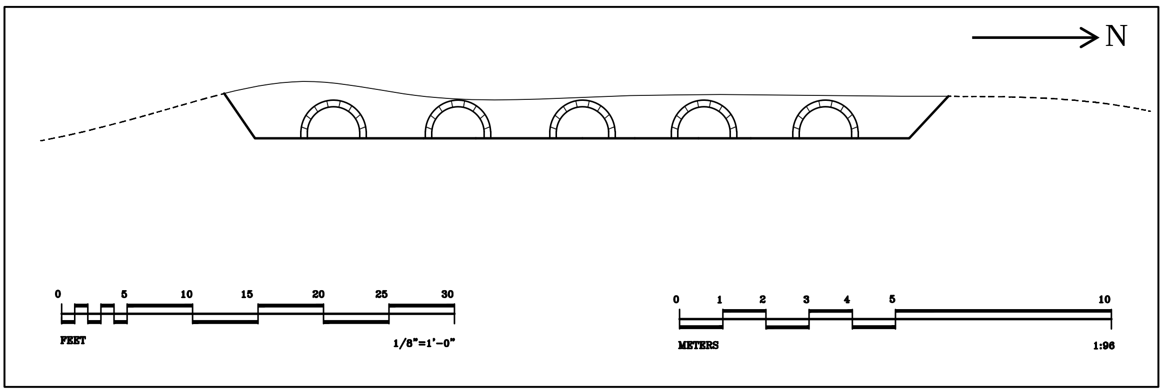

Figure 5.12: Clamp Section.


Figure 5.13: Wall as Viewed from Grove Creek (Photo Frances Pinto).


Figure 5.14: Retaining Wall at Landing, Outer Layers of Wall Pulling Away from Bank (Photo Frances Pinto).

As the creek continues west to the Cooper River, the ground slopes down closer to water level. The soil composition changes with this slope from clay to sand

and pluff mud. The salt-water marshes of the Carolina Lowcountry is composed of a soil known as pluff mud. This is a slushy soil with copious amounts of decomposing material. The brick rubble continues down to the point, lining the bank, covered in years of mud (See Figure 5.15). At the water's edge, where the clay bank erodes away, a layer of clay tops the pluff mud like a film.

Figure 5.15: Creek Bed Littered with Brick Fragments (Photo Frances Pinto).

Parts of the trail are composed of brick rubble. Like the brick rubble along the creek bank, the ground above is littered with fragments of brick (See Figure 5.23). These sections have been covered with layers of decomposing leaves, but the bricks still protrude in countless places (See Figure 5.24). These pieces, poor specimens, easily broken, form a path parallel to the creek bank that extends down to the point. Near the point there is evidence of more activity and ruins, but this area has not, by the date of this publication, been excavated. Similar paths crisscross the area, systematically spreading out from the clearing. These paths often run parallel to large depressions, each about four to five feet below grade and varying in shape and dimensions (See Figure 5.16). Some depressions are long and linear, up to fifty feet wide and 150 feet long, while others are circular, 150 feet in diameter. The soil of these depressions fall into two categories, clay and sand. Depressions comprised of clay are somewhat defined, and are frequently seen retaining water. Sand areas are less clearly defined, sloping away from current footpaths and in some cases ending in clay banks.

Figure 5.16: Depressions (Trimble Outdoor Navigator).

CHAPTER SIX

SITE ANALYSIS: INTERPRETATION

Contained in this nine and one half acre site are all the resources necessary to produce bricks. The site is divided into a designated production area with the remainder of the site left as resources (See Figure 6.1). While there are both sand and clay pits on the site, the majority of identified pits contain clay. Due to the modified nature of the property, brick production, rice, forestry, and industrial site, it is difficult to determine how extensive the original production was. This study relies on the archaeological studies conducted in the 1970s to illuminate the condition of the property at that time, as well as the story told through the U.S Geological Survey maps. LIDAR images of the area are not well enough defined to determine the limits of underground material, brick rubble and clamp structures, or the extend that the site contains (See Figure 6.2) (See Appendix Figure B-7).

Figure 6.1: Resource Locations (Trimble Outdoor Navigator).

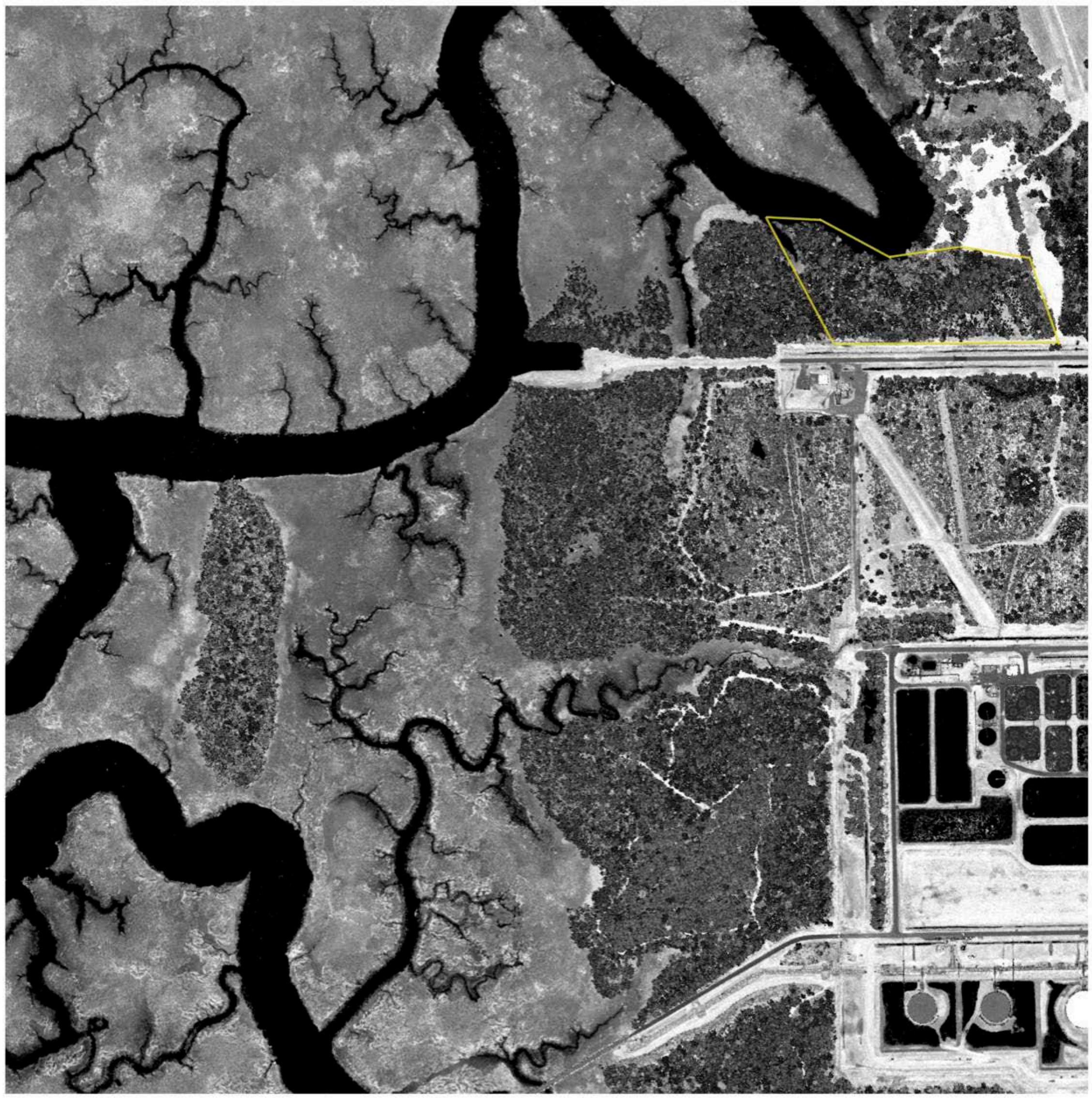

Figure 6.2: DNR LIDAR.

The pits discussed in this study have a topsoil layer composed of several inches of decomposing matter and debris. Beneath that top layer, both sand and clay have extensive contaminates mixed in the desired resource, as discussed in Chapter Seven. The located sand pit ends abruptly in a vein of clay, further corrupting the sand. However, at the locations where the soils mingle, does not appear to suffer from extensive excavation for resources. The existence of these pollutants within the sources is expected as Charleston grey brick is know for the greyish inclusions that are the result of these contaminates.

Though most aspects of the site have been located due to the presence of the Eagle Scout nature trail, it is postulated that this trail was placed over the existing trails left from the brick production. This is the reason many of the trails are composed of brick rubble. These rubble trails were created to aid in the transport of sand and clay to the production area. Without this reinforcement, any method of conveying the materials to the work yard would quickly become bogged down in soil that it frequently water logged by the characteristic Charleston wet weather. The bricks used in the trail are poor quality, easily crumbling in the hand.

Salmon bricks refers to the distinctive light pinkish color typical of bricks that are under fired. Through the usage of the clamp method, often results in under fired bricks. Those bricks furthest from the heat source do not reach adequate temperatures and so are not as strong as their counterparts. Though the clamp's location below grade, and the practice of covering the construct with soil is to retain heat, it does result in uneven outcomes. Therefore, using them to produce an adequate "road" bed and would be beneficial and cost effective. The number of salmon bricks produced by the clamp method would be significant, and these bricks are an otherwise unusable material. Piles of salmon bricks litter the site, both near the production area and into the woods. The sheer number of these bricks indicates a large scale production over an extended period of time.

Salmon bricks were also extensively placed along the creek bank, presumably to prevent soil erosion. The banks along Grove Creek are typical of the Carolina Lowcountry and composed of pluff mud which does not allow access to the water's edge due to its consistence and lack of support. The bricks lining the bank differ from the brick used in the "sea" wall as they appear not to have been placed in any organization pattern and did not employ mortar in the construction method. It is typical in this area to line the bank with oyster shells, rocks, brick, or other rubble to create a surface which will allow access. While the brick rubble does allow for a person to access the water edge, it would not provide enough support to load brick onto a barge or other boat. It is probable that there was a wooden dock at some point, but there is no evidence of this any longer. The creation of the sea wall would allow for a suitable structure from which to offload bricks into an awaiting barge.

Structure A has been interpreted as a drying shed or hack, necessary to the process of brick production. Three brick foundations, partially unearthed, are located on one side of the structure with evidence to show that at least one of these continued across the structure. These foundations would provide a suitable floor for drying green bricks or a work area form molding clay into bricks. The location of this structure would place the work area and drying shed in close proximity to the clamp, but far enough to shield it from the heat when the bricks were burning (See Figure 6.3).

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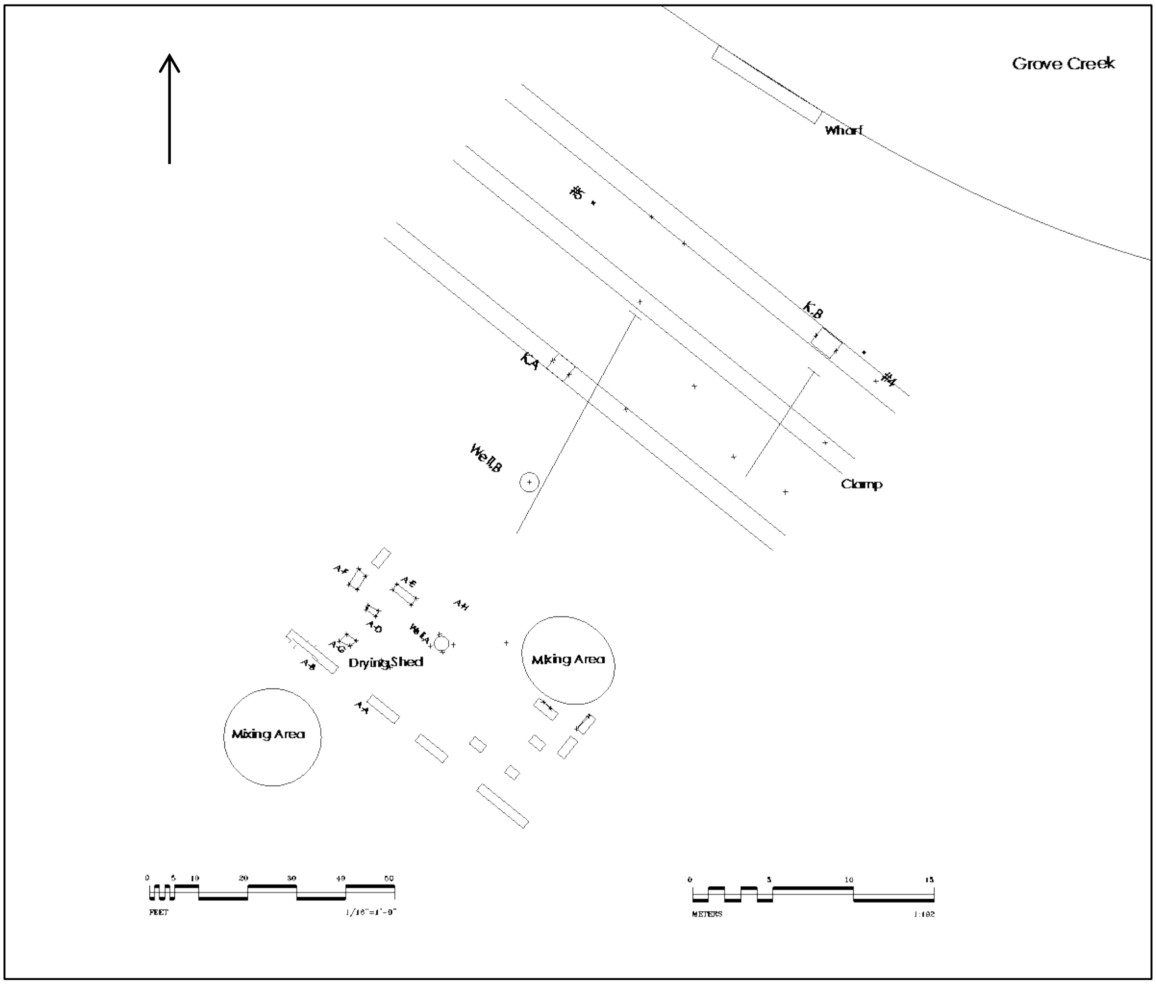

Figure 6.3: Postulated Site Plan.

Within the production area the terrain is dramatically different. The ground is predominantly level and alterations appear intentional. Unearthed trees and cave in of the clamp passages provide a limited knowledge of the site's contents around the clamp. Three clamp passages have been identified with several other potential structures. With further excavation a better indication of the extent of the production area can be determined. Much of the production area is as yet undiscovered. In the site grid for Structure A, the grid quadrant formed by section A-

A, Well A, and section A-J is, as of the date of this publication, devoid of components belonging to Structure A. This area is occupied by extensive vegetation that has delayed excavation. However, from the elements that have been located a potential layout of the structure has been extrapolated. This plan is based upon the located elements, and isolated points that could indicate a mirroring of the known elements (See Figure 6.4).

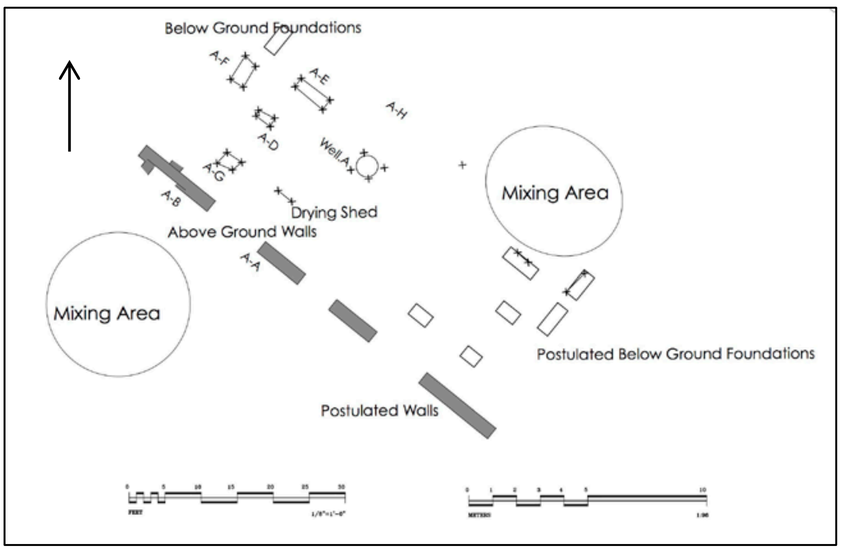

Figure 6.4: Postulated Building Layout.

The two wells, Well A within the structure and Well B outside the structure, would supply the fresh water necessary to production. The two large circular depressions associated with the structure would allow areas to mix the resources in close proximity to the source of water. The lack of structure within these depressions indicating a production with hand mixing rather than with mechanized means. A covered but not completely enclosed building would then provide a drying area before moving the bricks into the below ground clamp for burning. Broken clay roof tiles have been found in piles around the production area (See Figure 6.5) These tiles further sustain the belief that Structure A was a defined building covered by a roof. The lack of definable, exterior walls endorse the supposition of an open air, covered workspace (See Figure 6.6). As few tiles have been found, the extent of the roof on that structure is yet to be determined.

Figure 6.5: Clay Tile. (Photo Frances Pinto).

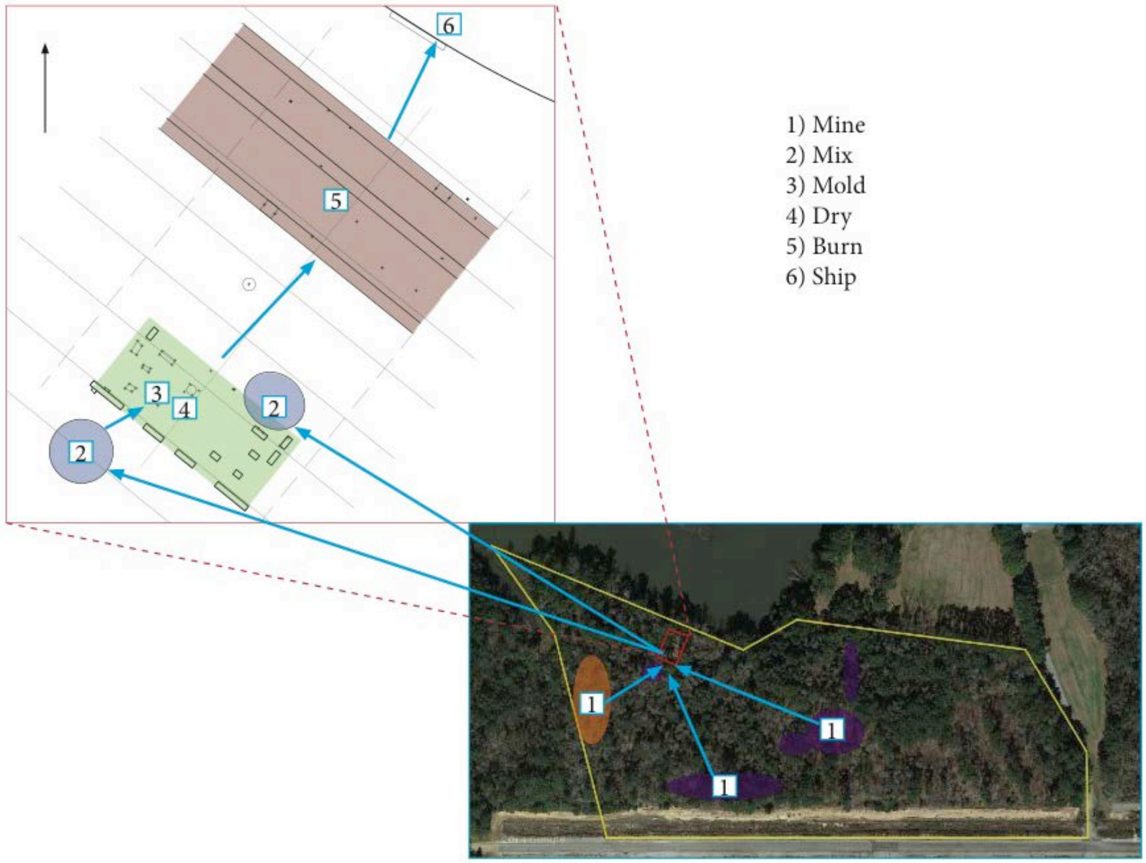

Figure 6.6: Production Order of Operations.

The brick sea wall would provide a reinforced structure from which to convey the bricks onto a waiting barge. Any wooden elements would have deteriorated long ago, but the bricked wall would afford the necessary reinforcement for such heavy cargo. A wall would also provide an area for the produced bricks to be placed pending loading. As the wall is now collapsing it is unknown the extent of its projection into the creek.

Through the construction of the clamp passages and the sea wall the change in technology is apparent. Within the clamp passages and in some of the other structures the bricks are quite large by modern standards, up to nine inches long, four inches wide, and two inched high. These bricks have rounded edges and are typically darker in color (See Figure 6.7). By contrast, the bricks found in the clamp, between the firebox passages, and in the sea wall, are quite smaller, typically six inches long, four inches wide, and two-and a half inches high (See Figure 6.8). These bricks have much sharper edges and faint lines down the lateral side, possibly from a change in the molding process. As discussed in Chapter Seven these bricks can be classified into two separate groups which are associated with two distinct production periods (See Figure 6.9). It is likely that at some point in the brick production older, wooden molds were exchanged for cast iron molds that would have left such marks. Further, the bricks in Group A very greatly in dimensions while those in Group B are fairly uniform. This would coincide with a shift from handmade wooden molds to manufactured cast iron molds. The sharp edges of the bricks in Group B would also be explained by a change in molding methods. These distinctions further support that the production occurred over an extended period of time.

Figure 6.7: Group A Brick, Hand Molded. (Photo Frances Pinto).

Figure 6.8: Group B Brick , Cast Mold Showing Form Lines (Photo Frances Pinto).

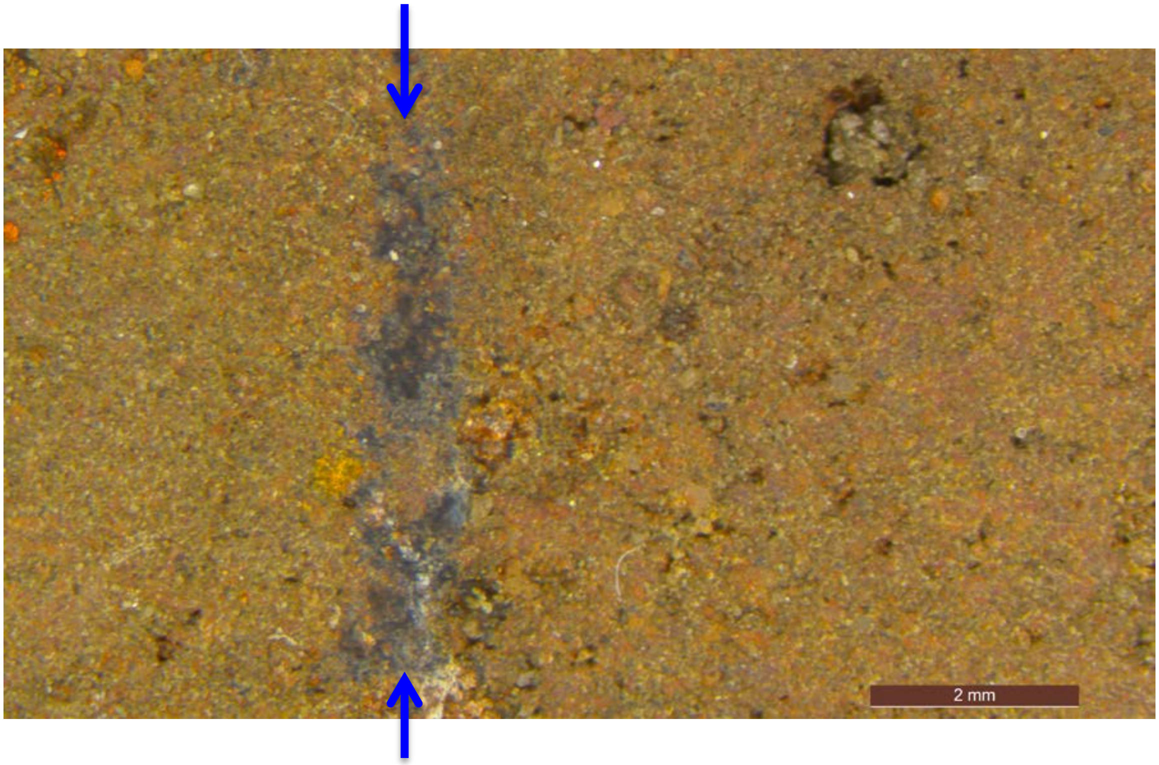

Figure 6.9: Microscopy of Form Lines.

Other methods for discerning continued use of the site is the evaluation of metal hardware. A variety of nail types have been recovered from the site displaying a change in technology while the site was in use. Older, hand forged nails (See Figure 6.10) as well as newer machine cut nails (See Figure 6.11) have both been found within the bounds of Structure A. hand forged nails were used from the seventeenth to nineteenth century. Multiple types of machine cut nails were located including brads dating from the 1790s to early 1800s and headed nails typical of the 1810s to 1830s.[65] This change in types indicates that the site was in continued use over a period of some time.

[65] Lee H. Nelson, "Nail Chronology as an Aid to Dating Old Buildings," *American Association for State and Local History* 48 (1968), 4.

Figure 6.10: Rosehead Nail (Photo Frances Pinto).

Figure 6.11: Machine Cut Nail (Photo Frances Pinto).

The clamps show evidence of repeated burnings. The bricks that form the arched top of the interior of the firebox are coated with a green glaze (See Figure 6.12). With each successive burn cycle, the glaze has been heated, cooled, and reheated further vitrifying the surface of the brick. Microscopic analysis shows that the glaze contains extensive bubbles, the result of repeated heating and cooling (See Figure 6.13). Arsenic would have caused the silica contained in the brick to boil. The bricks have gone through this process so many times the glazing has vitrified and melted, dripping down the surface of the bricks.

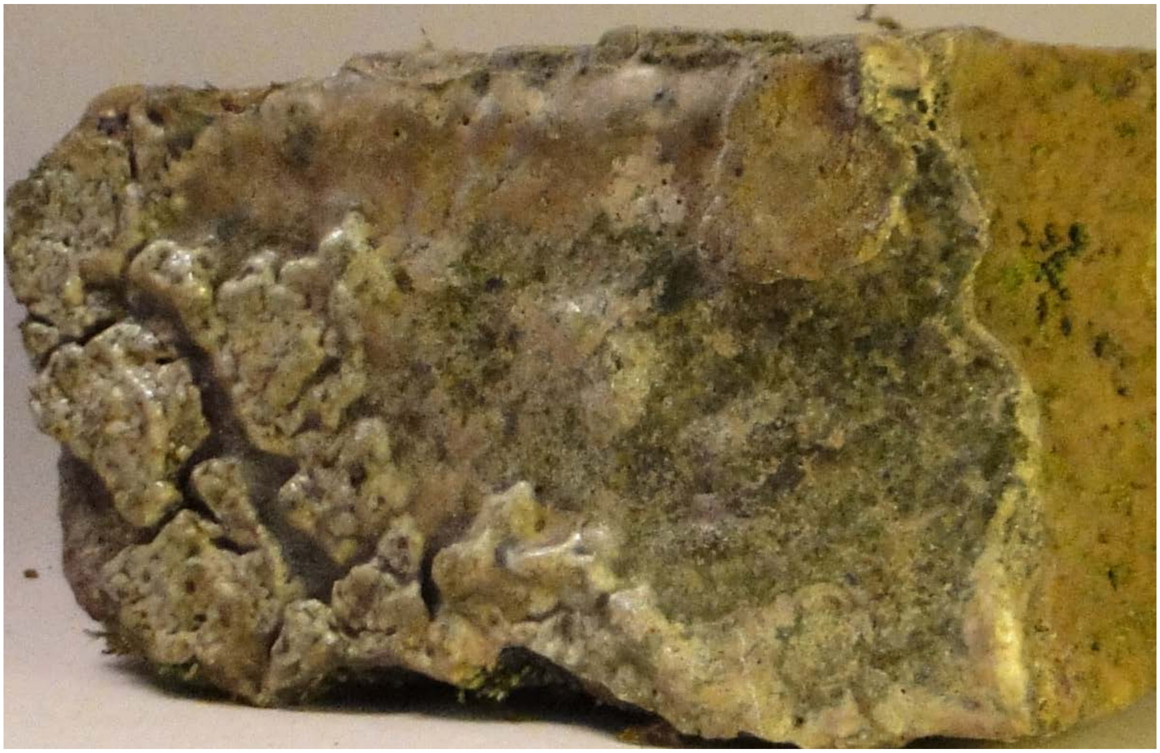

Figure 6.12: Vitrification of Brick Glaze (Photo Frances Pinto).

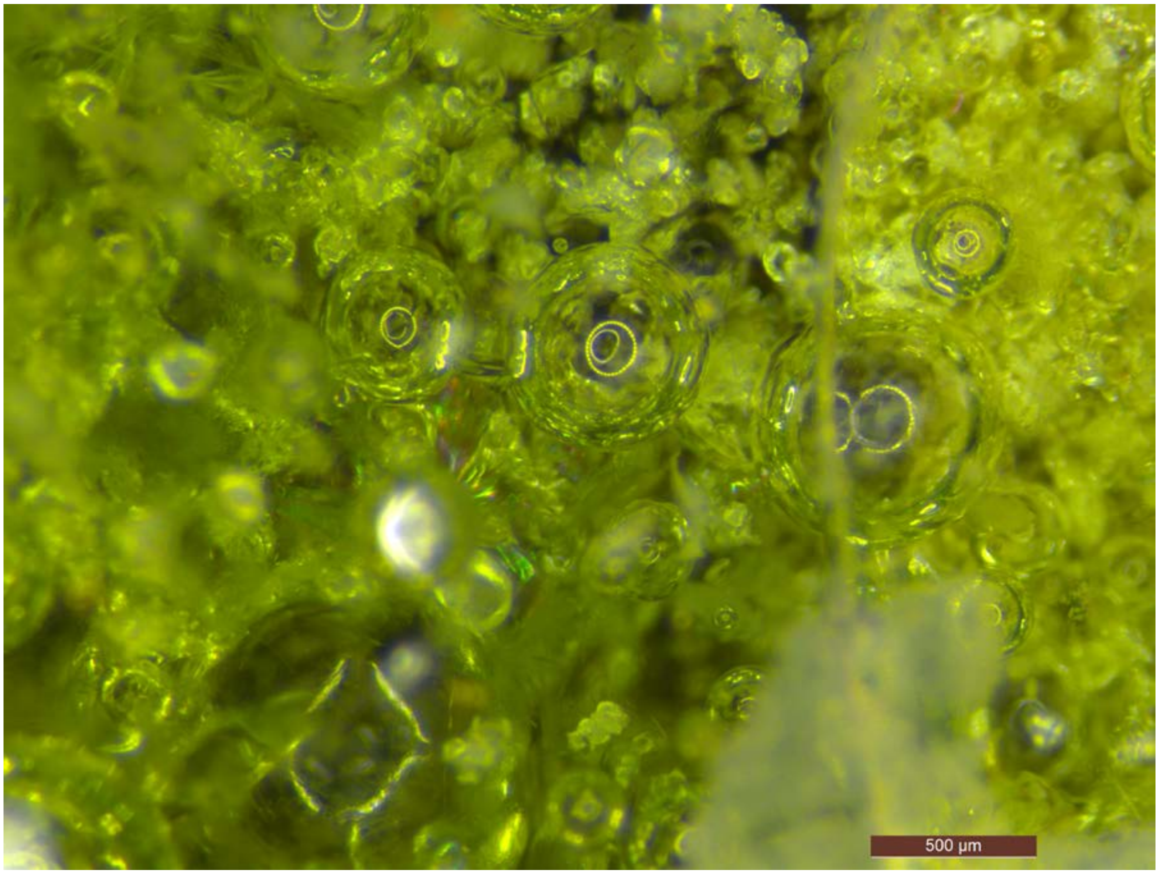

Figure 6.13: Glaze on Brick. Microscopic View of Bubbles in Glass. Magnification 2x.

CHAPTER SEVEN

BRICK ANALYSIS: PHYSICAL

The analysis of the Grove Plantation's bricks reveal the method of brick production at the Grove. Size, color, and microscopic composition were measured to sort the bricks. Similarities and differences provide evidence of different production methods. The analysis of physical characteristics in combination with the XRF analysis were used reveal the bricks origin. The bricks in this study fall into two groupings. Group A, handmade bricks, are larger in size, darker in color, and have less defined edges. Group B, extruded bricks, are smaller, lighter in color, and have sharper, more precise edges

Size

Due to the fragmented condition of many of the samples some allowances were made in this study. In analyzing the bricks' size any samples that appeared fragmented were discarded from this analysis since the accurate measurement could not be analyzed. However, if other features indicated that the brick corresponded to a given group, those measurements that could be accurately taken are taken into account.

Early bricks varied in size before dimensions were standardized. The sizes of English brick was standardized in 1517 at the dimensions 9 inches x 4½ inches x 2 inches and later revised by Charles I as 9 inches x 4 inches x 2¼ inches.[66] American brick size fluctuated between production sites. Common bricks ranged from 7½ to 9¼ inches in length, 3½ to 4½ inches in width, and 2 to 2¼ inches in height.[67] The sizes of Charleston bricks were determined by whoever made the mold at each production site but fall within the range of American-made brick. Dimensions were based upon a ration with the length being twice the width. The molds were made so that width of a brick fit comfortably in a man's hand. In her thesis "Brickwork of Charlestown to 1780," Marie Hollings noted, "9 inches by 4½ inches by 2½ was the easiest for handling."[68]

Within Group A there is significant variation in length, height, and width, the average size being 8⅞ inches x 2¾ inches x 4⅜ inches. The length of Group A's brick varied as much as 2⅜ inches forming a significant range of sizes (See Table 7.1). While some samples in Group A were actually shorter than those in Group B, the average length for Group A is 8 ⅞ inches. The bricks' heights varied as well with a disparity of ¾ inches and with an average of 2¾ inches (See Table 7.2). The widths differed as much as 1⅛ inches, with an average of 4 inches (See Table 7.3).

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[66] Gerard C.J. Lynch, *Brickwork: History, Technology and Practice* (London: Donhead, 1994), 8.

[67] Davis, *A Practical Treatise,* 65.

[68] Marie Ferrara Hollings, *Brickwork of Charlestown to 1780* (Columbia: University of South Carolina, 1978), 7.

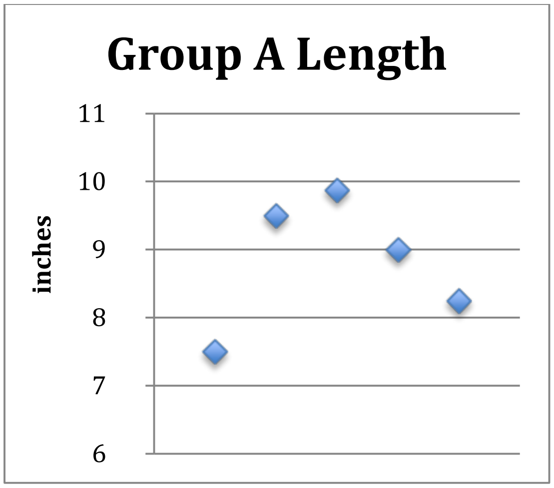


Table 7.1: Group A Brick Length.

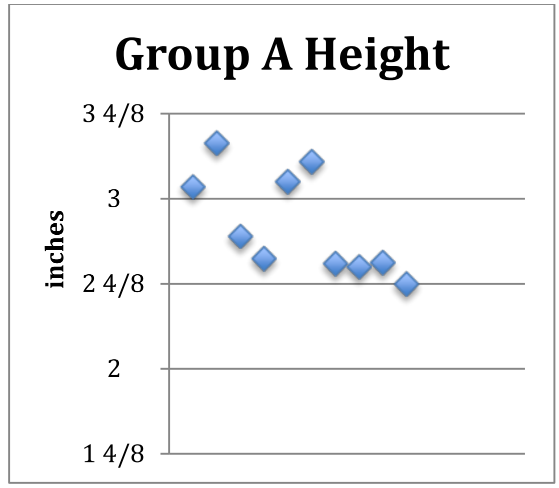


Table 7.2: Group A Brick Height.

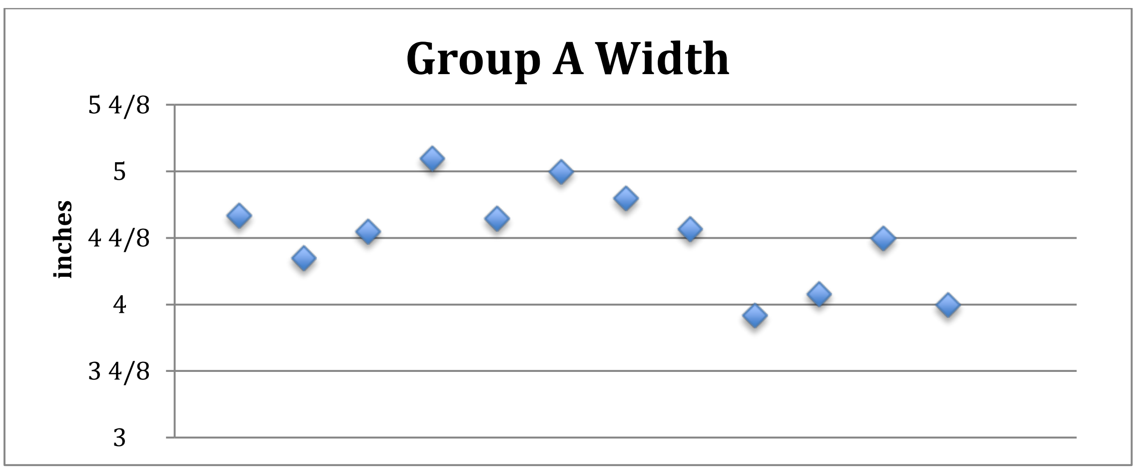


Table 7.3: Group A Brick Width.

The bricks in Group B varied considerably less that those of Group A, the average size being 8¼" x 2⅜" x4." All samples in the group measured precisely 8.250 inches in length (See Table 7.4). There is a slight variation in heights, but the variation within the group is only 0.23 inches and average 2.376 inches (See Table 7.5). The widths have marginally more differentiation with a range of 0.30 inches and an average of 4.039 inches (See Table 7.6).

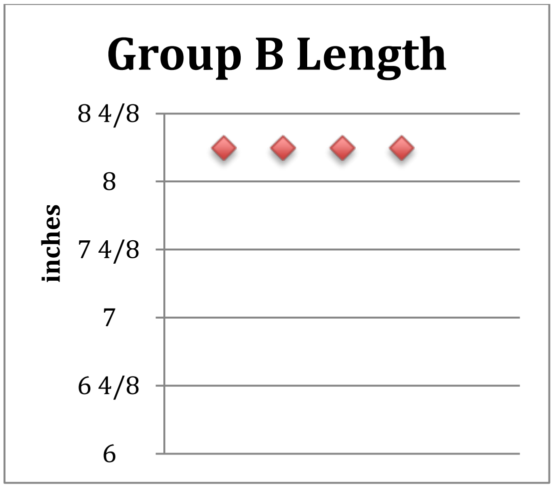


Table 7.4: Group B Brick Length.

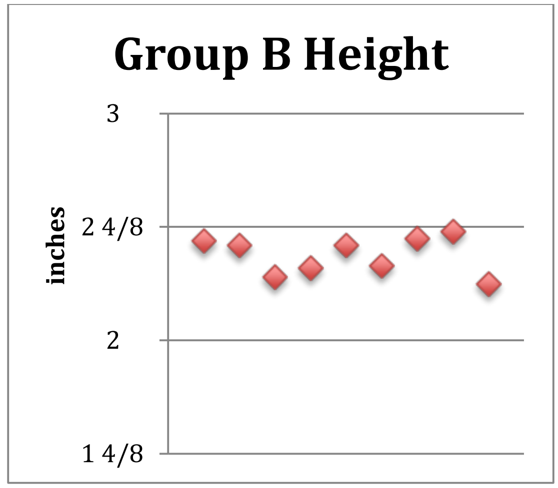


Table 7.5: Group B Brick Height.

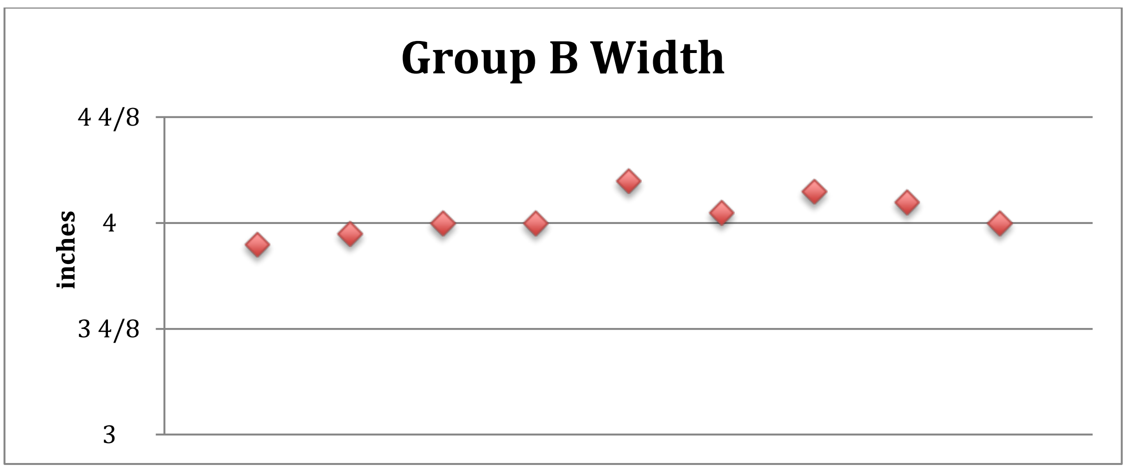


Table 7.6: Group B Brick Width.

By comparing samples from each group the differences become clear. There is significantly more variation in size for the bricks in Group A while Group B is quite consistent. The length disparity of the bricks is the most notable difference between the groups. Group A bricks are noticeably greater in length than those of Group B with an average difference of ⅝ inches (See Table 7.7). There is less distinction with the height variance, the bricks in Group A are an average of ⅜ inches higher than those of Group B (See Table 7.8). There is a slight variation in widths, but they range less than ⅜ inches (See Table 7.9). While these may seem minor deviations in size, the result measurements indicate that the bricks of Group B are only 73% the size of those in Group B, a significant decrease in size.

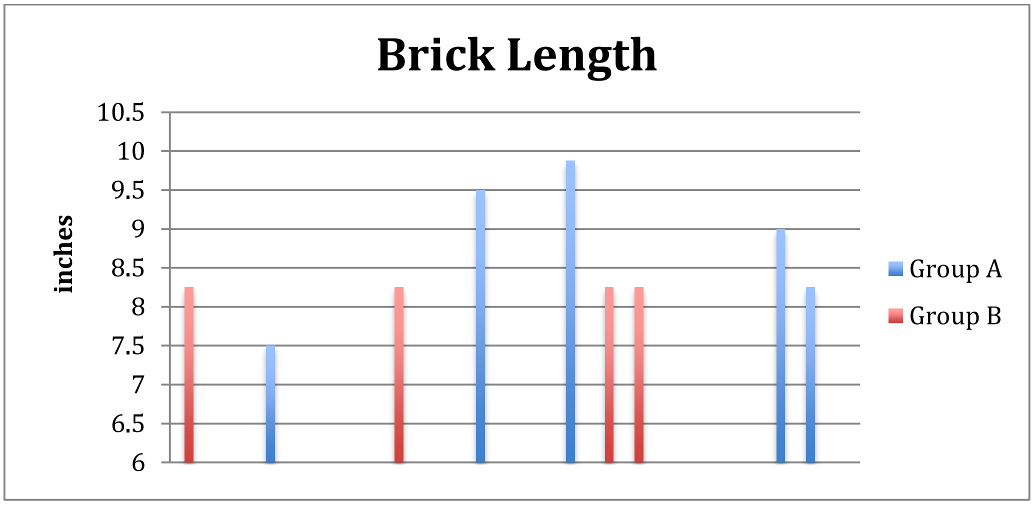


Table 7.7: Brick Length Comparison.

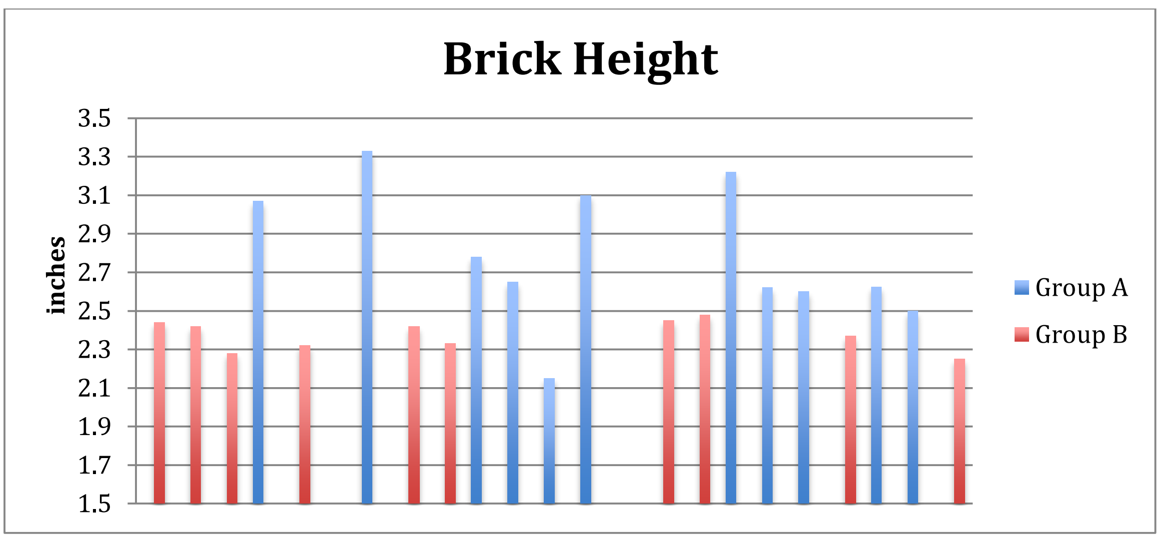


Table 7.8: Brick Height Comparison.

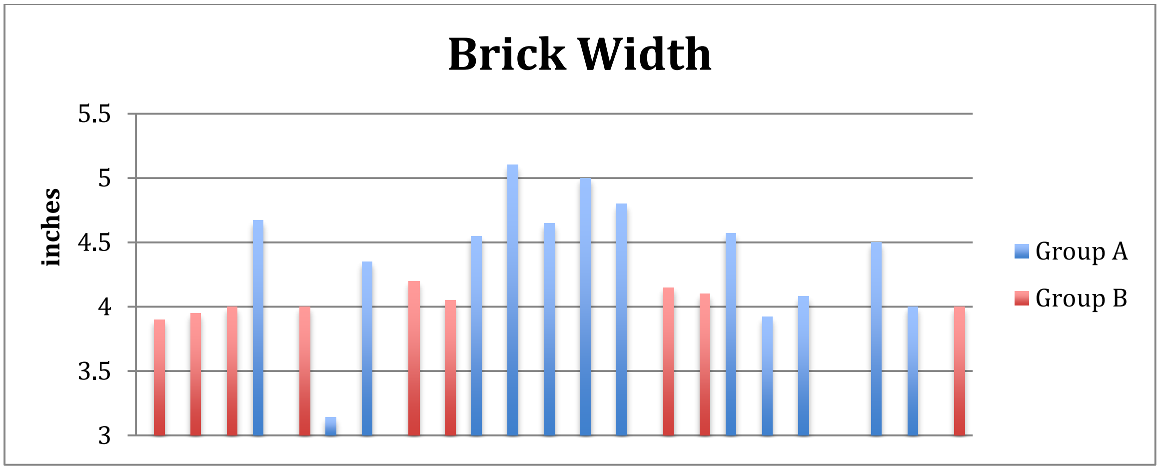


Table 7.9: Brick Width Comparison.

Color

Grove brick displayed a range of color. The color variation in brick can be caused by several factors. Temperature, chemical makeup, and the amount of oxygen all can affect color. Bricks fired at lower temperatures tend to be lighter in color, a hue associated with softer, under fired salmon brick.[69] This color alerted brick inadequately fired and not as durable. High amounts of iron oxide cause brick to be redder in color. However, even with the higher iron content, the brick could be more purple in color due to a lack of oxygen.[70] Similarities in color can imply correspondences in the production process.

Color analysis applied values provided by Munsell Soil Color Charts. This system describes color using quantifiers for hue, value, and chroma. Hue is labeled with letter notation from red to yellow, R, YR, Y. Value ranges from 0 for black to 10 for white. Chroma involves increasing increments of neutral greys. This study

[69] Beall, *Masonry Design and Detailing*, 16.
[70] Ibid., 18.

evaluated only hue. The bricks found at the Grove can be categorized into four color hues using Munsell Soil Color charts, all variations of yellow-red, with 2.5YR being the most red to 10YR being the most yellow.

Though the color variations in each groups does not clarify much about the individual brick, they do show similarities and differences within the groups (See Table 7.10). While a great deal of the bricks in Group A fall within the 7.5YR hues, there is still a great deal of disparity within the group (See Table 7.11). Color variation implies discrepancies in the production process. Whether the result of clay mixing or burning, at this point, unknown.

There is less variation in Group B there is less variation in hue with 63% of the samples classified among the 2.5YR hues (See Table 7.12). This denotes that the bricks in Group B are predominately more red than yellow. There is significantly less variation in color, which would imply that the process had become more standardized.

Group A:		Group B:	
2.5YR	29%	2.5YR	63%
5YR	21%	5YR	13%
7.5YR	43%	7.5YR	13%
10YR	7%	10YR	13%

Table 7.10: Comparison of Brick Colors.

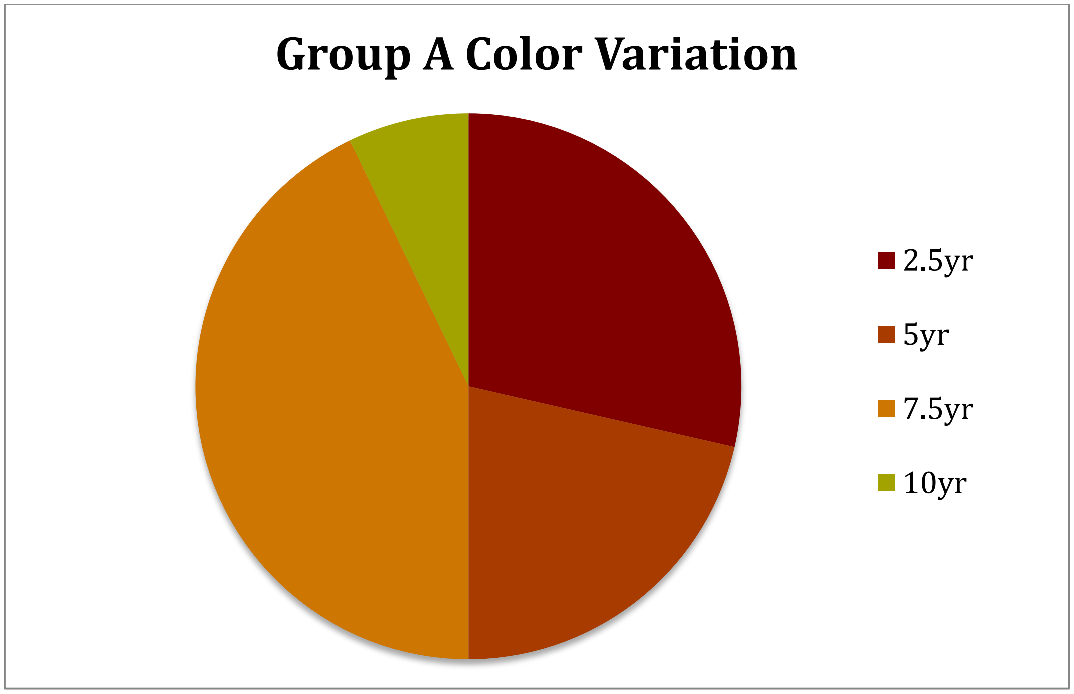


Table 7.11: Group A Color Variation.

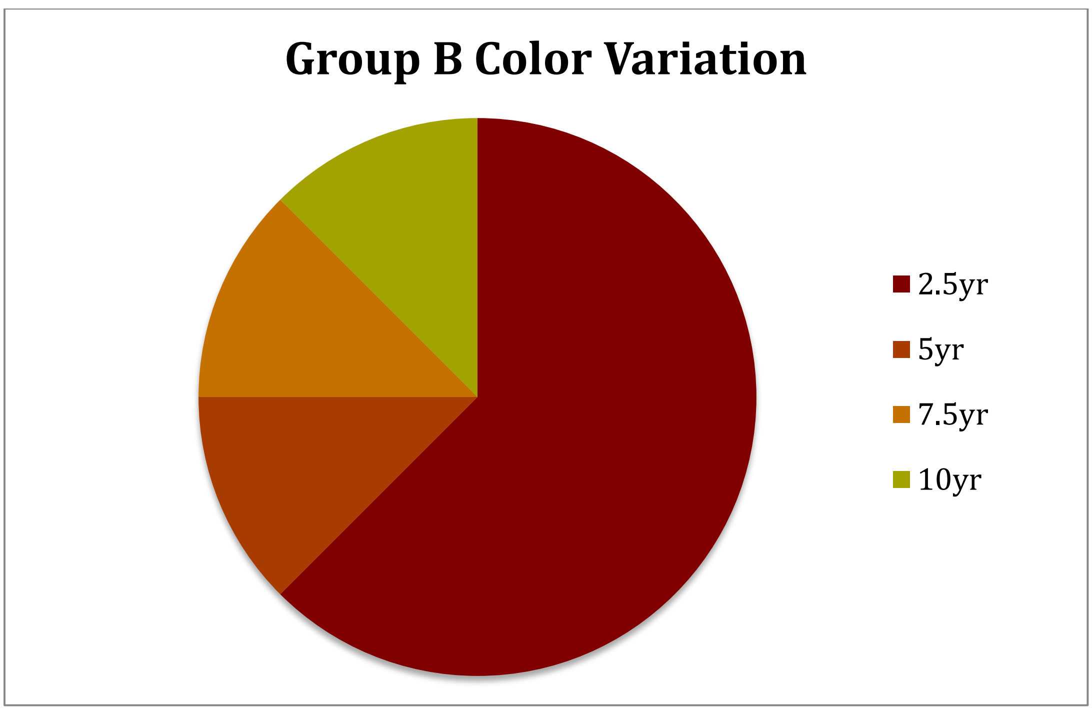


Table 7.12: Group B Color Variation.

By comparing the groups to one another it becomes apparent that there were significant differences between the two brick types (Table 7.13). This could indicate either a change in components or in the firing process. Color itself, however, cannot specify what changes in the manufacturing process were made.

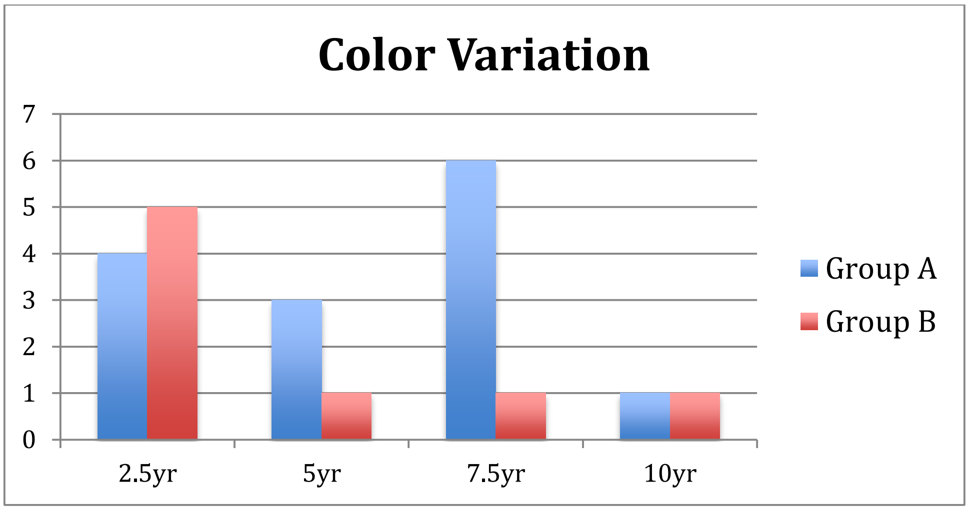


Table 7.13: Color Variation Between Groups.

Microscopy

Brick and soil samples are evaluated at the microscopic level to observe uniformity of components and micro inclusions. The sand in the samples can be evaluated by the size of the grains, sorting, sphericity, and roundness. The size of soil particles determines how the soil is classified, each type having a size range. Sorting is determined by homogenous a mixture is. The closer to perfectly circular the grains are, the higher the sphericity. Roundness describes the angles of the grains. These classifications are used to analyze the sample and compare samples to each other.

A Leica Mz95 stereomicroscope was used to analyze the samples. The bricks were cleaned before viewing under microscope. Each brick was dry brushed with a soft nylon brush to remove particles. Then low-pressure compressed air, canned air as is used for electronics, removed any remaining particulates. The initial microscopy of the surface shows a grainy surface (See Figure 7.1). A closer view shows that the brick has a high sand content. The mixture appears to have a significant number of contaminates, such as iron and organic debris, and is moderately sorted.(See Figure 7.2).

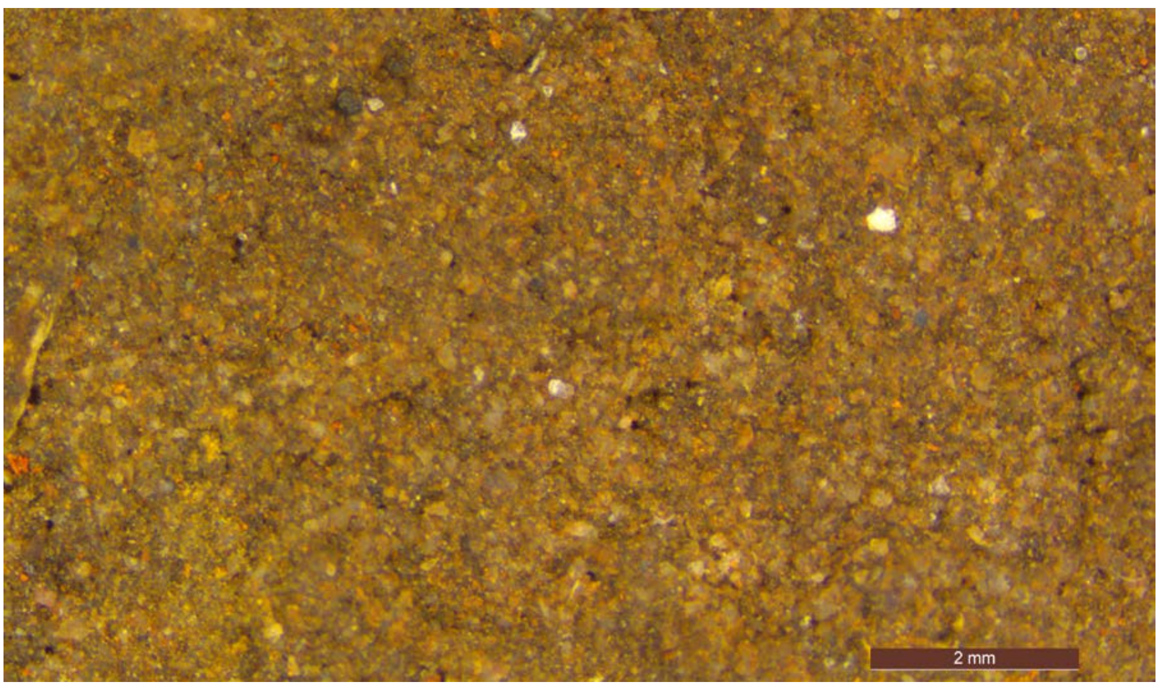


Figure 7.1: GC.K.B.19.

GC.K.B.19		Magnification:	.63x
Size:	Fine sand	Roundness:	Sub-rounded
Sorting:	Moderately sorted	Sphericity :	Low

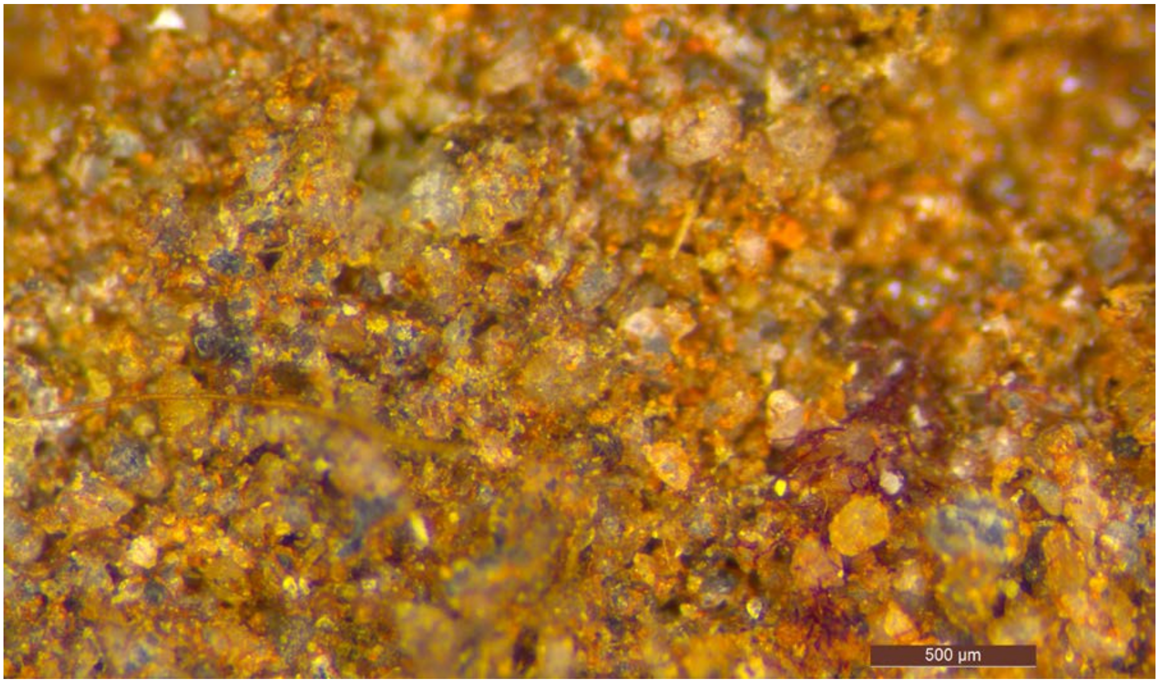


Figure 7.2: GC.K.B.06, Sand Content.

GC.K.B.06		Magnification:	2x
Size:	Fine sand	Roundness:	Sub-rounded
Sorting:	Moderately sorted	Sphericity :	Low

Comparatively, a sample from Martinsville, Indiana, circa 1920, contains very little sand and significant amounts of clay (See Figure 7.3). The sample is well sorted, with few inclusions. The components have fused well together and present a uniform surface compared to the Charleston brick. Its bright red color suggested it received significant oxygen while burning. This could be indicative of a different firing method that would circulate the heat and air more efficiently than the more rudimentary clamp.

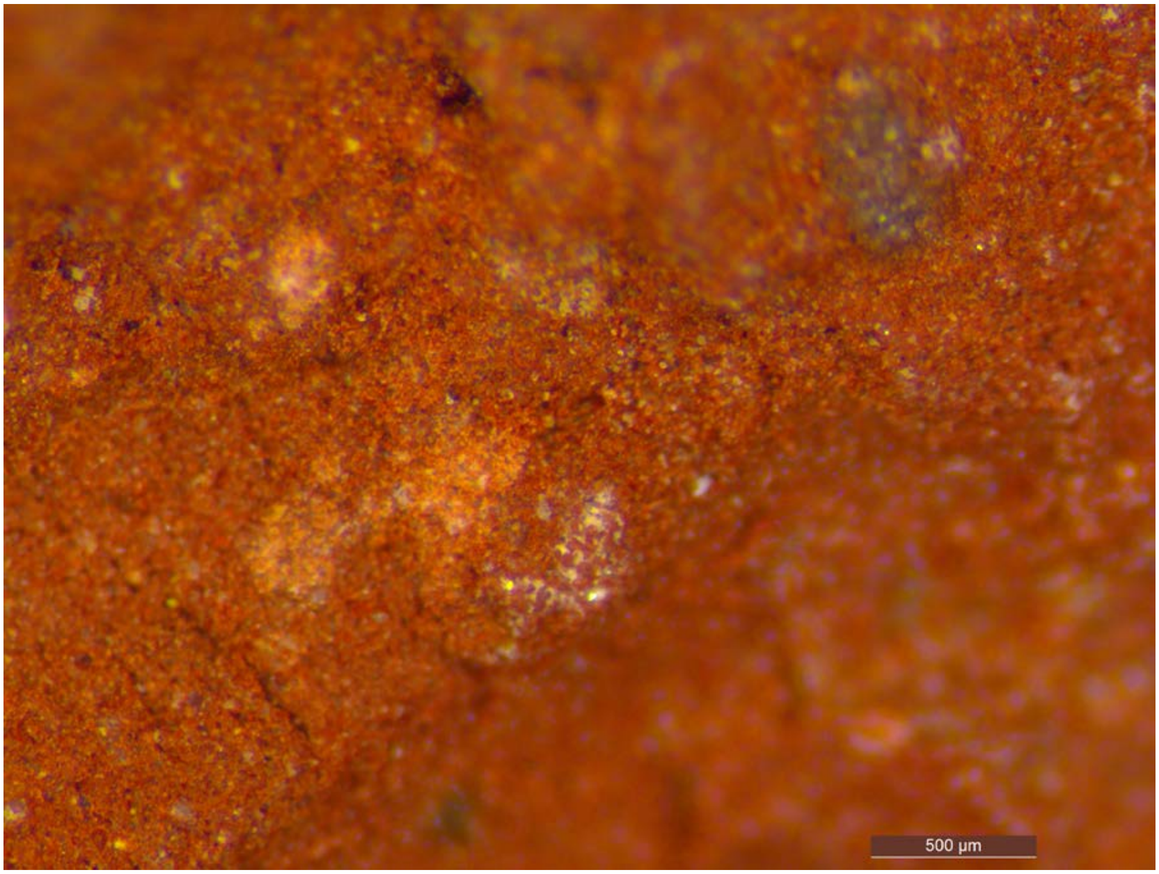


Figure 7.3: Brick Sample – Martinsville, Indiana.

Martinsville, Indiana[71]		Magnification:	2x
Size:	Silt/Fine sand	Roundness:	Rounded
Sorting:	Well sorted	Sphericity :	Medium

Flecks of iron can be seen in some of the brick samples (See Figure 7.4). The dark purple would suggest that the brick received little oxygen while burning, more oxygen would have produced a brighter red color. This sample is poorly sorted with significant inclusions as is typical of Charleston brick. The bricks found at the Grove have a high sand content and number of inclusions. A potential reason for this is the high iron content of the sample. Significant iron content would cause excessive

[71] Courtesy of Warren Lasch Conservation Center

shrinkage which could be reduced by increasing the sand levels. As well as iron, the burned bricks have notable amounts of other, as yet unidentified, inclusions which is indicative of a Charleston Grey Brick (See Figure 7.5).

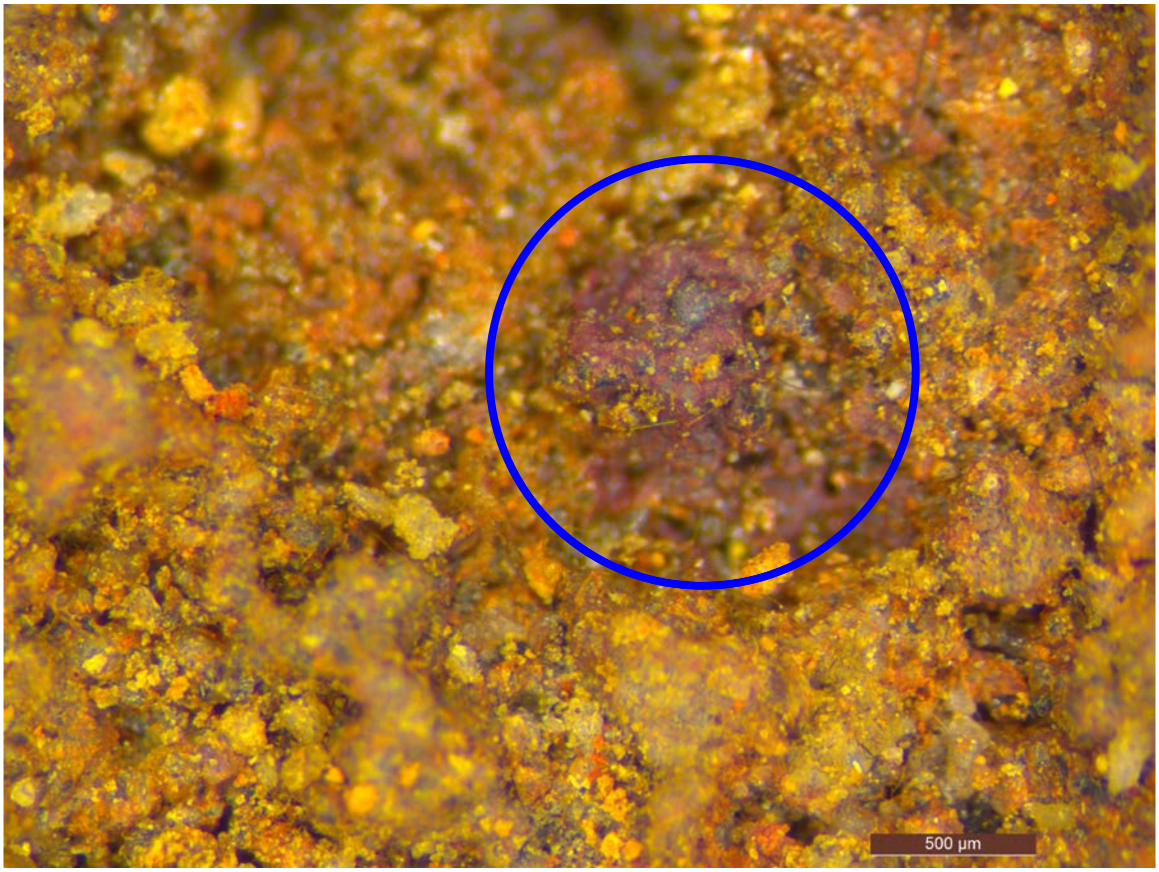


Figure 7.4: GC.K.B.12, Iron Inclusions.

GC.K.B.12		Magnification:	2x
Size:	Fine/Medium sand	Roundness:	Sub-rounded
Sorting:	Poorly sorted	Sphericity :	Low

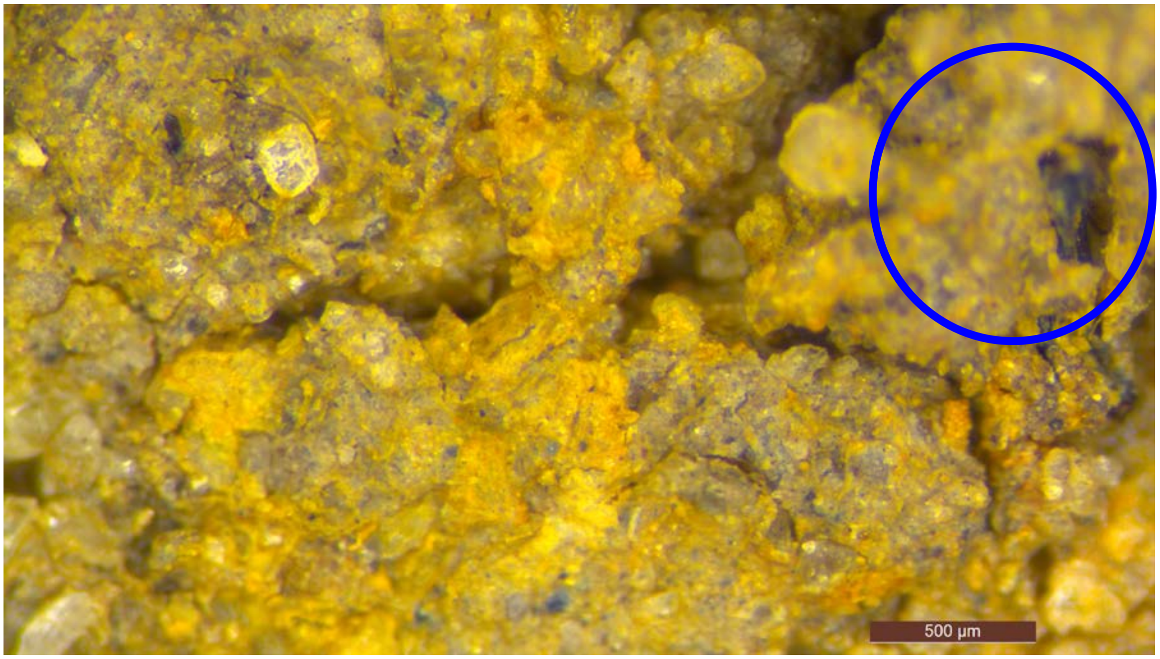


Figure 7.5: GC.K.B.05, Inclusions, Organic Debris.

GC.K.B.05		Magnification:	2x
Size:	Fine sand	Roundness:	Sub-rounded
Sorting:	Poorly sorted	Sphericity :	Medium

The clay samples taken from the clay pits on site show high quantities of sand contaminating into the clay (See Figure 7.6). This is another potential reason for the high sand content. The sand sample taken from sand pits on site as well as the sand particles noted in the clay samples are of similar size, roundness, and sphericity to that seen in the bricks (See Figure 7.7). By comparing the characteristics of the sand in these sample it can be postulated that the sand used in brick production was mined from the land adjacent to the production area.

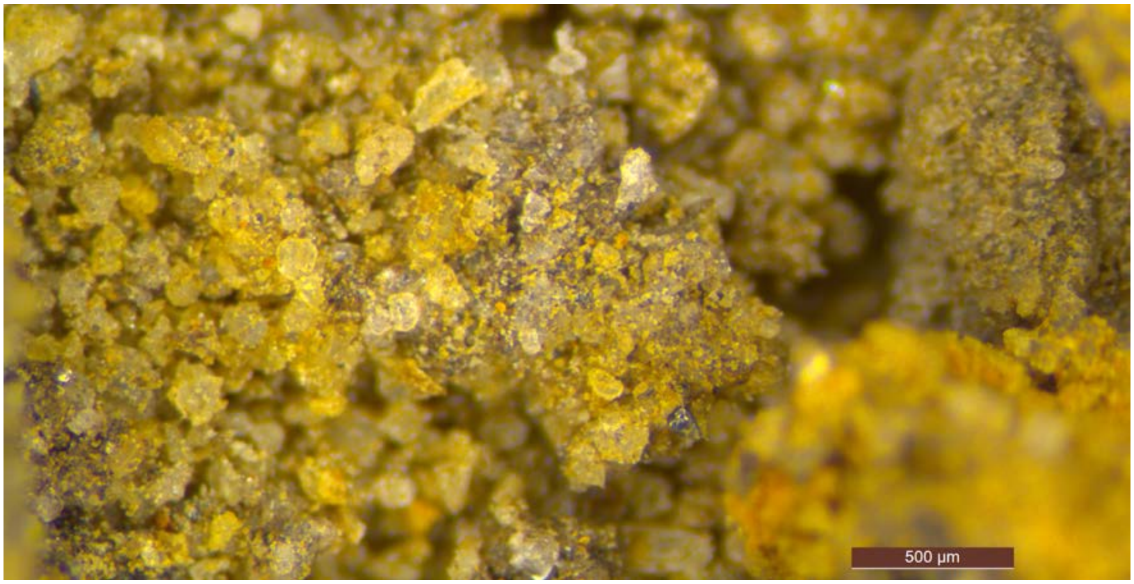


Figure 7.6: GC.Clay.20, Clay Sample.

GC.Clay.20		Magnification:	2x
Size:	Fine sand	Roundness:	Sub-rounded
Sorting:	Moderately sorted	Sphericity :	Low

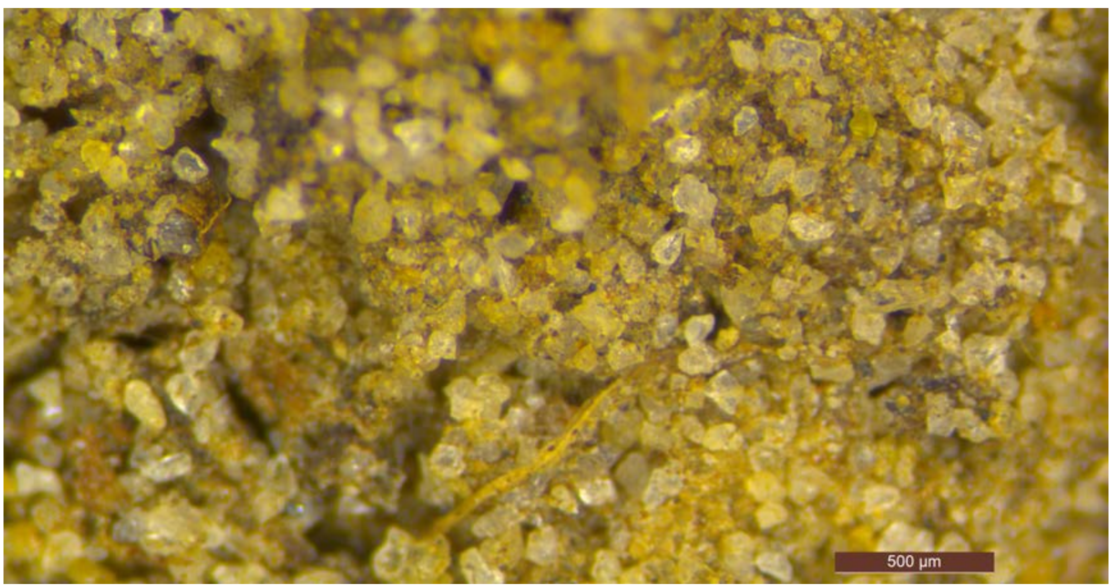


Figure 7.7: GC.Sand.22, Sand Sample.

GC.Sand.22		Magnification:	2x
Size:	Fine sand	Roundness:	Sub-rounded
Sorting:	Well sorted	Sphericity :	Low

The bricks lining the firebox passageways are glazed on the interior side. On microscopic inspection it is apparent that the silica has vitrified and turned to glass. Microscopic bubbles can be seen in the surface, approximately 0.1-0.2 mm in diameter. This implies that the fire burned in excess of 1,600˚F (See Figure 7.8).

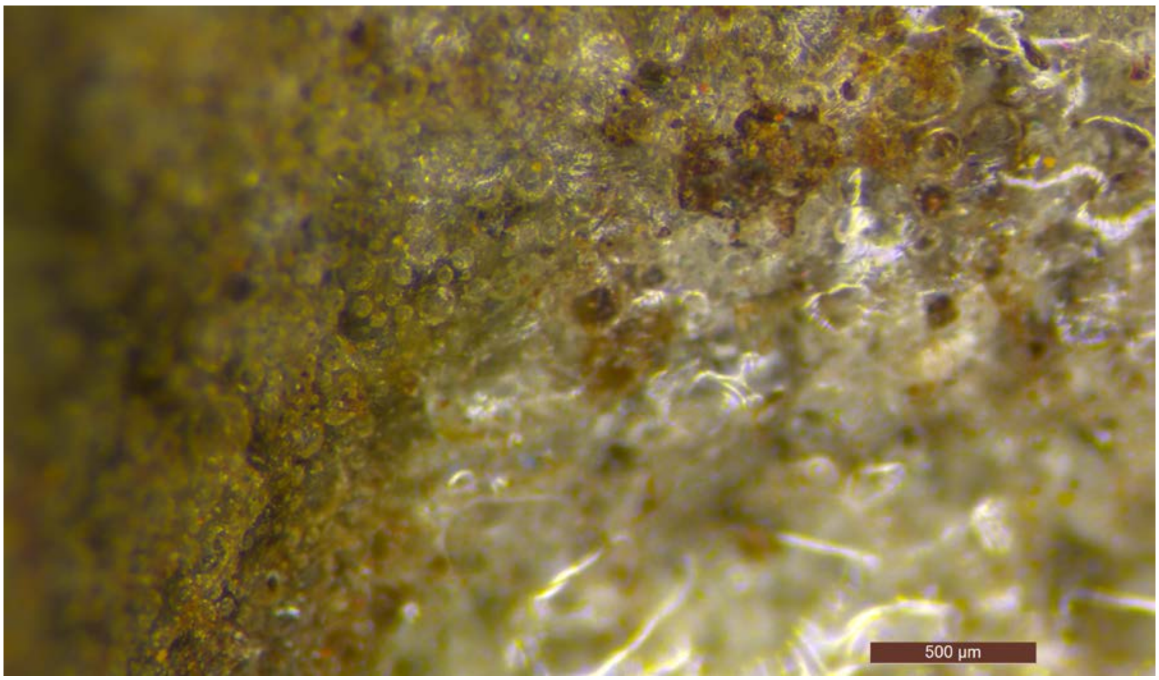


Figure 7.8: GC.K.B.19, Vitrification.

GC.K.B.19 Magnification: 2x

Several of the samples from Group B have minuscule vertical markings along the stretcher face (See Figure 7.9). These lines are minor depressions in the brick's surface (See Figure 7.10). The depressions are most like cause by part of the manufacturing process, such as a seam in the molds used. Only a portion of the Group B samples have these marks, but they occur at the same location and in the same pattern on each brick (See Figure 7.11).

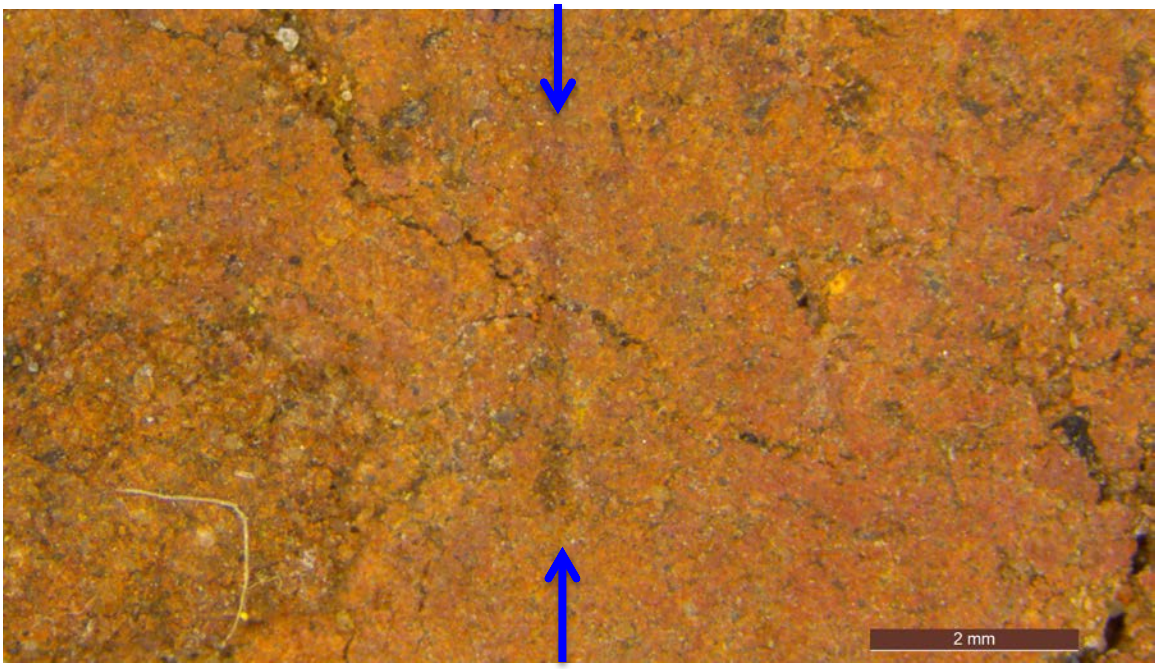


Figure 7.9: GC.K.B21a, Markings on Brick Stretcher Face.

GC.K.B.21a Magnification: .63x

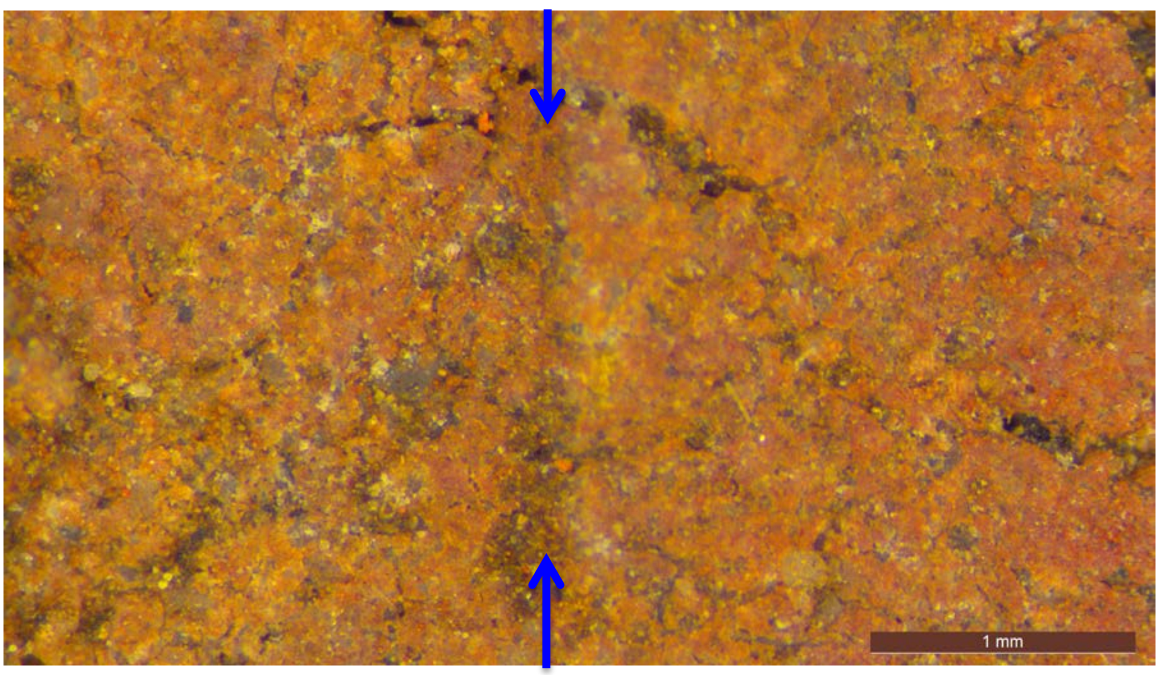


Figure 7.10: GC.K.B.21b, Markings on Brick Stretch Face.

GC.K.B.21b Magnification: 1.6x

Figure 7.11: Line Patterns (Photo Frances Pinto).

Analysis determined that there were two methods of molding bricks at the Grove. Group A were hand molded in wooden molds. Mahogany was the typical choice for brick molds due to its enduring nature.[72] The wood mold created rounded edges. Variations in size were produced by discrepancies in the constructions of the molds. Bricks in Group B were likely molded in cast iron molds, a method that produced sharper edges. The size of a cast mold would be standardized, demonstrated by the uniform size of this group. Defects in the mold created by the casting process caused vertical markings along a stretcher face of Group B brick were caused by defects in the mold created by the casting process.

[72] Wayne, *Burning Brick,* 80.

CHAPTER EIGHT

BRICK ANALYSIS: CHEMICAL

Since the premise of this study is the use of on site resources in the production of bricks, it is necessary to confirm that the clay and sand located on site were indeed the components of that production. Therefore, samples of bricks from various points across the site were tested with x-ray florescence (XRF) to match the trace elements in the bricks to the materials on site. Samples were taken from the clamp structure, bricks fired within the clamp, the structure surrounding the work yard, and the remains of structures on the trails to the clay and sand pits.

Tests are conducted with a Bruker Tracer Series Portable XRF. Each brick was tested in three locations on the surface to achieve an accurate reading. This process is to adjust for any anomalous readings of contamination on the brick's surface. If one set of results greatly varies from the rest it can be assumed to include contaminates and omitted from the study. Prior to testing, the brick samples are gently cleaned to remove as much of the surface debris as possible. Dry brushing with soft nylon brushes removes biogrowth and much of the surface contaminates. Then compressed air, such as canned air used to clean electronics, is employed to removes fine particulates. Between test of different brick samples, the testing surface is also cleaned with compressed air to ensure there is no cross contamination of the samples. Testing cycles are 180 seconds long and are run with no vacuum or filter.

The test parameters focused on elements heavier in atomic weight than calcium; therefore many elements above calcium are not displayed in the results. The predominate element seen in each sample is iron, which is what gives the brick its red coloring. This however is not informative as to the manufacturing location of the sample. For this thesis, samples were tested for levels of rubidium (Rb), strontium (Sr), yttrium (Y), zirconium (Zr), and niobium (Nb). These volcanic elements are used to determine where the sample originated.[73] The results shown are qualitative and semi-quantitative. In the images shown the graphs have not been adjusted, so the peaks are shifted to the left of where the element is marked. While the height of the peak does relate to the amount of the element, the pertinent information is the ratio and pattern of peaks which define the trace elements distinct to a given location.

As there are two distinct groupings of bricks it was speculated one group (Group A) consisted of bricks that were brought in to construct components of the production area and the other were bricks made on site. Various structures have been evaluated individually before comparing to each other. First to be assessed are bricks taken from clamp B, samples: GC.K.B.01, GC.K.B.06, GC.K.B.07, GC.K.B.12, GC.K.B.17, GC.K.B.19, GC.K.B.21, and GC.K.B.22. These samples include four bricks of each grouping, those that formed the firebox of a clamp (Group A), which would remain through each burning cycle, as well as samples of fired bricks found within the clamp assembly (Group B) (See Figure 8.1). These were the samples most likely

[73] Communication with Amy Elizabeth Ubel, Warren Lasch Conservation Laboratory.

to come from multiple sites as those constructing the clamp's fireboxes may have been produced at another site. If the samples came from different regions their trace elements would most likely diverge, however while there are some variations, these differences are not with the elements, rubidium, strontium, yttrium, zirconium, and niobium, which identify a site. These elements are found in approximately the same ratio for all the samples from clamp B (See Figures 8.2 & 8.3). While these results cannot absolutely confirm that both groupings came from the same planation, they do suggest that both groupings came from within a close vicinity to one another along the Cooper River corridor. With such correspondence between groups of bricks, it is quite likely they were produced at the same site.

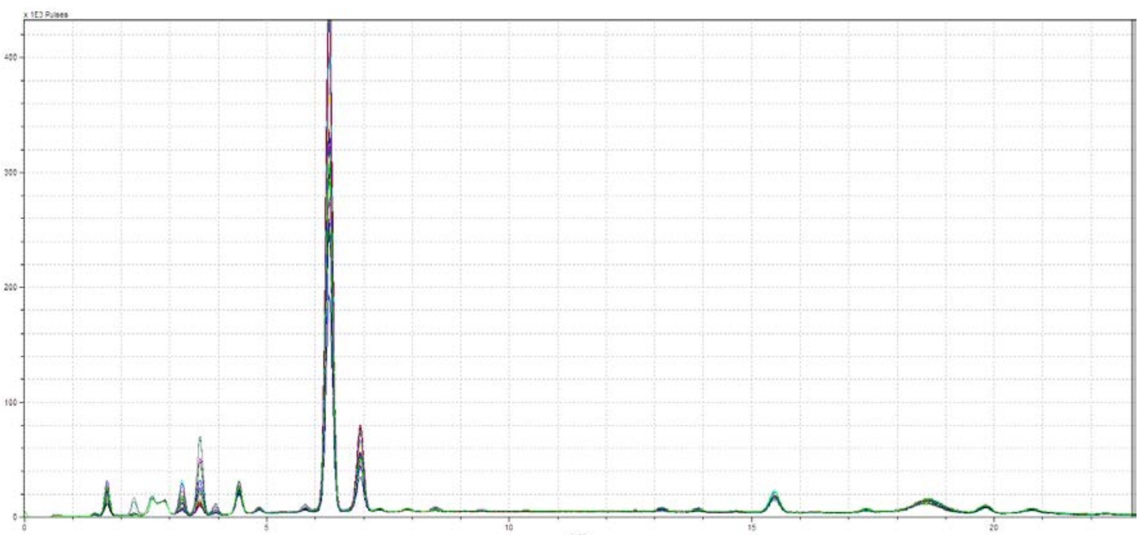


Figure 8.1: XRF. All GC.K.B Samples. Includes bricks found within the clamp as well as those used in the construction of the fireboxes forming the clamp. No glaze samples included.

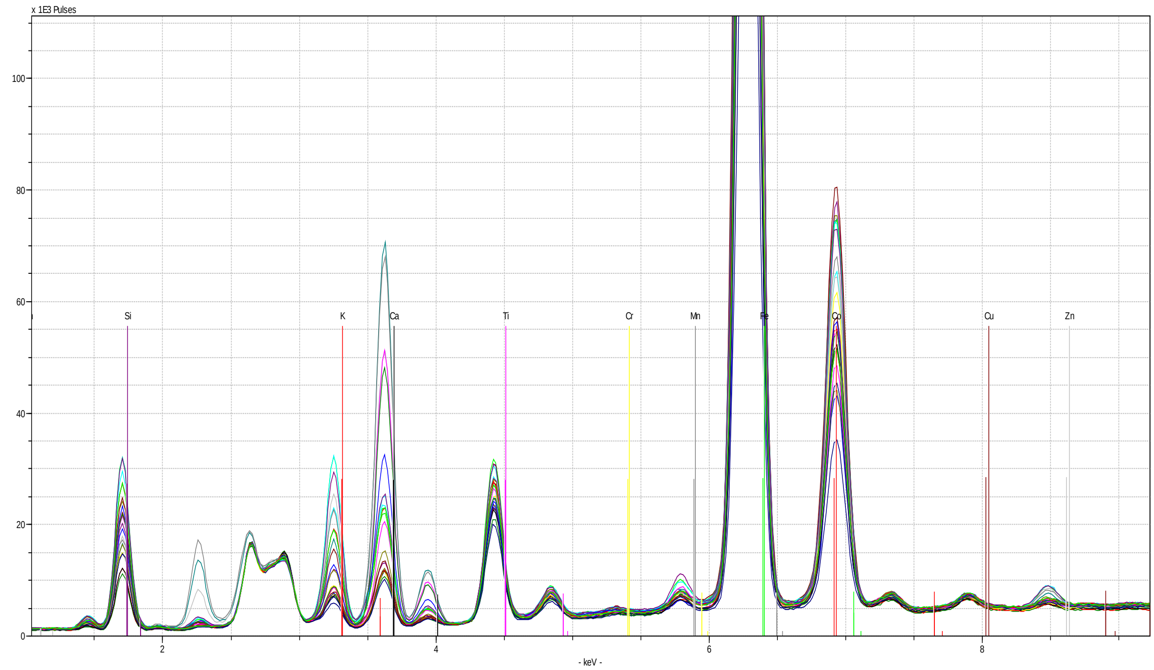


Figure 8.2: XRF. All G.C.K.B Samples - expanded spectrum focusing on the patterns of elements lighter in atomic weight than iron. Includes bricks found in the clamp as well as those used in the construction of the fireboxes forming the clamp. No glaze samples included.

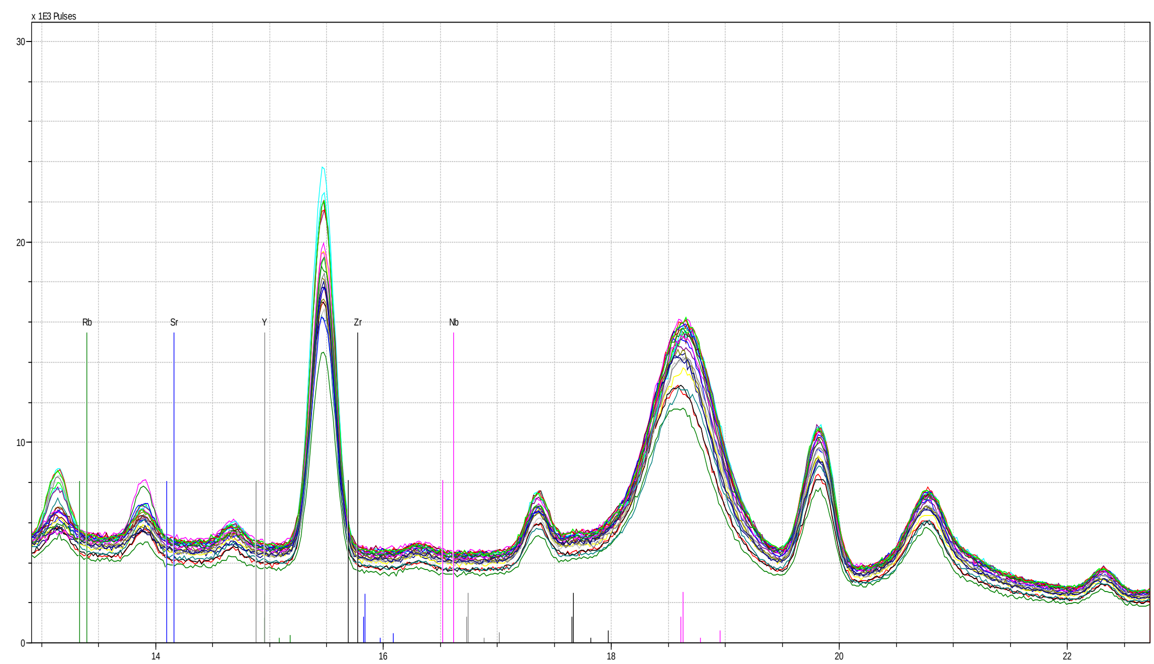


Figure 8.3: XRF. All GC.K.B Samples - Expanded spectrum focusing on the patterns of rubidium, strontium, yttrium, zirconium, and niobium. Includes bricks found within the clamp as well as those used in the construction of the fireboxes forming the clamp. No glaze samples included.

The glaze, found on the interior surface of the bricks forming the firebox, is slightly altered from the bricks themselves. While the pattern of elements is quite similar to the unglazed bricks, the elements are found in lower quantities (See Figure 8.4). This could be a result of exposure during the burning process or a reaction to an applied treatment. Glazes are typically a mixture of base metals, clays, and fluxes. Typical components include, cobalt, vanadium, chromium, tin, nickel, aluminum, and other metals.[74]

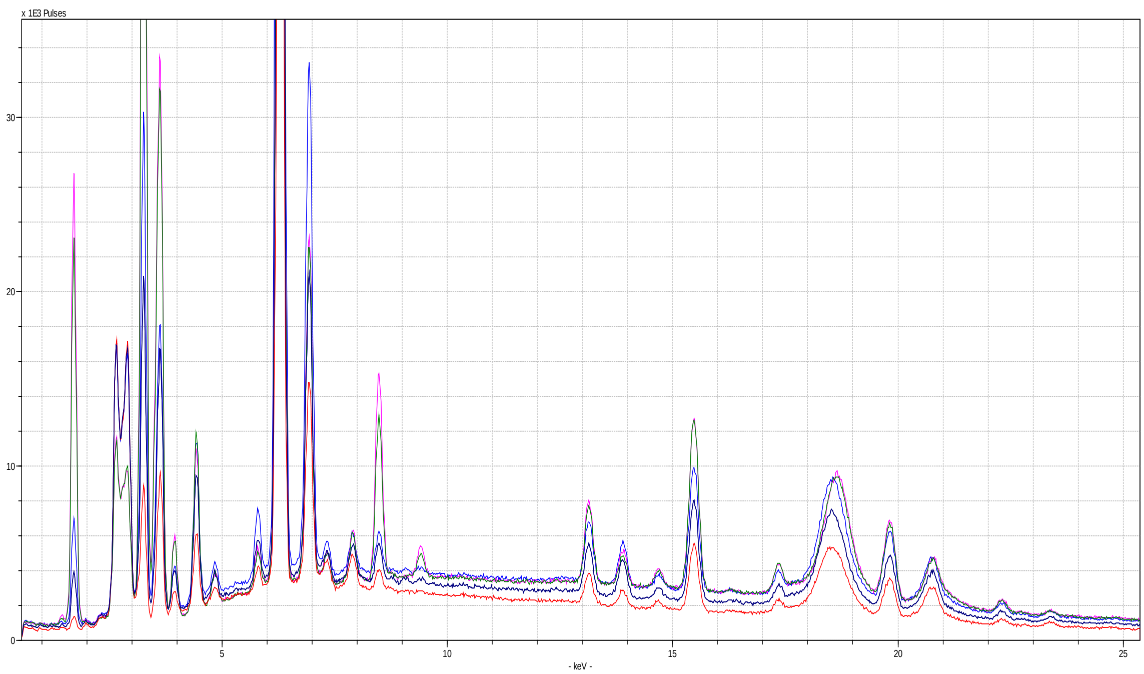


Figure 8.4: Glaze Samples.

The bricks from Structure A, wall fragments around the work yard, show similar results to those of the clamp with one exception (See Figure 8.5). Sample GC.S.A.18 shows a notable spike in arsenic on its glazed side (See Figure 8.6).

[74] Beall, *Masonry Design and Detailing*, 15.

Arsenic has long been included glazing of ceramics. It was considered by some to create a desired milkiness and other colored effects.[75] Arsenic was also used to remove bubbles from the glass by forcing the glass to "boil."[76] This treatment could have been applied as a glaze to the bricks that were intended to line the firebox as a method of regulating the temperature within the clamp. The ratio of trace elements in GC.S.A.18 shows a marginally different pattern than that of other samples. It is possible that these samples include contaminates from another source (See Figure 8.7).

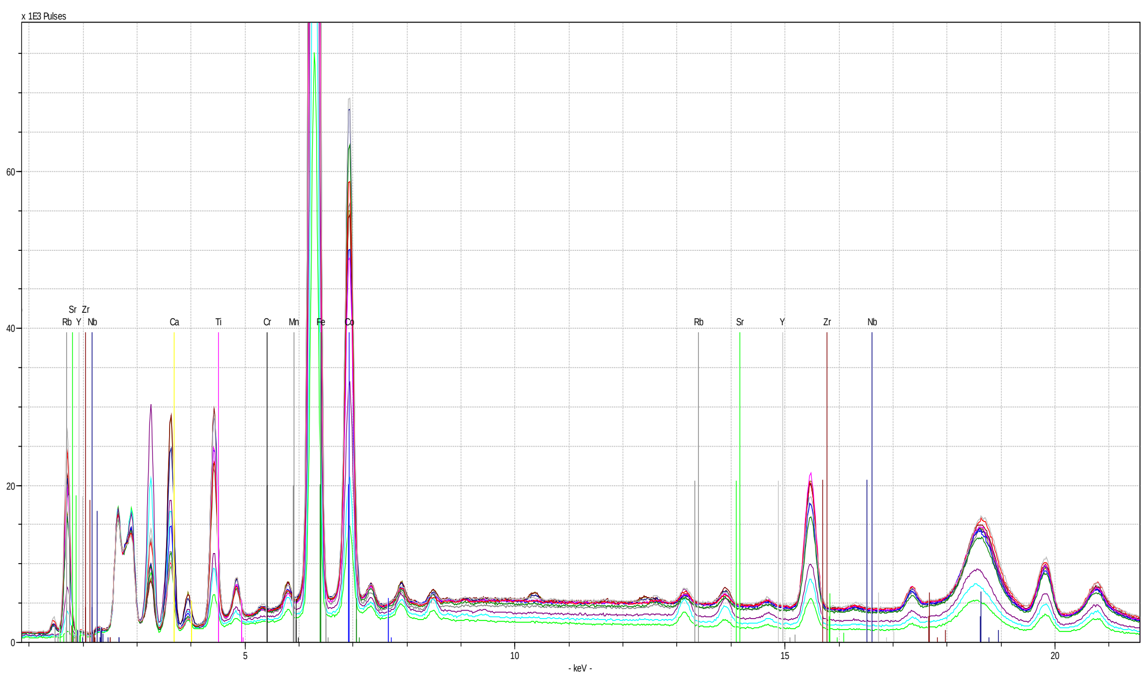


Figure 8.5: XRF. All GC.S.A Samples.

[75] C.N. Fenner and J.B. Ferguson. "The Effect of Certain Impurities in Causing Milkiness in Optical Glass." *Journal of the American Ceramic Society* 1, no. 1 (January 1918).
[76] E.T. Allen and E.G. Zies. "The Condition of Arsenic in Glass and Its Role in Glass-Making." *Journal of the American Ceramic Society* 1 (January 1918).

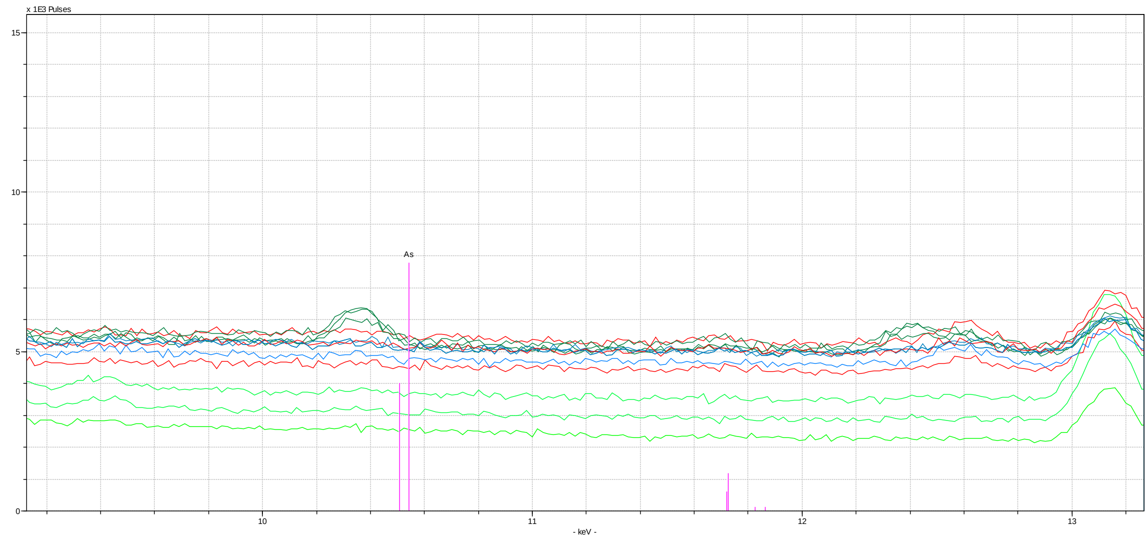


Figure 8.6: XRF. GC.S.A Samples expanded. Green color indicates GC.S.A.18 which shows a higher concentration of arsenic.

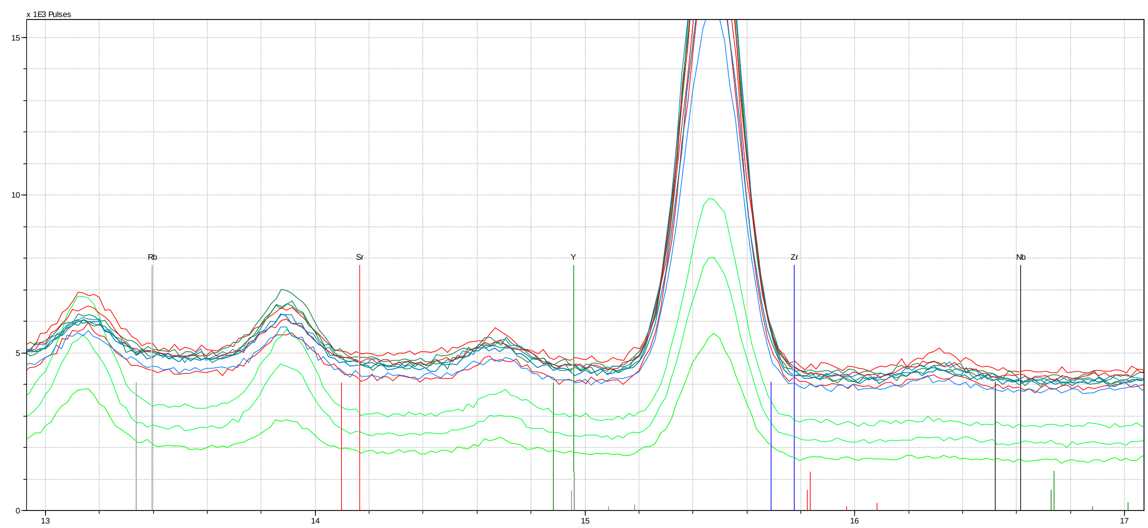


Figure 8.7: XRF. GC.S.A Samples Expanded. Light green shows glazing of brick GC.S.A.18 with a different pattern of trace elements, no known reason.

When all the brick samples are examined together, the similarities become obvious (See Figure 8.8). While there are some outliers, the majority of results follow the same pattern of elements. These outliers are the reason for the multiple tests per sample brick. The ratio of certain elements (rubidium, strontium, yttrium, zirconium, and niobium) is consistent through all samples (See Figure 8.9). This would indicate that all the samples were manufactured in close proximity to one another, though as yet how close a proximity cannot be determined.

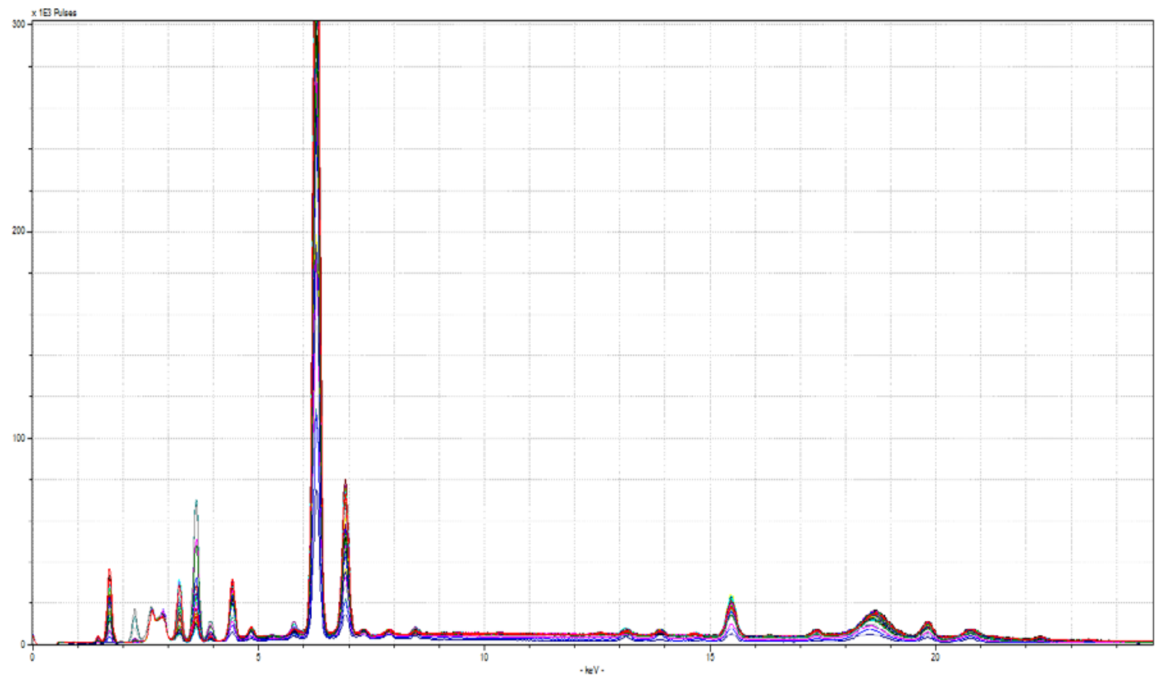


Figure 8.8: XRF. All brick samples overall comparison. No glaze samples included.

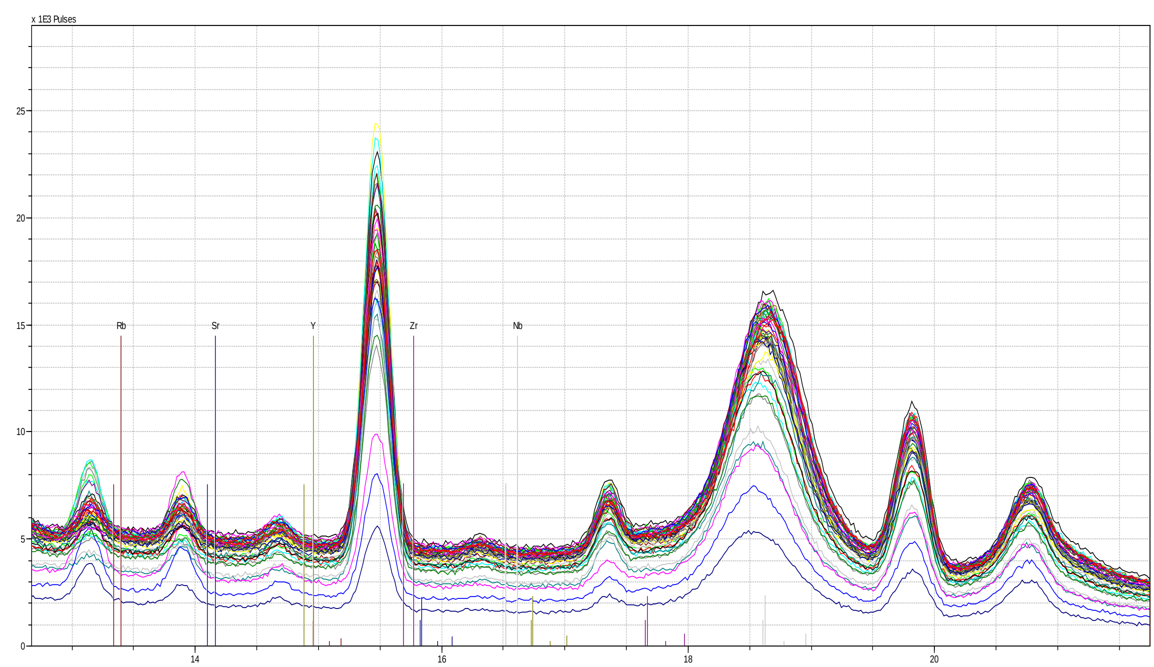


Figure 8.9: XRF All Brick Samples, No Glaze - expanded spectrum focusing on the patterns of rubidium, strontium, yttrium, zirconium, and niobium.

Clay and sand samples have been taken throughout the site. Of the samples taken, two clay sample and one sand sample were chosen for XRF testing. The samples were chosen by their visual appearance in an attempt to study the range of soils found at the site. These are the same samples that were evaluated under microscope (See Table 8.1 & Figure 8.10).

Sample	Location	GPS Coordinates	
GC.Clay.5	Pit C	32.978896	-79.893780
GC.Clay.20	Pit E	32.978963	-79.892632
GC.Sand.22	Pit F	32.979411	-79.895350

Table 8.1: Clay and Sand Sample Details.

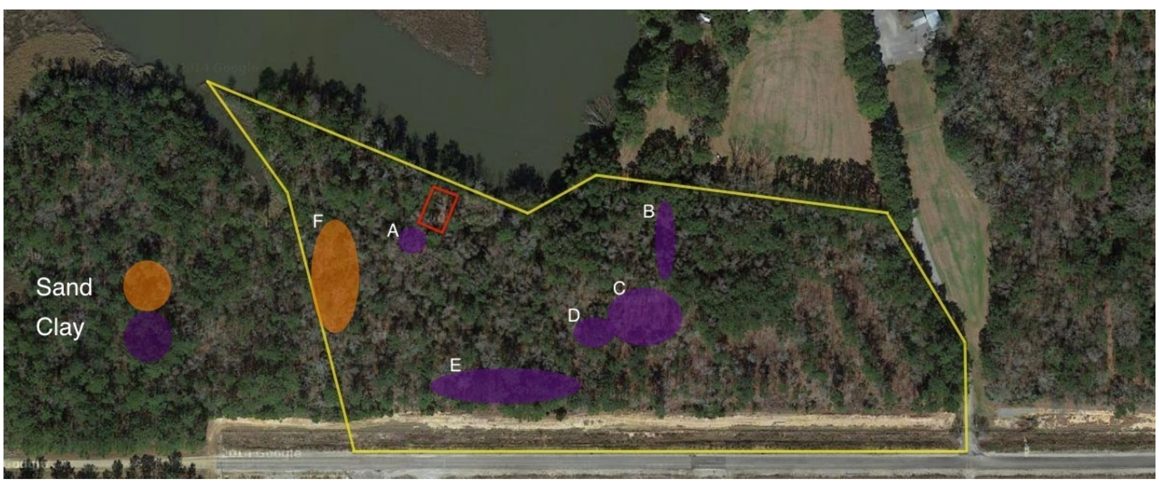


Figure 8.10: Clay and Sand Pits (Google Map).

As with the brick samples, the soil samples were evaluated for the patterns of elements rubidium, strontium, yttrium, zirconium, and niobium (See Figures 8.11 – 8.13). While the composition of clay and sand differ, the trace volcanic elements of a given locale do not. The sand, clay, and finished bricks all contain the same pattern of trace elements (See Figures 8.14 – 8.16). These results imply that the bricks are composed of the resources found at the site or in close proximity.

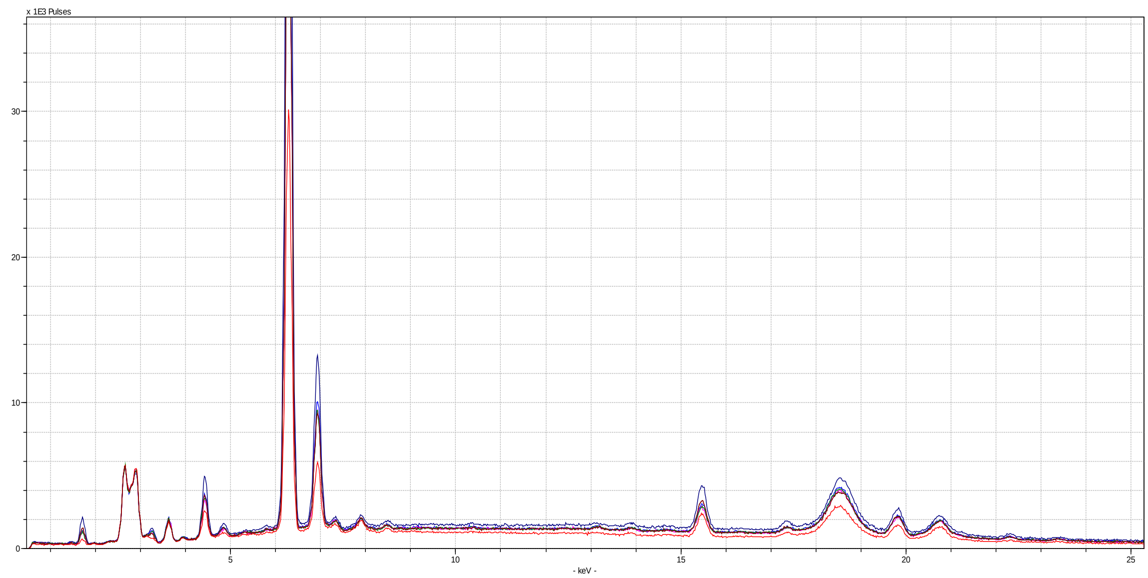


Figure 8.11: XRF. Clay Samples.

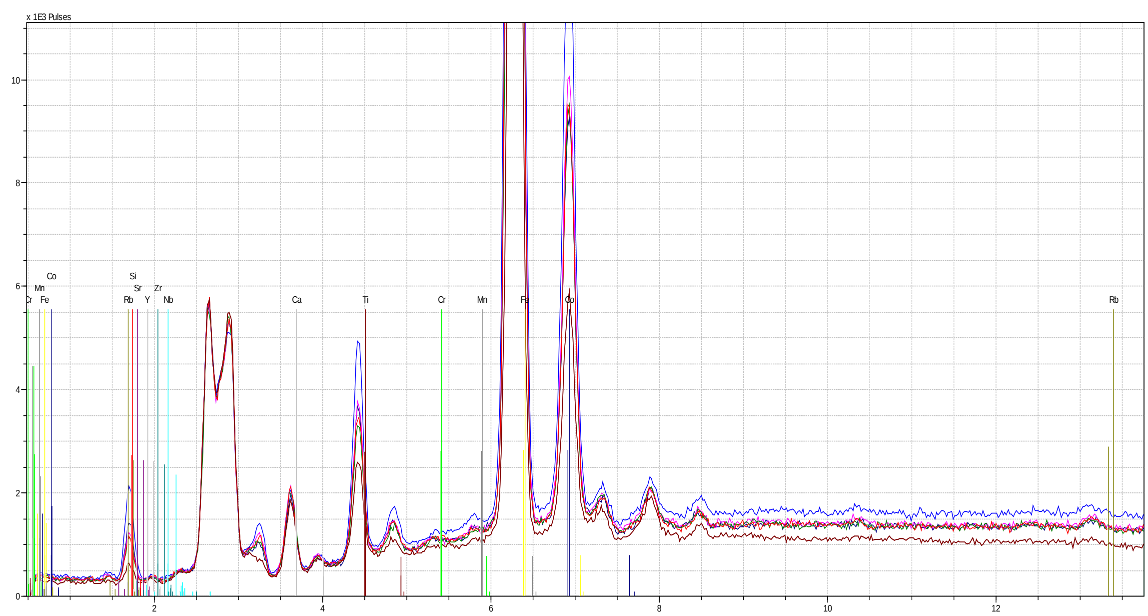


Figure 8.12: XRF. Clay Samples - expanded spectrum focusing on the patterns of elements lighter in atomic weight than iron .

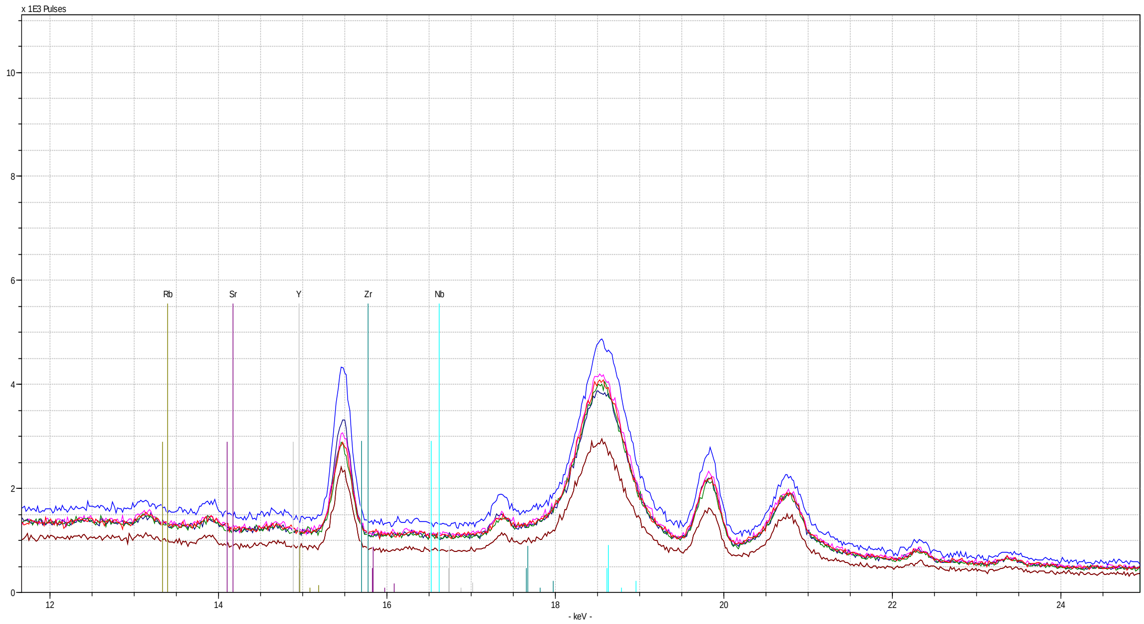


Figure 8.13: XRF. Clay Samples - expanded spectrum focusing on the patterns of rubidium, strontium, yttrium, zirconium, and niobium.

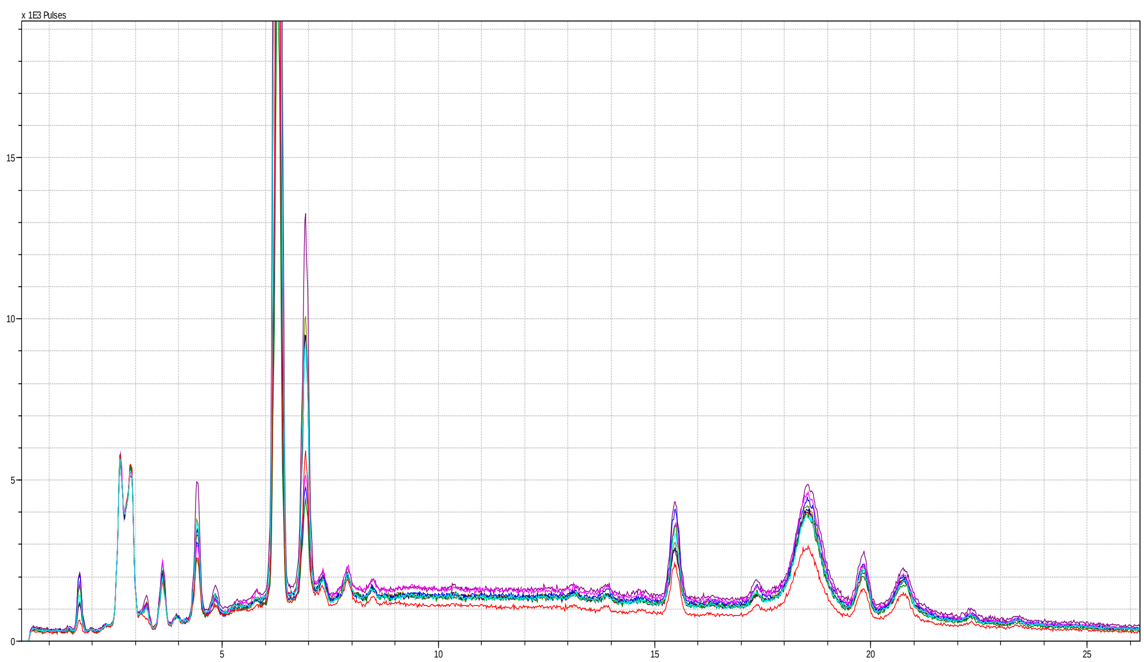


Figure 8.14: XRF. Clay and Sand Samples Overall Comparison.

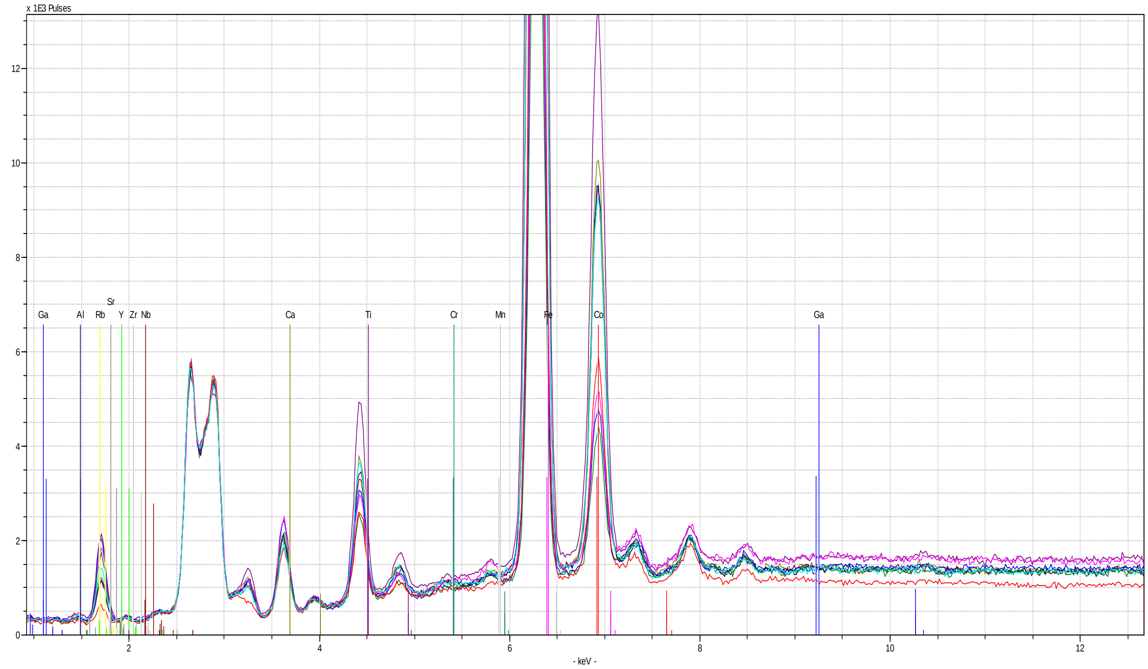


Figure 8.15: XRF. Clay and Sand Samples - expanded spectrum focusing on the pattern of elements lighter in atomic weight than iron.

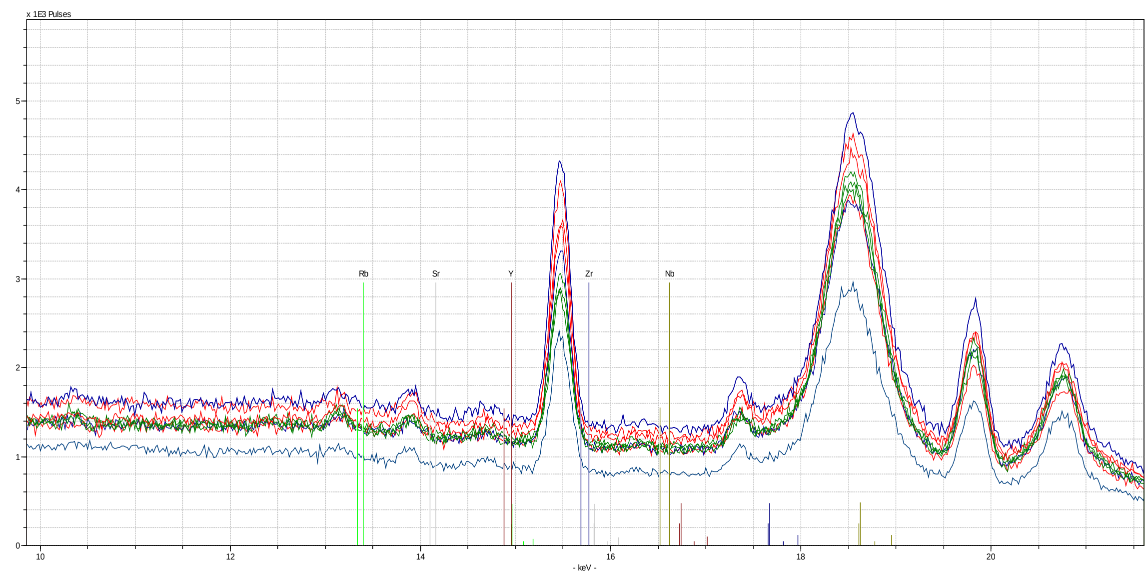


Figure 8.16: XRF. Clay and Sand Samples - expanded spectrum focusing on the patterns of Rubidium, strontium, yttrium, zirconium, niobium. GC.Clay.5 – green, GC.Clay.20 – blue, GC.Sand.22 – red.

By relating the results from the Grove to samples from other locations it can be better understood the distinction between locales. The peaks are offset due to prior adjustments and but do not have any significant impact on ratios. The height and pattern of peaks is indicative of the elements specific to each location. Two of the samples, Archdale Hall Plantation and a structure on East Bay Street, each are bricks from an unknown location in the Lowcountry (See Figure 8.17). While the bricks from East Bay Street and Pacachamac are quite different, the bricks from Archdale Hall are quite similar to those from the Grove. This indicated that they were most likely manufactured in close vicinity to one another.

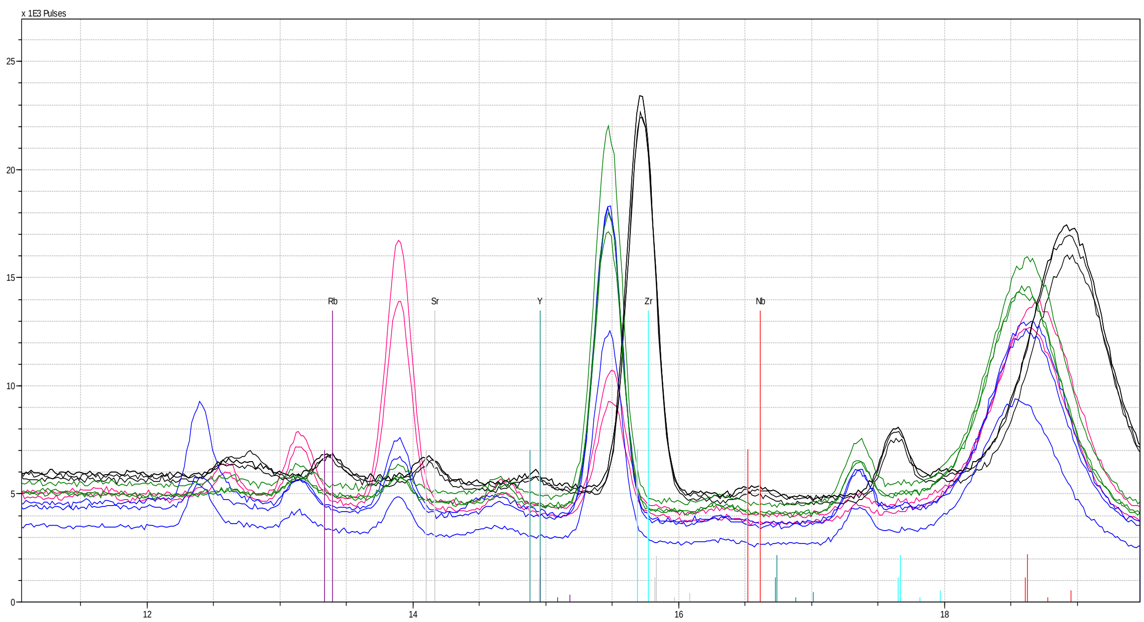


Figure 8.17: XRF. Trace elements in samples from different locations. Focusing on rubidium, strontium, yttrium, zirconium, and niobium. The Grove – green, Pacachama, Peru – pink, East Bay Street – blue, Archdale Hall – black (Courtesy of Warren Lasch Conservation Center).

CHAPTER NINE

CONCLUSIONS

The Grove was one of thirty plantations lining the east branch of the Cooper River and its tributaries that diversified their economic activities by making bricks. Operated from perhaps as early as 1810 when John Gordon acquired the plantation from Thomas Karwon until about 1835 when Gordon sold the plantation to Edmund Ravenel, a brick making operation thrived at the Grove during the antebellum period. Located on Moreland Creek, a tributary of the eastern branch of the Cooper River, the Grove was ideally situated to provide brick for building projects in Charleston, a short distance away by boat. Brick making at the Grove depended on demand from Charleston, and it depended on easy access to the raw materials required for brick production. Sources of clay, sand and water were present at the Grove in close proximity to each other, an asset created by geological forces. During what may have been a relatively short period of activity, the managers of the brick making operation linked borrow pits from which clay and sand were dug to sheds, work yards, clamps and a wharf in linear organization that transformed raw sand and clay into shipped brick. Now visible only as ruins, the brick making operation at the Grove is an ideal location at which antebellum brick making can be assessed.

Brick produced at the Grove also provide an opportunity to investigate the geophysical properties of antebellum brick. While the Grove offers an opportunity to reconstruct the workflow of a brick making operation, the brick produced there also offer an opportunity to begin to track Grove brick from dug raw material to brick laid in Charleston buildings. Examination of sand from Grove sand pits and analysis of Grove clays and Grove brick using microscopy and XRF technology produced a geophysical profile that can be used to identify Grove brick at Charleston building sites.

Brick making at the Grove put the advantages of its setting and the assets of its site to good purpose. Within a relatively compact site, veins of clay and sand pits bordered the rear of an industrial area organized linearly to move raw materials through processing and firing to shipping. Sand and clay were mixed and molded at the center of the industrial area where ruins of the footings for a drying shed indicate green brick were dried before being laid up into a clamp for firing. Wells dug within the industrial area provided water for the mixing process. Further archaeological investigation of the site might reveal if the clay and sand combined for Grove brick were mixed by hand or by a pug mill. Further archaeological investigation would also reveal more about the clamp in which Grove brick were burned.

One of the most interesting features of the Grove brick making site are the three large subterranean flues which provided a permanent base for the clamps of green brick that were laid up for firing. Constructed of brick that form long, arched shafts that directed hot gases from fireboxes into the clamp during firing, these clamps bear the evidence of repeated firings. While the purpose of these flues is clear, additional archaeological investigation would provide information about the relationship of fireboxes to the flues as well as more precise information about the size and capacity of the clamp.

During its operation, the Grove produced two types of brick. Brick labeled for analytical purposes Group A were hand molded, most likely shaped in wooden forms. While Group A brick fell within the general size range for Charleston area brick, they did demonstrate significant variation in size. Variation in Group A brick may reflect varying rates of shrinkage during firing, an effect of both drying and proportion of sand to clay in the brick mix. Group B brick, on the other hand, were uniform in size and bore distinct impressions of iron molds. It is unknown why the managers of the Grove brick making operation switched molding methods. It is even possible that both molding methods were used simultaneously. Geophysical examination of the two brick groups suggests, however, that they are distinct types.

The brickmaking industry of the east branch of the Cooper River was most active in the decade that preceded the Civil War. Federal census records indicate that Christ Church and St. Thomas & St. Denis Parishes produced more than 9,000,000 bricks annually, earning their operators returns of approximately $64,000. More than one plantation owner "made his fortune" by producing brick. Producing brick for Charleston builders was vital to the East Cooper plantations, especially those which did not diversify. During John Gordon's ownership of the Grove, the *Charleston City Directory* changed his profession from "bricklayer" to "planter." Census reports and other records indicated that John Gordon received a significant income producing brick on his three properties.

Interpretation of brick making at the Grove will expand historic understanding of the brick industries that were once an essential component of Cooper River plantations. Further investigation of brick produced along the Cooper will build on XRF analysis conducted for this study. XRF analysis of clay, sand and brick from the Grove have identified a distinctive signature that can, it is hoped, be used to identify brick burned at the Grove and laid up into Charleston buildings. The application of this comparative technique will, on one level, confirm what is already historically well known. Cooper River brick were used in Charleston. The ability to identify Groove brick, to distinguish it from brick from other Cooper River sites and from brick making sites along the Ashley River may become a diagnostic tool that allows architectural historians to differentiate episodes of repair and rebuilding that current diagnostic methods cannot discern. For the present, XRF testing confirms that it is possible to match a brick to its source through the comparison of certain trace elements. The results from the Grove have already shown a correlation between the source material at the Grove and bricks from Archdale Hall. These results will allow future study to locate the origin of other bricks in the Charleston area.

APPENDICES

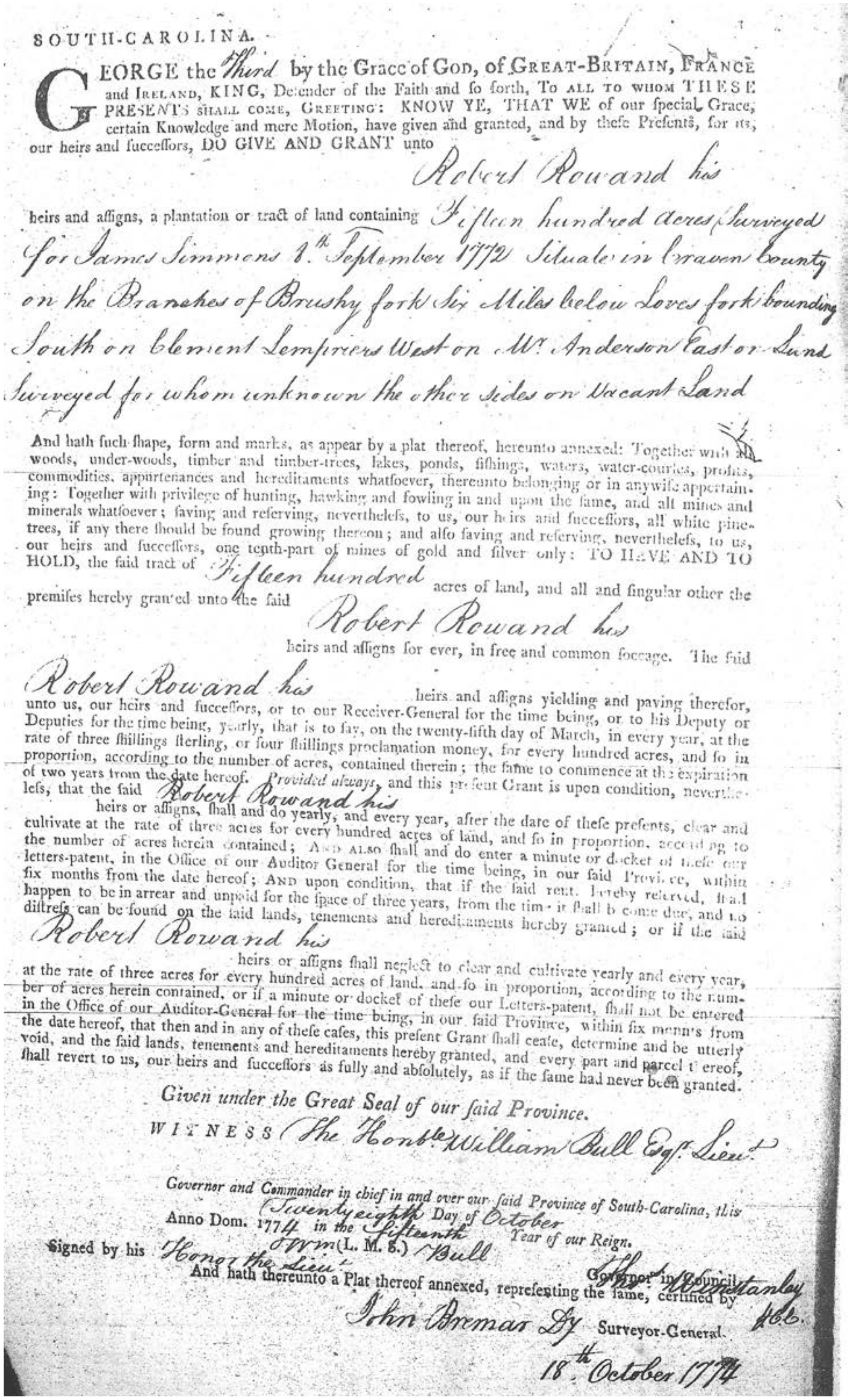
Appendix A

Documents and Images

3 Feb. 1773; granted 28 Oct. 1774. Quit rent in 2 years. Robert Ellison, DS. [13-456:5]

ROBERT ROWAND, 27 Apr. 1775: 1500 acres in Craven County on branches of Bushey Fork 6 miles below Love's Fork. Bounded S on Clement Lampriere {P20-204:2}; W on Anderson; E owner unknown; other sides vacant. Also, 1000 acres in Colleton County on waters of Saltcatchers. Bounded by vacant land. Both surveys certified 18 Oct. 1774. Also, 500 acres in Orangeburgh District, commonly called the Three Ponds, about 5 miles S of the S fork of Edisto. Bounded by vacant land. Survey certified 16 Aug. 1774. Also, 500 acres, as above. Bounded W on said Rowand; other sides vacant. Also, 500 acres,as above. Bounded E on said Rowand; other sides vacant. Both surveys certified 17 Aug. 1774; all granted 28 Oct. 1774. Quit rent in 2 years. Malcolm Clark, DS. Delivered 3 May 1775 to John Rowand Forrester. [13-457:1]

Figure A - 1: Memorial of Land Title, Robert Rowand. Jesse Hogan Motes III and Margaret Peckham Motes, *South Carolina Memorials: Abstracts of Land Titles* (Greenville: Southern Historical Press, 1996), 301.



SOUTH-CAROLINA.

GEORGE the Third by the Grace of GOD, of GREAT-BRITAIN, FRANCE and IRELAND, KING, Defender of the Faith and so forth, To ALL TO WHOM THESE PRESENTS SHALL COME, GREETING: KNOW YE, THAT WE of our special Grace, certain Knowledge and mere Motion, have given and granted, and by these Presents, for us, our heirs and successors, DO GIVE AND GRANT unto Robert Rowand his heirs and assigns, a plantation or tract of land containing Fifteen hundred Acres Surveyed for James Simmons 8th September 1772 Situate in Craven County on the Branches of Brushy fork Six Miles below Loves fork bounding South on Clement Lempriers West on Mr. Anderson East on Land Surveyed for whom unknown the other sides on Vacant Land

And hath such shape, form and marks, as appear by a plat thereof, hereunto annexed: Together with all woods, under-woods, timber and timber-trees, lakes, ponds, fishings, waters, water-courses, profits, commodities, appurtenances and hereditaments whatsoever, thereunto belonging or in anywise appertaining: Together with privilege of hunting, hawking and fowling in and upon the same, and all mines and minerals whatsoever; saving and reserving, nevertheless, to us, our heirs and successors, all white pine-trees, if any there should be found growing thereon; and also saving and reserving, nevertheless, to us, our heirs and successors, one tenth-part of mines of gold and silver only: TO HAVE AND TO HOLD, the said tract of Fifteen hundred acres of land, and all and singular other the premises hereby granted unto the said Robert Rowand his heirs and assigns for ever, in free and common soccage. The said Robert Rowand his heirs and assigns yielding and paying therefor, unto us, our heirs and successors, or to our Receiver-General for the time being, or to his Deputy or Deputies for the time being, yearly, that is to say, on the twenty-fifth day of March, in every year, at the rate of three shillings sterling, or four shillings proclamation money, for every hundred acres, and so in proportion, according to the number of acres, contained therein; the same to commence at the expiration of two years from the date hereof. *Provided always*, and this present Grant is upon condition, nevertheless, that the said Robert Rowand his heirs or assigns, shall and do yearly, and every year, after the date of these presents, clear and cultivate at the rate of three acres for every hundred acres of land, and so in proportion, according to the number of acres herein contained; AND ALSO shall and do enter a minute or docket of these our letters-patent, in the Office of our Auditor General for the time being, in our said Province, within six months from the date hereof; AND upon condition, that if the said rent, hereby reserved, shall happen to be in arrear and unpaid for the space of three years, from the time it shall become due, and no distress can be found on the said lands, tenements and hereditaments hereby granted; or if the said Robert Rowand his heirs or assigns shall neglect to clear and cultivate yearly and every year, at the rate of three acres for every hundred acres of land, and so in proportion, according to the number of acres herein contained, or if a minute or docket of these our Letters-patent, shall not be entered in the Office of our Auditor-General for the time being, in our said Province, within six months from the date hereof, that then and in any of these cases, this present Grant shall cease, determine and be utterly void, and the said lands, tenements and hereditaments hereby granted, and every part and parcel thereof, shall revert to us, our heirs and successors as fully and absolutely, as if the same had never been granted.

Given under the Great Seal of our said Province.

WITNESS The Honble William Bull Esqr. Lieut. *Governor and Commander in chief in and over our said Province of South-Carolina, this* Twentyeighth Day of October Anno Dom. 1774 in the Fifteenth *Year of our Reign.*

Wm (L. S.) Bull

Signed by his Honor the Lieut. Governor in Council

Thos. Winstanley

And hath thereunto a Plat thereof annexed, representing the same, certified by

John Bremar Dy Surveyor-General.

18th October 1774

Figure A - 2: Colonial Land Grant, Robert Rowand.

WILL OF
T
CLEM. LEMPRIER

JUNE 8th 1776. SO. CAROLINA. In the Name of God Amen &c. &c.
Being in Sound and perfect Sense. Imprimis. I bequeath to my dear and Loving Wife Sarah Lemprier to the amount of Six thousand Pounds Currency, exclusive the Sum Mentioned in her Marriage Settlement. The Remainder of my little Estate I leave in the Hands of my good friend George Padden Bond to be disposed of between my Daughter and her Children as he shall think most proper. And it is my full meaning That Charles Prince nor any other Person shall not have any Intermedling with my Affects after my decease But in case of the said Bond's death, the whole to be under the direction my dear wife Sarah Lemprier. The Substance on the other side Wr-itten I do acknowledge to be the whole Substance and Intent of my last Will.

Clem Lemprier (L S)

Witness

Mary Milner.
Philip Tidymann.
Mary Milner Junr

Proved before John Scott Esqr by virtue of a dedimus from the Honble James Simpson Esqr ordinary of his Majesty's Province of South Carolina the 19th November 1780- - -

Recorded in Original Will book 1780- 1783, page 45

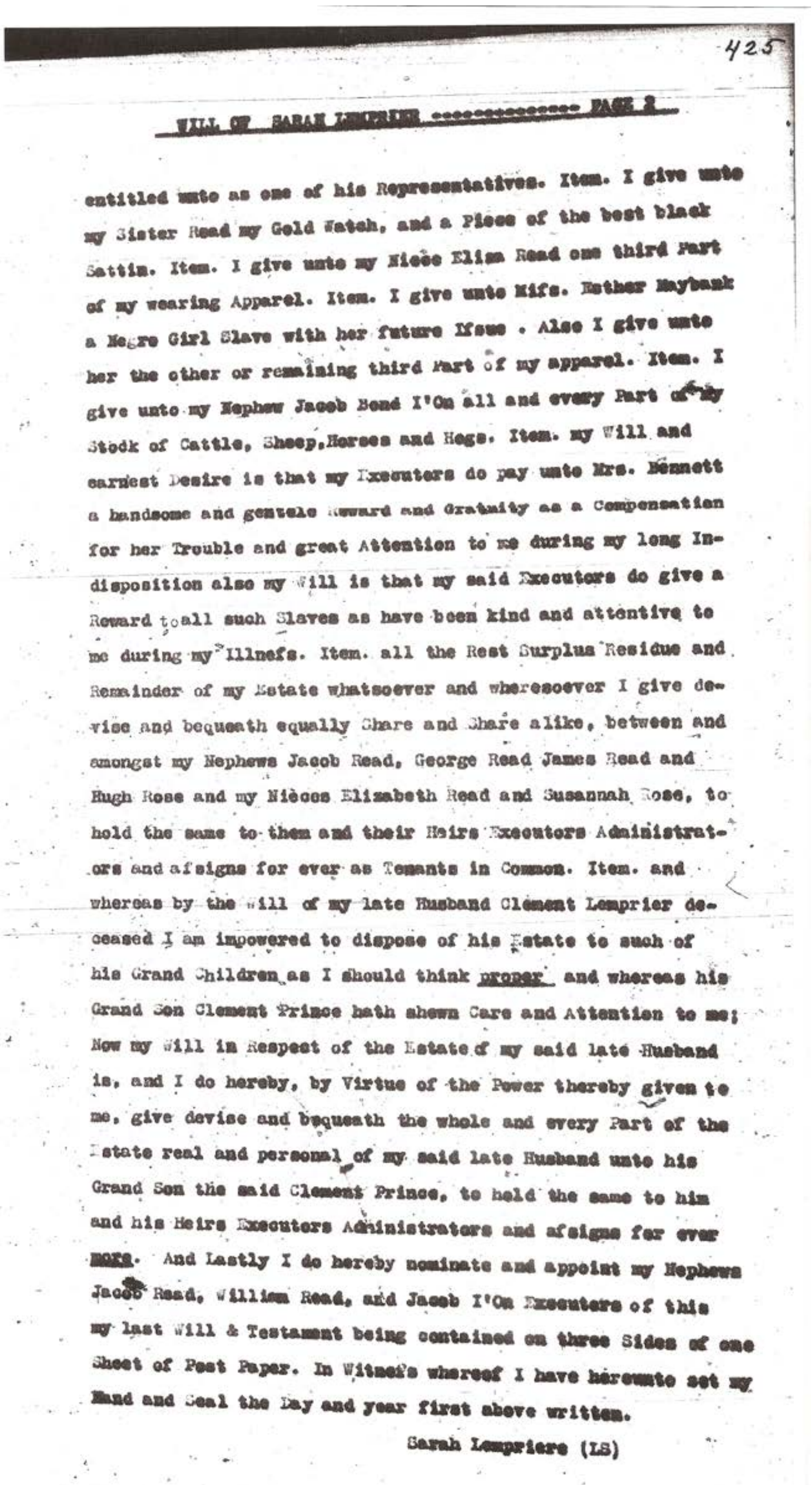
Figure A - 3: Will of Clement Lemprier.

WILL OF

SARAH LEMPRIER

11 Qs No.30 In the Name Of God Amen, I Sarah Lemprier of Christ Church Parish in the State of South Carolina, Widow, and Relict of Clement Lemprier late of the said Parish Esquire, deceased, do this twenty first day of April in the Year of our Lord one thousand seven hundred and eighty four, make publish and declare this my last Will and Testament in Manner and Form following, that is to say, First I will that all my Debts and funeral Charges be fully paid and satisfied by my Executors herein after named. Item. I give unto Jane Rose, six young Negro Wenches with their future Ifsue and Increase . Item. I give unto Hester Tidyman Daughter of my Niece Mrs. Hesther Tidyman, two Negro Women Slaves with their future Ifsue. Item. I give unto my Niece Mrs. Hesther Tidyman, my Negro Woman Slave named Deb with her future Ifsue, and also a Piece of the best Head-Lace, Likewise a Gold Brooch made as Mourning for her Aunt I'on. Item. I give unto the Negro Woman Beck belonging to the Estate of my late Brother, the Sum of twenty Pounds Sterling to be paid to her yearly and every year during her natural Life by my Executors out of the Rents Ifsues and Profits of my Estate. Item. I give and bequeath unto my Sister Randal six Negro Slaves, or the Value thereof in Sterling Money at the Discretion of my Exe utors Item. I give unto John Bond Randal six Negro Slaves, or an equivalent thereto in Sterling Money at the Discretion of my said Executors . Item. I give unto my Niece, Mrs. Hasel, two Negro Slaves and their future Ifsue, if female Slaves, as also one third Part of my wearing apparel, Item. I give and bequeath unto my Nephew William Read the Sum of one hundred Pounds Sterling Money as also all and every Part of my Household and Kitchen Furniture, Likewise I give unto him ten of my Negro and other Slaves. Item I give and devise unto Jacob Bond I'On the younger the Son of my Nephew Jacob Bond I'On, and to his Heirs and afsigns for ever, all and every Part of the Land and real Estate and which upon the Death of my late Brother I became

Figure A - 4: Will of Sarah Lemprier (1/5).



425

WILL OF SARAH LEMPRIER -------------- PAGE 2

entitled unto as one of his Representatives. Item. I give unto my Sister Read my Gold Watch, and a Piece of the best black Sattin. Item. I give unto my Niece Eliza Read one third Part of my wearing Apparel. Item. I give unto Mifs. Esther Maybank a Negro Girl Slave with her future Ifsue . Also I give unto her the other or remaining third Part of my apparel. Item. I give unto my Nephew Jacob Bond I'On all and every Part of my Stock of Cattle, Sheep, Horses and Hogs. Item. my Will and earnest Desire is that my Executers do pay unto Mrs. Bennett a handsome and genteele Reward and Gratuity as a Compensation for her Trouble and great Attention to me during my long Indisposition also my Will is that my said Executors do give a Reward to all such Slaves as have been kind and attentive to me during my Illnefs. Item. all the Rest Surplus Residue and Remainder of my Estate whatsoever and wheresoever I give devise and bequeath equally Share and Share alike, between and amongst my Nephews Jacob Read, George Read James Read and Hugh Rose and my Nièces Elizabeth Read and Susannah Rose, to hold the same to them and their Heirs Executors Administrators and afsigns for ever as Tenants in Common. Item. and whereas by the Will of my late Husband Clement Lemprier deceased I am impowered to dispose of his Estate to such of his Grand Children as I should think proper and whereas his Grand Son Clement Prince hath shewn Care and Attention to me; Now my Will in Respect of the Estate of my said late Husband is, and I do hereby, by Virtue of the Power thereby given to me, give devise and bequeath the whole and every Part of the Estate real and personal of my said late Husband unto his Grand Son the said Clement Prince, to hold the same to him and his Heirs Executors Administrators and afsigns for ever more. And Lastly I do hereby nominate and appoint my Nephews Jacob Read, William Read, and Jacob I'On Executers of this my last Will & Testament being contained on three Sides of one Sheet of Post Paper. In Witnefs whereof I have hereunto set my Hand and Seal the Day and year first above written.

Sarah Lempriere (LS)

Figure A - 5: Will of Sarah Lemprier (2/5).

426

WILL OF SARAH LEMPRIER ---------- PAGE 3

Witnefses.

Joshua Ward ---------- Joseph Righton ---------Daniel Starnes--

A Codicil to be added to and made a Part of the Last Will and Testament of the abovesaid Sarah Lemprier that is to say I give and bequeath unto my Niece Margaret Tunno two Negro Slaves, or an equivalent thereto in Sterling Money at the Discretion of my herein before mentioned Executors. Item. I give unto Samuel Daws one Negro Boy Slave or a Sum in Sterling Money as an equivalent thereto at the Discretion of my said Executors. In Witnefs whereof I have to this Codicil contained on the same Sheet of Paper with my last Will and Testament hereunto set my Hand and Seal the Day and Year above said.

her
Sarah + Lempriere (LS)
mark

Witnefses

Joshua Ward ---------------Jonathan Clarke ---------------------

A further Codicil to be added to the last Will and Testament aforesaid the Day and Year abovesaid that is to say I give and bequeath unto my Great Niece Sarah Bond I'On ten Negro Slaves under fifteen Years of age, Witnefs my Hand and Seal.

her
Sarah + Lempriere (LS)
mark

Witnefses.

Joshua Ward -------------Jonathan Clarke -----------------------

South Carolina. SS.

I Sarah Lempriere of the State of South Carolina Relict of Clement Lempriere of the said State Esquire deceased, do on the twenty third day of April in the Year of our Lord one thousand seven hundred and eighty four, being of sound Mind and Memory, make publish and declare this my Codicil to my last Will and Testament in Manner following, that is to say: Whereas in and by my said last Will and Testament bearing Date on or about the twenty first Day of this present Month of April, I have herein given and bequeathed unto my Grand Nephew Jacob Bond I'On, the Son of my Nephew Jacob Bond I'On, and to his

Figure A - 6: Will of Sarah Lemprier (3/5).

427

Heirs and Afsigns for ever, the whole and every Part of the real Estate and Lands to which I am entitled as one of the Representatives of my late Brother George Padden Bond Deceased: Now, my Will in Respect of the said Lands and real Estate is, that the same shall be sold and disposed of by my Executors in my said Will named, and the Monies arising therefrom I will & direct shall be paid unto the Hands of my said Nephew Jacob Bond I'On, for the Use and Behoof of his Son the aforesaid Jacob Bond I'On, to be by him used and improved in such Manner and Way as he the said Jacob Bond I'On shall think most for the advantage of the said Son. And Whereas also in and by my said Will, I have given and devised the whole and every Part of the Estate of my late Husband Clement Lempriere (and which by his Will I was authorized and empowered to dispose of unto any of his Grand Children that I should see fit) unto his Grand Child Clement Prince his Heirs and Afsigns for ever: Now I do hereby revoke the said Devise and my Will in Respect of the same is, that the Sum of ten thousand Pounds old Currency, the Interest whereof I was entitled to receive during my Life, shall go to, be had, taken and received by the said Clement Prince his Executors, Administrators and afsigns for ever, and that the Rest, Residue and Remainder of the said last mentioned Estate, shall go to and be divided among the said Clement Prince, his Mother Ann Prince (Wife of M^r. Charles Prince) and Elizabeth Prince and Joseph Prince her Children, and whereas also in and by my aforesaid Will I have given and devised ten Negroe Slaves unto my Grand Niece Sarah Bond I'On and to her Heirs and Afsigns for ever: Now I do hereby authorise and empower my Nephew Jacob Bond I'On, Father to the said Sarah Bond I'On, to chuse the said ten Negroe Slaves for her out of my Estate at large. Item. I do hereby give devise and bequeath unto my aforesaid Grand Nephew Jacob Bond I'On and to his Heirs and afsigns for ever, my Negro Boy named Stephey. And lastly it is my Desire that this present Codicil be annexed to and made a Part of my last

Figure A - 7: Will of Sarah Lemprier (4/5).

428

WILL OF SARAH LEMPRIER ---------- PAGE 5

Will and Testament, In Witness whereof I the said Sarah Lem-
priere have hereunto set my Hand and Seal the Day and Year
first above written.

Sarah Lempriere (LS)

Sealed Published and Declared by Sarah Lempriere as a Codicil
to be annexed to her last Will and Testament in Presence of
us.

Robert Wilson------------James Barnett ----Samuel Wilson

Proved before Charles Lining Esq[e]. O.C.T.D. June 30[th] 1784.

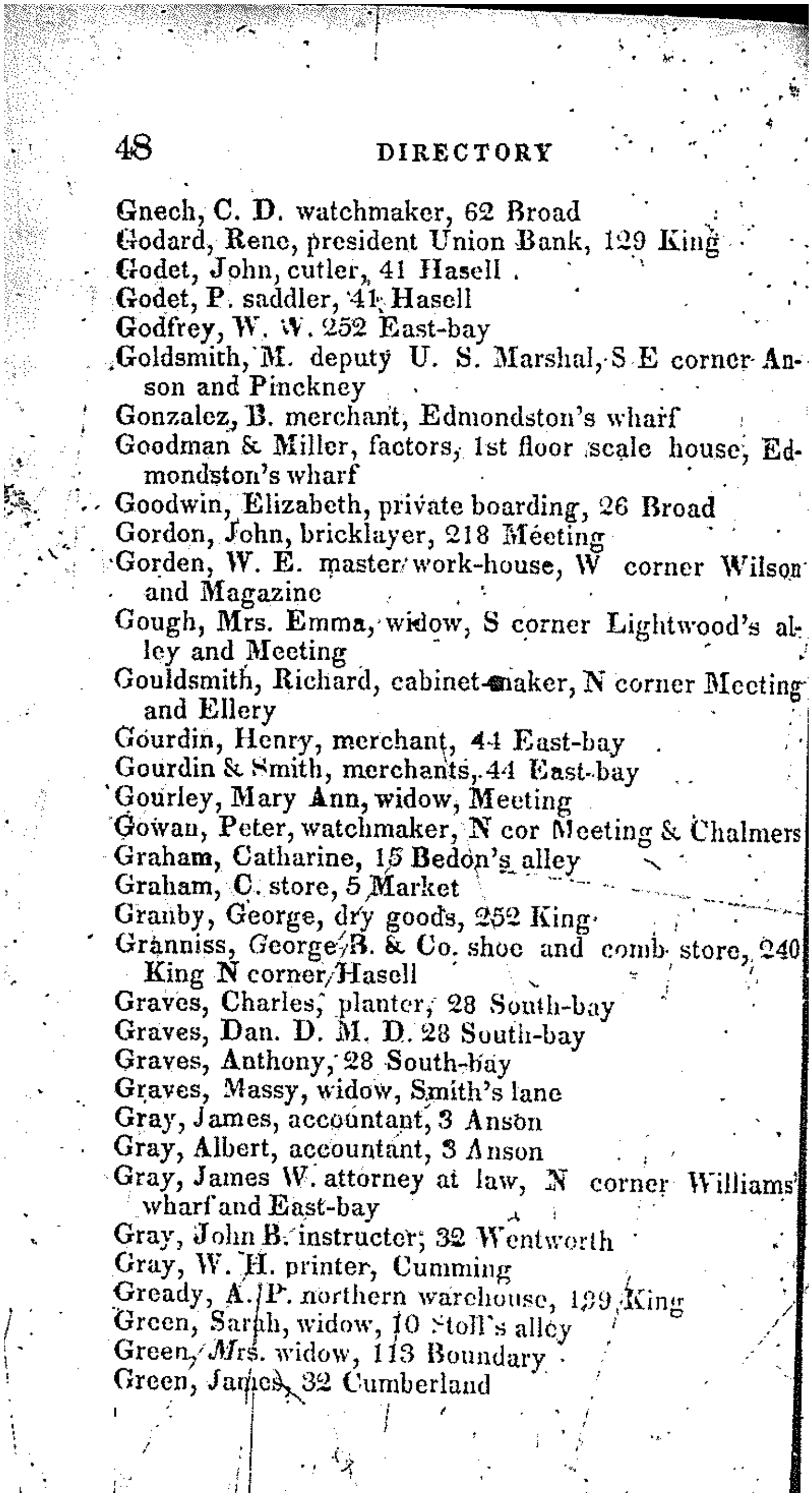
At same Time qualified William Read Executor.

Examined } C.L.
18 Co Sh }

Recorded in Will Book A 1783-86 Page 351

Figure A - 8: Will of Sarah Lemprier (5/5).

Figure A - 9: Charleston County RCM, C8-239.


48 DIRECTORY

Gnech, C. D. watchmaker, 62 Broad
Godard, Rene, president Union Bank, 129 King
Godet, John, cutler, 41 Hasell
Godet, P. saddler, 41 Hasell
Godfrey, W. W. 252 East-bay
Goldsmith, M. deputy U. S. Marshal, S E corner Anson and Pinckney
Gonzalez, B. merchant, Edmondston's wharf
Goodman & Miller, factors, 1st floor scale house, Edmondston's wharf
Goodwin, Elizabeth, private boarding, 26 Broad
Gordon, John, bricklayer, 218 Meeting
Gorden, W. E. master work-house, W corner Wilson and Magazine
Gough, Mrs. Emma, widow, S corner Lightwood's alley and Meeting
Gouldsmith, Richard, cabinet-maker, N corner Meeting and Ellery
Gourdin, Henry, merchant, 44 East-bay
Gourdin & Smith, merchants, 44 East-bay
Gourley, Mary Ann, widow, Meeting
Gowan, Peter, watchmaker, N cor Meeting & Chalmers
Graham, Catharine, 15 Bedon's alley
Graham, C. store, 5 Market
Granby, George, dry goods, 252 King
Granniss, George B. & Co. shoe and comb store, 240 King N corner Hasell
Graves, Charles, planter, 28 South-bay
Graves, Dan. D. M. D. 28 South-bay
Graves, Anthony, 28 South-bay
Graves, Massy, widow, Smith's lane
Gray, James, accountant, 3 Anson
Gray, Albert, accountant, 3 Anson
Gray, James W. attorney at law, N corner Williams' wharf and East-bay
Gray, John B. instructer, 32 Wentworth
Gray, W. H. printer, Cumming
Gready, A. P. northern warehouse, 199 King
Green, Sarah, widow, 10 Stoll's alley
Green, Mrs. widow, 113 Boundary
Green, James, 32 Cumberland

Figure A - 10: City Directory 1829, John Gordon.

Goddard, George *merchant*, 18 Vanderhorst's wharf
Godet, Ann *seamstress*, 4 Liberty st
Godfrey, Eleanor 20 Anson st
Godfrey, W W *book keeper*, 14 Anson st
Godfrey, Mrs Catharine Gadsden's wharf
Goldsmith, Morris *deputy US marshal* } 129 Wentworth st
Goldsmith, Henry } 129 Wentworth st
Goldsmith, Joseph H } 129 Wentworth st
Goldsmith, Abraham Synagogue Yard, Hasell st
Goldsmith, Frances widow, 38 Hasell st
Goodman & Miller, *factors*, Edmondston's wharf
Gordon, John *planter*, 218 Meeting st
Gordon & Reid, *bakers*, 54 Tradd st
Gonzalez, B *merchant*, 15 Champney st
Gough, Caroline 15 St Philips st
Gough, Edward } 4 New st
Gough, John *medical student*, } 4 New st
Gough, Thomas *student at law*, } 4 New st
Gouldsmith, Richard *cabinet maker*, 203 King st
Gourdin, Henry *merchant*, 44 East Bay
Gourman, Saml. *grocery*, cr. Rutledge & Wentworth st
Gowan, Peter *watch maker*, 78 Meeting st
Gowan, Peter 19 Friend st
Graham, J C — Market st
Graham, Michel cr. Meeting and Boundery sts
Granniss, G B & Co. *shoe store*, 240 King st
Granby, George *dry goods*, 252 King st
Grant, Mrs Elizabeth 33 Horlbeck's alley
Grant, Mrs Ann 9 Wall st
Graves, Charles *planter*, 9 Archdale st
Graves & Horlbeck, *druggists*, 118 Church st
Graves, Massy widow, Smith's lane
Gray, A H *painter*, 42, res. 5 Broad st
Gray, J W *com. in equity*, 5 Waring's row, res. 220 E Bay
Gray, J widow, 80 Market st
Gray, Wm *printer*, 5 Green st
Gray, Sylvanus *merchant*, Magwood's wharf
Gray, John B *teacher*, 82 Wentworth st
Greely, Catharine 12 Berresford st
Green, Catharine *boarding house*, 68 State st
Green, T P *druggist*, 187 East Bay

7*

Figure A - 11: City Directory 1831, John Gordon.

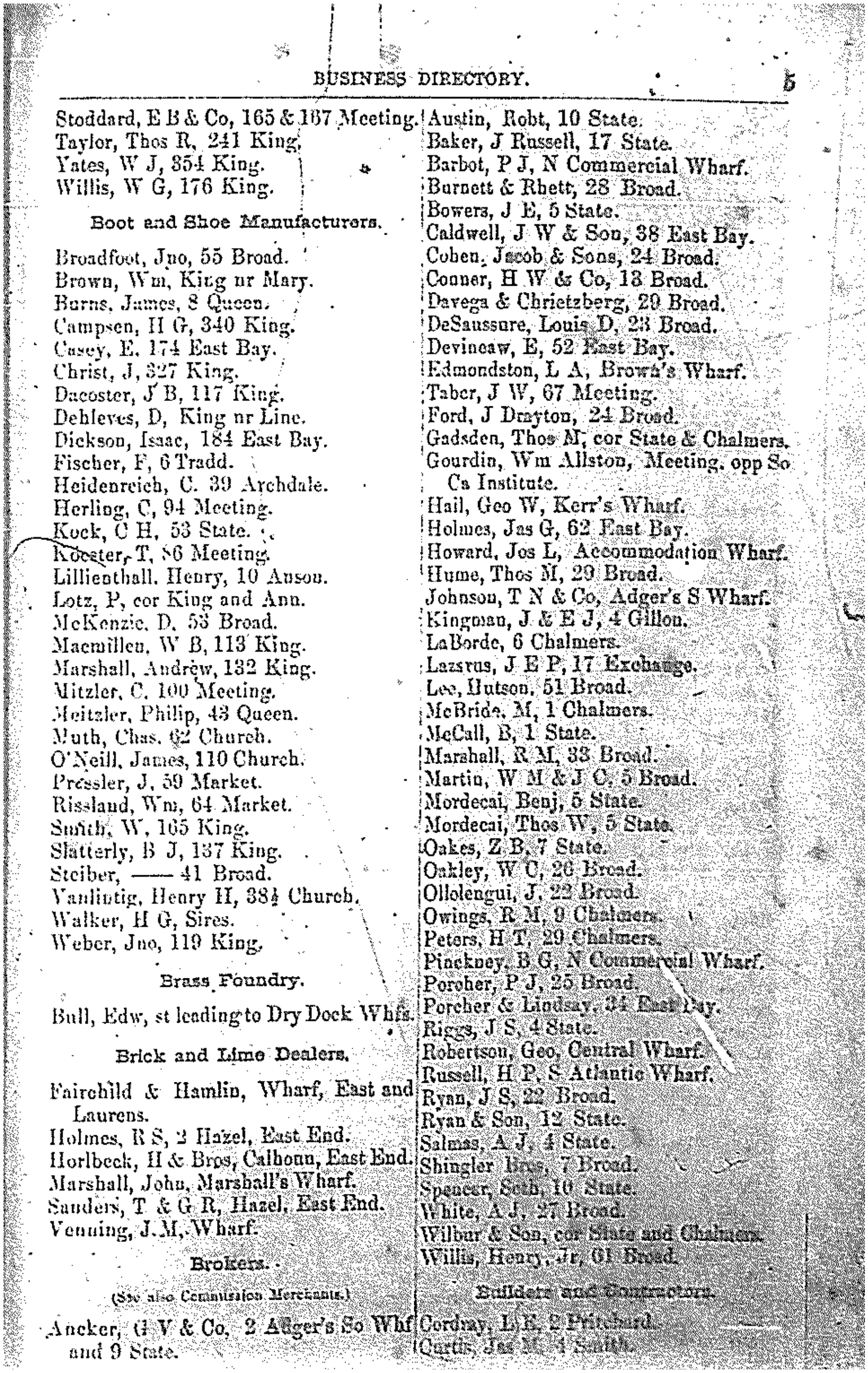
Rankin William, firm of Sproul's & co. 16 hayne,
Raney B. carpenter, N coming,
Ranlett Charles H. firm of H. Johnson & co. 222 king,
Rantin mrs Caroline, 28 beaufain,
Ratcliffe Norman, bricklayer, spring,
Ravenel Henry, 2 short,
Ravenel mrs C. 60 broad,
Ravenel Dr. E. 42 meeting,
Ravenel mrs. John, 69 meeting,
Ravenel Daniel, pres. P. & M. Bank, r c bay and water,
Ravenel John, firm of Ravenel & Stevens, c bay and water,
Ravenel, Stephens & co. factors, 14 bay,
John Ravenel, c bay and water,
Samuel Stevens, r 11 george,
William Ravenel,
Raverna J. D. linguist, 95 church,
Rayne Paul, corset maker, 231 king,
Rebb Lewis, carpenter, 38 george,
Reccli Carlo, victualer, 3 vendue range,
Reddock Arthur, carpenter, 3 st michael,
†Reddy Ann, 42 coming,
Redfern Edward, saddler, 119 church,
Redmond W. S. firm of Green and Redmond, r 67 church.
Reid Geo. B. 10 logan.
Reid James, scavenger, r west end queen,
Reid mrs C. 25 broad,
Reid James, miller, 119 queen,
Reid Andrew, 107 king,
Reid Dr William, 31 meeting,
Reid Geo. B. book-keeper, So. Ca. Bank, r 4 cumberland,
Reid Elizabeth, 21 cumberland,
Reed Samuel H. firm of Shegog and Reed, 57 market,
Reed Luke, firm of J. R. Stevens & co, 272 king,
Reed John Harleston, planter, 4 rutledge,
Reed Sarah E. 11 st philip,
Reedy James, carpenter, 48 queen,
Reedy mrs, 48 queen,
Reeder Oswell, 76 N king,
Reeves Sol. carpenter, 16 coming,
Reeves M. S. music teacher, N st philip,
Reicke George, grocer c king and burn's lane

Figure A - 12: City Directory 1840-1841, Edmund & William Ravenel.

88 CHARLESTON [R]. DIRECTORY.

Ravenel S. T. physician, residence corner South Bay and East Battery
Ravenel William, commission merchant, 16 East Bay, res. 11 East Bay
Raymond Henry H. lawyer, 21 Broad, res. cor. Pitt and Montague
Read W. W. & J. R. laces and embroideries, 237 King
Read J. R. laces, &c. 237 King, residence 249 King
Read William W. laces, &c. 237 King, residence Lowell, Mass.
Redfern Miss Ann S. residence Cannon
Ranser James, conductor, S. C. R. R. residence Hampden court
Rebb Lewis, carpenter, residence 25 Bull
Redmond Edward, rigger, residence 5 Pinckney
Reed Andrew, wood factor, Bennett's wharf, residence Rutledge
Reed Isaac, carpenter, residence Coming
Reed J. P. dry goods, King, ward 6
Reed William, rigger, 79 East Bay, residence Church
Reeder & DeSaussure, factors and com. merchants, Adger's N. wharf
Reeder Oswell, factor, Adger's North wharf, residence King, ward 8
Reeder W. B. clerk, Adger's North wharf, residence 86 Wentworth
Reedy Frederick, blacksmith, 24 Wentworth, residence 24 Wentworth
Reeves Matthew M. S. prof. of music, residence Warren
Reeves Solomon L. carpenter, 184 Meeting, residence Reed
Reeves William, laborer, residence Washington
Reid Andrew, factor, Bennett's wharf, residence Charlotte
Reid Benjamin, planter, Georgetown, residence Rutledge
Reid B. F. clerk, 19 Hayne, residence Victoria Hotel
Reid George, book-keeper, 38 East Bay, residence 3 Logan
Reid George B. Cashier Bank of S. C. residence 18 New
Reid Harleston, planter, Pee Dee, residence Charlotte
Reid James, drayman, residence Charlotte
Reid John, planter, Georgetown, residence Rutledge
Reid R. clerk, King, residence 74 Wentworth
Reid William, rigger, residence 7 Atlantic
Reilly T. factor, 2 Southern wharf, residence Mansion House
Reilly Mitchell, carriage maker, 40 Wentworth, res. 8 Horlbeck's alley
Reils Benjamin, grocer, corner Rutledge and Montague
Reinhardt Henry D. surgical instruments, 117 King
Remily Mrs. Amanda, tailoress, Boigard
Renken John G. baker, 97 King, residence 97 King
Renneker John H. grocer, cor. King and Queen, res. cor. Queen & Smith
Rennett William, dry goods, 44 Anson, residence 44 Anson
Renter John, shoemaker, 205 East Bay, residence 205 East Bay
Reynolds & Co. carriage makers, 89 Meeting
Reynolds George N. jr. carriages, 89 Meeting, res. cor. John and Meeting
Reynolds J. W. bricklayer, residence Calhoun
Reynolds R. F. carriages, 89 Meeting, res. cor. Lamboll and Legare
Rhett & Robinson, factors and com. merchants, Atlantic wharf
Rhett Barnwell, lawyer, 20 Broad, residence Vanderhorst
Rhett B. S. factor, Atlantic wharf, residence cor. Meeting & Wentworth

Figure A - 13: City Directory 1855, William Ravenel.



BUSINESS DIRECTORY. 5

Stoddard, E B & Co, 165 & 167 Meeting.
Taylor, Thos R, 241 King.
Yates, W J, 354 King.
Willis, W G, 176 King.

Boot and Shoe Manufacturers.

Broadfoot, Jno, 55 Broad.
Brown, Wm, King nr Mary.
Burns, James, 8 Queen.
Campsen, H G, 340 King.
Casey, E, 174 East Bay.
Christ, J, 327 King.
Dacoster, J B, 117 King.
Dehleves, D, King nr Line.
Dickson, Isaac, 184 East Bay.
Fischer, F, 6 Tradd.
Heidenreich, C. 39 Archdale.
Herling, C, 94 Meeting.
Kock, C H, 53 State.
Koester, T, 86 Meeting.
Lillienthall, Henry, 10 Anson.
Lotz, P, cor King and Ann.
McKenzie, D, 53 Broad.
Macmillen, W B, 113 King.
Marshall, Andrew, 132 King.
Mitzler, C. 100 Meeting.
Meitzler, Philip, 43 Queen.
Muth, Chas. 62 Church.
O'Neill, James, 110 Church.
Pressler, J, 59 Market.
Rissland, Wm, 64 Market.
Smith, W, 165 King.
Slatterly, B J, 137 King.
Steiber, —— 41 Broad.
Vanlintig, Henry H, 38½ Church.
Walker, H G, Sires.
Weber, Jno, 119 King.

Brass Foundry.

Bull, Edw, st leading to Dry Dock Whfs.

Brick and Lime Dealers.

Fairchild & Hamlin, Wharf, East and Laurens.
Holmes, R S, 2 Hazel, East End.
Horlbeck, H & Bros, Calhoun, East End.
Marshall, John, Marshall's Wharf.
Sanders, T & G R, Hazel, East End.
Venning, J. M, Wharf.

Brokers.

(See also Commission Merchants.)

Ancker, G V & Co, 2 Adger's So Whf and 9 State.
Austin, Robt, 10 State.
Baker, J Russell, 17 State.
Barbot, P J, N Commercial Wharf.
Burnett & Rhett, 28 Broad.
Bowers, J E, 5 State.
Caldwell, J W & Son, 38 East Bay.
Cohen, Jacob & Sons, 24 Broad.
Conner, H W & Co, 13 Broad.
Davega & Chrietzberg, 29 Broad.
DeSaussure, Louis D, 23 Broad.
Devineaw, E, 52 East Bay.
Edmondston, L A, Brown's Wharf.
Taber, J W, 67 Meeting.
Ford, J Drayton, 24 Broad.
Gadsden, Thos N, cor State & Chalmers.
Gourdin, Wm Allston, Meeting, opp So Ca Institute.
Hall, Geo W, Kerr's Wharf.
Holmes, Jas G, 62 East Bay.
Howard, Jos L, Accommodation Wharf.
Hume, Thos M, 29 Broad.
Johnson, T N & Co, Adger's S Wharf.
Kingman, J & E J, 4 Gillon.
LaBorde, 6 Chalmers.
Lazarus, J E P, 17 Exchange.
Lee, Hutson, 51 Broad.
McBride, M, 1 Chalmers.
McCall, B, 1 State.
Marshall, R M, 33 Broad.
Martin, W M & J C, 5 Broad.
Mordecai, Benj, 5 State.
Mordecai, Thos W, 5 State.
Oakes, Z B, 7 State.
Oakley, W C, 26 Broad.
Ollolengui, J, 22 Broad.
Owings, R M, 9 Chalmers.
Peters, H T, 29 Chalmers.
Pinckney, B G, N Commercial Wharf.
Porcher, P J, 25 Broad.
Porcher & Lindsay, 34 East Bay.
Riggs, J S, 4 State.
Robertson, Geo, Central Wharf.
Russell, H P, S Atlantic Wharf.
Ryan, J S, 22 Broad.
Ryan & Son, 12 State.
Salmas, A J, 4 State.
Shingler Bros, 7 Broad.
Spencer, Seth, 10 State.
White, A J, 27 Broad.
Wilbur & Son, cor State and Chalmers.
Willis, Henry, Jr, 61 Broad.

Builders and Contractors.

Cordray, L E, 2 Pritchard.
Curtis, Jas M, 4 Smith.

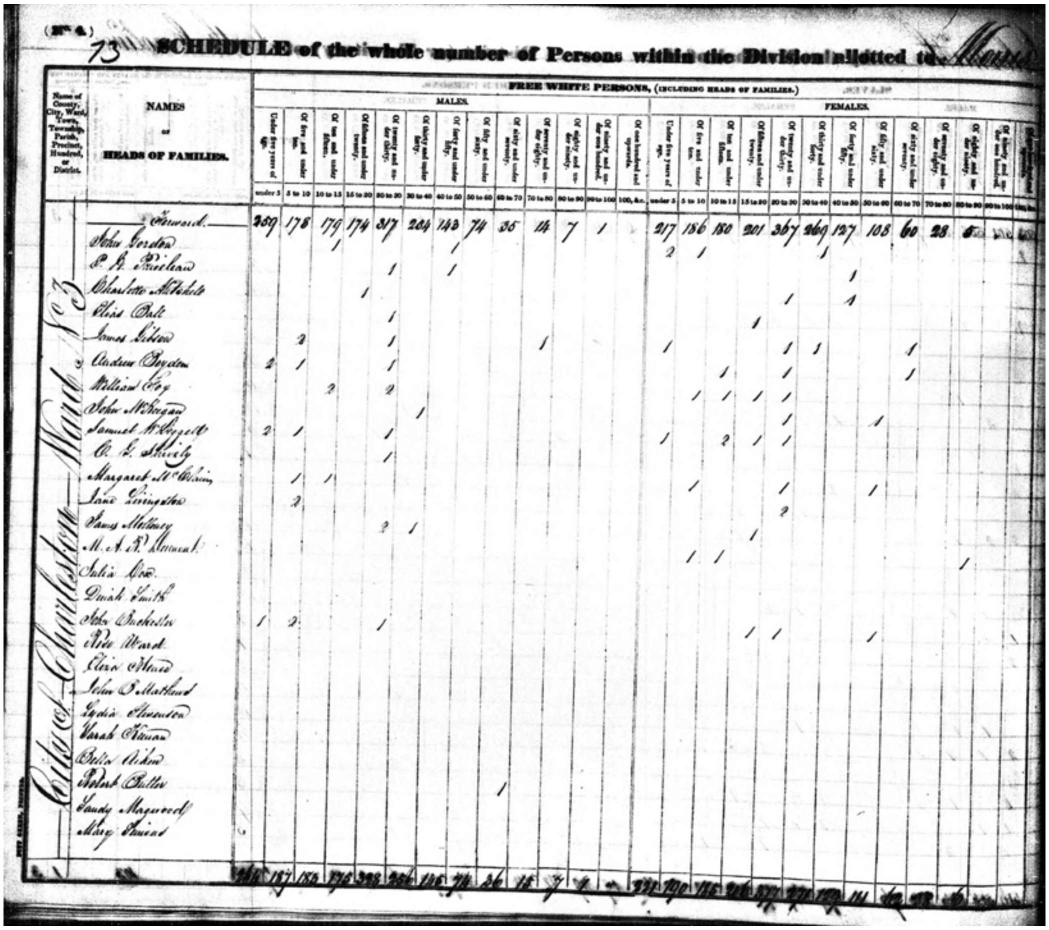
Figure A - 13: City Directory 1860, Brick Dealers.

CHARLESTON DIRECTORY. 117

goods, 12 & 14 E Bay.
Ravenel, J of J & S P R, h cor Water and E Battery.
Ravenel, John h 1 E Battery.
Ravenel, J & S P com mer, 22 E Bay.
Ravenel, P h 4 Limehouse.
Ravenel, S Prioleau of J & S P R, h E Battery cor Water.
Ravenel, St Julien physician, h 5 E Battery.
Ravenel, Wm of R & Co., h 5 E Bay.
Ravenel, W C physician, h 41 E Bay.
Ravenel, W Parker clerk Coffin & Pringle, h 8 Limehouse.
Rawlins, R M clerk Hyatt, McBurney & Co., bds Pavilion Hotel.
Ray, Patrick laborer, bds 22 State.
Raymond, H H atty at law, 21 Broad, h 2 Water.
Raymond, Mrs M widow, h 2 Water.
Rayne, E carpenter, h Nassau next cor Mary.
Raysdale, C H cadet Citadel Academy.
Raysor, T E cadet Citadel Academy.
Read, Jno E bds 260 King.
Read, J R of W W & J R R, bds Mrs Dibble.
Read, Oscar J clerk C C Drake, bds 481 King.
Read, W W & J R cloaks, mantillas, laces & embroideries, 237 King.
Reade, A h N E cor Rutledge & Calhoun.
Readimer, J P conductor S C R R, h 9 Hampden ct.
Reading Room of 3d Presbyterian Church, 30 Hasel.
Ready, John bds cor Church & Cumberland.
Reaves, E engineer S C R R, h Nassau nr Woolfe.
Reaves, R B engineer S C R R, h Nassau nr Woolfe.
Rebb, Mrs M C h 21 Radcliffe.
Rebmann, J boot maker, cor King & Reid.
Redding, W J bds 3 Trapman.
Redick, G h King bt Warren & Cannon.
Redman, Wm moulder Lockwood & Johnston, bds cor Cumberland & State.
Redmann, —— boot maker, 53 State.
Redmond, Jno grocer, cor Market & Archdale.
Reed, J h cor Smith & Marion ct.
Reed, J clerk A F Browning & Co., bds Mrs Smyth, Ann.
Reed, John foreman car dep't S C R R, h Meeting ab Line.
Reed, John P h 477 King.
Reeder & DeSaussure, factors & com mer, Adger's N whf.
Reeder, M B clerk E H Rodgers & Co., h Montague bel Coming.
Reeder, Oswell of R & DeSaussure, h King opp Columbus.
Reeder, T H clerk Waldron, Egleston & Co., h 1 Montague.
Reeder, Wm clerk Reeder & DeSaussure, h 1 Montague.
Rees, Mrs J E h cor Pitt & Vanderhorst.
Reese, Thos time keeper Cameron & Co., bds Victoria House.
Reesland, A boot maker, 66 Market, h 64 Market.

Reeves, H P ship joiner, 17 State, h E Bay nr Hasel.
Reeves, M S music teacher, h Warren nr Coming.
Refo, W A printer, bds E Bay nr Broad.
Regan, C dry goods, 64 State.
Rehkopf, F G cabinet maker, h King nr Mary.
Reiche, H A bird dealer, 229 King.
Reid, Andrew factor, West End of Bull, h N E cor Calhoun and Rutledge.
Reid, Andrew, jr., clerk, h 10 Laurens.
Reid, Geo collection clerk Bank of Charleston, h 62 Spring.
Reid, Geo B cashier Bank of So Ca, h 18 New.
Reid, James cotton press, h 18 Charlotte.
Reid, J Harleston planter, h S E cor Wentworth and Rutledge.
Reid, L R clerk, bds 18 New.
Reigne, A P confectioner, 18 Queen.
Reiley, Philip junk shop, St Philips ab Warren
Reilly, Thos h St Phillips bel Cannon.
Reilly, Thos factor, cor Southern Wharf and E Bay, bds Mansion House.
Reilly, W shoemaker, W side St Philips.
Reils, B grocer, cor Coming and Vanderhorst.
Reils, J P grocer, S W cor Cannon and Smith.
Reils, T grocer, S E cor Anson and Wentworth.
Reils, W carter, h Nassau rear Line.
Reinee, B carpenter, h 28 Coming.
Reiners, E clerk Klinck, Wickenburg & Co, h 16 Magazine.
Reinhardt, H D of H D & Co., h 310 King.
Reinhardt, H D & Co., manuf iron railing and trusses, 310 King.
Reiniky, F boot maker, 53 State, h same.
Relyea, Capt Chas of str Gen Clinch, h 40 Tradd.
Reucken, H clerk, S W cor E Bay and Market.
Renee, B P sergt city police, h Queen nr State.
Renken, J G of Moelchers & R, h 97 King.
Renneker & Glover, grocers, 151½ E Bay.
Renneker, John H of R & Glover, h cor Queen and Smith.
Rennett, Wm clerk, A King, h Anson nr Wentworth.
Reuter, Jno grocer, S W cor Coming & Cannon.
Reynolds, —— medical student, bds 25 Queen.
Reynolds, G N h 18 Friend.
Reynolds, G N jr., carriage manuf, Meeting opp Institute Hall, h cor Meeting & Wragg's sq.
Reynolds, Geo T of Smith & R, h 28 Chalmers.
Reynolds, James boarding house, 61 E Bay.
Reynolds, Jas bar room & boarding house, 14 Tradd.
Reynolds, Richard F bds Mills House.
Rhett, B S of R & Robson, h cor Rutledge & Vanderhorst.
Rhett, B S jr., clerk Rhett & Robson, h Rutledge cor of Vanderhorst.
Rhett, G bds cor Rutledge & Vanderhorst.
Rhett, J bds cor Rutledge & Vanderhorst.
Rhett, M physician, office 41 Meeting.
Rhett, R B h N E cor Vanderhorst & Thomas.
Rhett, R B jr., editor Charleston Mercury, h 24 S Bay.
Rhett & Robson, com mer, 2 Atlantic wharf.
Rhett, Wm atty at law & magistrate, 45 Broad

Figure A - 14: City Directory 1860, Ravenel & Co.

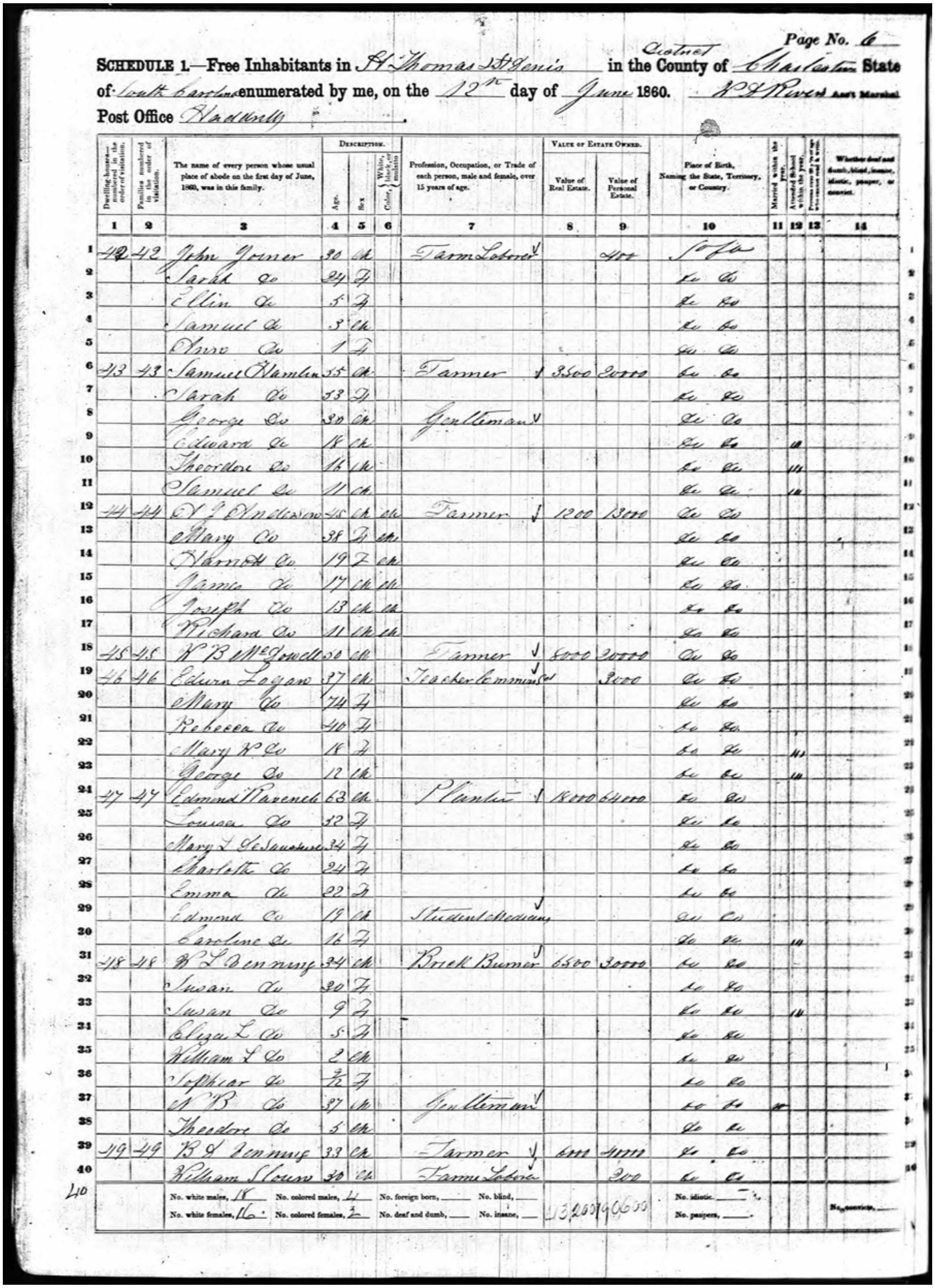

SCHEDULE of the whole number of Persons within the Division allotted to

FREE WHITE PERSONS, (INCLUDING HEADS OF FAMILIES.)

NAMES of HEADS OF FAMILIES.

Forward.
John Gordon
P. R. Puckland
Charlotte Mitchell
Elias Ball
James Gibson
Andrew Boyden
William Foy
John McKeegan
Samuel McLeggett
O. G. Shively
Margaret McAlvin
Jane Livingston
James Maloney
M. A. R. Durrant
Julia Crow
Dinah Smith
John Rochester
Rose Ward
Eliza Moore
John S. Mathand
Lydia Stevenson
Sarah Brown
Betsy Aiken
Robert Butler
Sandy Maywood
Mary Daines

Figure A - 15: U.S. Census 1830.



Page No. 6

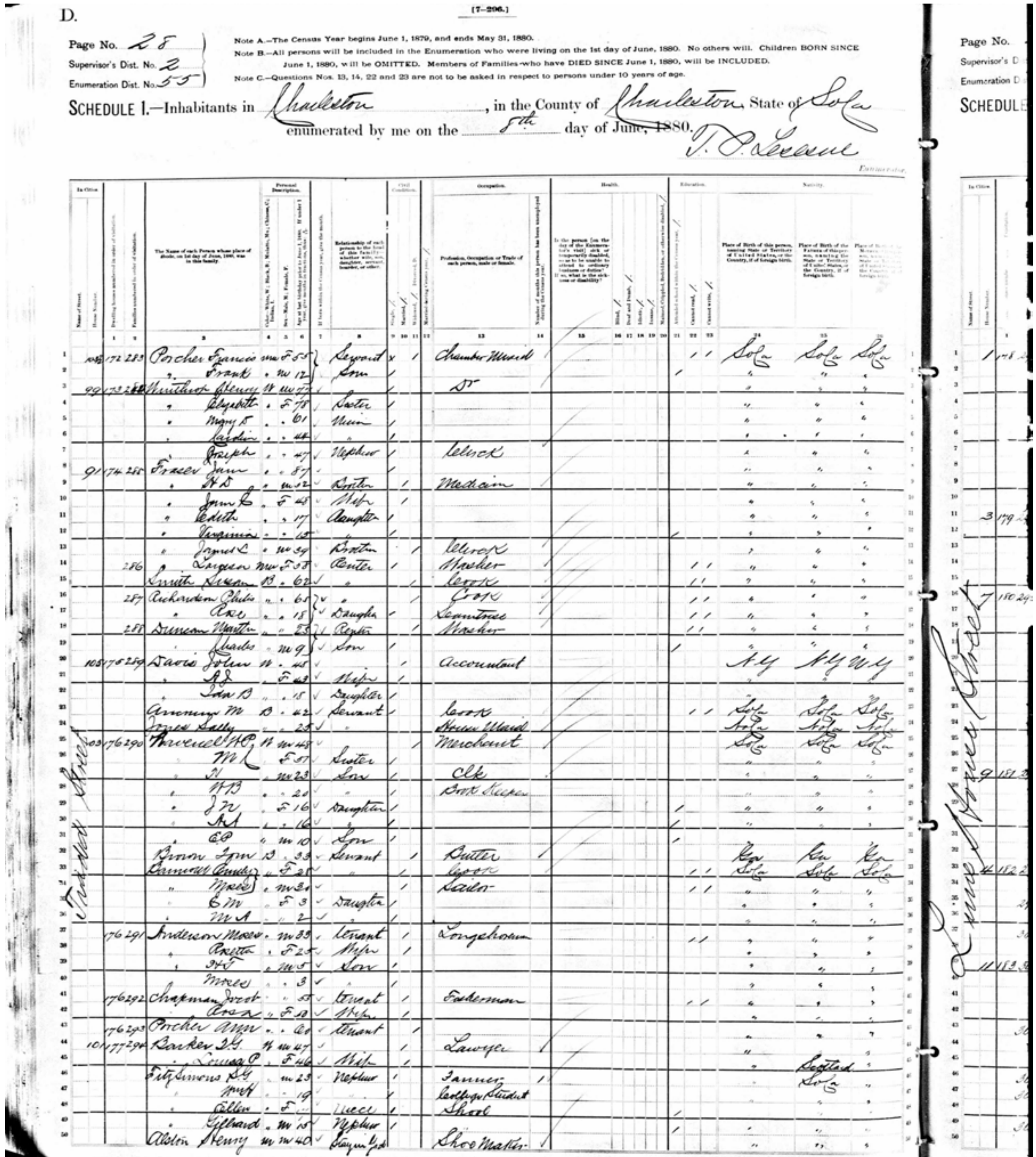
SCHEDULE 1.—Free Inhabitants in St Thomas & St Denis District in the County of Charleston State of South Carolina enumerated by me, on the 12th day of June 1860. R S Rivers Ass't Marshal.

Post Office Haddrells

	Dwelling-houses—numbered in the order of visitation.	Families numbered in the order of visitation.	The name of every person whose usual place of abode on the first day of June, 1860, was in this family.	Age.	Sex.	Color, White, black, or mulatto.	Profession, Occupation, or Trade of each person, male and female, over 15 years of age.	Value of Real Estate.	Value of Personal Estate.	Place of Birth, Naming the State, Territory, or Country.	Married within the year.	Attended School within the year.	Persons over 20 y'rs of age who cannot read & write.	Whether deaf and dumb, blind, insane, idiotic, pauper, or convict.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	42	42	John Yonner	30	M		Farm Laborer		400	S Ca				
2			Sarah do	24	F					do do				
3			Ellin do	5	F					do do				
4			Samuel do	3	M					do do				
5			Anno do	1	F					do do				
6	43	43	Samuel Hamlin	55	M		Farmer	3500	2000	do do				
7			Sarah do	53	F					do do				
8			George do	30	M		Gentleman			do do				
9			Edward do	18	M					do do		1		
10			Theordore do	16	M					do do		1		
11			Samuel do	11	M					do do		1		
12	44	44	A J Anderson	45	M	M	Farmer	1200	1300	do do				
13			Mary do	38	F	M				do do				
14			Harriett do	19	F	M				do do				
15			James do	17	M	M				do do				
16			Joseph do	13	M	M				do do				
17			Richard do	11	M	M				do do				
18	45	45	R B McDowell	50	M		Farmer	8000	20000	do do				
19	46	46	Edwin Logan	37	M		Teacher Common Sch		3000	do do				
20			Mary do	74	F					do do				
21			Rebecca do	40	F					do do				
22			Mary R do	18	F					do do		1		
23			George do	12	M					do do		1		
24	47	47	Edmund Ravenel	63	M		Planter	18000	64000	do do				
25			Louisa do	52	F					do do				
26			Mary L DeSaussure	34	F					do do				
27			Charlotte do	24	F					do do				
28			Emma do	22	F					do do				
29			Edmond do	19	M		Student Medicin			do do				
30			Caroline do	16	F					do do		1		
31	48	48	B L Denning	34	M		Brick Burner	6500	30000	do do				
32			Susan do	30	F					do do				
33			Susan do	9	F					do do		1		
34			Eliza L do	5	F					do do				
35			William L do	2	M					do do				
36			Sophia do	[illegible]	F					do do				
37			N B do	37	M		Gentleman			do do	1			
38			Theodore do	5	M					do do				
39	49	49	B S Denning	33	M		Farmer	6000	4000	do do				
40			William Sloan	30	M		Farm Laborer		300	do do				

40 No. white males, 18 No. colored males, 4 No. foreign born, No. blind, No. idiotic, No. of servants,
No. white females, 16 No. colored females, 2 No. deaf and dumb, No. insane, 43200 140600 No. paupers,

Figure A - 16: U.S. Census 1860.



D. [7-296.]

Page No. 28
Supervisor's Dist. No. 2
Enumeration Dist. No. 55

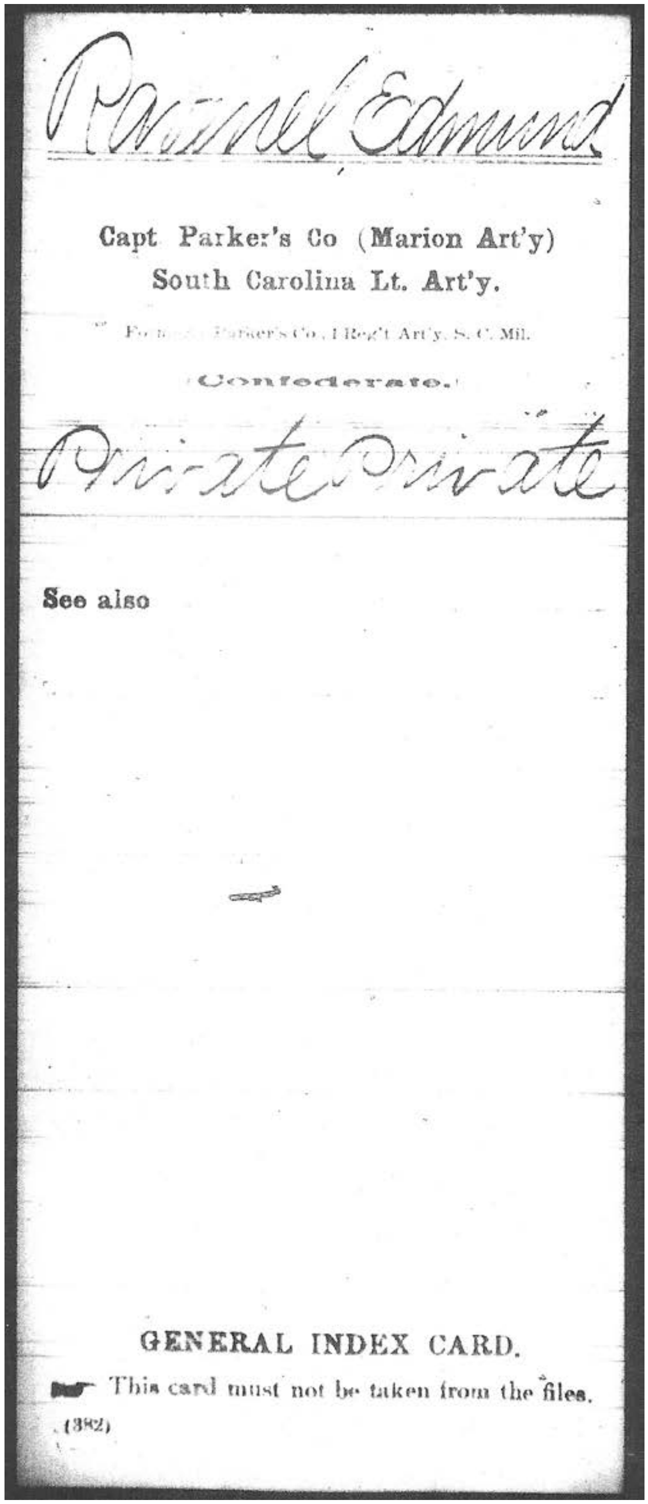
Note A.—The Census Year begins June 1, 1879, and ends May 31, 1880.
Note B.—All persons will be included in the Enumeration who were living on the 1st day of June, 1880. No others will. Children BORN SINCE June 1, 1880, will be OMITTED. Members of Families who have DIED SINCE June 1, 1880, will be INCLUDED.
Note C.—Questions Nos. 13, 14, 22 and 23 are not to be asked in respect to persons under 10 years of age.

SCHEDULE 1.—Inhabitants in Charleston, in the County of Charleston, State of So Ca, enumerated by me on the 5th day of June, 1880. T. P. Lesesne, Enumerator.

	Dwelling	Family	Name	Color	Sex	Age	Relationship	Occupation	Birthplace	Father's birthplace	Mother's birthplace
1	172	283	Porcher Francis	Mu	F	55	Servant	Chamber Maid	So Ca	So Ca	So Ca
2			" Frank	"	M	12	Son		"	"	"
3	173	284	Winthrop Henry	W	M	77		Dr	"	"	"
4			" Elizabeth	"	F	78	Sister		"	"	"
5			" Mary B	"	"	61	Niece		"	"	"
6			" Caroline	"	"	44	"		"	"	"
7			" Joseph	"	"	47	Nephew	Clerk	"	"	"
8	174	285	Fraser Jane	"	"	87			"	"	"
9			" H D	"	M	52	Brother	Medicine	"	"	"
10			" Jane C	"	F	48	Wife		"	"	"
11			" Edith	"	"	17	Daughter		"	"	"
12			" Virginia	"	"	15	"		"	"	"
13			" James L	"	M	39	Brother	Clerk	"	"	"
14		286	" Lavinia	Mu	F	58	Renter	Washer	"	"	"
15			Smith Susan	B	"	62	"	Cook	"	"	"
16		287	Richardson Chloe	"	"	65	"	Cook	"	"	"
17			" Ann	"	"	18	Daughter	Seamtress	"	"	"
18		288	Duncan Martha	"	"	25	Renter	Washer	"	"	"
19			" Charles	"	M	9	Son		"	"	"
20	175	289	Davis John	W	"	45		Accountant	N Y	N Y	N Y
21			" A J	"	F	43	Wife		"	"	"
22			" Ida B	"	"	18	Daughter		"	"	"
23			Ammons M	B	"	42	Servant	Cook	So Ca	So Ca	So Ca
24			Jones Sally	"	"	25	"	House Maid	So Ca	So Ca	So Ca
25	176	290	Trenholm W P	W	M	48		Merchant	So Ca	So Ca	So Ca
26			" M L	"	F	51	Sister		"	"	"
27			" H	"	M	23	Son	Clk	"	"	"
28			" W B	"	"	20	"	Book Keeper	"	"	"
29			" J N	"	F	16	Daughter		"	"	"
30			" A L	"	"	16	"		"	"	"
31			" E P	"	M	10	Son		"	"	"
32			Brown Tom	B	"	33	Servant	Butler	Ga	Ga	Ga
33			Barnwell Emily	"	F	25	"	Cook	So Ca	So Ca	So Ca
34			" Moses	"	M	30		Sailor	"	"	"
35			" E M	"	F	3	Daughter		"	"	"
36			" M A	"	"	2	"		"	"	"
37	176	291	Anderson Moses	"	M	33	Tenant	Longshoreman	"	"	"
38			" Rosetta	"	F	25	Wife		"	"	"
39			" H F	"	M	5	Son		"	"	"
40			" Moses	"	"	3	"		"	"	"
41	176	292	Chapman Jacob	"	"	55	Tenant	Fisherman	"	"	"
42			" Rosa	"	F	18	Wife		"	"	"
43	176	293	Porcher Ann	"	"	60	Tenant		"	"	"
44	177	294	Barker S G	W	M	47		Lawyer	"	"	"
45			" Louisa P	"	F	46	Wife		"	"	"
46			FitzSimons S G	"	M	23	Nephew	Farmer	"	Scotland	"
47			" W H	"	"	19	"	College Student	"	So Ca	"
48			" Ellen	"	F	[illegible]	Niece	School	"	"	"
49			" Gilliard	"	M	15	Nephew		"	"	"
50			Alston Henry	Mu	M	40	Staying [illegible]	Shoe Maker	"	"	"

Note D.—In making entries in columns 9, 10, 11, 12, 16 to 23, an affirmative mark only will be used—thus /, except in the case of divorced persons, column 11, when the letter "D" is to be used.
Note E.—Question No. 12 will only be asked in cases where an affirmative answer has been given either to question 10 or to question 11.
Note F.—Question No. 14 will only be asked in cases when a gainful occupation has been reported in column 13.
Note G.—In column 7 an abbreviation in the name of the month may be used, as Jan., Apr., Dec.

Figure A - 17: U.S. Census 1880.



Ravenel, Edmund

Capt. Parker's Co (Marion Art'y)
South Carolina Lt. Art'y.

Formerly Parker's Co., 1 Reg't Art'y, S. C. Mil.

(Confederate.)

Private Private

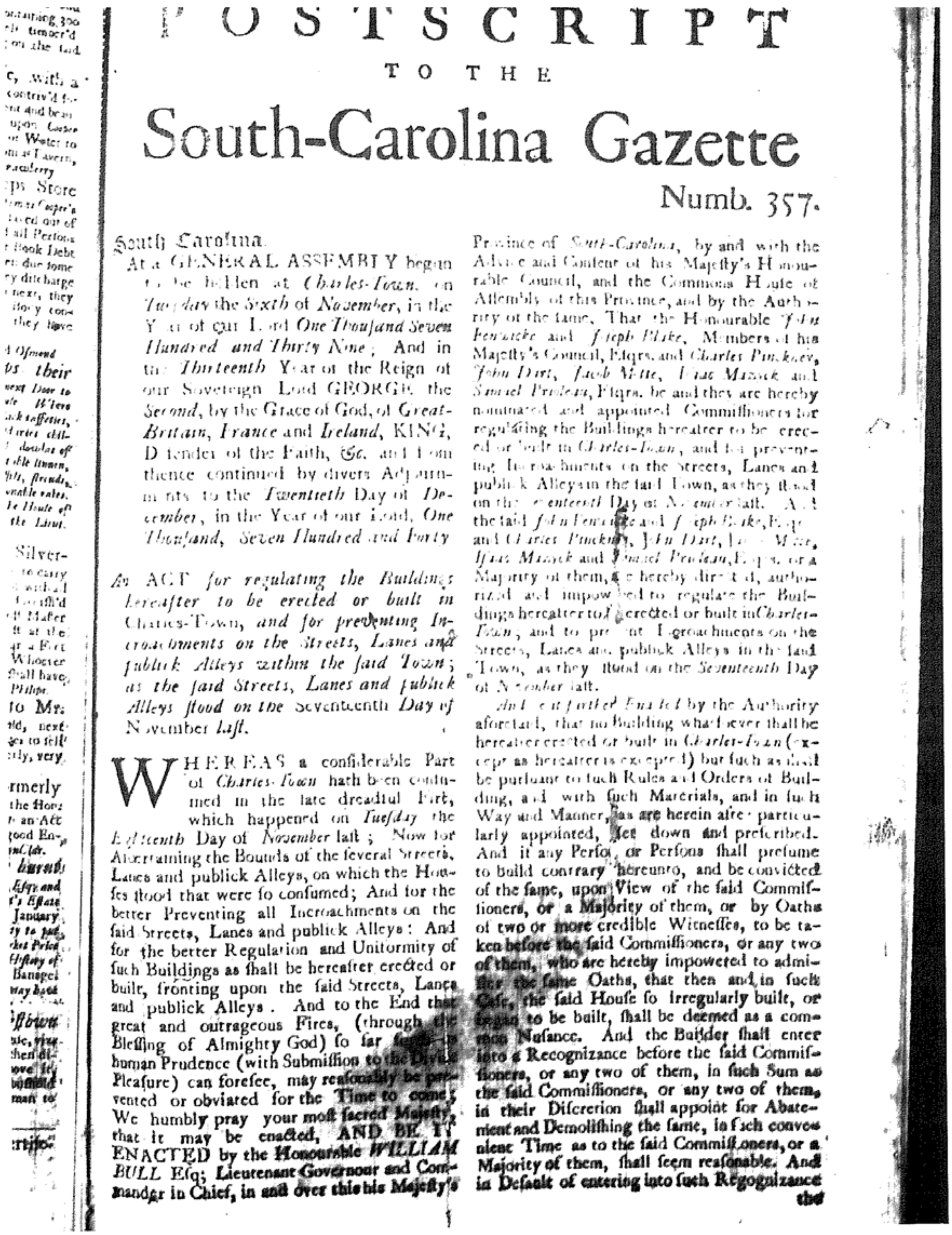
See also

GENERAL INDEX CARD.

This card must not be taken from the files.

(382)

Figure A - 18: Edmund Ravenel Index Card.



POSTSCRIPT TO THE South-Carolina Gazette

Numb. 357.

South Carolina.

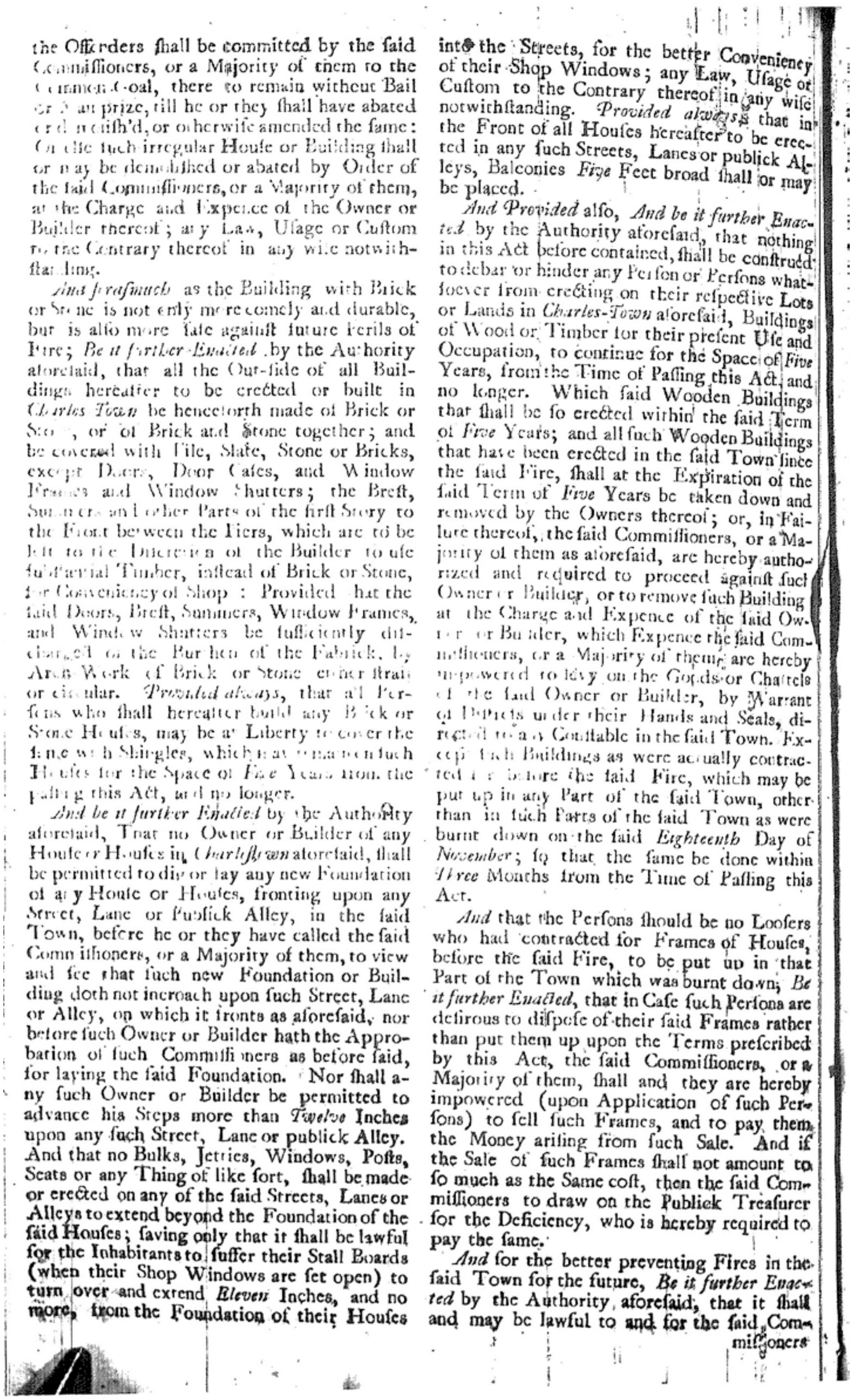
At a GENERAL ASSEMBLY begun to be holden at *Charles-Town*, on *Tuesday* the *Sixth* of *November*, in the Year of our Lord *One Thousand Seven Hundred and Thirty Nine*; And in the *Thirteenth* Year of the Reign of our Sovereign Lord GEORGE the *Second*, by the Grace of God, of *Great-Britain*, *France* and *Ireland*, KING, Defender of the Faith, &c. and from thence continued by divers Adjournments to the *Twentieth* Day of *December*, in the Year of our Lord, *One Thousand, Seven Hundred and Forty*.

An ACT *for regulating the Buildings hereafter to be erected or built in* Charles-Town, *and for preventing Incroachments on the Streets, Lanes and publick Alleys within the said Town; as the said Streets, Lanes and publick Alleys stood on the* Seventeenth *Day of* November *last.*

WHEREAS a considerable Part of *Charles-Town* hath been consumed in the late dreadful Fire, which happened on *Tuesday* the *Eighteenth* Day of *November* last; Now for Ascertaining the Bounds of the several Streets, Lanes and publick Alleys, on which the Houses stood that were so consumed; And for the better Preventing all Incroachments on the said Streets, Lanes and publick Alleys: And for the better Regulation and Uniformity of such Buildings as shall be hereafter erected or built, fronting upon the said Streets, Lanes and publick Alleys. And to the End that great and outrageous Fires, (through the Blessing of Almighty God) so far as human Prudence (with Submission to the Divine Pleasure) can foresee, may reasonably be prevented or obviated for the Time to come; We humbly pray your most sacred Majesty, that it may be enacted, AND BE IT ENACTED by the Honourable *WILLIAM BULL* Esq; Lieutenant Governour and Commander in Chief, in and over this his Majesty's Province of *South-Carolina*, by and with the Advice and Consent of his Majesty's Honourable Council, and the Commons House of Assembly of this Province, and by the Authority of the same, That the Honourable *John Fenwicke* and *Joseph Blake*, Members of his Majesty's Council, Esqrs. and *Charles Pinckney*, *John Dart*, *Jacob Motte*, *Isaac Mazyck* and *Samuel Prioleau*, Esqrs. be and they are hereby nominated and appointed Commissioners for regulating the Buildings hereafter to be erected or built in *Charles-Town*, and for preventing Incroachments on the Streets, Lanes and publick Alleys in the said Town, as they stood on the *Seventeenth* Day of *November* last. And the said *John Fenwicke* and *Joseph Blake*, Esqrs. and *Charles Pinckney*, *John Dart*, *Jacob Motte*, *Isaac Mazyck* and *Samuel Prioleau*, Esqrs. or a Majority of them, are hereby directed, authorized and impowered to regulate the Buildings hereafter to be erected or built in *Charles-Town*, and to prevent Incroachments on the Streets, Lanes and publick Alleys in the said Town, as they stood on the *Seventeenth* Day of *November* last.

And be it further Enacted by the Authority aforesaid, that no Building whatsoever shall be hereafter erected or built in *Charles-Town* (except as hereafter is excepted) but such as shall be pursuant to such Rules and Orders of Building, and with such Materials, and in such Way and Manner, as are herein after particularly appointed, set down and prescribed. And if any Person or Persons shall presume to build contrary hereunto, and be convicted of the same, upon View of the said Commissioners, or a Majority of them, or by Oaths of two or more credible Witnesses, to be taken before the said Commissioners, or any two of them, who are hereby impowered to administer the same Oaths, that then and in such Case, the said House so irregularly built, or begun to be built, shall be deemed as a common Nusance. And the Builder shall enter into a Recognizance before the said Commissioners, or any two of them, in such Sum as the said Commissioners, or any two of them, in their Discretion shall appoint for Abatement and Demolishing the same, in such convenient Time as to the said Commissioners, or a Majority of them, shall seem reasonable. And in Default of entering into such Regognizance the

Figure A - 19: Charleston Fire Act 1740.



the Offenders ſhall be committed by the ſaid Commiſſioners, or a Majority of them to the Common Goal, there to remain without Bail or Mainprize, till he or they ſhall have abated or demoliſh'd, or otherwiſe amended the ſame: Or elſe ſuch irregular Houſe or Building ſhall or may be demoliſhed or abated by Order of the ſaid Commiſſioners, or a Majority of them, at the Charge and Expence of the Owner or Builder thereof; any Law, Uſage or Cuſtom to the Contrary thereof in any wiſe notwithſtanding.

And foraſmuch as the Building with Brick or Stone is not only more comely and durable, but is alſo more ſafe againſt future Perils of Fire; *Be it further Enacted* by the Authority aforeſaid, that all the Out-ſide of all Buildings hereafter to be erected or built in *Charles Town* be henceforth made of Brick or Stone, or of Brick and Stone together; and be covered with Tile, Slate, Stone or Bricks, except Doors, Door Caſes, and Window Frames and Window Shutters; the Breſt, Summers and other Parts of the firſt Story to the Front between the Piers, which are to be left to the Diſcretion of the Builder to uſe ſubſtantial Timber, inſtead of Brick or Stone, for Conveniency of Shop: Provided that the ſaid Doors, Breſt, Summers, Window Frames, and Window Shutters be ſufficiently diſcharged of the Burthen of the Fabrick, by Arch Work of Brick or Stone either ſtrait or circular. *Provided always*, that all Perſons who ſhall hereafter build any Brick or Stone Houſes, may be at Liberty to cover the ſame with Shingles, which may remain on ſuch Houſes for the Space of *Five* Years from the paſſing this Act, and no longer.

And be it further Enacted by the Authority aforeſaid, That no Owner or Builder of any Houſe or Houſes in *Charleſtown* aforeſaid, ſhall be permitted to dig or lay any new Foundation of any Houſe or Houſes, fronting upon any Street, Lane or Publick Alley, in the ſaid Town, before he or they have called the ſaid Commiſſioners, or a Majority of them, to view and ſee that ſuch new Foundation or Building doth not incroach upon ſuch Street, Lane or Alley, on which it fronts as aforeſaid, nor before ſuch Owner or Builder hath the Approbation of ſuch Commiſſioners as before ſaid, for laying the ſaid Foundation. Nor ſhall any ſuch Owner or Builder be permitted to advance his Steps more than *Twelve* Inches upon any ſuch Street, Lane or publick Alley. And that no Bulks, Jetties, Windows, Poſts, Seats or any Thing of like ſort, ſhall be made or erected on any of the ſaid Streets, Lanes or Alleys to extend beyond the Foundation of the ſaid Houſes; ſaving only that it ſhall be lawful for the Inhabitants to ſuffer their Stall Boards (when their Shop Windows are ſet open) to turn over and extend *Eleven* Inches, and no more, from the Foundation of their Houſes into the Streets, for the better Conveniency of their Shop Windows; any Law, Uſage or Cuſtom to the Contrary thereof in any wiſe notwithſtanding. *Provided always*, that in the Front of all Houſes hereafter to be erected in any ſuch Streets, Lanes or publick Alleys, Balconies *Five* Feet broad ſhall or may be placed.

And Provided alſo, *And be it further Enacted* by the Authority aforeſaid, that nothing in this Act before contained, ſhall be conſtrued to debar or hinder any Perſon or Perſons whatſoever from erecting on their reſpective Lots or Lands in *Charles-Town* aforeſaid, Buildings of Wood or Timber for their preſent Uſe and Occupation, to continue for the Space of *Five* Years, from the Time of Paſſing this Act, and no longer. Which ſaid Wooden Buildings that ſhall be ſo erected within the ſaid Term of *Five* Years; and all ſuch Wooden Buildings that have been erected in the ſaid Town ſince the ſaid Fire, ſhall at the Expiration of the ſaid Term of *Five* Years be taken down and removed by the Owners thereof; or, in Failure thereof, the ſaid Commiſſioners, or a Majority of them as aforeſaid, are hereby authorized and required to proceed againſt ſuch Owner or Builder, or to remove ſuch Building at the Charge and Expence of the ſaid Owner or Builder, which Expence the ſaid Commiſſioners, or a Majority of them, are hereby impowered to levy on the Goods or Chattels of the ſaid Owner or Builder, by Warrant of Diſtreſs under their Hands and Seals, directed to any Conſtable in the ſaid Town. Except ſuch Buildings as were actually contracted for before the ſaid Fire, which may be put up in any Part of the ſaid Town, other than in ſuch Parts of the ſaid Town as were burnt down on the ſaid *Eighteenth* Day of *November*; ſo that the ſame be done within *Three* Months from the Time of Paſſing this Act.

And that the Perſons ſhould be no Looſers who had contracted for Frames of Houſes, before the ſaid Fire, to be put up in that Part of the Town which was burnt down; *Be it further Enacted*, that in Caſe ſuch Perſons are deſirous to diſpoſe of their ſaid Frames rather than put them up upon the Terms preſcribed by this Act, the ſaid Commiſſioners, or a Majority of them, ſhall and they are hereby impowered (upon Application of ſuch Perſons) to ſell ſuch Frames, and to pay them the Money ariſing from ſuch Sale. And if the Sale of ſuch Frames ſhall not amount to ſo much as the Same coſt, then the ſaid Commiſſioners to draw on the Publick Treaſurer for the Deficiency, who is hereby required to pay the ſame.

And for the better preventing Fires in the ſaid Town for the future, *Be it further Enacted* by the Authority aforeſaid, that it ſhall and may be lawful to and for the ſaid Commiſſioners

Figure A - 20: Charleston Fire Act 1740.

miſſioners, or a Majority of them, from time to time to prohibit and remove ſuch Trades and Occupations (*that is to ſay*) Diſtillers, Candle-Makers and Soap-Makers, from being uſed or exerciſed in ſuch Parts or Places of the ſaid Town as they ſhall judge noiſome or perillous in Reſpect of Fire: And in caſe any Perſon or Perſons ſhall carry on or exerciſe any ſuch Trade or Occupation in any Place which he, ſhe or they ſhall be prohibited by the ſaid Commiſſioners, or a Majority of them, upon View or Information as aforeſaid, every ſuch Perſon ſhall for every Month they ſhall continue in ſuch Offence, forfeit and pay the Sum of *Twenty Pounds* current Money, to be recovered by Warrant under the Hands and Seals of a Majority of the ſaid Commiſſioners in Manner aforeſaid.

And be it further Enacted by the Authority aforeſaid, that in Caſe of any Fire hereafter in *Charles-Town*, it ſhall and may be lawful for the Fire-Maſters of the ſaid Town, or any one of them, with the Conſent and Advice of a Magiſtrate, to give Directions, and command any Number of Perſons whatſoever, (preſent at ſuch Fire) to blow up any Houſe or Houſes, or other Buildings, as by the ſaid Fire-Maſter and Magiſtrate ſhall be adjudged fit to be blown up, for the ſtopping and preventing the further ſpreading of Fire, any Thing in an Act, intitled, *An Act for preventing as much as may be Accidents which may happen by Fire in* Charles Town, *in the Province of* South Carolina contained to the Contrary thereof in any wiſe notwithſtanding. And the Owner or Owners of ſuch Houſe or Houſes ſo blown up, ſhall be intitled to the ſame Satisfaction, and in the ſame Way, Manner and Proportion, as if ſuch Houſe or Houſes had been pulled down in order to prevent the further ſpreading of the Fire; and as is directed by the ſaid Act.

And be it further Enacted by the Authority aforeſaid, that in caſe of the Death, Refuſal to act, or Departure from this Province, of any of the ſaid Commiſſioners, that then his Honour the Lieutenant Governor or Commander in Chief (for the Time being) with the Advice and Conſent of his Majeſty's Honourable Council, ſhall be and he is hereby impowered to appoint one or more Commiſſioner or Commiſſioners, in the Room and Stead of ſuch Commiſſioner and Commiſſioners ſo dying, refuſing to act, or departing this Province as aforeſaid. And ſuch Commiſſioner and Commiſſioners appointed as aforeſaid, by the ſaid Lieutenant Governor or Commander in Chief (for the Time being) ſhall have the ſame Powers and Authorities as the Commiſſioners named in and by this Act, are inveſted with.

And to the Intent that no Brick-Maker or Brick-Seller, Lime-Burner or Lime-Seller, Carpenter, Bricklayer, Maſon, Joiner, or other Artificer, Workman or Labourer, may make the late Calamity a Pretence to extort unreaſonable or exceſſive Prices or Wages, *Be it further Enacted* by the Authority aforeſaid, That no Perſon or Perſons whatſoever, ſhall for the Space of *Ten* Years from the Paſſing of this Act, demand, have, receive or take any greater Sum or Sums, than the ſeveral Rates and Prices hereafter appointed, limitted and ſet down, for the ſeveral Articles herein after mentioned, to be applied or made Uſe of in *Charles-Town*. And if any of the ſaid Artificers or Sellers of ſuch Commodities, ſhall (during the ſaid Term) demand or take more for the ſaid Materials, than the Prices herein limitted: And if any Carpenters, Bricklayers, Maſons, Plaiſterers, Joiners, or other Workmen or Labourers, ſhall (during the ſaid Term) either refuſe to work for the Wages ſo limitted, or ſhall depart from his ſaid Work, after he hath undertaken to do the ſame, without the Licence of ſuch Perſon or Perſons as employed him, and before it be finiſhed; unleſs it be for Non payment of their Hire, or other juſt Cauſe, to be allowed before one Juſtice of the Peace reſiding in *Charles Town*; or if any Perſon or Perſons whatſoever, ſhall during the Term aforeſaid, by any Ways or Means, give, covenant, article or agree to give, directly or indirectly, by himſelf, or any other for him, any other or greater Wages, Prices or other Commodities than are ſo limitted and appointed, the ſaid Offender and Offenders being hereof legally convict, by Oaths of one or more Witneſſes, which the ſaid Juſtice is hereby impowered to adminiſter, ſhall be by the ſaid Juſtice of the Peace forthwith committed to the common Goal, there to remain by the Space of *one* Month, without Bail or Mainprize, unleſs

Figure A - 21: Charleston Fire Act 1740.

...as he ſhall pay or cauſe to be paid for every ſuch Offence, to the ſaid Juſtice of the Peace, ſuch Fine as by the Diſcretion of the ſaid Juſtice ſhall be ſet upon any ſuch Offender, not exceeding *Eighty* Pounds current Money; out of which Fine ſuch Juſtice ſhall and may award to the Party injured ſuch Satisfaction as he ſhall judge reaſonable; and the Reſidue thereof ſhall pay to the Publick Treaſurer of this Province, for the Uſe of and towards the re-edifying the Publick Buildings of the ſaid Town. Which ſaid ſeveral Rates and Prices, for the ſeveral Articles following, to be deliver'd on the Wharfs of *Charles-Town*, ſhall be as follow, in current Money, *that is to ſay*,

For Engliſh Bricks *per* 1000, *Six* Pounds.

For New-England Bricks *per* 1000, *Three* Pounds and *Ten* Shillings.

For Carolina Bricks *per* 1000 *Five* Pounds.

For Lime *per* Buſhel, *Two* Shillings and *Six* Pence.

For Cypreſs Timber *per* 100 Feet, *Three* Pounds *Five* Shillings.

For Cypreſs Inch and Quarter Boards *per* 100 Feet, *Two* Pounds *Five* Shillings.

For Cypreſs Inch and Half Boards *per* 100 Feet, *Two* Pounds *Ten* Shillings

For Cypreſs Inch Boards *per* 100 Feet, *Two* Pounds

For Cypreſs Shingles *per* 1000, *Four* Pounds.

For Pine Timber per 100 Feet, *Two* Pounds *Fifteen* Shillings.

For Pine Laths *per* 100 Feet, *Two* Pounds

For Pine Inch and Quarter Boards *per* 100 Feet, *One* Pound *Ten* Shillings.

For Pine Inch Boards *per* 100 Feet, *One* Pound *Seven* Shillings and *Six* Pence.

For Pine Shingles *per* 1000, *Three* Pounds.

For Carpenters and Joyners Maſter Workmen *per* Day, *Two* Pounds.

For Negro Men Carpenters or Joyners *per* Day, *One* Pound.

For Apprentices (white or black) in the firſt Year of their Time *per* Day, *Seven* Shillings and *Six* Pence. In the Second *per* Day, *Ten* Shillings. In the Third *per* Day, *Fifteen* Shillings. In the Fourth *per* Day, *One* Pound.

For Bricklayers and Plaiſterers Maſter Workmen, *per* Day, *Two* Pounds.

For Negro Men *per* Day, *One* Pound *Five* Shillings.

For Apprentices (white or black) the ſame Prices as are limitted for Carpenters or Joyners Apprentices.

Negro Men Labourers *per* Day, *Seven* Shillings and *Six* Pence.

If Bricks are laid by the 1000, then *per* 1000 *Two* Pounds.

For Lathing and Plaiſtering *per* ſquare Yard, *Two* Shillings and *Six* Pence.

For Plaiſtering Laths Five Feet long, *per* 1000, *Two* Pounds.

And be it further Enacted by the Authority aforeſaid, that in Caſe any Action or Suit, ſhall be brought, ſued or proſecuted againſt any Perſon or Perſons whatſoever, for any Matter or Thing by them done, or to be done, in Purſuance of the Direction of this Act, it ſhall and may be lawful for the Defendant and Defendants in every ſuch Action or Suit to plead the General Iſſue and to give this Act, and the ſpecial Matter in Evidence; and in caſe the Plaintiff or Plaintiffs ſhall diſcontinue, become Non-Suit, or a Verdict ſhall paſs againſt him, the Court in which ſuch Action ſhall be brought or commenc'd, ſhall tax and allow to every ſuch Defendant his and their double Coſts of Suit.

WILLIAM BULL *jun.* *Speaker.*

In the Council-Chamber,
December 20, 1740.

ASSENTED to,

WILLIAM BULL.

In the Commons Houſe of Aſſembly the 9th Day of December 1740. All Perſons who have any Demands on the Publick, are hereby required to bring in their Accounts of the ſame to the Clerk of this Houſe, on or before the firſt Day of *February* next; after which Time no ſuch Account will be received, nor will the Payment of any Debt to ſuch Creditors as ſhall omit delivering their Accounts by that Time, be provided for the Eſtimate of the Current Year.
By Order of the Houſe.
Childermas Croft, C.D.C.

Charles-Town: Printed by PETER TIMOTHY *in King-ſtreet.*

Figure A - 22: Charleston Fire Act 1740.

124 CHARLESTON DIRECTORY.

Coffee in casks, 1568lbs nett; in bags 1830bls nett; Cocoa, in casks, 1120lbs, nett, in bags, 1307lbs, nett; Pimento in casks, 1120 lbs nett, in bags, 1100lbs net; All heavy Goods, as bar, pig, and rod iron, 2240 lbs, nett; All heavy dye woods, rice, sugar, and all other heavy goods, 2240 pounds nett; Flour of 1 3-4 cwt 8 barrels; Beef, pork, fish; (pickled,) tallow, 6 bls; Pitch, tar and turpentine of the capacity of 30 gallons each, 6 bls; Oil, wine, brandy and other liquors, reckoning the full contents of casks, 200 gals; Grain in casks, 22 bushells; Salt in casks, fine 36, coarse 31 bushels; Seacoal, 29 bushels; Mahogany, square timber, plank, boards, bale goods and dry goods, in casks, boxes and trunks, 40 cubic-feet; Dried hides, 1120 lbs nett; Raw silk, 896 lbs nett; Tobacco, ton 1600 lbs nett: Tobacco in hhds. 1200 lbs nett.

RATES of WHARFAGE, STORAGE, WEIGHING &c.

According to Law of this State, passed March, 1778, and perpetuated by the revival Act of 1783, and amended by an Act of 1807.

Wharfage for Vessels.

For the dockage of every vessel, coaster excepted, loading or unloading of or under 100 tons, per day, 50 cts; for the same, if lying idle per day 100 cts; from 100 tons burden, to 150 per day 75 cts; for every vessel above 150 tons per day 100 cts; and for every idle vessel, double dockage per day.

Wharfage of Goods, Merchandize, &c.

Anchors, small size, each 12 1-2 do 6 cwt & upwards, 25 cts; do 12 cwt and upwards, 50 cts. Apples per bbl. 4 cts.

Beef per bl. 3 1-4; Beer per bl. do. read in small bls, per bl do; Bread per keg, 1 ct. Boards of all kinds, from 3-4 inch and upwards, incuding plank, and reduced to an inch measure pr 1000 foot 47 1-2 cts Bark, tannerspr cord 31 3-4. Bricks pr thousand, 15 1-2 cts. Brazelletto pr ton, 23 cts. Butter per keg, 1 1-4. Blades corn, 1000 lb, 15. Blacksmith's bellows, 6 cts. Bottles full, not packed, pr gross, 13 cts. Bolts of canvas, osnaburgs, &c pr bolt, 2 cts. Bags of coffee, pimento, sugar, &c and other bags of the same size, per bag, 4 cts. Butts of 200 galls. and upwards, each 25 cts. Boxes of soap, candles, chocolate, prunes, raisins, cordials, segars, &c pr box 4 cts. Boxes of indigo, 8 cts. Bales each 12 1-2 cts. Bundles, each 6 1-4 cts. Barrels of the size of beef, beer, &c pr bl, 3 1-4 cts. Barrels of indigo, per bl, 8 cts. Barrels of goods. pr bl, 6 1-4. Barrels, staves, and heading, per thousand, 39 3-4 cts.

CHARLESTON DIRECTORY. 125

Cheese pr hundred, 4 cts. Cider, pr bl, 3 1-4 cts. Corn in bulk, pr hundred bushels 31. Corn per bl 2 1-2 cts. Coffee do 4. pr bag do. per pun or hhd, 15 1-2 cts. Coaches, and other 4 wheeled carriages, each 64 1-2 cts. Chairs, riding and chaises, each 31 3-4 cents. Chairs sitting, each 1 ct. Coal pr ton, 15 1-2 cts. Cables of 12 cwt. and upwards, each 50 cts. Cables of 6 cwt. and upwards, each 25 cts. Cordage of all other kinds, pr coil, 6 1-4 cts. Cannon of 12 cwt. and upwards, each 50 cts. Cambooses, each 12 cts. Candles, pr box 4 cts. Chocolate, do 4 cts. Cordials, do 4 cts. Chest of drawers, each 12 1-2 cts. Casks, cases, and chests of large size, each 6 1-4 cts. Crates of earthenware &c. each, 12 1-2. Cotton pr bale or case, 4 cts.

Demijohns, each 1 ct. Desks & chests of drawers, 12 1-2 cts.

Featheredge boards, per 1000 feet, 47 1-2 cts. Fire wood pr cord, 15 1-2 cts. Fustic pr ton, 23 cts. Flour pr bl, 3 1-4 cts. Flour pr keg, 1 ct. Fish pr quintal, 2 cts.

Grain, in bulk, pr 100 bush. 31 1-4: gunpowder, in bbls of 100lbs pr bbl 8: do. in smaller bbls, pr bbl 4: do. in kegs 1: Graplins each 12 1-4: Glass, window pr box 6 1-4.

Heading, hhd pr 1000 63 1-2; heading bbl pr 1000 39 3-4; hearth tiles pr do. 15 1-2; hemp pr hundred cwt. 2 1-2; hides, raw and tanned, pr hundred 63 1-2; hay, pr 1000 cwt. 15 1-2; do. in bundles, pr bundle 12 1-2; hoop-poles pr 1000 31 3-4; do. in bundles, pr bundle, 2; hogsheads, of goods about 63 gallons pr hhd. 4 3-4; do. of goods about 120 galls. pr hhd. 12 1-2; do. of rum, wine &c., 120 galls pr hhd. 12 1-2; do. of sugar, coffee, &c., of 1000lbs pr hhd. 15 1-2; do. of sugar, &c., above 1000lbs pr hhd. 23; hampers each 6 1-2.

Indigo pr bbl, box, case, cask, or other package 8; iron, and other heavy goods pr ton 15 1-2.

Jugs each 1-2; jars each 1-2.

Kegs of shot, paint, &c. of small size, each 1-2; do. of bread, flour, butter, tallow, lard, and such like articles, each 1; do. of liquors, of a smaller size than quart cask, 2; logwood pr ton 23; lignumvitæ pr ton 23; lime pr 100 bushels 31 3-4

Figure A - 23: Rates of Wharfage, Charleston City Directory with Supplement 1835-1836.

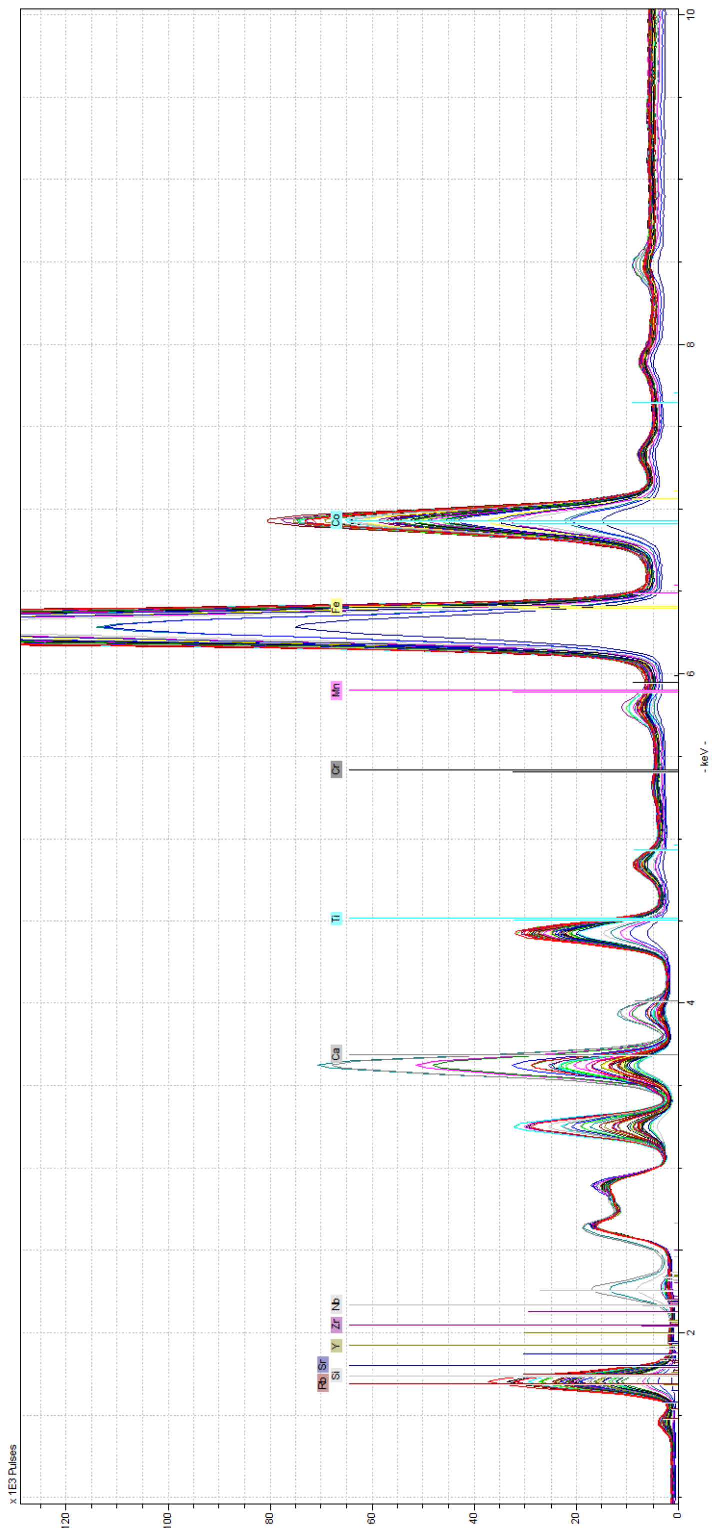


Figure A - 24: XRF, All brick samples, no glaze samples included. Expanded spectrum.

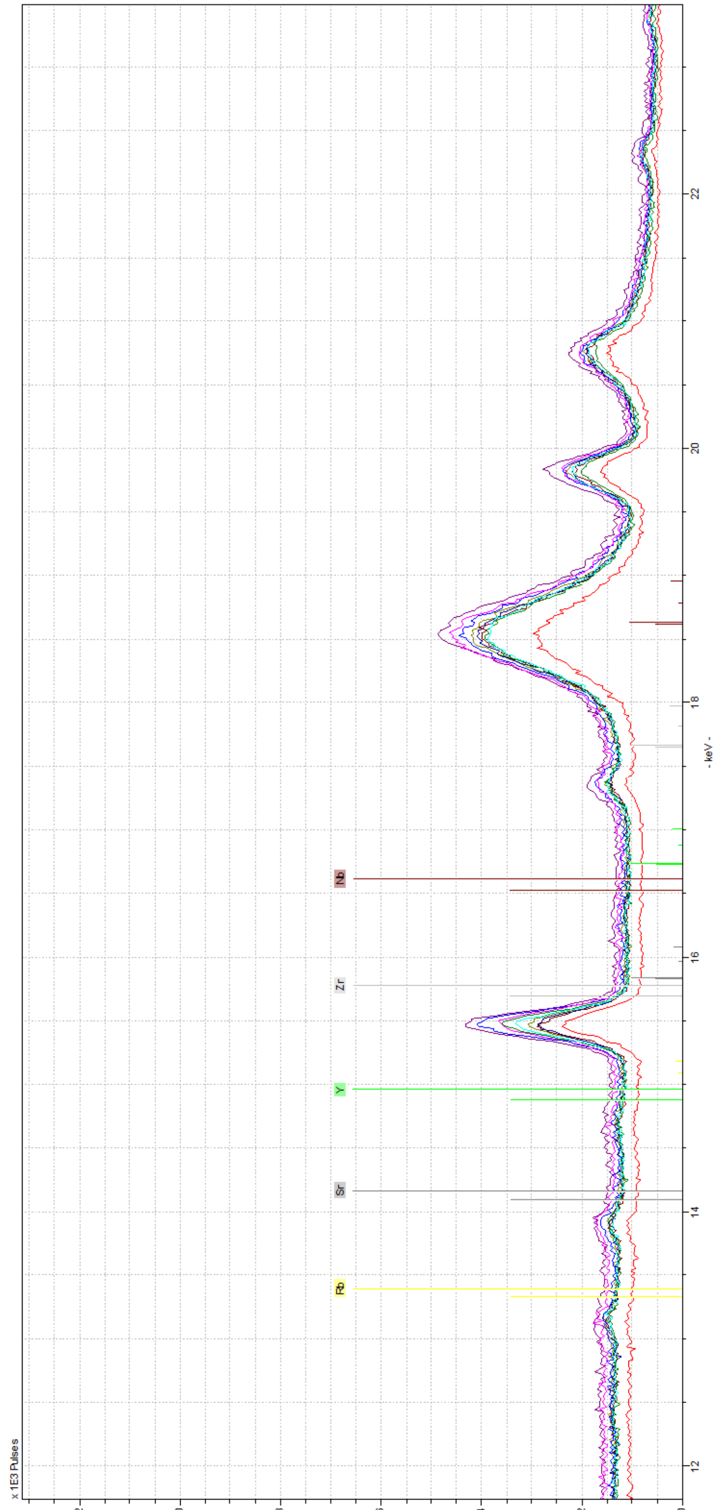


Figure A - 25: XRF, Clay and sand samples, Expanded spectrum.

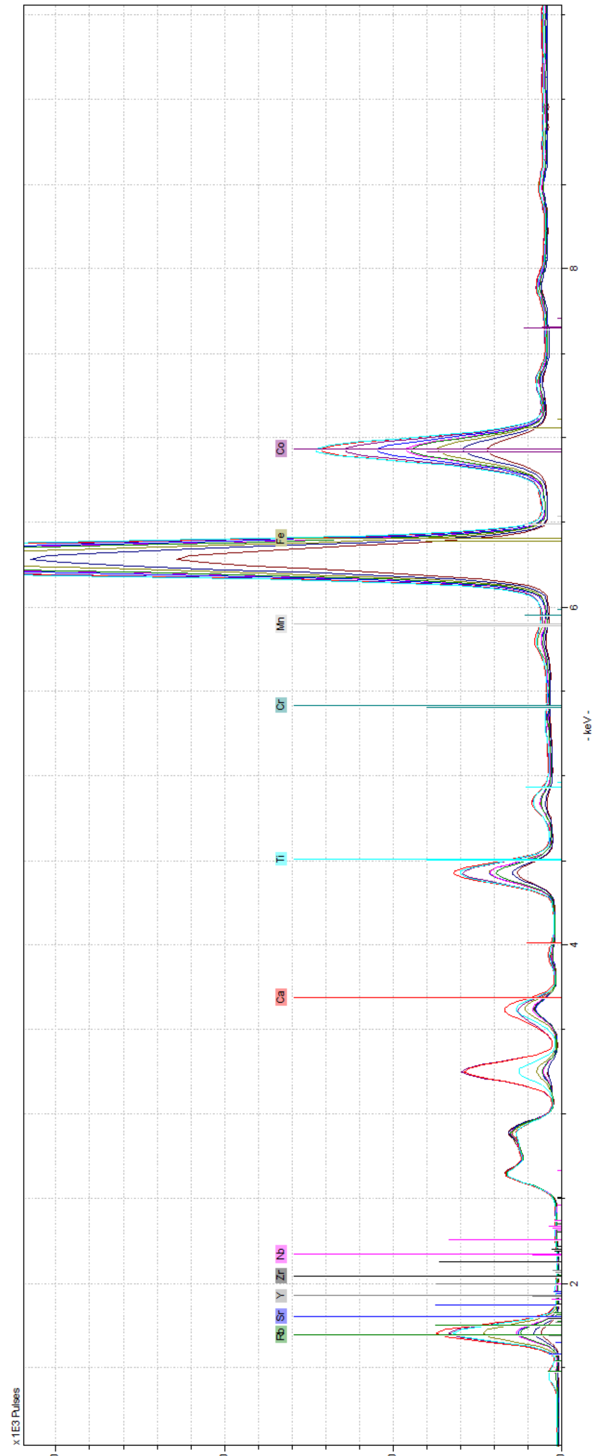


Figure A - 26: XRF, GC.T.A samples, expanded spectrum focusing on the patterns of elements heavier than iron.

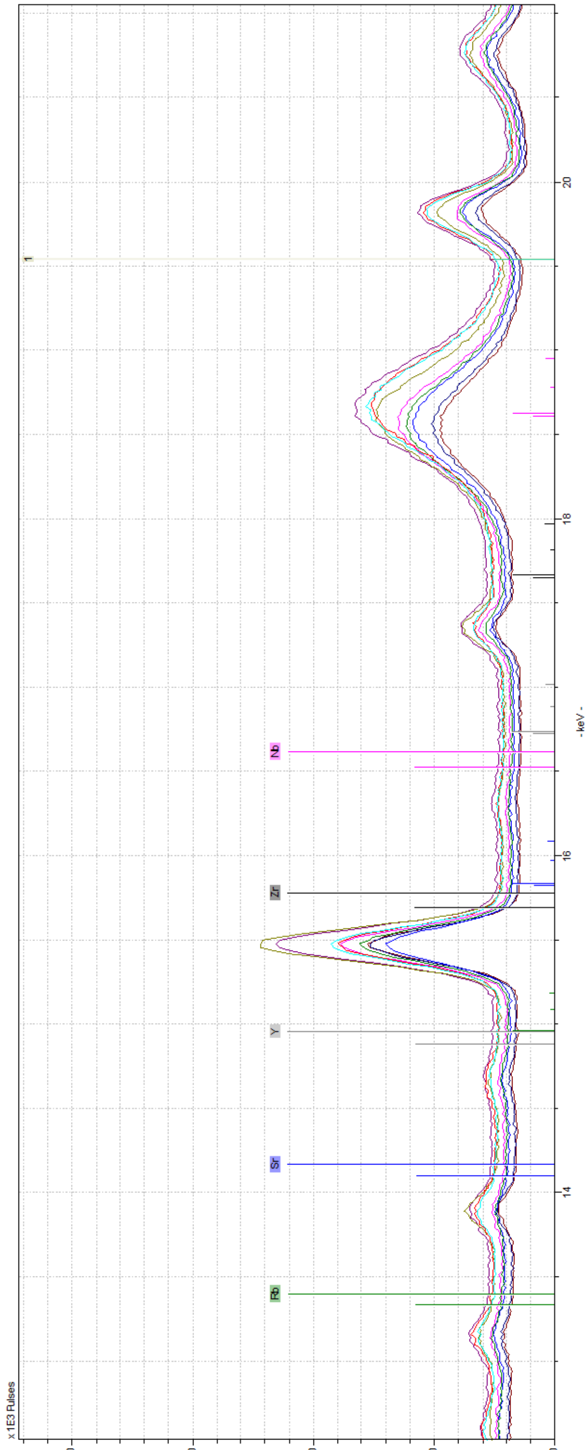


Figure A - 27: XRF, GC.T.A samples, expected spectrum focusing on the patterns of rubidium, strontium, yttrium, zirconium, and niobium.

CLEMSON UNIVERSITY/ COLLEGE OF CHARLESTON
GRADUATE PROGRAM IN HISTORIC PRESERVATION

Architectural Conservation Laboratory

Mortar Analysis

Sample number: A-1	
Project/Site: Grove Creek	
Location: Wall A	Date sampled:
Analysis performed by: Frances Pinto	Date analyzed: 10/7/14
Description of sample	
Type/Location: bedding mortar	
Surface appearance: excessive shell in aggregate	
Cross section:	
Snap Strength:	
Color: 10 yr / 7/ 2	Texture: very rough
Hardness: scratched by glass	Gross weight:

Excessive sample loss due to high shell content.

5

Figure A - 28: Mortar Analysis (1/2).

Gross sample attached	Photomicrograph

Components: after acid digestion

Fines:	Color: white N/9	%weight: 97%	Weight: 23.246
	Organic Matter:		
	Composition: silt / sand		

Acid soluble fraction:	%weight:	Weight:
	Description of reaction: excessive	
	Filtrate color:	
	Composition:	

Aggregate characterization:	Color: 5yr section	Weight: .6155	%
	Mineralogy:		
	Grain shape: round		

Sieve #	Size	Sphericity	Roundness	Sorting	Color
10	very coarse	well rounded	5	5	5yr/7/4
20	sand	well rounded	5	5	5yr/8/1
40	sand	" "	5	5	5yr/7/1
60	fine sand	" "	5	5	5yr/7/2
100	very fine	" "	5	5	5yr/7/2
200	silt	" "	5	5	5yr/7/1
Pan	silt	" "	5	5	5yr/8/1
Fines	silt	" "	5	5	white N/9

Assessment: primarily shell total sample weight 23.8615
Mortar type: lime
Fines: majority of sample
Acid Soluble:
Aggregate: shell, sand

6

Figure A - 29: Mortar Analysis (2/2).

name	grouping	site	type	designation	description		connections
GC.K.A	---	GC	clamp	A		below ground	
GC.K.B	---	GC	clamp	B			
GC.S.A			building				
GC.S.A-A	S.A	GC	wall/ foundation	A-A	exterior	above ground	
GC.S.A-B	S.A	GC	wall/ foundation	A-B	exterior	above ground	
GC.S.A-C	S.A	GC	wall/ foundation	A-C	interior	below ground	
GC.S.A-D	S.A	GC	wall/ foundation	A-D	interior	level	connected to GC.S.A-F
GC.S.A-E	S.A	GC	wall/ foundation	A-E	interior	level	connected to GC.S.A-F
GC.S.A-F	S.A	GC	wall/ foundation	A-F	exterior	level	
GC.S.A-G	S.A	GC	wall/ foundation	A-G	interior	below ground	connected to GC.S.A-F
GC.S.A-H	S.A	GC	wall/ foundation	A-H		below ground	
GC.S.A-I	S.A	GC	wall/ foundation	A-I		below ground	
GC.S.A-J	S.A	GC	wall/ foundation	A-J		below ground	
GC.S.B	---	GC	river wall	B		below ground	
GC.W.A	---	GC	well	A	contained well		
GC.W.B	---	GC	well	B			

Figure A - 30: Structure List.

Figure A - 31: Pine Sample (Photo Frances Pinto).

Figure A - 32: Clamp A Borescope.

Appendix B

Maps

Figure B - 1: Nature Trail Map (Trimble Outdoor Navigator).

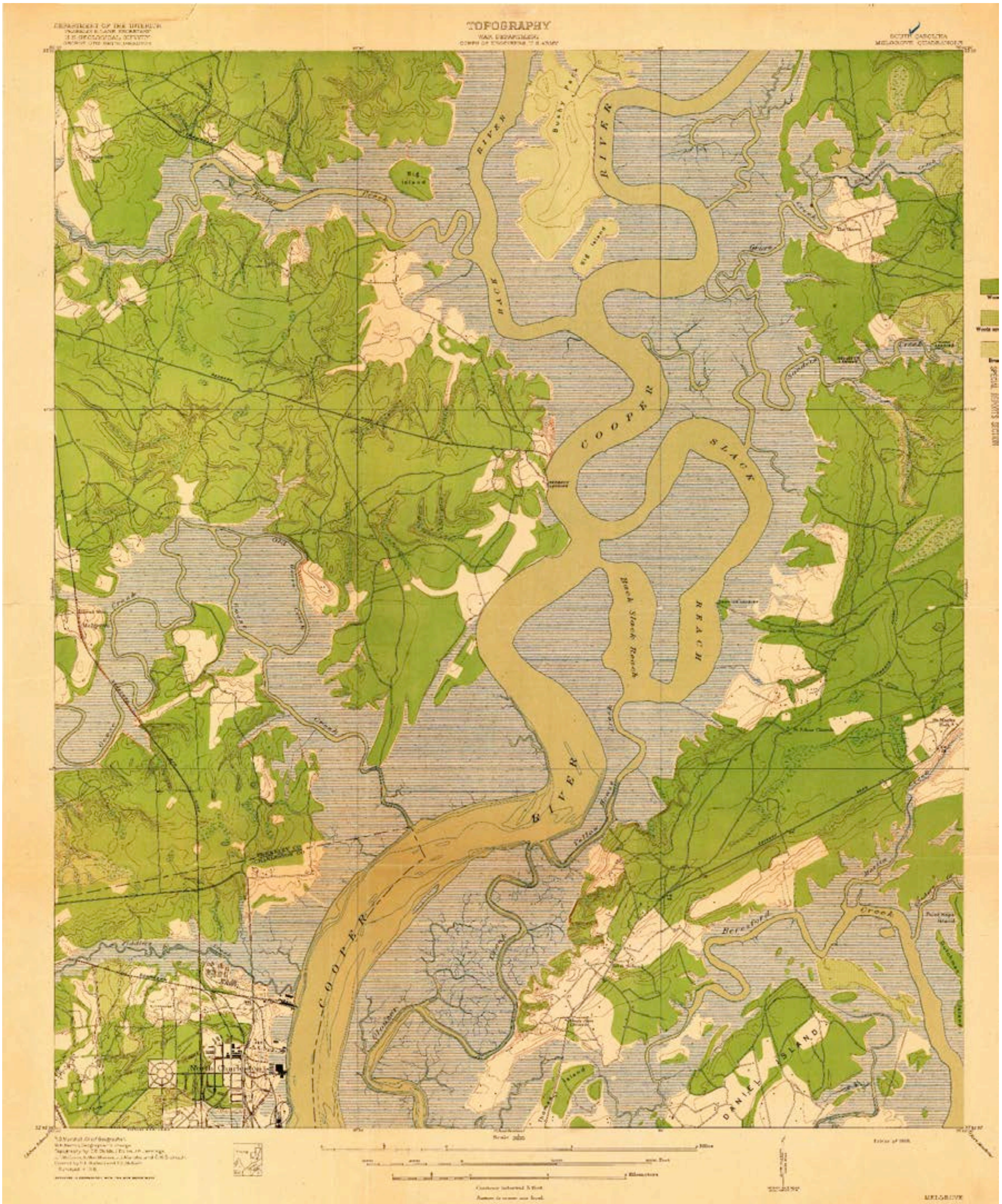


Figure B - 2: USGS 1919, Melgrove Quadrangle.

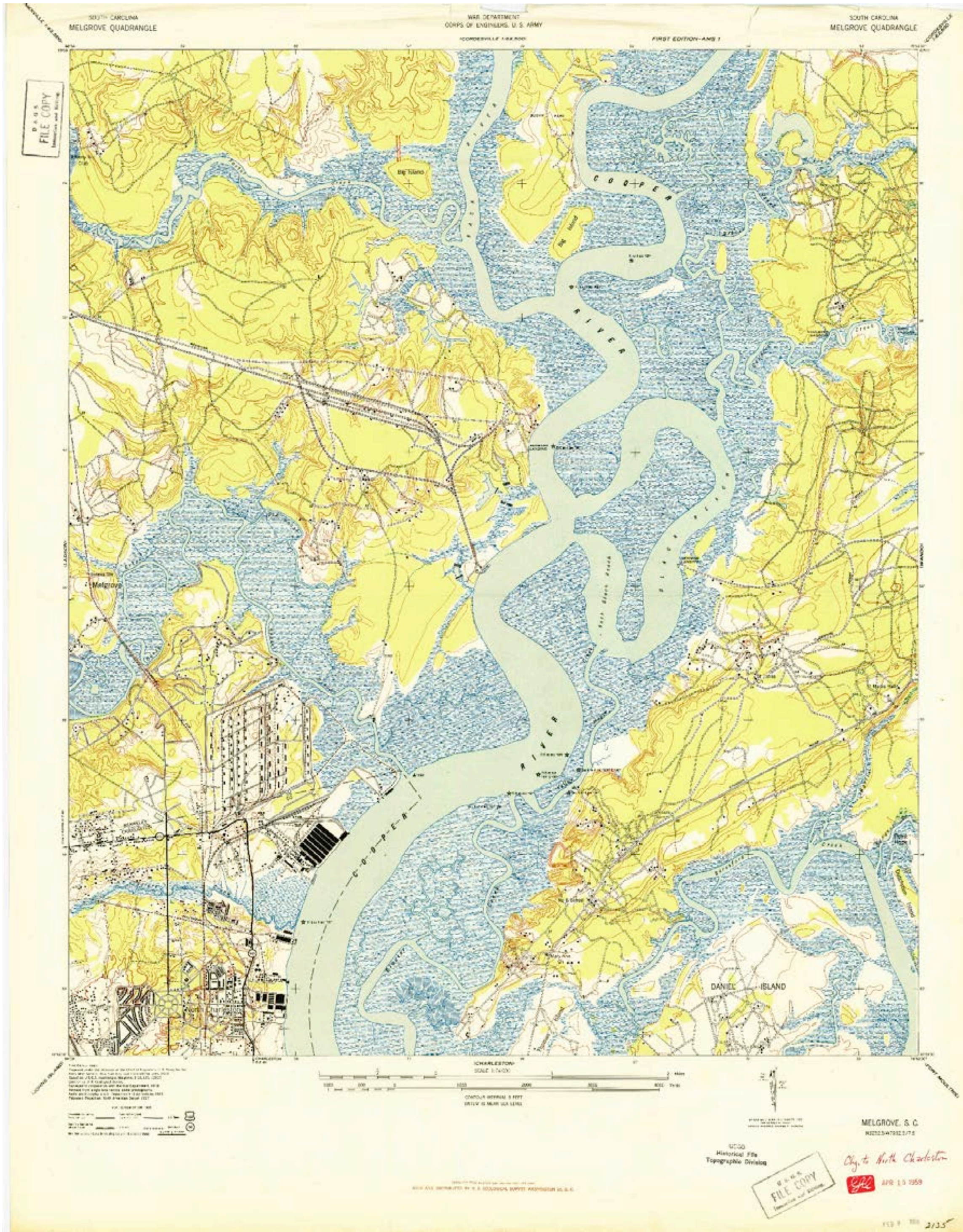


Figure B - 3: USGS 1940, Melgrove Quadrangle.

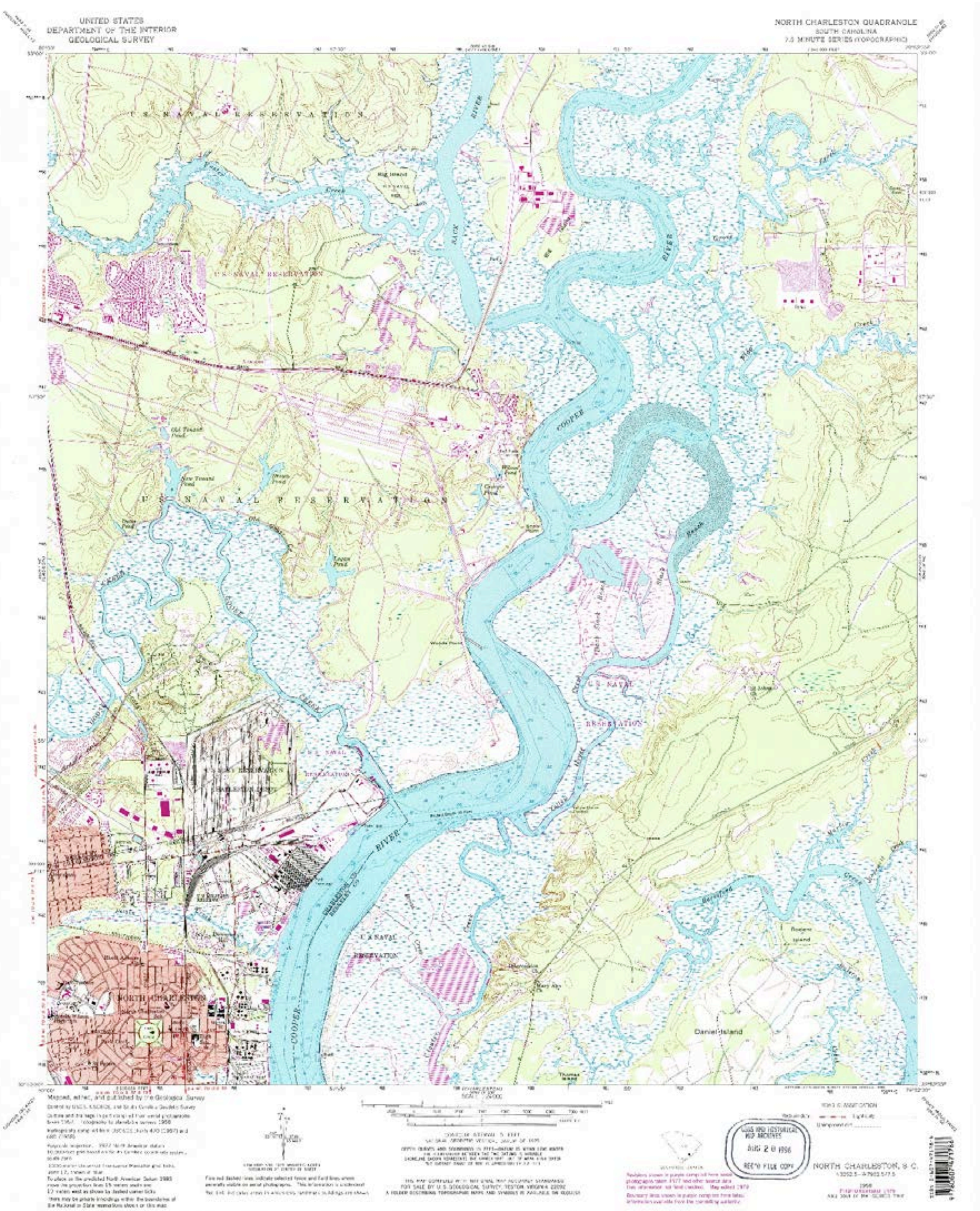


Figure B - 4: USGS 1958, North Charleston Quadrangle.

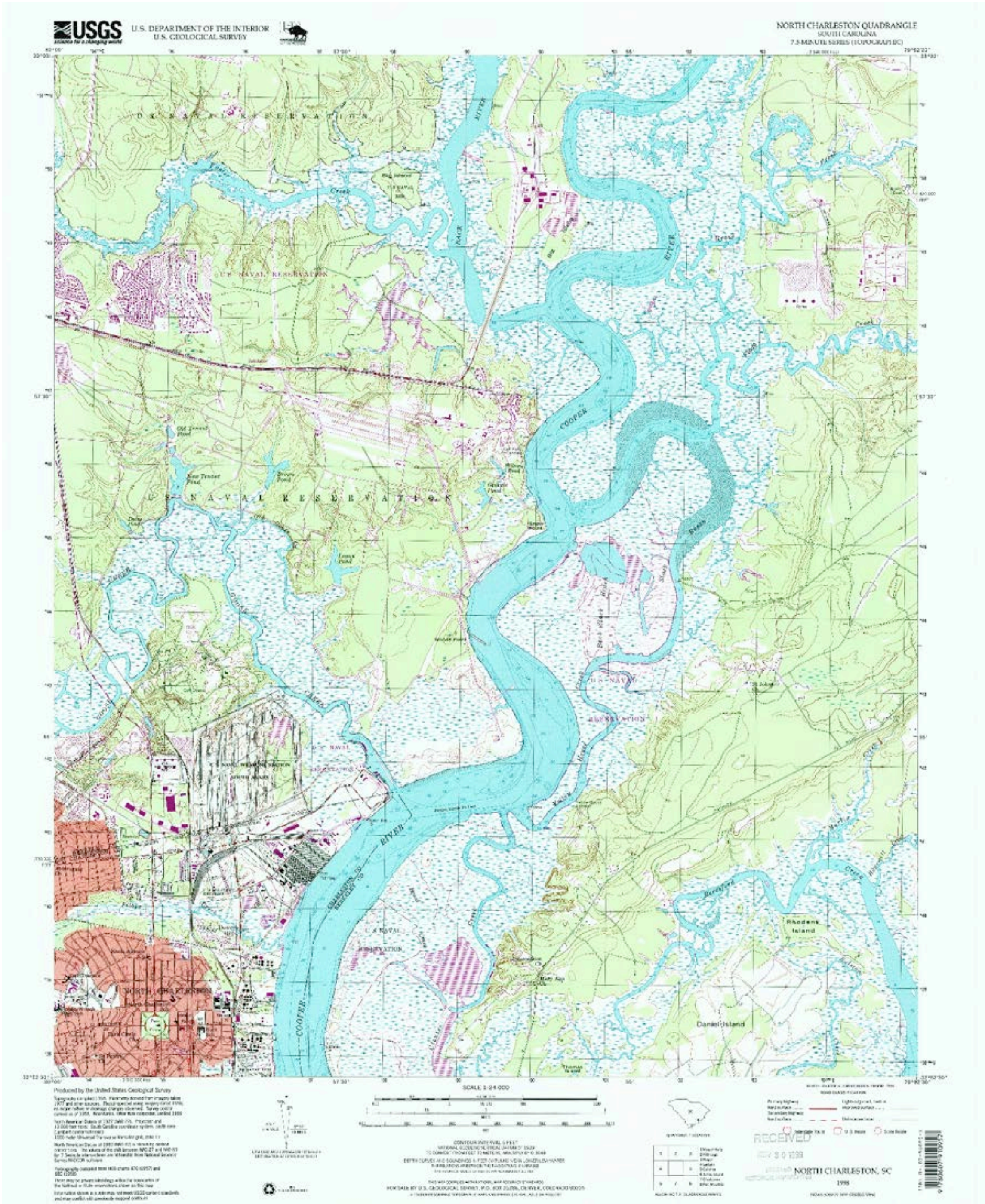


Figure B - 5: USGS 1998, North Charleston Quadrangle.

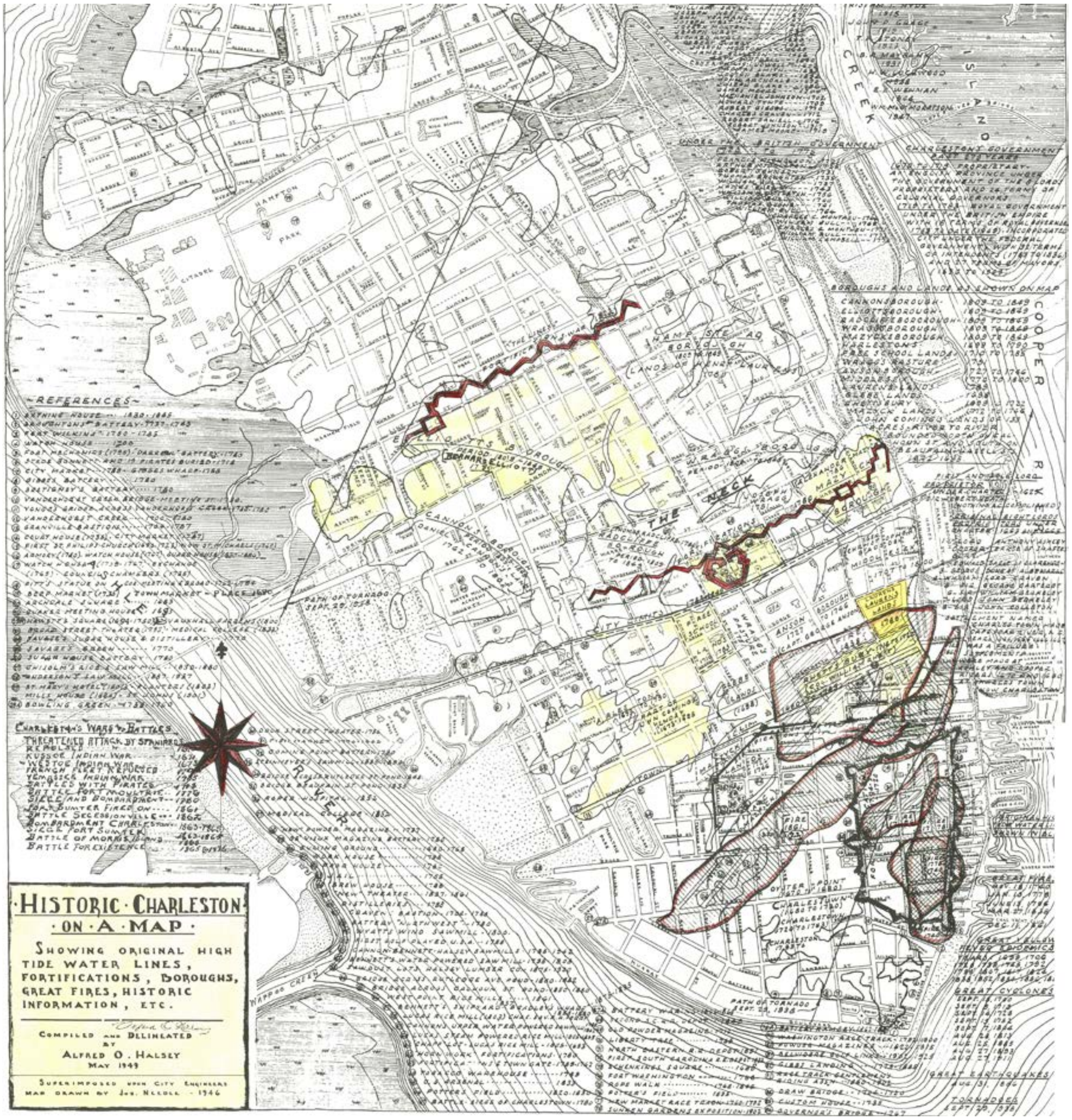


Figure B - 6: Halsey Map of Charleston.

Figure B - 2: SC DNR LIDAR, Statewide Digital Elevation Model for South Carolina.

Appendix C

Metal Conservation

Plan for The Treatment of Metal Artifacts

Grove Creek Historic Industry Site

Frances Pinto

December 3, 2014

HP 810

Frances Ford

Richard Marks

Off the Cooper River, along Grove Creek are the remains of a plantation's brick industry. Though the timeline of this industry is as of yet undetermined, the plantation is known to date to the mid 1700s.[77] Little current knowledge of the brick production on this site existed until Hurricane Hugo uprooted several trees in 1989, exposing what remained of several clamps. Currently there is a graduate thesis study, conducted by the author, to explore the history of these clamps and their significance to the area. As this research is conducted, along with samples of historic bricks, metal artifacts, primarily wrought and cast iron, are being uncovered.

This report is to provide guidelines that are to be implemented at the BP Chemical – Cooper River Plant in Huger, South Carolina, for metal artifacts found on the property. Because of the nature of this site, procedures for unearthed metal artifacts are necessary to prevent mishandling. Without specialized training, cleaning methods that can damage artifacts may be chosen. This report was made necessary by the research conducted at the Grove Creek Historic Industry site on brick kilns adjacent to the creek. This investigation of brick kilns along Grove Creek as well as other educational or recreational activities that occur on the site, necessitate a plan for future artifacts that may be recovered. It is the goal of the property owners to use this site to promote the education of cultural and natural knowledge of the area. These recommendations are to further that goal, by facilitating others in the preservation of artifacts and increase comprehension of this site and its importance to the South Carolina Lowcountry.

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[77] "C8:239."*Charleston County RCM*

When artifacts are discovered, before being unearthed, their location must be noted. If located within the designated study area, the corresponding grid square location is to be noted. (see figure 1) If outside of this area, or if the grid square is unknown to the finder, the GPS coordinates may be recorded instead. The GPS application utilized at the time of this publication is "Trimble Outdoor Navigator,"[78] which is available as a free mobile phone application. However, any method of determining the coordinates is permitted.

Upon recovery, each artifact is to be thoroughly documented. A process has been created for the recording of this data. All existing measurements are to be recorded. An index has been created to record this data from all artifacts. This index is used both for the bricks collected for the kiln thesis project, as well as any metal artifacts. The index is set to include length, width, and height, as well as any additional measurements specific to each individual artifact. (see figure 2) The artifacts are named by the location, associated structure and its designation, and the order in which it was found. For example, GC.S.A.17 was located adjacent to Grove Creek, at structure A, and was the 17th artifact from this area.

New artifacts are to be recorded on a New Artifact Survey form. (see figure 3) This form is to assist the finder of each artifact document all relevant information which is significant for future study. Some of this information is to be recorded on site while other aspects can be documented later. On site, the artifact category (nail, bracket, strap) or at least a description must be noted. Next to be recorded is the

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[78] *http://www.trimbleoutdoors.com*

associated structure, if known to the finder. As previously stated, the location is the grid or GPS coordinates. This information particularly is critical for the site interpretation. An archaeological study is within the purview of future research for the Grove Creek site, and this evidence will be required for that study.

Next, each artifact should be photographed before cleaning and after each step in the cleaning process. Photographs are to be taken with a white background and with two light sources. The light sources are to eliminate shadows and illuminate all surfaces of the artifact. This standardizes all photographs in the catalogue and reduces the variations of images. Photographs should be taken of each side, with close ups of any relevant details. (see figure 4)

Following documentation, the artifact is submitted to a cleaning process. There are multiple methods that can be utilized without damaging the artifact. Initially, dirt and debris are removed with a series of nylon brushes. Metal brushes, files, and scouring pads are to be avoided as these could potentially disfigure the artifacts. Varying sizes of brushes and degrees of stiffness of the bristles should be used to properly clean all aspects and surfaces. With this step some imagination may be required through the creative use of unexpected tools. Brushes can range from artist paintbrushes, scrub brushes, toothbrushes, and baby bottle brushes.

Pressurized air can be used to remove light soiling in addition to dry brush cleaning, if there is apparent fragmentation of the artifact.[79] The cleaner must

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[79] Yoichi Nishiyama, "Preservation Techniques for Metal Artifacts," Nara University

ensure that delicate artifacts are not damaged. Air pressure should initially be set as low as possible, and increased by gradual increments. Air can be used at any stage of cleaning to remove debris or to dry between treatments.

Another cleaning method is submersion in a caffeinated beverage such as Coca-Cola or Pepsi. (see figure 5) While not the most effective method, as a temporary storage method, it does restrict deterioration until electrolysis or other stabilizing methods are used. Phosphoric acid is a common chemical treatment for iron artifacts. But as it does not prevent further deterioration it is not a permanent solution.[80] Treating with a phosphoric acid solution is referred to as "phosphating."[81] This is a rust conversion technique which converts the outer layer of rust to iron phosphate.[82] While care must be taken with the use of a phosphoric acid solution, the cola contains such a small amount of phosphoric acid it does not present a problem. When using the cola the artifact should periodically be inspected. (see figure 6) The artifact should remain submerged so additional soda may be required. Additionally, the cola should be changed regularly to remove debris and deter the growth of mold. (see figure 7)

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[80] Hamilton, Donny L., "Methods of Conserving Archaeological Material from Underwater Sites" (Texas A&M University, 2010)

[81] "How To Remove Rust From Iron Relics & Artifacts by Electrolysis." *Metal Dectecting World*, http://www.metaldetectingworld.com/electrolysis_rust_removal.shtml

[82] "How To Remove Rust From Iron Relics & Artifacts by Electrolysis"

Electrolysis is an excellent treatment for the cleaning of iron artifacts. It requires little instruction and can be conducted in a limited amount of space. The advantage that an acid treatment has over electrolysis is that of time. For sizable artifacts electrolysis can take months to years. Given that most artifacts from this site are fragments of nails and small plates, the process will not take quite so long.

For this report, the artifact subjected to electrolysis is GC.S.A.17. (see figure 8) There are several supplies necessary for this treatment: a power source; a sacrificial metal, such as wire mesh; wire to connect the power to the artifact; nonconductive supports, seen in the illustrations as 2 boards; sodium carbonate, washing soda; and water. (see figure 9) Depending on the power source used, it is recommended to monitor the output of the experiment with a voltage meter. (see figure 10) This ensures that the power supply does not overhead and cause damage to the artifact. The process is a simple one, contaminates are drawn out of the artifact through the completion of an electrical circuit.

For the electrolysis process, a waterproof container, in this example a plastic tub, is lined with ¼ inch steel mesh. (see figure 11) This mesh serves as the sacrificial material. Where two different metals are placed together, one will sacrifice to another. In this case, the mesh will deteriorate rather than the artifact. In the illustration the mesh has been clamped to the tub, this is not necessary to the process, but is simply to keep the edges out of the way. Two boards are placed across the opening to suspend the artifact from. (see figure 12) From each support a wire is suspended which holds the artifact in the tub, above the mesh. The coated wire must be stripped where it wraps around the artifact. The wire is secured at each support. Its ends are also stripped then the ends of each wire are twisted together. The wire loops are then connected to each other, either by wire or metal rod. (see figure 13) Water and sodium carbonate are then added to the tub. For this process, a 5% sodium carbonate solution is adequate. This is a less caustic than other solutions, such as sodium hydroxide, though it is less conductive and requires higher concentrations. [83] The water should completely cover the artifact. A power supply, in the illustration a 12 V battery charger, is connected to the artifact. The positive lead attaches to the wire supporting the artifact, while the negative lead is attached to the sacrificial mesh. This arrangement causes the charge to travel from the power, through the artifact, through the water, to the mesh, and completes the circuit. The arrangement should be occasionally monitored with a voltage meter to ensure the power source does not over heat.(see figure 14) Though the process is slow, results can be seen even in short term applications. (see figures 15 – 17)

After the cleaning process is complete, the use of a rust inhibitor is recommended. The type of inhibitor used is dependent on the storage or display of the artifact. Most sources agree that there are several criteria for the selection of a sealant: reversibility, impermeability, natural looking, and transparency/translucent.[84] Any nonreversible treatments, such as rustoleum, should be avoided. A temporary solution is the use of an oil or oil based product as a

[83] Hamilton, Donny L.
[84] Hamilton, Donny L.

water displacer. WD-40 is such an example of a temporary coating. It and other are protect the artifact, and are easily removed when desired. These products must be reapplied regularly and so are not considered a long-term solution.

There are multiple wax applications which are more lasting solutions. Microcrystalline wax is suitable coating for uses both indoors and out. However this process involves placing the artifact in a vat of the wax, heated above the boiling point of water. It is therefore, considered outside the scope of these guidelines. Briwax, conversely, can be applied with common household supplies. The artifact is heated with a hairdryer or lamp until warm and the product, a solvent blend of beeswax and carnauba wax, is directly applied with a cloth.[85] Though now considered an outdated method due to wax solvents, beeswax and paraffin wax can be used as a coating for artifacts stored indoors.[86]

The cleaning process described in this paper are recommended for the site at Grove Creek due to the lack of specialized training and supplies required for the process. This is by no means the only possible technique. If faster, more extensive results are desired, the artifacts can be taken to a laboratory, such as the Warren Lasch Conservation Lab where more extensive, chemical treatments can be applied.

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85 "How To Remove Rust From Iron Relics & Artifacts by Electrolysis"

86 Valentin Boissonnas. "An Introduction to the History of Metals Conservation." *The Metals Conservation Summer Institute*, 2006.

Metal Conservation Bibliography

Becker, Elmor H. “The Conservation and Analysis of Metal Objects Found in the Southern African Iron Age.” *University of South Africa: Department of Anthropology and Archaeology*, 2013.

Boissonnas, Valentin. “An Introduction to the History of Metals Conservation.” *The Metals Conservation Summer Institute,* 2006.

“Caring for Your Treasures: How To Protect Your Metal Objects.” American Institute for Conservation of Historic and Artistic Works, n.d.

Cultural Heritage Protection Cooperation Office. “Conservation Technologies for Archaeological Sites and Artifacts.” Cultural Heritage Protection Cooperation Office: Asia - Pacific Cantre for UNESCO, n.d.

Hamilton, Donny L. “Conservation of Cultural Materials from Underwater Sites.” Nautical Archaeology Program Department of Anthropology Texas A&M University, March 1, 2010. http://nautarch.tamu.edu/CRL/conservationmanual/index.htm.

Hernandez-Escampa, M, J Gonzalez, and J Uruchurtu-Chavarin. “Electrochemical Assessment of the Restoration and Conservation of a Heavily Corroded Archaeological Iron Artifact.” *Journal of Applied Electrochemistry* 40, no. 2 (February 2010): 345-346.

Hollner, S, F Mirambet, E Rocca, and S Reguer. “Evaluation of New Non-Toxic Corrosion Inhibitors for Conservation of Iron Artefacts.” *Corrosion Engineering, Science and Technology* 45, no. 5 (October 1, 2010): 362–66.

“How To Remove Rust From Iron Relics & Artifacts by Electrolysis.” *Metal Dectecting World*, http://www.metaldetectingworld.com/electrolysis_rust_removal.shtml.

Nishiyama ,Yoichi. “Preservation Techniques for Metal Artifacts,” Nara University.

REFERENCES

REFERENCES

Allen, E.T., and E.G. Zies. "The Condition of Arsenic in Glass and Its Role in Glass-Making." *Journal of the American Ceramic Society* 1 (January 1918).

"Atlas of the State of South Carolina by Robert Mills." *South Carolina Department of Archives and History,* Library.sc.edu/digital.collections.millsabout.html

Beall, Christine. *Masonry Design and Detailing Sixth Edition*. New York: McGraw-Hill Professional, 2012.

Brooks, Mark, and James Scurry. "An Intensive Archeological Survey of Amoco Realty Property in Berkeley County, South Carolina with a Test of Two Subsistence-Settlement Hypotheses for the Prehistoric Period." *Research Manuscript Series*, 1978.

Campbell, James W. P. *Brick: A World History*. Thames & Hudson, 2003.

Carson, Cary, and Carl R. Lounsbury. *The Chesapeake House: Architectural Investigation by Colonial Williamsburg*. Chapel Hill: The University of North Carolina Press, 2013.

Charleston County RMC

Charleston County Will Book, 1780 – 1783.

Charleston Mercury, S.C Room, Charleston County Public Library.

Crary, J. W. *Sixty Years a Brickmaker: A Practical Treatise On Brickmaking and Burning and the Management and Use of Different Kinds of Clays and Kilns for Burning ... and Hints to Bricklayers and Builders*. Ulan Press, 2012.

Crooks, Daniel J., Jr. *Charleston Is Burning!: Two Centuries of Fire and Flames*. Charleston, SC: The History Press, 2009.

Davis, Charles Thomas. *A Practical Treatise On the Manufacture of Bricks, Tiles, Terra-Cotta, Etc. ...* Nabu Press, 2010.

DenBoer, G., & Long, J. *South Carolina Atlas of Historical County Boundaries*. New York, New York: Charles Scribner's Sons. (1997).

Denis, Brosnan. *South Carolina Brick Masonry - Green Forever: Insights in Preservation and Restoration*. BiblioGov, 2012.

Derting, Keith, Sharon Pekrul, and Charles Reinhart. "A Comprehensive Bibliography of South Carolina Archaeology." *Research Manuscript Series*, 1991.

Dobson, Edward. *A Rudimentary Treatise On The Manufacture Of Bricks And Tiles: Containing An Outline Of The Principles Of Brickmaking*. Nabu Press, 1882.

Dowling, Daniel. *The Charleston Directory, and Register for 1835-6: Containing the Names, Occupations, and Residences of Persons in Business, Heads of Families, &c., Collected by James Smith, and the City Register Consisting of a Variety of Useful Information Connected Wi*. Charleston, 1835.x

Eams, Alannah. "The History of the Bolt." *Bolted* 2 (2012).

Eaton, Clement. *A History of the Old South*. Macmillan, 1949.

Fenner, C.N., and J.B. Ferguson. "The Effect of Certain Impurities in Causing Milkiness in Optical Glass." *Journal of the American Ceramic Society* 1, no. 1 (January 1918): 559-566.

Frazier, Herb. *Behind God's Back: Gullah Memories Cainhoy, Wando, Huger, Daniel Island, St. Thomas Island, South Carolina*. Charleston, S.C: Evening Post Books, 2011.

Greene, Kevin, and Tom Moore. *Archaeology: An Introduction*. Routledge, 2010.

Hammond, M. D. P. "Brick Kilns: An Illustrated Survey," *Industrial Archaeology Review* 1 (1977).

Hammond, Martin. *Bricks and Brickmaking*. Botley, Oxford: Shire, 2001.
Harris, George F. *The Science of Brickmaking: With Some Account of the Structure and Physical, Properties of Bricks*, 1897.

Hart, Emma. *Building Charleston: Town and Society in the Eighteenth-Century British Atlantic World*. Charlottesville: University of Virginia Press, 2009

Hartley, Michael, and Robert L. Stephenson. *An Archaeological Survey of the Flagg Plantation Site (Hendricks Track)*. Institute of Archeology and Anthropology, University of South Carolina, 1975.

Halsey, Alfred O. Halsey Map of Charleston 1949. South Carolina Room, Charleston County Library.

Hendrix, Pat. *Down and Dirty: Archaeology of the South Carolina Low Country*. Charleston, SC: The History Press, 2006.

Herman, Bernard L. *Town House: Architecture and Material Life in the Early American City, 1780-1830*. Edition Unstated edition. Chapel Hill: The University of North Carolina Press, 2005.

Herold, Elaine B., Stanley G. Knick, III, and Allen Liss. *An Archaeological Survey of the Grove Plantation Site (Boswell Track)*. Charleston Museum, 1978.

Herold, Elaine B., and Kay R. Scruggs. *An Historical Survey of the Grove and Flagg Plantation Sites (Boswell and Hendricks Tracks)*. Charleston Museum, 1975.

"Historical Hurricanes in South Carolina," *NOAA.* http://www.weather.gov/.

Hollings, Marie Ferrara. *Brickwork of Charlestown to 1780*. University of South Carolina., 1978.

Hopkins, Thomas Cramer. *Clays and Clay Industries of Pennsylvannia: I. Clays of Western Pennsylvania (in Part). Description of the Clays and Clay Industries in the Ohio, Monongahela, Youghiogheny and Conemaugh River Valleys in Pennsylvania, and the Allegheny Valley as Far Up as Kittanning, Including Allegheny, Westmoreland and Fayette Counties and Parts of Beaver, Washington, Greene, Indiana, Armstrong and Cambria Counties*. W.S. Ray, 1897.

Horn, Jonathon C. *Historic Artifact Handbook*. Alpine Archaeological Consultants, Inc., 2005.

Institute, Industrial Fasteners. *The Heritage of Mechanical Fasteners*. Industrial Fasteners Institute, 1991.

"Introduction to the Sanborn Map Collection (Geography and Map Reading Room, Library of Congress)." Accessed July 13, 2015. http://www.loc.gov/rr/geogmap/sanborn/san4a1.html.

Irving, John Beaufain. *A Day on Cooper River*. Kessinger Publishing, LLC, 2010.

Joseoh, J.W. "Pattern and Process in the PLantation Archaeology of the Low Country of Georgia and South Carolina." *Historical Archaeology* 23, no. 1 (1989).

Kampf, L. "Factors Affecting Bond of Mortar to Brick." In *Symposium on Masonry Testing*, edited by Committee C-12, Committee C-15, and Committee E-6. ASTM International, 1963. http://enterprise.astm.org.libproxy.clemson.edu/SUBSCRIPTION/DIGITAL_LIBRARY/STP/PAGES/STP39546S.htm.

Lanphear, Kristina Marie. “Profile of an Origin : A Chemical and Physical Characterization Study of Historic Brick and Clay from the Ashley River, South Carolina.” lemson University and College of Charleston, 2011.

Lawson, John. *A New Voyage to Carolina, Containing the Exact Description and Natural History of That Country; Together with the Present State Thereof; and a Journal ... Account of Their Customs, Manners, Etc.*, 1709.

Lees, William. “Limerick - Old and in the Way: Archaeological Investigations at Limerick Plantation, Berkeley County, South Carolina.” *Anthropological Studies*, 1980.

Lloyd, Nathaniel. *A History of English Brickwork*. Woodbridge: Antique Collectors Club Dist, 1983.

Loveday, Amos J. *The Rise and Decline of the American Cut Nail Industry: A Study of the Interrelationships between Technology, Business Organization, and Management Techniques*. Westport, Conn.: Greenwood Press, 1984.

Lynch, Gerard. *Brickwork: History, Technology and Practice: v.1&2*. London: Routledge, 2013.

McCrady, John. “McCrady Plats,” South Carolins Dept. of Archives & History.

McInnis, Maurie D. *The Politics of Taste in Antebellum Charleston*. Chapel Hill: The University of North Carolina Press, 2005.

Miles, Suzannah Smith. *East Cooper Gazetteer : People, Places, and Events in History*. Charleston, S.C: History Press, 2004.

Miller, Nathaniel A. and Jason J. Henderson, **“**Correlating Particle Shape Parameters to Bulk Properties and Load Stress at Two Water Contents,” *Access Alliance of Crop, Soil, and Environmental Science Societies.* *https://dl.sciencesocieties.org/publications/aj/abstracts/103/5/1514?show-t-%20%20f=tables&wrapper=no?access=0&view=article*Morrison, R. B. *Brickmakers' Manual - Primary Source Edition*. Nabu Press, 2014.

Mulcahy, Matthew. “The ‘Great Fire’ of 1740 and the Politics of Disaster Relief in Colonial Charleston.” *The South Carolina Historical Magazine* 99, no. 2 (April 1, 1998)

Murray, Haydn H. *Applied Clay Mineralogy: Occurrences, Processing and Applications of Kaolins, Bentonites, Palygorskitesepiolite, and Common Clays*. Elsevier, 2006.

Nelson, Lee H. *Nail Chronology as an Aid to Dating Old Buildings*. American Association for State and Local History, 1968.

Nelson, Louis P. *The Beauty of Holiness: Anglicanism and Architecture in Colonial South Carolina*. Chapel Hill: The University of North Carolina Press, 2009.

Orton, Edward, and Ohio Institute of Mining Engineers. *The Technical Education of Clay-Workers ...* Columbus, O., 1894.

Plumridge, Andrew. *Brickwork: Architecture & Design*. London : New York, NY: Phoenix Illustrated, 2000.

Poplin, Eric C., Kara Bridgman Sweeney, and Michael Patrick Hendrix. *Cultural Resources Survey and Testing at the Harper Tract, Berkeley County, South Carolina*. Brockington and Associates, 2001.

Purse, R. S. *Charleston City Directory and Strangers Guide for 1856*. New York: J.F. Trow, 1856.

Record of Wills: Charleston County. Vol 19

Rhodes, Daniel. *Kilns: Design, Construction, and Operation*. Chilton Book, 1968.

Richardson, Willard D. *Burning Brick In Down-Draft Kilns. Prepared As A Manual For The Author's Kiln Records.* Sabine Press, 2010.

"Sediments," *University of Texas.*

Singleton, Theresa A. *The Archaeology of Slavery and Plantation Life*. Walnut Creek, CA: Left Coast Press, 2009.

Smith, Julia Floyd. *Slavery Rice Culture: Low Country Georgia, 1750-1860*. Knoxville: Univ Tennessee Press, 1991.

Smoot, Thomas W. "Clay Minerals in the Ceramic Industries." *Clays and Clay Minerals* 10, no. 1 (1961).

Soil Grain Size Chart. http://sciopticgeo.com/geo-mudlogging/charts-scales/scioptic-grain-size-chart.html

St. Thomas & St. Dennis Parish Episcopal Church National Register Nomination
Cainhoy Historic District National Resister Nomination

"State Plat Books (Charleston Series)." Surveyor General's Office., South Carolins Dept. of Archives & History.

Stauffer, M. *The Formation of Counties in South Carolina*. Columbia, S.C.: South Carolina Department of Archives & History, Public Programs Division. (1994)

Stine, Linda F., Christopher Judge, Lesley M. Drucker, and Martha Zierden. *Carolinas Historical Landscapes: Archaeological Perspectives*. Knoxville: Univ Tennessee Press, 1997.

Stoney, Samuel Gaillard. *Plantations of the Carolina Low Country*. New York: Dover Publications, 1990.

"Trading Secrets: A Different Kind of Baking Project (Bricks)," *Colonial Williamsburg, Making History: Inspiration for the Modern Revolutionary.* http://makinghistorynow.com/2014/11/trading-secrets-a-different-kind-of-baking-project-bricks/

Trimble Outdoor Navigator.http://trimbleoutdoors.com/

Tuten, James H. *Low Country Time and Tide: The Fall of the South Carolina Rice Kingdom*. University of South Carolina Press, 2010.

Wallace, Kim E. *Brickyard Towns: A History of Refractories Industry Communities in South-Central Pennsylvania*. America's Industrial Heritage Project, National Park Service, U.S. Dept. of the Interior, 1993.

Wayne, Lucy B. *Burning Brick : A Study of a Low Country Industry*. Gainesville, FL,, 1992.

Will Book A: 1783-86

Woolson, Constance Fenimore. "Up the Ashley and Cooper." *Harper's Magazine*, 1875.

Zimmerman, Lisa. "Brick by Brick: A Comparative pXRF Analysis of Brickworks and Structures in the Belgian-American Community of the Door Peninsula." *Theses and Dissertations*, 2013.