Warren Mill Dam Remains Documentation

Colleton County, South Carolina

New South Associates, Inc.

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Report submitted to:

South Carolina Department of Transportation • 955 Park Street • Columbia, SC, 29201

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ABSTRACT

New South Associates, Inc. (New South) examined the remains of a mill dam identified as Site 38CN1140. Located in northern Colleton County, South Carolina, this site was identified and assessed for National Register of Historic Places (NRHP) eligibility by the South Carolina Department of Transportation (SCDOT). Although SCDOT recommended the site as not eligible for the NRHP, the State Historic Preservation Office (SHPO) requested additional site documentation and research to better contextualize the resource. To this end, New South compiled a historic context for the site and examined available archaeological literature for similar mill occupations. This report provides the results of that research and feature documentation occurring on January 27 and 28, 2020. These features include the core of the earthen dam and the base of the sawmill. Background research associated the mill dam with the nineteenth-century Warren sawmill and George Warren, a locally significant individual. The site is also significant for its role in the Warren family's nearly 200-year-old sawmill operation. Although further work is needed to assess the Warren Mill site under Criterion C, New South recommends the site eligible for the NRHP under Criteria A and D.

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ACKNOWLEDGEMENTS

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TABLE OF CONTENTS

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LIST OF FIGURES AND TABLES

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I. INTRODUCTION

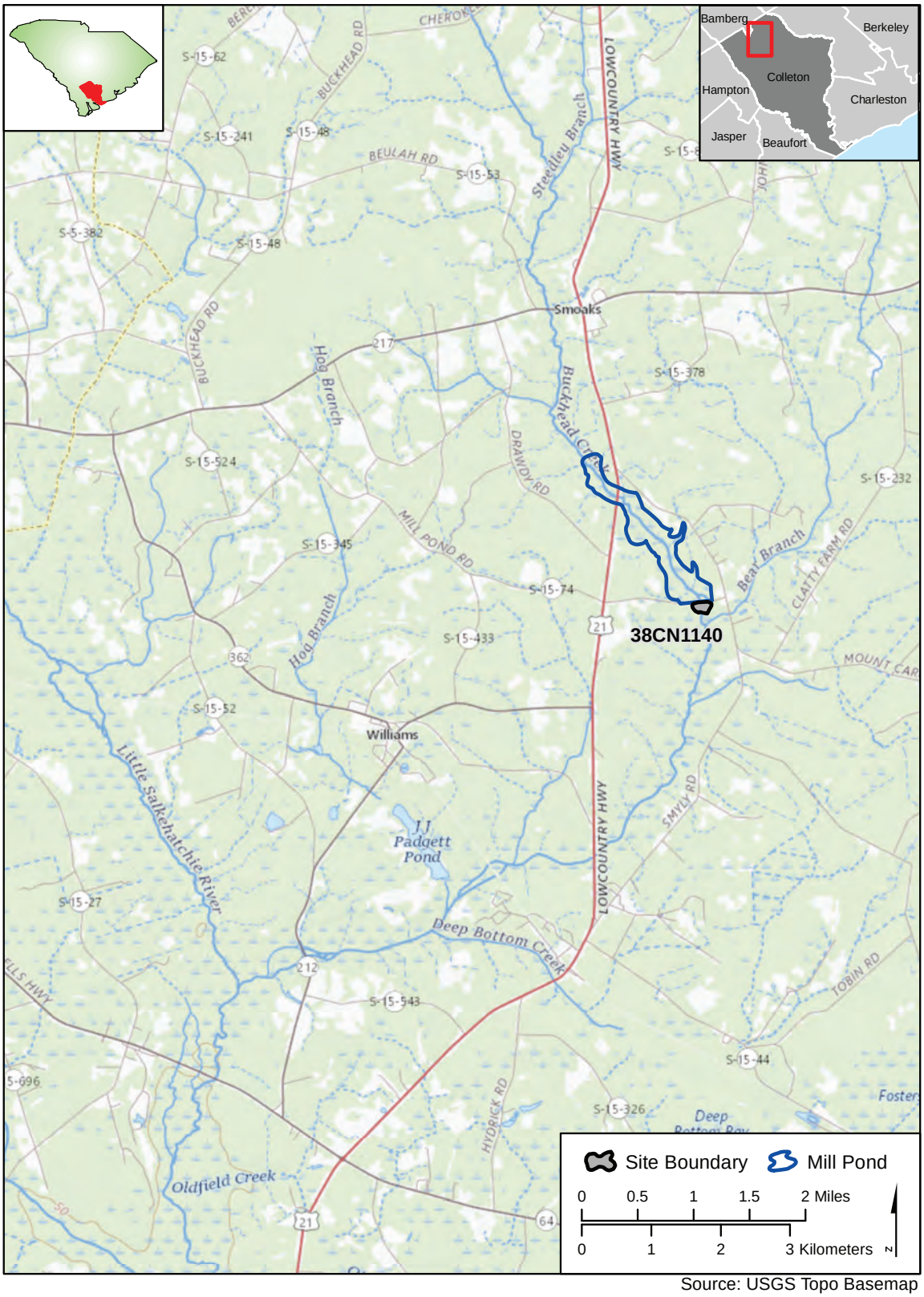
The South Carolina Department of Transportation (SCDOT) plans to replace two bridges on Mill Pond Road (S-74) that span two channels of Buckhead Creek in Colleton County (Figure 1). Since this project requires a United States Army Corps of Engineers (USACE) permit, SCDOT performed an archaeological survey of the project's Area of Potential Effect (APE) in 2019. SCDOT archaeologists identified wooden dam remnants and several artificial water features to the south of S-74. The wooden remnants and these features were recorded as Site 38CN1140. This array of features and the contemporary road name indicated that the site was part of a water-powered mill. Evidence of milling activity (e.g., structural remnants or machinery) were not identified within the APE. SCDOT determined that the site had little integrity and recommended the site not eligible for the National Register of Historic Places (NRHP) (Shepherd 2019).

The South Carolina State Historic Preservation Office (SHPO) requested additional research to better contextualize the remains found at the site. To satisfy this request, SCDOT contracted New South Associates, Inc. (New South) to collect historical information and additional documentation of the Site 38CN1140 wooden remains. Data collection was divided into three tasks. Katie Quinn developed a local historical context for the site. James Stewart synthesized archaeological mill site reports, Coastal Plain mill research, and nineteenth-century dam construction practices. He also recorded the wooden remains with a total station. The mill dam remnants were underwater during his January 27-28 revisit. While this presented a challenge to data collection, fieldwork did produce useful information for site documentation.

This report presents the results of New South's research and fieldwork at an archaeological dam site, 38CN1140. Historical research established that the dam was part of a sawmill constructed by Col. George Warren circa 1830. This location was the first of many sawmills in the Williams, South Carolina area bearing the Warren name. The Warren family has remained in the sawmill business for almost 200 years. Today, the great-great-grandsons of Col. George Warren operate the Warren & Griffin Lumber Company, the largest employer in nearby Williams, South Carolina.

Chapter II presents the archival research and field methods used for this analysis. The chapter also presents the NRHP eligibility criteria and two examples of their application for comparable sites in Minnesota and Florida. A brief discussion of the site's physical setting is included in Chapter III. Chapter IV presents a historical overview for Colleton County and in-depth research on Warren Township and Warren family history. Chapter V consolidates archaeological research on

Figure 1.
Site 38CN1140 Location Map



Source: USGS Topo Basemap

archaeological mill sites in South Carolina, Georgia, and northwest Florida. Mills from the latter two areas were included as they represent one of the only comparable studies of Coastal Plain mill sites that also made NRHP eligibility assessments. A discussion of nineteenth-century dam-building practices is also included in this chapter. The final chapter, Chapter VI, integrates these results with the historic and archaeological research and concludes with an individual NRHP eligibility assessment for Site 38CN1140 and a recommendation to conduct potential historic district evaluations for Colleton County mills associated with the Warren family.

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II. METHODS

ARCHIVAL RESEARCH

Archival research centered on the development of upper St. Bartholomew's Parish and Warren Township as well as the history of the Warren family itself. The history of transportation networks, economic development, and patterns of property ownership were all used to place the Warren Mill in a larger picture and provide more detailed information about the mill itself.

Primary and secondary documents were located and examined in hardcopy and online formats. These included secondary sources in books. Primary documents, such as newspapers and some plats, were examined online through the Newspapers.com online database and through the South Carolina Department of Archives and History (SCDAH) online database. Other records kept by SCDAH, including Colleton County architectural surveys and resources, were examined via SCArchSite.org. The SCLends library system was used to obtain both primary and secondary materials relating to Colleton County.

Property transactions and records were reviewed at the Colleton County Register of Deeds and Colleton County Probate Court. This review was intended to determine the history and original owners of the parcels where the mill remains and mill pond are located. In addition, information was gathered through personal communication with members of the Warren family and employees of the Warren and Griffin Lumber Company. Table 1 provides a list of archival sources utilized for this study.

Table 1. Archival Repositories Consulted During the Preparation of this Report

Collection	Source	Location
U.S. Federal Census Collection (Electronic)	Ancestry.com	Provo, UT
Colleton County Deed and Plat Books	Colleton County Register of Deeds	Walterboro, SC
Colleton County Estate Records	Colleton County Probate Court	Walterboro, SC
South Carolina Room	Colleton County Library	Walterboro, SC
GIS Records	Colleton County Technology Department	Walterboro, SC
SC Picture Project (Online Archive)	South Carolina Picture Project	South Carolina
USC Digital Collections	University of South Carolina Libraries	Columbia, SC
SCArchSite.org	NRHP and Survey Files	Columbia, SC
SCDAH Online Archives	South Carolina Department of Archives and History	Columbia, SC
Library Stacks		Columbia, SC
Industry/Manufactures Schedules Microfilm		Columbia, SC

FIELDWORK

The wooden mill dam remains were covered by several feet of water during New South's field inspection. Total station documentation of these structures was limited by stream depth and visibility. Using a Trimble S-7 robotic total station and Trimble TSC-7 controller, measurements were collected along accessible portions of the mill remains. GPS data was also collected for the instrument locations used during data collection. Local measurements were tied into a local coordinate system and a nearby benchmark identified on the 1982 Williams, SC 1:24,000 topographic quadrangle as 23.7 meters above mean sea level (amsl). Recent SCDOT data provides a corrected elevation of 23.56 meters (77.29 ft.) amsl for this benchmark. This elevation was used to correlate total station measurements with the statewide elevation system.

SCDOT recorded most of the hydrological features for bridge replacement design work. New South's data collection focused on documentation of the wooden remains and some of the smaller channels. Accessible wooden remains were recorded by feel. The prism rod was used to locate the outer surfaces of each timber. The rod was leveled and the resulting measurement was stored in the data collector. New South re-recorded the perimeter of several of these features and some smaller channels that may have been created for the mill.

Nonsystematic metal detection was also performed during the field inspection. Areas adjacent to the stream channels and irregular ground surfaces were examined with a Tesoro Bandido metal detector with iron discrimination turned on. The only items identified by the detector were aluminum cans and lead fishing weights. These were not collected as they were found in flood sediments that lacked integrity.

NATIONAL REGISTER OF HISTORIC PLACES (NRHP) EVALUATION

Cultural resources are evaluated based on criteria for NRHP eligibility specified in the Department of Interior Regulations 36 CFR Part 60: National Register of Historic Places. Cultural resources can be defined as significant if they "possess integrity of location, design, setting, materials, workmanship, feeling, and association," and if they:

A) are associated with events that have made a significant contribution to the broad pattern of history;

B) are associated with the lives of persons significant in the past;

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

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

Criteria A, B, and C are usually applied to architectural resources. Archaeological sites are generally evaluated relative to Criterion D. In order to evaluate a resource under Criterion D, the National Register Bulletin Guidelines for Evaluation and Registering Archeological Properties (Little et al. 2000) lists five primary steps to follow:

1. Identify the property's data set(s) or categories of archaeological, historical, or ecological information.

2. Identify the historic context(s), that is, the appropriate historical and archaeological framework in which to evaluate the property.

3. Identify the important research question(s) that the property's data sets can be expected to address.

4. Taking archaeological integrity into consideration, evaluate the data sets in terms of their potential and known ability to answer research questions.

5. Identify the important information that an archaeological study of the property has yielded or is likely to yield.

Three studies of mill or dam sites offer additional criteria for evaluating mill or dam sites. The nearest study was located at Fort Gordon, Georgia (Joseph et al. 1993). This study made eligibility recommendations based on degree of preservation, uniqueness of design, and research potential. Three of the Fort Gordon mills were recommended eligible for the NRHP due to their research potential or design.

Phillips identified similar criteria for evaluating water-powered sites in Northwest Florida (Phillips 1996). He listed sites with limited archaeological remains or historical information as *not evaluated.* Sites with intact deposits and limited historical data were considered *potentially significant*. Finally, well-documented sites significant to the development of northwest Florida with intact artifact deposits were considered *significant*. Following these criteria, Phillips

considered six sites potentially significant as a National Register District. Twenty-five sites were individually assessed as potentially significant. The five sites Phillips evaluated as significant were "among the best known or best preserved water-powered sites in northwest Florida (Phillips 1996:114)." The twenty-one sites not evaluated during the survey were artifact scatters, steam-powered mills, water storage dams, and a brick kiln. Phillips recommended additional work for all significant or potentially significant sites.

Evaluating Minnesota's Historic Dams: A Framework for Management provided a set of criteria for evaluating *archaeological dam sites, historic dam structures*, and *historic dam districts* (Arnott et al. 2013). Dam sites contained the ruins of a structure no longer capable of impounding water. Functioning dams greater than 75 years in age were classified as historic dam structures. Districts were composed of dams that collectively regulated water flow along a hydrological area (i.e., single-stream or swamp) and accompanying standing structures or features. The assessment of dam integrity emphasized the organization of structures for water impoundment as a system of inter-related features. "The aspects of integrity most important to dams are design and setting, which together convey the intersection of a human-designed water control structure with the natural hydrological setting (Arnott et al. 2013:109)." Their mill structure evaluations emphasize a continuity of use with elements that "preserve a record of labor and materials from the period of significance (Arnott et al. 2013:114)." Eligible archaeological dam sites should also retain their original feature configuration, even if they are no longer functional.

For archaeological dam sites and historic dams, *setting* referred to the use of topography, hydrology, and landscape to develop a technological system. *Material integrity* was defined by preservation of elements representative of a specific tradition or era. Assessment of *workmanship* was likewise focused on the details and methods of construction used for the dam. Finally, *integrity of feeling* was an impression of the dam informed by historic context and sense of quality (Arnott et al. 2013).

District design integrity also included a consideration for the planned and built relationships between impoundment structures and related buildings or altered spaces. The Minnesota document also stresses the evaluation of dam and mill features within the broader context of related activity areas or structures. For instance, wooden remnants of log dams should not be individually evaluated. Instead, they could be evaluated in concert with other impoundments found on the same stream or watershed (Arnott et al. 2013).

III. PHYSICAL SETTING

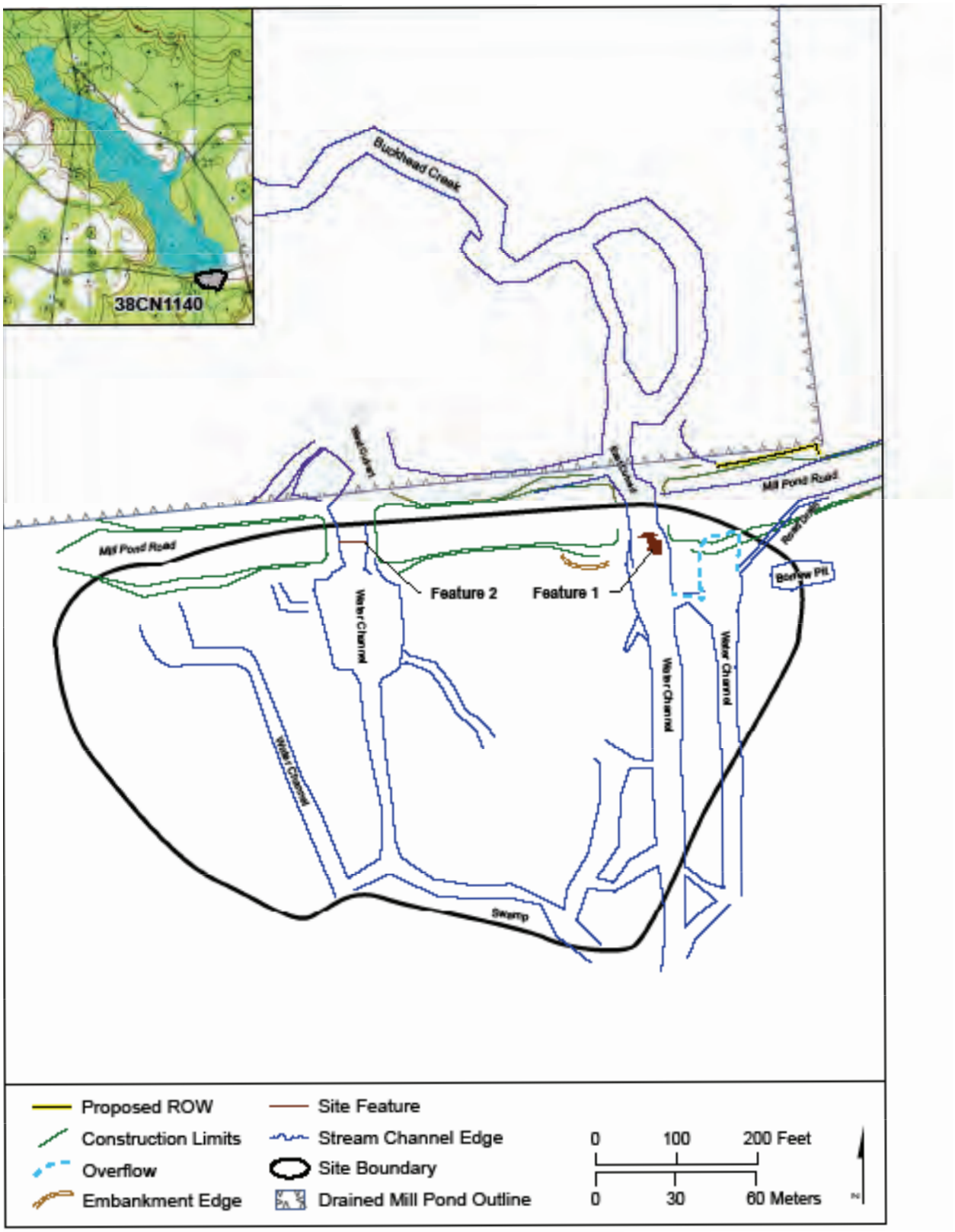
Site 38CN1140 is located on the Buckhead Creek tributary of the Little Salkehatchie River (see Figure 1). Like most of the Coastal Plain, the local terrain is characterized by gradual slopes and slow-moving swamps created by several high sea level stands during the Pleistocene Epoch stands. The local elevation ranges between 71 and 77 feet amsl. Mill Pond Road extends over an upland constriction of the Buckhead Creek swamp (Figure 2). This swamp is so low-lying that an impoundment equal to the height of the current bridge, 76 feet amsl, extends more than 1.2 miles upstream. Assuming that the surface elevation of Mill Pond Road approximates the height of the original reservoir, these data indicate that the pond would encompass 227 acres. Estimating an average depth of 3.5 feet (half the dam height), this pond had a capacity of 794.5 acre-feet (258,871,140 gallons).

Buckhead Creek joins Bear Creek 980 feet south of the roadway. Their convergence forms a third-order stream which flows southwest to the Little Salkehatchie River. Historically known as the Little Saltketcher, this stream joins the Big Salkehatchie (Big Saltketcher) River, which flows into the Combahee River and out to St. Helena Sound. The Coastal Plain terrain provides very little relief, and George Swain, an engineering professor responsible for assessing the water power potential of the Atlantic-draining streams, stated: (1885:126):

> The streams flowing into the Atlantic between the Santee and Savannah are, in general, valueless as sources of water power, only one of them, the Edisto River, being worthy of mention. They rise for the most part below the fall-line, flow through a low and swampy country, and are entirely without power, except on some of their small upper branches, which belong to the class of sand-hill streams.

Water mills were not a common feature on these streams. The 1825 Colleton District Map only shows five water mills (Mills 1938). Fifteen years later, there were only eight operational mills in the district (Bureau of the Census n.d.). Extensive pine woods and bottomland forests covered Colleton County until the Antebellum period. Merchantable timber was a profitable source of income for the region, which until the mid-nineteenth century had limited overland transportation routes. To reach markets, local lumbermen floated timber and planking down Salkehatchie tributaries and up the coast to Charleston (Ruffin 1992). Agricultural and timbering activity expanded once railroads connected the more remote parts of Colleton County with market towns. Consistently rural throughout the historic era, the nearby uplands have been cultivated or fallowed interchangeably. The area is currently enclosed within a bottomland forest of hardwood and pine. Hayfields are located to the east of Site 38CN1140.

Figure 2.
Site 38CN1140 Terrain Map



IV. HISTORICAL OVERVIEW

This historical overview was augmented by in-depth research of the local area, Warren Township, and the Warren family. Focused property record research was also included to better contextualize the mill and the local landscape. The results of the latter research are included at the end of the chapter.

OVERVIEW

In 1663, King Charles II granted the Province of Carolina to eight Lords Proprietors. The chartered boundaries extended from the southern boundary of modern Virginia to just below present-day Daytona Beach, Florida. The width of the province stretched from the Atlantic Ocean to the Pacific Ocean and well into territory claimed by the Spanish almost 100 years before. This lower boundary was contested but never taken over by British settlers. Over the eighteenth century, the Province was halved to create North and South Carolina. With the addition of the Georgia Colony in the 1730s, the borders of the latter colony were greatly reduced to a form recognizable to modern-day South Carolinians (Edgar 1998).

In 1670, the Lords Proprietors established a permanent settlement on the west bank of the Ashley River on Albemarle Point. They owned the colony until 1720 and sought to procure wealth via a robust colonial population and commercial agriculture. By 1680, the early settlement moved across the river to Oyster Point. Charles Town, as it was then called, would later become modern-day Charleston. Charles Town quickly ascended to a position of political, religious, economic, and social dominance within the region (Edgar 1998).The peninsular position provided better defense, as well as a more healthful climate. In addition, it was convenient for settlers to bring their crops to market since the settlement was situated at the mouths of two major rivers.

South Carolina was divided into three counties, Craven, Berkeley, and Colleton, shortly after the establishment of the port city. Colleton County was named for Sir John Colleton, one of the original eight Lords Proprietors. Early growth throughout the colony was slow, hampered in part by issues with proprietary leadership. While the Lords Proprietors intended for there to be a number of settlements and plantations spread across the counties, early development efforts remained concentrated at Charles Town (The Jaeger Company 1995).

Colleton County's original boundaries ran roughly from the mouth of the Combahee River to the south to the Stono River to the north, including both modern-day Colleton and Dorchester counties. Like the other two original counties, no western boundary was established for Colleton County (Edgar 1998).

Early settlers were lured to Carolina by generous land grants from the Lords Proprietors. Under the "headright" system, settlers were granted a certain quantity of acreage per person. The grant was originally 150 acres per adult free person, but was modified to 100 acres per adult free male with lesser quantities of land being granted for women, children, and the enslaved. In addition to the headright-based land grants, the Lords Proprietors granted larger parcels to select individuals. As a result, earlier settlers owned more land than they could reasonably expect to cultivate (The Jaeger Company 1995).

One of the earliest settlers in Colleton County was John Jackson, who was granted 400 acres in 1701. He was the namesake of the Jacksonboro settlement, established 39 years later (The Jaeger Company 1995). As overland travel was unreliable and arduous, early settlers tended to cluster near the county's rivers, particularly the Chehaw and the southern portion of the Edisto which was then called the Pon Pon (Glover 1969). Settlement also gravitated towards the Round O Savanna, located roughly ten miles northeast of Jacksonboro. The fertile land there was used first for raising livestock and later for farming rice. Free range animal husbandry was common throughout Colleton County. Other early industries included trade with Native Americans, especially in deerskin, and the exploitation of native timber for logging and naval stores production (i.e., pitch and tar) (Gallay 2010; Healey et al. 2015)..

Colleton County was divided into two Anglican parishes, St. Bartholomew's to the west of the Edisto River and St. Paul's to the east in 1706. St. Bartholomew's Parish stretched 40 miles north to south and 30 miles east to west, with boundaries that largely coincide with those of modern-day Colleton County. Early churches in the county included the Pon Pon Chapel of Ease, constructed circa 1725, and the 1728 Bethel Presbyterian Church, near Jacksonboro (Glover 1969).

Colonial settlement of these parishes was challenged by the native population during the 1715 Yemassee War. The Yemasee, residing near Beaufort, were spurred into action by injustices ranging from enslavement to nonpayment for traded goods to forceable loss of land (Ramsey 2008). On Good Friday, 1715, the Yemassee and other Carolina tribes began a coordinated attack against outlying plantations at Port Royal. A Yemassee war party also raided through St. Batholomew's Parish in Colleton County. One of the early decisive battles between the Yamasee and the colonists was fought near Salkehatchie, a Native American town on the banks of the Big Salkehatchie River near the project area. During this battle, militia led by Governor Craven was ambushed by the indigenous warriors. Craven and his militiamen managed to defeat the Yemassee, proving that the hitherto-untested Carolina militia was capable of winning (Marcoux 2015). Further battles were won near Port Royal; however, the Yemassee Indian War did not end with a decisive victory. While the conflict was mostly settled by 1716, raids by Yemassee and their allies continued until at least the mid-1720s. In total, roughly 400 settlers were killed (Edgar 1998).

The war's devastation and fear of continued raids by the Yemassee caused a decline in the local settler population. The population of St. Bartholomew's Parish was estimated at only 379 in 1720 (The Jaeger Company 1995). Population growth stalled until rice cultivation shifted towards inland swamps. In the mid-eighteenth century, the parishes became significant rice producers. Additionally, the cultivation of indigo became an important component of the Lowcountry economy. Both rice and indigo required more labor, and the enslaved population rose accordingly. At the close of the Yemassee War the population was 38 percent enslaved. By 1790 the enslaved population had risen to over 80 percent (Edgar 1998; The Jaeger Company 1995).

Colleton County's population grew relatively slowly through the mid-eighteenth century. The 1773 Cook map (Figure 3) of South Carolina shows St. Bartholomew's Parish and Saltketchers with the Big and Little Salkehatchie rivers running through the project vicinity. Names of early settlers in the region include Pagett, Jones, and Roper. While not demarcated on the map, land directly adjacent to the project area was being granted starting in the 1760s, when a parcel containing 200 acres on a "branch of the Saltketcher" was granted to George Warren (Mitchell and Troup 1764). The parcel was surrounded by vacant land on all four sides, indicating that the area was unsettled when Warren received his grant. Warren had neighbors within a decade. In 1771, 100 acres on Buckhead Swamp were granted to William Starling, which adjoined land owned by George Warren and Joseph Glover (Forster 1771).

The June 1776 Battle of Sullivan's Island marks the opening act of the American Revolution in the Lowcountry. It was a victory for the Patriots. Several skirmishes, including the Battle of Parker's Ferry, were fought in Colleton County. When Charleston was occupied by British forces the Patriot government established a temporary capital at Jacksonboro (The Jaeger Company 1995). Dorchester Village was pressed into service and transformed into a British Army depot. Within the project vicinity, George Warren served in one of the county's 13 militias. He also provided the Continental Army with five head of beef cattle (Blake 1783; Brunson 2015).

The Revolution in South Carolina ended with the 1782 withdrawal of the British Army from Charleston. With the damage from war and the loss of British subsidies for crops, many planters turned to a tidal irrigation system for rice cultivation and abandoned the less profitable indigo trade. Inland rice cultivation was subject to the whims of the weather and the control of a large enslaved labor force. The shift towards tidal cultivation of rice resulted in an entrenchment of the plantation system in Colleton County.

Only the wealthy were able to successfully build and maintain the complex irrigation systems necessary for tidal rice cultivation. This meant that capital, in the form of wealth and slaves, was necessary to procure more wealth (Glover 1969). Capital was also needed to construct mills and impound streams.

Figure 3.
Project Vicinity on A Map of the Province of South Carolina, 1773 by James Cook

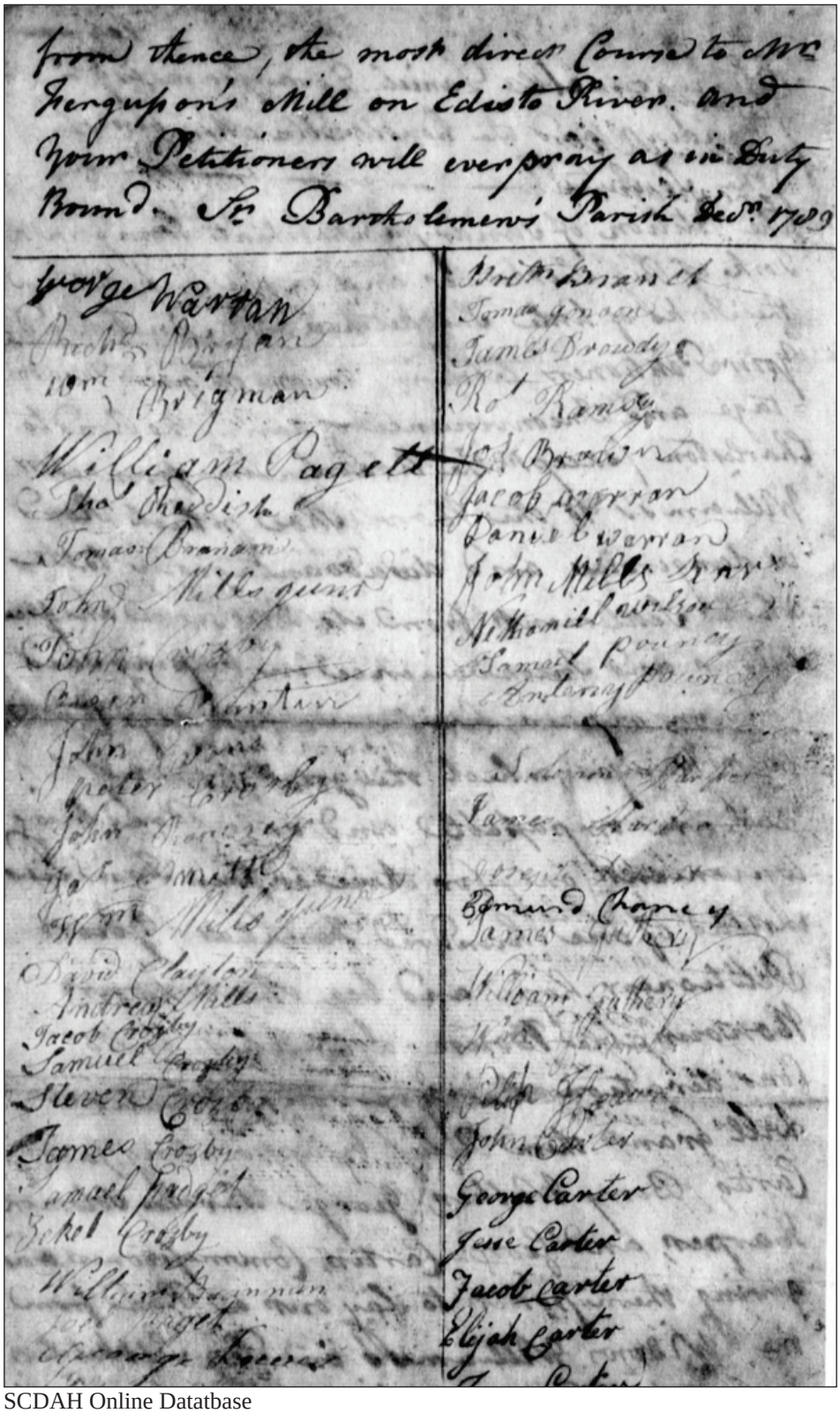
Given the local labor regime and the similarities in the embankment of rice dikes with mill dams, contemporary discussions of rice bank construction practices are included in the following chapter. Those living in the inland regions of the county, such as the project vicinity, made a living by other means, including less capital- and labor-intensive crop cultivation, animal husbandry, and logging.

By 1790, when the first Federal Census occurred, over 80 percent of the roughly 12,500 people living in St. Bartholomew's Parish were enslaved laborers (The Jaeger Company 1995). Wealthy residents of Charleston began purchasing houses in the county as summer retreats and would escape to their second homes when the summer heat, malaria, and other ills beset their city homes. Walterboro was established as a summer retreat and, by 1830, the summertime population of the town was over 900. As Walterboro's population overtook Jacksonboro, the town named for Jacob and Peter Walter was made the county seat. By 1820 the county courthouse had been constructed there (The Jaeger Company 1995). Although the population shifted towards the middle of the county, a 1790 petition, signed by George Warren, Jacob Carter, and many others, for better roads in the area attests to the difficulties of overland travel (Figure 4). This petition indicated that the only road extant in upper St. Bartholomew's Parish was frequently impassable (Warren and Carter 1790).

The population throughout the county grew steadily in the early-nineteenth century. In 1792, a post office opened in Jacksonboro. By 1820, four post offices were in operation, including one in Walterboro and one in Canadys, roughly 15 miles east of the project area (The Jaeger Company 1995). An 1820 map of the Colleton District in the 1825 Mills Atlas (Figure 5) shows infrastructure development within the project vicinity. The Columbia and Barnwell roads, as well as the river crossings at Buckhead and Carter, are shown along with several sawpits. The Padgett family is still represented, and others in the area include the Smoke and Williams families, for whom the communities of Smoaks and Williams were named. Two homesteads for the Warren family are shown twice near the confluence of Bear Branch and Buckhead Creek, where George Warren settled roughly 50 years earlier. While the population of Colleton County grew 22 percent between 1820 and 1850, much of this growth occurred in the southern portion of the county where Walterboro and Jacksonboro were located and the northeastern area that would later become Dorchester County. Contemporary population growth in the northern part of St. Bartholomew's Parish was comparatively slow (The Jaeger Company 1995).

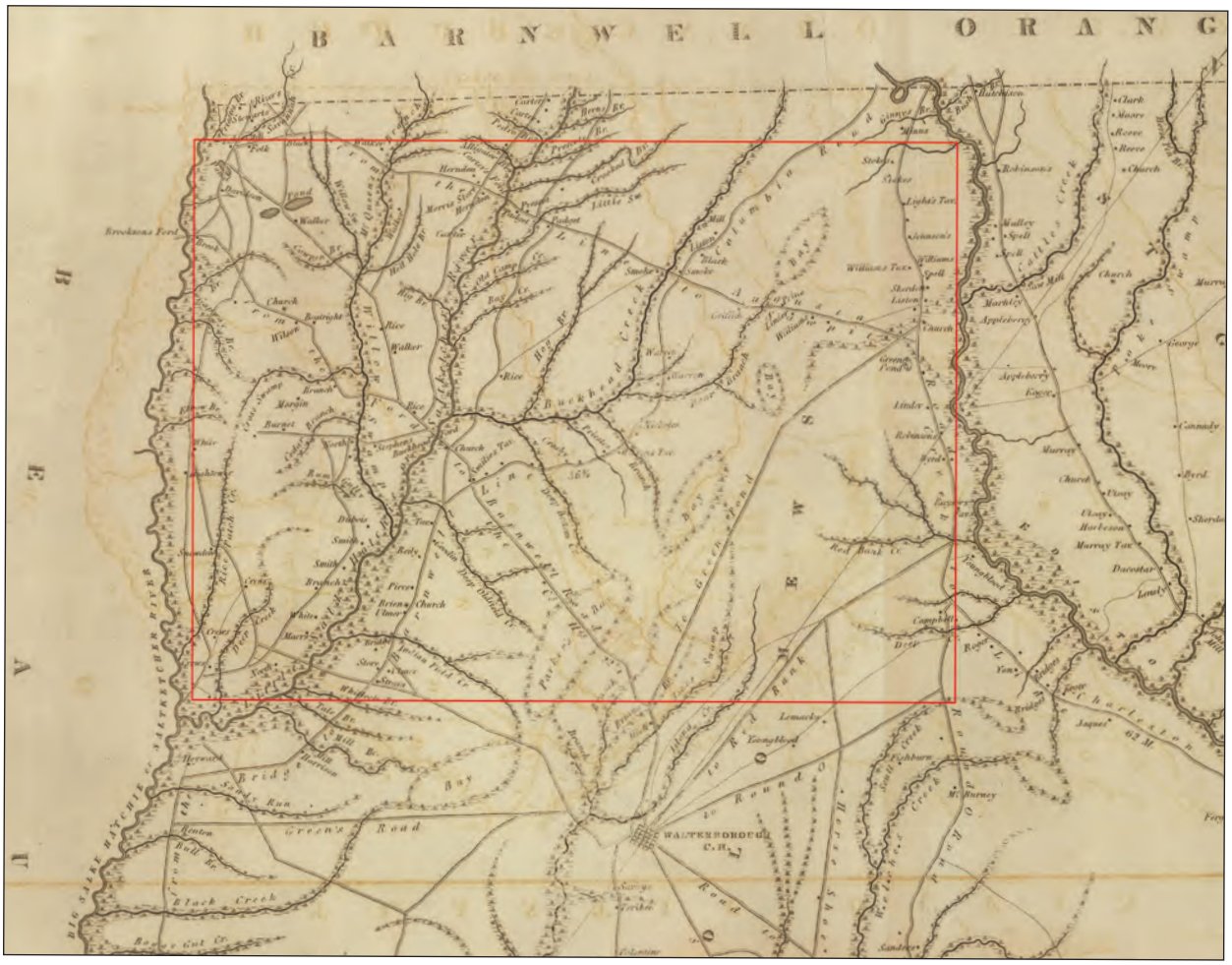
As with the rest of South Carolina, the import of railroad technology in the early- to mid-nineteenth century played an important role in the economic development of Colleton County. Early roads were often unreliable and were not efficient for the transportation of the bulky commodities being produced in Colleton County (Stockton 1980).

Figure 4.
1790 Petition to South Carolina State Senate Showing Signatures of Residents of Upper St. Bartholomew's Parish



SCDAH Online Datatbase

Figure 5.
Project Vicinity on Map of Colleton District, South Carolina, Improved for Mills Atlas, 1825, Robert Mills



David Rumsey Map Collection

Transportation of goods via waterways was more efficient. Virtually all rivers in Colleton County were navigable, but similarly unreliable, as river transport required complex navigation and was subject to the vagaries of the weather (Simms 1843; South Carolina General Assembly 1824).

Unwieldy lumber products were one of the chief commodities sent downstream to market. During Edmund Ruffin's travels through the region, he observed (1992:236):

> Every stream of any size in this region is dammed to turn a sawmill, and immense quantities of lumber are sent from them in rafts down both the North and South Edisto. The rafts are made of boards (or other timber) clamped together so as to form a close mass 20 feet long, 10 wide, and about 18 inches deep. When sufficient quantity of timber has been prepared at one mill to send to market, a number of these single rafts are constructed and put in and confined in the stream. When all are ready they are started together, and the floating aided by letting loose water from the mill pond.

Lumber rafts were also sent down Savannah River tributaries. At Barnwell, South Carolina, Ruffin identified several mills located on small falls "not often exceeding 8 feet, and the ponds are partly dry in the summer…(Ruffin 1992:246)." He also noted their concentration on relatively short streams.

The appearance of railroads reduced the need for lumber rafting since they could provide constant and reliable overland transportation for heavy goods. By 1840, the Branchville & Columbia Railroad passed through Dorchester, Summerville, and St. George's in the northeast part of the county on its way to Branchville. J.H. Colton's map of South Carolina railroads shows this line in 1852 but no others in Colleton County (Figure 6A) (Colton 1855). In 1847, the Colleton Railroad was chartered but was never constructed (Lewis 2016). In 1856, the Charleston & Savannah Railway opened, connecting Jacksonboro and Salkehatchie with Charleston to the northeast and Savannah to the south (see Figure 6B) (Walker, Evans & Co. 1856).

By 1860, businessmen in the northern part of St. Bartholomew's Parish, including George Warren, were advocating for a railroad that connected the northern part of the county with the region. A meeting at Bell's Crossroads of the "Friends of the People's Railroad" occurred that year, with the intent to promote local interest and stock ownership in the People's Railroad Company (chartered in 1859) (Brunson 2015; Downey 2006). Although the local population was supportive, the crisis of the Civil War and the confusion of Reconstruction intervened and a rail line through northern St. Bartholomew's Parish would not be constructed for 20 more years.

Figure 6.
Railroads in the Project Vicinity, circa 1850s

A. Project Vicinity on Colton's South Carolina, 1852, J.H. Colton Library of Congress

B. Map Showing the Location of the Charleston & Savannah Railroad, May 1856, Walker, Evans & Co. Library of Congress

The Civil War threw Colleton County into virtual chaos. Issues with transportation led to the loss of crops, as did the requirement that enslaved workers be evacuated from the large plantations. The accessibility of Charleston via the newly constructed Charleston & Savannah Railway meant that Colleton County and its many rivers were of great strategic importance during the war. After a number of early raids on sea island forts and attempts by locals to prevent Federal forces from utilizing the rivers, U.S. Army troops sought to gain control of the Charleston & Savannah Railway by way of the Edisto River. The resulting skirmish at Chapman's Fort resulted in the Union forces being repelled and control of railroad remaining in the hands of the Confederates (The Jaeger Company 1995).

The war resulted in the destruction of all the large plantation homes in Colleton County save one, Beech Hill. As rice cultivation needed low cost labor to be economically viable, the emancipation of enslaved African Americans threw the district into disarray. Among other major changes, the economy shifted towards smaller farms and a decentralized tenant farming system. The education of freed African-Americans proved to be a problem for the disorganized county, with only 167 African-American students attending school in 1870 (The Jaeger Company 1995). African Americans depended heavily on the agrarian economy, and even as South Carolinians moved into a tenant farming and sharecropping system, some of them realized land ownership for the first time. In Colleton County, the South Carolina Land Commission redistributed 12,894.5 acres of land to former slaves. While agriculture remained the county's primary economic sector, the production of rice never regained its Antebellum supremacy. Improved cultivation techniques in other states coupled with a slow exodus of freed African Americans from the county meant that rice was both less profitable and more difficult to grow than ever before.

In 1897, the South Carolina legislature separated the populous northeastern part of Colleton County, including Summerville, into Dorchester County. The area remaining within modern-day Colleton County loosely conforms to the former boundaries of St. Bartholomew's Parish (Fick and Davis 1997). Between 1910 and 1930, the population of Colleton County dropped from 35,390 to 25,821. Over 80 percent of that population loss was attributed to African-Americans leaving the county (The Jaeger Company 1995).

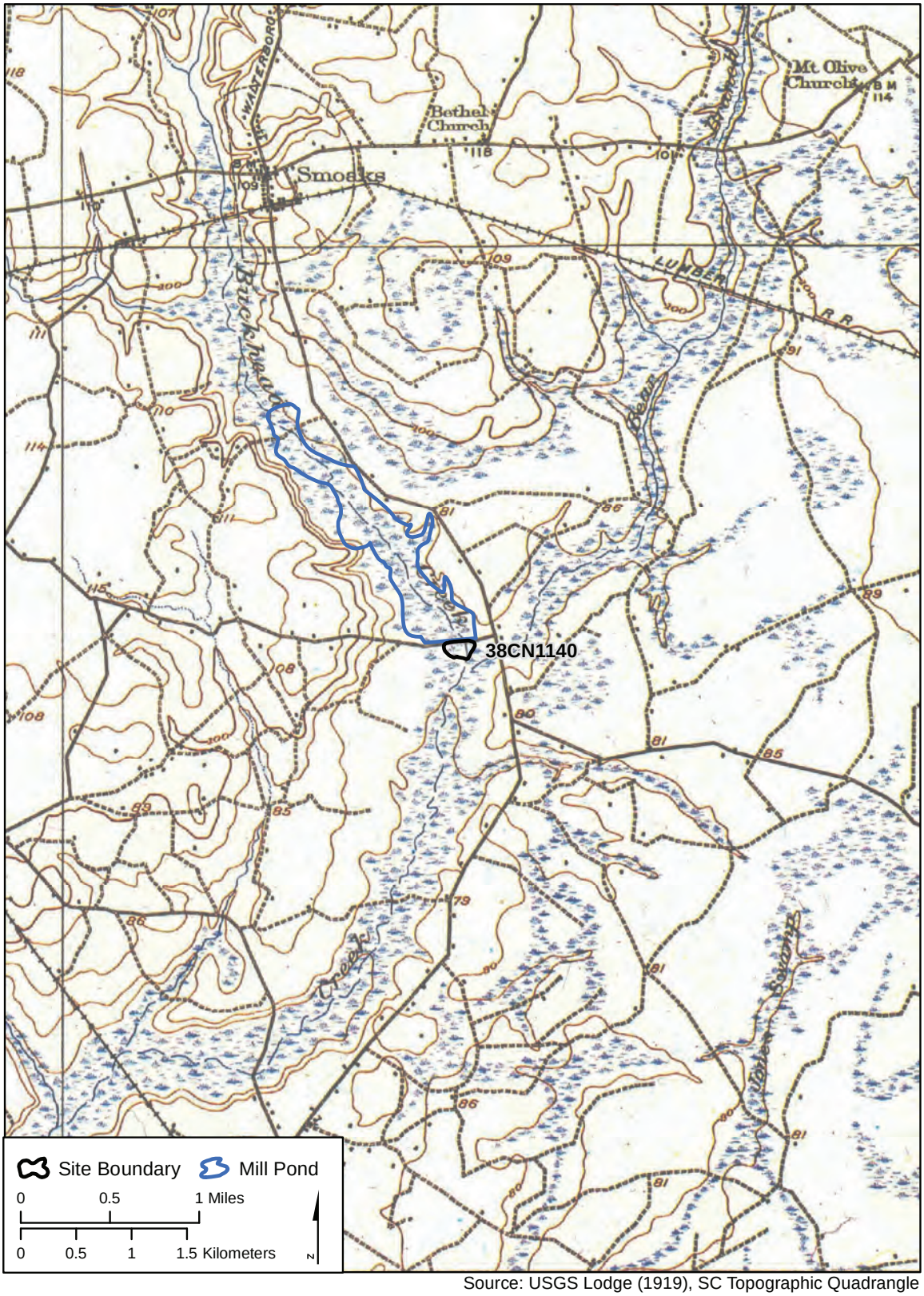
Within the project vicinity, the construction of two new rail lines opened up new opportunities for local landowners to take renewed advantage of a long-existing resource: timber. The northern portion of the county contained extensive old-growth longleaf pine and cypress forests, both commercially valuable types of wood (The Jaeger Company 1995). The Green Pond, Walterboro, and Branchville Railroad was chartered in 1882 and completed in 1887 (Poor 1894). This short line connected the Charleston & Savannah Railway in the south with Branchville in the north, and appears to have followed the path of the Walterboro and Branchville Road, which runs directly

adjacent to the project area (Lewis 2016). By 1896, the Walterboro & Western Railroad ran from Walterboro in the south to Ehrhardt in the north (Staff Writer 1896). Its phased construction took place over almost a decade. When the railroad ran out of money to complete the line in 1894-1895, the end of the line grew into a small town, Williams, named for its only literate resident and first postmaster (Brunson 2015). In 1909 the Hampton & Branchville Lumber Railroad connected Hampton to Smoaks (Interstate Commerce Commission of the United States 1926). A 1919 USGS map of the Lodge Quadrangle shows a number of railroads passing through the project vicinity, including the renamed Walterboro & Western, which became the Atlantic Coast Line in 1902 (Figure 7) (Lewis 2016). The Green Pond, Walterboro, and Branchville Railroad is not visible on the map although the Walterboro and Branchville Road can be seen passing directly to the east of the project area. According to the 1896 *Railroad Gazette*, the chief purpose of all local rail lines was to haul lumber (Staff Writer 1896)

While some of these railroads carried passengers as well, their primary purpose was for hauling sawn lumber, which was becoming a key component of the local economy. The Warren mill was operating within the project area as early as 1832, when George Warren's mill dam backed up water on Buckhead Creek as far as Smoaks (Brunson 2015). However, the industry began to take off as more and more railroads improved market access. When the Walterboro & Western Railroad was prematurely halted at Williams in circa 1895, Warren moved his sawmill there (Brunson 2015). Williams grew into a mill town, complete with a small mill village for workers and a company store, where mill workers used credits to buy goods. The mill was located in several places in Williams and moved to its current location in the 1930s (Carroll et al. Personal Communication 2020). To the south, Wiggins was a similar logging town. The Charleston Lumber Company constructed roughly 115 buildings within the community (The Jaeger Company 1995).

By 1930, the Colleton County economy had shifted away from agriculture, with virtually no rice production remaining. Logging and lumber production were paramount along with the related turpentine industry to make advances between 1920 and 1940, with at least six distilleries operating in the county (Cawley 1998). Overall, the county was in a period of demographic and economic contraction. Between 1910 and 1930 the population dropped by roughly 25 percent. Following the Great Depression, it began to experience slow but steady growth (The Jaeger Company 1995). Industry in the project vicinity retained a focus on timber during the Post-World War II era and the Warren & Griffin Lumber Company remains in operation today as the largest employer in Williams (Carroll et al. Personal Communication 2020).

Figure 7.
Project Vicinity on 1919 USGS Lodge Quadrangle Map



Source: USGS Lodge (1919), SC Topographic Quadrangle

WARREN TOWNSHIP

Though townships were established during South Carolina's colonial period, they were not the same as the system of administrative county subdivisions used for the 1870 Federal Census (U.S. Census Bureau n.d.). Warren Township was one of 25 such administrative areas demarcated in Colleton County by the time of the 1880 census (U.S. Census Bureau 1880). Named for the Warren family, the boundaries of historic Warren Township encompass the northwestern-most quadrant of Colleton County and Smoaks, the most populated town in the township at that time (Figure 8).

WARREN FAMILY HISTORY

Little is known about the early history of George Warren, progenitor. While family lore indicated that he came overland from another colony rather than directly from overseas, his birthdate and place of origin remain unknown. What is known is that he was granted 200 acres of land on a "branch of Saltcatcher" in 1764 (Figure 9A). His original land grant was surrounded by vacant land (Mitchell and Troup 1764). While it is not clear whether he was traveling alone or with a family, the headright system at that time allowed for 100 acres for a male head of household and 50 acres per wife, child, or slave, suggesting that George was married and had one child when he settled in Colleton County. His wife was named Elizabeth or Eliza, and her birthdate and maiden name are unknown (Brunson 2015).

The 1764 land grant was the first of several grants and other types of acquisitions with George amassing land between the Little Salkahatchie River and what was then known as Buckhead Swamp. In 1767 he was granted 200 more acres directly bisecting Buckhead Swamp and surrounded on all sides by vacant land (see Figure 9B) (Forster and Troup 1767). He purchased 100 acres on Buckhead Swamp from William Starling in 1772 and was granted 200 more acres on Buckhead Swamp in 1773 (Brunson 2015). In 1787, another land grant, this one for 502 acres, was given to George. It was surrounded by Buckhead Swamp on the northeast and southeast, and on the southwest by land already owned by George (Brunson 2015).

Records indicate that George Warren raised cattle (Blake 1783; Warren 1771). Free-range cattle and pig husbandry had been a primary economic driver for the region in the early-eighteenth century, although its popularity was waning by the time George arrived in the 1760s (The Jaeger Company 1995).

Figure 8.
1930 Federal Census Map Showing Townships of Upper Colleton County

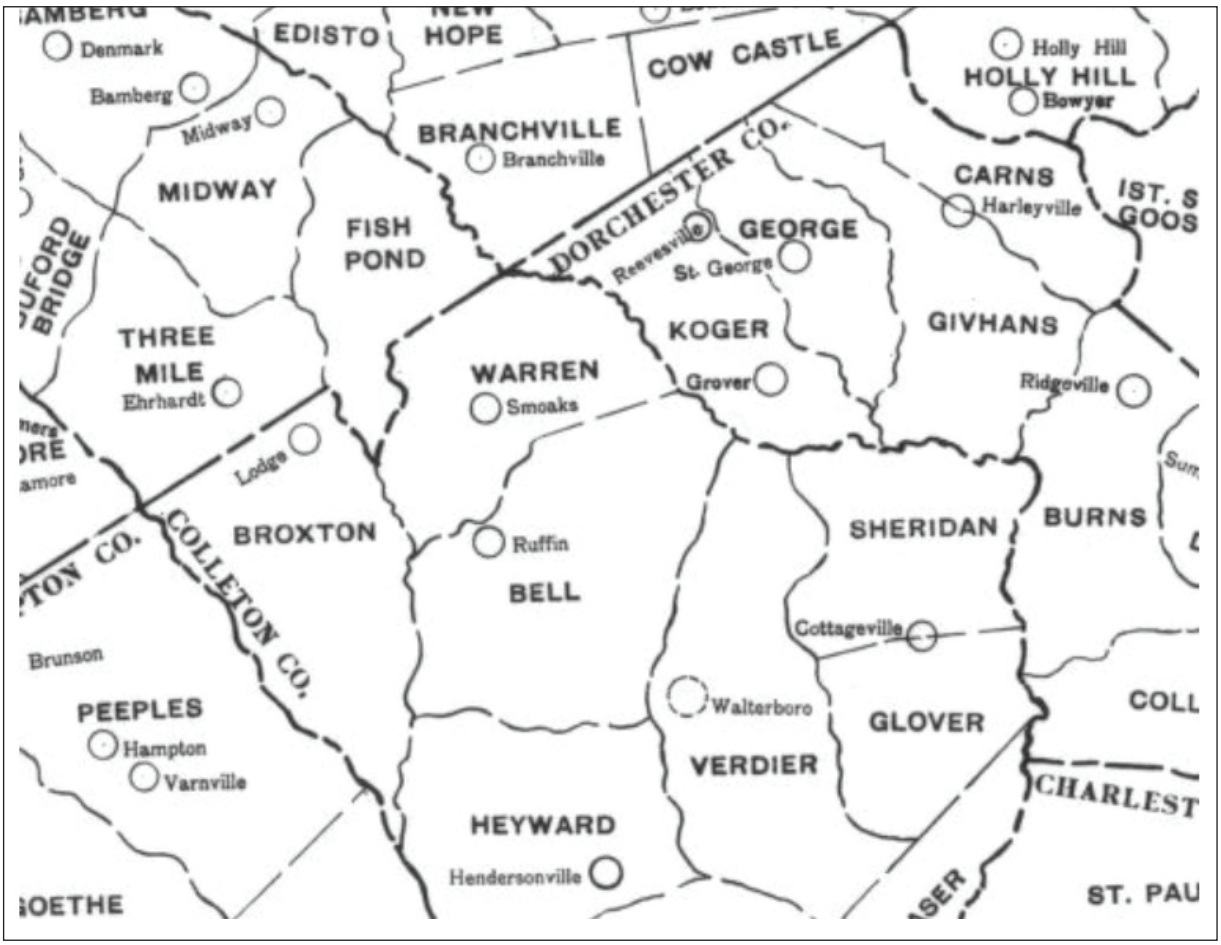
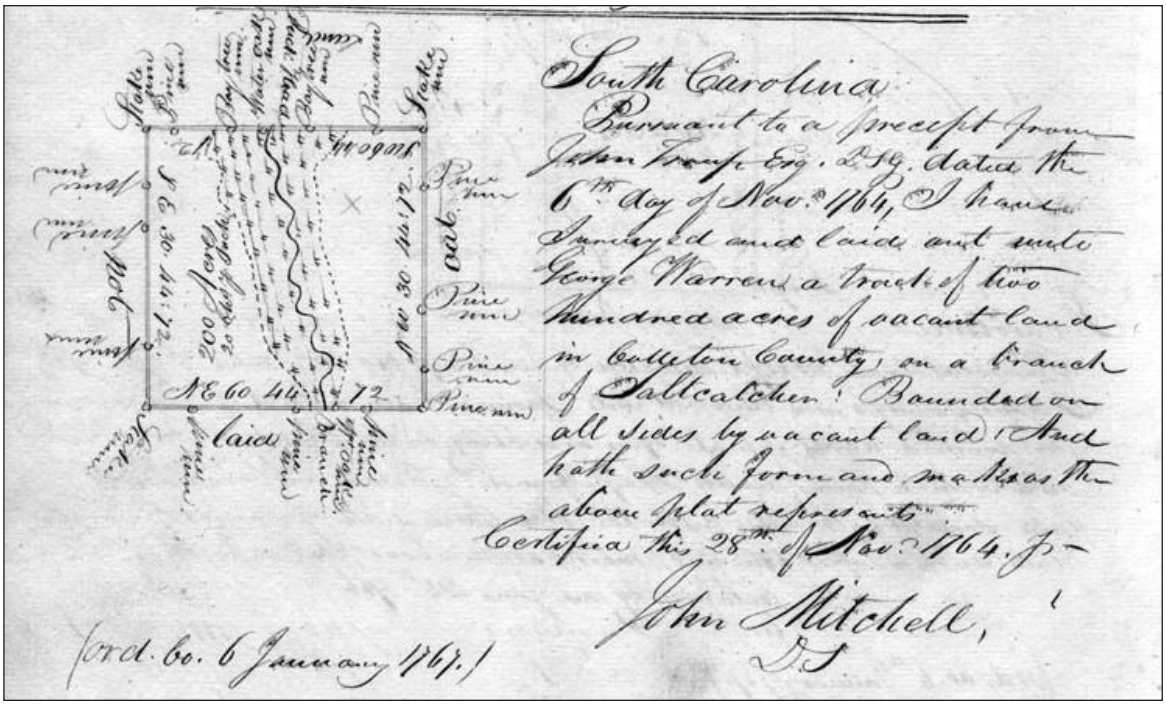
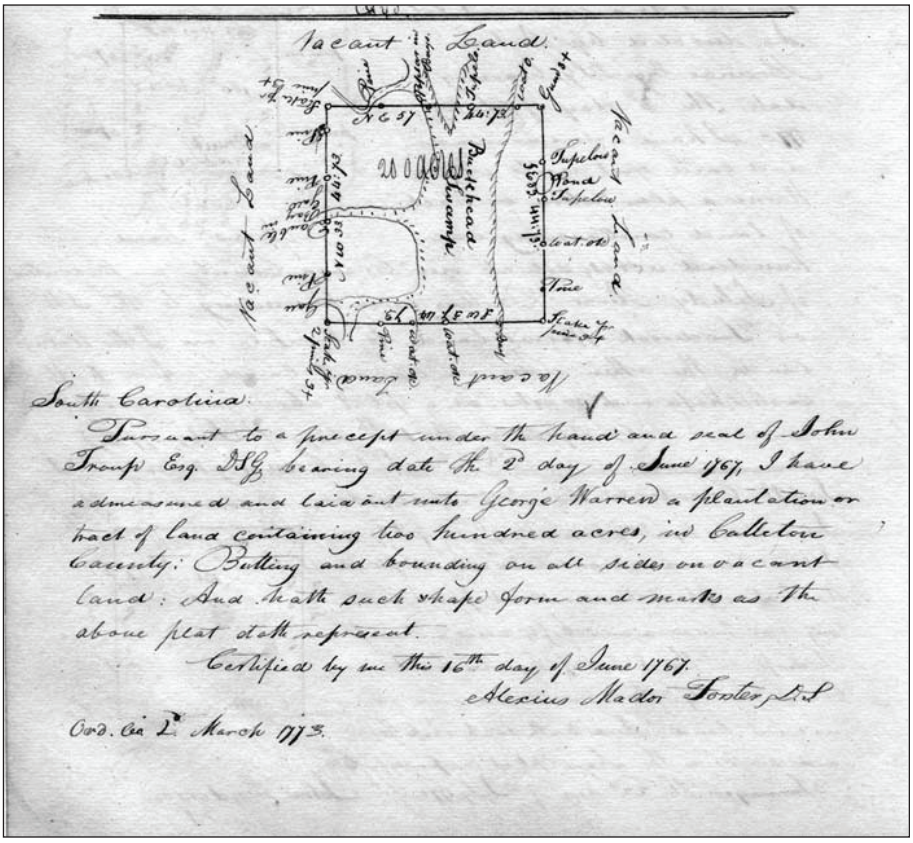


Figure 9.
Plats for George Warren's Land Grants, circa 1765



A. 1764 Plat for 200 Acres in Colleton County



B. 1767 Plat for 200 Acres in Colleton County

An advertisement placed in 1771 in the *South-Carolina Gazette* indicates that George met with difficulties making a living in this way: in it, he seeks to break up and sell off his cattle herd (Figure 10). This advertisement also confirms George's residence at Buckhead Creek (Warren 1771). During the Revolutionary War, George served in the local militia and sold five steers to feed General Green's army, for which he was paid £53 in 1783 (Blake 1783).

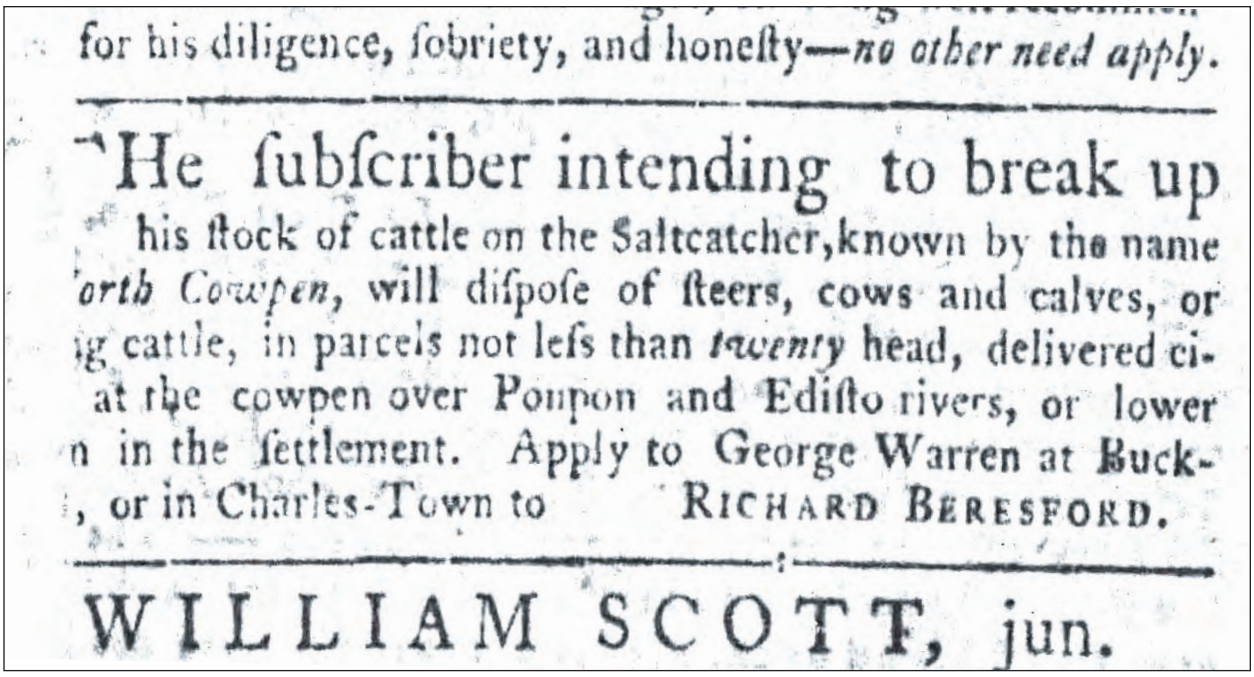
Issues with transportation were a likely cause for George's cattle-raising difficulties. In the years 1790 and 1791, George appears to have been the author of at least four road improvement petitions to the General Assembly (Warren and Carter 1790; Warren 1791). George Warren was always the first signature on these petitions, often signing on the front page while others would sign the back. Additionally, George had a somewhat idiosyncratic handwriting style and unusually heavy hand which suggests he was also the petitions' author (Figure 11) (Warren 1791). The petitions additionally provide interesting information regarding the built environment in the area in the 1790s. In 1791, the men sought to construct a road from Widow William's Ford on the Big Saltketcher, to Carter's Ford on the Little Saltketcher, and finally through to Ferguson's Saw Mills on the Edisto River (McCord 1841; Warren 1791).

Either George was a community leader or he was highly motivated to improve overland transportation in the region for personal reasons. In either case, the lack of reliable roads clearly concerned him; in 1790 he laments the situation at length, as follows:

> Your petitioners laboring under the great Disadvantage and Inconvenience of having no Road to Charleston / except the Road leading from Mrs. William's to the Horse Shoe which Road is dangerous and disadvantageous to the whole Settlement from its distance and gross Labour and Inconvenience in keeping said road in repair, having several deep Creeks and Swamps, which the greater part of the year are impassable… (Warren and Carter 1790)

The 1800 census listed George Warren as the head of a St. Bartholomew's Parish household containing three male children, three males over 26 years old, four women over 15 years old, and five enslaved people (U.S. Census Bureau 1800). While no occupation is listed, the relatively low ratio of enslaved to free occupants, indicates that he likely continued to engage in cattle raising and other less labor-intensive agricultural pursuits.

Figure 10.
Newspaper Advertisement Placed by George Warren Regarding his Cattle, 1771

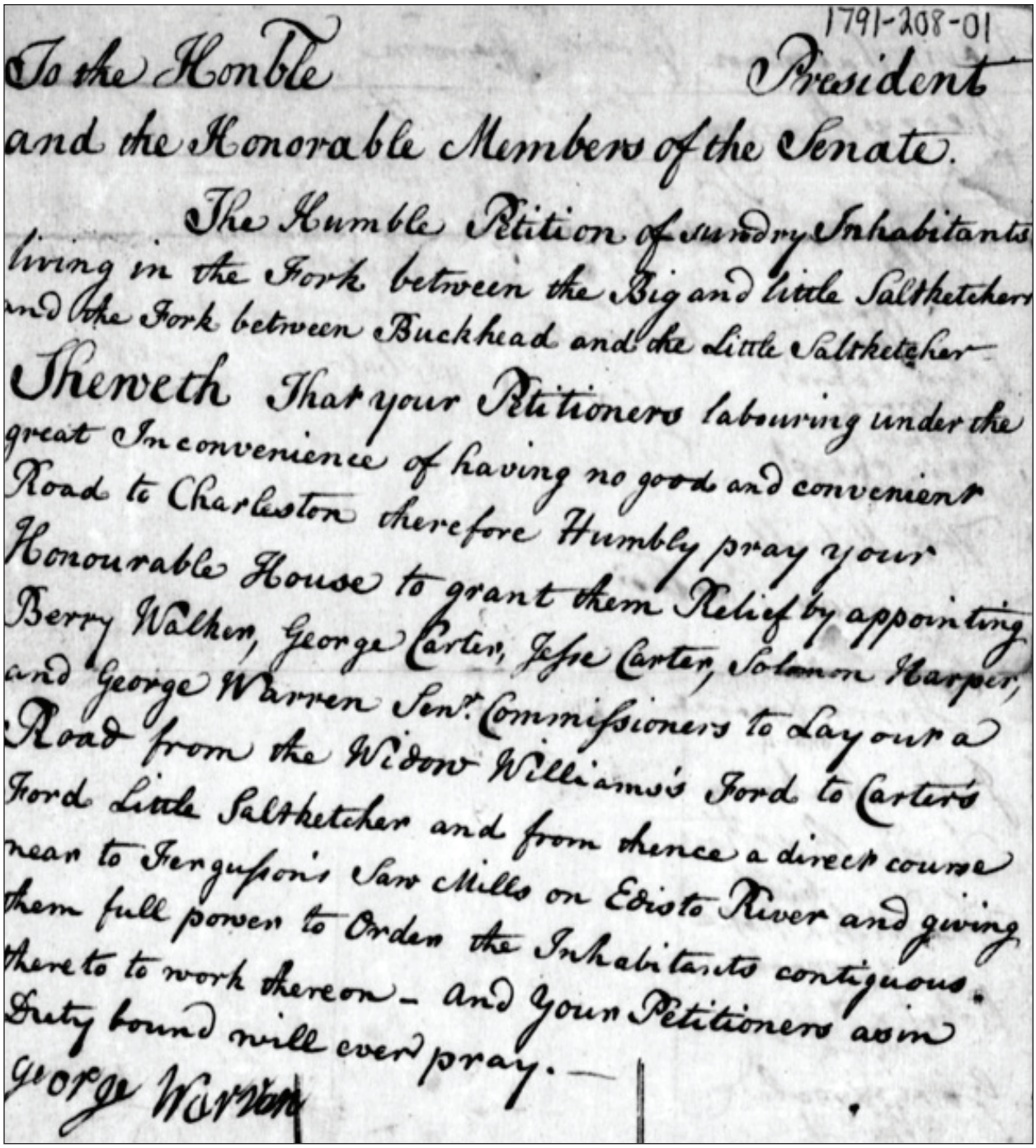


for his diligence, ſobriety, and honeſty—*no other need apply.*

THE ſubſcriber intending to break up his ſtock of cattle on the Saltcatcher, known by the name *orth Cowpen*, will diſpoſe of ſteers, cows and calves, or ig cattle, in parcels not leſs than *twenty* head, delivered ci- at the cowpen over Ponpon and Ediſto rivers, or lower n in the ſettlement. Apply to George Warren at Buck-, or in Charles-Town to RICHARD BERESFORD.

WILLIAM SCOTT, jun.

Figure 11.
1791 Petition to the General Assembly Regarding Roads, Written and Signed by George Warren



1791-208-01

To the Honble President
and the Honorable Members of the Senate.

The Humble Petition of sundry Inhabitants living in the Fork between the Big and little Saltketchers and the Fork between Buckhead and the Little Saltketcher

Sheweth That your Petitioners labouring under the great Inconvenience of having no good and convenient Road to Charleston therefore Humbly pray your Honourable House to grant them Relief by appointing Berry Walker, George Carter, Jesse Carter, Solomon Harper, and George Warren Senr. Commissioners to Lay out a Road from the Widow Williams's Ford to Carter's Ford Little Saltketcher and from thence a direct course near to Ferguson's Saw Mills on Edisto River and giving them full power to Order the Inhabitants contiguous thereto to work thereon - and Your Petitioners as in Duty bound will ever pray. -

George Warren

SCDAH Online Database

By 1810, George Warren's household dwindled to one male child, one man over 45, and one woman over 45. Residing in the same domicile in St. Bartholomew's Parish was his son, Daniel, who was listed as the head of his own household, along with five male children, two men over 16, three female children, and one woman over 26 (U.S. Census Bureau 1810). The households collectively held eleven slaves. While George Warren's birthdate is unknown, he had been residing in the Buckhead Creek area for over 40 years. Similarly, the exact date of his death and burial place are unknown. His son Daniel was named executor of his estate when George died without a will in 1819 (Brunson 2015). George's widow was granted a third of his estate, and the rest was divided equally between his six children. As one of his daughters (Susannah Prescott) had preceded him in death, her children inherited her sixth. Daniel bought out the land shares of Susannah's children. In 1820 he sold 428 acres of his father's land at auction (Brunson 2015).

There is little information on Daniel Warren. He died a year after his father and did not have a will. Family oral history indicates that he was buried in a family plot near Warren Mill Pond (Fender's Pond) but no grave markers remain in that area. An 1824 indenture provides some information regarding the dissolution of his estate, which was split between his widow, Martha, and his nine children. The estate included three parcels of land on Buckhead Swamp which were sold at auction to his son, Daniel Junior, for $35 (Brunson 2015). A tax return from 1825 indicates that Daniel Warren Junior owned 575 acres of land (Warren 1825). Daniel then sold various portions of the land to his siblings, including Eldred and George (Brunson 2015).

George Warren, Junior, was born in 1803. His gravestone reads "Col. George Warren" and for the remainder of this discussion he will be referred to as "Col. Warren" to differentiate between him and his grandfather. Col. Warren first appears as head of household on the 1830 census, which shows him living with another male, aged 15-20. He is listed near his other relatives on the tally sheet, including his mother Martha and brothers James, Daniel, Dred, and Paul indicating that the family was still living in close proximity if not in the same domicile (United States Census Bureau 1830). Family records show that he married Harriet Ann (Williams) Risher in 1836. She had two children from a previous marriage and bore Col. Warren eight additional children (Brunson 2015).

In 1842, Col. Warren constructed an I-house on Warren family land. The two-story, five-ranked frame house (Resource 557 1122.02) is still standing. The house has a concealed brick and stone pier foundation, weatherboard siding, and a laterally gabled V-crimp metal roof (Figure 12). The 1850 census showed that Col. Warren, was a farmer living there with his wife, Harriet, their seven children, aged one through 13, and her son Joseph Risher from her previous marriage, age 17. The value of his real estate is listed as $3500; this placed him somewhere in the middle of his nearby peers, which included a "lumber getter" with an annual income of $1,000 and "planters" with $1,100 and $20,000 (U.S Census Bureau 1850). His neighbor, the "lumber getter", indicates a potential large lumber industry in the area at that time. The location of the Warren-Key House along with other resources associated with the Warren family is shown in Figure 12.

Figure 12.
Warren-Key House (Resource 557 1122.02)

A. Southwest (Front) Oblique

B. Northeast (Rear) Oblique, Showing Kitchen Addition

C. Undated Historic Painting, Showing No Longer Extant Additions

Robbie Lee Warren n.d.

Col. Warren's wife Harriet died in 1851 at 35 years old, and his daughter Georgetta (1837-1906), who went by "Hettie," took over many of her mother's responsibilities towards her younger siblings. Col. Warren did not remarry and as he aged, she cared for him as well (Brunson 2015). In 1846 Col. Warren became Sheriff of Colleton District. State records indicate that he held one two-year term in the 1840s and was re-elected for three more terms starting in the 1860s (Brunson 2015). His name appears frequently in newspapers in this capacity, with the byline "George Warren, S.C.D." (Warren 1847). It appears that he had trouble getting compensated for his services as sheriff; on at least two occasions he had to petition the Senate of South Carolina for money owed when issuing subpoenas and conveying prisoners (Warren 1846; 1850).

Col. Warren sold the house along with a 200-acre tract, termed the "home tract," to his daughters Hettie and Luvenia in 1869 for $500 (Brunson 2015). Hettie remained in the house until she died. Her younger sister Amelia Anna Phoebe (Warren) Key (1847-1920) and Amelia's husband, Sidney Milton Key, also lived in the house. Sidney did not work in the lumber business but was rather a salesman of sewing machines and musical instruments. Sidney added decorative details to the house, including the decorative porch railing (see Figure 12C). Family records indicate that Sidney also made additions to the house, most of which have been removed.

The interment of Col. George and Harriett Warren established a family plot near the house. The Warren-Key family cemetery (Resource 557 1122.01) is located north of the house, approximately 650 feet across George Warren Road (Figure 13). Hettie's will provided for the two acres surrounding the cemetery to be preserved in perpetuity, and stipulated that the family home should be kept for any Warrens to live in free of charge (Brunson 2015). The Warren-Key House remained in active use by the Warren family until 1945, and was sold out of the family in 2006 (Brunson 2015; Finley 2013).

WARREN MILL HISTORY

While Col. Warren amassed a significant amount of land within the Buckhead Swamp/Little Saltketchers region starting in the late 1830s, his first lumber mill predated this land acquisition. It was constructed in 1832, on the original Warren family tract near where his father is said to be buried. This land was at least 800 acres in size (Brunson 2015). His first mill appears to have been constructed within the project area, near the confluence of modern Buckhead Creek and Bear Branch. An April 15, 1832 letter addressed to Col. Warren from a farmer in Smoaks complained about the new dam backing water up onto his fields (Staff Writer 2007). Smoaks is directly upstream from the Site 38CN1140 dam.

Figure 13.
Warren-Key Family Cemetery (Resource 557 1122.01)

A. Contextual, Facing Northwest

B. Col. George Warren Gravestone

C. Harriett Warren Gravestone

While smaller streams run through the Warren family land, the Buckhead Creek provides the only water courses that are large enough to power a lumber mill. No information regarding the design of this early mill could be found via archival research, save that the mill predated the use of steam power (Brunson 2015). The first mill is frequently described as near the house. Considering that the Colleton District Map shows Warrens living on the east side of the creek, and the project area is roughly 1.75 miles northeast of the Warren-Key House, it is possible that an earlier house was being referenced by this statement (Finley 2013). The Warren-Key House was constructed at least a decade after the Warren Mill.

During this era, timber was an important Buckhead Creek economic resource. The 1840 Federal Agricultural Census lists 13 sawmills in operation in Colleton District. Ten years later, there were eight mills and two tanneries enumerated in the district (Bureau of the Census n.d.). The region contained ample stands of longleaf pine and cypress, both valuable trees for timber. In 1842, Col. Warren signed a petition to the South Carolina State Senate requesting that the Little Saltketcher be made navigable from Buckhead Causeway (now Bells Highway) to the south for the purpose of floating timber. The petition specifically mentions cypress, ash, oak, and yellow pine, which it states "abounds in inexhaustible quantities" along the waterways (Brunson 2002). Buckhead Creek, where Col. Warren's first mill was constructed, drains into the Little Saltketcher River, so the navigability was of key importance to him. In 1850, the mill and six hands (workers or laborers) produced 20,000 board feet of lumber valued at $1,000. In 1854, Col. Warren added his name to another petition requesting that portions of the Ashepoo River and various swamps be cleared to facilitate the movement of timber via waterways (Bellinger 1854). While the water features mentioned in the second petition are located to the southeast of the project area, Col. Warren's signature shows a continued interest in the transport of timber via waterways. Given this, it is likely that his mill was still in operation on Buckhead Creek in the 1850s.

By 1860, Col. Warren was seeking a more reliable way to transport his lumber. He was a member of a committee seeking to run the "People's Railroad" through the upper St. Bartholomew's Parish area (Brunson 2015). While several of his sons fought in the war, Col. Warren was over 50 years old at that time. In 1869 he sold a 600-acre parcel described as the "mill tract" to J.J. Klein, who in turn sold it to G.L. Warren in 1873 (Colleton County Register of Deeds various). G.L. Warren was likely Col. Warren's son, George L. Warren (1845-1928).

While it is unclear when the mill on Buckhead Creek ceased operation, the property remained in the Warren family until 1888, when the 600 acre "Warren Mill Tract" was sold at auction to Benjamin Sanders (Colleton County Register of Deeds various). By the time the tract was sold to J.J. Klein, Col. Warren would have been 66 years old, and was likely retired. He died in 1891. Led by Birdett Monroe Warren, the Warren family remained in the sawmill business (Brunson 2015). Birdett went into business with L.P. Griffin in 1890, operating a sawmill under the name of Warren & Griffin Lumber Company (Brunson 2015).

During its early years, the Warren & Griffin Lumber Company operated at a number of different locations in Warren Township, in part because the company started out operating a portable mill (Carroll et al. Personal Communication 2020). The portable sawmill was a then-recent invention and was sold through catalogs such as Sears Roebuck & Co. Suitable for small-scale operations, the portable, steam-powered sawmill was moved to the woods rather than having timber brought to the mill (Shertzer 1918). As the Warren & Griffin Lumber Company became more established, they constructed larger and more permanent mills (Carroll et al. Personal Communication 2020).

By the turn of the twentieth century, railroads were erecting roads through less populated areas like Warren Township. In 1894-1895 the Walterboro & Western Railroad ran out of money to complete a project attempting to extend a rail line from Walterboro to Denmark. They had to cease construction at Brocton Station (Figure 14). A post office was established there, and T.R. Williams, the only literate man in the area, was named postmaster (Fetters 1990). Brocton Station was only about 3 miles from the Antebellum mill location and 1.5 miles from the Warren family house. Seeing an unexpected opportunity, Birdett Warren and L.P. Griffin set up shop adjacent to the terminus of the rail line (Brunson 2015).

The town of Williams was named for T.R. Williams, postmaster, but grew primarily due to the location of the Warren & Griffin Lumber Company there. The mill quickly became the largest employer in Williams and a small mill village, including housing and a company store, was constructed for workers (Figure 15) (Brunson 2015; Carroll et al. Personal Communication 2020).

By the time the mill was operating in Williams, it was powered by steam, which made it slightly easier to move. The mill operated in at least three different locations in Williams (Carroll et al. Personal Communication 2020). Additionally, the portable sawmill continued to be used in various different locations. Two short articles in the Walterboro *Press and Standard* from 1907 indicate that at that time a mill was located at Bell's Crossroads, while another was planned for Williams:

> B.M. Warren is going to put up a dry kiln and planing machine very soon. He is hauling lumber from his mill at Bells. He is also talking of putting a mill up here, too (Staff Writer 1907a).

> Mr. B.M. Warren is putting a dry kiln at his mill at Bells first before putting the one up here (Staff Writer 1907b).

Figure 14.
Train Infrastructure in Williams, South Carolina

A. Train Depot, East Elevation

B. Atlantic Coast Line, Contextual, Facing Northwest

Figure 15.
Historic Buildings, Williams, South Carolina

A. Worker's House

B. Company Store, Southwest Oblique

According to *Logging Railroads of South Carolina*, Warren & Griffin Lumber Company operated a short rail line in 1917, connecting to the Atlantic Coast Line from Williams (Fetters 1990). The mill has been in operation at its current location since the 1930s. At about the same time, the County Highway map identified the former mill pond on Buckhead Creek was identified as Fender's Mill Pond. J.L. and Carrie Fender owned the property from 1897-1923 (Colleton County Register of Deeds various). The Warren and Griffin operation originally processed cypress but switched to pine due to the lengthy cure times for cypress. The Warren & Griffin Lumber Company still operates both a sawmill and a planning mill and still uses much of the original 1930s equipment (Carroll et al. Personal Communication 2020) (Figure 16). The lumber company's location is shown on Figure 28. The Warren family bought out Griffin's interest in the company in 1962, and the mill is currently owned by Maxwell and Paul Warren, Birdett's grandsons (Brunson 2015). It remains the largest employer in Williams.

CONCLUSION

The Warren family has lived in the St. Bartholomew's Parish area since the mid-eighteenth century, when George Warren moved to the region and became a cattle farmer. The family has been involved in the timber business since at least 1832, when his grandson, Col. George Warren, established a sawmill on Buckhead Creek within the project area. That year, his mill pond backed up water from Buckhead Creek all the way to Smoaks, roughly three miles to the north. Col. George Warren dealt with continual issues regarding the transportation of logs, as indicated by a number of petitions to the General Assembly and Senate of South Carolina regarding both overland and water transport. It is unclear when the sawmill within the project area ceased operations, but it likely had done so by 1869, when the "mill tract" was first sold out of the Warren family. By 1897, the "Warren mill tract" was being subdivided into smaller parcels, indicating that the mill within the project area had ceased operations by then. The Warren family remained in the mill business however, going on to operate the Warren & Griffin Lumber Company starting in the late 1800s with a portable sawmill. The business remains in the family and in operation, and is currently the largest employer in Williams, South Carolina, roughly three miles west of the project area.

ANNOTATED CHAIN OF TITLE

While Mill Pond Road and the bridges that carry it over Buckhead Creek are owned by the state, there are two parcels which abut the bridges and which would likely contain all possible remnants of the Warren mill. Parcel 040-00-00-008.000 is 123 acres and is located to the north of the bridges. It runs irregularly up Buckhead Creek and is the location of the no longer extant mill pond.

Figure 16.
Warren and Griffin Lumber Company, Williams, South Carolina

A. Planing Office, Facing East

B. Drying Kiln, Facing Southeast

C. Equipment, Facing South

Parcel 040-00-00-015.000 is 94.7 acres and spans both Mill Pond Road and Mt. Carmel Road. It contains the section of land to the south of the mill pond. The parcel boundaries are estimated in Figure 17 and a chain of title for the parcels dating back to George Warren's colonial land grant is provided in Table 2.

Table 2. Annotated Chain of Title for Parcels 040-00-00-008.000 and 040-00-00-015.000

Item No.	Transaction Type	Deed Book and Page	Date	Grantor	Grantee	Property Description	Notes
1	Plat for Colonial Land Grant	Colonial Plat Books: S213184, Vol 0009, Page 00106	11/28/1764	John Troup, Esq.; Lords Proprietors	George Warren	200 acres in Colleton County	On "branch of Saltcatcher"; butting on vacant land; accompanying land grant and memorial missing; records from SCDAH
2	Colonial Land Grant	Colonial Land Grants: S213019, Vol 0014, Page 00277	2/19/1767	John Troup, Esq.; Lords Proprietors	George Warren	200 acres in Colleton County	Plat shows parcel straddling "Buckhead Swamp"; butting on vacant land; accompanying plat drawn 6/17/1767, accompanying memorial 4/4/1767; records from SCDAH
3	Plat for Colonial Land Grant	Colonial Plat Books: S213184, Vol 0021, Page 00086	12/10/1771	John Bremar, Esq.; Lords Proprietors	William Starling	100 acres in Colleton County	Plat shows parcel on confluence of "Buckhead Swamp" and smaller tributary; butting on land belonging to George Warren on NW, Joseph Glover SE, vacant land elsewhere; accompanying memorial 5/7/1722, land grant missing; records from SCDAH
4	Colonial Land Grant	Colonial Land Grants: S213019, Vol 0029, Page 00544	5/18/1773	None specified; Lords Proprietors	George Warren	200 acres in Colleton County	Accompanying memorial 9/21/1773; accompanying plat missing; records from SCDAH
5	Deed of Release	Conveyance Books: S372001, Vol 04W0, Page 00557	1775	William Starling	George Warren	100 acres in Colleton County	Parcel as described in item 3

Table 2. Annotated Chain of Title for Parcels 040-00-00-008.000 and 040-00-00-015.000

Item No.	Transaction Type	Deed Book and Page	Date	Grantor	Grantee	Property Description	Notes
6	Plat	State Plat Books (Charleston Series): S213190, Vol 0030, Page 00153	8/26/1793	William Windham	George Warren	276 acres in Charleston District	On "Branch of Indian Creek"
7	Plat	State Plat Books (Charleston Series): S213190, Vol 0037, Page 00028	12/3/1805	Thomas Underwood	George Warren	128 acres in Charleston District	On "Buckhead Swamp of Little Saltcatcher River"
8	N/A	Various	1838-1850	Various	George Warren	5500 acres in Colleton County	While unrelated to the parcel in question, Col. George Warren amassed roughly 5500 acres
9	Fee Simple Conveyance	Book C, Page 299	10/13/1869	George Warren	J.J. Klein	600 acres in Colleton County	Parcel known as the "mill tract"; butting on land of Dr. J.M. Warren to the north, John T Jennings to the east, Joseph Smyly to the south, and Eldred, Paul, and John Warren to the west
10	Fee Simple Conveyance	Book G, Page 389	7/24/1873	J.J. Klein	G.L. Warren	600 acres in Colleton County	Parcel known as the "mill tract"; butting and bounding as in item 9
11	Purchase at Auction	Book 7, Page 521	12/3/1888	H.D. Padgett, et al; B. Stokey, Master	Benjamin Sanders	600 acre and 308 acre tracts in Colleton County	H.D. Padgett, et al, are relatives of Sidney M. Key branch of Warren family; conveyance includes 600 acre "Warren Mill Tract" butting on land of Dr. J.W. Warren to north, John T Jennings to east, Joseph Smiley to south, and Eldred Warren, et al to east; 308 acre "Paul Warren Tract" butting on the aforementioned mill tract to the east, G.L. Warren to the south, Paul Warren to the west, and J. Warren to the north

Table 2. Annotated Chain of Title for Parcels 040-00-00-008.000 and 040-00-00-015.000

Item No.	Transaction Type	Deed Book and Page	Date	Grantor	Grantee	Property Description	Notes
12	Fee Simple Conveyance	Book 9, Page 221	1/22/1890	Benjamin Sanders	J.L. Fender	600 acre and 308 acre tracts in Colleton County	Including mention of "Warren Mill Tract"; butting and bounding as described in item 11; Jake L. Fender
13	Conveyance —Unknown Type	Book 18, Page 197	8/23/1897	Julius and Hattie Strickland	J.L. Fender	17 acres for $75	It appears that J.L. Fender either sold a small portion of the tract and bought it back or perhaps made a loan against the property; "On Buckhead Swamp or on the Warren Mill Pond"; bounded on the south and west by J.L. Fender, on the east by the Columbia Public Road
14	Timber Lease	Book 32, Page 525	7/7/1911	J.L. Fender	Warren and Griffin Lumber Company	N/A	J.L. Fender leased the timber rights of his land to the Warren and Griffin Lumber Company
15	Will	Book 30, Page 231	Unknown	J.L. Fender and R.M. Jeffries, Master	Carrie J. Fender	357 acres	When J.L. Fender died, his wife Carrie L. Fender, and his daughter, Mary (Fender) Robertson, inherited all his property, which is not separated out by parcel
For Parcel 040-00-00-015.000:							
16	Conveyance of Half Interest	Book 55, Page 268	7/17/1923	Carrie J. Fender	B.G. Robertson	79.5 acres	B.G. Robertson bought out the half interest of Carrie J. Fender
17	Fee Simple Conveyance	Book 85, Page 102	9/28/1943	B.G. Robertson	Roscoe T. Sapp and Robert Kitchens	123 acres	Bounded on north by N.M. Maxey, east by W.H. Varn, south by estate of P. Padgett, west by Burdett Warren (of Warren and Griffin Lumber) and N.M. Maxey
18	Conveyance of Half Interest	Book 85, Page 271	1943	Robert Kitchens	Willie Mae Sapp	123 acres	Roscoe Sapp's wife bought out the half interest of Robert Kitchens

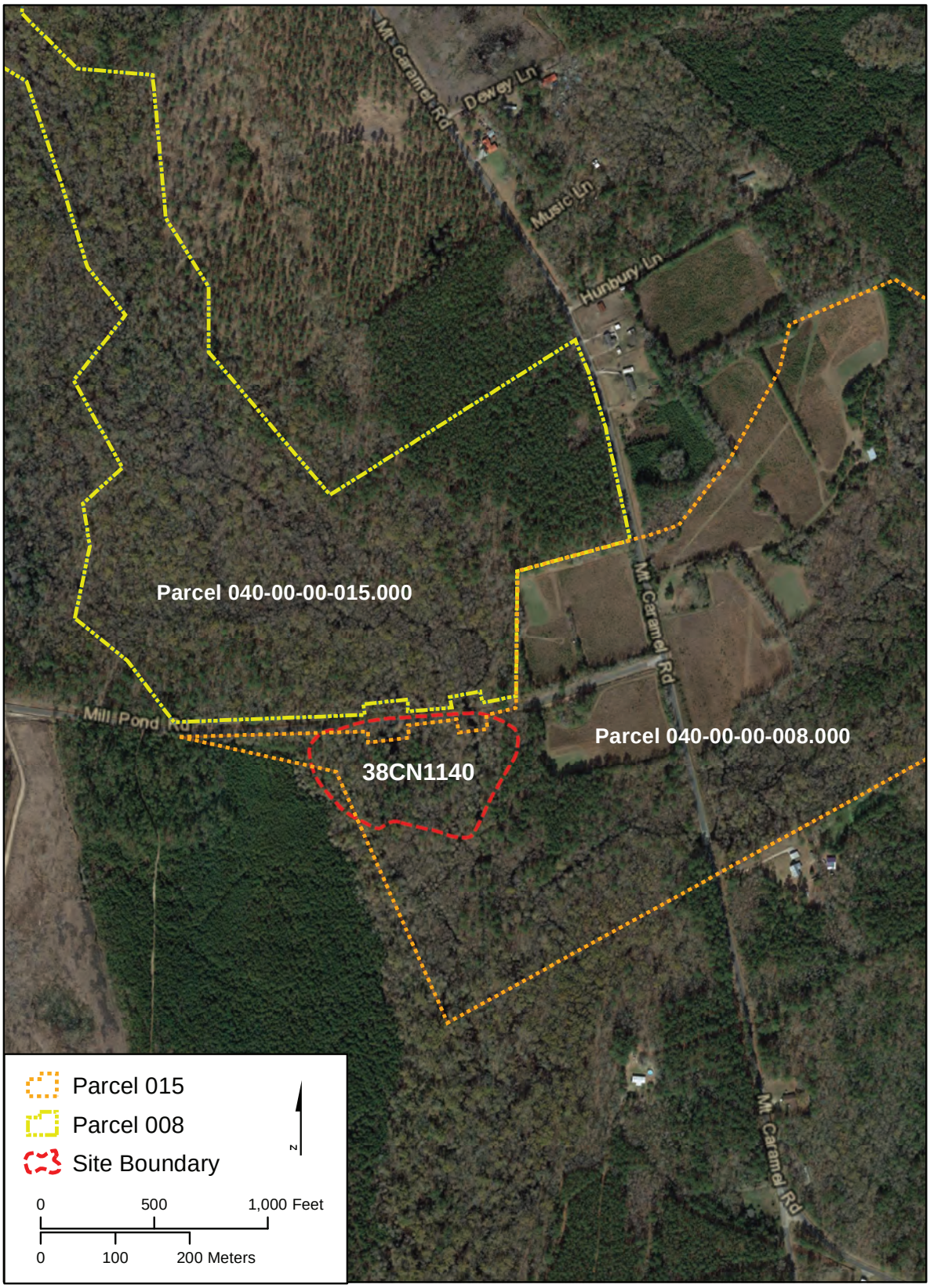
Table 2. Annotated Chain of Title for Parcels 040-00-00-008.000 and 040-00-00-015.000

Item No.	Transaction Type	Deed Book and Page	Date	Grantor	Grantee	Property Description	Notes
19	Will	Unknown	12/16/1946	Roscoe T. Sapp	Edward Sapp, Willie Mae Sapp	Unknown	Roscoe Sapp's wife and son inherited his property
20	Gift	Book 116, Page 495	9/10/1955	Willie Mae Sapp and Edward V. Sapp	Robert Kitchens and Frances Sapp Kitchens	22.5 acres	For $1, love and affection; Francis Sapp Kitchens is the daughter of Willie Mae and Edward V. Sapp; Roscoe T. Sapp's tract got subdivided; bounded on southwest by the "State Highway known as the Mt. Carmel Road", Varnadoe, and other estate lands of Roscoe T. Sapp
21	Gift	Book 249, Page 138	8/6/1982	Robert Kitchens and Frances Sapp Kitchens	Ernest W. Smyly, Jr.	22.5 acres	$5 sale price; Relation between Grantor and Grantee undetermined
22	Fee Simple Conveyance	Book 1096, Page 299	5/27/2006	Ernest W. Smyly, Jr.	Frances Sapp Kitchens	95.75 acres	Bounded on north by Louie Ott and Robert and Francis Kitchens, east by Russell Warren, south by Edna and Donald DeWitt, west by Russell Warren
23	Will	Book 1938, Page 104	6/10/2011	Francis Sapp Kitchens	Kathy Kitchens Gordon	22.5 acres	Kathy Gordon Kitchens is Francis Sapp Kitchens' daughter; see item 20 for description
24	Fee Simple Conveyance	Book 2327, Page 180	6/4/2015	Kathy Kitchens Gordon	1-6-3 Double Barrell, LLC	94.7 acres	$130,000
For Parcel 040-00-00-008.000							

Table 2. Annotated Chain of Title for Parcels 040-00-00-008.000 and 040-00-00-015.000

Item No.	Transaction Type	Deed Book and Page	Date	Grantor	Grantee	Property Description	Notes
16	Conveyance	Book 42, Page 613	12/19/1916	Carrie J. Fender and B.G. Robertson	N.M. Maxey	155 acres	B.G. Robertson was Mary (Fender) Robertson's husband; land bounded by Columbia Public Road to the east, the "Mill Lane" to the south, and B.G. Robertson and Carrie Fender to the west; N.M. Maxey amassed a significant amount of property in the area
17	Will	Unknown	Unknown	Newton M. Maxey	Rhumel Herndon	Not provided	Rhumel (Maxey) Herndon was the daughter of Newton M. Maxey
18	Gift	Book 141, Page 198	4/4/1966	Rhumel M. Herndon	Louie P. Ott	159 acres	Iris (Herndon) Ott, Louie P. Ott's first wife, was the daughter of Rhumel M. Herndon
19	Will	Book 84, Page 301	11/4/1984	Louie P. Ott	Sarah M. Ott, et al	Not provided	Sarah Elizabeth Westbury (Murray) Ott was Louis P. Ott's second wife.
20	Will	Book 320, Page 35	6/27/1985	Sarah M. Ott, et al	Janie Lee Ott Burns	159 acres	Janie Lee Ott Burns was Louie and Iris Ott's daughter
21	Fee Simple Conveyance	Book 637, Page 290	8/17/1994	Janie Lee Ott Burns	Curtis M. and Sadie M. Murdaugh	123.4 acres	Formerly listed as 159 acres

Figure 17.
Parcel Boundaries for 040-00-00-008.000 and 040-00-00-015.000



Source: Google Aerial

V. HISTORIC CONTEXT FOR MILLING

INTRODUCTION

Before proceeding with the milling historic context, a brief discussion of mill and dam terminology has been compiled for clarity. Water-powered mill systems harness the power of motion of water to operate machinery (e.g., millstones or frame saws). This may be achieved by the diversion or temporary storage of surface water. Dams are the principal tool for diverting or impounding water. Impoundment dams normally stretch across a stream at a point suited for the storage of water. Diversionary, or wing, dams are used to draw some water off from a stream without wholly stopping the current. These are generally used when mills are sited near major streams. Dams extending the full width of smaller order streams create upstream reservoirs called *mill ponds*. These ponds were typically designed to store enough water to power one day of mill operation (Hunter 1979). Gates direct this water onto a water wheel or channel called a headrace. If the *millhouse*, the building containing the mill, is located some distance away from the water supply, the water may be carried overhead in a *flume.* When water is funneled through narrow channels or pipes, it is passing through a *penstock*. When a mill was sited at a fall, the drop in elevation between the water supply and the point where the water impacted the water wheel was called the *fall* or *head* (Howell 1975; Hunter 1979; Jeane 1974).

The motion power of the fall is transferred to the mill machinery via a water wheel or turbine. The orientation of the axle (horizontal or vertical) is the simplest division of water wheel types. The three basic types of horizontal axis power trains mill wheel are *overshot*, *undershot*, and *breastshot* (Espenshade and Gardner 1989). These three forms were used across Europe as far back as the Roman period (Hunter 1979). Overshot wheels are turned by water directed towards their top. This provides a mechanical advantage to the turn in comparison to undershot wheels. However, one turn of the overshot wheel would be slow as it also had to turn against water flowing through the wheel pit. Overshot wheels required high falls to operate. Antebellum mill literature recommended their placement at sites with heads of 10-36 feet (Espenshade and Gardner 1989; Hunter 1979). Water impacts the breastshot wheel mid-height and continues to push the wheel as it flows downwards. Breastshot mills were best placed at falls of 10-20 feet (Espenshade and Gardner 1989). They required less head to operate but were also less powerful. Undershot wheels required little or no fall for operation. In the undershot type, the water flows against the bottom of the wheel with the wheel rotating in the direction of the stream. The flutter wheel, a small diameter undershot wheel with elongated paddles, was often preferred in early sawmills, especially in areas of with low head (six feet of fall or less) and large supplies of water. The flutter wheel

provided a high number of revolutions per minute and was readily direct geared to a saw blade. Blade speed could be controlled by increasing or decreasing the water flow into the head race (Zimiles and Zimiles 1973). The flutter wheel weighed considerably less than all other wheel types, and the engineering needs to support a flutter wheel were minimal. Although flutter wheels were inherently inefficient, they were often the preferred solution in low flow or low gradient settings, such as the Coastal Plain (Espenshade and Gardner 1989).

Vertical axle wheels include tub wheels and turbines. The *turbine*, however, did not evolve from tub wheel designs until the early-nineteenth century (Jeane 1974). Frequently, the axle was directly linked with the mill machinery. Tub wheels are so named for their location within an enclosed chamber or tub. Within the chamber, a concentrated flow of water is directed towards the wheel paddles. Tub wheels were popular in low elevation areas as it could be operated by falls of 8-20 feet (Espenshade and Gardner 1989; Hunter 1979). Turbines developed in the Antebellum era. The scroll and inward flow of turbines directed water against runners as it spiraled towards a central device outlet.

Once water flowed over, under, or through a mill wheel, it rejoined the stream by means of a channel called a *tailrace*. The change in elevation between the top of the water supply and the tailrace was called the *head.* Streams with less than 10 feet of head were better suited to undershot wheels. In the case of impounded reservoirs, water not used to power the mill was allowed to flow over the top of the dam or through openings called *spillways*.

The number of archaeological dam sites in South Carolina is not currently known. One approximation is available from the 2018 National Inventory of Dams (NID). This USACE database identifies 2,343 functional dams in South Carolina. Almost two-thirds of these dams (n=1520) were completed before 1970, and South Carolina dams have an average age of 60 years (United States Army Corps of Engineers 2020). This is significant because South Carolina lacks a comprehensive study or thematic assessment of functioning dam structures. The NID dataset includes 997 Piedmont dams and 523 Coastal Plain dams. Given the age of these features, and the regulatory issues inherent to them, 96 percent of South Carolina's dam inventory is constructed from earth and measure between 15 feet and 9.7 miles in length. These dams also range between five and 213 feet high. The NID also identifies six other dam types in the state. These include gravity, concrete, rockfill, buttress, and undefined. One functional timber crib dam is also identified at the Columbia Canal Diversion, in Richland County, South Carolina.

COASTAL PLAIN MILL AND DAM RESEARCH

Although there were 141 Coastal Plain mills identified on the 1840 Agricultural Census, Coastal Plain water-powered mills are archaeologically understudied. This may result from the impression that the lower part of the state was not convenient for mill operation when compared to the more rugged parts of the state. Water-powered gristmills were not as significant to Lowcountry

subsistence practices. Edmund Ruffin, an Antebellum agronomist, explains that there was "little custom or demand for those which are established, so general and inveterate is the habit of grinding by the ancient and unimproved hand-mill, which is universally used in all the lower country (Ruffin 1992:139)." However, the Lowcountry has a legacy of rice cultivation which had complex processing and engineering needs (Porcher, Jr. and Judd 2014; Myrick 1824; Pinckney 1824a). Coastal Plain sawmills also answered a regional demand for building material. During the eighteenth and nineteenth centuries, the Coastal Plain also provided the timber and planking needed for markets in Charles Town, the West Indies, and the northeastern United States. Prior to the development of railroads, timber needed to be processed at sawmills before transportation to market. These sawmills ran on water power for most of the Antebellum period.

Though Braley's 2005 survey of Piedmont mills provides a thorough context of the upper part of the state, there are sufficient variations between this region and the Coastal Plain to merit a comparative study. Interestingly, Braley begins his mill development by identifying the water-powered mills at Saxe-Gotha township, in modern-day Cayce, South Carolina, and across the Congaree River at Adams Pond as the two earliest *Piedmont* mills (Braley 2005). But, both of these mills are located below the Fall Line in the Coastal Plain. Commercial rice production was the dominant economic force in the Lowcountry for the first half of the eighteenth century (Porcher, Jr. and Judd 2014). Water-powered mills were used to thresh rice and remove the husk before it was shipped abroad. In 1735, the same year the Governor established the Saxe-Gotha township, the Lowcountry exported 49,656 barrels of mill-processed rice (Clowse 1971).

New South's study of rural industries includes a discussion of grist and sawmilling in the Sandhills physiographic region (Botwick and Joseph 2009). Mill operations were either supplying local need or commercial markets. Commercial sawmills tended to concentrate on the coast where transportation to market could be achieved via rivers and the ocean. Eighteenth- and nineteenth-century sawmills employed single blade frame saws, multi-blade gang saws, or circular saws (Botwick and Joseph 2009).

CENSUS DATA

Nineteenth-century industrial census data did not consistently record the types of industries occurring in their enumerations. The 1840 Agricultural Census identified 1,016 gristmills, 309 flouring mills, and 740 sawmills in South Carolina districts. This census did not specify whether the mills were operated by water or steam power, but a contemporary report on South Carolina steam engines only identifies 37 steam engines in the entire state (United States Department of the Treasury 1838). All but two of these steam-powered operations were located at or below the Fall Line. Table 3 provides a count of the state's mills and other establishments requiring water for power or processing. The count of steam-powered mills from the 1838 report is also included.

Table 3. South Carolina Gristmills, Sawmills, Flouring Mills, Steam-Powered Mills, and Tanneries in 1840.

District	Gristmills	Sawmills	Tanneries	Flouring Mills	Steam Powered Mill	Industrial Workers
Piedmont Districts						
Abbeville	42	24	7	10		486
Anderson	38	29	8	13		397
Barnwell	66	75	0	7		215
Chester	24	14	6	5		298
Chesterfield	45	16	3	1		157
Edgefield	80	52	8	0		571
Fairfield	16	8	0	0	2	109
Greenville	65	42	7	8		512
Kershaw	34	10	4	8		233
Lancaster	9	8	0	2		81
Laurens	41	34	10	20		397
Newberry	18	18	4	15		354
Pickens	72	25	7	9		279
Richland	19	21	1	0	3	268
Spartanburg	52	41	8	6		390
Union	20	12	7	5		323
York	21	15	3	6		378
Piedmont Total	662	444	83	115	5	5,448
Coastal Plain Districts						
Beaufort	13	11	0	0	6	837
Charleston	19	21	2	3	20	1,317
Colleton	**12**	**13**	**0**	**1**	**2**	**63**
Darlington	41	27	4	0		262
Georgetown	6	2	0	0	4	640
Horry	51	12	0	0		4
Lexington	28	61	3	30		298
Marion	46	18	0	0		105
Marlboro	21	20	0	6		165
Orangeburg	67	78	0	0		204
Sumter	50	30	5	0		764
Williamsburg	0	9	0	9		218
Coastal Plain Total	354	302	14	49	32	4,877
Total	1016	746	97	164	37	10,325

This table shows that the Piedmont contained more than double the Coastal Plain counts of gristmills and sawmills. That stated, only two districts, Williamsburg and Georgetown, had fewer than ten mills. In terms of the people working in industrial settings, the Piedmont and Coastal Plain have similar numbers overall. However, this is largely due to high number of workers in Charleston (n=1,317). None of the Piedmont districts employ fewer than 81 industrial workers. In contrast, Horry County has only 4 workers listed. Colleton District had the second lowest number of industrial workers, people employed in mills and manufacturing, within the state (n=61).

In 1850, Colleton District had eight water-powered mills and one steam powered mill. By 1860, the state's manufacturing base increased by 1,230 establishments. A decade later, the 1870 statewide enumeration decreased the total to 1,042. Of these, only 141 mills were in Coastal Plain districts. Only 60 percent (n=542) of the Piedmont enumerated mills were water powered. The rest were steam powered. In the lower elevation counties almost three-quarters (74.4 percent) were powered by steam engines (n=105). This brief examination of census data shows that water-powered mills played a role in the Coastal Plain economy but were largely eclipsed by the development of steam-power in the mid- to late- nineteenth century.

Earthen mill dams share functional and design similarities with rice banks. As noted in Chapter III, rice underpinned much of the lower Coastal Plain economy. It was the dominant commodity exported from the colony during the first half of the eighteenth century and continued through the Antebellum Period (Clowse 1971; Porcher, Jr. and Judd 2014). The presence of commercial rice plantations in Colleton District indicated that the inhabitants were conversant with the practices of impounding water for tidal and inland rice cultivation. This agricultural experience likely influenced the construction methods used at local mill dams. Unlike cereal or cotton cultivation, rice fields required intensive construction to enclose fields with earthen banks (also called dikes) and regulate their water levels (Porcher, Jr. and Judd 2014). Two banks were commonly used to impound inland rice fields. Wooden trunks and gates were erected within the banks to control water flow. The downstream bank was constructed parallel to a stream and tied into adjacent uplands. On the upper end of the field, a second bank was built to create a ready supply of water (Hawley 1949).

RICE CULTIVATION

Rice bank construction practices were idiosyncratic. Historical evidence shows that bank builders, and likely mill dam builders, put some thought into their composition. In the Cooper River, for example, one rice planter mixed his bank soil with "highland earth" to improve impermeability (Irving 1969; Porcher, Jr. and Judd 2014). This planter, Jordan Myrick, and General Thomas

Pinckney also wrote on the subject of rice planting and the creation of embankments (Myrick 1824; Pinckney 1824a). Their letters describe the construction techniques pre-industrial Lowcountry residents would have likely used to erect milldams. Pinckney was an advocate for a trapezoidal bank form that, when compared to those of vertical construction, was "superior in strength, tightness, durability, cheapness of construction, and facility of repair (Pinckney 1824a:5)."

Pinckney also described how labor was used in embankment construction. Assuming that the embankment was constructed from soil excavated from a parallel five-foot-deep ditch. One enslaved spadesman and a female helper working together, could complete 30 feet of embankment in two days.

> The ground being marked off by stakes as usual, the ditcher takes his station in his task on the outward line of the ditch, which is usually placed within a few feet of the river; he there digs down to the bottom of the ditch, throwing each spadeful as he proceeds as far as he can, toward the inner line of the ditch, where a woman, his partner in the task, is stationed; who removes with her hoe to the inner part of the bank, the earth pitched to her, by the spadesman; and the gentle acclivity of this bank rendering it unnecessary that the excavated earth should remain to become more dry, before it is formed into the bank, as is the case in the common mode, it is at once placed in its proper position (Pinckney 1824a:5).

These methods are also echoed in construction of the Santee Canal (Kapsch 2010). Here again, enslaved women were employed to excavate and carry off the spoil from the canal cut. Also relevant to our discussion of milldams, Pinckney offers the following: (Pinckney 1824a:7):

> I will take the liberty of describing the mode which I have found the most effectual in securing the creeks, which frequently intersect the course of a bank; as well as in stopping any considerable breaches, which may be made by storms, freshets &c. The usual mode in this, our timber country, is to drive down several pair of large posts across the breach, parallel with the sides of the standing bank, and to unite the tops of each pair, by a cross timber morticed on their tops; then driving a row of large and strong puncheons into each side of the breach, supported by horizontal timbers, which rest against the cap'd posts; the earth to form the bank is then thrown between these rows, and kept in its place by the puncheons.

TEXTS ON DAM CONSTRUCTION

This following summary of earthen and timber dams was extracted from prominent nineteenth and early-twentieth-century texts on mill and dam construction. Oliver Evans published the first edition of the *Young Millwright and Miller's Guide* in 1795. This popular text was advertised in southeastern newspapers and remained in circulation for several decades. Dennis Mahan was a United States Military Academy instructor in engineering and military science. In this position, he trained the first generation of American professional engineers. His book (1838), *An Elementary Course on Civil Engineering,* provided instruction on dam-building, canal building, and the construction of buildings of all types. *The Practical American Millwright and Miller* by David Craik (1870), provides a similar overview of millhouses and machinery. Leffel and Bookwalter's (1881) text on mill dams and mill mechanics discusses the various forms of dams used for mill construction. *Leffel's Construction of Mill Dams and Bookwalter's Millwright and Mechanic* includes an array of illustrations for timber and frame dams. Leffel owned a turbine manufacturing company, and the book was a marketing vehicle for his business. His company would also send engineers to recommend the most appropriate designs and materials for local conditions. Wegmann offers a farther-reaching historical and mathematical approach to the subject. His *Design and Construction of Dams* (1908) systematically surveys the construction of dams around the world and offers contemporary examples of their use in the United States. Trautwine's *Civil Engineer's Pocket-Book* (1904) provided an abbreviated discussion of dam-building largely drawn from Leffel's earlier text.

Wegmann (1908) defined four types of earthen dams. The simplest and earliest type identified is an earthen embankment laid on an unmodified ground surface. The second type has soil banked around a puddling core. Pinckney defined puddling as "a mixture of earth and water, worked to the consistence of wet mortar (1824b:17)." The core provides an impermeable barrier against water seepage and was also useful for canal construction. In these dams, puddling is poured into a slot placed along the main axis of the dam and allowed to dry (Mahan 1838). The embankment and slot are extended upwards and additional layers of puddling are added. This method provides an effective check against seepage and continues to be used into the modern era. The Dreher Shoals dam on Lake Murray, once the largest earthen dam in the world, has a puddling core. In Wegmann's third type, a masonry core-wall provides the water barrier. The fourth, and final, type is an earthen bank with the upstream slope covered by puddle.

Wegman stated that the top should be at least 10 feet wide and "if the top of the dam is to serve as a road across the valley, it may require a width of 20-30 feet (Wegmann 1908:223)." The upstream dam face should be pitched at a slope between 2:1 and 3:1. The downstream side may be steeper, between 1.5:1 and 2.5:1. These slopes echo the trapezoidal form Pinckney advocated eighty years earlier.

Specialists agree that wooden dams are less costly and very common. They are sorted into timber and frame types. Simple timber dams were laid in a wedge shape, with the narrow end facing upstream. In streams with rocky beds, these dams were joined to the stream bed with metal spikes. In softer stream beds, dams were constructed on timber mud sills or pilings. To prevent seepage, *Practical Milling* recommended the construction of core walls (Dedrick 1924:452):

> The core may be of puddled clay, timber sheet piling, stone or concrete, and should be thick enough to be impervious to water. It should start considerably below the foundation of the dam to prevent dangerous seepage, and then carried nearly to the crest.
>
> Some timber dams are built of crib work, sunk and held in place by filing with stones. On the crib the covering planks are placed. Others may be built by driving in sheet piling, spiking timber to mudsills, thus forming a sort of foundation or mat upon which the same is built.

Leffel and Bookwalter recommended construction of an apron on the downstream side to prevent their undermining by erosion. The apron is a protective layer composed of planking, masonry, or loose stones held in cribbing or gabions. Unlike earthen dams, timber dams were not watertight. In fact, gaps were often left in apron planking to keep the structure wet. Where stream bottoms are sandy or soft, wooden-plank s*heet piles* or *puncheons* are used to secure the dam and apron in place (Leffel and Bookwalter 1881; Wegmann 1908). Sheet piles are composite structures of vertical planks held together by bracing. They are usually driven into the ground together. Puncheons, on the other hand, are driven individually and fastened to a horizontal frame (Pinckney 1824a; Porcher, Jr. and Judd 2014). Trautwine also advocated the use of sheet piles and an apron of round tree trunks or hewn timbers for an apron extending 15-30 feet downstream of the fall to prevent undermining of soft streambeds (1904). In soft-bottomed streams, these timbers are bolted to a frame running crosswise to the stream flow.

Frame dams were the least expensive to make. In these dams, the wedge-shape was achieved through an arrangement of mortised and tenoned beams covered by planking. They were held in place by sheet piles or puncheons and the downward pressure of the impounded water pressing against the upstream side of the structure. Planked aprons were also used to prevent the erosion of their substructure. It should be recognized that the use of timber and earth for dam construction were not mutually exclusive. At mills with earthen dams, wooden gates and spillways were needed to regulate the water flow. The American Society of Civil Engineers (ASCE), National Research Council (NRC), and USACE identify these features, along with other features that are necessary to a dam's function, as relevant structures (De Rubertis 2018; National Research Council 1983; USACE 2014).

Historical dam literature research identified three types of materials used in dam construction: masonry, wood, and earth (Braley 2005; Hunter 1979; Leffel and Bookwalter 1881; Wegmann 1908). The following section on South Carolina dam site documentation shows that the latter two are the most common types observed at recorded archaeological dam sites. Earthen dams are also the most common type of historic dam structure in the NID statewide database (United States Army Corps of Engineers 2020).

ARCHAEOLOGICAL DAM SITE DOCUMENTATION

In the 2000s, Deborah Joy et al. (2000) and Chad Braley (2005) authored two studies on Piedmont water-powered mills. The 2000 study focused on Catawba River gristmill sites and the Braley study developed a Piedmont context for the Peters Creek mill in Spartanburg County. While both of these texts provide worthwhile contextual information and mill descriptions, they provide few points for comparison for the Antebellum Coastal Plain sawmill. For this investigation, attempts to locate comparable sites included a search of the ArchSite database, and information requests to colleagues working in South Carolina and Georgia. *The Rural Industries of the Sandhills, Georgia, South Carolina, and North Carolina* (Botwick and Joseph 2009) provides a discussion of mill sites recorded at Department of Defense (DoD) installations located along the upper edge of the Coastal Plain. A literature search for water-powered Coastal Plain sites also identified a relevant study from northwest Florida (Phillips 1996).

COASTAL PLAIN MILL AND DAM SITES

The *Rural Industries* discussion includes a detailed discussion of 14 mill sites at Forts Gordon and Benning in Georgia, and Fort Jackson in South Carolina (Botwick and Joseph 2009). A significant outcome of the Fort Gordon analysis was the development of a spatial model for Sandhill mill locations. These locations were normally located downstream of stream confluences at areas where the terrain was constricted. The mill locations were also spaced within a few miles of each other, often along the same stream. These mills did not use headraces to power their wheels, rather embankments were raised to achieve higher millpond pool levels. A variety of milldams were observed at Sandhill military installations. Botwick and Joseph (2009) identified further study of these features and their distribution as one of several topics for further research. Three additional topics included the examination of mill power sources across the region, the spatial distribution of mill seats, and water management practices.

Site documentation for 37 South Carolina Coastal Plain mill or dam sites was examined for this study (Table 4). Most of these sites were recorded for the Savannah River Site (SRS) (n=18) (Brooks and Crass 1991) and SCDOT projects (n=11). Table 4 collated the types of features identified at each site as well as the NRHP eligibility recommendation for these sites.

Table 4. Summary of Mill/Dam Sites Discussed in This Report

Site	Len. (feet)	Width (Feet)	Ht. (Feet)	Report	Features Described	NRHP Rec.
38AK0404	410	12.5	3	Site Form on File	Dam	Unevaluated
38AK1159	-	-	-	Steen and Southerlin 2016	Machine Parts, mill stones, concrete spillway, dam	Unevaluated
38AK402	167	6	3.9	Brooks and Crass 1991	Wooden Elements	Unevaluated
38AK403	143	11	4	Brooks and Crass 1991	-	Unevaluated
38BK0955	124	30	5	Fletcher and Hendrix 2001	Dam	Unevaluated
38BR0288*	255	40	-	Brooks and Crass 1991	Dam, Borrow Pits	Unevaluated
38BR0568	610	-	-	Site Form on File	Dam, Spillway, Headgate, Turbine Pit	Unevaluated
38BR112	175	8	2.5	Brooks and Crass 1991	-	Unevaluated
38BR226	100	10	3	Brooks and Crass 1991	-	Unevaluated
38BR246	234	13	2.8	Brooks and Crass 1991	-	Unevaluated
38BR269	110	10	3	Brooks and Crass 1991	-	Unevaluated
38BR288*	110*	11	3	Brooks and Crass 1991	Wooden Elements	Eligible
38BR289	116	10.5	1.5	Brooks and Crass 1991	Wooden Elements	Eligible
38BR292	103	8.7	1.6	Brooks and Crass 1991	Wooden Elements	Eligible
38BR293	120	12	4	Brooks and Crass 1991	-	Unevaluated
38BR305	75	12	3	Brooks and Crass 1991	Wooden Elements	Unevaluated
38BR327	192	9	3.3	Brooks and Crass 1991	Wooden Elements, Millhouse, Machinery	Eligible
38BR346	100	10	3	Brooks and Crass 1991	-	Unevaluated
38BR470	152	10	3.4	Brooks and Crass 1991	Wooden Elements, Diversion Channel, Bridge	Unevaluated
38BR483	115	5	3.2	Brooks and Crass 1991	Wooden Beams	Unevaluated
38BR485	120	12	2.4	Brooks and Crass 1991	Concrete spillway, wheel supports	Unevaluated
38BR499	60	6	2.1	Brooks and Crass 1991	Wooden Elements, Axle	Unevaluated
38CH0837/ 38DR0137	460			Site Form on File	Dam	Eligible (disturbed)
38CR1009/ Res. No. 305	878	34		Fletcher and Garnett 2019	Dam, Mill Complex	District Eligible
38CT0289/Res. No 466			-	Blackwelder and Hudson 2011	Dam, Spillway	Not Eligible
38DR0034	880	40	16	Baluha and Munson 2003	Earthen Dam, wooden remnants	Not Eligible
38KE0152	150	25	10	Charles 1984	Dam, Sluice	Unevaluated
38KE0153	100	25	10	Charles 1984	Dam	Unevaluated
38KE1173	25	10		Stewart 2017	Frame Dam	Eligible
38LX0668			-	Jurgelski and Martin 2017a	Dam, Apron, Headwall, Mill Pond,	Not Eligible
38ML0373	1,630	40		Martin and Jurgelski 2019	Dam, Millhouse, Mill Pond, Mill Race, Sluicegate/Spillway	Not Eligible
38OR370	1,150			Site form on File	Dam, Apron, Headgate	Unevaluated
38RD0536/620	213	26	6.5	Smith et al. 2017	Dam, Spillway, Channels	Eligible

Site	Len. (feet)	Width (Feet)	Ht. (Feet)	Report	Features Described	NRHP Rec.
38RD0635	75			Styer and Poplin 1993; Shogren 1992	Pilings, Frame Dam	Unevaluated
Resource Number 0981 (Lex. Co.)	300	55	10	Martin 2019	Dam	Not Eligible

**Site maps and table dimensions are inconsistent for site 38BR0288.*

Individual site summaries are also provided for all of the sites identified outside of the SRS and two of the more detailed sites located on the SRS. The measurements for the remaining SRS sites were reported in *A Desperate Poor Country,* the only multiple dam site metrics dataset compiled for the South Carolina Coastal Plain (Brooks and Crass 1991).

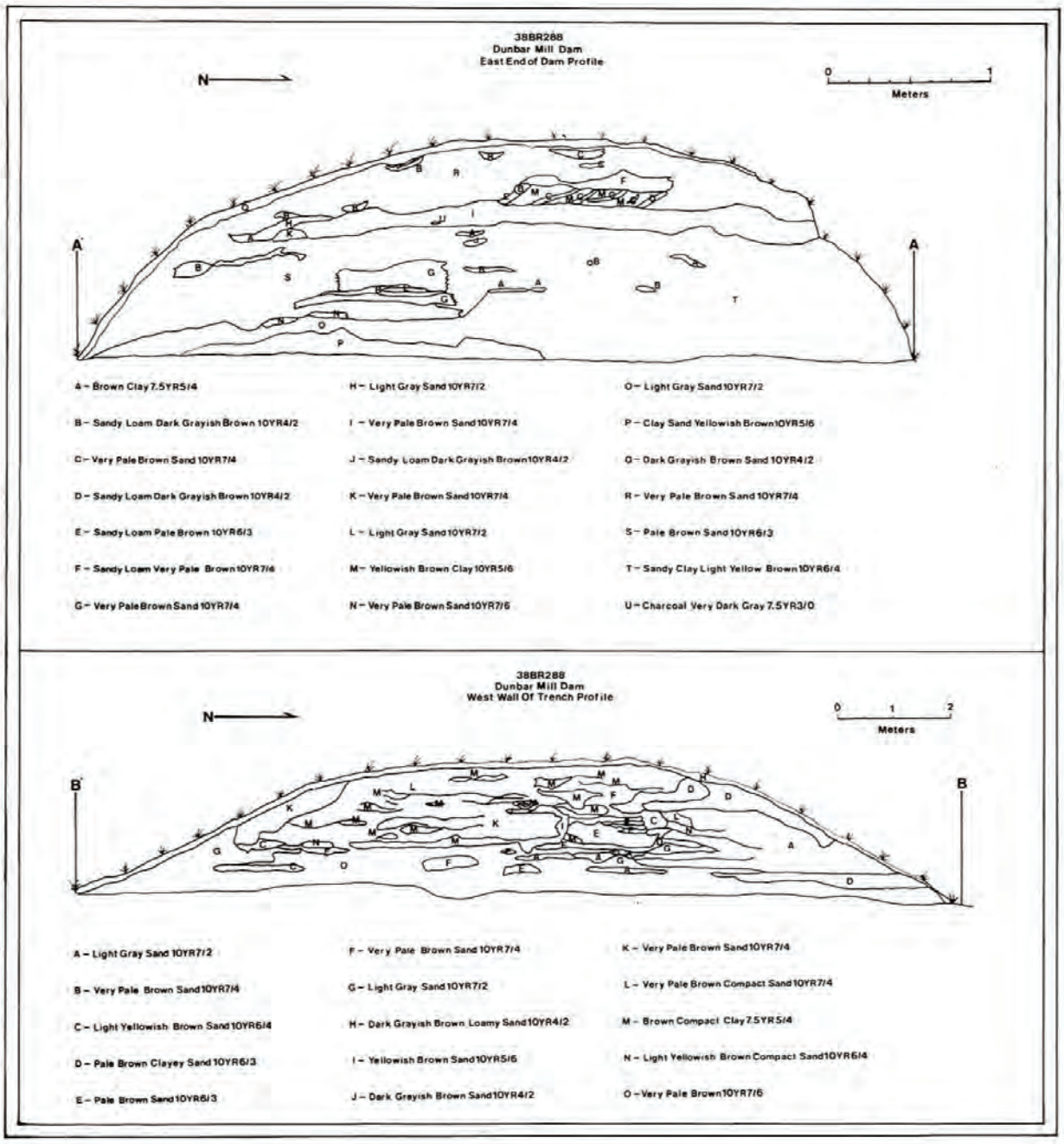
Most of the archaeological dam sites recorded on the SRS were evaluated as NRHP-eligible or required additional work. It is significant to note that all dams with visible wooden elements or relevant structures were minimally recommended for further work. This need for additional work is underscored by the consistent absence of feature descriptions or adequate site mapping. Site 38BR0288 documentation is the exception to this pattern (Brooks and Crass 1991).

Site 38BR0288 contains the remains of the late-eighteenth- and nineteenth-century Dunbar Mill. The mill's earthen dam and a borrow pit were archaeologically examined in 1984 and two profiles were collected from the 225x40-foot dam (Figure 18). One was recorded for the eastern end of the dam. The other was recorded from a 46-foot long profile trench located 164 feet west of the dam terminus. These profiles showed that the dam was constructed from material mined from the nearby area. No evidence of foundations or surface preparation were observed in either profile (Brooks and Crass 1991).

Site 38AK0404 was another mill dam recorded by Savannah River Archaeological Research Program (SRARP). This dam extended across Tim's Branch and measured 410 feet long. This earth embankment measured 12.5x3 feet. Although the embankment served to impound a reservoir, it was unclear when it was constructed or for what purpose (e.g., milling or stock-watering) (Site Form on File 1994).

SRARP also recorded Site 38BR568. This mill dam included a 610-foot long embankment and 30-foot wide concrete culvert. A headgate, flood chamber, and turbine pit were identified on the western side of this culvert. These were approximately six feet wide. The rest of the culvert functioned as a splash apron. The use of concrete indicates a late-nineteenth- or twentieth-century date range for dam construction. Remnants of a house were identified 800 feet south of the culvert. Further work was needed to determine whether these two areas had concurrent occupations (Site Form on File).

Figure 18.
Site 38BR0288 Dam Profiles



Site 38BK0955 was recorded near Goose Creek, South Carolina. This earthen dam remnant was identified between the St. James Parish church and parsonage locations. The remnant measured 124 feet long and intersected with an area of higher ground. It was 30x5 feet tall (Fletcher and Hendrix 2001).

The Axtell Mill dam (38CH0837/38DR0137) was identified by SCDOT in the 1980s. This dam was located near Summerville on Sawmill Creek/Dorchester Canal. It was associated with Daniel Axtell and, with a circa 1700 construction date, represented one of the earliest water-powered mills in South Carolina. The site was recommended eligible for the NRHP. Unfortunately the site was disturbed by development before it could be formally nominated (Shackle 2004). When recorded in 1985, 150-, 70-, and 250-foot segments were documented in an alignment measuring 460 feet long.

The Teal's Mill site (Site 38CT0289/Resource Number 466) was identified in Chesterfield County. This structure included a curving buttressed dam and a spillway. The buttresses and dam are composed of brick. The spillway was made from board-formed concrete. No dimensions were reported for the dam or spillway and the resource was recommended not eligible for the NRHP (Blackwelder and Hudson 2011).

The Elliott's Mill Pond Historic District (Site 38CR1009/Resource Number 0305) was near Rimini, in Clarendon County. This mill seat was used in the early nineteenth and twentieth centuries for grist and sawmilling operations. The mill pond dam (Resource 305.03) was constructed from earth and measured 878x34 feet. When the dam failed in 2016, the core of this feature was found to include simple earth construction without any foundation improvements (Fletcher and Garnett 2019).

An earthen bank was identified at Site 38DR0034. This feature spanned Rumph's Hills Creek with an overall length of 880 feet. The earthwork measured 40x16 feet. A wooden gate was present at the creek when it was first recorded in 1981. Most of the gate elements were gone when the site was revisited in 2003 (Baluha and Munson 2003). Background research could not identify a period of construction for this gate or determine whether the feature was used for rice cultivation or milling. It was recommended not eligible for the NRHP.

Sites 38KE0152 and 38KE0153 were identified near Lugoff, South Carolina. Both sites were identified on tributaries of Twenty-Five Mile Creek (Charles 1984). Site 38KE0152 contained a dam and a sluice feature. The former measured 150x20-25 feet. The dam height was estimated at 8-10 feet. The sluice was 8x6 feet. It extended 900 feet from the dam to a lower stream. No other mill remains were identified and additional work was recommended. The nearby site 38KE0153 dam was 100 feet in length. The dam was 8-10 feet tall and 20-25 feet wide at the base. It was also not evaluated for NRHP eligibility.

Site 38KE1173, the Big Pine Tree Creek Canal, had an approximately 25x10-foot frame dam placed near the eastern canal end (Figure 19). This structure was pinned together with spikes and half-lap joinery. Remnants of what appears to be planking were also observed on the southwestern end of the timber elements. Mortise holes along the upper face of the timbers suggests upright beams were part of the original construction. This structure was unique, in that it was impounded below ground level. This was due to the mill's reuse of an abandoned canal (Stewart 2017).

Site 38LX668 (Shumpert's Mill) was recorded on the western edge of South Congaree, in lower Lexington County (Jurgelski and Martin 2017). This site was identified when road construction exposed wooden elements of the former mill seat under S-32-103 (Ramblin Road). The dam impounded Amour's Pond. SCDOT work exposed a 12x12-foot section of the dam and uncovered wooden and brick remains. The wood remains were sawn and formed a flat surface originally interpreted as a basement floor for a mill seat (Jurgelski and Martin 2017). However, the description and photos provided in their report are more consistent with a frame dam and apron. The presence of mortise and tenon joints offers further evidence of a timber framed structure. Cut nails were used to attach planking to the deck of this structure. A 1954 diagram for the construction of Ramblin Road identified the brick structure as a mill headwall. SCDOT recommended Site 38LX668 not eligible for the NRHP due to the incomplete nature of the preserved remains and the absence of any significant individuals associated with the mill operation.

David's Mill (site 38ML0373) was recorded by SCDOT as a historic district (Resource Number 2737). The district included remains of the mill building, the mill pond, a mill race, sluicegate/spillway, and earthen dam. The dam measured 1,630x40 feet and had a sluice gate located near its center. This feature was damaged by Hurricane Florence in September 2018. The dam was also used as a roadway (David's Pond Road) into the 1960s. Historical research indicated that the mill dated from the late-nineteenth to early-twentieth century. It was also recommended not eligible for the NRHP (Martin and Jurgelski 2019).

SCDOT recorded the Etheridge Mill Pond dam as Site 38OR370 during a 2016 flood damage assessment. Site form mapping indicated that this composite earth and concrete structure was approximately 1,150 feet long. Photographs reveal evidence of board-formed construction on the apron and head gate. This material and method of formwork suggests a late-nineteenth- or early-twentieth-century construction date. SCDOT recommended additional work was needed to complete the NRHP assessment for this site.

Site 38RD0536/620, historically known as Garner's Mill, contained an earthen dam, a timber dam, a spillway, two horseshoe-shaped water channels and a dry channel of unknown function. These features were located along a 722-foot stretch of Colonels Creek, near the eastern end of the Fort

Figure 19.
Photograph of the 38KE1173 Frame Dam

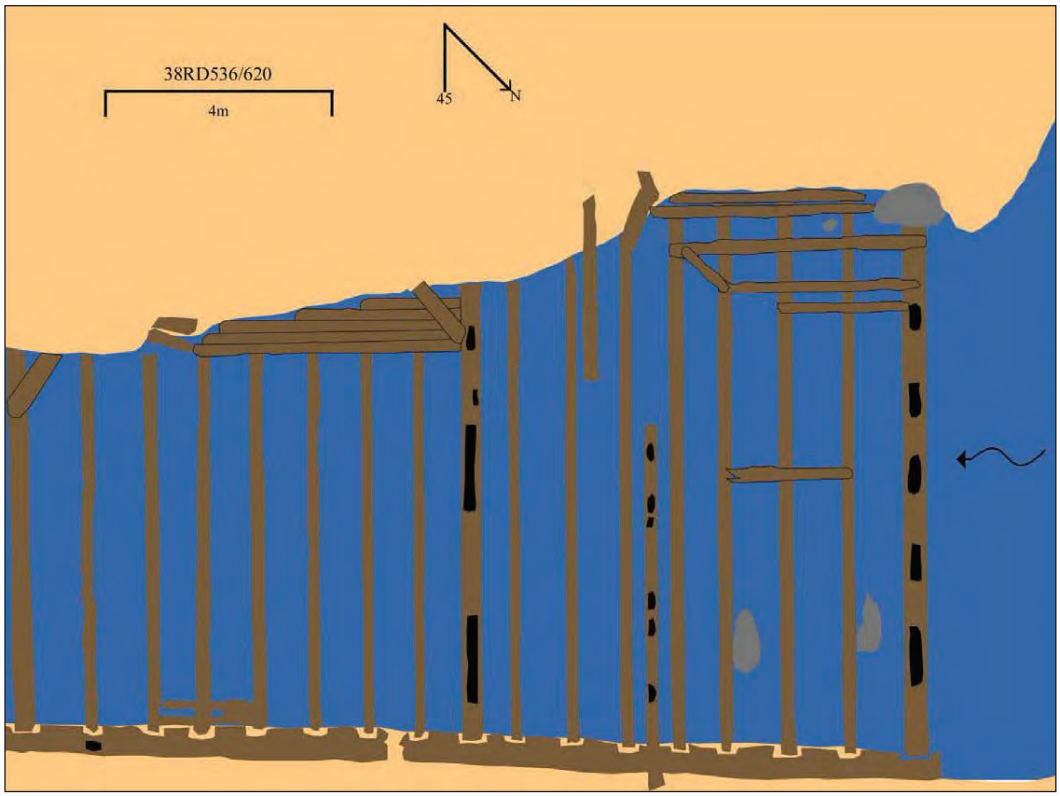
Jackson Military Reservation. The earthen dam measured 213x26 feet. The height of the feature was estimated at six and a half feet. Within the creek, parallel rows of sheet piling or puncheons were identified in alignment with the earthen dam. Elements of a frame dam were also identified in the stream. These included 17 crossbeams spaced between 3.3 and 3.9 feet apart (Figure 20). They are joined to sills with butt-cogged pocket or dovetail joints to form a structure measuring approximately 33x66 square feet. Trunnel, or nail-fastened, planking was also found on the upper face of this structure. Detached planks were also identified downstream. In 2017, SCIAA conducted a supplemental investigation of the mill remains and determined that recent flood damage had not affected the site's NRHP-eligible status (Smith et al. 2017).

Site 38RD0635 was also identified as a potential location for Garner's Mill due to its location on an acute bend in Colonel's Creek. This site included the remnants of a timber structure and several pilings. Site maps indicate the structural remnants extended over a 75-foot long stretch of the creek. The upright pilings were not aligned respective to the creek channel or the approximately 16x19-foot structure. Shogren (1992) suggested the structure dated from the early- to mid-nineteenth century. Given this, a 1993 re-examination of the site suggested that the site contained bridge remains (Styer and Poplin 1993). These investigations concluded that there was insufficient information to complete the site's NRHP assessment.

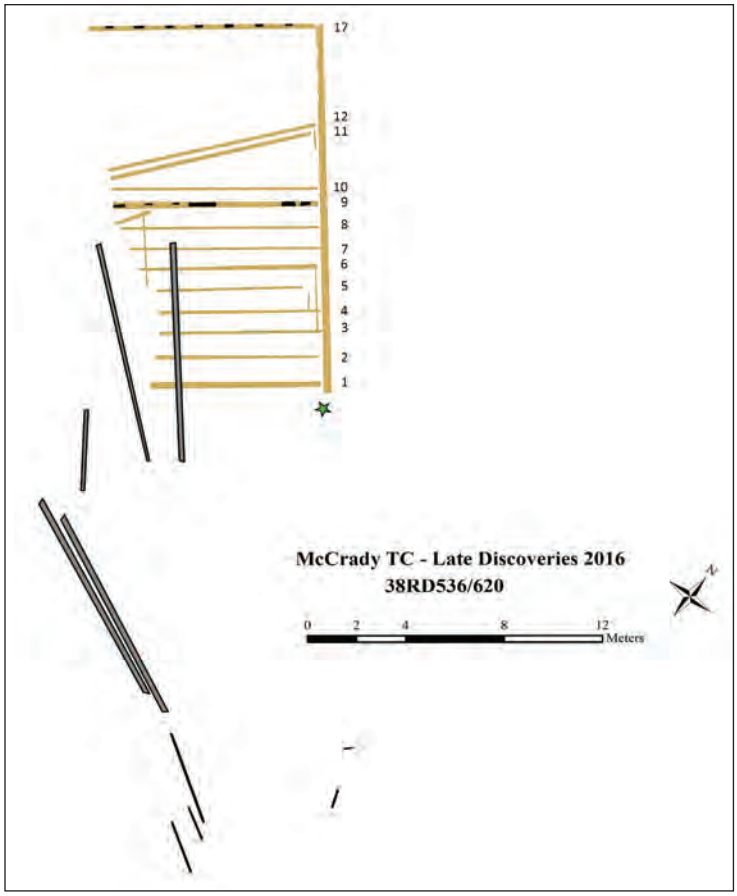
The Wilton Pond and Dam (Resource Number 0981) was recorded by SCDOT in 2019. Located in Lexington County, this 300-foot-long earth and concrete dam was 55x10 feet. The dam was constructed between 1925 and 1939. No evidence of historic mill activity was identified for this location. It was also disturbed by modern utilities and recommended not eligible for the NRHP (Martin 2019).

Earth was the primary material used in the construction of the 37 dams identified. One entirely wooden dam was identified at Site 38KE1137. This was attributed to the unique location of the dam within the Big Pine Tree Creek Canal. Integrated structures or features were recorded at 22 sites, and wooden remains were explicitly mentioned at 11 sites. Coastal Plain dam lengths ranged from 25-1,630 feet. Dam widths measured from 5-55 feet. Heights varied between 1.5 and 16 feet. Unsurprisingly, the range of measurements recorded for these dams indicate that impoundments were constructed to fit their immediate environment. Although wooden materials are not commonly found in South Carolina terrestrial archaeological settings, almost one-third of the dam sites contained wooden elements. Wooden remains were also identified at most of the water-powered sites recorded in northwest Florida.

Figure 20.
Site 3RD536/620 Frame Dam Foundations



A. 2007 Field Sketch



B. 2016 Schematic Following Historic Flooding Event

FORT GORDON

Fort Gordon in Georgia, located about 35 miles west of the SRS, contains 15 mill sites. Nine of these sites were examined in detail to mitigate impacts on mill and dam sites affected by a 1990 extreme weather event (Lewis et al. 2009). Most of these mills date from the late-nineteenth or twentieth century and several were still operating in the 1940s. The presence of multiple mill dams or composite single dams at several of these sites was also interpreted as evidence for the improvement, replacement, or repair of existing mill structures (Braley, Chad O. 1994; Braley and Froeschauer 1991; Joseph et al. 1993; Lewis et al. 2009). The following table (Table 5) summarizes the Fort Gordon mill occupation date ranges, the types of features identified at each of the nine sites, and their NRHP eligibility recommendations. Six of the nine mills had wooden remains. The three mills that were recommended eligible had excellent preservation and research potential.

Table 5. Fort Gordon Mill Date Ranges and Associated Features.

Name/Site Number	Occupation Date Range	Features	NRHP Eligibility	References
Boardman Mill	Late Eighteenth – Mid-Twentieth Century	Millpond, earth and wood dam, millhouse foundations, water wheel supports	Not Eligible	(Braley and Froeschauer 1991; Lewis et al. 2009)
Gordon Mill	Late nineteenth-1942	Mill structure wooden remains	Not Eligible	(Joseph et al. 1993; Lewis et al. 2009)
Leitner Mill	Early Nineteenth-Twentieth Century	Failed earthen dam, concrete dam, Possible sawmill remains	Eligible	
Lower Leitner Mill/ 9RI0452	Unknown	Millpond, Earthen dam, concrete and brick raceway, wheel pit, mill seats	Not Eligible	
Maxwell Lake Mill/ 9RI0455	Late nineteenth -twentieth century	Stone and concrete dam remains	Eligible	
Scout Mill/ 9RI0454	Late eighteenth-nineteenth century	Mill structure, earthen dam with interior wooden structural remains	Eligible	
Thomas Lake Mill/ 9RI0456	Late nineteenth century	Wooden remains	Not Eligible	
Union Mill/ 9RI0453	1870s-1940	Raceway, earth and concrete dam, concrete raceway, wooden remains and structural planking	Not Eligible	
Wilkerson Lake Dam	Twentieth century	Millpond, earthen dam, millhouse, concrete spillway	Not Eligible	(Braley, Chad O. 1994; Lewis et al. 2009)

NORTHWEST FLORIDA

John C. Phillips conducted a comprehensive examination of northwestern Florida mill seats in the mid-1990s (Phillips 1996). During his examination of 36 mill or water-powered sites in Escambia and Santa Rosa and Okaloosa counties, Florida, Phillips identified 78 features or artifact deposits (Table 6) (Phillips 1996). Like the SRS report, he provided dimensions for each recorded feature. Analysis of these dimensions found that earthen dams ranged between 66 and 1,115 feet in length and 9.8 and 98 feet in width (Phillips 1998).

Table 6. Mill-Related Features or Deposits Recorded in Northwest Florida (Phillips 1996)

Feature Type	Count
Artifact Scatter	12
Dam	32
Machinery	2
Mill Pond	1
Mill Race	2
Sluice	6
Structural	23
Total	78

They also had relative heights of 4.9 and 16 feet. Wooden elements were recorded at most of the sites Phillips visited. These included timber foundations or mortised and tenoned cribbing. Cribs had between three and nine timber sills held in place by pilings, sheet pilings, and toe walls. Timbers measured between 0.5 and 1.0 feet in width and were covered by plank flooring fastened by iron spikes or wooden pins called trunnels (Phillips 1998).

Phillips (1998) also offers some site patterning observations. Using historical documentation and artifact analysis, the mills were sorted into six periods (British, Second Spanish, Early American, Late-Nineteenth Century, Early-Twentieth Century, and Depression). Sawmills were the earliest to be identified and most common mill type found in the survey area. Gristmills did not appear in this part of Florida until the Early American period (1821-1860). His spatial analysis indicated a preference for locating mills near upland settings or river terraces. Earlier mills were also identified near estuaries on embayment terraces (Phillips 1998). By the end of the Early American Period, sawmills moved closer to transportation corridors. Phillips attributes this shift to the appearance of steam engines altering water-power considerations from site selection practices.

After examining the South Carolina, Fort Gordon, and northwest Florida archaeological literature on mill dams, it is apparent that they are the most substantial part of water-powered industry archaeological sites. In the Coastal Plain and Sandhill sites examined for this report, dams were constructed from the two most commonly available materials, earth and wood. This research also showed that wooden remains are common on archaeological dam sites.

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VI. FIELD RESULTS AND DISCUSSION

The Warren Mill site boundaries encompass a 1,300-foot long earth and wood dam. In 2019, SCDOT identified two integrated wooden features, four ponds, five water channels, and one depression of unknown function at the site (Figure 21) (Shepherd 2019). They interpreted these features as the remains of a milldam. During New South's January 2020 field visit, the identified features and the surrounding area were re-examined for evidence of milling activity. However, the wooden remains were submerged beneath 2-4 feet of water. The ground was also saturated.

One pond and a channel identified by SCDOT as possible mill features post-date the period of sawmill operation. The rectangular pond, located on the northeastern site corner, was surrounded by large earthen piles indicative of mechanical excavation. The absence of similar piles and the vertical edges of the three remaining ponds suggest an earlier episode of borrowing activity. Four of the five water channels were filled with water during the New South visit. These channels flowed over 200 yards south before dissolving into a swamp. The fifth channel, located near the rectangular pond at the northeastern site corner, was a road ditch that mirrored a similar ditch on the north side of S-47. Although none of these features were intrinsically datable, the ditch was likely excavated during a period of early-twentieth-century road improvement activity.

Both wooden features are located within water channels running underneath Mill Pond Road. Two bridges, constructed in 1955, span these openings (Shepherd 2019). The eastern channel measures 57 feet wide. The base of the eastern channel was identified at an elevation of 64.4 feet amsl. Similar elevation measurements (63.7 feet amsl) were obtained in the accessible parts of the 62.6-foot wide western channel. Although unmeasured, probing indicated that the center of the western channel extended one or two feet (62.7 or 61.7 feet amsl) below the eastern channel bed. SCDOT designated the wooden features as the *eastern* and *western* dams (Shepherd 2019). However, it was apparent that these features were parts of a single 1,300-foot long dam and mill foundation. and New South renamed the eastern feature (the mill foundation) as Feature 1 and the western feature (the dam core) as Feature 2 (Figures 22 and 23).

Feature 1 included 14 beams laid across the eastern channel (Figures 24 and 25). These beams extended downstream from the base of the dam. The outer edges of these beams were buried beneath debris and earth. These one-foot diameter timbers were laid parallel at intervals of 2.25-3 feet. Perpendicular planks and a beam were visible along the western edge of this approximately 25x27-foot feature.

Figure 21.
2019 38CN1140 Site Map

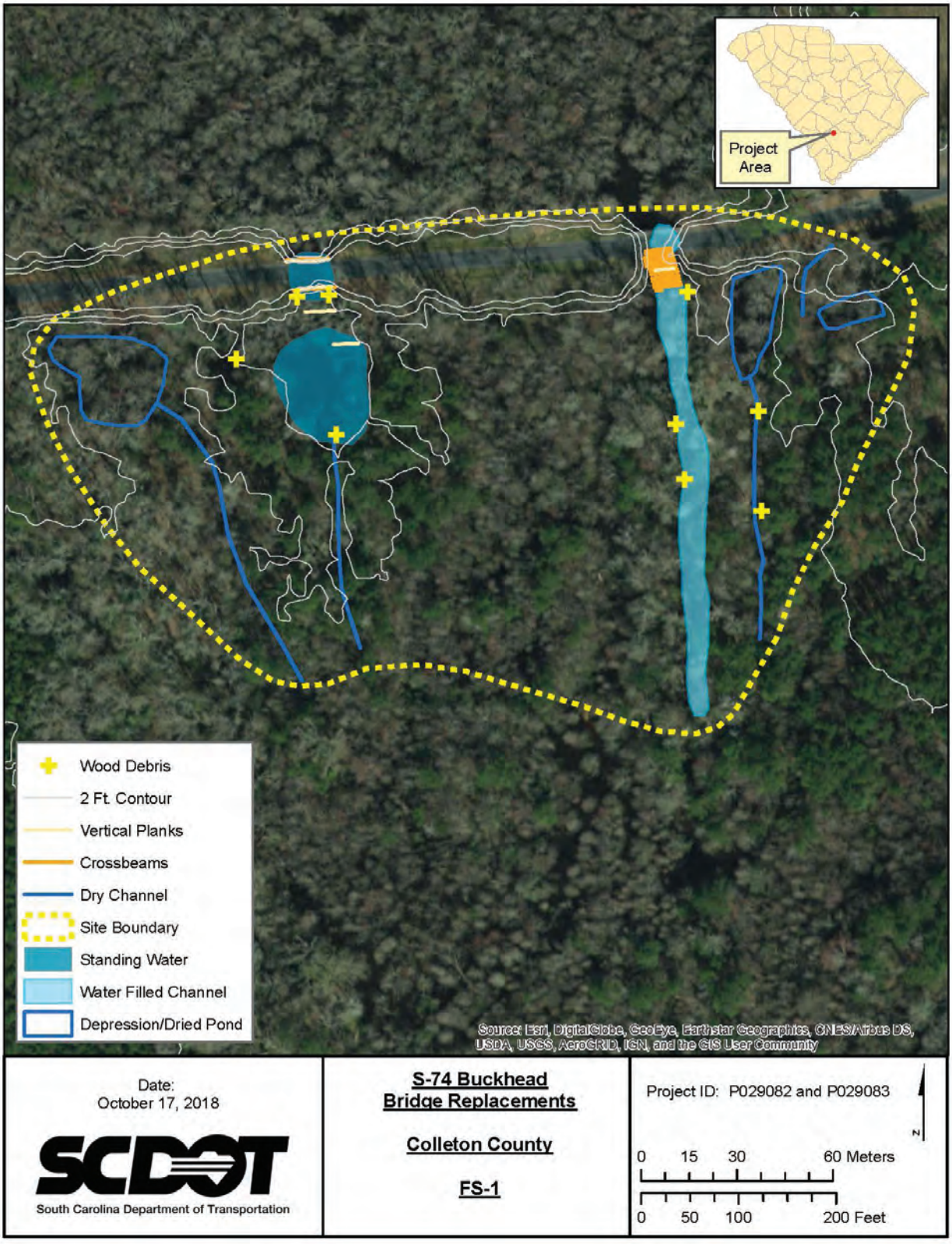

Figure 22.
Schematic Drawing of Features 1 and 2

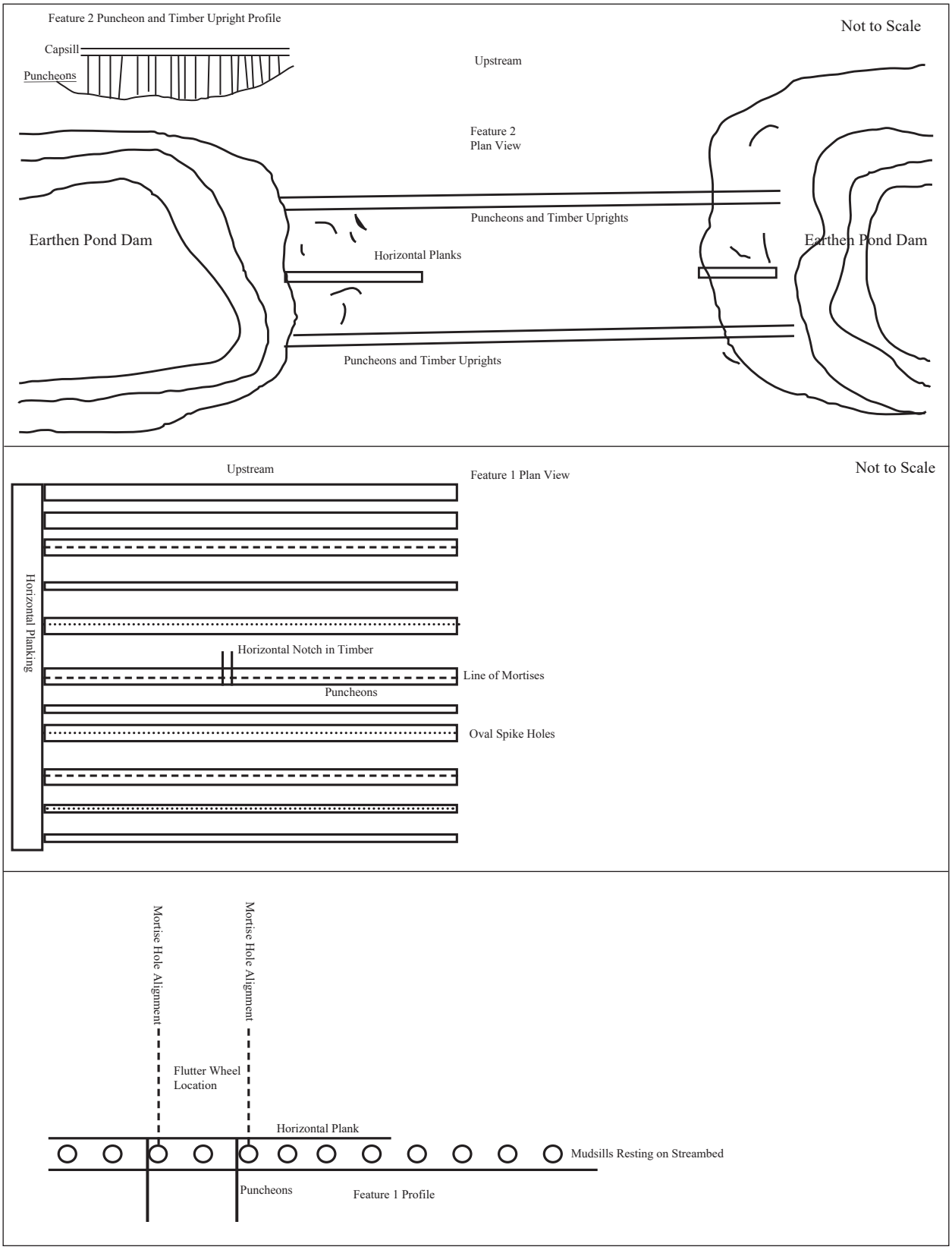

Figure 23.
The Entire Earthen Dam and Locations of Features 1 and 2

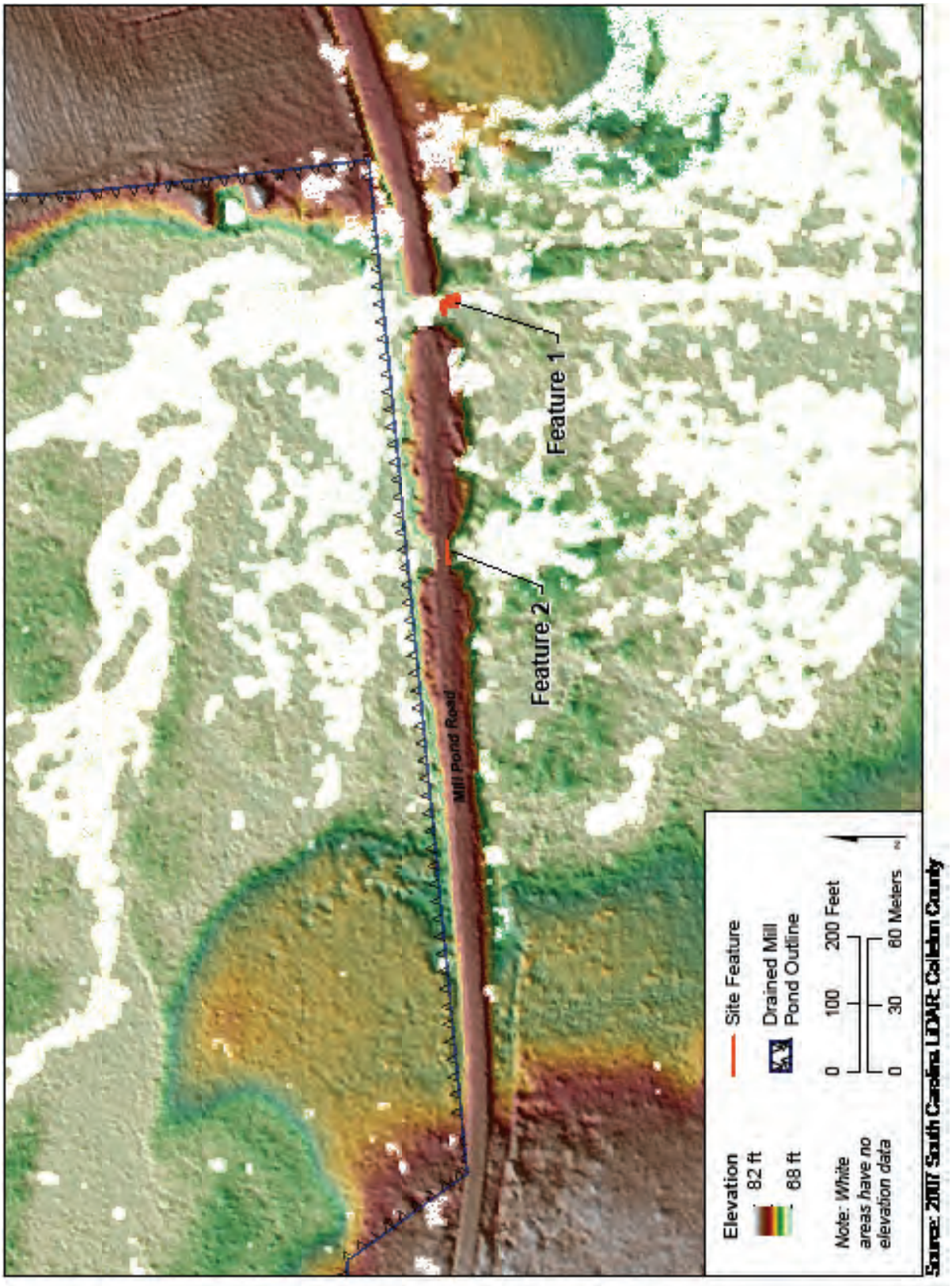

Figure 24.
Setting Photograph of Site 38CN1140

A. Feature 2, Facing North

B. Feature 1, Facing North

C. Eastern Channel, Facing South

Figure 25.
Feature 1 Photographs from SCDOT Visit

A. Oblique View, Facing Northwest

B. Puncheon Close-up

Nine top elevation measurements for these beams ranged between 65.9 and 66.1 feet amsl. Because of absent interlocking end timbers or prepared joints, these beams were identified as mudsills. Plank puncheons were attached to the upstream side of one of the middle sills. With this configuration, the puncheons anchored the structure to the bottom of the channel. Vertical mortise holes were also cut along the central axis of the puncheon-anchored sill and a mudsill located six feet upstream (see Figure 25).

Feature 1's position and flat configuration indicate that the structure was a millhouse. First, the structure projects outward from the dam. Second, the level plane of the mudsills shows that they were deliberately flattened, likely for planking. The mortises were fitted for substantial timbers that likely suspended a horizontal axle flutter wheel. Early sawmills were commonly driven by high-speed undershot wheels, known as flutter wheels, that relied on water flow rather than head. Such wheels were constructed on or immediately adjacent to dams (Evans and Ellicott 1795:450 (78)).

The timber remains, recorded as Feature 2, are different from Feature 1 (Figure 26). They were aligned with the center of the dam embankment. No mudsills were identified at Feature 2. Instead, the wooden remnants were limited to three parallel sections of timber framing affixed with planking as depicted in *Leffel's Construction of Mill Dams and Bookwalter's Millwright and Mechanic* (1881) (Figure 27). Each frame included tenoned uprights joined to a cap sill. The southernmost beam was decayed and ranged between 0.5-1.0 feet in thickness. This timber extended into the sides of the channel. The middle section of Feature 2 was composed of framing and horizontal planks. At the upstream and downstream ends, the planking consisted of individually placed puncheons that extended vertically above the cap sill. These outer puncheons anchored Feature 2 to the channel bottom and formed the earthen dam's core walls (Dedrick 1924:452). The exposure of these internal members also shows that the western channel was cut into the milldam after it was constructed. While it is unknown when this channel was opened, it likely occurred after the mill was moved in the mid-nineteenth century and before the bridges were constructed in 1955.

Mill Pond Road runs across the dam at an elevation of 76 feet amsl. Using available terrain data, and this elevation as an approximation of the milldam and maximum pool for the impoundment, a digital representation of the mill pond was created (Figure 28). This modeled pond would flood about 227 acres, extending more than 1.2 miles up the Buckhead Creek drainage. The upper elevations for the Feature 1 mudsills (66.1 amsl) and Feature 2 beam elevations (67.8 feet amsl) differ by 1.7 feet. This difference in elevation offers a further indication that Feature 2 was part of a dam substructure, since it was below the ground level of the sawmill operation.

Figure 26.
Feature 2 Photographs from SCDOT Visit

A. Oblique View, Facing Northwest

B. Feature 2, Tenons, Framing, and Puncheons

Figure 27.
Leffel's Illustration of a Plank Frame Dam Constructed on Mudsills

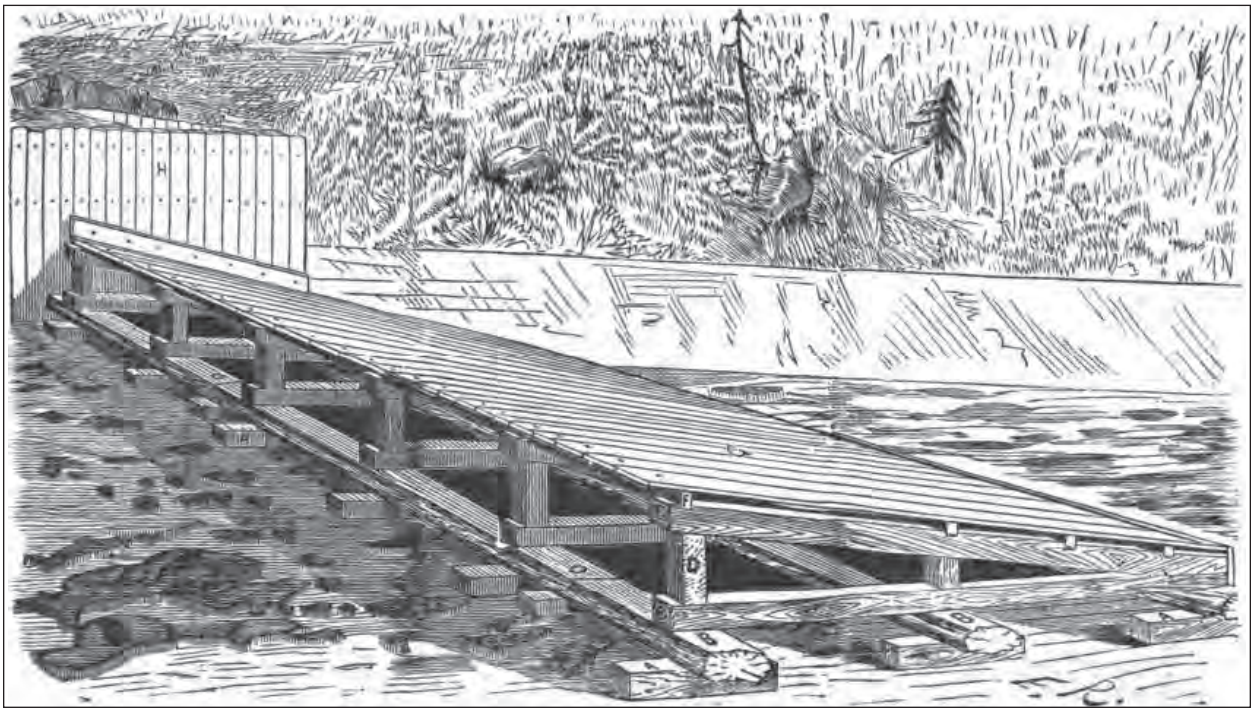

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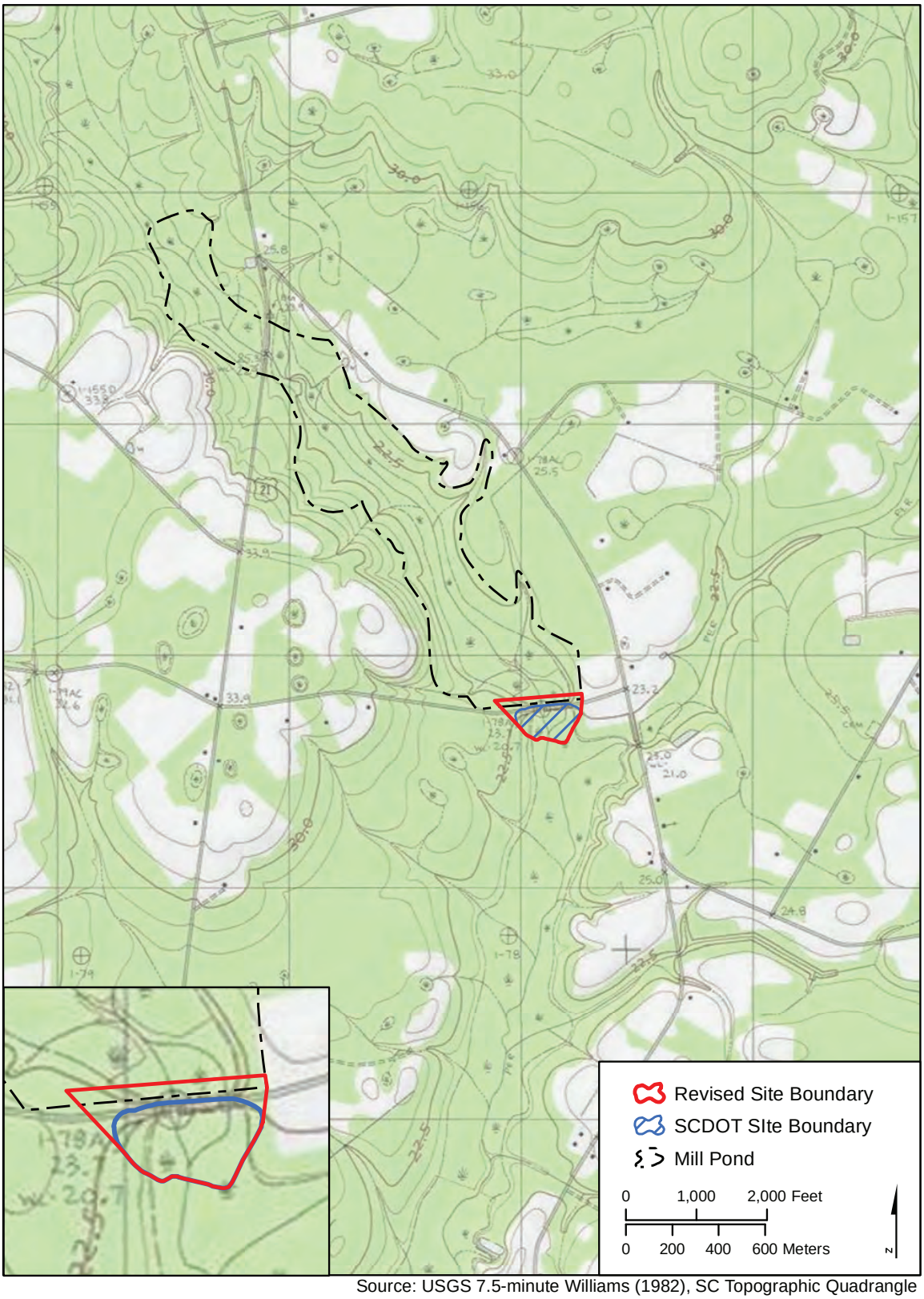
Figure 28.
Revised Site 38CN1140 Boundaries



Source: USGS 7.5-minute Williams (1982), SC Topographic Quadrangle

The information offered in this report was oriented towards establishing a context for evaluating the Warren Mill remains. To this end, New South examined archival records for this corner of Colleton County and the Warren family. Additional efforts were directed towards understanding nineteenth-century dam construction practices and summarizing archaeological research on Coastal Plain archaeological dam sites. While the later research topic would benefit from a comprehensive examination of site records and existing documentary resources, there is sufficient data to evaluate the site for NRHP eligibility.

NRHP ELIGIBILITY RECOMMENDATION

The site boundaries of Site 38CN1140 should be expanded to capture the former entirety of the 1,300-foot long dam and mill (see Figure 28). At present, the boundaries of the actual historic impoundment cannot be accurately defined. Lacking any contemporary mapping for the millpond or correct height for the milldam, our impoundment model was based on the current height of Mill Pond Road. If additional mapping or data suitable for accurate definition of the millpond become available, the site boundaries should expand to incorporate the full pond impoundment. The following NRHP recommendations are relative to the full resource.

New South identified Site 38CN1140 with the sawmill constructed by Col. George Warren circa 1830. In upper Colleton County, the timber industry was a primary economic driver in the nineteenth and early twentieth century. Sawmills were closely linked to the historic themes of extractive industries and frontier economics/commerce. Site 38CN1140 represents an early example of this important local industry. Under Criterion A, Site 38CN1140 retains the integrity to relate its structure and internal features to its past function as a water-powered sawmill. The site is recommended eligible under Criterion A on the local level with a period of significance (1832-1869) extending from when the dam was constructed until the mill tract was sold out of the Warren family. The NRHP boundary follows the site boundaries as delineated in Figure 27.

The Warren family was one of the first to settle in the upper St. Bartholomew's Parish area and is one of roughly five families represented on the 1825 Colleton District Map. Col. George Warren was a relatively noteworthy figure; he was a community leader who served multiple terms as Sheriff of Colleton District. The Warren-Key House, which Col. George Warren constructed on his family land in 1842, remains extant. The house has good integrity and readily communicates its historic significance. If an individual resource should be recommended for the NRHP due to an association with Col. George Warren, the Warren-Key House is the preferred choice. Further, the mill and dam association with Col. George Warren may not rise to a level of importance that would warrant inclusion. The mill is recommended not eligible under Criterion B.

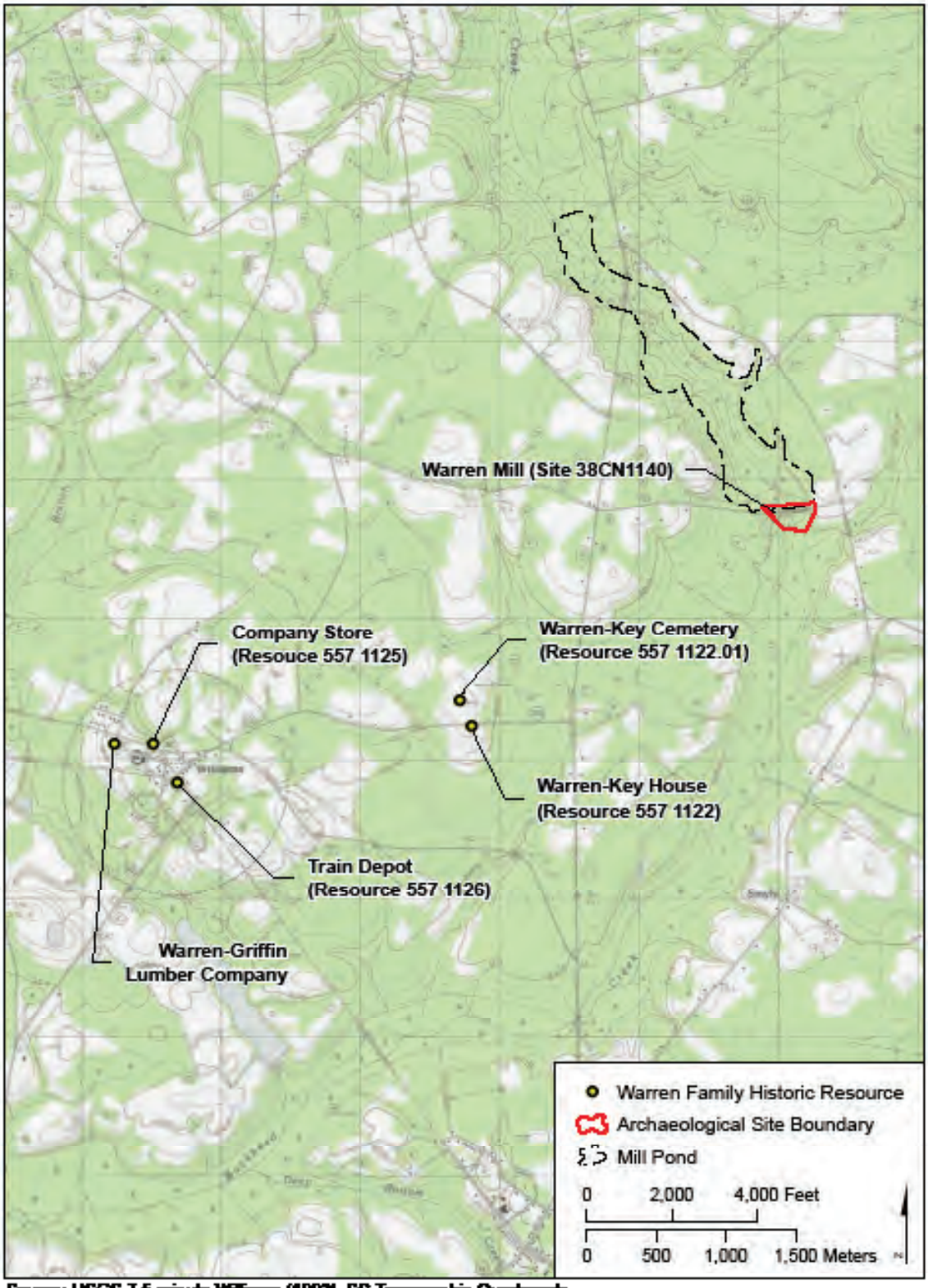
The excavation of the western channel was associated with late-nineteenth- or twentieth-century road construction activity. This excavation exposed timber-framing and planking used to raise the core of the embankment. Although probably not the work of a master, the mill site stands as an example of how an individual frontier landowner sited a dam and mill on the landscape they owned. Site 38CN1140 can be seen as representative of vernacular engineering that considered topography, materials, and needs to create an appropriate design. Given the comparatively small number of mill sites studied in the South Carolina Coastal Plain, we presently lack sufficient data to determine whether the elements are representative of a local or regional building tradition. Additional work is needed to evaluate the site under Criterion C.

Water-powered mills were systems composed of elaborate activity areas and engineering features. The archaeological examination has shown that the Warren sawmill remains are still present at Site 38CN1140. Based on these remains, we can identify the principal activity area for the sawmilling operation. Site 38CN1140 retains integrity and its preservation has the potential to benefit research on Antebellum and Reconstruction era sawmill operations and milldam construction practices. It also is associated with the working life of a significant individual and the economic development of the region. New South recommends Site 38CN1140 as eligible for the NRHP under Criteria A and D.

As suggested by Arnott et al. (2013), the evaluation of a resource such as this is most accurate when it is placed within a broader context. There are a number of other noteworthy historic resources associated with the timber interests of the Warren family and with the family itself in the vicinity of the mill remains. These include the circa 1840 Warren-Key House, the Warren-Key Cemetery, and multiple resources within the town of Williams e.g., the Warren-Griffin Lumber Company sawmill, company store, train depot, and worker houses. These resources could be combined to create a discontiguous district. A full assessment of all of the historic resources within Williams is beyond the scope of this project. However, an evaluation of the resources examined including the Warren-Key House and Cemetery, Warren-Griffin Lumber Company, and Warren Mill remains indicates that there is a discontiguous district. It is recommended eligible for the NRHP under Criterion A on the local level due to its association with the development of the timber industry in upper Colleton County. Given that the lumber company is still in operation, the period of significance extends from 1832, when the mill was built, until 1970. The district is also recommended eligible under Criterion C on the local level on the architectural strength of the Warren-Key House and Warren-Griffin Lumber Company. The Warren-Griffin Lumber Company in particular is unusually complete, retaining both original buildings and historic equipment. Further study of the historic resources in the Williams area including the lumber company and other buildings is recommended to determine the final components of the Warren Family Mill District.

The location of various components of the district is shown in Figure 29. Please note that certain resources within Williams, such as worker's houses, have not been identified. The contributing resources for the district are as follows: the Warren Mill (Site 38CN1140), the Warren-Key House (Resource 557 1122), the Warren-Key Cemetery (Resource 557 1122.01), the Warren-Griffin Lumber Company (unassigned), company store (Resource 557 1125), and train depot (Resource 557 1126). A number of residential resources in Williams require further evaluation to determine their contribution.

Figure 29.
Warren Family Mill District, Known Resources



Source: USGS 7.5-minute Williams (1982), SC Topographic Quadrangle

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