

ANNABELLA: A NORTH AMERICAN COASTING VESSEL

A Thesis

by

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Submitted to the Office of Graduate Studies of
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in partial fulfillment of the requirements for the degree of

MASTER OF ARTS

May 1998

Major Subject: Anthropology

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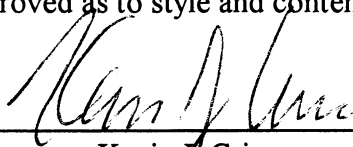
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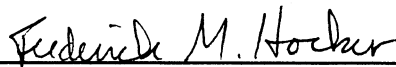
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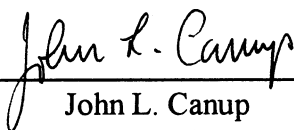
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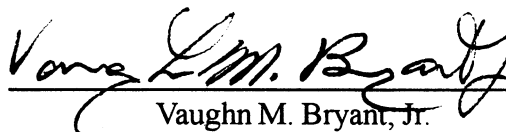
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ABSTRACT

Annabella: A North American Coasting Vessel. (May 1998)

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The coasting schooner *Annabella* was built at Port Elizabeth, New Jersey, in 1834. Originally constructed as a sloop, the vessel was built specifically for transporting raw materials such as cordwood, brick, coal, and perishables to markets and industries along the northeast United States coast. During its lengthy 50-year career, ownership of *Annabella* was transferred among numerous merchants in Philadelphia, Plymouth, Boston, and, finally, Cape Neddick, Maine. The vessel was finally abandoned on October 17, 1885, in the Cape Neddick River, in Cape Neddick, Maine, beyond repair and no longer fit for service.

This study covers the following topics: the 1994 and 1995 archaeological field seasons, including hull and artifact descriptions and analyses; the history of the coasting trade and the cordwood industry during the 19th century in the vicinity of southern Maine; and an analysis of historical documents that detail the history of *Annabella*. Toward these ends, this thesis will present a description and analysis of a type of craft that once was common to the eastern seaboard, including discussions about how the craft was designed and built for transporting specific cargoes, and how this ship may be representative of maritime activities and shipbuilding technologies of the 19th century.

ACKNOWLEDGMENTS

Many individuals have contributed to this research project; without their support, interest, and dedication, it could not have been a success. The author wishes to thank the archaeological staff of the Institute of Maritime History (Mason Palmer McDaniel, Christopher Ellis, and Samuel Turner), and those individuals who volunteered their time on the wreck site. I would like to thank the following organizations and individuals for their invaluable assistance: Old York Historical Society of York, Maine, which provided office and storage facilities; Molly Carlson of Bath, Maine, for the conservation of wooden artifacts; Dr. Alaric Faulkner of University of Maine at Orono for iron conservation; Guy Denoux of the Geochemical and Environmental Research Group, Center for Wood Anatomy Research in Madison, Wisconsin; the support and advice of Dr. Kevin Crisman of Texas A&M University; Dr. Robert Bradley of the Maine Historic Preservation Commission; contributors Mr. Neil Rolde, Dr. Anna Marguerite McCann, and the members of the Institute of Maritime History. A very special thanks is extended to Sivert, Margareta and Ingrid Claesson for their tireless energy and support.

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INTRODUCTION

In 1995 the Institute of Maritime History conducted an archaeological investigation of the 19th-century coasting schooner *Annabella* in Cape Neddick, Maine. This type of craft, though ubiquitous on the eastern seaboard in the 19th and early 20th century, had never before been documented in an archaeological setting in New England. *Annabella* was primarily involved in the transportation of cordwood along the east coast of the United States, demonstrating the pivotal role that Maine played in America's economy, supplying other states and Caribbean islands with raw materials such as timber, stone, ice, lime, and agricultural goods. *Annabella's* heavily-built, shallow-draft hull was ideal for transporting bulk cargoes through the shallow tidal inlets of New England. Built in New Jersey in 1834 and finally abandoned in Cape Neddick, Maine in 1885, *Annabella* endured over 50 years of service, surviving the antebellum coasting trade, the Civil War, and post-Civil War period. The study of this vessel provides us with a detailed look at the 19th-century coasting trade.

The wreck site was first surveyed in 1994 by graduate students from Boston University and Texas A&M University, and an excavation of the derelict vessel by the Institute of Maritime History (IMH) followed in 1995. The excavation and study of *Annabella* included complete documentation of the hull remains and the recovery of artifacts associated with the vessel. The primary objective of this investigation was to examine a type of craft that had never before been archaeologically documented in New England.

Documentary research of *Annabella* has provided important information in the identification and history of the vessel, and to a limited extent, the social and economic

This thesis follows the style of *Northeast Historical Archaeology*.

factors that affected the development and decline of the coasting trade in the 19th century. Documents that contribute to the historical background of *Annabella* include primary sources such as enrolment records obtained from the National Archives, ledgers from a private collection in Cape Neddick, Maine, and manuscripts from Old York Historical Society in York, Maine. These records provide information concerning cargoes that were shipped by the vessel and related items such as bills for wharfage, repairs, and outfitting; the owners of the vessel; descriptions of various structural changes; the schooner's use during the 19th century; and ports of call.

In discussing the maritime history of southern Maine and specifically Cape Neddick, economic and environmental factors will be considered in both the rise and decline of the coasting trade in this region. Primary resources have been compiled to analyze the industries and raw materials of the region and the geographical factors that facilitated and affected the coasting trade.

The shores of Delaware Bay, particularly southern New Jersey, have given rise to a variety of vessel types for transporting agricultural and timber products to markets throughout the Americas. A study of the shipbuilding industry of Delaware Bay, principally sloop and schooner construction, will increase the understanding of various construction techniques and the shipbuilding traditions that created shoal-draft coasting vessels.

Analysis of hull data recovered from the 1995 excavation season will be the primary focus of this study. This material includes excavation methodologies, descriptive and graphic catalogs of hull timbers, and an overview of artifacts collected from the field. The hull remains of *Annabella* are not sufficiently preserved to permit a complete reconstruction of the vessel (i. e., lines and construction drawings), but do allow the extraction of significant insights into the design and construction of the vessel. Site plans of the hull, section drawings, scantling lists, and details of construction features will be presented. To

gain further insight into *Annabella*'s hull form, research has also focused on acquiring comparative material to form an accurate representation of *Annabella*'s design and construction. Sources for this study include plans of Delaware Bay sloops and schooners obtained from the Independence Seaport Museum and historical societies of southern New Jersey. In addition, libraries in Maine have been queried for comparative material.

A small collection of artifacts were recovered and conserved from the site but are still undergoing analysis. The artifacts, consisting primarily of 19th-century glass and ceramics are summarized here, but a full description, analysis, and discussion of distribution patterns will be addressed in future publications.

These archaeological and documentary sources will ultimately provide a detailed picture of a vessel that was specifically designed to carry cumbersome cargoes such as cordwood and brick through the shallow inlets and tidal rivers of the eastern seaboard. Ultimately, the analysis of *Annabella* has illuminated typical trade patterns of coasting vessels, and contributes to our knowledge of design and building of 19th-century American watercraft.

GEOGRAPHICAL AND HISTORICAL BACKGROUND

Geographically, Cape Neddick, Maine, has a diverse landscape, which includes mountains, lakes, rivers, coastlines, marshlands, extensive forests, and pastureland all located within a region of approximately 20 square miles (FIG. 1). Access to timberlands was afforded to Cape Neddick via its relatively short tidal river and swift freshwater upriver section. Though the upriver portion of the Cape Neddick River is no longer navigable, its potential for water-driven saw, grist, and fulling mills was quickly exploited. It has been suggested that the lumber industry began simultaneously with the first settlement, and that a sawmill was built in York as early as 1637 (Wood 1971: 27). The source for the Cape Neddick River is Chase's Pond, three miles (4.82 km) long and nearly a half-mile (.80 km) wide, which currently serves as the water supply for the Town of York. The recent damming of the pond has altered the environment significantly by restricting the flow of water into the lower, tidal portion of the river. The tidal river played an important role in the development of Cape Neddick, as tidal crests were also used to supply power to mills.

In the immediate vicinity of *Annabella's* remains, topographic features consist of low-level terrain with few elevations rising 100 feet above mean sea level (FIG. 2). The coastline and harbor are primarily wetland and beach with interspersed rock outcrops, while areas further inland consist of Lyman rock outcrops and soils, as well as pockets of Raynum and Scio family soils (Flewelling and Lisante 1982: 35-38). In the tidal and marsh areas of the river, the soil is composed primarily of sulfhemists, or organic material derived from saltwater marsh grasses. Man-made architectural features, such as the current Cape Neddick Bridge that crosses the mouth of the river, may be partially responsible for the development of sulfhemists. After an earlier wooden-piled bridge was replaced by the current cement and earthen bridge, built by the U. S. Army Corps of Engineers in 1923, the water channel shifted and silted up the harbor and river.

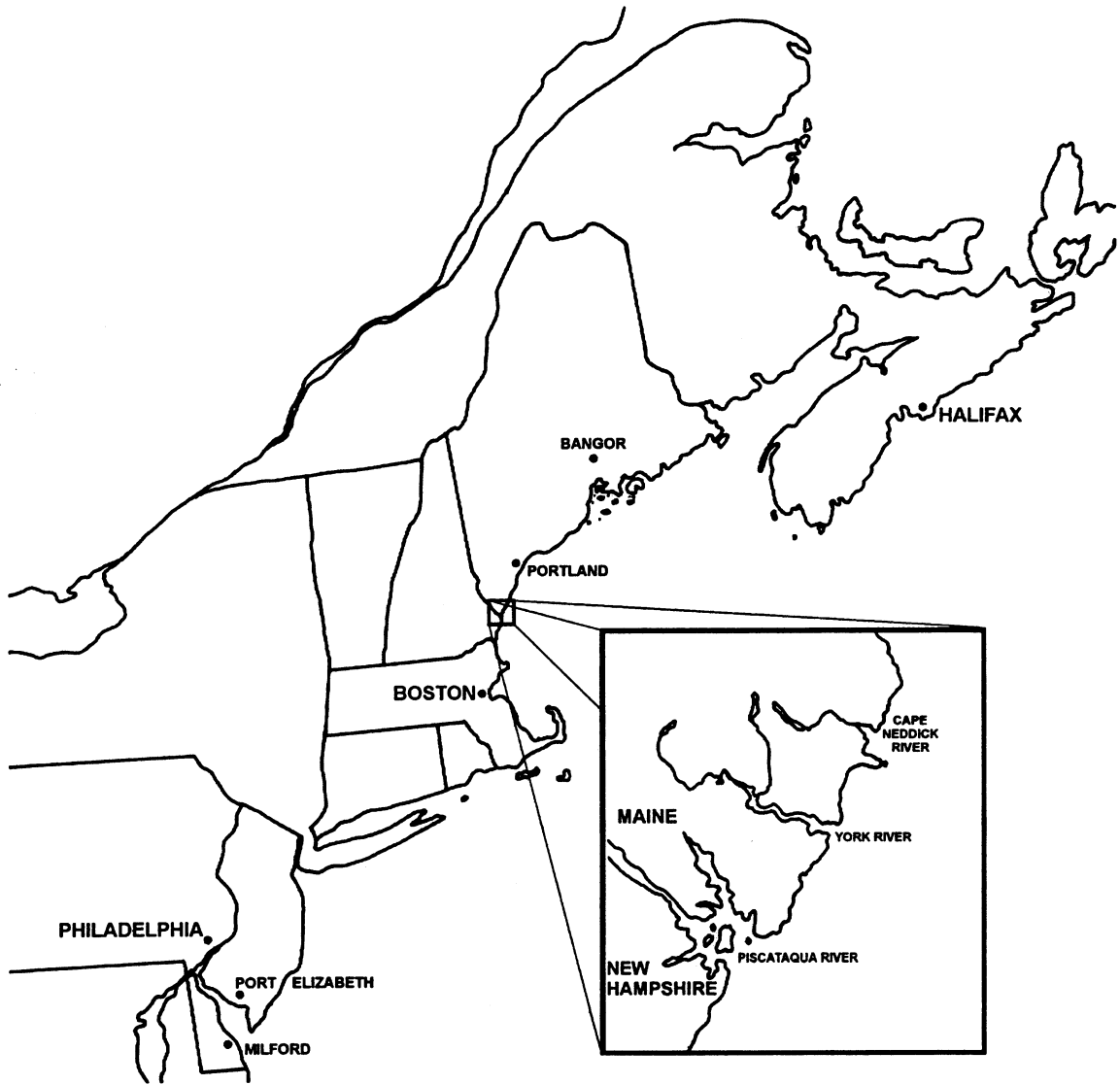


Figure 1. The site of *Annabella* is located at the southern tip of Maine in Cape Neddick.
(Drawing by Stefan Claesson)



Figure 2. A detail of the USGS York Beach 7.5 minute topographic quadrangle map showing the location of Annabella (United States Department of the Interior Geological Survey 1989).

The jutting peninsula of Cape Neddick and the isolated peak of Mount Agamenticus served as excellent navigational aids throughout the centuries (FIG. 3). Mount Agamenticus has an elevation of 692 feet; its proximity to the coast and surrounding low topography make it an extremely visible landmark to seagoing vessels that are within a half degree of the 43rd parallel (Banks 1967: 3). The accessibility of the town to southern New England markets was also a factor that led to its early settlement.

The first known European explorer to the area was Giovanni de Verrazano (1524), who was guided to Cape Neddick by the Agamenticus promontory and visited the peninsula of Cape Neddick where the Cape Neddick Lighthouse now stands. Although his stay was not long, he was greeted by those whom he termed “barbarous” Native Americans (Spencer 1930: 122). On May 14, 1602, Bartholomew Gosnold was the next to investigate the Cape Neddick peninsula, which he named “Savage Rock,” as it was the location that Native Americans first presented themselves to the explorer (Banks 1967: 32). The topographical features of Cape Neddick were used as a navigational aid for most explorers who followed the Maine coast to and from the West Indies and the European mainland. It was during these early explorations of the New World that the southern Maine and New Hampshire coasts were first noted for their extensive forests, fine farming land, protected harbors, and penetrating rivers.

In 1614, explorer and surveyor John Smith recognized during his survey of the New England seaboard that “Accominticus [Agamenticus or York, Maine] and Passataquack [Piscataqua or Portsmouth, New Hampshire] are two convenient harbors for small barks” (Spencer 1930: 124). The land-based resources of York were first noted by Christopher Levett in 1624, who thought it an area where “a good plantation may be settled, for there is a good harbour for ships, good ground, and much already cleared, fit for planting corn and other fruits, having heretofore been planted by the Salvages who are all dead. There is good timber, and likely to be good fishing, but as yet there hath beene no



Figure 3. An 18th-century chart illustrating (a) the location of Cape Neddick (C. Nedock) and environs, and (b) seaward elevations of the Agamenticus Hills (Blunt 1815).

tryall made that I can heare of,” (Spencer 1930: 124). It was not surprising then that York and Cape Neddick would be settled in 1630, shortly after the pioneering Pilgrims set foot at Plymouth.

The geography of Cape Neddick was extremely conducive to settlement due to its well-protected natural harbor and navigational aids, extensive native forests, pastureland, and potential for water-driven mills. The principal landing, where the river widens to a marshy bay, developed as the main shipping and milling area and survived as the primary manufacturing and trading center in Cape Neddick for over 300 years (FIG. 4). However, only vessels with a draft of ten feet or less could navigate the shallow and narrow channel of Cape Neddick River. Sloops and schooners would navigate through the river at tidal crests, and sit aground with the fall of the tide. The shallow nature of this tidal river allowed only ships that were fairly shallow-drafted to traverse a number of submerged sandbars. Nevertheless, larger ships were not prohibited from entering, as vessels nearly 100 feet in length were capable of loading lumber at the landing area (Goodwin 1832-1882).

The forest and fishing resources led to the early acquisition of a “water-course there called by the Name of Cape Nuddock Creek” by Edward Godfrey in 1638 (York Deeds 1894, 8:120). The first concerted attempt at development of Cape Neddick was in 1649, primarily by fishermen John Ball, Thomas Waye, Sylvester Stover, and Michael Powell (York Deeds 1887, 1:14). Sylvester Stover also had the largest fishing station in York and was the ferryman for the Cape Neddick River during this early period. Some years later, in 1733, the Stover family sold a large tract of land to William Pepperrell, who was well known for his monopolization of the shipping industry in and around the Piscataqua region at that time (York Deeds 1894, 15: 204).

Cape Neddick was repeatedly devastated by Indian attacks in the 17th century, but the opportunity for growth through the exploitation of natural resources in Cape Neddick

Pasture lands belonging
to this estate,

Plan of Mowing, Millage, Orchardage and Wharf.

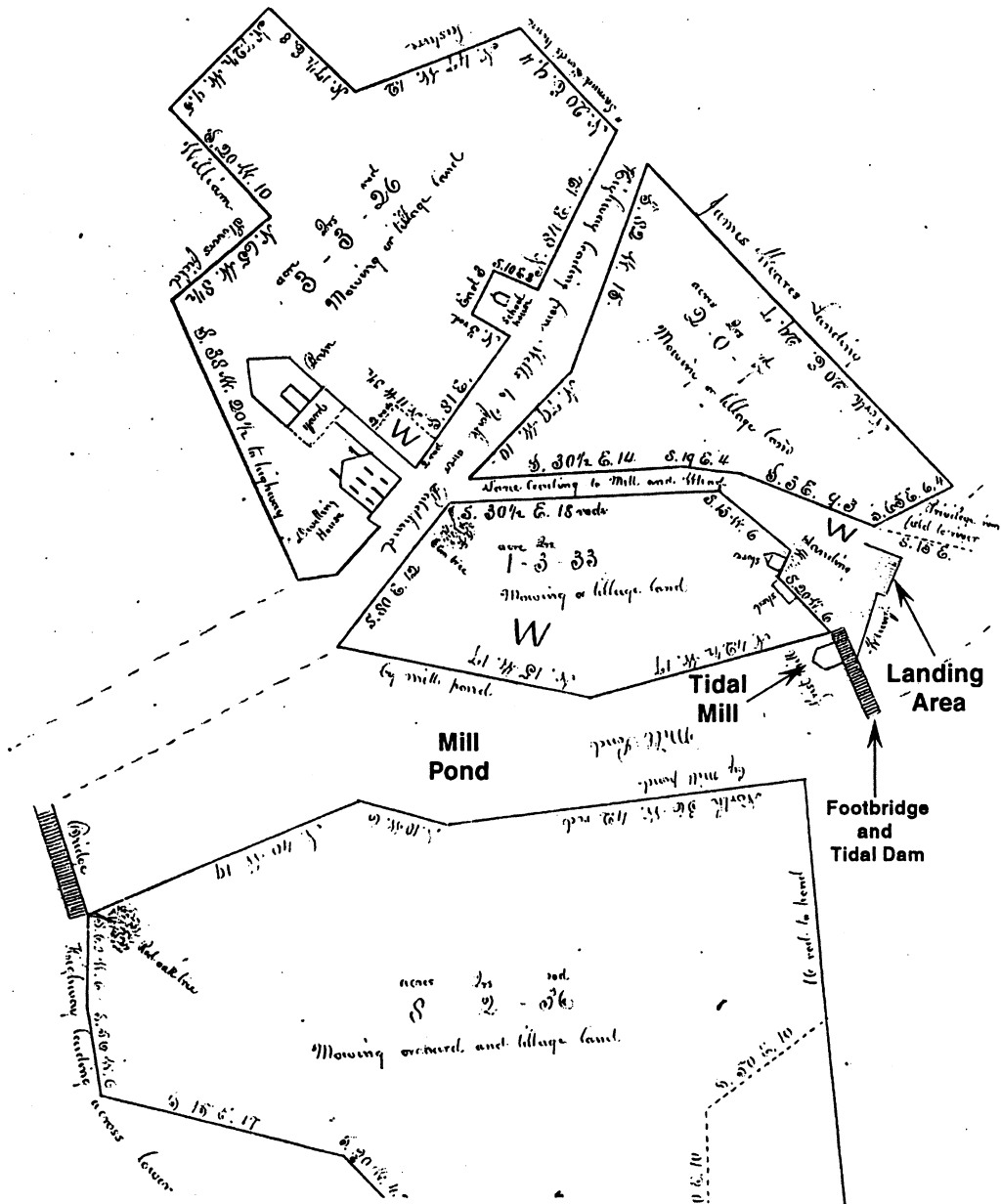


Figure 4. Historical map (1821) showing landing area, mills, and mill pond (Norton 1821: 26).

quickly led to the construction of some of the earliest mills built in North America. These mills became the basis for the permanent establishment and growth of the settlement. The earliest recorded use of waterpower began slightly before the outbreak of King Philip's War. Settler John Smith was the first to take advantage of the local timber resources and begin large-scale lumbering operations, although subsequent Indian raids destroyed his mill. Few documents are left pertaining to John Smith's mill, and the only reference to it states that Smith was required to pay the town 4000 feet of "merchantable pine boards annually" for use of land granted to him in the 17th century (Banks 1967: 10). The first reference to the construction of a sawmill in Cape Neddick is a 1671 deed that mentions one owned by Henry Sayward; the original construction date and location of this mill is unknown, however (York Deeds 1887, 2: 130).

Shipbuilding also began early in Cape Neddick. In 1689, Samuel Banks acquired land where he operated a shipyard on both banks of the river. By 1690, the river was attracting shipbuilders and sawyers from other European colonies. Samuel Webber was the most ambitious of these colonists. In 1693, he received a grant to build corn and fulling mills, and in 1703, he expanded his milling industry in Cape Neddick to saw, grist, shingle, and cording mills. These industries, along with the fishing industry, which was the most enduring commercial use of this area, firmly established Cape Neddick as a leading supplier of raw materials in southern Maine. Natural resources, such as fish and timber, were exported to markets in the West Indies and the Atlantic seaboard throughout the 17th and 18th centuries.

The Clark and Weare families of Cape Neddick also established mills and shipyards, and the shipping industry quickly absorbed the manpower of the community by employing citizens as mariners. Although census records are not available for Cape Neddick until 1860, the majority of the population was undoubtedly involved in maritime enterprises throughout the area's history. The fishing and lumber industries grew rapidly,

and York County was the leader of both industries in production and trade in the 17th and 18th centuries. In 1800 41.2% of tonnage ownership in the Custom District of York was for fishing vessels (O'Leary 1996: 305). By 1805 the Penobscot, St. Croix, and St. John fishing industries had expanded dramatically, leaving the York Custom District with a mere 3.2% in tonnage ownership of fishing vessels (O'Leary 1996: 305). This percentage change does not indicate that the fishing industry in Cape Neddick and York was in decline, but rather that other districts developed quickly and overshadowed the capabilities of the York Custom District in the 19th century.

The Weare and Goodwin families were the most prolific of York's West Indies traders in the 17th and 18th centuries and were primarily involved in the export of lumber, fish, and agricultural products. The types of ships that traded with such distant places as Martinique, Guadeloupe, Nevis, St. Thomas, Puerto Rico, Port au Prince, Trinidad, Havana, and Santo Domingo from York and Cape Neddick were primarily schooners and brigantines designed to carry heavy cargoes. Upon arrival in the Caribbean, markets were sought for the sale of lumber, potatoes, beans, fish, beef, butter, shooks (sets of staves and heads for a hogshead or barrel, prepared for use and stored in pieces for increased cargo capacity), heading pieces, barrel hoops, staves, and bricks (Grow 1820). Hogsheads of molasses and sugar were the most common types of cargo to return to the Northeast, though a number of West Indies spices, confections, liquors, and manufactured goods were also brought back to southern Maine (Lindsey 1820).

Following the War of 1812, there was a sharp increase in the exploitation of Maine resources, rapid growth of many port towns and cities, and development of inland regions via roads and canals, all of which resulted in further expansion of the coastal trade (Chapelle 1960: 40). United States vessels were officially excluded from trading at British West Indies ports after the War of 1812, but this action did not greatly hinder American merchants. British merchants were also profiting from trade between the West

Indies, United States, and European ports. The United States responded to the British exclusion of American ships in the British West Indies by closing U.S. ports to British ships arriving from colonies that were closed to American ships. British exports to America dropped, and in 1822 the British government allowed certain American articles to be imported to the British West Indies with the condition of a 10% duty (Wood 1971: 207). In turn, the U.S. Government insisted that American goods should be admitted to British colonial ports on an equal basis with European goods.

The political struggle and market boycotts by both the British and American governments continued until Andrew Jackson finally arranged the Reciprocity Treaty of 1830, which allowed trade on an equal basis (Wood 1971: 207). Typically, American lumber was brought to the West Indies in exchange for rum, sugar, and molasses. Great Britain continued to discriminate against American shippers, but American ships were still able to profit by trade directly with British colonies. The preferential treatment of British shippers and lack of good markets was even felt in Cape Neddick, as it was often difficult to find a British market that would accept Maine products. In the early 1800s, the schooner *Gold Hunter* was forced to travel from island to island in the Caribbean until a sale was made, often resulting in the loss of perishable cargoes such as potatoes and other agricultural goods that had to be heaved overboard (Weare 1859).

The growth of the lumber trade in the West Indies and along the Atlantic Seaboard stimulated the shipbuilding industry and increased the demand for trading vessels designed specifically for carrying heavy cargoes. Before 1820, many varieties of vessels were used to transport goods to the West Indies. After 1825, construction of sloops was overtaken by the construction of schooners, with the coasting trade constituting a large portion of the American merchant marine (Chapelle 1960: 40). Schooner-rigged vessels approximately 50 to 70 feet in length eventually became the most commonly employed type, as sloops of comparable size required too many hands to operate efficiently. When the West Indies

trade declined circa 1860, trading shifted to domestic markets and the coaster was developed specifically for trade along the Atlantic seaboard (a coaster is defined, generally, as any sailing vessel carrying cargo from one coastal port to another).

Generally, trade shifted from the West Indies to domestic markets throughout the United States when domestic markets became more profitable because of a dramatic increase in the number of industries and increasing population in urban areas. With its vast natural resources, Maine continued to process timber for markets and maintained a strong shipbuilding industry, as it had throughout the 17th and 18th centuries. Industries on the Atlantic seaboard increased their demand for raw materials from Maine not only in the form of timber, but also brick, lime, ice, and hay.

The composition of imports and exports in Cape Neddick remained relatively unchanged, then, for nearly 250 years. The origins of the lumber industry in Maine were in Kittery, York, and Cape Neddick. Timber resources in Massachusetts, Connecticut, New York, and New Jersey were almost depleted soon after the War of 1812, and these states relied on Maine as the primary supplier of cordwood, laths, clapboards, shingles, staves, headings, and barrel hoops. The forests of Cape Neddick and southern Maine were likely among the first to be exhausted because of their proximity to markets such as Boston and because they were the earliest to be exploited. When resources were depleted in southern Maine, lumbering spread north and east in search of virgin forests.

The depletion of timber was apparent by 1850, when Maine began importing southern pine and timber from New York for its own shipbuilding industry (Wood 1971: 224). The shipping of timber continued for the coasting schooners of Cape Neddick, however, through shipping contracts from timber firms in Bangor and communities located further Downeast (Downeast is a geographic term that refers to an eastward destination or location of one's position within the limits of the northeast coastal region of North America [O'Leary 1996: 16]). Maine's northeastern forests continued to supply both the

shipbuilding industries in the state and domestic industrial markets with raw and manufactured timber products well into the 20th century. Cape Neddick also continued the lumber trade into the 20th century, but a wooden-piled bridge built in 1893 and an electric railroad constructed in 1897 across the Cape Neddick River restricted sloops and schooners from reaching the landing area where mills and wharves were located (York Town Report 1893: 22-24; Bardwell 1986: 66).

By the mid-19th century, schooner-borne trade was focused along the New England coast. Boston was the most frequently visited port for Cape Neddick vessels, as it was a mere 60 miles away from the southern Maine coast; however, transport of foodstuffs, merchandise and lumber products was also extending north to Halifax and townships around the St. Lawrence Bay. By the 1840s ports of call for Cape Neddick vessels had altered significantly, and in place of the individuals and families that had represented the backbone of the Maine lumber industry prior to that time, the mid-19th century witnessed the development of lumbering associations (Wood 1971: 29).

One result of this economic development was that a number of Cape Neddick schooners and sloops were contracted to load cargoes at Bangor, Cohasset, Wells, and other ports further up the Maine coast (Ferguson & Jewett 1825). Cargoes that originated from Cape Neddick also became increasingly diverse, including a variety of country goods such as eggs, mittens, socks, cider, and corn (Goodwin 1832-1882). In addition, clay, sand, brick, and lime were shipped to markets (Weare 1859). Rough-cut lumber remained the most common export of Cape Neddick, although a number of new timber products were introduced in the mid-19th century such as laths, shingles, and cedar posts (Weare 1859).

Throughout the 19th century, hemlock was processed and transported to markets more than any other type of timber in Cape Neddick. The forests of Cape Neddick contained a number of hardwoods (ash, maple, and red oak) and softwoods (pines), but the

fellings and processing of hemlock far exceeded other wood types. Hemlock processing began to increase in the 1830s concurrently with the tanning industry of southern Maine; hemlock wood was used as coarse lumber in construction, and the bark was used for tanning (Wood 1971: 24). Families in Cape Neddick engaged in tanning was probably on a small scale, since no tannery is listed in census records for the second half of the 19th century. York County, however, had the highest valued tanneries in Maine in 1820, leading the state in tanning production with 101 establishments (Wood 1971: 183).

Late 19th-century ledgers for sawmills in Cape Neddick contain detailed records of the types and quantities of lumber produced (Talpey 1871). The Talpey Mill (1871-1882), one of at least five mills in operation in Cape Neddick during this period, produced approximately 60,000 feet of sawn timber per year. It is apparent that Cape Neddick was not competing with other ports and mills in lumber manufacture, as even an 18th-century mill was expected to produce approximately 600,000 board feet yearly (Wood 1971: 159). In fact, the Talpey records indicate that products were almost entirely absorbed by local use. Surplus resources in the form of sawn boards and planks were not readily available, and the Talpey Mill was not in a position to supply large quantities of lumber.

Timber production in Cape Neddick, however, was negligible in comparison to the processing of lumber at Orono, which produced over sixty million feet of lumber in 1854. The meager timber production in Cape Neddick during the second half of the 19th century was largely due to the extensive deforestation that had occurred in York County in the late 18th and early 19th centuries. By 1860, York County could no longer supply large quantities of pine, which was in high demand, while northern Maine, particularly the Penobscot River Basin and Aroostook County, still had extensive tracts of red pine, white pine, and pitch pine (Wood 1971: 33).

The lack of pine in Cape Neddick is shown in the records of the Talpey sawmill, which averaged only 8200 feet of pine lumber per year throughout its operation. In comparison, the production of hemlock lumber averaged nearly 12,000 feet each year from 1871 to 1882. It is surprising that pine was still being cut in Cape Neddick at all, as warnings of the disappearance of the pine began as early as the 1840s (Wood 1971: 46). Despite a declining supply of timber in Cape Neddick, one advantage of the area was that wood could be cut and shipped year round. While the majority of other timber-producing rivers had to wait until the ice thawed to ship out their lumber, the tidal river in Cape Neddick never froze, allowing ships to enter and load cargoes throughout the winter season.

The production of cordwood in Cape Neddick was intense for good reason; as early as the middle of the 18th century, firewood in the Boston area was depleted (Wood 1971: 178). Cordwood was often mentioned in cargo manifests and vessel ledgers, though it rarely appears in sawmill records and then only in reference to the production of slabs. The amount of cordwood produced in Cape Neddick is difficult to determine, although cordwood was still being stacked to a height of 10-20 feet along both sides of the river for approximately one mile upriver from the harbor mouth in the early 20th century (personal communication, Harry Hutchins and Robert Morin 1997). Cordwood and slabs were used not only for firewood in New England homes but were also important for fueling the glass and ceramic industries and powering railroad locomotives in the second half of the 19th century.

The census records of 1870 indicate the extent of maritime activity in Cape Neddick during the second half of the 19th century. Cape Neddick had 50 individuals enrolled as fishermen or mariners, while the communities of York Village, York Harbor, York Beach, York Corner, Josias River, and York River had a combined total of 67 individuals engaged in maritime activities. It is clear through census records that Cape

Neddick was the primary regional center for marine-related activities. The percentage of the population employed as mariners increased from 43.8% in 1870 to 72.7% in 1880, with an almost parallel decline in the fishing population from 35.6% to 11.8% (United States Census). Individuals engaged in agriculture and lumbering activities constituted barely 10% of the population in 1870, but this percentage rose steadily from 1860 to 1900, when it reached 23.5%. It is unlikely that land-based occupations had risen higher than 10% in previous centuries. Cape Neddick was still primarily a fishing community, but the increase of mariners was likely the result of changes in trade patterns following the Civil War. At the close of the 19th century, however, the mariner population fell to 15.7% while the fishing population rebounded to 57.1%, the highest recorded percentage of fishermen in York since 1860.

These shifts in occupations are indicative of the changing economy of Cape Neddick and maritime activity on the eastern seaboard. The lumbering trade made the transition to industrialism with the paper industry, but the lumbermen of Cape Neddick were still functioning as individuals, in partnerships, and in lumbering associations and were unable to compete with new lumbering monopolies. Moreover, extreme changes in the environment of Cape Neddick, primarily the construction of a railroad across the Cape Neddick River, prevented masted vessels from reaching the wharves and mills upriver. Only smaller fishing vessels, therefore, were able to utilize the upper portion of the river. The milling and shipping industries quickly fell into disarray at the turn of the 20th century, when the railroad took over the transportation industry.

By the beginning of the 20th century, the schooners of Cape Neddick were no longer needed as the more efficient railway system replaced the coasting trade. Railroads were able to reach remote forests farther inland and could transport previously inaccessible lumber quickly and directly to markets. Another profound change in the economy occurred in the last decade of the 19th century, when the Cape Neddick district

began to develop as a summer resort town. The schooners of Cape Neddick were dealt their final blow in 1923 when the Army Corps of Engineers constructed a cement and earthen bridge that replaced the earlier wooden Passaconaway Bridge (York Town Report 1893: 29). This bridge altered the channel of the Cape Neddick River and resulted in the rapid siltation of the river and harbor of Cape Neddick, ending over 300 years of maritime subsistence. Buried in the silt at the mouth of the Cape Neddick River, however, was the coasting schooner *Annabella*, a legacy of the area's coastal trade that was fortuitously preserved throughout the 20th century.

EXCAVATION METHODOLOGY AND HULL CATALOG

Located in Cape Neddick, Maine, the remains of *Annabella* came to the attention of the Institute of Maritime History in 1993. The hull of *Annabella* lay partially exposed during low tide, lying on its port side; as a result, the starboard frames and planking had eroded noticeably, primarily as a result of the constant tidal changes in the river (FIG. 5). The port side of the vessel lay buried beneath the sediment, protecting the wood from decay and erosion. The visible features of the hull and its location in the shallow tidal flat suggested that it was a derelict vessel, laid up against the bank after it was no longer profitable to repair. The arrangement and sturdy character of the exposed timbers and its overall size suggested that the vessel was a 19th-century coasting schooner designed to carry heavy cargo such as timber or stone. Because no other vessel of this type and period had been excavated along the Maine coast, an in-depth analysis of the hull was expected to shed new light on a type of vessel that was in widespread use along the Atlantic seaboard,



Figure 5. The derelict vessel prior to the excavation. To the right is the bow of the vessel. (Photograph by Patrick Grace)

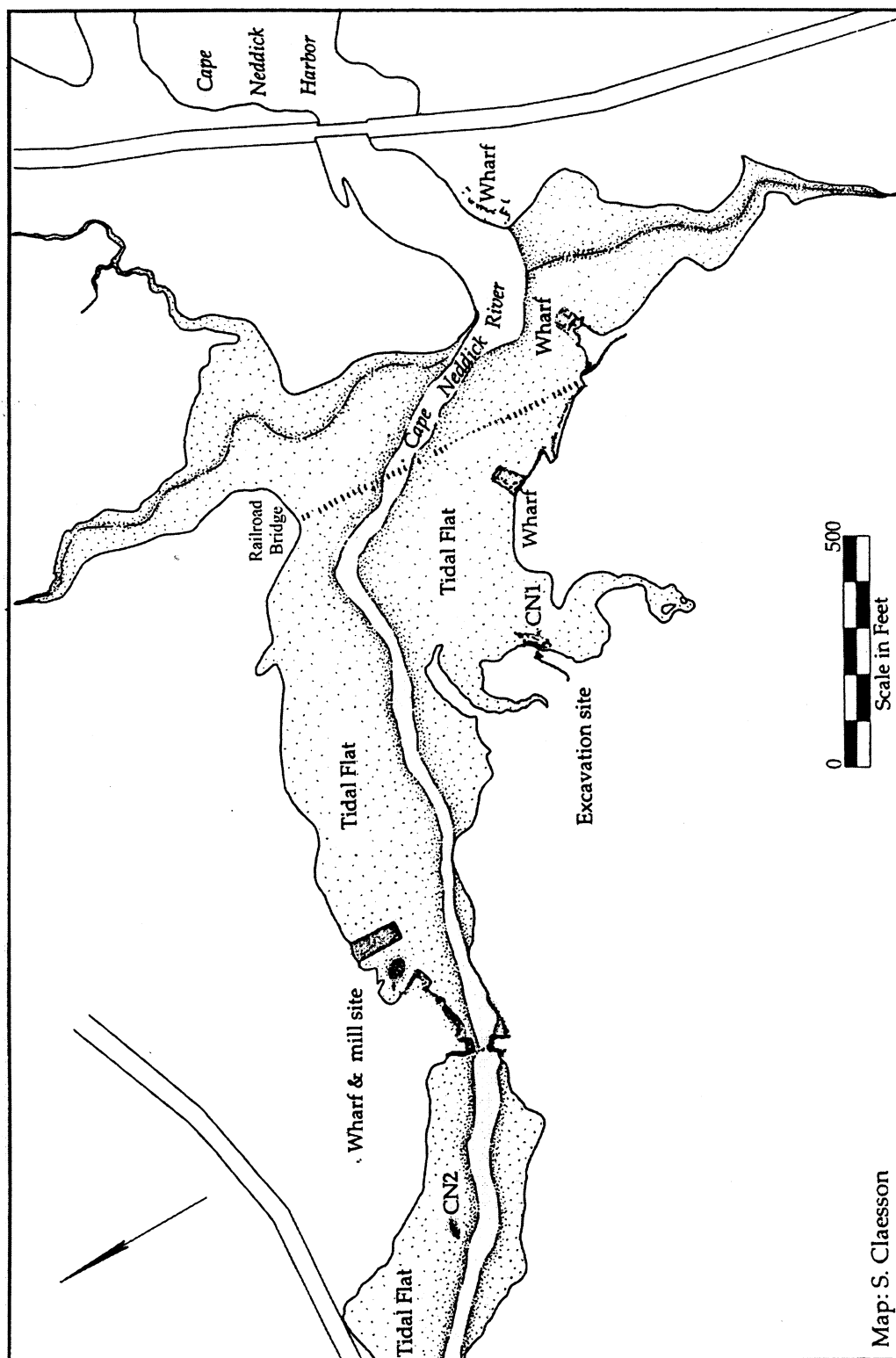


Figure 6. Detailed map of the Cape Neddick River and Harbor illustrating the location of wharves and the site of the excavation. (Drawing by Stefan Claesson)

with structural characteristics that could potentially typify schooners of the antebellum coasting trade.

The sediment that covered the port side of the hull had been deposited as a result of the construction of the current Cape Neddick Bridge at the mouth of the Cape Neddick River in 1923. The construction of the bridge narrowed the river channel significantly, restricting the flow of water and sediment out of the estuary and causing the rapid siltation of the river and harbor (FIG. 6). The construction of a railroad bridge across the river in 1897 eliminated access for all masted vessels to the mills and landing areas upriver (Bardwell 1986: 66). This consequence proved disastrous for the fishing and coasting trade in Cape Neddick, which was forced to succumb to the more efficient transportation of the railroad, and the local economy gradually shifted to the more profitable tourism industry. These factors were damaging to the traditional economy at the time, but they ultimately resulted in the preservation of a number of maritime archaeological sites in the Cape Neddick River basin, including the remains of *Annabella*.

Recording and Excavation Methods

The site of *Annabella* was originally surveyed in 1994 by five graduate students from Boston University and Texas A&M University. During the survey, the visible features of the vessel were mapped using a scaled drawing in conjunction with a theodolite to record the position of the ship's timbers, and a preliminary site plan was generated. The coordinates from the theodolite were then entered into an AutoCad file and plotted at the same scale as the site plan. Discrepancies in the locations of timbers in the measured drawing were adjusted using the coordinates obtained with the theodolite.

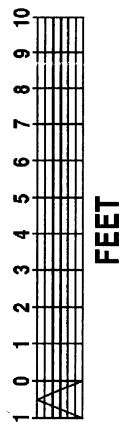
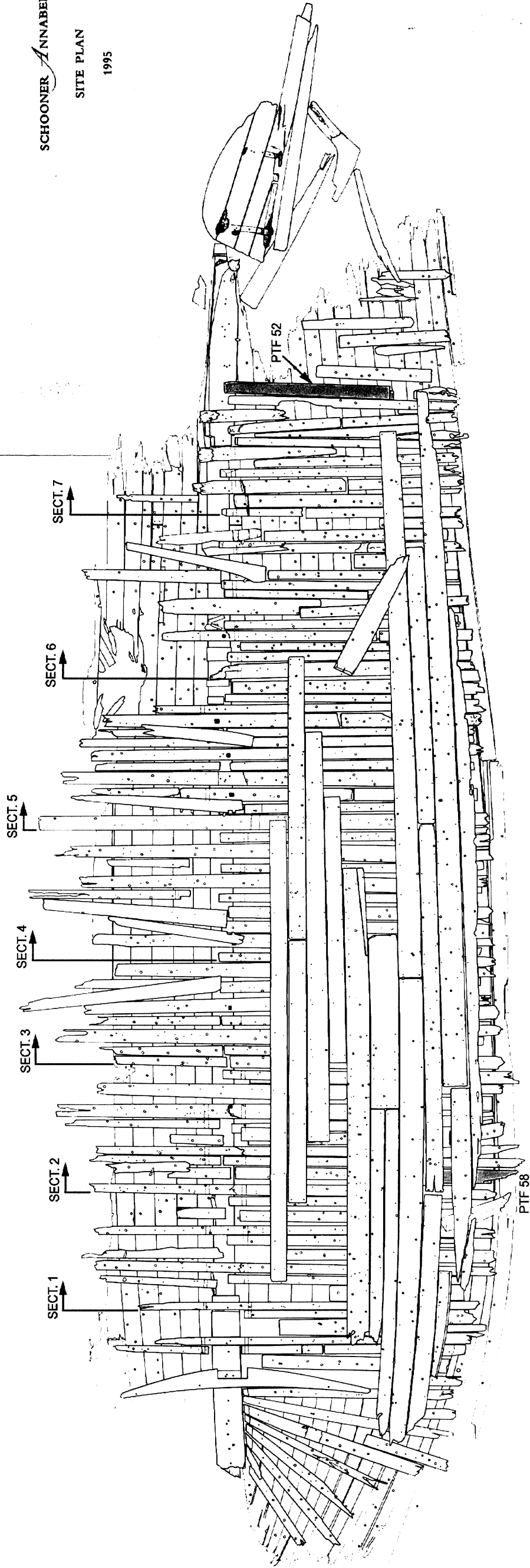
This preliminary survey was helpful for planning a complete excavation of the hull remains. Although the site was situated in a tidal flat and could be recorded with standard

terrestrial site recording techniques, IMH determined that the excavation would be a low-impact investigation. This decision was based on several circumstances, including the vessel's location in protected wetlands, a concern on the part of the Department of Environmental Protection that displaced sediment might alter the existing water channels, and the local community's request to maintain the visual aesthetics of the shipwreck. The excavation was also limited by tidal changes that allowed only a four-to-five-hour excavation period daily. Moreover, the site was not easily accessible because of the soft, knee-deep sediment covering the hull.

Using the probable location of the buried keel as a baseline, a grid composed of two-meter squares was established over the entire site. A local surveying company using a SOKKIA surveying instrument accurately located the coordinates of individual grid squares. Cedar posts were pounded into the sediment at the ends of grid, and string was stretched and leveled between the posts and marked at 2-meter intervals. Offsets were then taken from the grid using measuring tapes and plumb bobs in order to locate each timber, fastener, and artifact related to the hull (FIG. 7).

Transverse hull sections were recorded at approximately 3-meter intervals along the length of the hull to determine the shape of the preserved hull remains (FIG. 8). Again, marked and leveled strings were extended across the hull to record the sections. Generally, section measurements were recorded every 10 cm using plumb bobs and measuring tapes. Longitudinal sections were also taken at the bow and stern to illustrate the construction and dimensions of the keel, apron, deadwood, stern knee, and garboards.

The sediment overlying the site was cleared from each unit with shovels and trowels and placed into semi-permeable sandbags (FIG. 9). Placement of the sediment into the sandbags prevented the sediment from being redeposited elsewhere in the river, but did not allow the excavators to screen this material for smaller artifacts. We initially used shovels to remove the mud in approximately 1-inch layers from each unit. Layers of



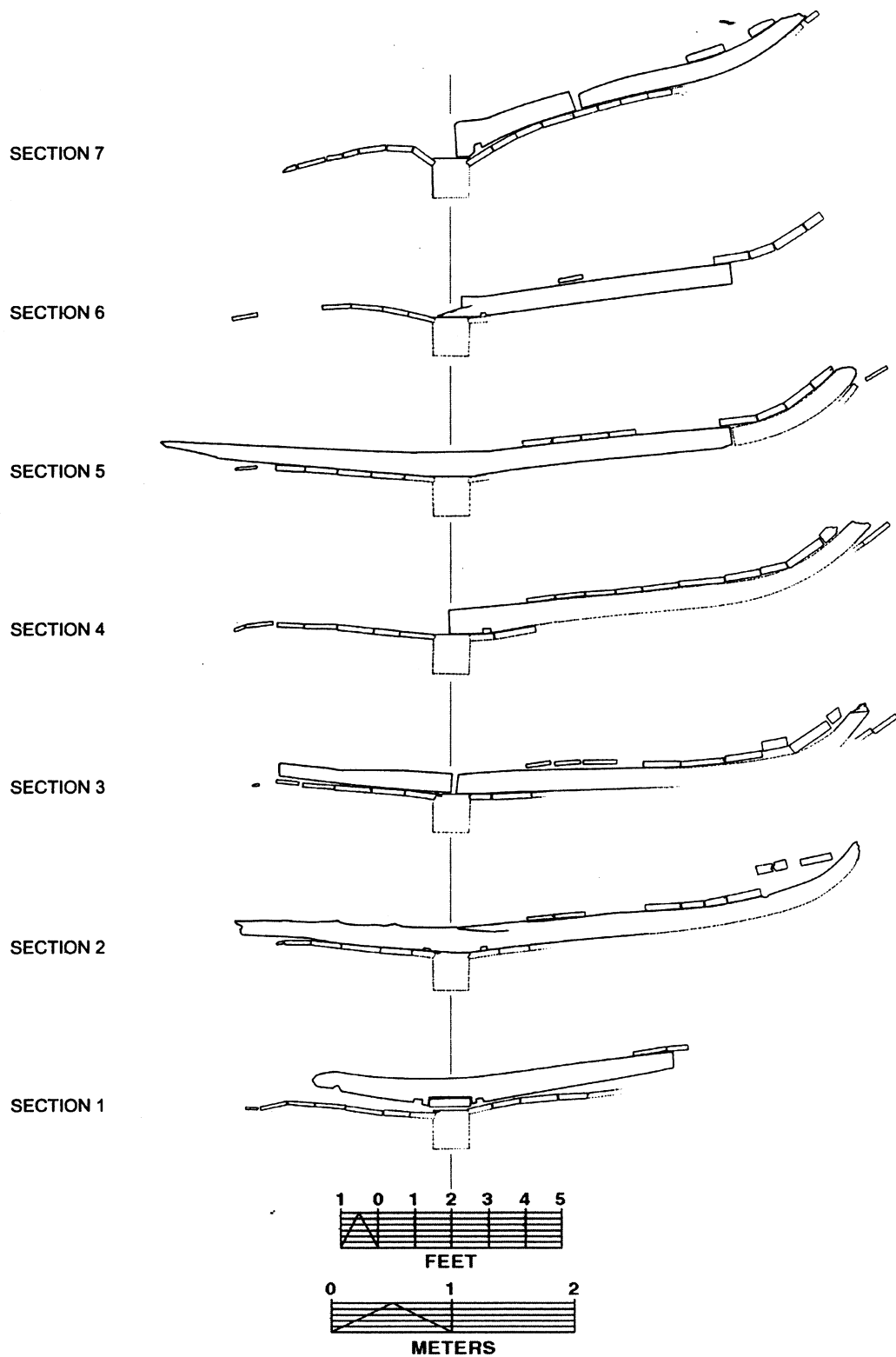


Figure 8. Hull sections were recorded at approximately 3-m intervals along the length of the hull. The locations of the sections are illustrated in Figure 7. (Drawing by Stefan Claesson)



Figure 9. The excavated remains of *Annabella* seen at low tide (facing the stern). Sediment excavated from the hull was put in semi-permeable sandbags and placed along the starboard side of the vessel. (Photograph by Christopher Ellis)

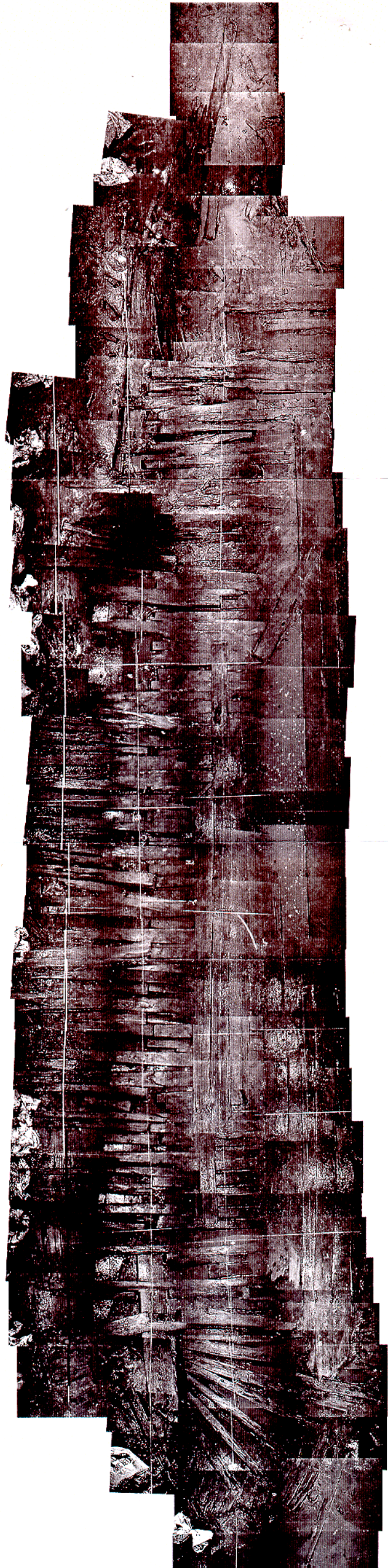
sediment that had accumulated shortly after the vessel's abandonment, trowels and wooden tools were used to scrape through these deposits, revealing *in situ* artifacts. The location of artifacts were mapped from the grid coordinates and each find was identified by material (ceramic, glass, wood, metal, organic) and recorded with a sequential numbering system (001, 002, 003, etc.).

Tidal changes limited time on the site each day to approximately five hours. Using hand pumps and snow shovels, the field crew first had to clear water from the bilge of the port side of the vessel for nearly one hour before excavation or mapping could begin. Water also had to be cleared from the site regularly during each 5-hour work day, for it would seep through the plank seams into the hull. The sandbags, however, were very

useful in diverting water from excavated areas and in creating levees that prevented water, for a limited time, from entering the hull during incoming tides. The excavated sediment in the sandbags was also used in the reburial of the wreck, which was easily accomplished in two days.

After the vessel was completely excavated, over 250 black and white photographs were taken of the exposed hull remains in order to create a photomosaic. A remote-controlled 35mm camera was mounted on a tripod at a height of approximately 2 meters. The grid lines were used to establish lanes along the length of the hull to control forward and lateral movement of the camera, and to ensure adequate overlap of the photographs. Following documentation of the vessel, the photograph negatives were digitized and placed on compact discs, and assembled using PhotoShop computer software (FIG. 10). Difficulties were encountered during this recording method, as there was not enough time to complete the photomosaic before tidal waters submerged the site. The lighting and weather conditions the following week, unfortunately, did not allow for the complete photographic documentation of the port side of the hull.

Individual timbers were also removed from the site for detailed documentation. A mast step, cant frame, and several stern frames and chocks were drawn at a 1:1 scale to document wood grain, fastening patterns, and tool marks. After inspection, the timbers were redeposited on the site to prevent further decay. Although the removal of ceiling may have further clarified the construction sequence and revealed other artifacts associated with the vessel, the planks were not removed from the hull in order to limit deterioration of the hull and to prevent any loose timbers from becoming navigational hazards for boats in the shallow tidal river. The project, with a full-time field crew of four archaeologists, required 3 months to excavate, document, and backfill the site.



Photomosaic of the hull remains.

Hull Remains

The vessel that we examined in 1995 experienced over a century of deterioration, and the timbers bore evidence of decay and damage. Each day, when water receded during low tides, leaving the schooner high and dry in the flats, a considerable amount of pressure was placed upon the hull. *Annabella's* upperworks had long ago disappeared, and only on the port side was the hull preserved to the turn of the bilge. On the starboard side of the hull, planking had fallen from the frames, distorting the shape of the lower portion of the hull. Floor timbers supporting the starboard side had also cracked amidships, and that entire side of the vessel had collapsed. Much of the bow structure was preserved, including cant frames, apron, and what appears to be a chock or the heel of the stem; in the stern, portions of the vessel's stern knee and rudder also survived.

Table 1. Maximum dimensions of hull timbers

Timber	Molded (cm)	Sided (cm)	Length (m)	Molded (in)	Sided (in)	Length (ft)
Keel	33.0	30.0	16.85	13.0	11.8	55.28
Apron	22.0	38.0	2.45	8.6	14.9	8.03
Stern knee	20.0	37.0	2.68	7.9	14.6	8.79
Deadwood	24.0	27.0	1.35	9.4	10.6	4.43
Mast step	23.5	26.9	2.25	9.2	10.6	7.38
Rudder						
Main piece	27.0	15.0	3.55	10.6	5.9	11.65
Middle piece	29.0	13.0	2.02	11.4	5.1	6.63
After piece	31.0	16.0	1.78	12.2	6.3	5.83
Inner piece	20.0	15.0	1.12	7.9	5.9	3.67

Table 2. Average dimensions of hull timbers

Timber	Molded (cm)	Sided (cm)	Width (cm)	Thickness (cm)	Molded (in)	Sided (in)	Width (in)	Thickness (in)
Floors	20.0	18.2			7.8	7.2		
Futtocks	18.0	13.7			7.1	5.4		
Planking			23.0	4.0			9.1	1.6
Ceiling			26.5	6.0			10.4	2.4

During the excavation, ship timbers were recorded in metric units for ease of documentation and for purposes of standardization. The craft was built employing the English system of measurement so timber dimensions are also presented in Tables 1 and 2 in inches and tenths of inches. The wooden remains have an overall length of 19.6 m (64.3 ft), a maximum breadth of 6.1 m (20.0 ft), and a maximum depth of approximately 1.5 m (5.0 ft). Most major timbers below the turn of the bilge are represented with the exception of the keelson and mast step(s). The types of wood used in construction of the vessel are given in Table 3.

The following timber catalog is a description of the primary components of the schooner's hull. This detailed documentation of the ship's structural elements, however, is essential in determining if the type of construction seen in *Annabella* represents a

Table 3. Wood identification

Timber samples	Wood type
Keel	Hard maple group
K5	degraded, most likely hard maple group
Apron	White oak
APR3	White oak
Stern knee	White oak
Deadwood	White oak or chestnut (<i>castanea dentata</i>)
Rudder	
RUD1	White oak
RUD3	White oak
Stern knee	White oak
Hull planking	
SHP10	Red oak group
SHP11	Red oak
Ceiling	
CP2	White oak
CP3	White oak
CP5	White oak
CP16	White oak
Floors	
FLR5	White oak group
FLR23	White oak
Futtocks	
FUT1	White oak
PCF6	White oak
Starboard garboard	White oak
Treenails	White oak

vernacular watercraft. Moreover, the description and interpretation of structural features, materials used in construction, and shipboard items aid in determining a craft's specific purpose and may illuminate the economic and social environment of the individuals who built, owned, and sailed *Annabella*.

Considering the proliferation of coasting schooners in the 19th century, it is surprising that there are so few archaeological examples of coasting schooners with which to conduct a comparative structural analysis with the heavily-built *Annabella*. Rarely is a derelict vessel identified and associated with such a wealth of historical documents as the *Annabella*. The maritime archaeologist is usually faced with only hull remains with which to draw conclusions about vessel type and the economic and social factors that led to the ship's construction, career and eventual demise. The structural elements of *Annabella*, in light of the serendipitous identification of the vessel and the subsequent discovery of historical documents pertaining specifically to *Annabella*'s career, offer a rare opportunity to study a hull design that allowed vessels to navigate both shallow tidal inlets and the high seas.

Keel

The entire length of keel is extant; constructed of hard maple (*Aceraceae* sp.), it is 16.85 m in length and averages 30 cm sided and 33 cm molded, although in the stern it tapers to 15 cm sided and 22 cm molded. A mortise for the sternpost is cut 30 cm from the after end of the keel, and measures 4 cm deep and 18 cm wide. The shape of the rabbet varies along the length of the keel; forward of the sternpost it maintains a v-shape, but it terminates in the bow with chamfered edges for placement of the garboards. The chamfered rabbets also extend along the edges of the chock below the apron. In the stern, the rabbets, 2.5 cm in depth, are cut almost horizontally for the placement of nearly

vertical garboards. The forward end of the keel terminates with a flat scarf where the stem or an intermediate stem piece would have been attached. Its downward-angling table measures 96 cm in length, and the end is 9 cm high (FIG. 11).

Stem

The stem of the vessel was not found during the excavation, but the apron and a curious chock do exist (FIG. 11). These timbers are of white oak and were fastened to the keel by iron through-bolts. The apron has a maximum length of 2.45 m and is 22 cm molded and 38 cm sided. Three notches are cut into the top of the timber for the placement of the forwardmost floor timbers. The notch at the extreme after portion of the timber is 10 cm deep, the middle notch 6 cm, and the forward notch 2 cm. The lower edges or undersides of the timber are beveled to receive the hood ends of the garboards and first strakes.

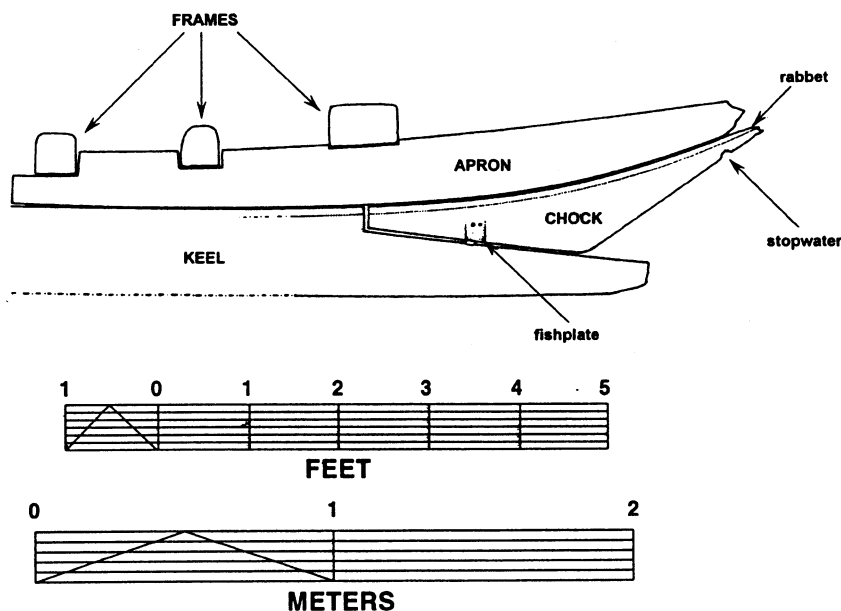


Figure 11. Profile of the keel, chock, and apron. (Drawing by Stefan Claesson)

Chamfered rabbets are also cut along the upper edges of the chock for fitting the garboards. The chock has a maximum length of 1.35 m, is 27 cm sided, and has a maximum molded dimension of 24 cm. A semi-circular concavity located at the forward upper edge of the timber is likely a stopwater impression. In addition, nail holes and a shallow mortise located at the lower edge of the chock may be the remnants of a fish plate, although there are no corresponding mortises or fasteners on the keel.

Stern

The sternpost was not located during the excavation, but the stern knee and complete rudder were exposed at the stern of the schooner. The stern knee is a naturally curving timber of white oak (FIG. 12), and its dimensions vary considerably. It has a maximum sided dimension of 37 cm and tapers to 23 cm at the throat. The upper portion of

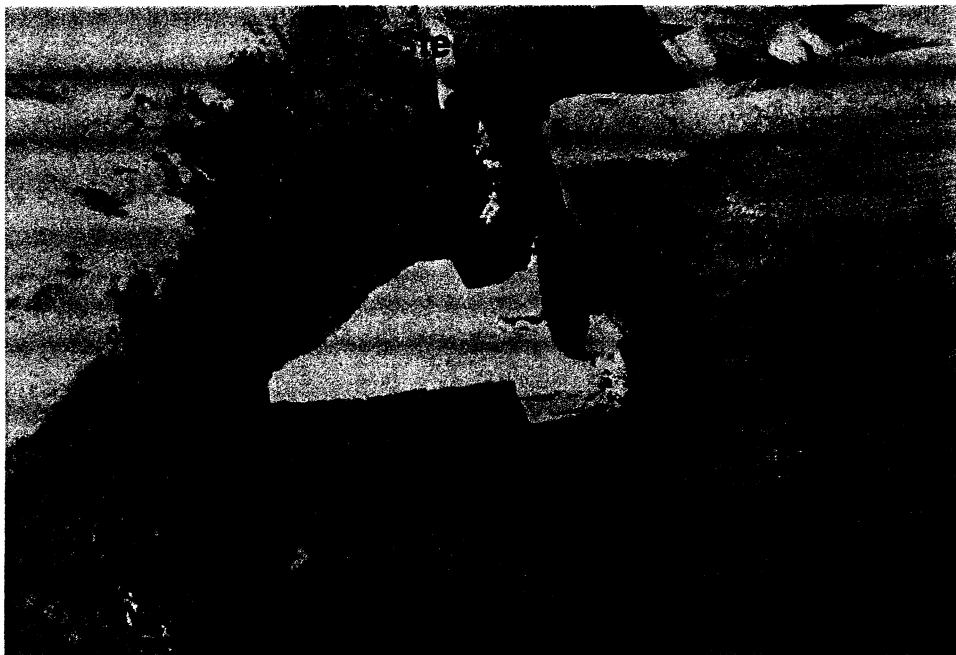


Figure 12. The stern assembly showing the stern knee, garboard, and keel. Note the mortise in the keel for the placement of the sternpost. (Photograph by Samuel Turner)

the stern knee is broken off, but its maximum preserved height is 63 cm, and the rake of the timber is approximately 20 degrees from vertical. The molded dimension of the stern knee is approximately 20 cm. A pair of notches are cut into the sides of the stern knee for the placement of half frames. The notches are 16 cm wide (parallel to the keel); the notch in the starboard side of the timber, however, is 10 cm deep, while the port side notch is 5 cm deep. The garboards were fastened to the stern knee with iron nails and treenails, and the stern knee was fastened to the keel with 15 iron through bolts.

Frames

The heavily-built hull has undergone extensive repair work. Consequently, a consistent framing pattern was difficult to determine, although there is a maximum of only 5 cm between any two given frame members. The 28 floor timbers average 18.2 cm sided and 20 cm in molded dimensions. The floor timbers sit flush or flat on the keel and are fastened to the keel usually by two iron through bolts. Most of the floor timbers consist of a short arm and a long arm, though some have arms of equal length. Generally, the heads of the floor timbers are butted to the heels of the second futtocks; however, there is an unusual example of a futtock (PTF 58) on the port side of the vessel that is butt-joined at its heel and flat scarfed at its head (FIG. 13). No fastenings are visible in the scarf. Although the head of the timber is slightly eroded, the cuts of the scarf are intentional. The futtock is likely a repair piece that replaced the lower end of a cracked futtock at the turn of the bilge.

The dimensions and locations of first futtocks vary greatly along the length of the hull, but their pattern maintains some regularity amidships, where most of the futtocks are placed forward of the floor timbers. In the other areas of the hull, the futtocks seem to display a rather haphazard placement. This random placement is likely indicative of

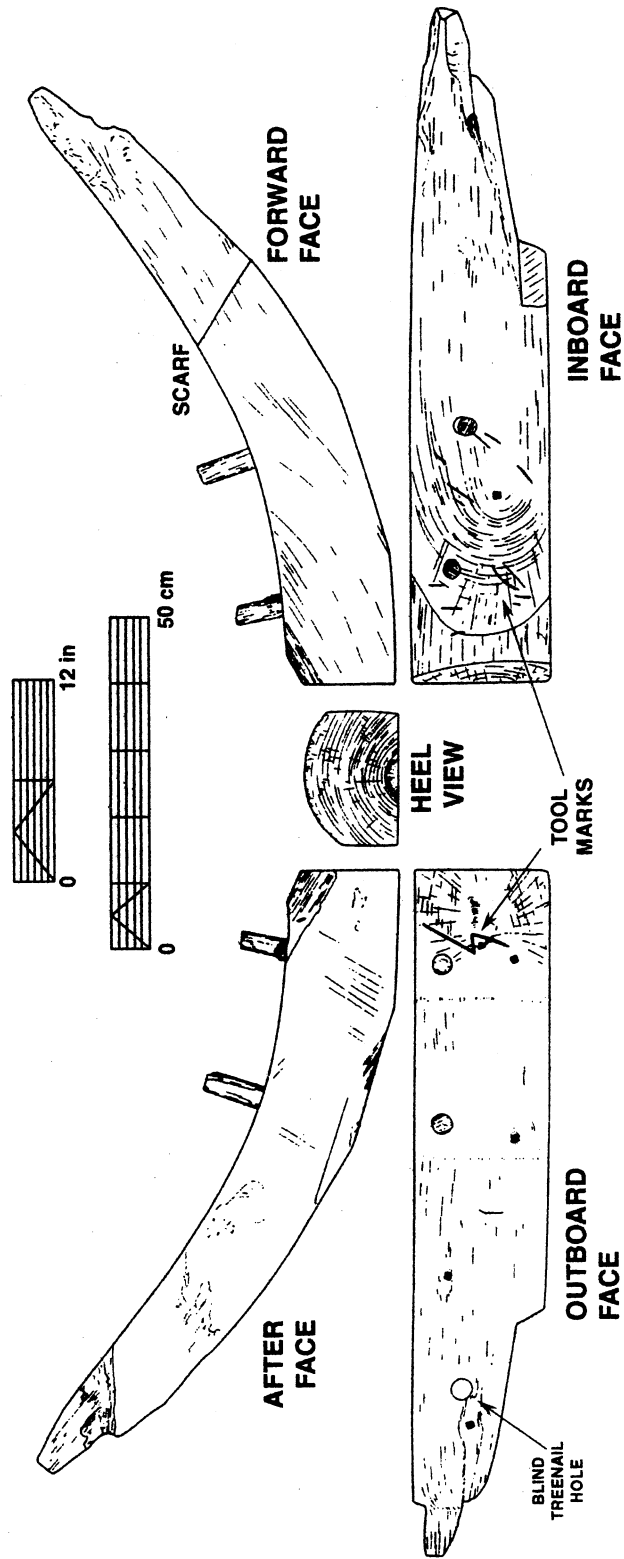


Figure 13. PTF 58 is a futtock with a flat scarf. Note the blind treenail holes in the outboard face of the timber. (Drawing by Stefan Claesson)

extensive repair work on the hull in combination with the original construction technique. Instead of spacing timbers at regular intervals, futtocks and filling pieces were laid between the floor timbers to fill in any gaps. In addition, shims were used to fill in areas between the futtocks and the hull planking (FIG. 14). This type of heavy construction would have been necessary to carry bulky cargoes such as cordwood and brick. None of the futtocks are fastened laterally to adjacent frames but are generally attached to the hull planking by trenails. Though most of the trenail holes extend through the planking and frames, there are a number of wedged trenails in blind holes (PTF 58, for example [see FIG. 13]).

There were 7 pairs of cant frames in the bow of the ship that were beveled at their heels to fit the apron, and they had average dimensions of 23 cm molded and 14 cm sided. The cant frames would once have abutted the apron. Though iron through bolts are located

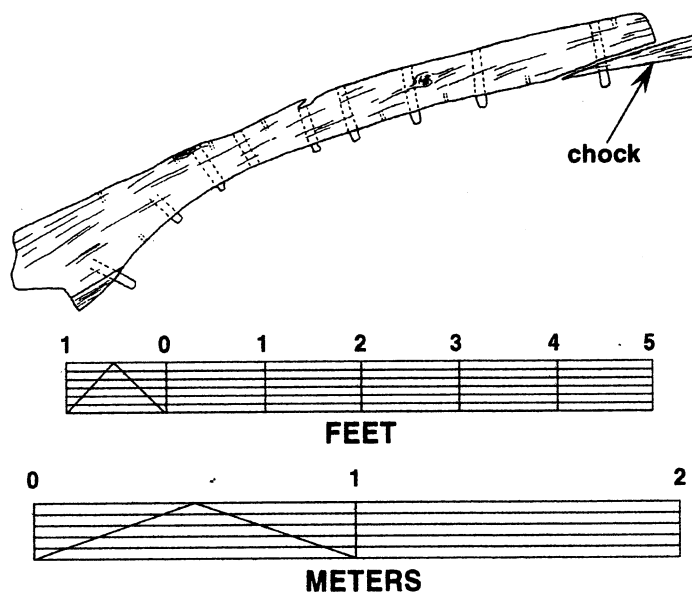


Figure 14. Stern hull frame PTF 52 with a shim treenailed to its outboard face. (Drawing by Stefan Claesson)

at the base of each cant frame, their point of attachment is unclear, as there are no adjoining fastening holes in the apron timber. A considerable amount of coal tar (see *Caulking* below) was also found at the base of the cant frames and around the base of the apron and chock.

Planking

The planking is of red oak, measures 4 cm in thickness, and averages 23 cm in width. The quarter-sawn planks are fastened to the frames almost exclusively with trenails, though graving pieces located forward of FLR 23 (FIG. 15), have been fastened with iron nails. In addition to being trenailed, the hooding ends of the first strakes at the bow of the vessel are fastened with a single iron nail and are joggled to fit the garboard strakes (FIG. 16). The garboard strakes are 25 cm wide and 6 cm thick amidships, but they taper in the bow to a width of 5 cm and a thickness of 3 cm. In the stern the garboards are trenailed and nailed to the stern knee in an almost vertical position.

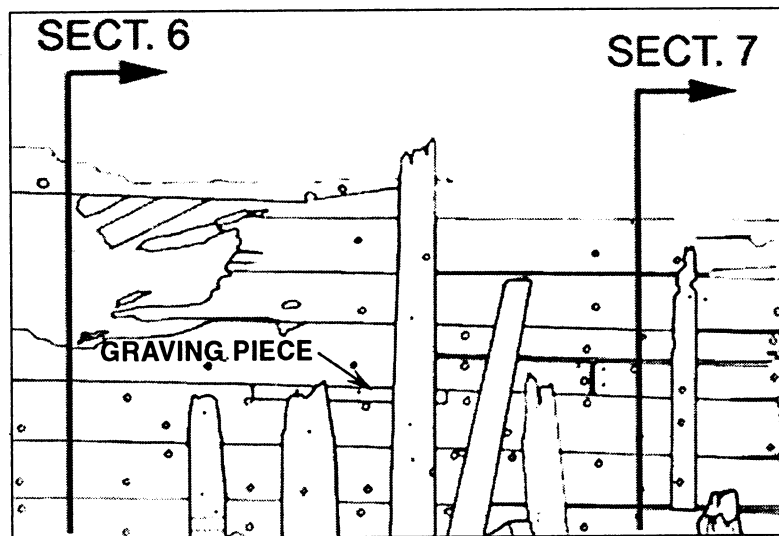


Figure 15. Detail of site plan showing the location of one of many graving pieces in the hull planking.



Figure 16. Detail of port garboard and joggled end of first strake at the bow. The scale is in 10 cm increments. (Photograph by Stefan Claesson)

Ceiling

The ceiling was fashioned from white oak, with thicknesses varying from 3.5 to 9 cm. Close to the keel the ceiling is relatively thin (3.5 cm), but there is a heavier stringer, 9 cm thick, at the turn of the bilge. Many of the ceiling strakes are apparently recycled timbers, as fastener holes can be seen in ceiling strakes where no fasteners exist. The ceiling is fastened to the hull primarily by treenails that are also driven through the planking and frames, but the ceiling is also attached to the frames by iron nails, iron bolts, and small wooden pegs.

Mast Step

Neither keelson nor mast steps were found within the hull, though a timber was discovered approximately 100 m southeast of the excavation site that seems to be a mast step for a ship (FIG. 17). The timber is extremely eroded and no surface detail is discern-

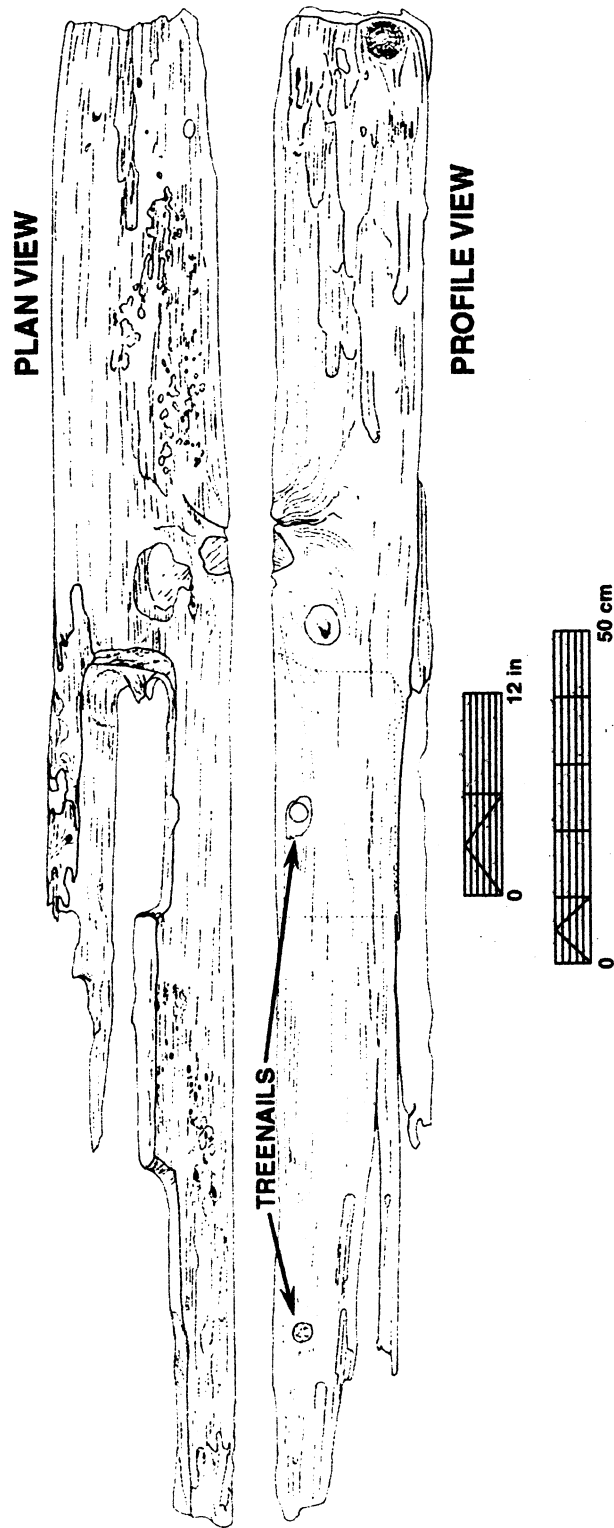


Figure 17. Possible mast step of *Amabella*. (Drawing by Stefan Claesson)

able, and the timber's distance from the excavation site prevents a firm association with *Annabella*. Moreover, ship timbers are widely scattered throughout the Cape Neddick tidal flats; the timber may derive from one of many other shipwrecks in the area. It is, however, of the same type of wood as the frames of *Annabella* (*Quercus* sp.). Its identification as a ship timber can be further supported by the fact that treenails are visible around the rectangular cut in the center of the timber. At the base of the rectangular cut is a circular depression that may represent wear from repeatedly stepping a mast. The timber is 2.25 m in length, and it has a maximum sided dimension of 26.9 cm and a molded dimension of 23.5 cm.

Rudder

The rudder lay under a thin layer of sediment immediately abaft the stern knee (FIG. 18). The rudder is traditional in its design, consisting of an after piece, a middle piece, a main piece, and a rudder stock, but there is also a smaller inner piece at the base of the rudder. The pieces average 15 cm in thickness and were fastened together by iron bolts. The maximum length of the main piece is 3.55 m. The rudder stock, which also forms the main piece, is 21 cm in diameter and is mortised at the top to take a tiller.

Chamfered notches have been cut into the forward edge of the main piece for the fitting of two pintles. The upper pintle of the rudder is cylindrical, 12 cm in length and 5 cm in diameter. The iron of the strap has deteriorated considerably, though heavy iron staining and impressions indicate the original extent of the fitting. The lower pintle is concreted, obscuring its details and dimensions. Like the upper pintle, the lower pintle has an iron strap extending across the face of the rudder pieces. Both of the iron straps were fastened to the rudder by iron nails.

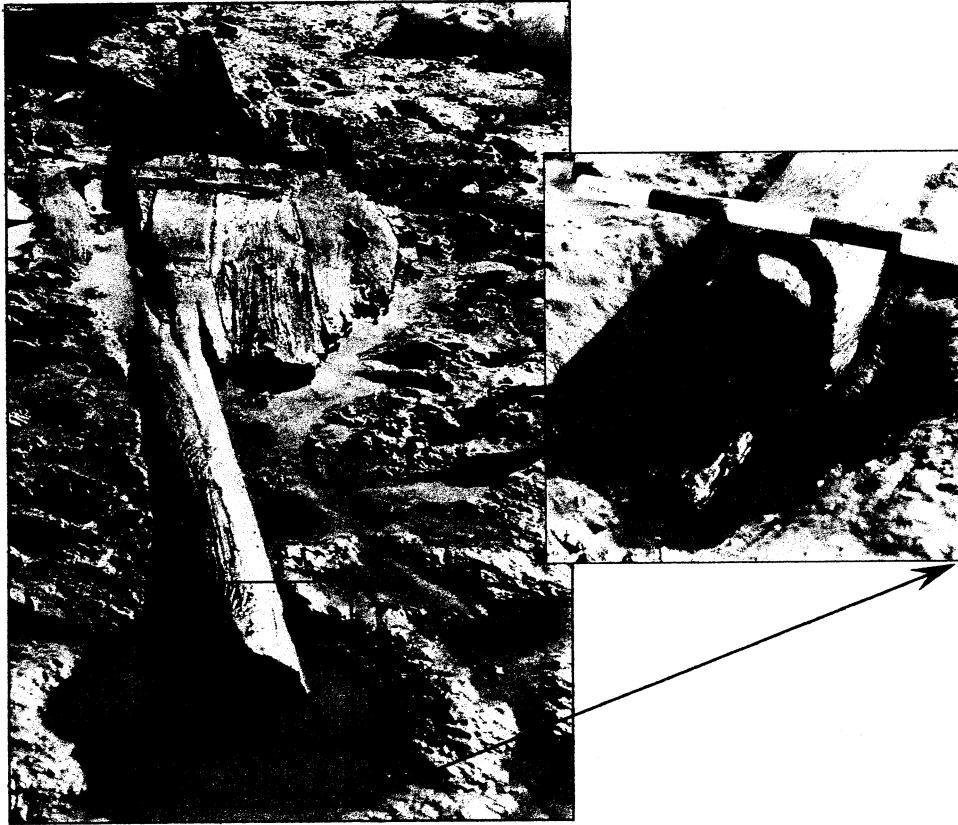


Figure 18. Rudder with detail of tiller scarf shown in inset. (Photographs by Samuel Turner)

Caulking

Adhering to the interior and exterior surface of the keel and the lower planks was a hard, black, granular tar. The substance was analyzed by the Geochemical and Environmental Research Group (GERG) at Texas A&M University and identified as coal tar. Aromatic hydrocarbon standard chromatograms were used to fingerprint the tar samples (FIG. 19). Analysis of the tar by Guy Denoux of GERG concluded the following:

These are primarily parent compounds. The first three peaks in your samples are naphthalene and then two methyl naphthalenes. The next clusters are the dimethyl naphthalenes. These merge into the trimethyl naphthalenes and larger compounds. The big doublet in the middle of the chromatograms (about 22 minutes) is composed of phenanthrenes and the methyl anthracene. This pattern of all these aromatics is why we felt the tars were coal tars and not pine tars. Pine tars do not contain these aromatic compounds.

High concentrations of tar were located around the apron and adjacent timbers and around the stern knee, particularly at the aft end of the timber. The garboards and lower strakes exhibit some dark staining on their exterior and edges, which may be residue from tarring the planks but is more likely a result of oxidizing iron. It is uncertain if the coal tar was used in the original construction of the ship, though it is probable that the ship was

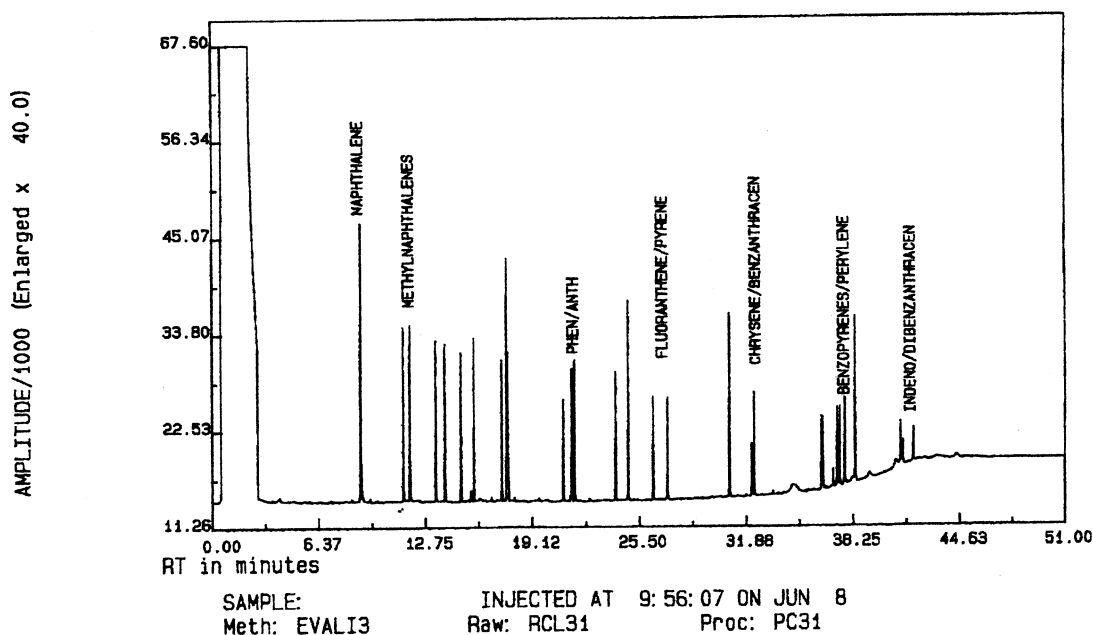


Figure 19. Chart of the concentrations of parent compounds found in tar samples from *Annabella*. (Courtesy Geochemical and Environmental Research Group, Texas A&M University, College Station, TX.)

recaulked in conjunction with the extensive repair work on other portions of the hull. The use of coal tar rather than pine tar for caulking or paying of seams during the 19th century is unusual. Southern New Jersey had significant coal resources, however, in the first half of the 19th century, so the use of coal tar may have been more common in the construction of southern New Jersey ships than it was elsewhere (Elmer 1869: 79). Coal tar was not the only type of material used to seal seams; the A. Goodwin & Co. ledgers (see Chapter 4: Historical Documents) note the purchase of oakum for *Annabella* in 1874, though no examples of oakum were recovered during the excavation (Goodwin 1832-1882).

Fasteners

Three primary types of fasteners were found: treenails, iron nails, and iron bolts. The treenails were mostly used to fasten planking to the frames, although ceiling is also fastened to the frames by wedged treenails. The treenails are white oak and average 3 cm in diameter. Many of the treenails have chamfered ends, which would have facilitated driving the fasteners through planking and frames (FIG. 20). In addition, the ceiling is

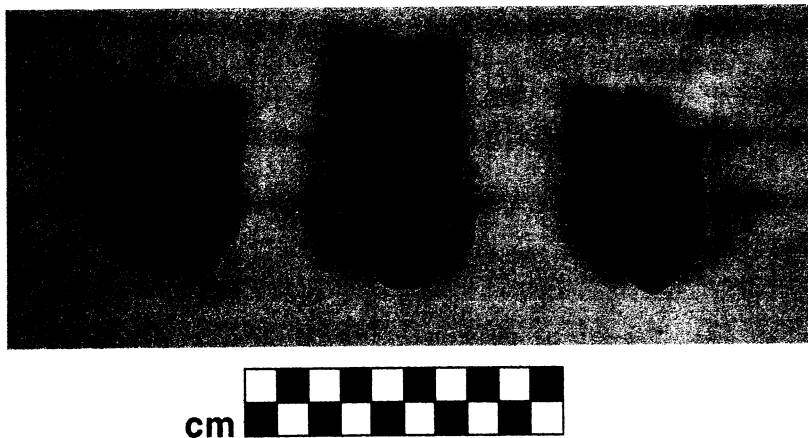


Figure 20. Treenails with faceted heads. (Photograph by Stefan Claesson)

fastened with small pegs (1.0 cm diameter) and square-headed iron nails. The pegs were probably used to fill old fastener holes in the ceiling rather than fastening the ceiling to the frames.

A number of iron through bolts were recovered from the site. These were used primarily for securing frames to the keel and for fastening larger timbers such as deck beams, the apron, and stern knee. Their length varies according to timber thickness, but the diameter is consistently 2 cm (7/8 inches). Numerous impressions of iron washers or clinch rings, which were used to prevent the heads of iron bolts from working through the ceiling, were found on the bilge stringer (FIG. 21).

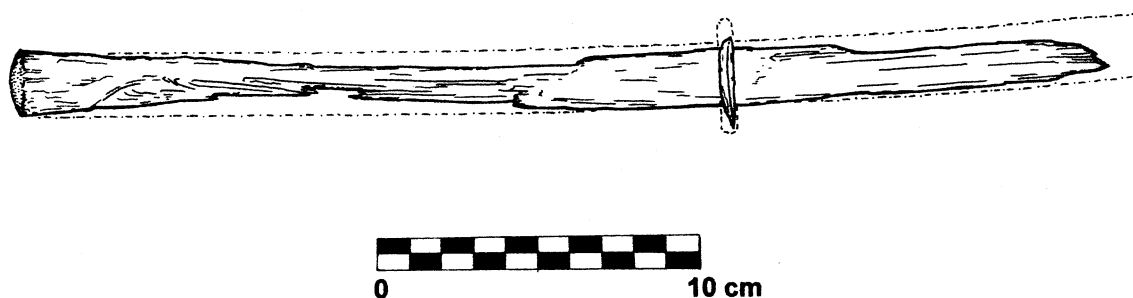


Figure 21. Deteriorated iron bolt with washer. (Drawing by Stefan Claesson)

Ship-related Artifacts

Only a handful of ship-related timbers (Appendix A) and rigging accoutrements were recovered during the excavation. These items include a hawse pipe, a running light, and miscellaneous timbers. The hawse pipe was recovered at the southern end of

excavation site, or at the bow of the ship (FIG. 22a). A green running light was found on the starboard side of the vessel approximately one meter from the stern knee. This glass light is square in plan (11.5 cm) with a curved or convex section (FIG. 23a).

This type of light was required by the Treasury Department following article amendments regarding ships' lights, torches, and fog-signals on steam and sailing vessels (United States Treasury Department 1873). Established April 29, 1864, Article 3 states:

..... starboard side, green light, constructed to throw a uniform and unbroken light over an arc of the horizon of ten points of the compass, so fixed as to throw the light from right ahead to two points abaft the beam on the starboard side, and of such a character as to be visible on a dark night, with a clear atmosphere, at a distance of at least two miles (United States Treasury Department 1873: 1).

A red light with the same variables as stated above was required on the port side of the vessel, although no red light was recovered during the excavation. The starboard and port lights were also required to be fitted with inboard screens, so that the lights could not be seen across the bow. Alternatively, the green light panel may have been part of a type of ship lantern common in the early 19th and late 20th centuries (FIG. 23b).

Shipboard Artifacts and Cargoes

The excavation resulted in the recovery of over 300 individual artifacts dating from the 1840s to the early 20th century (Appendix A). Refuse dumping and vandalism may have contributed artifacts that are not associated with the vessel. Most of the artifacts were located on the port side of the vessel, a result of the ship listing to that side.

Excavation between the midships frames revealed two distinctive deposits. The first was a dark brown layer approximately 6 inches (15.2 cm) deep, consisting primarily

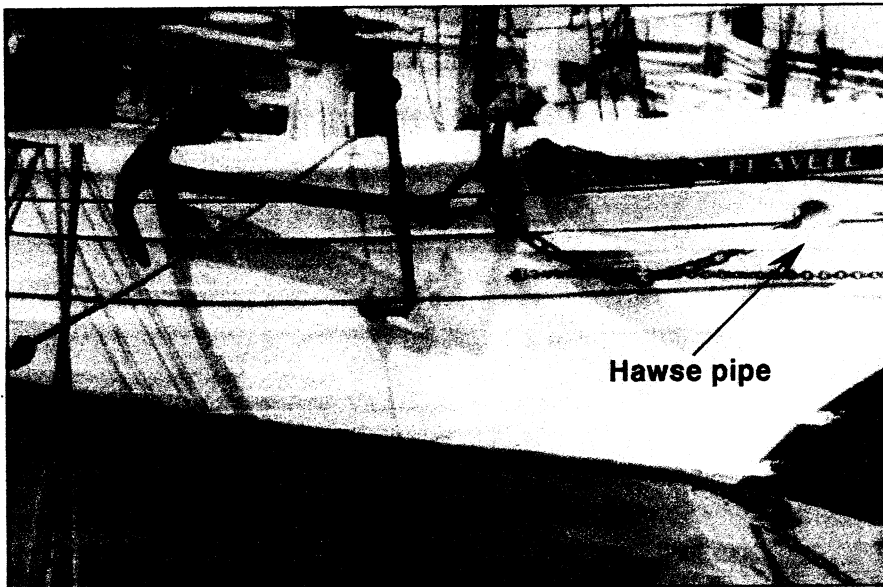
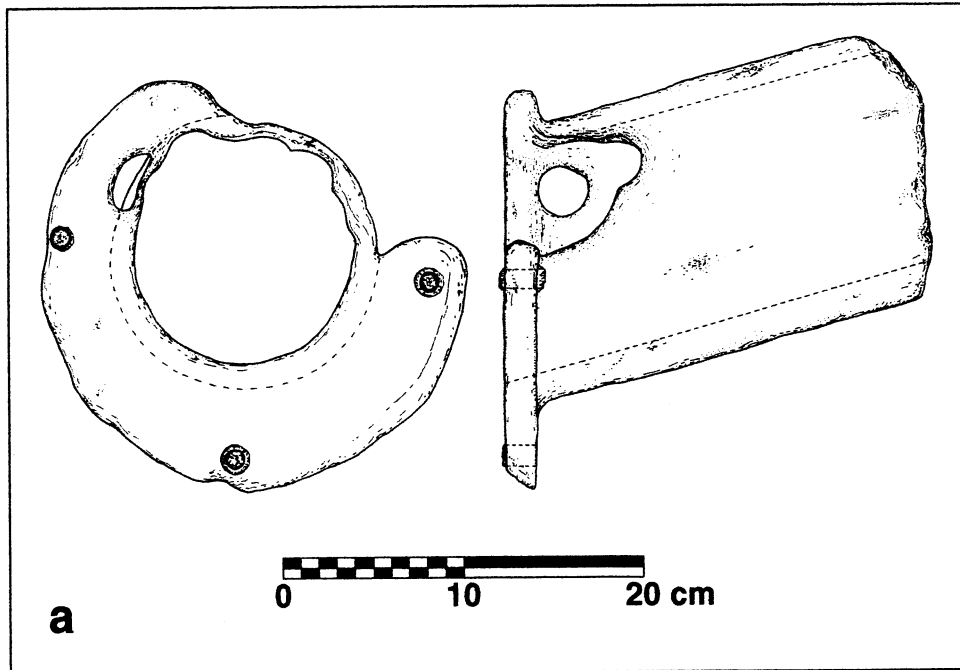
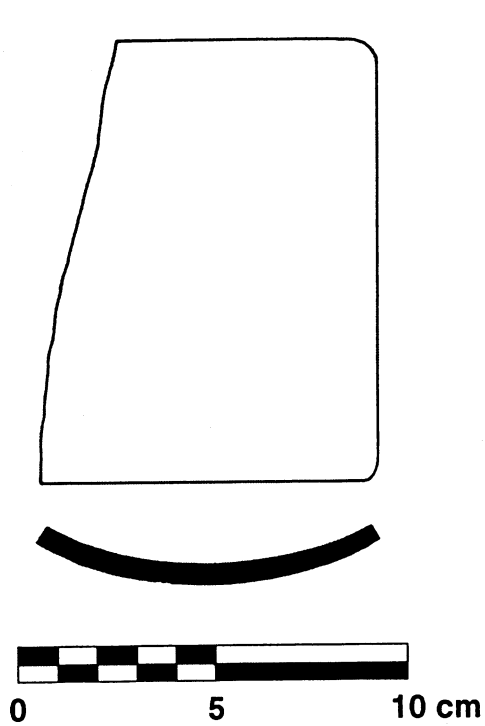
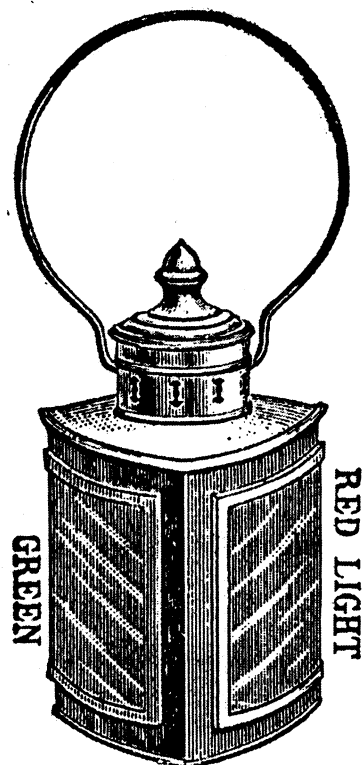


Figure 22. (a) Hawse pipe recovered from bow of *Annabella*. The flange and interior of the pipe have deteriorated considerably because of repeated lifting and securing of the anchor to the vessel's cathead as shown in the photograph of the *Mattie Flavell* (b). (Courtesy Cumberland County Historical Society, Greenwich, NJ.)



a



b

Figure 23. (a) Green ship's light from *Annabella*. (b) A running light of a type commonly used by catboats. The lantern was made of galvanized metal or brass with light panels that were 4 by 5 inches in dimension (Durkee 1901: 221).

of wood chips, which was probably from previous cargoes of cordwood and construction and repair debris left by ship carpenters. Interspersed among these wood chips, just above the surface of the keel and garboards, were brick chips and dust. These deposits suggested that the vessel once carried cargoes of both brick and wood. That the vessel transported such cargoes was finally verified when the ship was identified as *Annabella* and ledgers listing its cargoes in the late 19th century were discovered.

Cordwood (pine, hemlock, and poplar) was the primary cargo listed in the ledgers, with approximately 50 cords of wood transported at a time. The maximum load listed in the ledgers is 70 cords, which would have comprised an approximate volume of 9000 cubic feet. The vessel also transported slabs of timber and sawn lumber, its largest load being 11,038 board feet of “long” lumber (Goodwin 1874-1882: 173). Brick was not as common a cargo as cordwood on *Annabella*, though it was not an unusual export from the York River region, which was one of the largest brick-manufacturing centers in southern Maine (Norton Brickyard 1902-1905). A number of perishable cargoes were also exported to New England markets from York, among them apples, potatoes, salt, flour, and beans. The scant references to imported items specify sugar and hogsheads of molasses.

A number of ceramic fragments were recovered forward and to port of the stern knee. These artifacts included lead-glazed redware, Albany-slipped stoneware, Rockingham ware, and whiteware sherds (Appendix A). A large quantity of ceramic sherds were also deposited near the bow and to starboard of the bow, though these artifacts are likely post-depositional. This second ceramics deposit, which includes molded and gilded porcelain, appear to represent ceramics manufactured in the early 20th century. A variety of glass bottles and vials were found within and outside of the hull, which also date to the late 19th and early 20th centuries. As with the ceramics, the glass artifacts are difficult to associate with the ship because of post-depositional factors such as tidal fluctuations. Only two pipe stems were found; one of which has the maker’s mark

“Henderson.” This pipe was likely produced by William Henderson, one of the earliest known Montreal pipe manufacturers, who worked between 1847 and 1876 (Walker 1983: 22). In addition, barrel staves, a leather shoe, and leather fragments were recovered from the site (Appendix A).

HISTORICAL DOCUMENTS

There is a wealth of primary documents relating to the 19th-century maritime history of Cape Neddick, Maine, and southern New Jersey, but the historical documents discussed here relate specifically to *Annabella*'s original dimensions, structural changes or repairs to the hull, its ports of destination and cargoes, and changes in ownership and masters. The historical research conducted by IMH involved extensive hours combing through manuscript collections in local libraries, as well as interviews with local residents regarding the history of Cape Neddick. The ship was not identified until the middle of the excavation season, when an interview with a 93-year-old Cape Neddick resident, Harry Hutchins, revealed that his grandfather had remarked to him that he "was going down to work on the *Annabella*." Enrolment records eventually confirmed this statement, as Hutchin's grandfather was master of the schooner *Annabella* in the last years of the vessel's life. To further reinforce the identification of the vessel as *Annabella*, the last enrolment record relates that the vessel was finally "surrendered at York, October 17, 1885, vessel broken up or abandoned as unfit for service." (National Archives, File Folder 1789, E 1, 1882) The fact that the vessel was described as being abandoned in York and not Cape Neddick is not unusual, as Cape Neddick is considered part of, and is governed by, the Town of York.

The known primary sources that mention this ship consist of enrolment records obtained from the National Archives in Washington, D. C., and 19th-century ledgers from a private collection in Cape Neddick, Maine. There were seventeen enrolment records for *Annabella*, of which only two are missing (National Archives, File Folder 1789, E 188, 1843; E 22, 1851). The vessel's first enrolment record (National Archives, File Folder 1789, E 102, 1834) lists the builders and owners of the ship and its original outfitting and dimensions. The vessel was initially registered as a sloop in the port of Bridgetown, New

Jersey in 1834 (FIG. 24). Samuel McClintock, George Peterson, and William Chambers were listed as the vessel's builders. In enrolment E 83 (1841), a margin notation remarks that the vessel was originally a sloop built in Port Elizabeth, New Jersey and then altered to a schooner in 1841 (National Archives, File Folder 1789).

Generally, the enrolment records offer detailed information concerning modifications in the schooner's construction as well as descriptions of its principal characteristics. Most of the records note that the vessel had one deck, two masts, a square stern, a billet head, and no galleries. The records also include the overall dimensions of the vessel; it is apparent that any changes in the ship's measurements may be attributed to repairs or alterations in the ship's construction, in addition to any changes in tonnage laws established during the 19th century. In the first half of the 19th century, *Lloyd's of London* and subsequently, *American Lloyds' Registry of American and Foreign Shipping*, established in 1857, had instituted measuring techniques to determine net and gross tonnage for a vessel. *The List of Merchant Vessels of the United States* established in 1864 changed the technique for measuring ship dimensions and tonnage, which is accountable for some of the changes in dimension and tonnage of *Annabella*.

The first and most significant change in the vessel's construction can be seen in record E 83 (1841), which states "per enrolment no. 102 issued at Bridgetown November 1834 Surrd. Prop. Changed and vessel altered from a sloop to a schooner." (FIG. 25) The first listing of the hull's dimensions is found in the first enrolment record (National Archives, File Folder 1789, E 102, 1834), and these are as follows: 66 feet in length, 23 feet 9½ inches in beam, 5 feet 4¾ inches in depth, and 69-82/95 tons. Dimensions for the hull do not appear again until the fourth enrolment record following the alteration from sloop to schooner (National Archives, File Folder 1789, E 24, 1845), but they are identical to the dimensions given in 1834.

[PERMANENT.]

ENROLMENT.No. 102. *One hundred and two*

Enrolment, In conformity to an Act of the Congress of the UNITED STATES OF AMERICA, entitled "An Act for Enrolling and Licensing Ships or Vessels, to be employed in the Coasting Trade and Fisheries, and for regulating the same," *Isaac Townsend of the County of Cumberland in the State of New Jersey* having taken or subscribed the *Oath* required by the said Act, and having *affirmed* that *he the said Isaac Townsend*

is a citizen of the UNITED STATES, sole owner of the ship or vessel, called the *Annabella* of *Port Elizabeth* whereof *Philip Burch* is at present Master, and as he hath *affirmed* is a citizen of the UNITED STATES, and that the said ship or vessel was *built at Port Elizabeth in the State of New Jersey in the year 1834, as appears by the attestation of Samuel W. Bluntrock, by George Pelton and William Chaulson Ship Surveyors.*

And *John Miskat* occasional Surveyor, having certified that the said ship or vessel has *one* deck and *one* mast and that her length is *sixty six feet* her breadth *twenty three feet & 9 inches* her depth *five feet & 11 3/4 inches* and that she measures *sixty nine & 82/95 tons;*

that she is a *sloop* has *no* Gallies, and *no* figure head.

And the said *Isaac Townsend Junr* having agreed to the description and admeasurement above specified, and sufficient security having been given according to the said act, the said *sloop* has been duly enrolled at the Port of BRIDGETOWN.

Given under my hand and seal at the Port of BRIDGETOWN, this *sixth* day of *September* in the year one thousand eight hundred and thirty *four*

Figure 24. The first enrolment record of *Annabella* (National Archives, File Folder 1789, E 102, 1834).

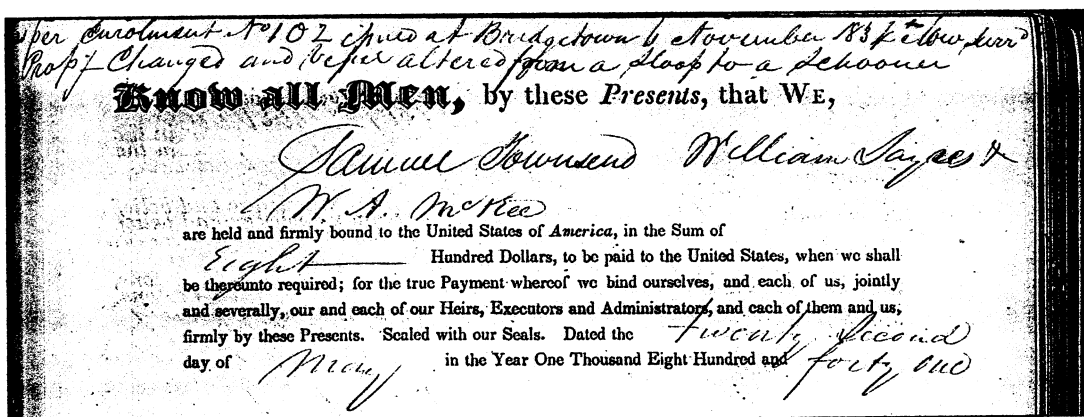


Figure 25. Enrolment record E 83 indicates the conversion of the sloop *Annabella* to a schooner in 1841 (National Archives, File Folder 1789, 1841).

Measurements for the schooner varied little until 1864, after the *Act to Regulate the Measurement of Tonnage of Ships and Vessels of the United States* was approved on May 6, 1864 (Butts 1864). Not long after the new tonnage laws were passed, *Annabella* was surrendered for new measurements, at which time she was recorded as having a length of 67 and 9/10 feet, a breadth of 23 and 9/10 feet, and a depth of 6 and 5/10 feet. Her tonnage measurement was 65-28/100 tons. The most significant changes were to the depth of hold and the length of the ship, which were both increased by approximately one foot. These changes in measurement may indicate repairs, though more likely they were a result of the changes in the method of documenting vessels established by the above-mentioned Act. Tonnage laws changed again under a tonnage act passed August 5, 1882 that delineated gross tonnage and net tonnage. The final enrolment record (National Archives, File Folder 1789, E 1, 1882) listed a gross tonnage for *Annabella* of 65.28 and a net tonnage of 62.02.

An entry listing for *Annabella* was also found in *American Lloyd's Registry of American and Foreign Shipping* (1862: 371). This register records additional details regarding *Annabella* that were not noted in the enrolment records. The vessel was first surveyed by Lloyd's in Boston in 1860, where it was recorded as 69 tons, single decked,

with a draft of seven feet. In addition, the register notes that repairs were made to the vessel in 1853. Unfortunately, these repairs are not specified in enrolment record E 19 in 1853 (National Archives, File Folder 1789), at which time the schooner was registered to Abner Boothby in Kennebunk, Maine (Table 4).

The dimensions in the enrolment records agree with the dimensions taken in the field. The length of the keel is preserved in its entirety, with a total length of 58.56 feet. When we take into account the rake of the sternpost and stem, the deck length would closely match the dimension listed in the enrolment records of 67 and 9/10 feet. The breadth listed in the records also corresponds closely to the dimensions established in the field. Additionally, *American Lloyd's Registry of American and Foreign Shipping* notes that the schooner was constructed of oak with iron fasteners, which corresponds to the white and red oak timbers found throughout the hull (1862: 371).

Table 4. *Annabella* enrolment records

Enrollment	Date	Port of Registration	Primary Owner	Master
E 102	11-06-1834	Bridgetown, NJ	unknown	unknown
E 83	05-22-1841	Philadelphia, PA	Samuel Townsend	William Sayres
E 188	12-02-1843	Boston, MA	unknown	unknown
E 24	03-08-1845	Barnstable, MA	William Stutson	Roland Gibbs
E 139	08-05-1851	Boston, MA	Denning Jarvis	John Piree
E 22	11-25-1851	Plymouth, MA	unknown	unknown
E 19	10-15-1853	Kennebunk, ME	Samuel Lindsey	Abner Boothby
E 13	10-21-1854	Kennebunk, ME	Samuel Lindsey	unknown
E 10	03-31-1864	Kennebunk, ME	Samuel Lindsey	George Goodwin
E 11	07-31-1867	Kennebunk, ME	Samuel Lindsey	Asa H. Bourne
E 4	06-22-1868	Kennebunk, ME	George Hobbs	George Goodwin
E 6	06-21-1869	Kennebunk, ME	Samuel Lindsey	Asa H. Bourne
E 4	03-26-1874	Kennebunk, ME	Samuel Lindsey	George H. Hutchins
E 1	04-10-1875	Kennebunk, ME	Samuel Lindsey	George H. Hutchins
E 2	04-01-1876	York, ME	Samuel Lindsey	Joseph A. Donnell
E 3	05-18-1878	York, ME	Joseph A. Donnell	Joseph A. Donnell
E 1	06-21-1882	York, ME	Joseph A. Donnell	Joseph A. Donnell

The enrolment records have also been instrumental in looking at ownership patterns. Before the Civil War, ownership in coasting vessels was usually a family affair and coasting enterprises were small. Though it was ultimately typical of vessel masters to own only a fraction of the vessels they commanded, this pattern of ownership did not become commonplace until the second half of the 19th century (O'Leary 1996: 22). In fact, George H. Hutchins was the first to be a master and an owner of *Annabella*, but not until 1874. This date marks a dramatic change in ownership of the vessel. From 1841 to 1874, the ownership pattern was invariable, consisting of two owners who divided their shares into halves or quarters, and a master who had no ownership in the vessel.

From 1874 to 1885, ownership of *Annabella* was divided into eighths and 16ths, and the number of owners never dropped below five individuals. Postbellum economic patterns of the western Maine coasting trade appear very different from those in eastern Maine and in southerly ports such as Gloucester, Massachusetts. The latter regions typically had mercantile firms owning large shares of schooners and began to spread their influence to smaller coasting ports by purchasing shares in vessels. Samuel Lindsey, primary owner of *Annabella* from 1853 to 1878, appeared reluctant to sell shares of the schooner, and did not sell a large portion of the vessel until 1874.

The relinquishing of shares to other owners after the Civil War was likely a necessary step for Lindsey to share the burden of economic hardship. The economic disruption caused by the Civil War and the economic depression of the 1870s must have been major factors in the sale of shares in *Annabella*, particularly as smaller, individually-owned vessels could not survive the steeply rising inflation that followed the war (O'Leary 1996: 187). Larger mercantile firms with their strong financial bases were able to cope with economic difficulties. It is not surprising, therefore, to see that *Annabella* was bought up by merchants from Cape Neddick, York, Wells, and Portsmouth in these later years. Most coasting vessels of this period fell under the aegis of commercial centers

and large capitalistic companies, a pattern which led to the demise of individually-operated coasting vessels.

The discovery of ledgers from a private collection of manuscripts in Cape Neddick afforded the archaeological investigation an in-depth look at the coasting trade along the New England coast in the late 19th century (Appendix B). A. Goodwin & Co., a mercantile firm that controlled the cordwood industry in Cape Neddick in the second half of the 19th century, carefully documented the maritime activity of the region. Holding part ownership in *Annabella*, the company recorded the ports of destination for the ship, the cargoes it was shipping out of Cape Neddick and bringing back in return, and the amounts and values of goods shipped. Moreover, the ledgers recorded related bills such as wharfage, repairs, and outfitting costs, as well as the owners and companies to whom goods were shipped.

The ledgers specifically address the activities of the vessel from 1874 to 1881, at which time Asahel Goodwin, who was probably the most active merchant in Cape Neddick in the 19th century, became part owner of the schooner. The earliest obtainable records of Asahel Goodwin's involvement in the maritime industries indicate his part ownership in approximately fifteen schooners, one brig, a sloop, and numerous fishing vessels (Goodwin 1832-1882). The majority of these vessels were involved in the coasting trade on the Atlantic seaboard and occasionally in West Indies trade. Asahel Goodwin also owned vast tracts of woodlands in Cape Neddick and was largely responsible for exporting cordwood, cut lumber, clapboards, and laths from Cape Neddick to southern markets in the second half of the 19th century.

The trade routes of *Annabella* were limited to New England in the 1870s and 1880s. Typically, she transported varieties of cordwood, as well as brick, hay, coal, and perishables (flour, vegetables, etc.), bulky cargoes that were important to America's economy. Raw materials from Maine such as these were essential for providing goods for

markets in primary ports such as Boston, New York, and Philadelphia, where most of the local timber resources had been depleted by the early 19th century.

From 1874 to 1881, *Annabella* made 56 voyages, averaging seven trips every year with a maximum of nine trips in 1875. It is estimated that coasting vessels of York, in the first half of the 19th century, would have made approximately 20 trips from York to Boston each year (Wood 1971: 214). Other Cape Neddick coasting vessels in the 1860s rarely made more than ten trips in any given year (Weare 1859). *Annabella* usually departed from Cape Neddick or Wells; in 1879, however, the schooner began to be contracted to mercantile lumber firms in Bangor. Bangor was also a port of destination for *Annabella*, but Boston and Cambridge, Massachusetts, were the most common destinations. Other ports of call, including Portland, Maine, and Portsmouth and Dover, New Hampshire, involved very short passages that were easily completed within a day.

In the 1870s and 1880s, large cargoes of brick and coal were occasionally shipped to markets, though lumber was still the most common cargo on *Annabella*. These bulky cargoes were usually accompanied by a variety of perishable and country goods. On one trip to Boston (1877), the cargo consisted solely of 414 bushels of potatoes. Perishable items transported to and from markets included oil, flour, potatoes, apples, beans, hay, salt, sugar, pork, cheese, and molasses. Country goods (e. g., cloth and mittens) were less common and were mentioned on only one trip.

Lumber was undoubtedly the most valuable resource of Cape Neddick, and on a larger scale, for the state of Maine. The demand for cordwood in Boston, New York, and other metropolitan New England areas was extremely high. For Boston, Cape Neddick was the first accessible source of timber on the Maine coast. Though Kittery and York are south of Cape Neddick, their rivers had to be plied well inland to reach timber resources in the 19th century. Consequently, Cape Neddick was able to supply a small but constant stream of cordwood and some building material to Boston and other ports.

The most common types of cordwood shipped by *Annabella* were pine and hemlock, though a variety of softwoods and hardwoods, slabs, and poplar were also exported. The mills of Cape Neddick produced pre-cut timbers such as laths, clapboards, shingles, planks, and boards (Talpey 1871), but *Annabella* was never responsible for shipping such products to markets. After 1850, most manufactured timber goods appear to have been absorbed by local consumption; surplus products had been exported more often in the 18th and early 19th centuries (Ferguson and Jewett 1825). There is only one example of *Annabella* shipping milled lumber to markets, and, in this case, the lumber was exported from Bangor, Maine, and consisted of 11,038 feet of long lumber and 198,400 laths (Goodwin 1874-1882: 173).

As noted above, cordwood shipped by *Annabella* was almost exclusively pine and hemlock. An average load was 58.5 cords of wood. Pine, the most common type of cordwood, sold for \$5.50/cord. Hemlock sold at \$4.75/cord, and hardwood and poplar were valued at \$4.00/cord. The costs of cordwood did not reflect any drastic price fluctuations during the 1870s and 1880s in Cape Neddick. Freight rates, however, consistently dropped toward the end of the century. In 1847 freight rates from Bangor to Boston were \$2.00 to \$2.50/cord and dropped the following year to \$1.50 to \$2.00/cord (Wood 1971: 223). Rates continued to fall, and, by 1880, shipping wood on *Annabella* cost \$1.00 per thousand board feet, or per cord (Goodwin 1874-1882).

The Goodwin ledgers also record wharf charges for *Annabella*. Generally, wharf charges for New England ports varied from ten to twenty-five cents per thousand board feet or cord in mid-19th century New England (Wood, 1971: 224). Wharf rates for *Annabella*, however, were consistently six cents per cord of wood. A drop in wharf charges may also be synonymous with lowered freight rates. The drop in freight rates and wharf charges may have been the result of fluctuating prices during the Civil War and the ensuing economic depression of the 1870s.

Annabella received numerous hull, sail and rigging repairs in the 1870s (Goodwin 1832-1882). In addition, occasional maintenance and outfitting expenses, such as repairing anchors, purchase of manilla rope and oakum for caulking, vessel launching, and hull repair, were recorded in ledgers kept by Asahel Goodwin. Sawmill records also suggest hull repairs, as 42 feet of pine planks and hardwood planks were cut for the vessel in 1879. Again, in June of 1880, 52 feet of spruce plank and 96 feet of pine plank were cut for the schooner by the Talpey sawmill (Talpey 1871).

Without the strong documentation, the first half of *Annabella's* life is slightly more enigmatic. Port Elizabeth, located on a branch of the Maurice River in southern New Jersey, the building site of *Annabella*, was rarely referred to as a shipbuilding center (FIG. 26). Founded in 1785, the township became a thriving industrial center in the 19th century through glass and leather manufacturing. The extent of shipbuilding in Port Elizabeth is unknown; nearby townships Dorchester and Leesburg, however, located only three miles from Port Elizabeth, carried on shipbuilding from the 18th century to the end of the 19th century, at which time 3-masted schooners were being built (Brown 1924: 7). Port Elizabeth is believed to have had considerable shipbuilding but only two vessels are referred to as built in Port Elizabeth, *John Compton* in 1846 and *Caroline* in 1861 (Bacon 1970). No other primary or secondary sources were found that mention shipbuilding in Port Elizabeth. This oversight may have occurred because other industries such as glass and iron manufacturing and the tanning overshadowed shipbuilding.

By 1841, *Annabella* came into the possession of William S. Townsend and Samuel Townsend. William Townsend's reasons for acquiring *Annabella* are likely related to the Townsend family's involvement in the lumber industry. He was a prominent Dennis Township landowner, lumber merchant and railroad stockholder (Dorwart 1971: 113). Conversion of the vessel from a sloop to a schooner was a change that was surely completed in order to increase the efficiency of the vessel. Townsend's sale of *Annabella*

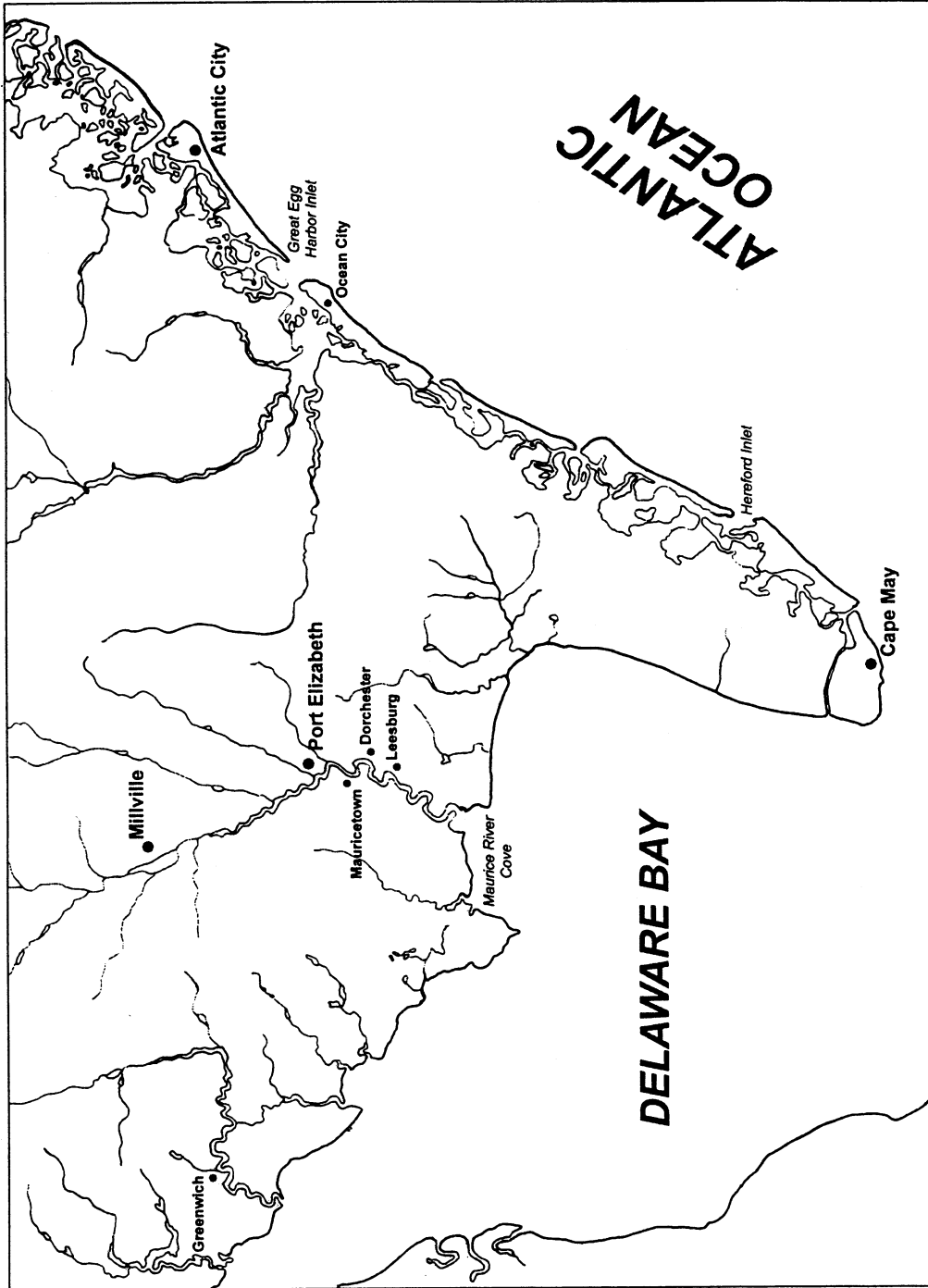


Figure 26. Map of southern New Jersey.

in 1843 to a Boston merchant may have been related to the depletion of timber resources in southern New Jersey as well as more lucrative investments in the railroads of the mid-Atlantic (National Archives, File Folder 1789, E 188, 1843). The railroad eventually became the primary means of transporting lumber from interior woodlands in New York and Pennsylvania to coastal and metropolitan communities. The abandonment of sea-going vessels and subsequent investments in railroads by Townsend were perhaps logical and foresighted decisions.

The Townsend family was also involved in glass manufacture in the mid-19th century in Port Elizabeth. Other early industries in this region included saw and grist milling and the transportation of raw materials to ports on the Atlantic seaboard. In 1814, a glass works was established in Port Elizabeth, which was purchased by Charles Townsend in the mid-19th century, and eventually sold to Samuel Townsend in 1863 (Cushing and Sheppard 1883: 716). It is likely that schooners owned by the Townsend family were used not only to transport glass products to markets, but also to supply their glass manufacturing plants with cordwood to fuel their furnaces.

Ties between New Jersey and northern New England were established early in the 19th century. As timber supplies dwindled in the mid-Atlantic states, lumber merchants were primarily traveling north to reap the benefits of virgin Maine forests. Contacts between these states were not rooted only in lumbering. Early in the 19th century, Maine fishermen headed south for the spring mackerel fisheries. The southern mackerel catches usually began in April in the vicinity of Cape May, but the fishery was not truly exploited until the 1850s (O'Leary 1996: 105). In addition, it was common for schooners built in New Jersey and used in the coal trade in the first half of the 19th century to be sold to Maine merchants in the second half of the 19th century for the lumber business (Leavitt 1970: 62). It should not be surprising then, to find that ships built in New Jersey were plying New England waters in the 19th century.

The historical significance of *Annabella* must be perceived in relation to its economic milieu in order to understand exactly how this ship is representative of maritime activity and technology of the 19th century. The information contained in the historical manuscripts relating to *Annabella* has provided a detailed account of the history of the vessel in its later years as a working vessel. Historical and archaeological maritime resources are essential in considering economic and social behaviors of the past, particularly in New England, where the survival of coastal communities was dependent upon the sea for its resources and on ships such as *Annabella* for transporting goods to markets.

ANALYSIS

The antebellum coasting trade prospered greatly from burgeoning domestic markets and well-established West Indies markets that had an insatiable need for lumber, coal, brick, and agricultural goods. The demand for raw materials along the Atlantic seaboard and West Indies colonies was ultimately met with impressive technological innovations in the transportation industries. The coasting vessel was one of the great improvements in sail, with its efficient fore-and-aft rig requiring far less manpower than was required by the brig. The shipbuilding industries of the 19th century witnessed dramatic changes in the development of sailing craft, with regard to both vessel construction and rigging, as well as the introduction of steam-powered vessels. Railroads were quick to prosper from the transportation of raw materials, but until the 1920s, rail and road service were often unable to reach timber resources accessible only to sailing vessels.

Despite the large numbers of coasting schooners throughout the United States in the 19th century, information on how these wooden sailing ships were designed and built is limited. Hence, comparative primary sources, both archaeological and documentary, for the analysis of construction, hull form, and deck and rigging arrangements for *Annabella* are incomplete or non-existent. To describe the remaining structural features of *Annabella* as typical of southern New Jersey coasting schooner construction would be theoretical at best. *Annabella*'s trade patterns and use, on the other hand, can be considered typical of a northeastern American coasting schooner.

Surprisingly little information has been preserved regarding the hull design of coasting schooners; consequently, the following analysis of *Annabella*, particularly with reference to the hull's design and construction, is based to some degree on secondary sources. Though there is substantial documentation of 19th-century coasting schooners in

oral, pictorial, and literary forms, little information exists about the relationship between vessel construction and vessel form. This final chapter, therefore, discusses what type of craft *Annabella* might characterize as much as it discusses what type of vessel it is not.

Hull Design and Construction

The primary method for determining the design of a wooden hull in the 19th century was to prepare a half model (King 1996). Although many examples of half models still exist in museums and private collections, there are not nearly enough half models to represent the many hull forms of 19th-century sloops and schooners. In addition, ship models that have survived from the first half of the 19th century are often unnamed, and cannot be matched with ships seen in paintings, in the archaeological record, or in other documentary sources, which could more clearly define the relationship of hull form and construction.

Structural details of 19th-century vernacular craft are extremely elusive, and tying a particular hull form to a specific type of construction can only be achieved by recording watercraft in an archaeological setting with the aid of documentary evidence. A recent proposal for reconstructing coasting schooners from tonnage admeasurement records has proven to be an effective method for determining hull form of late 19th-century vessels (Brownlee 1994). By combining tonnage admeasurement with historical photographs, maritime paintings, and the use of the scantling rules of the American Shipmasters' Association (ASA), a number of structural features, particularly external features such as deck arrangements and dimensions and placement of internal compartments, can be hypothesized (American Shipmaster's Association 1882).

Reconstructing ships by this method can only be attempted for vessels that were measured following *An Act to Regulate Admeasurement of Tonnage of Ships and Vessels*

of the United States, May 6, 1864 (Cunningham and Stitt 1980: 197). This Act introduced the use of the Moorsom System of measurement, which allowed surveyors to record precise tonnage measurements through a series of offset measurements taken along the length of a hull as well as specific measurements of compartments, decks, and miscellaneous internal features (Wallis 1981: 443). Increasing use of this method to reconstruct vessels will be an important step in determining hull form of 19th-century vessels in the future. Unfortunately, tonnage admeasurement records for *Annabella* have not been located to date.

Hull forms and construction techniques of southern New Jersey coasting vessels were first documented in the 20th century by Howard Chapelle (1960) and more recently, by Rolfs (1971) and Brownlee (1994). These studies, however, have focused on late 19th-century and early 20th-century vessels, particularly the oyster schooners and dredgeboats of Delaware Bay, and do not discuss in detail the characteristics of vessels built before 1850.

Presumably, *Annabella* would have shared some of the characteristics that the later vessels exhibited in both hull form and construction. *Annabella* was built shortly after centerboard sloops and schooners appeared on the Chesapeake (ca. 1825). Chesapeake-built vessels, which were likely influenced by the Bermuda Sloop and Virginia Pilot Boat vessel types, were noted for their fast-sailing capabilities (Chapelle 1960: 18). Some Chesapeake Bay schooners, precursors to the Baltimore clipper, had “long, low hulls having a straight sheer, raking ends, a straight keel with much drag, square stern, sharp entrance, a long easy run, and a V-shaped midsection with a rising straight floor, an easy bilge, and a shallow topside with a slight tumble-home,” features which do not describe *Annabella* (Chapelle 1960: 176). The sharp rise in the floor of these vessels would eventually become almost flat in the centerboard schooner, although not until the later half of the 19th century. A square stern is the only notable trait shared by

Annabella and Chesapeake Bay vessels; it is, therefore, unlikely that *Annabella* was greatly influenced by early Chesapeake Bay schooner designs.

The Bermuda sloop, the likely predecessor of the Chesapeake Bay sloop and schooner, was “a keel sloop of some size, up to 65 ft. in length, having a straight rising floor, well rounded bilge, and rather upright topside, giving it a rather heart-shaped midsection in extreme cases. The stem was usually well-rounded in profile and the hull drew much more water aft than forward. The main deck was commonly heavily crowned. The mast raked a good deal and the sloops carried two or more headsails, large gaff mainsail fitted with a boom, square course, topsail, and top-gallant sail” (Chapelle 1960: 16). The Bermuda sloop’s characteristics eventually spread to the Delaware Bay and the southern New Jersey coast, but we cannot be certain of its influences on the shallow-drafted hull form of the *Annabella*.

New Jersey schooner design was generally based upon the Chesapeake Bay schooner. The typical attributes of a southern New Jersey coaster, however, are not clearly implied in *Annabella*’s design. Sections obtained from the archaeological remains below the turn of the bilge, exhibit a very flat bottom with little deadrise amidships (FIG. 27).

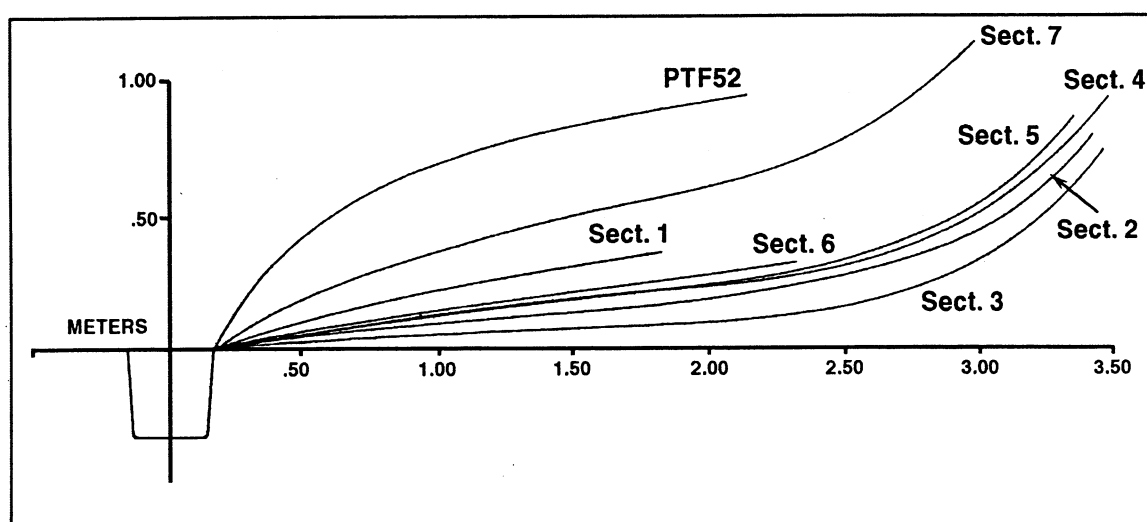


Figure 27. Section lines of the preserved remains of *Annabella*. (Drawing by Stefan Claesson)

This feature is certainly not reminiscent of the V-shaped and heart-shaped midsections typical of Bermuda sloops and Virginia pilot boats. The greatest difference between *Annabella* and known New Jersey built vessels is that *Annabella* lacks a centerboard. Most of the Delaware and New Jersey coasters had centerboards offset to the starboard side of the keel, which is a defining structural characteristic of a Southern New Jersey oyster schooner (Brownlee 1994: 120).

There are few references to sloop construction in southern New Jersey in the 19th century. It is known, however, that vessels constructed in New Jersey in the 18th century were almost exclusively sloops (Levitt 1981: 178). *Annabella* may have been one of the few sloops of its size constructed on the Maurice River in southern New Jersey in the 19th century. The schooner quickly surpassed the sloop as the most common type of craft built in America shortly after the War of 1812. The conversion of *Annabella* to a schooner by 1841 indicates the economy of this type of fore-and-aft rig, which required no more than two to three men per mast (Morgan 1979: 9).

Chapelle has suggested that the colonial period witnessed the rise of a type of shoal-drafted sloop that was designed for river trade on the James River in Virginia and Delaware River; a lack of plans and models, however, has prevented their documentation (1960: 38). This shallow-drafted and anomalous vessel type has also been documented by Brownlee (1994) and Macdonald (1990). Lines derived from a half-model (19th century) from the Abbot Shipyard in Milford, Delaware (FIG. 28), cannot be associated with any vessel from the Delaware region (Brownlee 1994: 120). Based on the dimensions and form of the ship, it is likely that this type of vessel was a two- or three-masted schooner designed to navigate the shallow tidal tributaries of the Delaware and Chesapeake Bays. Similar to *Annabella*, this type of vessel had a nearly flat bottom and a very shallow hull.

Sloops built on the tributaries of Delaware Bay were, as a rule, of less than 50 tons before the War of 1812. There were, however, anomalies such as the sloop *Antelope*,

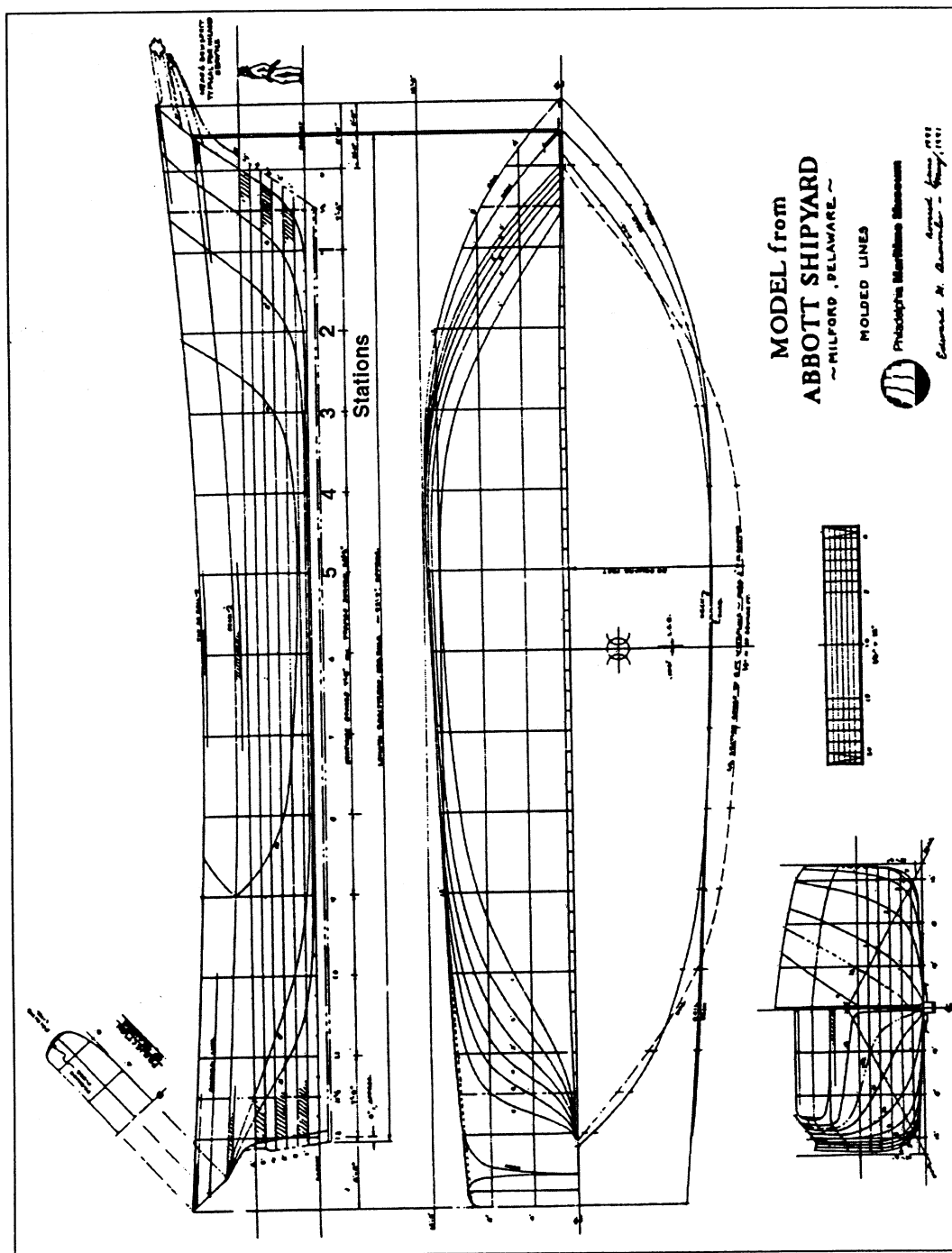


Figure 28. Lines of a Milford, Delaware vessel. (Courtesy Independence Seaport Museum, Philadelphia, PA)

built in Milford, Delaware, in 1795, which was registered at nearly 84 tōns (Macdonald 1990: 22). Following the war, there were major shifts in shipbuilding trends, primarily a result of growing domestic commerce. The Mispillion River in Delaware saw the sloop rig as the most popular type of ship and rig until 1836, at which time the schooner became the predominant type of vessel built not only in Delaware but also throughout the United States (Macdonald 1990).

The size of sloops steadily increased during the period 1790-1830. By the 1830s, sloops in the Delaware Bay region were about 60 feet in length and had a broad beam and shallow draft. Mispillion-built vessels nearly identical to *Annabella* in recorded dimensions and tonnage measurements are listed in Table 5 (Macdonald 1990). Proportionally, *Annabella* is similar to vessels built during the same period in Milford, Delaware, with a length-to-beam ratio of approximately 3:1. *Annabella* would have been a large example of its type in the 1830s; the sloop *William Frederick* (Table 5) was also considered an unusually large sloop (Macdonald 1990: 42). Before 1835, vessels from this region were built primarily for local trade. With an increase in commerce, larger vessels were needed, giving rise to a demand for 2-masted schooners between 1835 and 1850. By 1850, large 3-masted schooners, brigs, and barks were being built on Delaware Bay.

Table 5. Measurements of Milford, Delaware-built sloops in comparison to *Annabella*

Vessel	Built	Tonnage	Dimensions (in ft and in)
William S. Wray	1831	60 82/95	64'6" x 22'9" x 5'
James A Baynard	1832	56 73/95	65' x 23' x 4'7"
Rachel & Catherine	1833	50 58/95	60' x 22' x 4'8"
Caledonia	1833	57 76/95	63' x 21'6" x 5'
Samuel Richards	1833	59 91/95	62' x 22'6" x 5'2"
John M. Clayton	1833	60 47/95	65' x 22'3" x 5'
William Frederick	1834	67 39/95	66' x 23' x 4'
Three Brothers	1835	56 69/95	63'3" x 22'9" x 4'9 9/10"
Daniel Godwin	1835	62 85/95	64'6" x 23'3" x 5'1"
<i>Annabella</i>	1834	69 82/95	66' x 23'9 1/2" x 5'4 3/4"

Almost all vessels built in the Delaware Bay region, prior to 1835, are described as square-sterned vessels, with 1 deck, 1 mast, and a billet head. Although the centerboard is the feature that we now most often use to identify a ship from the Mid-Atlantic coast (Delaware or Chesapeake Bay), the first centerboard patent did not appear until 1811, granted to the Swain Brothers of Cape May, New Jersey (Macdonald 1990: 25). The first mention of a centerboard vessel built in Milford, Delaware, is the schooner *Two Brothers*, which was launched in 1838 (Macdonald 1990: 51). And it was not until after 1845 that the centerboard appears regularly in certificates of enrolment of Milford-built ships. Almost all Mispillion-built vessels were registered in Bridgeton, New Jersey, as was *Annabella*.

The dimensions for *Annabella* preserved in enrolment records allow limited reconstruction of the hull form of the vessel and a comparison of these dimensions to the archaeological remains of the hull. Reconstruction from registered dimensions taken from enrolment records, however, should always be used with caution. Chapelle was often bewildered by the inconsistency of registered dimensions and measurements obtained from models and working vessels (Chapelle 1960: 6). Comparison of registered dimensions with half-models has shown that registered dimensions are often questionable. For example, reconstruction of the tern schooner *Gertrude Abbot* revealed that its registered length was over 11 feet less than if it had been measured in accordance with admeasurement rules (Brownlee 1994: 121). Breadth measurements have also been proven inconsistent, while registered depth has proven the most reliable (Brownlee 1994: 121).

In the case of *Annabella*, registered depth shows the greatest discrepancy, from 5 feet and 4¾ inches in 1834 to 6 feet and 5/10 inches in 1864. The latter measurement is likely the more accurate, as the Moorsom System and *An Act to Regulate Admeasurement of Tonnage of Ships and Vessels of the United States*, May 6, 1864 had been adopted that

year (Butts 1864). Breadth and length measurements, on the other hand, were more consistent for *Annabella*.

From documentary evidence, primarily enrolment records of *Annabella*, a few structural elements such as a billet head and square stern are revealed. Evidence of typical billet heads and sterns of southern New Jersey vessels can be taken from both maritime paintings and historical photographs. Billet heads of southern New Jersey vessels were consistent in their appearance. There are no archaeological examples of this type of billet head, but historical photographs highlight the straightforward design that carried the name of the vessel on trailboards with occasional scrollwork (FIG. 29). The indication of a billet head in enrolment records usually refers to the plainest kind of head, which was a short timber extending from the bow to beneath the jib boom (Macdonald 1990: 37). More ornate billet heads were described as scroll heads.



Figure 29. A billet head of a 19th-century vessel built in southern New Jersey. (Courtesy Cumberland County Historical Society, Greenwich, NJ)

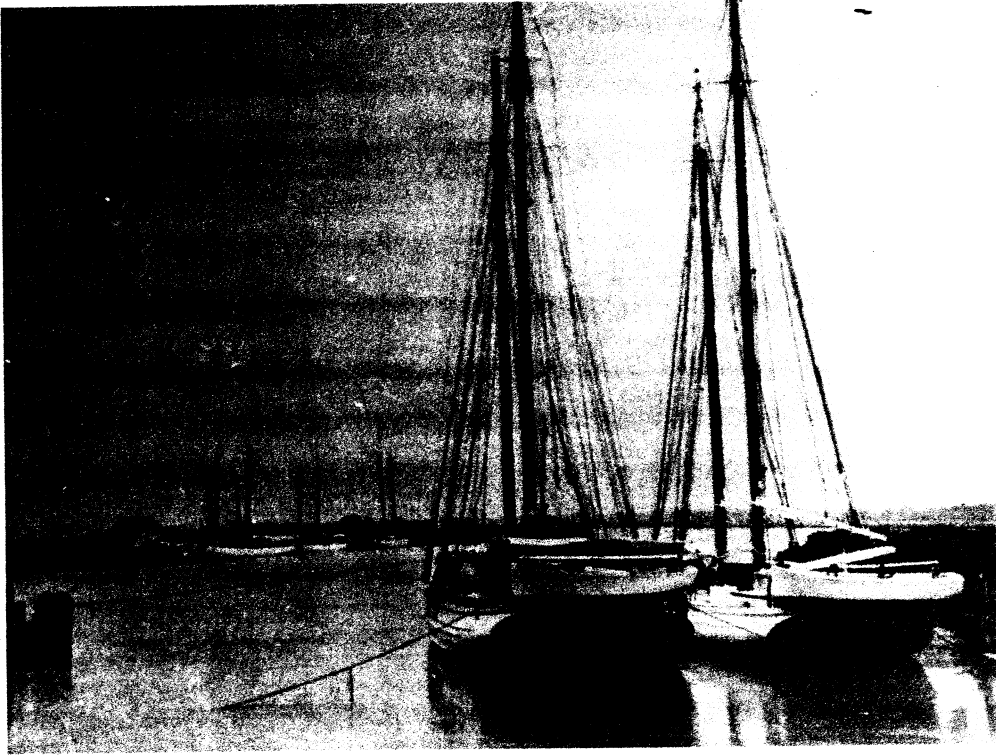


Figure 30. The elliptical stern was a common characteristic of southern New Jersey schooners. (Courtesy Cumberland County Historical Society, Greenwich, NJ.)

The sterns of schooners from Delaware Bay after 1850 were almost exclusively elliptical in shape and sharply angled with the rudder post extending up through the deck (FIG. 30). Before 1850, the majority of vessels were described as having simple square sterns. The rake of the lower transom, however, was not standardized on South Jersey coasters until the late 19th century (Brownlee 1994: 124). The elliptical stern first appears in Milford, Delaware, shipbuilding records in 1820 (Macdonald 1990: 27). With increasing use of the steam box, and hence more advanced bending of planks, elliptical sterns became a practical feature that was reputed to have enhanced speed and appearance (Macdonald 1990: 8). Both scrollwork on billet heads and elliptical sterns became standard features on Delaware Bay vessels after 1850.

A construction sequence for *Annabella* is difficult to discern at first because of its heavy and seemingly haphazard framing, a characteristic thus far unique to this vessel. *Annabella*'s construction does generally follow the prescribed rules of frame-first construction typical of 18th- and 19th-century shipbuilding (see Chapelle 1973; Estep 1918; Desmond 1984; McKay 1839; Webster 1914). A hard maple keel of substantial dimensions formed the backbone of the vessel. A sternpost was mortised into the top of the keel, and its adjoining naturally curving knee was bolted to the keel and sternpost with iron through bolts. Similarly, a now-missing stem was joined to the keel with a flat scarf. A wide, oak apron was then through-bolted to the keel and the stem, reinforcing the join between the stem and the keel.

Two adjacent floor timbers were erected amidships as the mould or guide frames (FIG. 31). The floor timbers were bolted flush to the surface of the keel. Additional floor timbers were bolted to the keel forward and aft of the guide frames at approximately 40-cm intervals forward of the guide frames and at approximately 20-cm intervals aft of the guide frames. Interestingly, floor timbers forward of the guide frames are notched with limber holes; floor timbers aft of the guide frames, however, do not contain limber holes except for those floor timbers at the stern portion of the vessel. The lack of limber holes in the midsection of the hull restricted the flow of bilge water through this area, suggesting that pumps may have been installed in the bow and stern.

No lateral fasteners connect futtocks to floor timbers; the next stage in construction, then, would have involved fastening the garboards and initial strakes to the floor timbers with treenails and iron nails. It does not appear that the garboards were nailed into the keel rabbets, as sections of the keel exposed during excavation revealed no fastener remains. With the bottom strakes in place, oak futtocks were inserted forward of floor timbers forward of the midships floor timbers and aft of floor timbers aft of the midships floor timbers (FIG. 31). Occasionally, pairs or even triplets of futtocks were

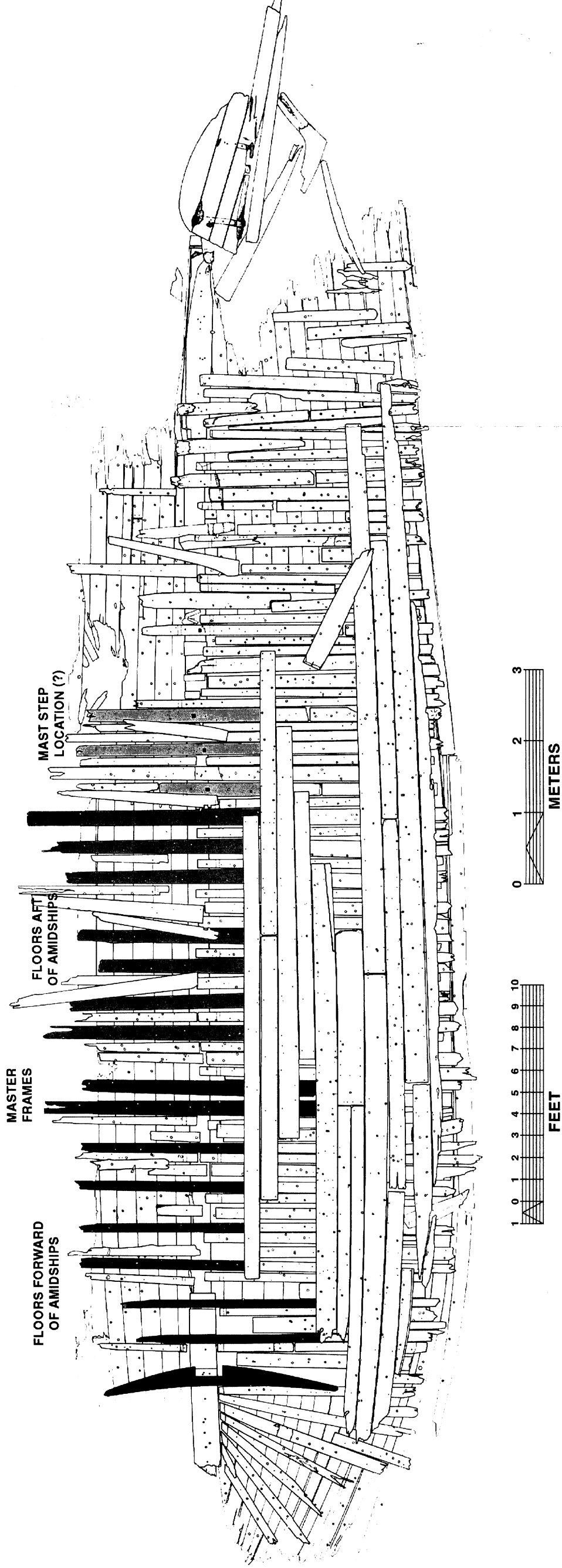


Figure 31. Site plan highlighting framing sequence.

inserted between the floor timbers to fill in any remaining spaces, though the stout framing pattern may also be a result of later repairs or alterations and not part of the initial construction of the vessel.

Following the placement of first futtocks, the bilges and sides of the ship were planked, and second futtocks were placed and butted to the heads of the floor timbers. Top timbers were then inserted adjacent to the frames to form the topsides and bulwarks of the vessel. Finally, ceiling planking was fastened to the interior of the hull by treenailing through planking, frames, and ceiling. The ceiling was also reinforced with iron nails. Careful attention was paid to staggering the ceiling to avoid a line of adjacent plank butts. Fastening through planking, frames, and ceiling as well as staggering the ceiling butts resulted in a rigid hull with excellent longitudinal and sectional strength. Final steps in construction would involve completing the deck construction and stepping the mast of *Annabella's* sloop rig (discussed in the following section).

In the second half of the 19th century, the American Shipmaster's Association (1882) established specific rules for the construction of wooden vessels. These rules were applicable to most vessels with a gross tonnage of more than 100 tons, but the degree to which shipbuilding rules were adhered to is unknown. It is uncertain if those shipbuilders of vessels less than 100 tons followed the rules of construction at all. The rules were most useful for surveyors in classifying vessels according to the *Records of American and Foreign Shipping*, as they established specific guidelines for construction and subsequent classification based upon specific features of a vessel (Butts 1864). Table 6 shows the scantlings of *Annabella* and the scantlings required by the American Shipmaster's Association (ASA).

There is no great discrepancy in ASA timber standards in comparison to the timber dimensions of *Annabella*, except for plank thickness. The slightly thinner planks of *Annabella* can be attributed to its smaller size as well as shrinkage from erosion. The

Table 6. Timber dimensions required for construction of 100 ton vessel by American Shipmaster's Association in 1882 compared to timber dimensions of *Annabella*

Ship	Unidentified	<i>Annabella</i>
Gross Tonnage	100	65.28
Names of Parts (for oak)	Dimensions in inches unless otherwise noted.	
Keel	10 x 11	11.8 x 13.0
Keelson and riders	10 x 11	-
Stem and sternpost	9 x 11	9.4 x 10.6
Transom	10 x 10	-
Floor timbers	8 x 10	7.2 x 7.8
Top timbers at planksheer	5 x 5	-
Bilge strakes, thickness	3.5	2
Ceiling on flat of floor	2	2
Ceiling, above bilge strakes	3	3
Clamps, both decks	4 x 11	-
Strakes below clamps	3 x 11	-
Main rails	5 x 11	-
Waterways, both decks	6 x 8	-
Garboard strakes, thickness	4	2.5
Plank, garboards to wales	2.5	1.6
Wales	3	-
Topside planking	2.5	-
Planksheer	3	-
Deck plank	2.5	-
Rudder stock, diameter	12	8.3
Rudder pintles	1.5	1.9
Deck beams		
Length in feet	22	-
Siding in inches	8	-
Hold beams		
Length in feet	22	-
Siding in inches	10.5	-

molded keel dimension, however, is larger than would have been expected for such a shoal-drafted vessel.

The 19th-century half-model from Milford, Delaware (FIG. 28), has been a useful tool in illustrating some aspects of the construction techniques that were used for designing and building vessels from the Delaware Bay region. On the back of the Abbot shipyard model, three vertical frame lines are drawn in pencil. A mark has been made at station 4 and at 22 ½ and 44 inches aft of station 4. Station 4 marks the point of greatest breadth or amidships, and corresponds to the master frame location. The master frame location on the model is remarkably similar to the location of the master frames of *Annabella*. In addition,

two marks at Station 1, and 22 ½ inches forward of Station 1, are indicative of a frame spacing of 20-22 ½ inches. This method of design and layout of frames was likely a common technique and *Annabella*, conceivably, underwent similar pre-construction design through use of a half model. These dimensional attributes adhere closely to ASA shipbuilding standards; *Annabella*'s frame spacing, however, is a mere 15.7 inches forward of the master frame and 7.8 inches aft of the master frame. Contemporary practice suggested a frame spacing of 27 inches, which was likely compatible with the locations of deck fixtures (Brownlee 1994: 135).

Rigging and Deck Arrangements

In the 19th century, rig, rather than hull design or construction, generally defined a sailing vessel as a sloop, schooner, or brig. Vessel design almost certainly took into consideration the association between rig and construction methodology, as the design of a ship was, to a certain degree, dependent upon sail and rigging plans. The rig of a ship probably does not affect form as much as it would have affected the internal structural components and deck arrangements of a vessel. Structural alterations would occur primarily at deck level, though additional hull timbers would also be required depending on the number of masts.

In the case of *Annabella*, altering a vessel from a sloop to a schooner would have required minor structural modifications. These included creating new mast steps on the keelson, new mast partners or related timbers at deck level, and the fitting of new chainplates for the standing rigging. It is possible that additional longitudinal or sectional support was required to counter increased stress in the hull resulting from an additional mast that was not included in the hull's original design. Sail plans would have to be drawn and structural elements refitted based on the sail plans. There are few examples of this

type of alteration documented, however, one example of this type of alteration is found in the Wayne B. Yarnall Collection at the New Jersey Historical Society. In this case, a mid-19th century sail plan illustrates the South Jersey two-masted schooner *E.B. Fithian*, which was originally built as a sloop (Yarnall Collection 1979).

The alteration of *Annabella* from a sloop to a schooner in 1841 is perhaps represented by the heavy framing that is present in the hull. Clearly, timbers have been formed to fill in almost any gap of the lower portion of the hull. This arrangement is particularly noticeable in the stern of the vessel, where oddly shaped framing members conspicuously fill any gaps. In addition, limber holes are not consistently cut in each floor timber or first futtock to allow the flow of material through the bilge. It is uncertain if additional frames and filler pieces were added to the hull during the rigging modification of *Annabella*. It is more probable, however, that the lack of frame spacing is simply a result of extensive repair work necessary to keep the vessel seaworthy during its lengthy 50-year career.

Three pairs of floor timbers, located aft of amidships, are likely related to the location of a mast step. On the forward floor of each pair of floor timbers, a shallow, square mortise is cut, and the floor timbers are through bolted to the keel (FIG. 31). When the vessel changes occurred, the second mast must have been stepped aft of amidships. Floor timbers were likely placed in this location to reinforce the hull to support the weight and stress of the mast on the ship. The possible mast step recovered from the site may have been situated over these frames, but the deteriorated surfaces of the step timber make it difficult to find any corresponding fasteners in the mast step (FIG. 17).

Figure 32 shows an enlarged image of *Annabella* taken from a panoramic photograph of the Cape Neddick River around 1890. The condition of the ship is clearly discernable in the picture, which was evidently taken shortly after the abandonment of the vessel. Top timbers are visible along the starboard side of the vessel, as well as decking, deck beams, and the holds of the schooner. A mast step may have been located near the aft

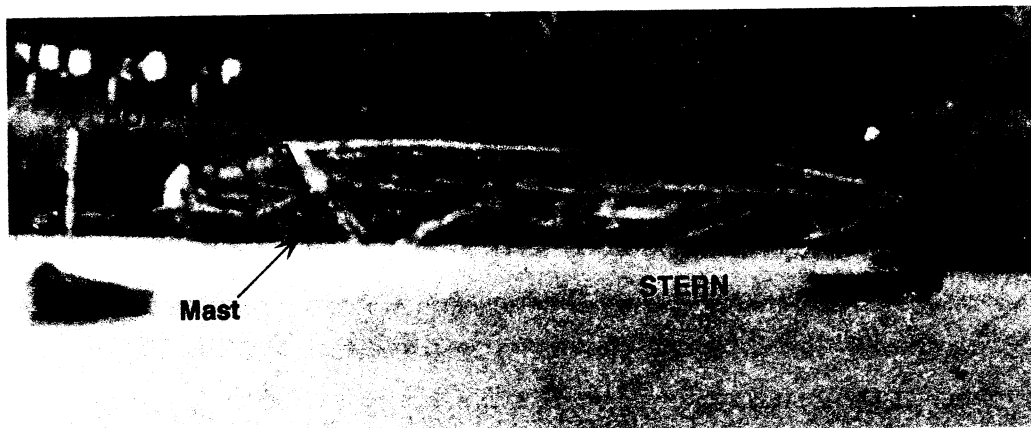


Figure 32. *Annabella*, as seen shortly after its abandonment in 1885. The poor resolution of the photograph results from its enlargement from a panoramic photograph taken of the Cape Neddick River circa 1890. (Courtesy Old York Historical Society, York, ME.)

end of the apron, as the foremast is visible in the bow. Computer enhancement of the photograph was attempted but was unsuccessful because the resolution of the original photograph is too poor. A maritime painting of the schooner *Thomas G. Smith* is also useful in interpreting parts of the superstructure of *Annabella* that are no longer extant (i.e., deckhouses and rigging components), though the *Thomas G. Smith* was considerably larger than *Annabella* (FIG. 33).

Changes to the hull such as repairs and outfitting of *Annabella* in Maine probably resulted in a schooner that had an appearance befitting Howard Chapelle's description of New England lumber trading vessels, which "had short quarter-decks usually combined with high main-deck bulwarks; as a result the cabin sole of the trunk cabin was actually the maindeck, giving all space below the maindeck for cargo. Small schooners often housed the entire crew in the trunk cabin." (Chapelle 1960: 39) These vessels were also "fore-and-aft rigged schooners 50-75 feet, having short, high quarterdecks with bulwarks or turned-stanchion rails." (Chapelle 1960: 40)

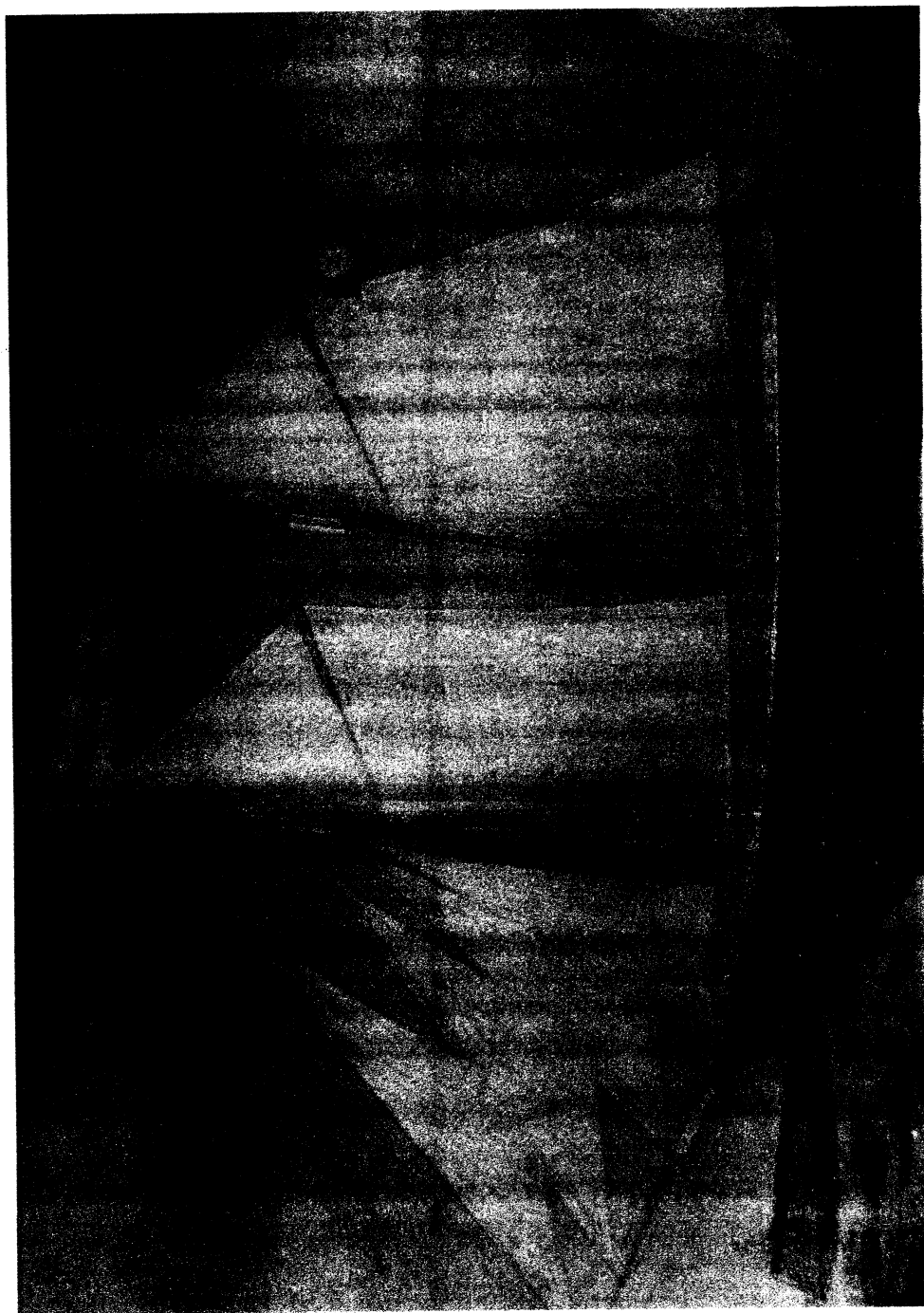


Figure 33. Maritime painting of *Thomas G Smith*, a 19th-century schooner built in Camden, New Jersey. (Courtesy Cumberland County Historical Society, Greenville, NJ.)

Artifact distribution suggests that crew quarters were situated in the stern of the vessel, reinforcing the likelihood of a trunk cabin at this location. A deposit of ceramics located to starboard, in the bow, hints at a storage space in the bow of the vessel (see *Shipboard Artifacts and Cargoes*), but the artifacts in this area are difficult to associate with the extant remains of *Annabella* because they date primarily to the last decade of the 19th century and the early 20th century. In order to maximize cargo space, this space in the bow would probably have been used solely as a boatswain's locker or some such storage facility rather than crew quarters.

Summary

Annabella was originally designed for traveling coastal and inland waterways of the Delaware Bay region, transporting raw materials and ordinary cargoes from its home port in Port Elizabeth, New Jersey, to Philadelphia markets. As such, *Annabella* is a vessel that represents the bulk trade through which domestic industries and markets developed. Port Elizabeth, a township where the economy was based primarily on milling and glass manufacturing industries, required ships to carry its cargoes to market. A ship for carrying heavy cargoes produced by sawmills and gristmills to and from markets required a hull design with maximum carrying capacity and sound construction. The design would also require a shallow-drafted or flat-bottomed hull to navigate the shoal tidal inlets of southern New Jersey and Delaware Bay. The stout construction of *Annabella*, illustrated by its massive apron timber and heavy framing, and the shoal draft of the vessel denote a craft that was specifically designed for these purposes.

CONCLUSIONS

Certain aspects of 19th-century sailing vessels are well documented in historical sources. Plans, ship lines, and general construction techniques (e.g., lofting, etc.) can be researched through documents; ship construction, however, can rarely be studied in detail through such sources. Only an archaeological study of hull remains can provide information that illustrates all of the nuances of a particular shipwright's skills or how a craft was adapted to a specific economic and physical environment. To understand how basic shipbuilding philosophies developed and varied in the 19th century, a detailed look at hull construction in an archaeological setting is essential. Coasting and fishing schooners, in particular, appear to exhibit a high degree of variation in their design and construction. Even Howard Chapelle's *American Fishing Schooners* (1973), a treatise dedicated to the evolution of the fishing schooner in New England, is unable to present a comparable representation of the construction and timber arrangement seen in *Annabella*. Schooners, whether employed in fishing, coasting, or the West Indies trade, showed a remarkable diversity in design, construction, and function.

Annabella represents not only a type of craft that was ubiquitous to the eastern seaboard in the 19th century, but also a vessel that was specifically built for carrying heavy cargoes across shallow waters. The historical analysis of *Annabella*'s career at sea for over 50 years, including the antebellum, Civil War, and post-Civil War eras, and the archaeological study of the schooner's remains, contribute to our knowledge of the coasting trade and maritime commerce in southern Maine in the 19th century. The recovery of the information contained in this hull has allowed us to analyze shipbuilding techniques as they really were, as opposed to how literary sources say they should have been. The study provides information that cannot be gleaned from archival sources; it is specifically the

study of construction, repairs, and the utilization of materials that brings to light new facts about the art and technology of shipbuilding.

A detailed picture of this particular, and probably ordinary craft has highlighted the design and construction of an early 19th-century Delaware Bay coasting vessel. The study has also provided an explicit discussion of the type of trade in which vessels such as *Annabella* were involved. The schooner transported raw materials, particularly lumber in the form of cordwood, laths, and rough-cut lumber, and it is currently the only archaeologically studied example of this class of vessel. Though the ship's construction, at first glance, seems to show a slipshod pattern of assembly, the use of archaeological and documentary evidence has provided a clearer understanding of how the ship was built and the effects of its subsequent alterations. *Annabella* makes a fundamental contribution to our general knowledge of mid-Atlantic shipbuilding and coastal trade throughout much of the 19th century.

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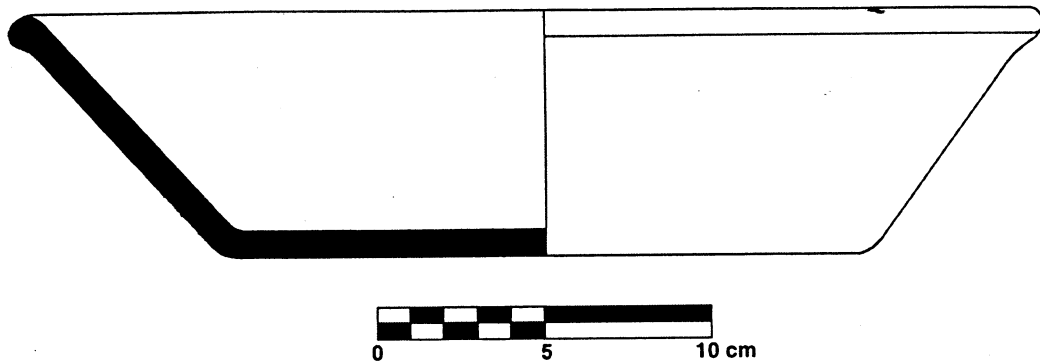
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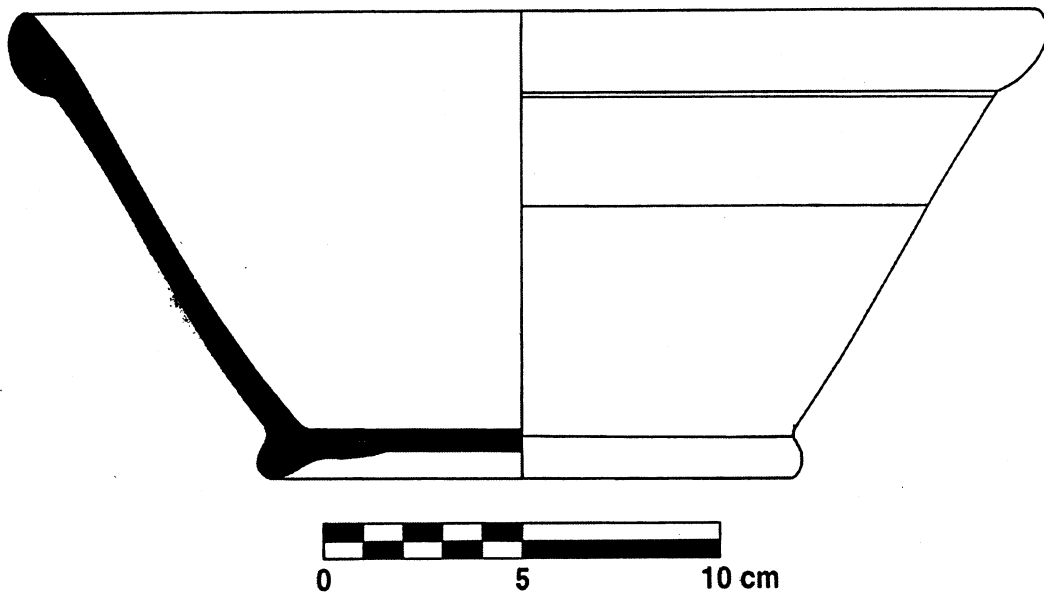
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APPENDIX A



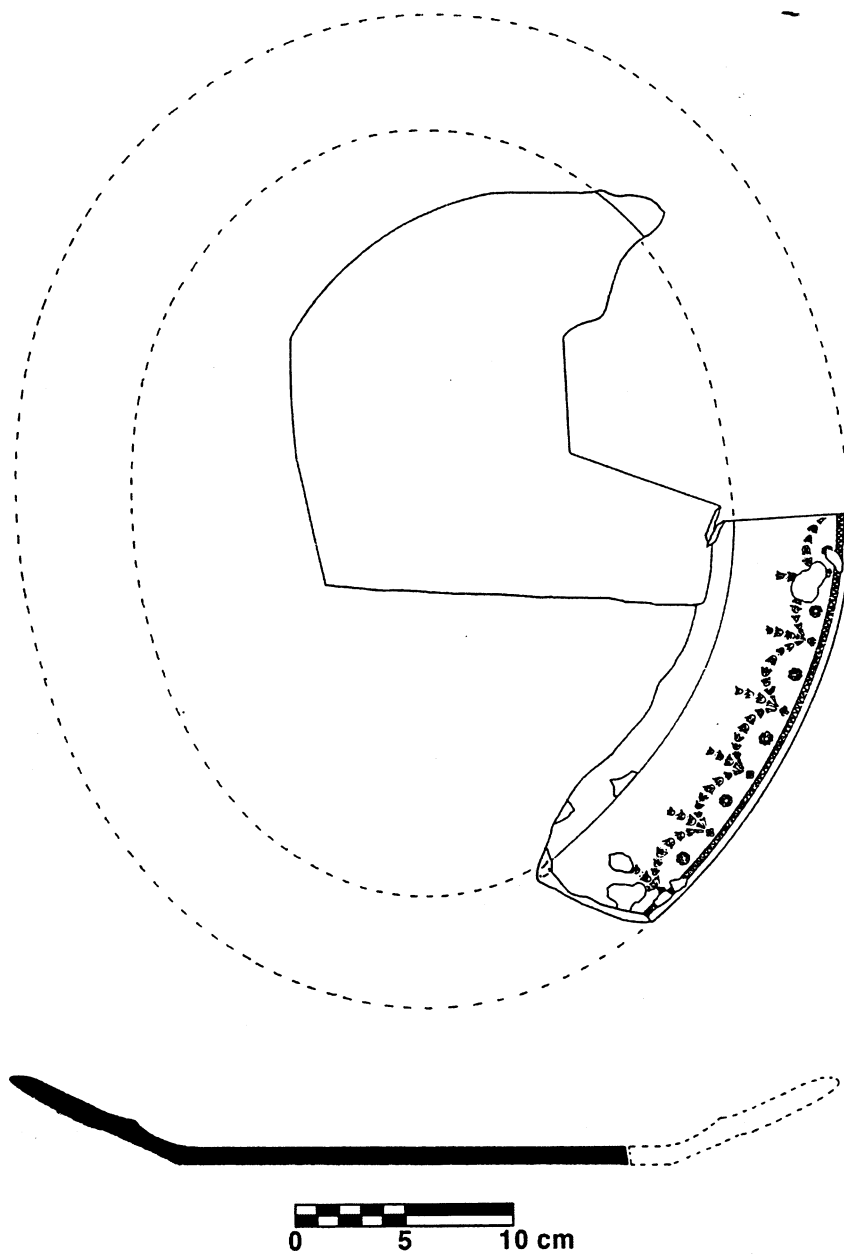
Artifact: 103
 Type: tableware
 Material: ceramic
 Specific Type: earthenware, Rockingham or
 sponge ware

Commercial Marks: none
 Decoration: sponge decorated
 Date: 1845-1900
 Site Association: yes



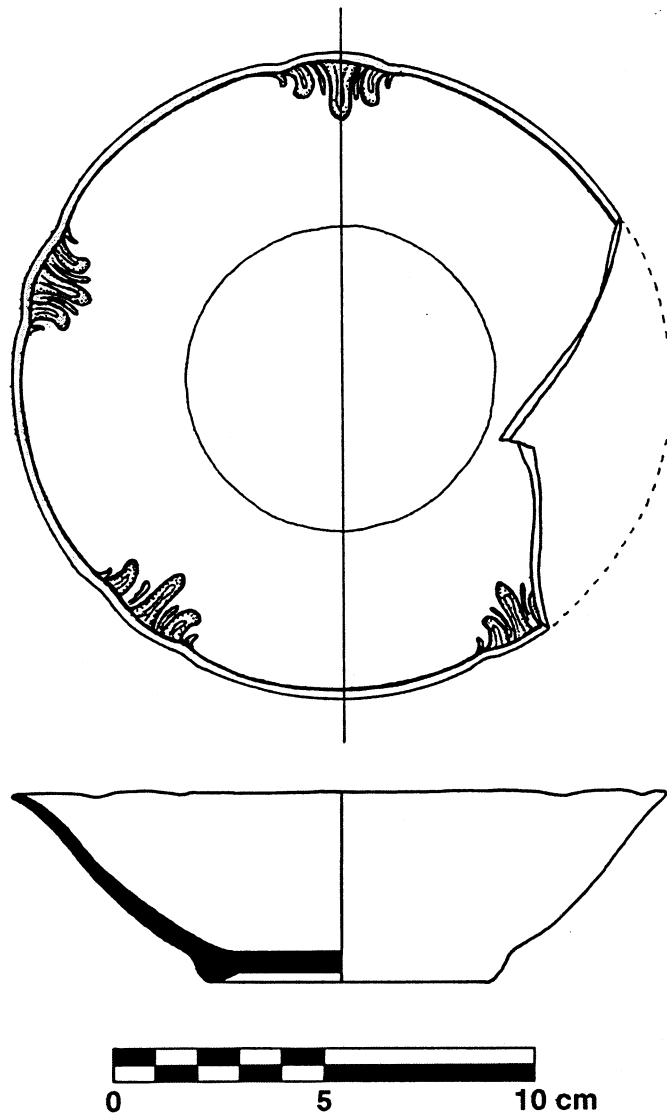
Artifact: 181
 Type: tableware
 Material: ceramic
 Specific Type: earthenware, yellow ware

Commercial Marks: none
 Decoration: white band below rim
 Date: 1840-1900
 Site Association: undetermined



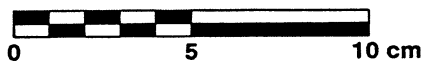
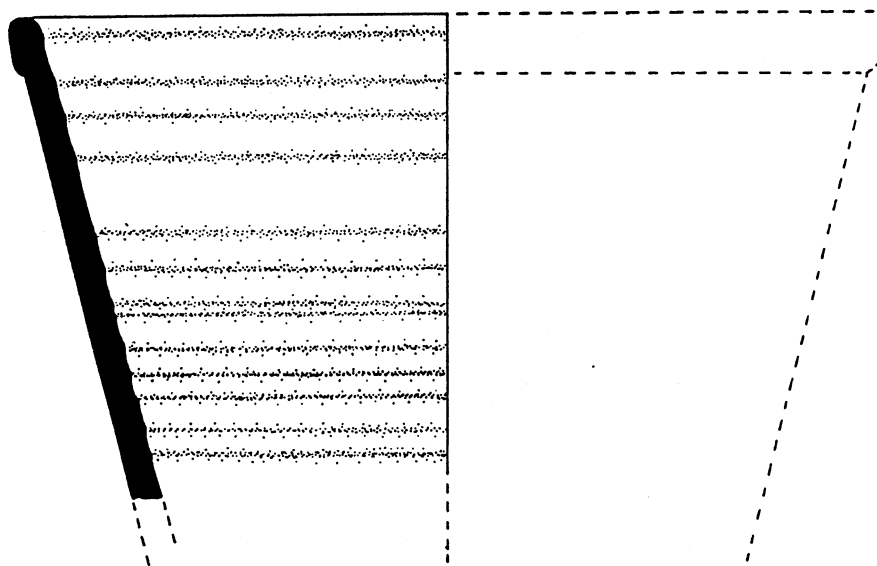
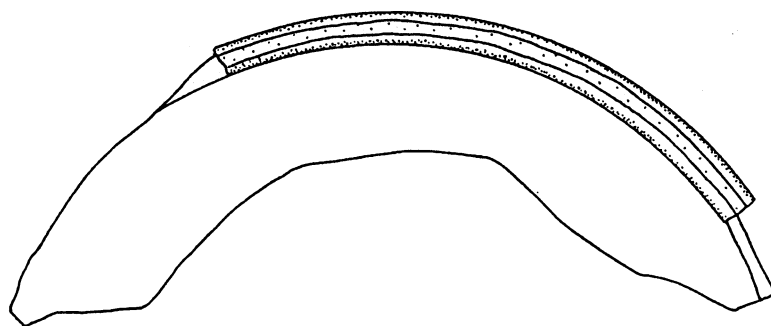
Artifact: 152
Type: tableware
Material: ceramic
Specific Type: earthenware, whiteware

Commercial Marks: none
Decoration: gilded interior
Date: 1842-1930
Site Association: yes



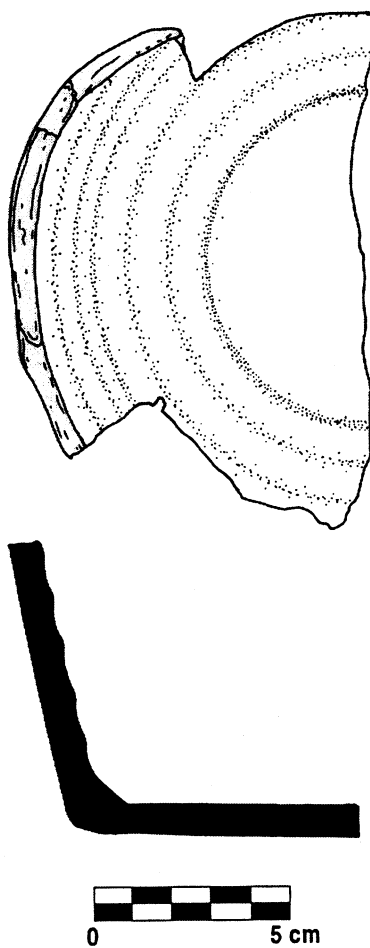
Artifact: 179
Type: tableware
Material: ceramic
Specific Type: porcelain

Commercial Marks: none
Decoration: gilded and molded interior,
scalloped rim
Date: 1880-1950
Site Association: undetermined



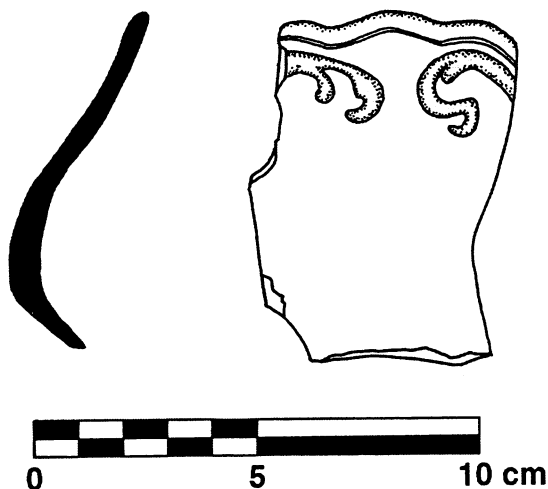
Artifact: 298
 Type: container
 Material: ceramic
 Specific Type: earthenware, redware, lead-glazed interior

Commercial Marks: none
 Decoration: none
 Date: 1834-1885
 Site Association: yes



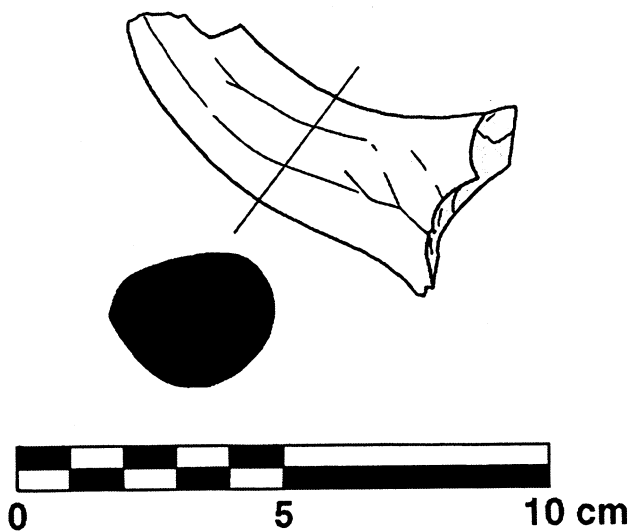
Artifact: 149
Type: container
Material: ceramic
Specific Type: earthenware, redware, lead-glazed interior

Commercial Marks: none
Decoration: none
Date: 1834-1885
Site Association: yes



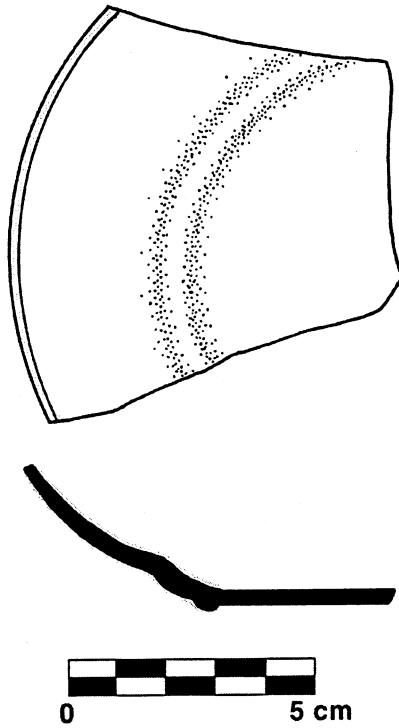
Artifact: 119
 Type: tableware, pitcher
 Material: ceramic
 Specific Type: ironstone

Commercial Marks: none
 Decoration: molded, scalloped rim
 Date: 1860-1930
 Site Association: undetermined



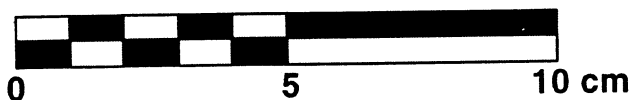
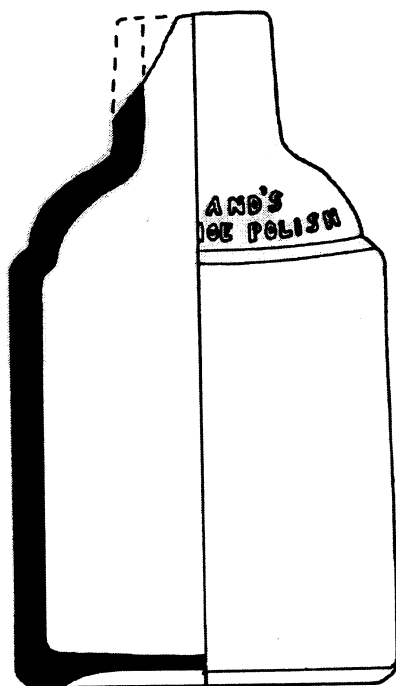
Artifact: 290
 Type: container, handle
 Material: ceramic
 Specific Type: albany-slipped stoneware

Commercial Marks: none
 Decoration: none
 Date: 1840-1920
 Site Association: yes



Artifact: 244
Type: tableware
Material: ceramic
Specific Type: porcelain

Commercial Marks: none
Decoration: none
Date: 1880-1950
Site Association: undetermined



Artifact: 011a

Type: container

Material: glass

Color: brown/amber

Commercial Marks: embossed 'CLEVELAND'S
SUPERB OIL SHOE POLISH' and
'ALDEN T. CLEVELAND HYDE
PARK, MASS.'

Manufacturing Technique: molded base, Ricketts-
type mold (?)

Finish/Rim: one-part, polished

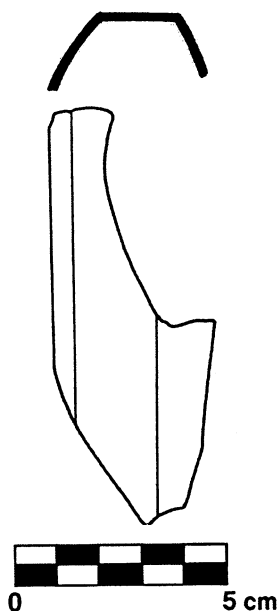
Body: circular

Base: flat indented

Decoration: none

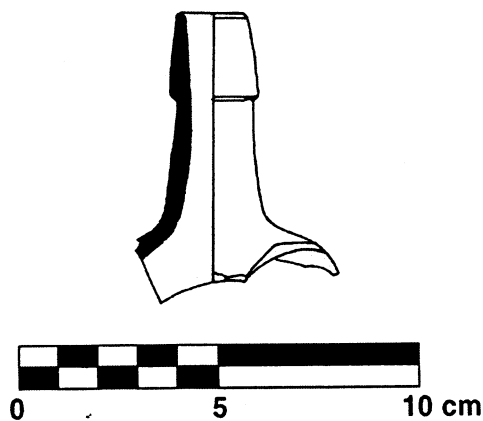
Date: 1880-1920

Site Association: undetermined



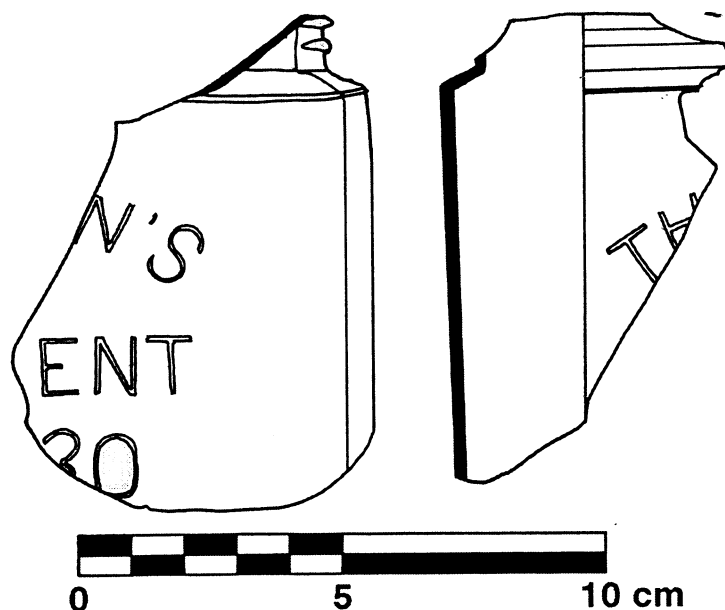
Artifact: 033
 Type: container
 Material: glass
 Color: green
 Commercial Marks: none
 Manufacturing Technique: molded

Finish/Rim: undetermined
 Body: undetermined
 Base: undetermined
 Decoration: pressed panels
 Date: 1870-1910
 Site Association: undetermined



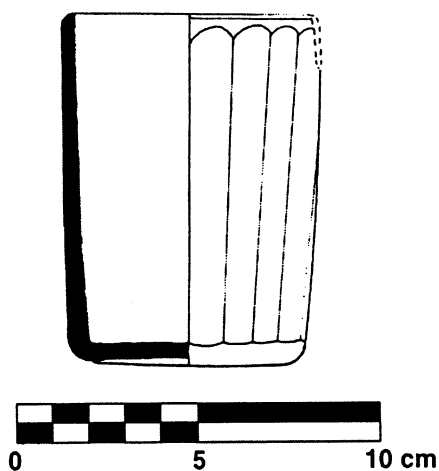
Artifact: 063
 Type: container
 Material: glass
 Color: blue-green
 Commercial Marks: none
 Manufacturing Technique: molded

Finish/Rim: down-tooled
 Body: undetermined
 Base: undetermined
 Decoration: none
 Date: 1880-1920
 Site Association: undetermined



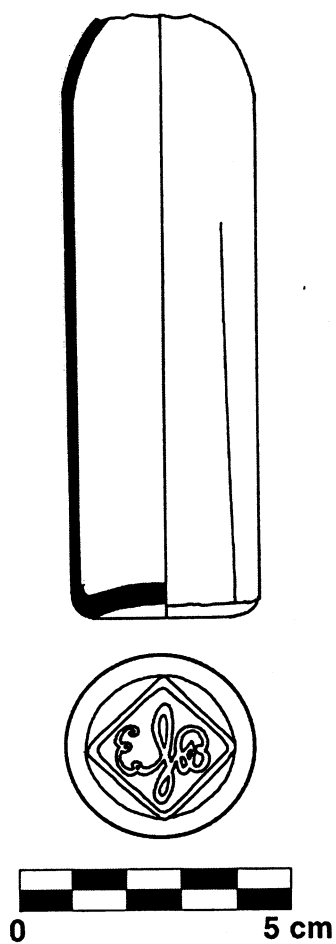
Artifact: 197
 Type: container
 Material: glass
 Color: blue-green
 Commercial Marks: embossed text
 Manufacturing Technique: molded

Finish/Rim: continuous thread
 Body: circular
 Base: undetermined
 Decoration: none
 Date: 1880-1920
 Site Association: undetermined



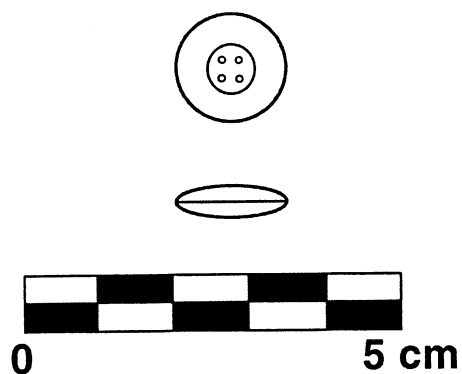
Artifact: 200
 Type: tableware, tumbler
 Material: glass
 Color: colorless
 Commercial Marks: none
 Manufacturing Technique: machine-made

Finish/Rim: plain (cut/polish)
 Body: circular, tapered
 Base: shallow concave
 Decoration: cut panels
 Date: 1920-
 Site Association: no



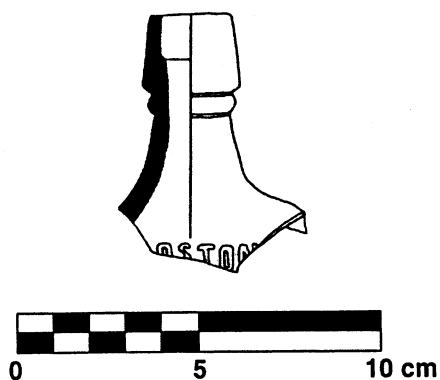
Artifact: 202
Type: container
Material: glass
Color: blue-green
Commercial Marks: embossed base 'E B'
Manufacturing Technique: molded, separate base

Finish/Rim: undetermined
Body: circular
Base: shallow concave
Decoration: none
Date: 1880-1920
Site Association: undetermined



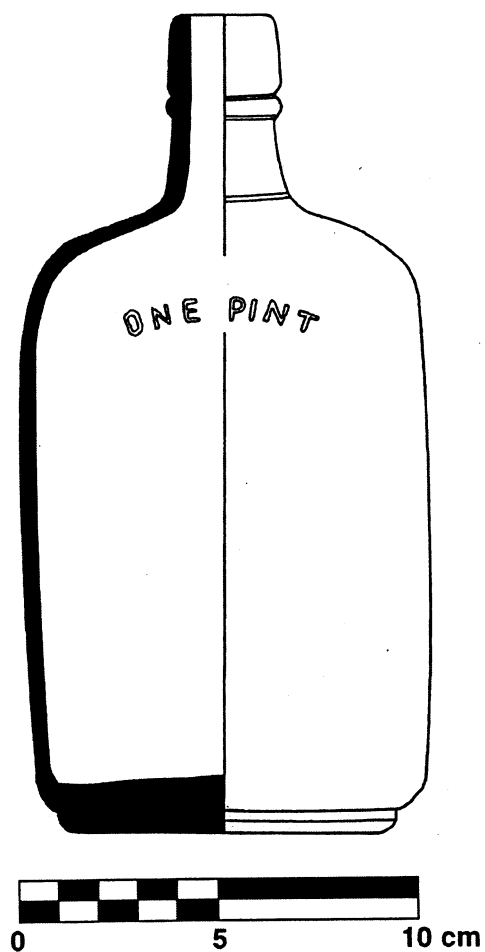
Artifact: 215
 Type: clothing-related
 Material: glass
 Specific type: 4-hole button

Color: white
 Manufacturing Technique: molded
 Date: undetermined
 Site Association: undetermined



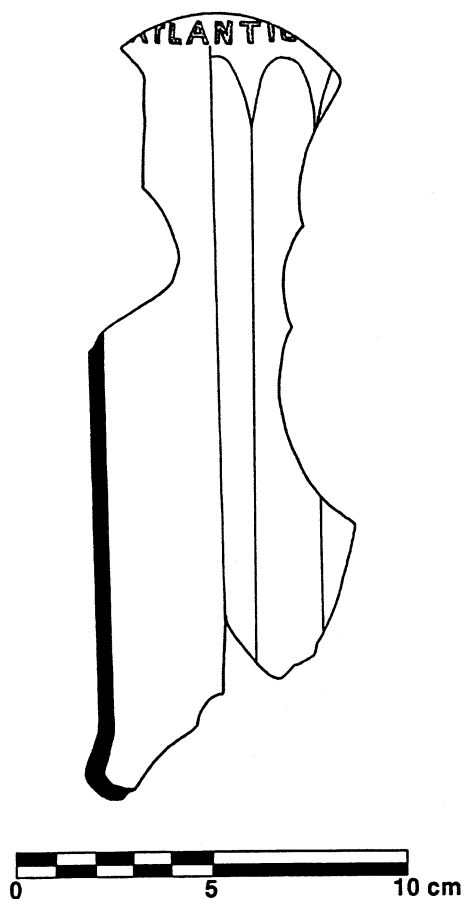
Artifact: 282
 Type: container
 Material: glass
 Color: colorless
 Commercial Marks: embossed 'BOSTON'
 Manufacturing Technique: molded

Finish/Rim: two-part, stopper finish
 Body: undetermined
 Base: undetermined
 Decoration: none
 Date: 1880-1920
 Site Association: undetermined



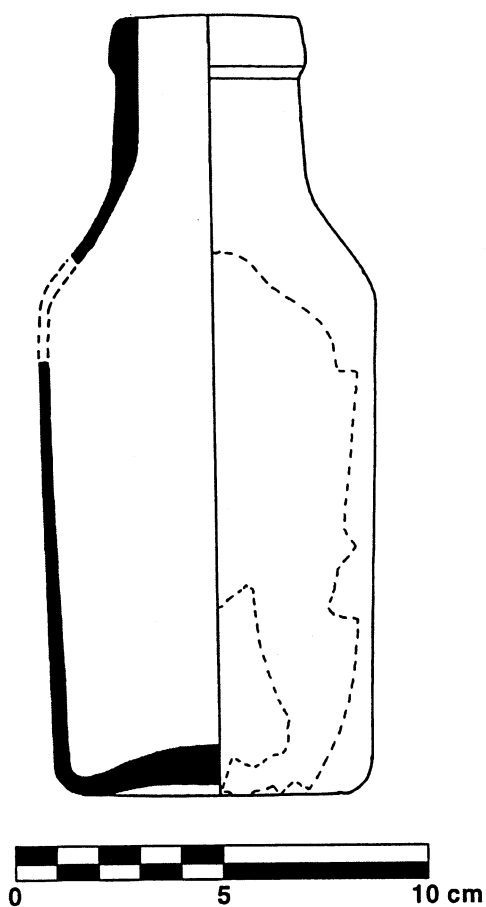
Artifact: 310
Type: container
Material: glass
Color: colorless
Commercial Marks: embossed 'ONE PINT'
Manufacturing Technique: machine-made

Finish/Rim: two-part
Body: flask
Base: flat
Decoration: none
Date: 1920-
Site Association: no



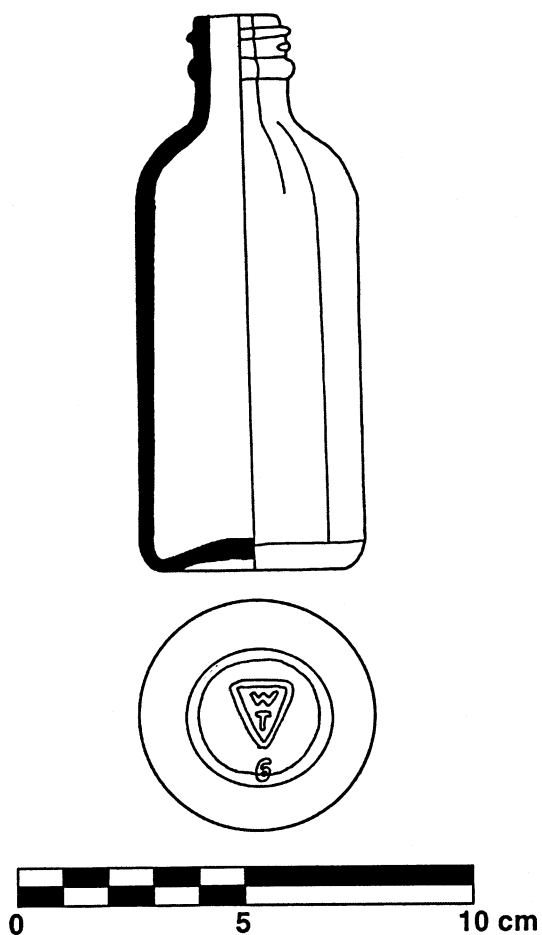
Artifact: 199
Type: container
Material: glass
Color: colorless
Commercial Marks: embossed 'ATLANTIC'
Manufacturing Technique: machine-made

Finish/Rim: undetermined
Body: round
Base: undetermined
Decoration: paneled
Date: 1920-
Site Association: no



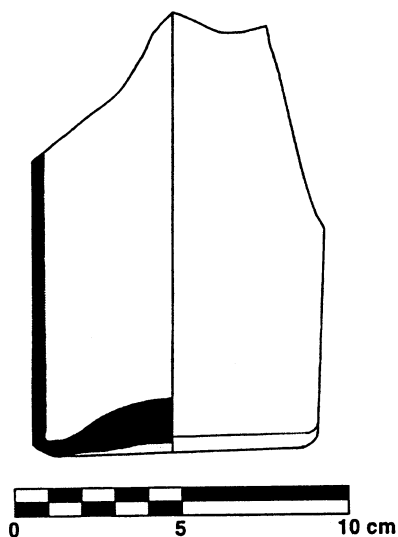
Artifact: 203
Type: container
Material: glass
Color: blue-green
Commercial Marks: none
Manufacturing Technique: molded

Finish/Rim: sloped down
Body: circular
Base: shallow concave
Decoration: none
Date: 1880-1920
Site Association: undetermined



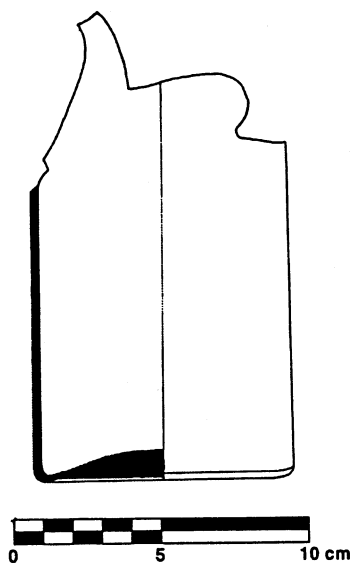
Artifact: 303
Type: container
Material: glass
Color: brown
Commercial Marks: embossed base 'WT 6'
Manufacturing Technique: machine-made

Finish/Rim: continuous thread
Body: circular
Base: shallow concave to flat indentation
Decoration: none
Date: 1920-
Site Association: no



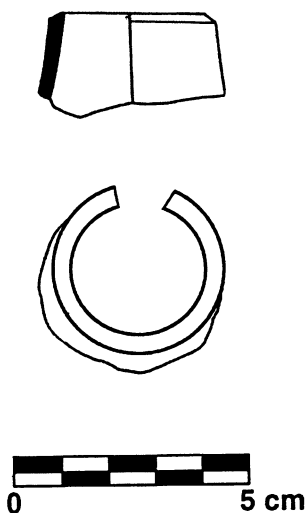
Artifact: 011
 Type: container
 Material: glass
 Color: blue-green
 Commercial Marks: none
 Manufacturing Technique: molded base

Finish/Rim: undetermined
 Body: flask
 Base: shallow concave
 Decoration: none
 Date: 1880-1920
 Site Association: undetermined



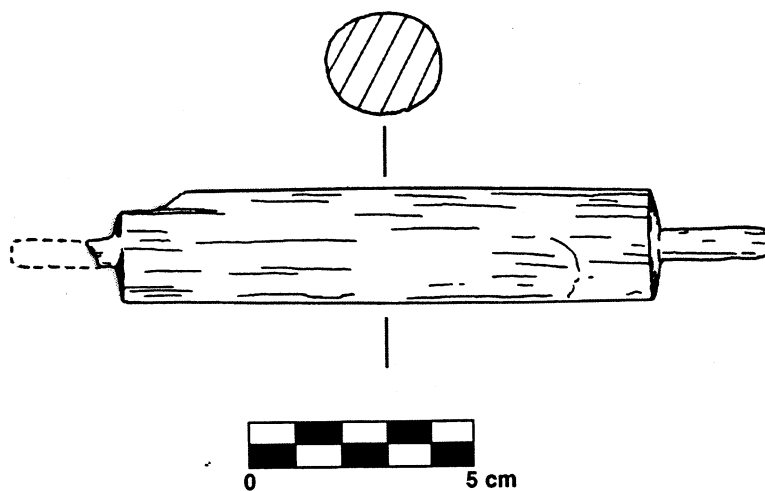
Artifact: 197
 Type: container
 Material: glass
 Color: blue-green
 Commercial Marks: none
 Manufacturing Technique: molded base

Finish/Rim: undetermined
 Body: flask
 Base: flat indentation
 Decoration: none
 Date: 1880-1920
 Site Association: undetermined



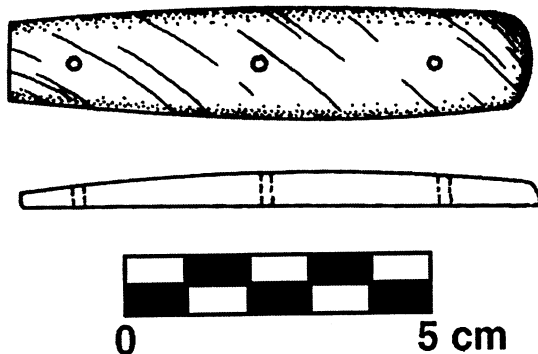
Artifact: 218
 Type: container
 Material: glass
 Color: green
 Commercial Marks: none
 Manufacturing Technique: molded

Finish/Rim: one-part, sloped-top
 Body: undetermined
 Base: undetermined
 Decoration: none
 Date: undetermined
 Site Association: undetermined



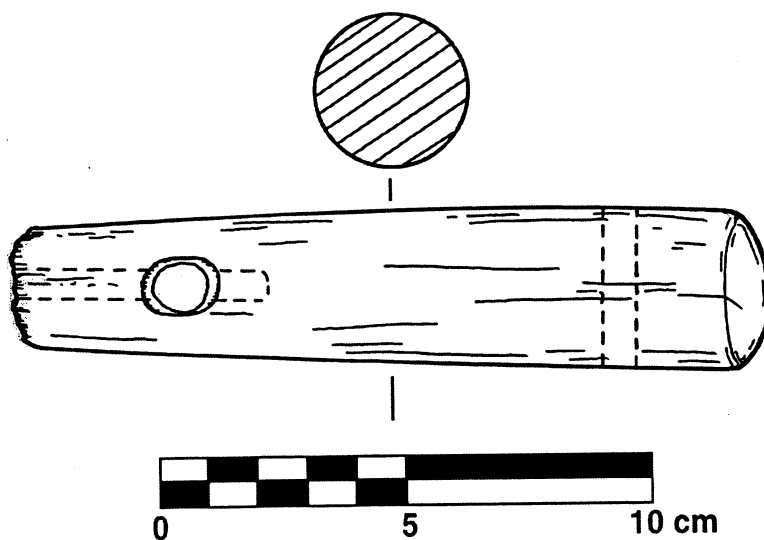
Artifact: 096
 Type: undetermined
 Material: wood
 Specific Type: undetermined

Wood Species: undetermined
 Date: 1834-1885
 Site Association: yes



Artifact: 177
 Type: utilitarian
 Material: wood
 Specific type: utensil handle (knife)

Wood Species: undetermined
 Date: 1834-1885
 Site Association: yes



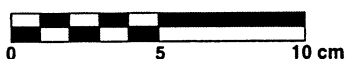
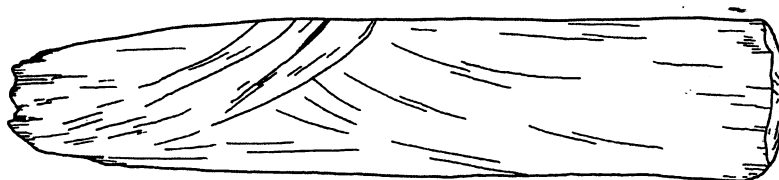
Artifact: 136
 Type: utilitarian
 Material: wood
 Specific Type: tool handle

Wood Species: undetermined
 Date: 1834-1885
 Site Association: yes



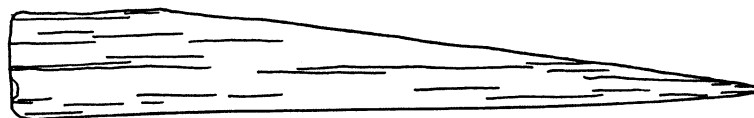
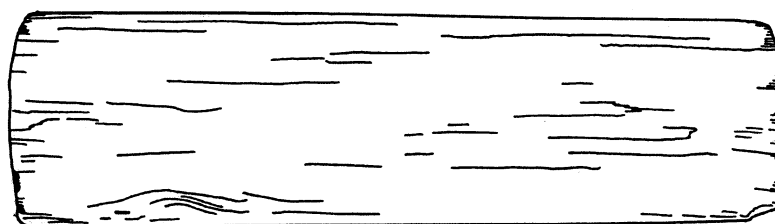
Artifact: 086A-D
Type: container
Material: wood
Specific Type: barrel staves

Wood Species: undetermined
Date: 1850-1885
Site Association: yes



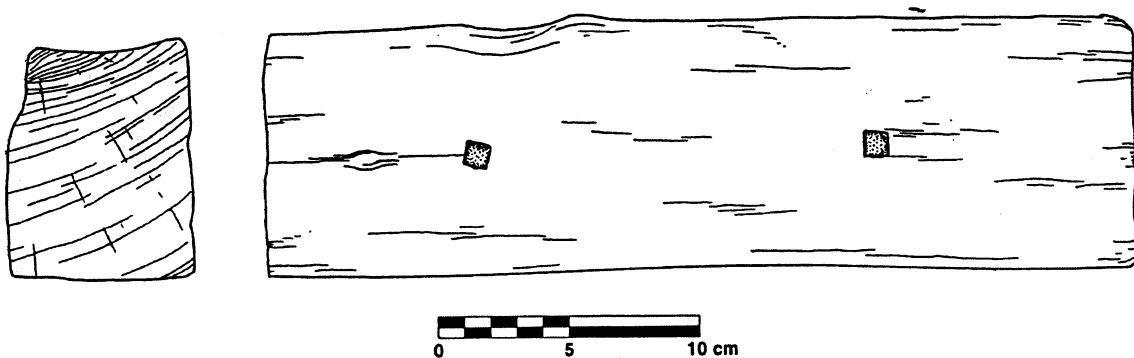
Artifact: 146
 Type: ship-related timber
 Material: wood
 Specific Type: chock, wedge

Wood Species: oak (*Quercus* sp.)
 Tool Marks: none
 Date: 1834-1885
 Site Association: yes



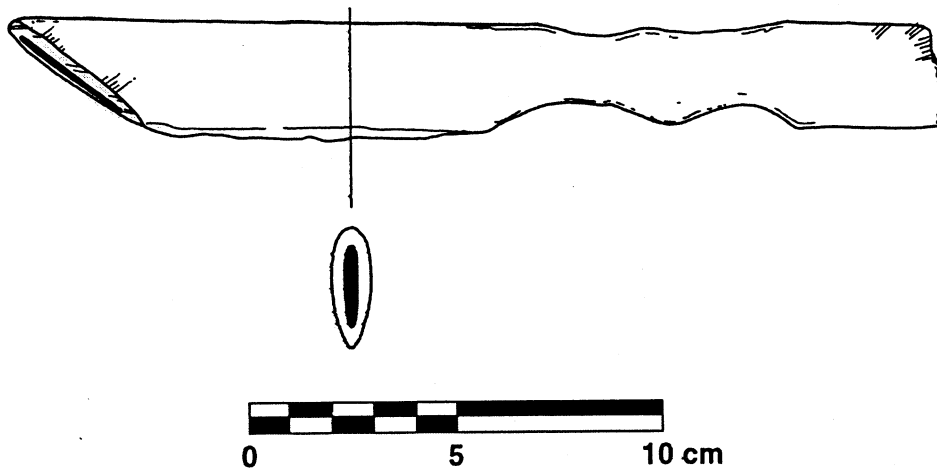
Artifact: 277
 Type: ship-related timber
 Material: wood
 Specific Type: chock, wedge

Wood Species: oak (*Quercus* sp.)
 Tool Marks: none
 Date: 1834-1885
 Site Association: yes



Artifact: 178
 Type: ship-related timber
 Material: composite (wood, iron)
 Specific type: block

Wood Species: undetermined
 Tool Marks: none
 Date: 1834-1885
 Site Association: yes



Artifact: 272
 Type: animal (bovine)
 Material: bone
 Specific type: rib

Tool Marks: diagonal cut at proximal end,
 cut marks at both ends
 Date: undetermined
 Site Association: undetermined



Artifact: 022

Type: tobacco pipe

Material: ceramic, ball clay

Specific Type: mouthpiece

Commercial Marks: none

Decoration: none

Bore diameter: 4/64

Date: 1850-1900

Site Association: yes



Artifact: 250

Type: tobacco pipe

Material: ceramic, ball clay

Specific Type: pipe stem

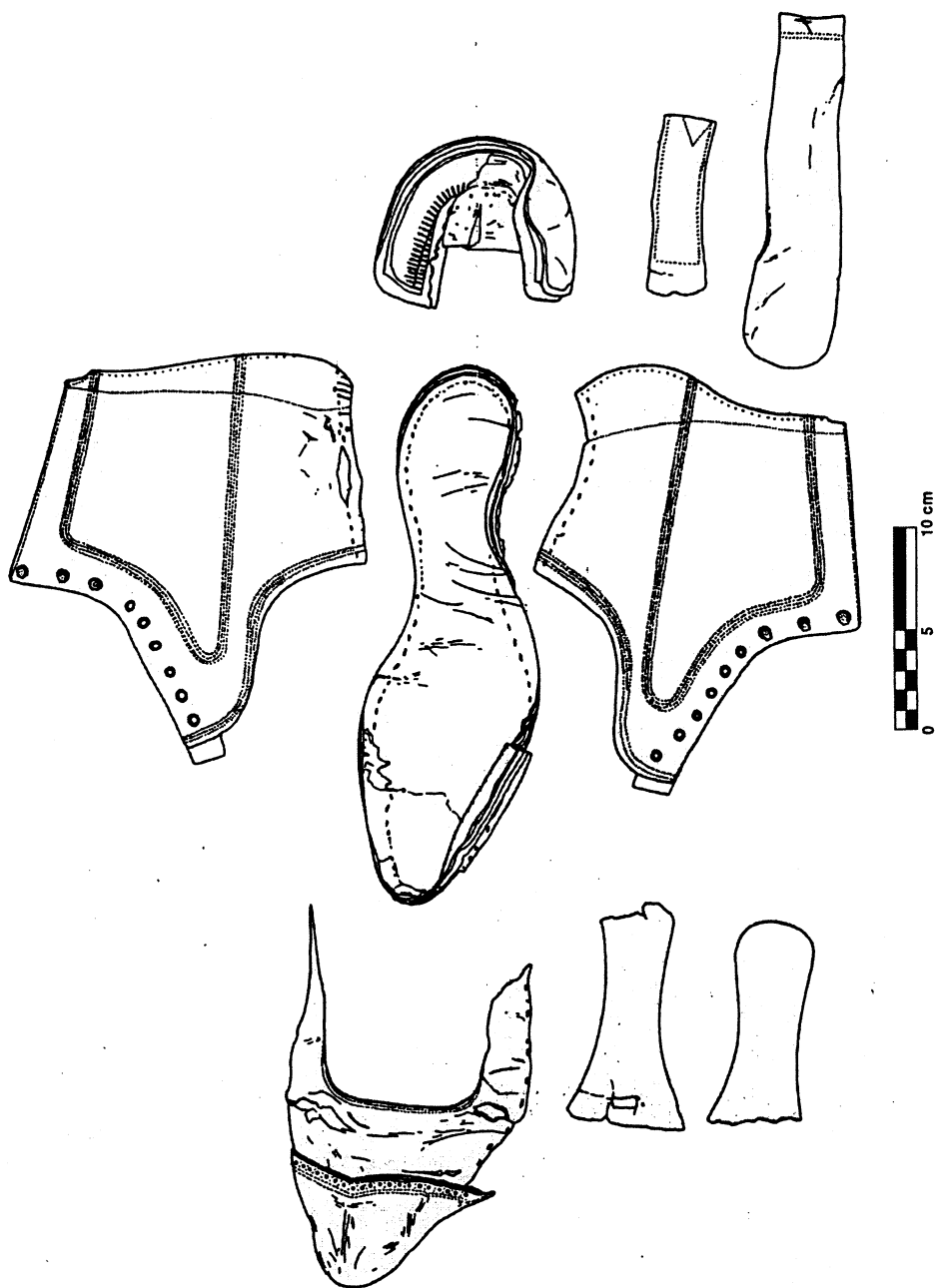
Commercial Marks: pressed lettering
'HENDERSON' and 'MONTREAL'

Decoration: none

Bore Diameter: 4/64

Date: 1847-1876

Site Association: yes



Artifact: 500
Type: clothing-related
Material: leather and copper alloy
Specific Type: shoe

Manufacturing Technique: machine-made
Date: undetermined
Site Association: undetermined

APPENDIX B

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156

Thomas - Anabella

53 Cado Pine 400	7160	3/10	51.50
53 Cado Pine 400	471		
31 55 ft on Cado Pine	1600		
28 55 ft on Cado Pine	1120		
27 55 ft on Cado Pine	1020		
26 55 ft on Cado Pine	920		
25 55 ft on Cado Pine	820		
24 55 ft on Cado Pine	720		
23 55 ft on Cado Pine	620		
22 55 ft on Cado Pine	520		
21 55 ft on Cado Pine	420		
20 55 ft on Cado Pine	320		
19 55 ft on Cado Pine	220		
18 55 ft on Cado Pine	120		
17 55 ft on Cado Pine	20		
16 55 ft on Cado Pine	20		
15 55 ft on Cado Pine	20		
14 55 ft on Cado Pine	20		
13 55 ft on Cado Pine	20		
12 55 ft on Cado Pine	20		
11 55 ft on Cado Pine	20		
10 55 ft on Cado Pine	20		
9 55 ft on Cado Pine	20		
8 55 ft on Cado Pine	20		
7 55 ft on Cado Pine	20		
6 55 ft on Cado Pine	20		
5 55 ft on Cado Pine	20		
4 55 ft on Cado Pine	20		
3 55 ft on Cado Pine	20		
2 55 ft on Cado Pine	20		
1 55 ft on Cado Pine	20		
53 Cado Pine 400	1900		
17 Oil Bu	200		
12 Oil Bu	100		
53 Oil Bu	100		
34 55 ft on Cado Pine	100		
33 55 ft on Cado Pine	100		
32 55 ft on Cado Pine	100		
31 55 ft on Cado Pine	100		
30 55 ft on Cado Pine	100		
29 55 ft on Cado Pine	100		
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27 55 ft on Cado Pine	100		
26 55 ft on Cado Pine	100		
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22 55 ft on Cado Pine	100		
21 55 ft on Cado Pine	100		
20 55 ft on Cado Pine	100		
19 55 ft on Cado Pine	100		
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15 55 ft on Cado Pine	100		
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9 55 ft on Cado Pine	100		
8 55 ft on Cado Pine	100		
7 55 ft on Cado Pine	100		
6 55 ft on Cado Pine	100		
5 55 ft on Cado Pine	100		
4 55 ft on Cado Pine	100		
3 55 ft on Cado Pine	100		
2 55 ft on Cado Pine	100		
1 55 ft on Cado Pine	100		

1876 Schooner Onabilla			
Oct	to	Lord	87
		General	20.50
		Wm. Pl.	5.60
			<u>179.75</u>
			27.18.7
2	to	18.75	43.75
2	to	575 11.50	
		27.00	
		24.35	
		3.35	
		55.91	
		7.05	
		89.88	
		23.12	
		1.81.23	
		3.16	
		2.18.4	
		2.22	
		27.18.7	
Nov	10	6272 Cds	93.00
		11.00	22.50
		2.00	<u>175.50</u>
			46.20
		Freight of 1000	80.00
		of 500	72.00
Dec	13	10240 Cds	
		17.00	101.80
			50.72

Alvin C. Arnold

[illegible]

1875 <i>Johnston Amabilis</i>			
Feb 12	1875 11.57-612-57	76.00	
	26 74.	30.00	
June 5	1875 572-612-57	76.00	
	24 74.15	30.00	
29-2	Pine 552-612-57		
12-18	Pine 1175-2 57.00-512-57		
41.13	24	11.00	
	11.00	11.00	
220.00	2.20		
	Chap 11.00		
	Ref. 11.00		
11.00			
	Amabilis		
	Pine 11.00		
June 12	11.00	11.00	
	11.00	11.00	
1876			
July 12	11.00	11.00	
	11.00	11.00	
	11.00	11.00	
1877			
Oct 12	11.00	11.00	
	11.00	11.00	
	11.00	11.00	
1878			
Jan 12	11.00	11.00	
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1879			
Feb 12	11.00	11.00	
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1880			
Mar 12	11.00	11.00	
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1881			
Apr 12	11.00	11.00	
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1882			
May 12	11.00	11.00	
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1883			
Jun 12	11.00	11.00	
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Jul 12	11.00	11.00	
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Aug 12	11.00	11.00	
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1886			
Sep 12	11.00	11.00	
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1887			
Oct 12	11.00	11.00	
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1888			
Nov 12	11.00	11.00	
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	11.00	11.00	
1889			
Dec 12	11.00	11.00	
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1890			
Jan 12	11.00	11.00	
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1891			
Feb 12	11.00	11.00	
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1892			
Mar 12	11.00	11.00	
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1893			
Apr 12	11.00	11.00	
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1894			
May 12	11.00	11.00	
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1895			
Jun 12	11.00	11.00	
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1896			
Jul 12	11.00	11.00	
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1897			
Aug 12	11.00	11.00	
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1898			
Sep 12	11.00	11.00	
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1899			
Oct 12	11.00	11.00	
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	11.00	11.00	
1900			
Nov 12	11.00	11.00	
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1901			
Dec 12	11.00	11.00	
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1902			
Jan 12	11.00	11.00	
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1903			
Feb 12	11.00	11.00	
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1904			
Mar 12	11.00	11.00	
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1905			
Apr 12	11.00	11.00	
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1906			
May 12	11.00	11.00	
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1907			
Jun 12	11.00	11.00	
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1910			
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1911			
Oct 12	11.00	11.00	
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1912			
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1913			
Dec 12	11.00	11.00	
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1914			
Jan 12	11.00	11.00	
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1915			
Feb 12	11.00	11.00	
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1916			
Mar 12	11.00	11.00	
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1917			
Apr 12	11.00	11.00	
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1918			
May 12	11.00	11.00	
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1919			
Jun 12	11.00	11.00	
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1920			
Jul 12	11.00	11.00	
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1921			
Aug 12	11.00	11.00	
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1922			
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1925			
Dec 12	11.00	11.00	
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1926			
Jan 12	11.00	11.00	
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1927			
Feb 12	11.00	11.00	
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1928			
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1929			
Apr 12	11.00	11.00	
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1930			
May 12	11.00	11.00	
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1931			
Jun 12	11.00	11.00	
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1932			
Jul 12	11.00	11.00	
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1933			
Aug 12	11.00	11.00	
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1934			
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1935			
Oct 12	11.00	11.00	
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1936			
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1937			
Dec 12	11.00	11.00	
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1938			
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1939			
Feb 12	11.00	11.00	
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[illegible]

1879 Schooner Anabella

58 lbs 10 oz 100

58 00

2/5 of 56 is 22.40

22.40

03

9.57

32.97

12.56

32.97

8.05

32.97

9.51

32.97

[illegible]

170

1881

Corno Inabilla

June 1	54 Lbs fine wood 45	310 00	
	for ch. 24.125	43 50	63 25
		246 50	
	to 6 Lbs wood	5 00	
	wharf age	238 50	
		234 50	

75 Lbs. 5. 10. 10. 10. 10.

3 ft m. 63.75 73 0

June 2	61 Lbs 125	70 25	
	~~25 00~~	~~2 50~~	
		78 75	
	1/2 of 78.75 is 24.38		26.38

July 1	14 1/2 Lbs Kara 150	21 60	
	39 1/2 Lbs 1.25	49 06 1/2	
	73 5	23.64	

20	24 1/2 Lbs Kara 150	37 50	
	17 1/2 Lbs Kara 125	21 87 1/2	
	41.2 1/2 1.50	61 80	

Sept 26	34 1/2 Lbs Kara 150	51 75	
	11 Lbs Kara 125	13 75	
	43 1/2 Lbs Kara 150	65 25	
	55 Lbs Kara 125	68 75	
	73 1/2 of 78.31		

Oct 17	20 Lbs Kara 150	30 00	
	25 Lbs Kara 125	31 25	
	25 Lbs Kara 150	37 50	

73 1/2 of 78.31

VITA

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 B. A. in Psychology, Boston University, 1992.
 M. A. in Anthropology, Texas A&M University, 1998.

Professional Research Positions:

Jan. 1998	Kingstown Harbor Shipwreck Project, Institute of Maritime History - Project Conservator
Sept. 1997	Cape Neddick River Survey, Institute of Maritime History - Principal Investigator
March 1997	La Salle Shipwreck Project, Texas Historical Commission - Assistant Archaeologist
July 1996	Saona Shipwrecks Project, Institute of Maritime History - Surveyor
Sept. 1995	Snow Squall Project, Spring Point Museum, National Maritime Museum - Project Assistant
May 1995	Annabella (Cape Neddick River Project), Institute of Maritime History - Principal Investigator
Sept. 1994	St. John Chapel Excavation, Texas A&M University - Field Director

Publications:

1994	(with Frederick M. Hocker) Beneath the Knights' Chapel: INA's Excavation in the Castle of St. Peter. <i>INA Quarterly</i> 21 (4): 3-7.
1996	<i>Annabella</i> : the Excavation of a Nineteenth-Century Coasting Vessel. <i>IMH Annual Newsletter</i> 1: 4-10.
1996	<i>Annabella</i> : the Excavation of a Nineteenth-Century Coasting Schooner in Cape Neddick, Maine. <i>INA Quarterly</i> 23 (2): 16-21.