THE CONSTRUCTION OF THE CITYPLACE SCHOONER

A Thesis

by

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MASTER OF SCIENCE

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ABSTRACT

In 2015, the wreck of the CityPlace schooner was discovered in downtown Toronto. The remains were excavated by Archaeological Services, Inc. and relocated to the Fort York National Historic Site, also in downtown Toronto. In the spring of 2018, students from Texas A&M University's anthropology department traveled to Fort York to document the wreck. The data collected during the field season served as the basis for a conjectural reconstruction of the vessel. An analysis of the remains shows that the wreck is that of a merchant schooner built in the late 1820s or the 1830s. It was initially constructed with a daggerboard or a centerboard and was modified during its career to remove the same. At the end of the vessel's working life, it was abandoned near the shoreline and used as fill during an expansion of Toronto's growing waterfront.

This thesis focuses on the construction of the CityPlace schooner. It examines the historical context for the vessel, including the impact of the Great Lakes' economy and transportation-related infrastructure on the region's shipbuilding industry during the 19th century. The 2015 excavation and 2018 hull documentation are also described. The study provides a detailed description of the hull remains observed during the 2018 field season and presents a hypothetical reconstruction of the vessel derived from an analysis of the remains and the construction of similar contemporary vessels. The CityPlace schooner wreck provides valuable insights into shipbuilding practices on the Great Lakes during the early 19th century and the effects that the development of the region had on shipbuilding during this time.

ACKNOWLEDGEMENTS

This project could not have been completed without the assistance and support of a number of individuals and organizations. I would like to start by thanking my committee chair, Dr. Kevin Crisman, for all the encouragement, guidance, and helpful insights he provided throughout the writing and reconstruction process. I would also like to thank my committee members, Dr. Filipe Vieira de Castro, who introduced me to the topic, assisted in coordinating the field season, and offered continued enthusiasm for the project, and Dr. Brian Rouleau, for his valued input and research suggestions.

The project would not have occurred without the initiative of Thanos Webb, who brought the wreck to the attention of Texas A&M University, helped to coordinate with all of the parties needed to make the field season happen, and provided much appreciated insights into the wreck and its 2015 excavation. Many thanks are also owed to Richard Gerrard and the City of Toronto, who permitted us to study the wreck, helped organize the field season, and provided valuable assistance during the project. I would also like to express my gratitude to the Fort York National Historic Site and all of its staff members who were incredibly welcoming and supportive of the field season, graciously allowed us access to the site and the museum, and provided us with supplies needed to complete our work in Toronto. Additionally, I would like to thank Archaeological Services, Inc. for their willingness to share the information collected during the 2015 excavation and Jeff Hubbell for his assistance navigating the Ports Toronto archival material.

The project was generously supported by the Friends of Fort York and Garrison Common, the Institute of Nautical Archaeology, and Texas A&M University, whose funding contributions made the 2018 field work possible. I am incredibly grateful for their assistance and interest in the research.

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Contributors

This work was supervised by a thesis committee consisting of Professors Kevin J. Crisman and Luis Filipe Vieira de Castro of the Department of Anthropology and Professor Brian Rouleau of the Department of History.

Professor Christopher Dostal helped to process the photogrammetry models referenced in Chapter IV and Nicole Deere, Robin Galloso, and Carolyn Kennedy assisted in the collection of the data described in Chapter V. All other work conducted for the thesis was completed by the student independently.

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CHAPTER I

INTRODUCTION

North America's Great Lakes region experienced a period of rapid development in the 19th century. Commencing in the 1820s, the population of the northern shores of the lakes, then known as Upper Canada, increased drastically, transforming rural settlements into bustling cities and transportation hubs. The region's economy expanded during this time to meet the demands of its new residents, which spurred the need for a reliable transportation system to move people and goods throughout the area. The roads around the Great Lakes remained underdeveloped throughout much of the 19th century and an efficient local railroad system was not established until the 1860s. Consequently, for much of the century, the cheapest and quickest way to transport goods and people throughout the region was by water. This resulted in a boom in the construction of commercial sailing vessels on the Great Lakes between the 1820s and the 1870s.

During this period, local shipbuilders recognized the need to adapt the designs of their vessels to meet navigational conditions, which included numerous unimproved and shallow harbors. Few contemporary records documenting the designs of these ships (such as lines drawings, models, contracts, etc.) have survived. As such, it is necessary to consult archaeological remains to gain a better understanding of their construction. However, few Great Lakes wrecks dating to the first half of the 19th century have been fully documented, particularly merchant vessels.

In 2015, the construction of the CityPlace neighborhood in downtown Toronto revealed the remains of a 19th-century schooner near the intersection of Bathurst Street and Fort York Boulevard. The wreck was excavated by Archaeological Services, Inc. (ASI) and subsequently relocated to the Fort York National Historic Site, also in downtown Toronto. In the spring of 2018, a team of four students from Texas A&M University (TAMU) travelled to Canada to fully document and analyze the remains of the vessel. The location of the wreck, its features, and artifacts found amongst the timbers suggest it was a small merchant schooner built during the late 1820s or early 1830s. The wreck (known as the CityPlace schooner) is a rare example of the construction techniques used on early Great Lakes merchant vessels and provides valuable insights into shipbuilding practices on the Great Lakes during the early 19th century.

This thesis focuses on the construction of the CityPlace schooner. It begins with a discussion of the development of the Great Lakes region (particularly that of Lake Ontario and Toronto) in the 19th century and the effects of a growing population and economy on local shipbuilding. This discussion is followed by descriptions of the 2015 excavation of the CityPlace schooner and the 2018 field season. This thesis then provides a detailed description of the remains of the vessel as documented in 2018 and proposes a hypothetical reconstruction of the schooner based on archaeological data and on the little that is known about the construction of contemporary Great Lakes vessels.

CHAPTER II

HISTORICAL BACKGROUND

During the 19th century, Toronto (along with many other Great Lakes settlements) transformed from a small military outpost into a thriving city and transportation hub. The region's economy greatly expanded during this period to meet the demands of its increasing population. Shipbuilding on Lake Ontario was closely tied to the burgeoning trade, which resulted in a boom in the construction of commercial sailing vessels on the lake between the 1820s and 1870s. Throughout much of the century, the development of the region's infrastructure lagged behind its growing economy and restricted the expansion of commerce. The shipbuilding industry was also greatly affected by the area's limited infrastructure, which resulted in shipbuilders altering the designs of vessels to compensate for the transportation challenges present throughout Upper Canada. This chapter first discusses European settlement of Upper Canada and the region around Lake Ontario, focusing on the establishment of Toronto and the growth of its economy. It then addresses transportation-related infrastructure on and around Lake Ontario and the effects of its limited development on local shipbuilding and the region's commercial shipping industry. An analysis of the impact of advances in infrastructure and technology on shipbuilding practices then follows.

Establishment of Upper Canada and Toronto

The French were the first Europeans to explore the area surrounding Lake Ontario. In 1612, Samuel de Champlain (the founder and Governor of New France) included the lake in a map of the region, although his depiction was based solely on information obtained from indigenous people. Champlain prepared updated maps in 1616 and 1632 to reflect his own observations and those of other Frenchmen who explored the area. French activity in the region centered on the fur trade. The government discouraged settlement, except around trading posts, which were established at Niagara, Frontenac, Fort des Sables at La Famine, and Oswego, because it feared that colonization would lead to increased competition and a scarcity of animals.[1] Consequently, in 1759, when the British gained control of the region at the end of Seven Years War, it remained sparsely settled. The Royal Proclamation of 1763 officially established Quebec (which included Lake Ontario and the land surrounding it) as a British colony. In 1791, the colony was split into two provinces, Lower Canada, which included all land northeast of the Ottawa River, and Upper Canada, which included Lake Ontario and all other land southwest of the Ottawa River. The provinces were named to reflect their positions along the St. Lawrence, with Lower Canada encompassing the mouth of the river and Upper Canada encompassing its source.[2]

Colonel John Graves Simcoe was appointed the first Lieutenant-Governor of Upper Canada. He recognized the importance of maintaining control over Lake Ontario for the security of the British colony. He thought that Kingston (Upper Canada's naval headquarters) was too close to American territory, making the town vulnerable and unfit to serve as the provincial naval base. With the assistance of the Queen's Rangers, in

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[1] Ford 2009, 43, 93; Library and Archives Canada 2013.
[2] Belshaw 2015, 210-11, 222, 247.

1793, Simcoe established Fort York on the northwest shore of Lake Ontario, in what is now Toronto (fig. II.1). He believed this location was better situated to defend the province. The site was remote, it had a sheltered harbor that could easily be protected, and it thawed earlier in the spring than Kingston, which would allow for earlier sailing.

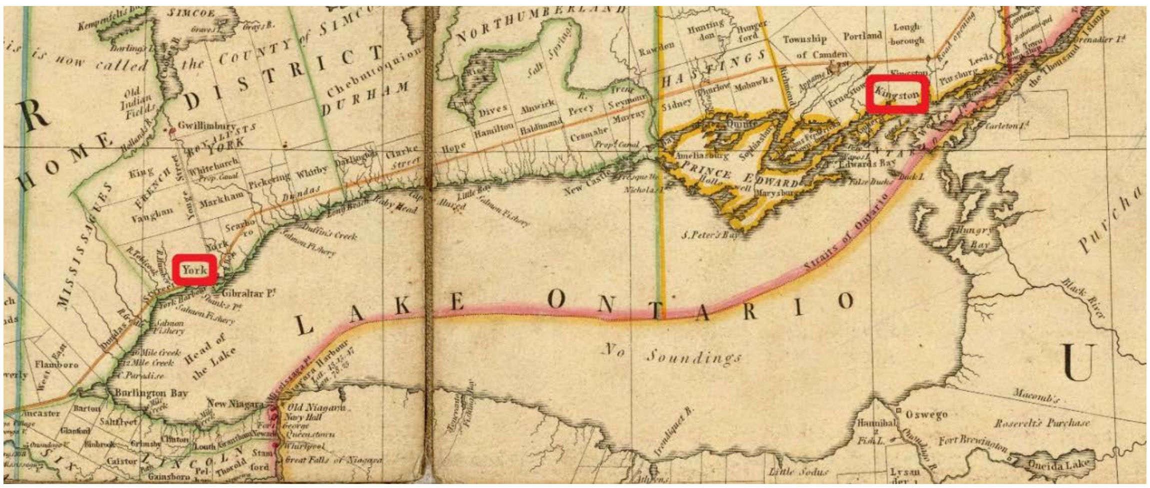

FIG. II.1 Detail of Lake Ontario in 1800 with Kingston and York highlighted (from D.W. Smyth 1800).

Simcoe's superiors disagreed with his assessment and refused to give him permission or funds to fortify the site. They believed Kingston was ideally situated to protect the British supply route along the St. Lawrence River, while Fort York was too isolated from Lower Canada to obtain the supplies needed to sufficiently provision a naval base. Fort York also lacked an established surrounding community, which Simcoe's superiors believed was necessary to effectively support such a base. Instead of abandoning his plans for the post, Simcoe named York (the town that was developing around the fort) the temporary provincial capital of Upper Canada. He used civil funds received in his capacity as Lieutenant-Governor to construct a barrack with limited defenses on the site. It was not until 1798, two years after Simcoe retired from his position, that Fort York became an official British military post.[3]

The fort and the town's political establishment drew some settlers to York, however, by 1799, the community had only 224 residents.[4] The area did not begin to prosper until the War of 1812. The fort expanded during the conflict to provide for the needs of an increased wartime military force and to better carry out its role as the British hospital center of the Niagara Peninsula, for which it served from June 1813 through the end of the war. The town's numbers grew in order to support the military, which purchased the majority of its supplies from local businesses and hired local workers.[5] The fort was captured twice by the Americans during the conflict, but was only occupied for a few days each instance. Following the end of the war, the British government continued to expand the fort and maintain a garrison at the post. As a result of this increased military activity, by 1818, the population of York rose to 700.[6]

Following the war, the British government began to offer new settlers free passage to Canada and promised 100 acres of land to heads of families and their male children upon reaching their 21st birthdays. It also subsidized the costs of necessary provisions and supplies.[7] The government provided this support because British politicians believed that emigration would help to relieve the country's post-war depression, by reducing population pressure and social unrest and increasing

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[3] Benn 1993, 21-26, 39; Benn 1994, 1-6.
[4] Ford 2009, 155.
[5] Benn 1993, 47, 66-68, 75.
[6] Benn 1993, 76, 84; Firth 1966, xxiii.
[7] Craig 2013, 52, 88.

employment levels, while simultaneously expanding the British empire.[8] Due in part to this state-sponsored emigration, beginning in the late 1820s, Upper Canada experienced a period of rapid growth, increasing from approximately 14,000 residents in 1791 to over 950,000 by 1851.[9] York's population grew during this period as well, increasing from 9,000 residents in 1834, to 23,500 in 1848, and to 50,000 by the 1860s. In 1834, the settlement became the first incorporated city in Ontario, was renamed Toronto, and was officially designated the permanent provincial capital.[10]

The rapid population growth resulted in an expansion of trade throughout the region. Prior to the War of 1812, there were not many merchants in Upper Canada. Most early settlers were subsistence farmers who provided for their own needs. Communities were largely rural, in part as a result of the government's expansive land grant policies, and could not support a vast trade network. A few local merchants did participate in the fur trade and sold agricultural surpluses. An assortment of American and European coins and British Army Bills were accepted locally. Given the lack of banking institutions, however, merchants typically operated through a system of barter or on letters of credit.[11] For all of these reasons, the British government initially monopolized the markets, in its efforts to supply military posts and obtain natural resources to ship back to Great Britain. This included the timber trade established by the Royal Navy in the

[8] Francis, Jones and Smith 2010, 128; Craig 2013, 125.
[9] Larkin 2018, 14; Statistics Canada 2015.
[10] Benn 1993, 84; Ford 2009, 134, 155; Firth 1966, xxiii.
[11] Craig 2013, 51-3, 132, 161.

18th century, which developed into a major industry by the early 1800s due to deforestation in Europe.[12]

By the late 1820s, the region's farmers started to produce a surplus of goods. Additionally, the increased demand generated by the wave of immigration created new markets that attracted businessmen with capital to the area.[13] The quantity of trade was further increased by a change in political relations between Canada and the United States, which resulted in the expansion of cross-border commerce. In the early 1800s, transnational trade was hampered by the embargo of 1807, which prohibited American vessels from conducting trade in foreign ports, and the War of 1812. American and British merchant vessels on the lakes were subject to boarding and harassment by each other's naval vessels. While cross-border trade existed throughout this period, it often took the form of smuggling and was a risky business enterprise.[14] With the signing of the Rush-Bagot Agreement in 1817, both the British and the Americans were required to reduce the size of their naval forces on the lakes. On Lake Ontario, they were each limited to one vessel of 100 tons burden or less that could only be used for activities such as transporting goods and troops and enforcing revenue laws. These naval limitations effectively opened the lakes to merchant traffic.[15] As discussed below, the development of canals and other infrastructural improvements in the second half of the

[12] Ford 2009, 136.
[13] Craig 2013, 149.
[14] Larkin 2018, 50, 25, 27, 68.
[15] Shuryan 2012, 235-9.

19th century further increased the quantity of commercial lake traffic throughout the region as trade routes were established and lake travel became more efficient.

The increase in trade was noted by the region's residents. An article in the *Colonial Advocate*, dated October 2, 1828, discusses the recent opening of multiple granaries and eight new wholesale, grocery, and general stores in York, all offering a wide assortment of goods, stating that, as a result of such increase in business, the "old established dealers have, very judiciously, determined to lower their prices and sell vastly cheap *for ready pay*…"[16] Prices of goods dropped further as the retail trade became more specialized.[17] The establishment of the Bank of Upper Canada in York in 1821 also helped to expand trade throughout the region, as it gave individuals access to the capital needed to create new retail businesses and develop industry.[18]

In the 1820s, a market for wheat rapidly arose. Between 1826 and 1832, the number of plowed acres in Upper Canada almost doubled. By the 1840s, wheat replaced timber as Toronto's primary export and, although there were some fluctuations and periods of depression, overall wheat production continued to expand until the early 1880s. The wheat market spurred land sales, land clearing, farming, and shipping, and created increased demand for labor, manufactured goods, and other crops to support the growing population. In the second half of the 19th century, ore (including copper and iron), coal, and oil also became major commodities.[19] These expanding markets created

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[16] *Colonial Advocate* 1828, 57-8.
[17] Ford 2009, 411.
[18] Firth 1966, xxxii.
[19] Belshaw 2015, 9.5; Ford 2009, 144-47.

a small merchant class that wielded a considerable influence in the development of the city.[20]

The Development of Transportation-Related Infrastructure

Goods exported from York and other settlements in Upper Canada had to be shipped to markets in colonial cities such as Montreal or Kingston, or to Great Britain. During the first half of the 19th century, the infrastructure in and around York and the rest of the region was insufficient to support the transfer of these goods and hampered the growth of trade. It was not until the 1830s that the government and private individuals started to invest in the improvement of roadways, harbors, and waterways in response to the growing demands of the merchant class.

Roads

Upper Canada lacked a comprehensive road system during the first half of the 18th century. Early travelers followed Native American paths and portage trails, which were typically just enlarged versions of these paths. During the Seven Years War, the British and French militaries constructed short sections of road, mainly around Kingston and Niagara. Additionally, some early settlers built preliminary roads to connect their properties to town, however, most people traveled by waterways or sleds, depending upon the time of year.[21] In 1791, Colonel Simcoe established the first road system around the north side of Lake Ontario, linking Upper Canada’s towns, ports, and mills. This included the 190 miles (306 km) long Kingston Road, which extended from

[20] Acheson 1969, 408.
[21] Guillet 1966.

Kingston to York. In 1817, a stage-coach line began providing a weekly service along the road during the winter months (avoiding the dangerously muddy conditions of all other seasons) and by the 1830s daily, year-round service was offered. However, these roads were still not under common ownership or management and were therefore disjointed and in poor condition (particularly through sparsely populated areas), making travel over land exceedingly difficult and uncomfortable. Plank roads (roads with wooden planks laid perpendicular to their length) improved conditions but were not constructed until the late 1830s and 1840s, and the road system as a whole did not become a reliable method of transportation until the end of the 19th century.[22]

Waterways and Harbors

Because of the slow development and poor condition of the local roads, it was cheaper and quicker to transport goods and people by water and, as a result, merchant vessels became vital to the success of the growing lake settlements. However, at the start of the 1800s, the region lacked the ships and infrastructure needed to support a successful commercial shipping industry. In the 17th and early 18th centuries, the British and French governments controlled the majority of lake commerce. Most early merchants transported their goods to market in canoes or bateaux (flat bottomed, boxy vessels of a size slightly larger than that of a canoe), while those in the timber trade commonly used rafts to transport their goods to market. In 1776, Sir Guy Carleton, the governor of Quebec, prohibited all private decked vessels from operating on the Great

[22] Craig 2013, 148; Ford 2009, 171-73.

Lakes. Consequently, merchants selling goods that could not be shipped by small craft (for either economic or practical reasons) were forced to transport their wares on military vessels. The ban remained in effect until 1785 and effectively limited commercial shipbuilding on the lakes during its enactment. As a result, there were few merchant vessels of significant size on Lake Ontario through the start of the 19th century.[23]

The growth of trade following the War of 1812 increased the demand for commercial vessels and the development of the shipbuilding industry. The expansion was supported by the labor force that was assembled during the war and it mirrored the growth in agricultural production and trade throughout the region.[24] Because of the small number of vessels previously operating on the Great Lakes, however, the infrastructure needed to support the increase in lake commerce did not exist. Waterways remained shallow and disconnected, requiring multiple portages for people and goods to reach their destinations. The harbors in York and the rest of Upper Canada were also shallow and unimproved, with many entrances obstructed by sandbars. As a result, merchants often had to employ carts or lighters to transport cargo between their vessels and shore. Comprehensive navigational charts of the lakes, which would have mitigated some of the navigational challenges of the shallow waters, were not made publicly available until around 1830.[25]

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[23] Kopp 2012, 15; Ford 2017, 53-59.
[24] Ford 2009, 139-40, 202.
[25] Ford 2017, 95.

In response to growing demand, starting in the 1830s, improvements were undertaken on the lakes to facilitate trade. This is demonstrated through the developments made to York's harbor facilities. In 1833, the first commissioners were appointed to oversee harbor improvements in the town. That same year, funds were appropriated for the construction of the Queen's Wharf (initially known as the "New Pier") adjacent to Fort York.[26] In addition to serving as a dock, the wharf was intended to slow both the growth of a sandbar at the harbor's entrance and the icing over of the harbor in the winter. A map of proposed improvements dated October 31, 1833 shows the wharf extending out over 700 feet (213.36 m) in length, yet reaching a depth of only 9 feet, 9 inches (2.97 m) of water (fig. II.2).[27] In the 1830s and 1850s, the pier was widened and extended to accommodate the increasing number and size of vessels on the lake and by the 1860s, various structures had been erected on the wharf to support the expanding lake commerce, including storehouses, a grain elevator, and a lighthouse. To further increase accessibility to the port, dredging of the harbor began in the 1830s and continued throughout the century. By 1855, the town had acquired four dredges for this purpose and in the 1860s, started to employ steam dredges.[28]

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[26] Moir 1998, 112.
[27] Bonnycastle 1833.
[28] McIlwraith 1991, 25.

FIG. II.2 Detail of Bonnycastle’s “No. 2 Plan of Comparison” showing planned location of the Queen’s Wharf (from Bonnycastle 1833).

The increase in commerce led to busier ports and a growing demand for access to the lake’s harbors. In Toronto, the shoreline to the east of the Queen’s Wharf was extended to accommodate this need. Starting in the 1850s, the railroad companies began to create new land along the waterfront. This was done by constructing coffer dams or shore walls out of timber cribbing around an area and filling in the enclosed space with a variety of material, including dirt excavated from construction sites, sand dredged from the harbor, stone, wood, sewage, and garbage. It was not uncommon for derelict or abandoned vessels to also be used as fill. These instances were not often recorded, likely because the disposal of dilapidated vessels was not considered noteworthy. However, to date, archaeologists have uncovered four vessels in Toronto from areas filled in during the late 19th and early 20th centuries and similar archaeological finds have been reported in many other North American cities.[29]

Canals

During the 18th and early 19th centuries, merchants relied on natural waterways to transport their goods from Upper Canadian settlements (including York) to Montreal and to other major markets. These waterways were not interconnected and required multiple portages, where passengers and cargo were unloaded for transportation over land, either by foot, horseback, sled, or wagon. While scenic, the portage roads were often dangerous, particularly in winter, and did not make for efficient or reliable travel.[30] One traveler recounting his journey from England to York in 1812 described a year long trek that commenced with overland travel from Leicester to Liverpool and was followed by a two month voyage across the Atlantic, transfer to a sloop to sail from New York City to Albany, a six week overland passage by covered wagon to Oswego, and a trip on a small schooner from Oswego to York. [31] These types of passages made for very long, expensive, and hazardous voyages that were too unpredictable and impractical for sustaining profitable trade routes.

Discussions regarding the use of canals to ease inter-lake travel began in the 1700s. By 1780, the British government constructed the first canal in North America, known as the Coteau-du-Lac canal, to supply its military posts on the St. Lawrence

[29] Archaeological & Cultural Heritage Services, Inc. 2016, 2-4; McIlwraith 1991, 19-25; Richards 2013, 2.
[30] Larkin 2018, 19-20; Palmer 2014, 112.
[31] Stevenson n.d., 302.

River.[32] The channel and locks were too small to provide a viable trade route, however, along with other infrastructure built on the St. Lawrence and on the Mohawk River, it demonstrated the effectiveness of canals in facilitating transportation and trade throughout the Great Lakes region and spurred the construction of additional canals. The three with the biggest impact on trade on Lake Ontario were the Erie, Oswego, and Welland Canals (fig. II.3).

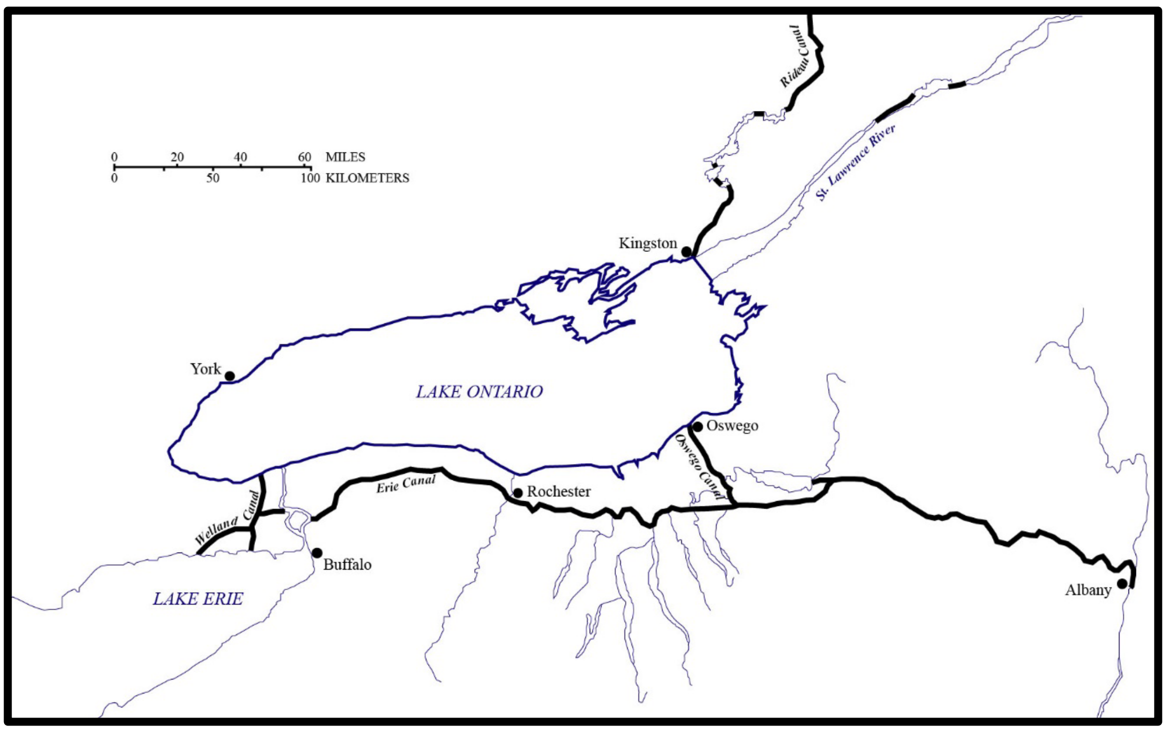

FIG. II.3 Map of canals surrounding Lake Ontario, 1816-1848 (after McIlwraith 1975, 854).

The Erie Canal was designed to establish a navigable water route between the Great Lakes and New York City. A survey to determine its location was authorized and

[32] Larkin 2018, 17.

completed in 1808. In 1817, the New York state legislature approved the construction of the canal, which was to follow an inland route, connecting Lake Erie at Buffalo, New York to the Hudson River at Albany, New York. The 363 miles (584.2 km) long canal was completed in 1825. Its prism was 40 feet (12.2 m) wide and 4 feet (1.2 m) deep, and its locks were 15 feet (4.6 m) wide and 90 feet (27.4 m) long.[33] The canal could support vessels with cargo capacities of up to 60 tons.[34] Its opening had an immediate effect on the amount of boat traffic on Lake Erie, as demonstrated through an increase from 286 arrivals into and departures from Buffalo in 1824 (prior to its construction) to 418 arrivals and departures in 1826 (following its completion).[35] However, the size of the vessels travelling on the Erie Canal was greatly limited by the size of the locks. The structure was built for intra-lake traffic and was not meant to accommodate seagoing vessels. As a result, while its completion led to an increase in trade, the regional shipping industry remained restricted. The size of the canal was not increased until 1862, when the locks were expanded to 18 feet (5.5 m) wide and 110 feet (33.5 m) long and the depth of the canal was increased to 7 feet (2.1 m).[36]

The New York legislature incorporated the Oswego Canal Company in 1823. Its purpose was to establish a canal route connecting Lake Ontario to the Erie Canal. Construction began in 1825 and was completed in 1828. The canal was 38 miles (61.2 km) long and 4 feet (1.2 m) deep, with locks that were 90 feet (27.4 m) long and 15 feet

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[33] New York State Canal Corporation; Stevens 2001, 215.
[34] McIlwraith 1976, 864.
[35] Barton 1847, 15.
[36] McIlwraith 1976, 857, 868; Stevens 2001, 217.

(4.6 m) wide.[37] Like the Erie Canal, the size of the Oswego Canal greatly restricted the number of ships that could utilize the structure, effectively limiting the amount of trade that could be conducted along its route. Its size was not increased until the 1860s, when its locks were expanded to 18 feet (5.5 m) wide, 110 feet (33.5 m) long, and 7 feet deep (2.1 m).[38]

The Canadian government was also interested in building canals in the region to ensure that the trade conducted by its colonies remained competitive with that of the Americans. The Province of Upper Canada incorporated the Welland Canal Company in 1824, giving its directors the power to survey the area between Lake Ontario and the river Welland to establish boundaries for a canal connecting Lake Ontario to Lake Erie.[39] Construction commenced in 1824 and the first ships successfully passed through the canal in 1829 (although it did not officially open until 1833). The canal prism and locks were much bigger than those of the Erie Canal to accommodate larger ships. It was 8 feet (2.4 m) deep with locks 100 feet (30.5 m) long and 22 feet (6.7 m) wide, and it could accommodate ships with cargo capacities of up to 120 tons. As with the Erie Canal, the effects on trade were seen almost immediately. In 1833, a Connecticut newspaper reported that the opening of the Welland Canal effectively increased the importation of flour from Ohio by 100 percent and the trade of all other goods by 50

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[37] Larkin 2018, 122; McIlwraith 1976, 856, 864; Whitford 1906, Chapter VII.
[38] Whitford 1906, Chapter VII; U.S. Congress, House of Representatives 1862, 3.
[39] Welland Canal Chap. XVII 1825; Gillham 1996, 89.

percent. In 1834, a Pennsylvania paper reported that the amount of trade conducted on Lake Ontario had doubled since the opening of the canal in 1829.[40]

Despite these benefits, by time the construction of the Welland Canal was complete, there were already ships on the lakes that were too large to pass through it.[41] Additionally, because the dimensions of the canals were not uniform, goods exported from Lake Ontario and Lake Erie still frequently had to be offloaded at Oswego and transferred to smaller vessels in order to continue through the Oswego and Erie Canals. In an effort to mitigate its size limitations, the Welland Canal was rebuilt between 1846 and 1850 to increase its locks to 150 feet (45.7 m) long by 27 feet (8.2 m) wide. The modified canal had a depth of 9 feet (2.7 m) and could accommodate ships with cargo capacities of up to 350 tons. The canal was again expanded between 1881 and 1884 to a length of 270 feet (82.3 m), with a width of 45 feet (13.7 m) and a depth of 14 feet (4.3 m). Each expansion of the canals allowed larger merchant vessels to enter the region, lowering shipping costs and increasing the amount of commerce conducted on the lakes.[42]

The construction of canals and other investments in the region's harbors and waterways during the 19th century opened markets, eased travel, and greatly reduced the time and expense required to ship goods throughout the region. These improvements made shipping a more profitable venture, which led to an increase in demand for

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[40] Ford 2009, 168; Larkin 2018, 83-110.
[41] McIlwraith 1976, 868.
[42] Ford 2009, 168-69; Gillham 1996, 89-91.

commercial sailing vessels on the Great Lakes.[43] As a result, the total tonnage on the lakes increased from 7,728 in 1830 to 450,726 in 1860 and the gross lake trade increased from $65 million in 1841 to over $300 million by 1851. The advances made, although beneficial, were still not sufficient to fully accommodate the needs of the region's growing economy. Particularly during the first half of the 19th century, the expansion of commerce was restricted by the size of the canals (which limited the size of the vessels that could conduct trade in the region) and the climate (as ice typically prevented travel on the lakes from December through March). Despite this, the number of commercial sailing vessels on the Great Lakes did not begin to decline until the 1870s, when the development of railroads, the shift in the centers of grain production to the west, and a financial panic drastically reduce shipping prices to such an extent that transport by merchant vessels was no longer economically viable.[44]

Railroads

The first railway in Canada (other than early temporary structures) was completed in the 1830s. It was 22 miles (36 km) long and connected La Prairie, on the St. Lawrence River, with Lake Champlain. In the 1850s, construction began on railways that had a more significant impact on Great Lakes trade. The Great Western Railway (linking Toronto with Windsor, Ontario and Niagara Falls) and the Toronto, Simcoe and Lake Huron Railway (linking Toronto with Lake Huron at Collingwood, Ontario) were both completed in 1855. The Grand Trunk Railway (connecting Montreal and Toronto)

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[43] Bukowczyk et al. 2005, 32-3.
[44] Ford 2009, 66, 142-46.

was also opened in the 1850s. Initially, the railways only attracted passengers and package freight, as it remained cheaper to ship bulk goods over water. However, by 1860, approximately 40 percent of grain traffic on the Great Lakes was transported at least partially by rail.[45] Railroads allowed for direct shipment to most major cities. They were also reliable and could be used year round (unlike merchant vessels which were dependent on the weather, relying on wind for transport and having to halt their business in the winter when the lakes froze over). Following the confederation of Canada in 1867, the government began to invest more in the rail system, standardizing gauges and connecting lines. This increased efficiency and reduced shipping costs. As a result, by the 1870s, trains were the dominant method of transportation for both goods and passengers throughout the area.[46]

The Effects of Trade Expansion and Infrastructural Limitations on Great Lakes Shipbuilding

Early Lake Vessels

The development of trade throughout the Great Lakes and the infrastructure built to support it had a significant impact on shipbuilding in the region, in terms of both the quantity and designs of the vessels produced. As noted above, there were very few merchant ships on the Great Lakes before the 19th century and the transport required for most early trade was conducted by small craft or military vessels. Many ships that were on the lakes during this time had construction features similar to seagoing vessels. They

[45] Belshaw 2015, 9.9; Bukowczyk et al. 2005, 58; Ford 2009, 186-7.
[46] Benn 1993, 128; Ford 2009, 185-89.

were often heavily built with deep hulls, emphasizing speed and seagoing capability. These vessels were quickly found to be unsuited to lake navigation. Their drafts were too deep and they were constructed too heavily to easily enter the region's unimproved harbors and waterways.

Adaption to Lake Conditions

During the War of 1812, a number of individuals with shipbuilding expertise immigrated to the Great Lakes from Europe and the East Coast. After the war, many stayed in the region and began to design new types of vessels with distinctive characteristics that better supported lake commerce.[47] These vessels were initially built to facilitate the intra-lake trade of high volume, low value, bulk goods. Given the short distance of most early trade routes, merchants valued cargo capacity and efficiency in loading and unloading cargo over sailing speed.[48] As a result, the vessels were full bodied with nearly flat floors to maximize cargo space. Masts were often placed close to the extreme ends of the ships to further increase the hold area and provide for easy cargo handling.

Centerboards and Daggerboards

To reduce a vessel's draft while still providing the lateral resistance needed to maintain maneuverability and responsiveness, shipbuilders began to construct merchant vessels fitted with retractable or drop keels. These were raised and lowered through the bottom of the hull and allowed vessels to enter into the shallow harbors of the Great

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[47] Wilson 1989, 202; Ford 2009, 132, 150.
[48] Wilson 1989, 227.

Lakes. There were two types of drop keels in use on the lakes during the 19th century, daggerboards and centerboards. Daggerboards are raised and lowered vertically through a watertight well or trunk carved through the center of a vessel's keel by tackle at both of its ends. The design was first used in America in 1774, on a vessel built by Captain John Schank of the Royal Navy, while he was stationed in Boston. Although daggerboards provided increased lateral resistance to cargo carriers, they could jam in the fore and aft direction upon grounding and could be hard to raise and lower, particularly if the vessel was not traveling directly against the wind. Consequently, they became obsolete with the invention and adoption of the centerboard.[49] The centerboard, like the daggerboard, is a retractable keel that is contained within a trunk. Instead of being raised and lowered vertically, however, it is pivoted around a bolt in its forward end by tackle attached to its after end. The first patent for a centerboard was issued in 1811 to Jococks, Henry, and Joshua Swain of Cape May, New Jersey, and by the 1840s, the design was widely used on the Great Lakes. Despite their advantages and popularity, drop keels did have some disadvantages. The placement of the trunk reduced the amount of available cargo space and the designs (particularly on early vessels) could be leaky. In at least one instance, a vessel that was originally built with daggerboards was rebuilt to remove the same and replace them with a standing keel, likely for these reasons.[50]

[49] Barkhausen 1990, 5-8.
[50] Barkhausen 1990, 9-15, Clark 1904, 148-51.

Schooners

Schooners were the most common rig on the Great Lakes during the 19th century. These vessels have at least two masts, each with fore-and-aft sails. They can be manned by a small crew, reducing operating costs. Additionally, they are highly maneuverable and excellent close-hauled sailers, which are desirable characteristics for Great Lakes vessels that have to navigate through confined spaces and deal with winds that generally run in only one direction. As a result of these advantages, by 1830, schooners outnumbered all other types of vessel rigs on the lakes and by 1870, they constituted 80 percent of all lake vessels.[51] Early 19th-century Great Lakes schooners were relatively small, full-bodied vessels constructed to maximize cargo capacity. Speed was not considered as important of a characteristic, as most were used for intra-lake travel. They were often constructed more lightly than oceangoing vessels because they did not need to withstand the hazardous conditions encountered at sea and doing so reduced construction costs and the weight of the vessels. As the canals were built and longer trade routes were established, speed became a more important feature. By the 1860s, schooner designs on the lakes were relatively uniform, as shipbuilders perfected a model that was efficient, fast, inexpensive, and profitable.[52] These vessels were slightly longer than their seagoing counterparts and had narrower beams. Despite the improvements made to harbors during this period, the later schooners still had shallow drafts, relatively flat floors, and were frequently outfitted with centerboards. To reduce

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[51] Ford 2009, 141; Bamford 2007, 172.
[52] Wilson 1989, 222.

the amount of weight carried above the waterline, they were often built with frames that narrowed in dimensions as they went upward and that were more widely spaced than those on oceangoing vessels. Additionally, many were designed with stanchions and clamps to support deck structures instead of knees.[53]

Scows

One example of the modifications made to vessel designs to meet the challenges of lake travel is the development and popularity of scows. These were inexpensive vessels with large cargo capacities used to transport goods to market from rural communities that lacked deep water access. Although construction methods varied, scows typically had very different features than the lake schooners described above.[54] Scows were flat-bottomed with slab sides, a ramp stern, and very few curves. Many were gunnel built with little to no framing.[55] The majority, however, were still rigged as schooners. The vessels were not very seaworthy, particularly in rough weather, and were frequently overloaded. They could be fitted with centerboards to improve handling, however, they were still usually only used for intra-lake travel.[56] They first appeared on the Great Lakes in the 1820s and by the late 19th century, there were over 700 in use in the region. Their popularity was due in large part to the slow development of transportation infrastructure in the region, particularly outside of the major market areas.

[53] Ford 2009, 148; Bamford 2007, 154.
[54] Meverden and Thomsen 2005, 10.
[55] Pott 1993, 30.
[56] Meverden and Thomsen 2005, 5.

Although they were not good sailors, they provided an economical way for settlers and merchants to transport their goods to market in the absence of better alternatives.

The Impact of Improvements in Transportation Infrastructure and Technological Advances on Great Lakes Shipping and Shipbuilding Industries

Canallers

The opening of the canals not only increased the levels of commerce and shipbuilding occurring in towns along the new waterways, but also had an effect on the types of vessels that were constructed. As early as 1830, shipbuilders began designing boats specifically to fit the dimensions of the canals. In 1831, a visitor to Buffalo observed 20 new vessels under construction in the city, all built to fit the Welland Canal, which had officially opened the year prior.[57] By 1860, approximately 750 out of the 1,400 ships on the Great Lakes were canallers. Many of these vessels were built in shipyards along the canal's route, frequently in Oswego or St. Catherines. Canallers were designed to carry as much cargo as possible, while still fitting through the locks of the canal. They were long, relatively narrow, boxy ships with flat floors, hard bilges, bluff bows, and square transoms. Their forward and aft extensions were reduced to fit into the locks. As a result, canallers often had very high length-to-beam ratios and were not well suited to sailing in open water. Like many other types of lake vessels, the majority of canallers were rigged as schooners and had centerboards to improve handling. The sizes of these vessels increased with each expansion of the canals. During

[57] Larkin 2018, 108, 127.

the second half of the 19th century, particularly after the third expansion of the Welland Canal, the popularity of the three-masted canal schooner increased.[58]

Steamboats

Lake Ontario's first steam powered vessel was launched in 1816. Early steamers were often rigged as schooners and sailed the majority of the time, only using their engines when traveling upstream, going against the wind, or while in harbors. The earliest of these boats were used mostly for passenger transport, as they were faster, more reliable, and more comfortable than sailed vessels.[59] By 1826, there were five passenger steamboats operating on Lake Ontario, offering passage from York to Niagara almost every day of the week.[60] During the 1850s, many steamers were owned and operated in connection with railroads, which made it particularly easy for passengers to transfer between land and water prior to the wholesale takeover by the railways of all regional transportation.[61]

Despite their popularity for passenger travel, steamboats were slow to gain widespread usage as commercial shippers due to their cost (both to build and operate), small cargo holds, inability to fit through the small locks of the early canals, and deep drafts, which made them unsuitable for many Great Lakes harbors.[62] The early boats were also rather dangerous, as they were susceptible to fires and explosions. Steamers

[58] Ford 2009, 149-51, 170-71; Monk 2003, 49.
[59] Bamford 2007, 166-68.
[60] *Upper Canada Gazette* 1826, 53.
[61] Ford 2009, 178, 185.
[62] Sullivan 1817, 40; Wilson 1989, 208.

did not compete with sailed vessels as cargo carriers until the 1830s and 1840s.[63] The popularity of steamboats increased following the expansion of the canals and improvements made to the harbor areas on the Great Lakes. By the 1850s, most new, large vessels were constructed as steamers and by 1884 steam tonnage on the Great Lakes surpassed that of sail.[64]

The earliest steamboats were equipped with side-mounted paddlewheels.[65] Propellers did not appear on lake vessels until 1841, and they were slow to replace paddlewheels due to a variety of challenges. Propellers required deep draft hulls, which many early harbors and canals could not accommodate, and they also caused their vessels to vibrate, which made for uncomfortable rides. Eventually, however, they did overtake paddlewheels on the Great Lakes because they allowed greater cargo capacity, thus were more economical, and they could fit through the enlarged canals.[66]

Iron-Hulled Vessels

Iron hulls were also slow to gain popularity on the Great Lakes. The first iron-hulled vessel on the lakes, the U.S. Navy steam warship *Michigan*, appeared in 1843. However, no commercial iron-hulled ships were built until 1861. These vessels were expensive to construct (requiring equipment that Great Lakes shipyards did not always possess), were too large to fit through the early canal locks, and the public and insurance companies were very skeptical of the seaworthiness of their designs. For these reasons,

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[63] Ford 2009, 168-81.
[64] Anonymous 1992, 51; Ford 2009, 195.
[65] Bamford 2007, 166-68.
[66] Ford 2009, 195; Wilson 1989, 208.

they did not become popular on Lake Ontario until the 1890s, following the third expansion of the Welland Canal, after the golden age of commercial sail on the lakes had come to an end.[67]

Summary

Shipbuilding practices and the creation and rise in popularity of various vessel types and rigs on Lake Ontario throughout the 19th century were greatly affected by the increasing population of Toronto and other lakeside communities and the resulting expansion of trade and development of transportation infrastructure that occurred throughout the entire Great Lakes region. Commencing in the 1820s, the number of commercial vessels built on the Great Lakes increased drastically to accommodate the area's increase in trade. Particularly in the first half of the century, however, the region was not prepared to support its growing economy. The roads of Upper Canada were in poor condition, its harbors were unimproved, and merchants had to rely on natural waterways to transport their goods to distant market, which was a complex, time consuming, and expensive process that required a number of portages.

Shipbuilders adapted the designs of their vessels to navigate areas of shallow water in the lakes and thereby overcome the lack of adequate transportation infrastructure. They did this by building lake schooners and scows equipped with daggerboards and centerboards. The opening of the canals had a major impact on the growth of trade and shipbuilding throughout the region. They reduced shipping rates and

[67] Ford 2009, 190; Wilson 1989, 204-5.

allowed for the use of larger ships of greater efficiency, as demonstrated through the rise in popularity of canallers. However, the growth of the economy remained limited by the size of the canals until the end of the 19th century, when the locks of the Welland Canal were expanded to accommodate much larger sailboats, steamboats, and iron-hulled vessels. Infrastructural and technological advances in the form of railroads eventually brought about an end to the age of commercial shipping on the lakes. Waterborne transportation began to decline as soon as the region's railway system developed to a point where it was cheaper to haul goods over land than it was by water.

CHAPTER III

2015 EXCAVATION

The CityPlace schooner was discovered in 2015 by Archaeological Services, Incorporated (ASI), which was hired by Concord Adex Developments Corporation (Concord) to conduct a stage four archaeological assessment of its CityPlace development in downtown Toronto. This area was known to include the remains of the Queen's Wharf, which was built on the southeast corner of Fort York by the British military. The schooner's hull was located alongside the remains of a section of the wharf that was constructed in the early 1830s, near the current-day intersection of Bathurst Street and Fort York Boulevard (fig. III.1). It was found on the east side of the wharf with its stern pointed inland and was located within a shore wall built during the 1870s (fig. III.2). ASI excavated the ship, screened all of the removed soil, and documented the vessel with scaled drawings, photography, photogrammetry, and LiDAR.[68] With the cooperation of Concord, ASI, EllisDon Corporation, and Amherst Crane and Concrete Pumping, the wreck was then lifted by crane, relocated to the grounds of the Fort York National Historic Site, and stored just outside of the entrance to the visitor's center.[69] In accordance with Ontario's Planning Act, the remains fell under the care of the City of Toronto.[70]

[68] Archaeological & Cultural Heritage Services, Inc. 2016, 1, 7, 14. LiDAR, or light detection and ranging, is a remote sensing technique that uses pulsing lasers to measure distances and create three-dimensional images. See Chase et al. 2017, 90.
[69] Archaeological & Cultural Heritage Services, Inc. 2015.
[70] *PLANNING ACT, R.S.O.* 1990.

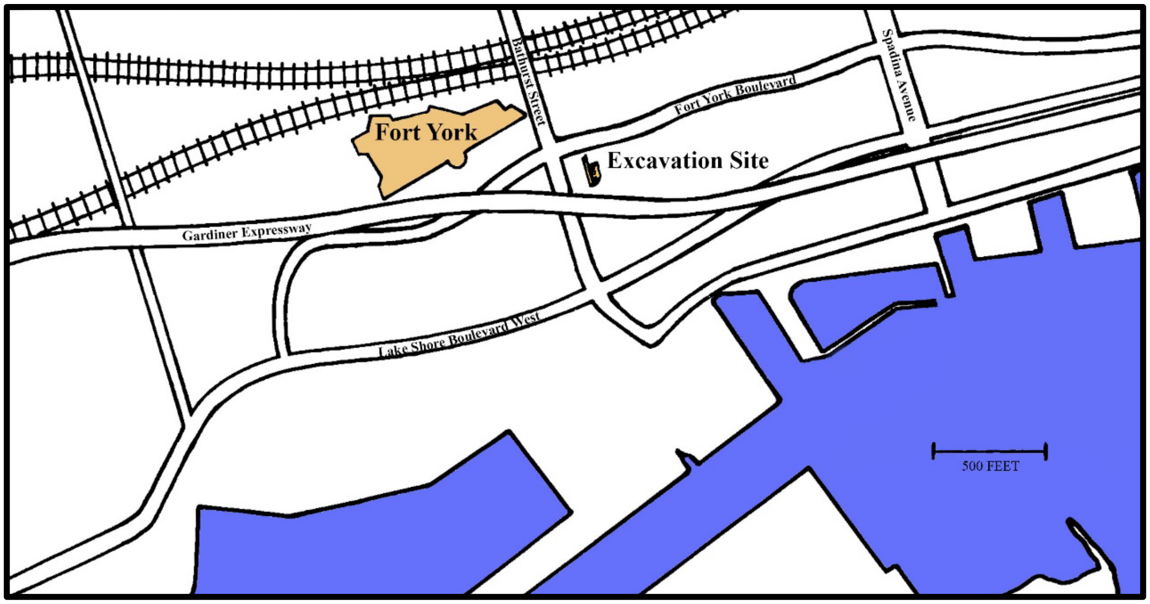

FIG. III.1 Map of Toronto's modern shoreline showing the locations of Fort York National Historic Site and the excavation site (map by J. Herbst).


FIG. III.2 CityPlace schooner wreck in situ alongside the remains of the Queen's Wharf (photograph by Archaeological Services, Inc.).

Based upon the hull features uncovered during the excavation, the vessel was thought to be a merchant schooner constructed in the late 1820s or early 1830s that was abandoned no later than the 1870s and used as fill during an expansion of Toronto's waterfront. This was determined by the wreck's location and artifacts recovered by ASI, including a United States Coronet Head cent found in the main mast step (fig. III.3). The coin appeared to have been deliberately placed under the mast (following a centuries old tradition for bringing the vessel good luck). The coin usefully provides a *terminus post quem* for the vessel's construction. The date on this coin is illegible due to wear, however, Coronet Head cents were produced between the years of 1816 and 1839 and, based on an analysis of its design, ASI dated the recovered coin to 1828.[71]

FIG. III.3 U.S. Coronet Head cent found in main mast step (photographs by R. Galloso).

The presence of a United States coin in the mast step may suggest that the vessel was constructed by (or for) an American. However, due to the prevalence of cross-border trade and the slow spread of Canadian banking institutions in the area, currency on the Great Lakes was fairly interchangeable in the early 19th century.[72] Additionally,

[71] Numismatic Guaranty Corporation; Archaeological & Cultural Heritage Services, Inc. 2016, 15.
[72] Acheson 1969, 420-21.

ASI recovered two artifacts, a sheave (a circular disk of wood that served as a wheel in a rigging block) and a chisel, both of which had a broad arrow incised into their surfaces (fig. III.4). The symbol was used to denote an item as British Government property. The discovery of the broad-arrow marked artifacts might suggest that the schooner belonged to the Royal Navy at some point during its career, but a more likely scenario is that the artifacts made their way onto the vessel after they were sold as surplus (the government dockyard at Kingston was gradually shut down and its property sold off over the 1820s and 1830s).[73] Over 1,000 other artifacts were also recovered during the 2015 excavation that, based on their location and function, were determined to be associated with the wreck. These fall under a variety of categories including tools, fasteners, personal items, and ceramics.[74] A catalog describing each recovered item is included in ASI's excavation report. The coin and broad-arrow marked objects hint at the general age of the wreck, but the artifact collection has not revealed the origin or name of the original vessel.

[73] Moore 2014, 199-201.
[74] Archaeological & Cultural Heritage Services, Inc. 2016, 16-21.

FIG. III.4 Sheave incised with a broad arrow indicating that it was once considered British Government property (photograph by R. Galloso).

CHAPTER IV

2018 FIELD SEASON

ASI conducted a thorough preliminary documentation of the wreck, however, a complete recording and analysis of the remains was outside of the scope of their work. For this reason, in the fall of 2017, Thanos Webb (a graduate of TAMU's Nautical Archaeology Program who served as ASI's nautical archaeologist during the 2015 excavation) reached out to TAMU to see if anyone was available to expand upon the results of their investigation. With his assistance, I coordinated with Richard Gerrard, an archaeologist with the City of Toronto, Andrew Stewart, Director of the Friends of Fort York and Garrison Common (FOFY), and the Fort York National Historic Site, to plan and carry out a field season to document the CityPlace schooner in greater detail. The project was supported by the FOFY, the Institute of Nautical Archaeology, and TAMU.

We started our work in May of 2018. I served as principal investigator, directing a team of three other TAMU anthropology students, including graduate students Robin Galloso and Carolyn Kennedy and undergraduate Nicole Deere. We spent four weeks at the Fort York National Historic Site recording the wreck in detail to obtain additional information regarding the schooner's construction, ownership, and use. The primary techniques relied upon were direct measurement and photogrammetry. Our methodology is described below.

During the 2018 field project, the wreck was located on a curb opposite the entrance to the Fort York visitor's center (where it was deposited after the 2015 excavation). A chain link fence that separates the grounds of the Fort York National Historic Site from the Fort York Armoury (an active military facility) bordered the starboard side of the vessel; a temporary fence enclosed the wreck on its three other sides. The hull rested at an angle on its lower keel and port side. Timbers used to support the remains during transport were present when we first arrived. They included two large modern beams sitting on top of the hull, one on the upper keelson and the other resting on top of the port side ceiling planking. There were also transversely-oriented modern timbers located below the lower keel and port side, near frames E-G and 1-3. The large beams on top of the wreck likely reduced the amount of warping that occurred as it dried out, but the beams underneath the vessel caused the planking and frames to sag unevenly. The topside beams were removed during our first week on site, while the timbers underneath the hull remained in place.

Modern alterations to the wreck include three holes cut into the hull planking that are spread out along the length of the remaining port side, located near the outboard edge of the port lower keelson, and the insertion of multiple iron reinforcing rods on the port side. These modifications were made for the purposes of reinforcing and lifting the wreck during its relocation.

The fort provided us with a table and tent to use while working outside on the main hull structure and also allowed us access to a working space inside of the visitor's center, which was particularly useful for drawing and artifact photography. Upon arrival to the site, we performed an initial analysis of the wreck to determine the best approach to recording. During this time, we met with Thanos Webb, who provided us with additional details regarding ASI’s excavation and pointed out areas of damage on the wreck, identifying those which predated the excavation and those which were caused during excavation or transport (such as the three holes mentioned above).

Recording Methodology

We started the documentation process by establishing a main baseline along the top of the centerline timbers; this was used to reference all other measurements. We also laid a secondary baseline along the lower keel on the starboard side of the wreck for ease of recording the area. For reference purposes, we then identified and labelled all of the frames (based on the locations of surviving timbers and, where no frames remain, on the locations of through bolts in adjacent timbers). We also identified and labelled the upper and lower ceiling planking, as we intended to remove these elements once documented in situ.

We measured and recorded the length, width, and thickness of each timber at regular intervals using measuring tapes and folding rulers (figs. IV.1 and IV.2). We also documented the size, location, and type of each fastener and all other construction features. All measurements were recorded in imperial units (as opposed to metric) because the vessel likely would have been built using English feet and inches and, as a result, this would make it easier to identify patterns in the vessel’s construction. We started by recording the ceiling planking. Once this was complete, we removed the timbers (fig. IV.3). The fasteners on the planks in the upper layer of ceiling had deteriorated, so while some of the planks still sat on top of the frames, only two remained in their original positions and they were easy to remove. We used a crowbar to gently lift the lower ceiling planks, which remained fastened to the frames. After the ceiling was removed and the sediments around the frames cleared, we measured the length of the frames and their molded and sided dimensions. We also measured the angle of each frame at regular intervals using a digital goniometer. While some team members cleaned and recorded the frames, others recorded profiles of the centerline timbers from the starboard side using the lower baseline as a reference. Another member of the crew recorded disarticulated but diagnostic timbers, including portions of the stem and sternpost. We concluded our field work by recording the hull planking and a plan view of the centerline timbers.

FIG. IV.1 Nicole Deere recording the sternpost (photograph by J. Herbst).

FIG. IV.2 Carolyn Kennedy and Robin Galloso recording the hull (photograph by J. Herbst).

FIG. IV.3 Julia Herbst, Carolyn Kennedy, and Robin Galloso removing the lower layer of ceiling planking (photograph by N. Deere).

The collected data were used to prepare scaled plan, profile, and section drawings (1 foot = 1 inch) of the hull, frame sections, and disarticulated timbers. We prepared as many of these drawings as we could in the field so that we could identify and collect any missing or contradictory data. These drawings were relied upon in my analysis of the vessel's construction and formed the basis of my proposed reconstruction of the vessel.

Photogrammetry

In addition to direct measurements, I also documented the wreck using photogrammetry, which is a process by which multiple photographs of an object, taken from all different angles, are used to derive measurements and produce three-dimensional models. Prior to removing the ceiling planking, I took hundreds of photos of the hull using a Panasonic Lumix DMC-FZ200 camera (on loan from TAMU's Analytical Archaeology Lab) (fig. IV.4). I did this as quickly as possible in an effort to maintain uniform lighting in all of the photographs. To minimize gaps in the model, I made sure that each photo had approximately 80 percent overlap and to improve the alignment process, I laid a number of photo-reference targets on the hull prior to taking the photographs.

FIG. IV.4 Julia Herbst photographing the wreck for photogrammetric models (photograph by C. Kennedy).

I sent the resulting images to Dr. Christopher Dostal, who used the computing power of TAMU's Analytical Archaeology Lab to process the model with Agisoft Photoscan (now Agisoft Metashape). Once completed, he uploaded the model to Sketchfab, an online three-dimensional model-sharing platform. Thanks to his assistance, we were able to use social media to share this model with the public while we were still in the field.

Once we removed the ceiling planking from the hull and cleared all of the sediment trapped beneath it, I took a second set of photographs to prepare another photogrammetric model of the wreck. Throughout our time on site, I also photographed disarticulated hull timbers, including the remains of the stem, sternpost, and two knees. Additionally, Robin Galloso photographed a piece of the lower keel that had broken off of the stern end of the vessel. Upon returning to TAMU, I processed these photos with Agisoft Photoscan to produce photogrammetric models (fig. IV.5). I then uploaded the models to Sketchfab and shared them using social media. The models increased public accessibility to the wreck and served as valuable references in finalizing the scaled drawings of the remains.[75]

[75] As of the date of this thesis, all photogrammetric models can be found at the following links: https://sketchfab.com/tags/cityplaceschooner and https://skfb.ly/6NxFy.

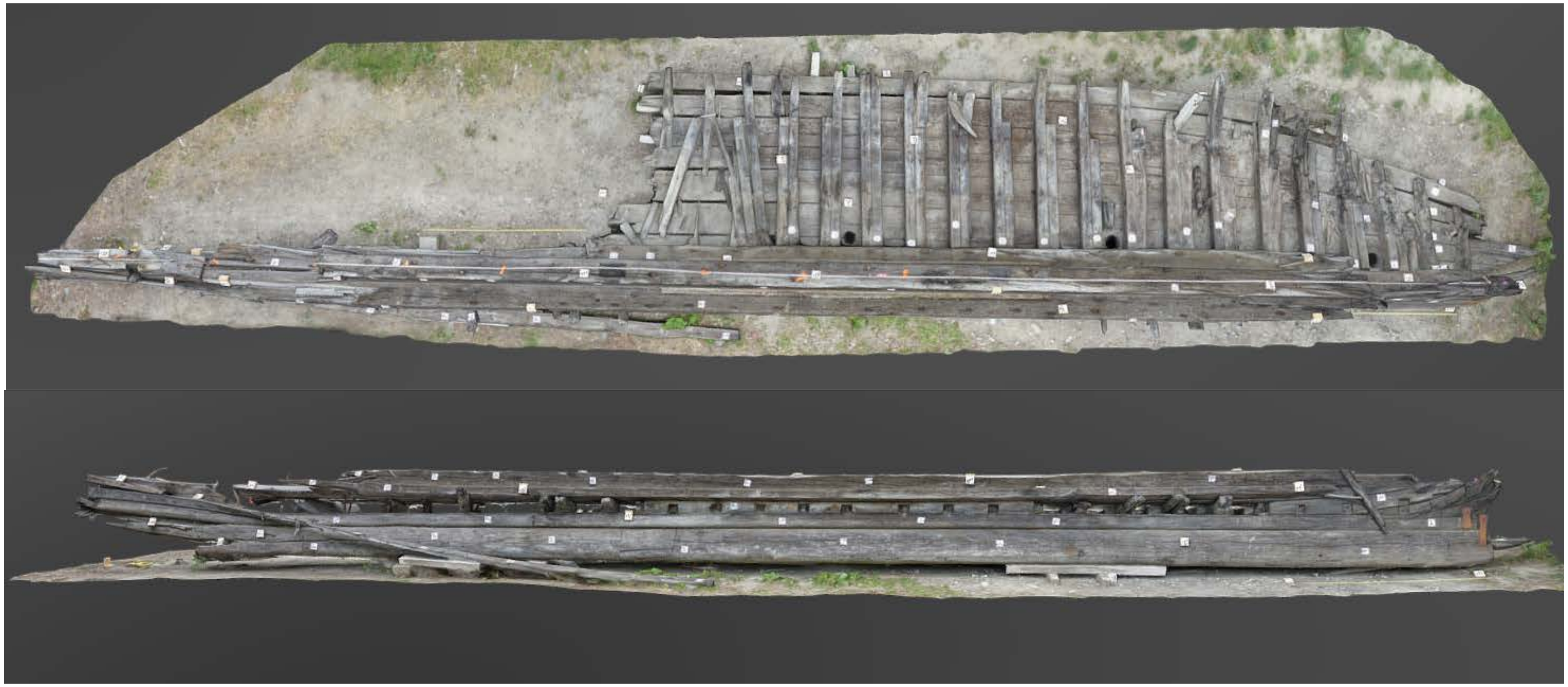
FIG. IV.5 Photogrammetric model of the CityPlace schooner wreck (model prepared by J. Herbst).

Artifact Excavation and Documentation

Because ASI had already excavated the remains, we were not expecting to find any artifacts during our field work. As noted above, however, upon removal of the vessel's ceiling planking, a significant amount of sediment remained between the frames. This needed to be removed in order to record the structure. Team member Robin Galloso dedicated a substantial amount of her time on site to removing the sediment with trowels and brushes, screening it, and documenting the finds. She recovered a number of small artifacts during this process, many of which were used in the construction of the vessel, including iron fasteners, caulking material, and small, shaped pieces of wood that were likely used as wedges. She also recovered ceramic sherds (similar in style to those recovered during the 2015 excavation), charcoal, and one piece of coal. Her most exciting find was an intact sheave from a rigging block, which was located between frames D and E. It is 1 inch (2.54 cm) thick and 6 inches (15.2 cm) in diameter and appears to be made of a dense tropical hardwood known as lignum vitae (figs. IV.6 and IV. 7). Unlike the sheave recovered by ASI, this example did not have a British Government broad arrow.

All of the recovered artifacts were logged, photographed, and left in the care of the City of Toronto. A catalog of the items recovered in 2018 is set forth in Appendix A. Although artifacts were not the focus of this study, after completion of the field season, the City of Toronto sent a select number of items to me for additional documentation and analysis. These included the U.S. Coronet Head cent, the broad-arrow marked chisel, two hammers, two caulking irons (tools used to wedge caulking material into the seams between a ship's planks), and a fish plate that was used to attach the vessel's lower keel to its upper keel. I prepared photogrammetric and laser scanned models of the items for inclusion in the project record. In addition, the coin was x-rayed in an attempt to identify its date, however, this was unsuccessful.

FIG. IV.6 Robin Galloso excavating the sheave (photograph by J. Herbst).

FIG. IV.7 Sheave recovered during the 2018 field season (photograph by R. Galloso).

Public Engagement

One goal of the project was to increase public interest in the CityPlace schooner. We provided updates on our progress and details of our findings through social media, maintaining Facebook, Twitter, and Instagram accounts throughout the field season.[76]

[76] The social media accounts can be accessed at the following links: https://www.facebook.com/cityplaceschooner/, https://twitter.com/CitySchooner, https://www.instagram.com/cityplaceschooner.

We also hosted an hour of official public visitation each day that we were on site and, outside of this window, frequently answered questions from those visiting the fort or passing through the area. The city and the fort prepared an exhibit inside of the visitor’s center displaying some of the artifacts that were recovered during the 2015 excavation, which helped to generate additional interest in the project. Additionally, at the end of the field season we participated in a short public program at the fort, along with members of the FOFY and individuals from the Fort York National Historic Site, ASI, and the City of Toronto to discuss the wreck, our methodology, and our initial findings with the public.

CHAPTER V

HULL DESCRIPTION

The CityPlace schooner had a unique centerline construction: it was initially built with a daggerboard or a centerboard that was later removed and the opening in the keel filled in. The extant remains included centerline timbers measuring approximately 50 feet (15.24 m) in length, consisting of a lower keel, an upper keel, port and starboard lower keelsons, and an upper keelson. Commencing in the bow, approximately 30 feet (9.14 m) of the port side of the hull, including frames, hull planking, and two layers of ceiling planking, was also preserved to the turn of the bilge (fig. V.1). Additionally, two knees and portions of the stem and sternpost were found disarticulated from the wreck. The principal dimensions of the surviving timbers are set forth in Appendix B.

As of the writing of this thesis, no wood analysis has been completed on the remains, however, all of the timbers appeared to be made of oak, probably white oak, with the exception of the upper layer of ceiling planking and two filler pieces in the lower keelsons, which were all likely shaped from pine. The state of preservation varied. The ends of many timbers were deteriorated or broken off and the surface of most of the wood was cracked from drying. The stern portion of the remaining centerline timbers was warped, with the timbers rising upwards from their original position. Additionally, there was significant sagging of the frames and planks in the areas between modern timbers that were placed under the hull for support during transport. The remains of the ship, as observed during the 2018 survey, are described in detail below.

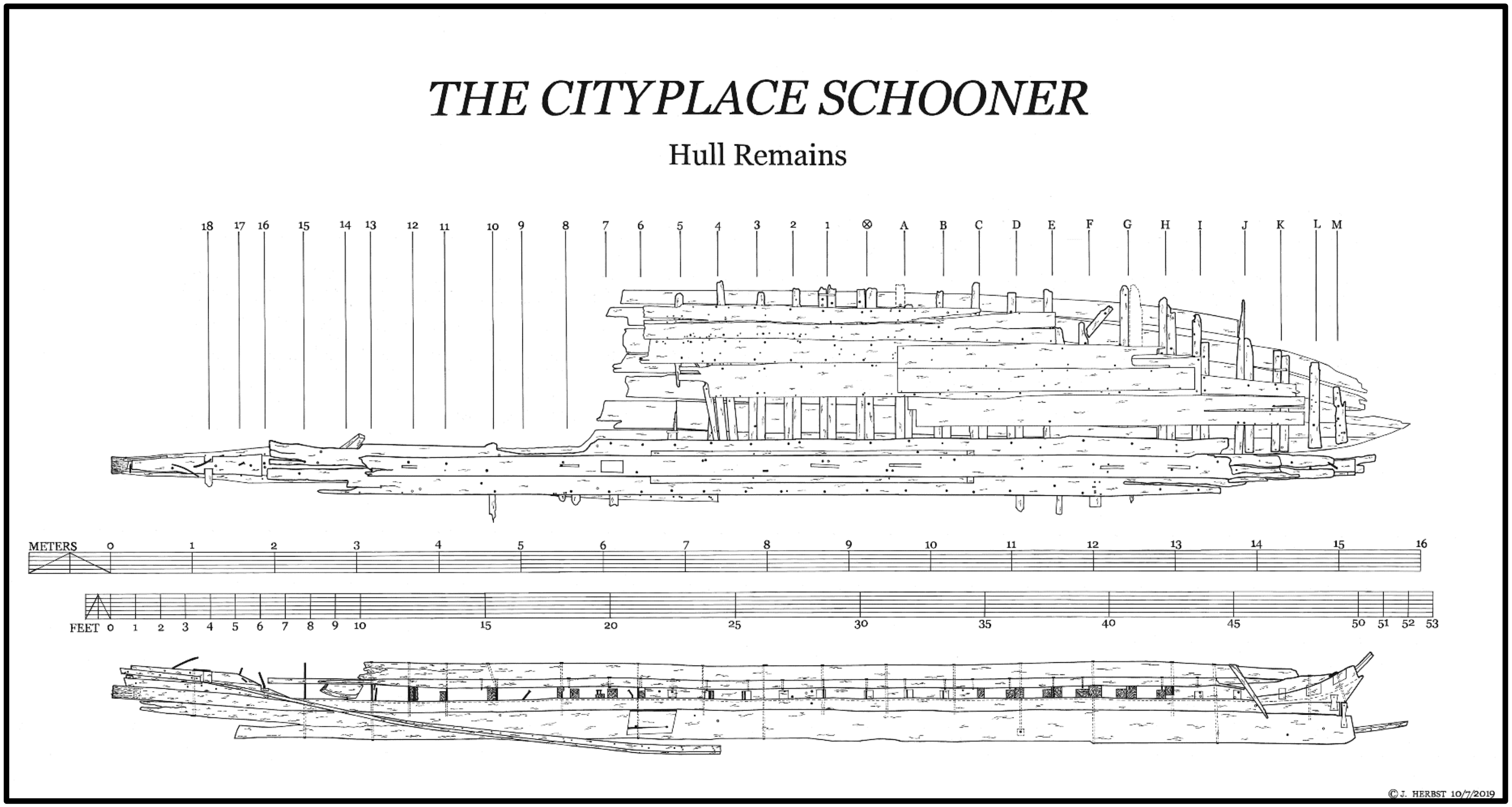

FIG. V.1 CityPlace Schooner site plan (drawing by J. Herbst, N. Deere, and R. Galloso).

Upper and Lower Keels

The upper keel consisted of a single timber. Its original length is unknown due to the broken, heavily eroded condition of its aftermost end, however, the extant remains measured 49 feet, 4 inches (15.04 m) long. In the bow, the timber was joined to the inner or main stem by two 7.5 inches (19.05 cm) long iron fish plates (one on each side of the hull) and a horizontal flat scarf located 3 feet, 4 inches (1.02 m) aft of the upper keel's forward end. A stopwater was installed between the upper keel and the heel of the stem at the after end of the flat scarf; this piece helped to make the scarf joint watertight and prevent the timbers from shifting. The upper keel terminated against the main stem just forward of the fish plates (fig. V.2). In the stern, mortises for an additional pair of fish plates were carved into the after end of the upper keel, however, these plates were no longer attached to the remains. Rabbets for the outer hull planking were also carved into the upper keel, commencing at the keel-stem scarf and continuing for the remainder of the upper keel's length. The lower edge of each rabbet was approximately 4 inches (10.16 cm) above the lower corners of the timber.

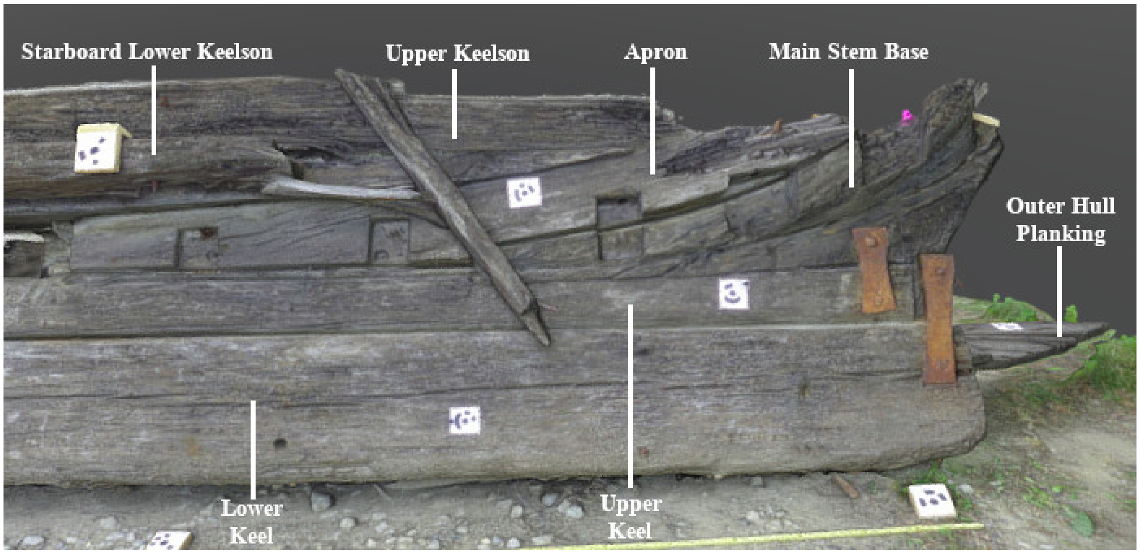

FIG. V.2 Centerline timbers in the starboard bow assembly (photograph by J. Herbst).

The upper keel had a sided dimension ranging from 5 inches (12.7 cm) in the bow, to 16.5 inches (39.37 cm) at frame ⊗, and to 7 inches (17.78 cm) in the stern. It had a molded dimension of 6 inches (15.24 cm) for much of its length. This increased to 11 inches (27.94 cm) just aft of frame C to form the base of the centerboard trunk, which served as the watertight compartment that housed the centerboard or daggerboard during the earlier part of the vessel's career (fig. V.3). The trunk base was 13 feet, 4 inches (4.06 m) long and terminated just forward of frame 6. Over the entirety of its length, floor timbers were fitted to mortises cut into the sides of the trunk base instead of crossing over the keel. The molded dimension of the upper keel also increased in the stern to form the lower part of the deadwood structure (fig. V.4). Starting at a point 42 feet, 3 inches (12.88 m) aft of its forward end, its upper edge rose at a 20 degree angle before leveling off at a molded dimension of 11 inches (27.94 cm). The upper keel continued at this height for another 6 feet, 4 inches (1.93 m) before the molded dimension again dropped to 5.75 inches (14.61 cm), just forward of the timber's after end. Notches were carved into this portion of the upper keel to accommodate frames 16 and 18.


FIG. V.3 After end of trunk from the starboard side (photograph by J. Herbst).

FIG. V.4 Forward end of the stern deadwood (photograph by J. Herbst).

The bottom corners of the upper keel were rounded, likely from years of wear (which may have included occasional groundings). This, along with the unusual trunk-base construction described above, indicates that the upper keel served as the vessel's original keel and that the lower keel was not added until the centerboard or daggerboard was removed, in order to compensate for the loss of lateral resistance under sail and perhaps to limit hogging of the vessel's ends.

Like the upper keel, the lower keel was shaped from a single timber. Its extant remains were 48 feet, 11 inches (14.91 m) in length, had an average molded dimension of 14.5 inches (36.83 cm), and a sided dimension ranging from 5 inches (12.7 cm) in the bow, to 9.25 inches (25.4 cm) at frame ⊗, and to 7 inches (17.78 cm) in the stern. In the bow, the lower keel was fastened to the base of the main stem with a fish plate measuring 1 foot (30.48 cm) tall. The timber terminated with a flat, vertical cut, corresponding to the base of the outer stem, however, there was no indication that it was directly fastened to the outer stem. This further suggests that the lower keel was not original to the ship or considered critical for its structural integrity, but was added after the vessel was modified to compensate for the loss of lateral resistance originally provided by the daggerboard or centerboard.

In the stern, the bottom half of the lower keel appeared to have been purposely cut. It is likely that this was done at the time the vessel was abandoned, rather than as part of its construction or as an in-service modification. The upper half of the timber continued for another 3 feet, 10 inches (1.17 m) beyond the break. A 2 feet, 9 inch (83.82 cm) long portion of the lower keel was found disarticulated from the wreck. It was originally attached to the after end of the upper half of the timber and included partial mortices for a pair of fish plates (one on each side of the piece), which fastened the lower keel to the upper keel (fig. V.5).

FIG. V.5 Disarticulated lower keel piece (photograph by R. Galloso).

The lower keel was also fastened to the upper keel with 17 iron bolts (averaging 1 inch [2.54 cm] in diameter) driven through the upper keelson, frames, and other centerline timbers, with eight terminating out the bottom or side of the lower keel. Evidence of a repair in the form of a patch (also known as a dutchman or graving piece) was found on the starboard side of the lower keel, located 27 feet, 4 inches (8.33 m) aft of the timber's forward end. The patch was 1 foot, 10 inches (55.88 cm) long, approximately 1 inch (2.54 cm) thick, covered almost the entire molded dimension of the lower keel, and was secured in place with two iron spikes (fig. V.6). It may have repaired impact damage, an area of rot, or an inherent weakness such as a knot in the lower keel timber. Like the upper keel, the bottom corners of the lower keel were rounded from wear.

FIG. V.6 Graving piece in lower keel (photograph by J. Herbst).

Stem and Apron

The base of the main stem remained attached to the hull of the vessel, with its heel joined to the top of the upper keel and the underside of the apron with horizontal flat scarves (fig. V.2). The surviving length of the stem was 4 feet, 8 inches (1.42 m) long and it had a molded dimension of 2 feet (60.96 cm) at its broken forward end and 4 inches (10.16 cm) at its after end. Notches to fit the heels of three cant frames (averaging 5 inches [12.70 cm] tall and 5.5 inches [13.97 cm] wide) were carved into each side of the main stem's base and continued onto the lower sides of the apron. Rabbets for the outer hull planking were carved into the timber just below the bottoms of these notches and, at the main stem's after end, continued onto the sides of the upper keel.

The forward (upper) part of the stem timber was found disarticulated from the wreck. The disarticulated portion of the stem was made up of two joined pieces, the upper end of the main stem and the outer stem (fig. V.7). The upper and lower ends of the main stem were broken off. The extent piece measured 6 feet, 7.75 inches (2.03 m) long and ranged between 3.5 and 6.75 inches (8.89 and 17.15 cm) sided, and 3 and 10 inches (7.62 and 25.40 cm) molded. The rabbets for the hood ends of the outer hull planking continued up the after (inner) corners of the main stem. An uneven row of fasteners located just forward of these rabbets (consisting of nine treenails and one nail on the starboard side and five treenails and two nails on the port side) suggests that the outer hull planking was patched in this location or perhaps sheathing planks or a metal patch were nailed to the hull. A 2 feet (60.96 cm) long wrought iron fitting used to attach the bowsprit's bobstay to the hull was bolted through the sides of the main stem, 4 feet, 10 inches (1.47 m) from the lower end of the timber. The outer stem was fastened to the main stem with five iron bolts. All were either 0.5 or 0.75 inches (1.27 or 1.91 cm) in diameter and one, located 2 feet, 2 inches (66.04 cm) from the base of the main stem, protruded out of the timber for a length of 1 foot, 3 inches (38.10 cm), suggesting the molded height of the main stem at this location.

The outer stem measured 6 feet, 4.5 inches (1.94 m) in length, and ranged from 2.5 to 4 inches (6.35 to 10.16 cm) sided, and 2 to 10.5 inches (5.08 to 26.67 cm) molded. The heel or lower end of the timber was cut to sit flat against the forward face of the lower keel, but there was no evidence on the outer stem to suggest that the two pieces were directly fastened to one another. Remnants of what appeared to be white paint were present on portions of both the main and outer stem.

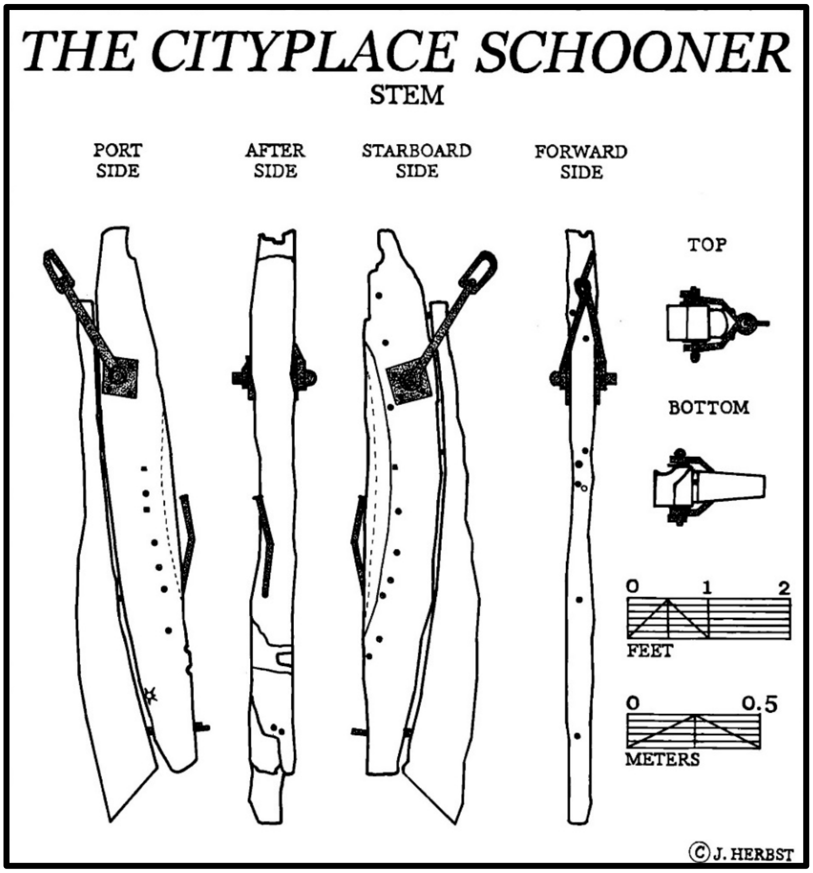

FIG. V.7 Disarticulated stem (drawing by N. Deere and J. Herbst).

The apron was bolted atop the main stem and upper keel (fig. V.2). Its forward end was broken off and eroded. The extant remains measured 6 feet, 6 inches (1.98 m) long and had an average molded dimension of 6 inches (15.24 cm). As noted earlier, notches for two cant frames carved into the main stem continued upwards onto each side of the apron. Aft of the stem, two additional notches (averaging 3.5 inches [8.89 cm] wide and 5.25 inches [13.34 cm] high) were carved into both sides of the apron. Each of these additional notches contained a shallow, circular hole drilled into the wood with an auger, which may have been used to determine how deep to carve them. The after end of the apron terminated in a 1.75 inch (4.44 cm) tall, 4 inch (10.16 cm) long lip, upon which the floor of frame H (the first frame to cross the keel) sat (fig. V.8). None of the wreck's other floors were arranged in a similar manner.

FIG. V.8 Lip at after end of apron for floor H (photograph by J. Herbst).

Sternpost and Deadwood

Like the stem assembly, the sternposts were found disarticulated from the wreck and were made up of inner and outer pieces that were bolted together (fig. V.9). The surviving portion of the inner or main post was 5 feet, 6 inches (1.68 m) long and ranged from 2 inches (5.08 cm) molded at its broken upper edge to 9.75 inches (24.77 cm) molded at its base and from 2.75 inches to 6 inches (6.99 cm to 15.24 cm) sided. The base of the main post was cut at nearly a right angle, suggesting that the vessel's stern had little rake. An impression in the wood 13.5 inches (34.29 cm) from the bottom of the sternpost assembly indicated the location of the lowest rudder gudgeon.

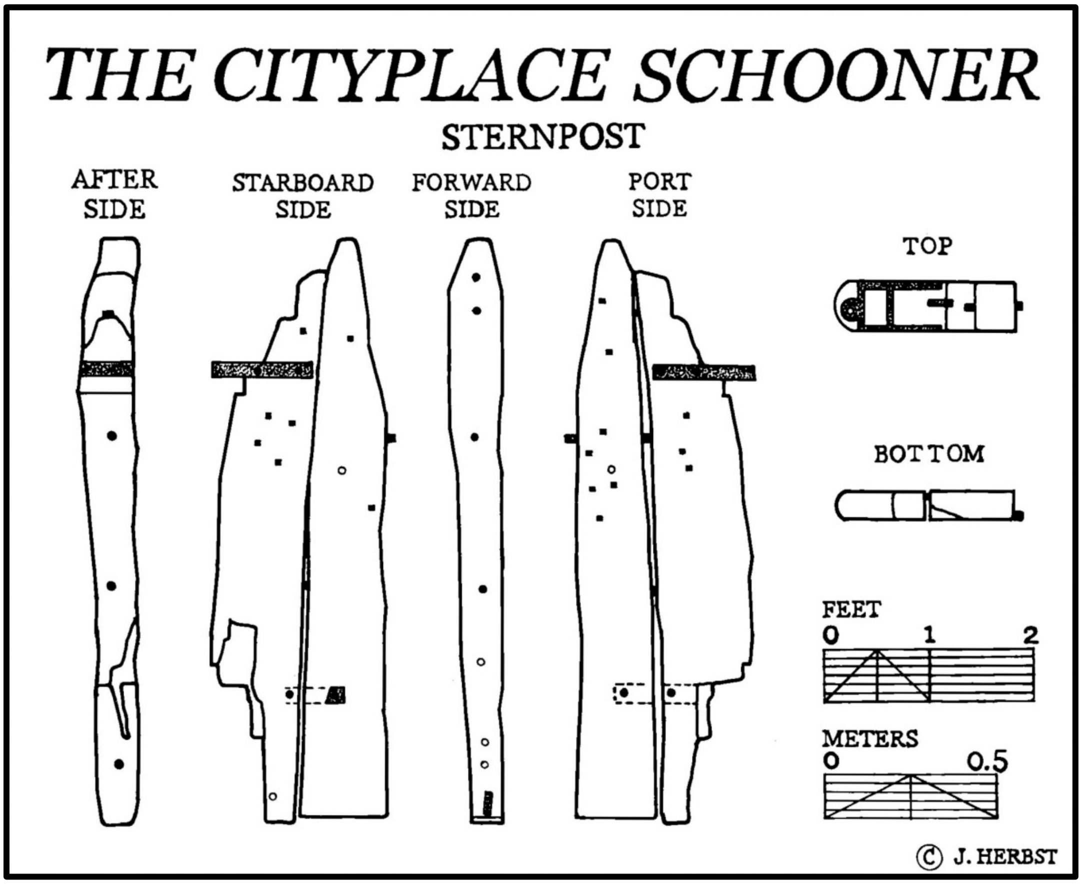

FIG. V.9 Sternpost (drawing by N. Deere and J. Herbst).

Neither the bottom nor the top of the outer sternpost survived. The extant remains measured 5 feet, 3 inches (1.60 m) long, with a maximum molded dimension of 10.5 inches (26.67 cm), and a maximum sided dimension of 6.5 inches (16.51 cm). As with the main post, an impression of the lower gudgeon remained on the timber, located 13.75 inches (34.92 cm) from its base. A second, partially-intact gudgeon was located 4 feet, 3 inches (1.30 m) from the bottom of the timber. It was 1.75 inches (4.44 cm) wide and 11.5 inches (29.21 cm) long. It did not extend onto the main sternpost (as the lower gudgeon once did). Due to breakage and corrosion, it was unclear how the sternpost assembly was fastened to the upper keel. Residue of what appeared to be white paint, similar to that found on the disarticulated stem, remained on the upper halves of both the main and outer sternposts.

As previously described, the base of the stern deadwood was carved out of the same timber that formed the upper keel. A second intact deadwood timber was fastened atop the keel (fig. V.4). It was 5 feet, 3 inches (1.60 m) long and 10 inches (25.4 cm) sided at its forward end, narrowing to 4.75 inches (12.07 cm) sided at its after end. The timber had a molded dimension of 6.5 inches (16.51 cm) at its after end and sloped down to meet the keel deadwood at its forward end. The notch for frame 18 that was carved into the keel deadwood (measuring 4 inches [10.16 cm] wide and 2.5 inches [6.35 cm] deep) also extended along the entire molded surfaces of the upper deadwood. The timber was fastened to the keel deadwood with three iron bolts, all of which extended an average of 9 inches (22.86 cm) beyond the top edge of the upper deadwood, suggesting that at least one additional piece was bolted to the top of the deadwood assembly.

Frames

The CityPlace schooner originally had 31 or 32 frames (fig. V.10). During the field season, these were labelled 1 through 32, commencing in the bow. Upon identification of the schooner's midship location (area of maximum beam), the frames were redesignated to reflect the shipbuilder's convention of representing the midships frame with a ⊗ symbol, representing the frames forward of midships with letters (A through M), and representing the frames aft of midships with numbers (1 through 18). Substantial portions of frames M through 5 survived on the port side of the hull, while the locations of the rest of the frames were indicated only by timber fragments or by bolts or notches between the upper keel and lower keelsons.

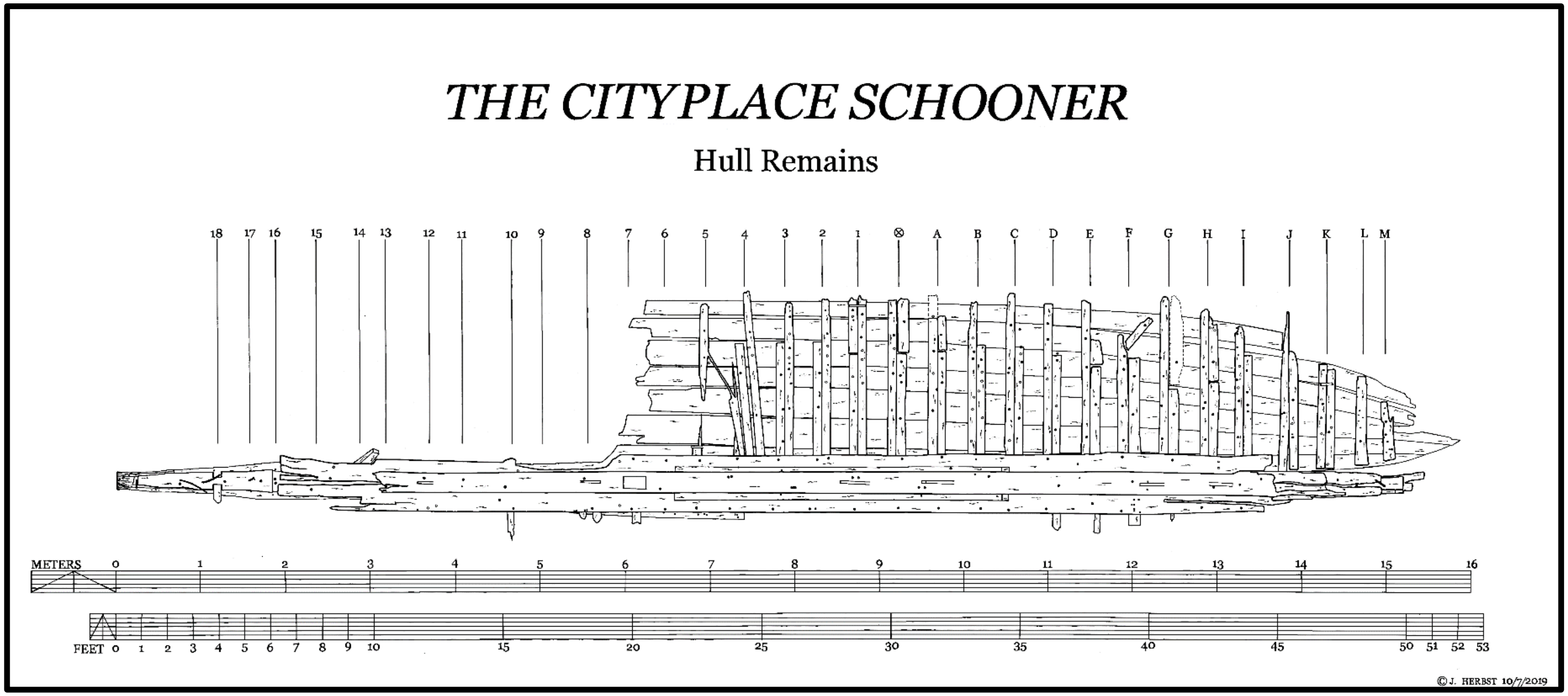

FIG. V.10 Frames (drawing by J. Herbst).

Frames L and M consisted of only a single timber, while frames K through 5 were made up of paired floors and futtocks. The heels of the cant frames (M through I) were fitted into notches carved into the base of the apron and main stem. The floors for frames H through C crossed the keel, while those for frames B through 5 were fitted into mortises notched into the raised trunk base atop the upper keel timber. Each mortise also contained a wedge used to secure the floors, which extended out from the trunk approximately 3 inches (7.62 cm) and measured (on average) 3 inches (7.62 cm) tall and 1 inch (2.52 cm) thick. The floors had an average molded dimension of 4.67 inches (11.86 cm), an average sided dimension of 4.25 inches (10.8 cm), and were spaced an average of 17.5 inches (44.45 cm) on their centers.

The first futtocks had an average molded dimension of 4.5 inches (11.43 cm) and an average sided dimension of 4 inches (10.16 cm). They were found directly aft of floors K through ⊗ and forward of floors 1 through 5. The transition in futtock placement between frame ⊗ and frame 1 indicated the schooner's midships location (fig. V.11). The vessel would have been constructed with its widest beam at this point, however, as a result of uneven sagging over time, frame ⊗ was no longer the flattest floor. Fragments of the second futtocks remained intact on frames H, E, A, ⊗, and 1, but were not preserved beyond the turn of the bilge. The second futtock for frame G was also identifiable, yet no longer attached to the hull. The floor and futtock pairs (with the exception of frames E, F, and G) were fastened together with wooden dowels or treenails. Additionally, limber holes were cut into the frames (with the exception of frames G, I, L, and M) to allow water that collected in the bilge to flow to the vessel's pump well. These averaged 1.5 inches (3.81 cm) long and 1 inch (2.54 cm) tall and were located an average of 5 inches (12.7 cm) out from the edge of the keel or base of the centerboard trunk. Recorded hull sections are provided for frames H, ⊗, and 3 (figs. V.12, V.13, and V.14).

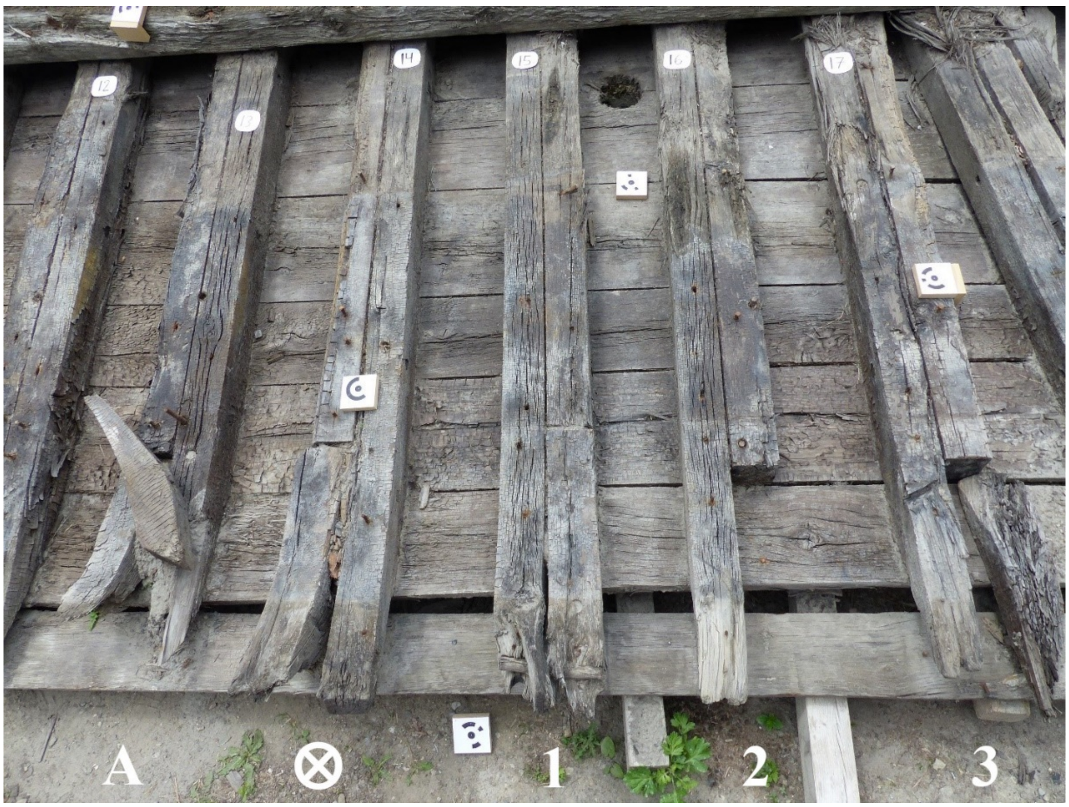

FIG. V.11 Framing pattern at midships (photograph by J. Herbst).

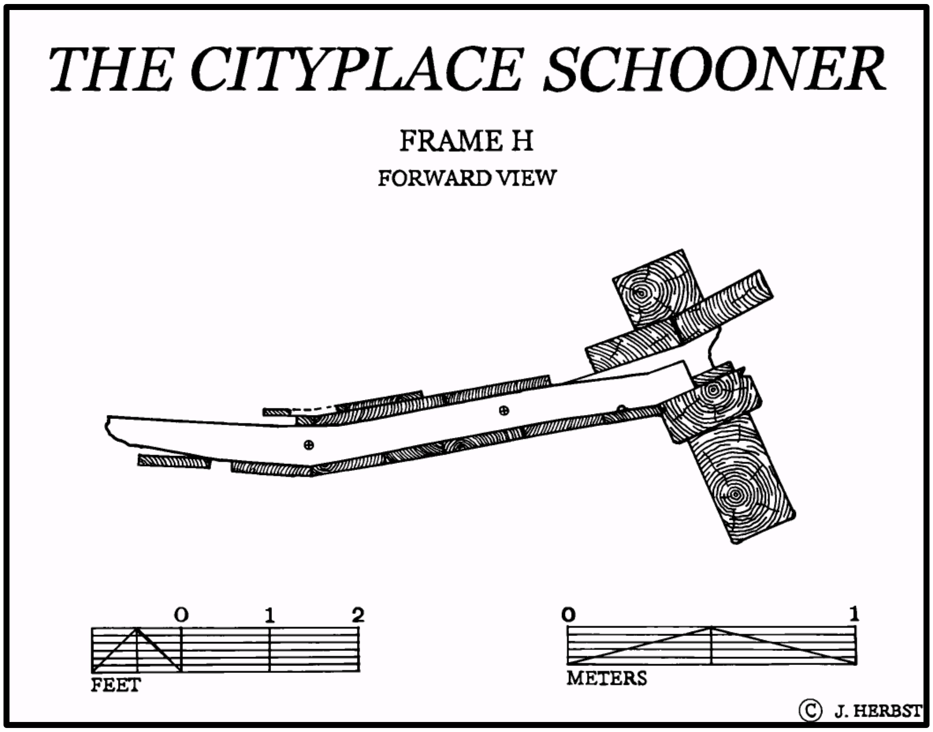

FIG. V.12 Cross section of frame H (drawing by J. Herbst and C. Kennedy).

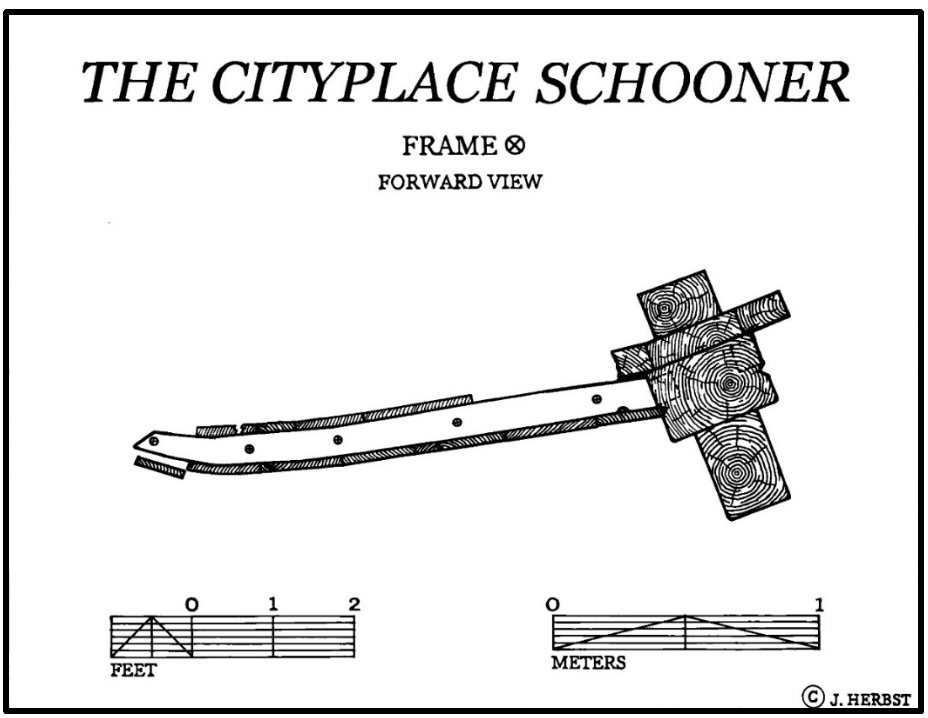

FIG. V.13 Cross section of frame ⊗ (drawing by J. Herbst and C. Kennedy).

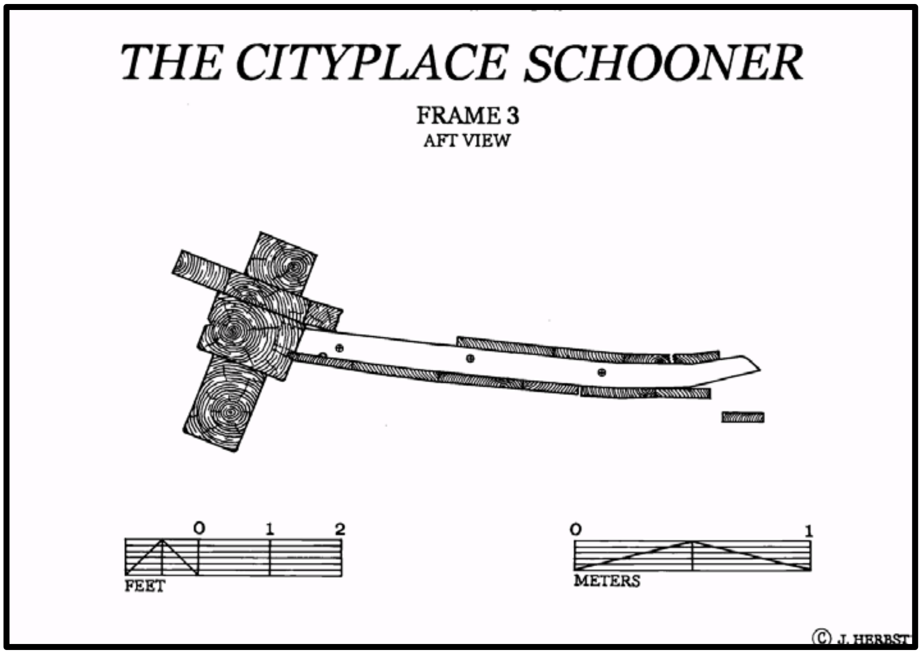

FIG. V.14 Cross section of frame 3 (drawing by J. Herbst and C. Kennedy).

Lower and Upper Keelsons

The CityPlace schooner wreck had two lower keelson timbers fastened side-by-side on the centerline of the hull. Each lower keelson was made up of a single timber, the extant remains of which measured 42 feet, 9 inches (13.03 m) long. These timbers started 2 feet, 9 inches (83.82 cm) aft from the forward end of the lower keel and were fastened atop the apron in the bow, and atop the frame floors and centerboard trunk base further aft. The lower keelsons had an average molded dimension of 4 inches (10.16 cm) and an average sided dimension of 13.25 inches (33.66 cm), protruding an average of 8.5 inches (21.59 cm) out from underneath the upper keelson on both sides of the vessel. Commencing, 12 feet, 4.75 inches (3.78 m) aft of their forward ends, pine filler pieces were inserted into a mortise through the inboard edges of the lower keelsons, located directly over the trunk. The first was a small, 3.25 inch (8.25 cm) long piece extending 2.5 inches (6.35 cm) in width out from under the upper keelson (fig. V.13). This was followed by a second filler piece, 12 feet, 8 inches (3.86 m) long, that also extended out 2.5 inches (6.35 cm) from underneath the upper keelson. The two pieces were likely inserted into the centerboard slot when the vessel was modified, in order to make the inside of the trunk watertight. Approximately 2 feet (60.96 cm) aft of the filler pieces, there was a 1 inch (2.54 cm) in diameter circular hole in each of the lower keelsons, located just behind the after (main) mast step (fig. V.14). With depths of 2.25 inches (5.72 cm) (port) and 2.75 inches (6.99 cm) (starboard), these notches did not extend all the way through the lower keelsons. Their purpose is unknown, however, it is possible that they were part of the system used to secure the mast.

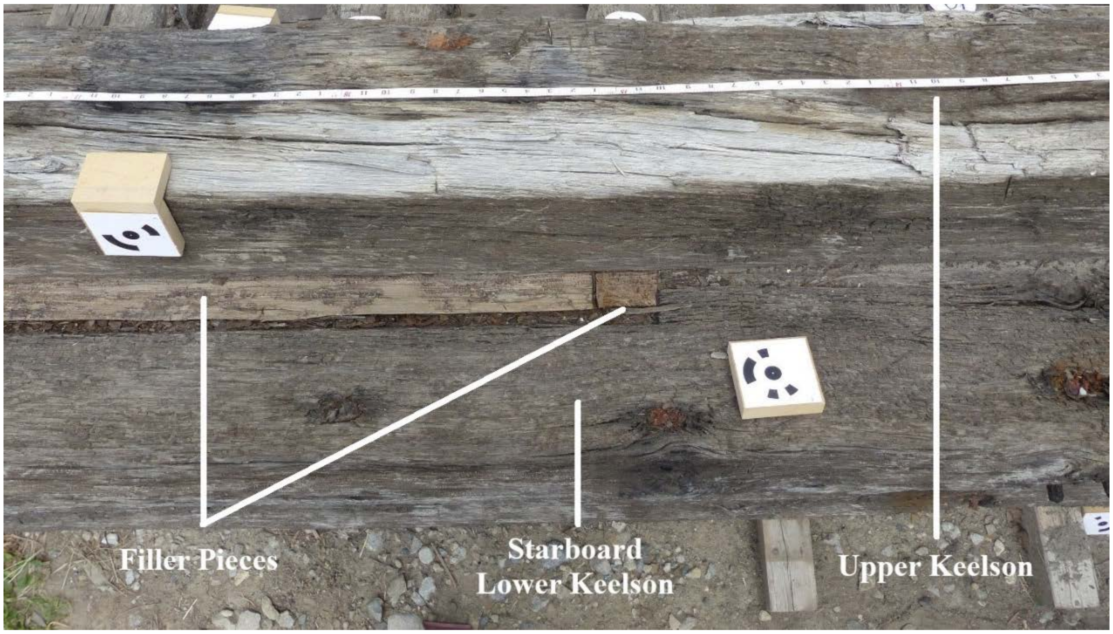

FIG. V.15 Forward end of pine filler pieces in starboard lower keelson (photograph by J. Herbst).

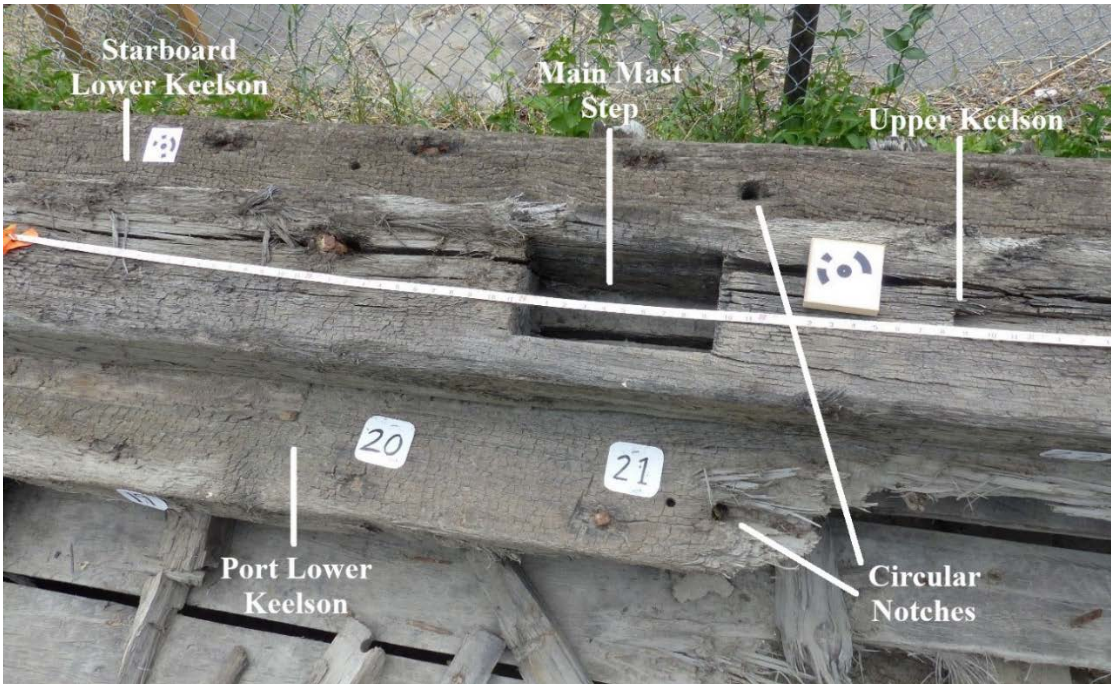

FIG. V.16 Main mast step (photograph by J. Herbst).

The upper keelson was broken at both ends. The surviving timber was 37 feet, 8.5 inches (11.49 m) long and was an average of 9.5 inches (24.13 cm) sided and 7.75 inches (19.69 cm) molded. There were 17 through bolts (an average of 1 inch (2.54 cm) in diameter) extending from the upper keelson, through the lower keelsons, floors, and upper keel down to the lower keel. Additionally, there were six notches for fitting the heels of stanchions on the top of the upper keelson, averaging 11.5 inches (29.21 cm) long and 1.25 inches (3.18 cm) wide. Stanchions are vertical timbers used to support a vessel's deck beams. These notches were staggered and irregularly spaced, with the smallest distance between them being 1 foot, 9 inches (53.34 cm) and the largest distance being 9 feet, 3 inches (2.82 m). The notches were sloped in profile with a maximum average depth of 0.5 inches (1.27 cm). Their orientation varied, with the forewardmost and the fifth notch from the bow sloping forward and the remainder sloping aft. None of the schooner's actual stanchion timbers were preserved. Additionally, there were three treenails (0.75 inches [1.91 cm] in diameter) inserted into holes drilled in the top surface of the upper keelson. Two were located alongside stanchion notches. These may have been inserted over areas of damage or natural weakness in the timber.

Two mast steps were cut into the upper keelson. The after end of the forward step was located 5 feet (1.52 m) from the start of the lower keel. The mortise was heavily eroded so its dimensions are unknown. It appears that the lower keelsons were notched in this location, possibly to make room for crutches or other forms of support for the step. The after or main mast step was located 29 feet, 6 inches (8.99 m) from the forward end of the lower keel. It was 10.5 inches (26.67 cm) long and 5.75 inches (14.60 cm) wide (fig. V.14). It was cut through the entire molded dimension of the upper keelson allowing the heel of the mainmast to step on top of the lower keelsons. The lower keelsons in the area of the main step did not show any signs of notching to accommodate a crutch (unlike in the area surrounding the forward step). The United States one-cent piece found during the 2015 excavation of the wreck was recovered from the main mast step.

Hull Planking

Nearly the full extent of the schooner's port and starboard garboards (the outer hull strakes closest to the keel) survived, although the both suffered damage. The starboard garboard consisted of two planks. The forward plank was completely disarticulated from the main hull structure, while the after plank was only partially attached. The port garboard remained largely in place, however, it rested on the ground in the bow (having fallen out of the rabbet) and was broken and degraded aft of frame 7. Portions of seven additional outer hull strakes were preserved on the port side of the vessel from the bow to the location of frame 6, extending out to the turn of the bilge. These strakes had an average thickness of 1.5 inches (3.81 cm) and their widths at frame ⊗ are set forth in Table V-1. The outside faces of the planks were not accessible, so the length of the individual planks and the number of planks in each strake could not be determined. The planks were fastened to the frames with iron spikes, which do not appear to have been nailed in any distinct pattern.

TABLE V-1 Outer hull planking widths at frame ⊗

Strake	Width (in)	Width (cm)
Garboard	12	30.48
2	13.25	33.66
3	14.25	36.20
4	10.25	26.04
5	12	30.48
6	10.5	26.67
7	7.25	18.42

Ceiling Planking

The schooner had two layers of ceiling planking (fig. V.15). The lower layer was likely sawn from white oak and included two limber boards (one of which was recovered disarticulated from the hull) that were not nailed to the frames. These allowed the crew to easily access the bilge for cleaning purposes. The limber boards averaged 4 feet, 7.25 inches (1.40 m) long, 5.33 inches (13.54 cm) wide, and 1.5 inches (3.81 cm) thick. The remainder of the surviving lower layer of ceiling consisted of seven larger planks, also 1.5 inches (3.81 cm) thick, that ranged from 3 feet, 11.5 inches to 20 feet, 10 inches (1.04 m to 6.35 m) in length and had an average width ranging between 5.9 inches (14.99 cm) and 17.2 inches (43.69 cm). These planks were fastened to the frames with iron nails. There is no apparent pattern to the fasteners, with some planks having multiple nails per frame and others not even nailed to each frame. Caulking that appeared to consist of birch bark, small strips of wood, and other material was found between the timbers (fig. V.16). Its existence suggests that the vessel may have been a grain carrier or used to transport other goods that required waterproof transit.

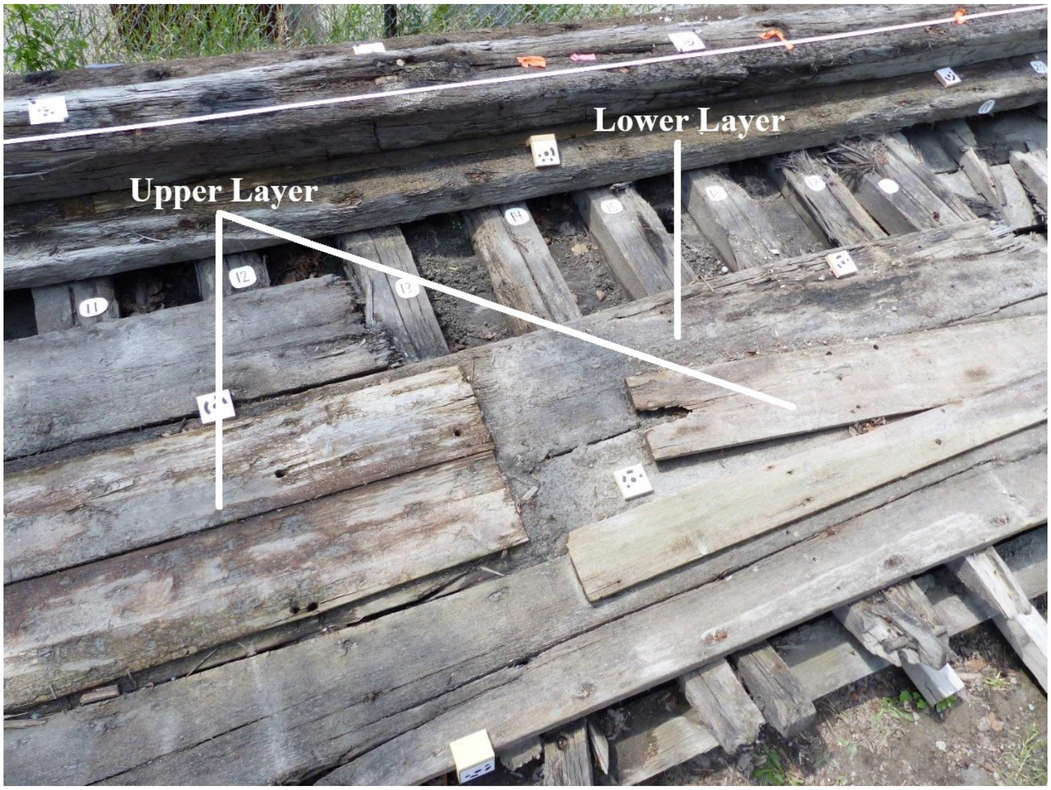

FIG. V.17 Upper and lower layers of ceiling planking (photograph by J. Herbst).


FIG. V.18 Caulking between lower ceiling planks (photograph by N. Deere).

A second layer of ceiling planking was nailed to the top of the lower ceiling planking. Six planks, all appearing to be made of pine, survived (with only two remaining nailed to the hull). They had an average width of 10.5 inches (26.67 cm), an average thickness of 0.75 inches (1.91 cm), and ranged in length from 9 feet, 3 inches to 11 feet, 11 inches (2.82 m to 3.63 m). A brown residue (possibly tar) was found between the lower and upper ceiling planking layers. This was likely used as additional caulking material. Its presence, and the existence of the second layer of ceiling planking (particularly when the lower level appears undamaged), further suggest that the vessel was used to transport cargo such as grain that would have been ruined by any leaks in the hull.[77]

Knees

Two knees were recovered disarticulated from the wreck (fig. V.17). The first had a base of 1 foot, 9.5 inches (54.61 cm), a vertical extension of 2 feet, 7.5 inches (80 cm), and was 3.5 inches (8.89 cm) thick. The second had a base of 1 foot, 10 inches (55.88 cm), a vertical extension of 2 feet, 4.5 inches (72 cm), and a thickness of 4.75 inches (12.07 cm). These knees appeared slightly too large to have been used to support the schooner's deck beams and, as noted earlier, many Great Lakes vessels used clamps instead of knees to support their beams.[78] Consequently, they may have instead been used for another purpose, such as to support a bitt for the schooner's windlass.

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[77] Vanhorn 2004, 198.
[78] Bamford 2007, 154; Ford 2009, 148.

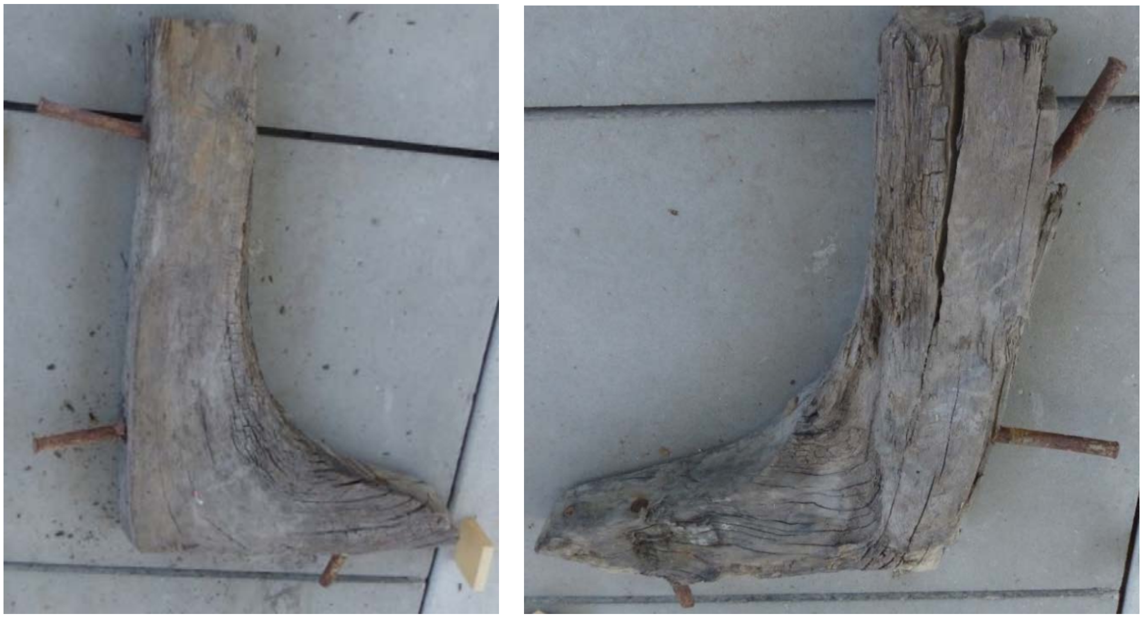
FIG. V.19 Knee 1 (left) and Knee 2 (right) (photographs by J. Herbst).

Summary

The CityPlace schooner had a unique and complex construction, which provides some indication as to the purpose and use of the vessel. It is likely that the upper keel, main stem, lower keelsons, and main sternpost were all original to the schooner, while the lower keel, upper keelson, outer stem, outer sternpost, and filler pieces in the centerline were added when the vessel was modified and its centerboard or daggerboard was removed. The original construction was substantial, carefully fitted, and probably rather expensive, requiring large oak trees and some care in the shaping of pieces such as the upper keel, which was carved from a single timber that included the vessel's centerboard trunk base and the base of the stern deadwood. The two layers of caulked ceiling planking suggest that the vessel was a grain carrier for at least part of its career. Finally, the remains show signs of wear, such as the rounded lower corners of the keel timbers and the graving piece in the lower keel, which suggest that the vessel had a long life before it was scuttled.

CHAPTER VI

RECONSTRUCTION AND ANALYSIS

In order to gain a better understanding of the CityPlace schooner's post-modification appearance and design, conjectural lines drawings and construction drawings were prepared using the data collected during the 2018 field season. Lines drawings depict the curves of a ship from three different perspectives to form a three-dimensional representation of the hull, while construction drawings portray the timbers and construction features that make up a vessel. The remains of the CityPlace schooner served as the primary source for the reconstruction of the contours and features of its lower hull. Because very little evidence of the schooner's upper works survived, informed conjecture was required to complete the drawings. The upper works were recreated by reference to the construction of similar late-18th and early-19th vessels, as determined through an analysis of archaeological remains, lines drawings, and historical records. Contemporary plans of early Great Lakes merchant sailing vessels are so scarce as to be non-existent, and only and handful of wrecks of these vessels have been found and studied by archaeologists. This chapter will describe the historical sources and wrecks relied upon for the reconstruction of the CityPlace schooner and explain the methodology used in the preparation of its drawings and construction drawings.

Comparison to the Construction of other 18th- and 19th-Century Vessels

Nancy was a Great Lakes schooner built in Detroit in 1789. It was constructed as a cargo carrier and initially used in the fur trade, operating between Fort Erie, Detroit and Michilimackinac, before it was converted into an armed transport and pressed into service by the British during the War of 1812.[79] In August of 1814, while in the Nottawasaga River on the southern shore of Lake Huron, the British set fire to the vessel to prevent it from falling into enemy hands. The ship was excavated and raised in the 1920s and a full investigation of the remains was completed in the late 1990s. A lines drawing of the vessel was prepared by Christopher Sabick using the data collected during the 1990s field work (fig. VI.1). *Nancy's* lower structure is well preserved, however, little remains of its upper works. For this reason, much of the reconstruction above the waterline was conjectural, based upon the construction of contemporary vessels.[80]

Although *Nancy* was built approximately 40 years prior to the CityPlace schooner and saw use as a naval vessel, the two ships appear to share certain characteristics that were common to early Great Lakes cargo carriers. Both were constructed with an emphasis on carrying capacity and stability, rather than speed. They have similar shapes, with full hulls amidships and moderate amounts of deadrise. *Nancy* had an estimated depth of hold of 7 feet, 6 inches (2.29 m), which facilitated navigation

[79] Sabick 2014, 72-4.
[80] Sabick 2004, 1-2, 85, 109.

in the shallow waters of Great Lakes and its harbors. It was slightly larger than the CityPlace schooner, with a keel measuring 59 feet, 9 inches (18.21 m).

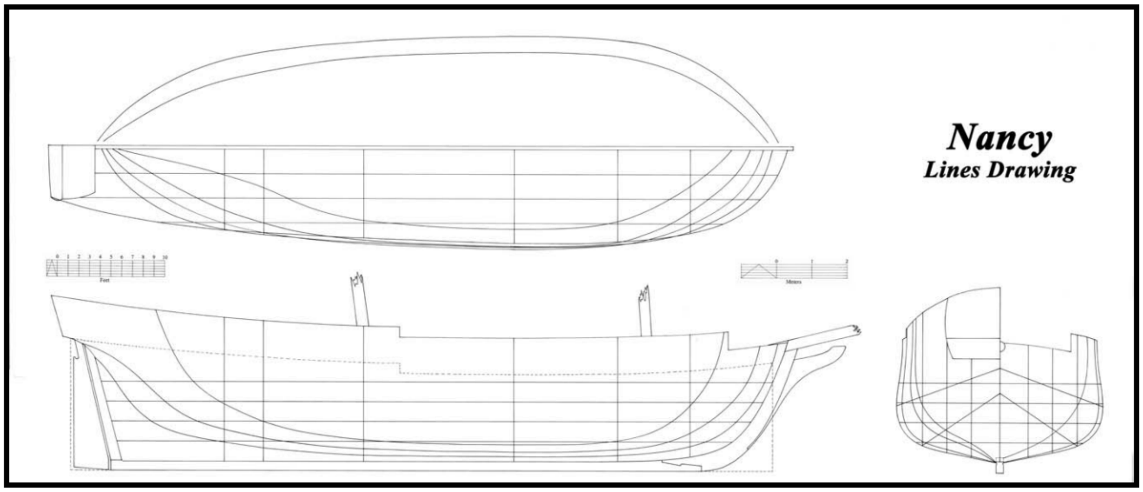

FIG. VI.1 *Nancy's* reconstructed lines drawings by C.R. Sabick (from Sabick 2004, 110, with permission).

Hamilton and *Scourge* were merchant schooners converted into gunboats by the United States Navy during the War of 1812. *Hamilton*, initially named *Diana*, was an 80-ton vessel built in Oswego, New York in 1809. Prior to its conversion, it carried salt and mixed cargo between Oswego and Lewiston, New York. *Scourge*, initially named *Lord Nelson*, was a 50-ton vessel built in Niagara, Upper Canada in 1811. It regularly operated between Niagara and Prescott, Upper Canada before entering into naval service.[81] On August 9, 1813, both ships were knocked over in a squall on Lake Ontario and sank in over 300 feet (91.44 m) of water. Today, the wrecks remain in situ and are largely intact. Due to their depth, they have not been excavated, but were extensively

[81] Moore 2014, 123-4.

documented with side scan sonar and remote operated vehicles (ROVs).[82] As a result, information regarding the internal construction of these vessels is somewhat limited, however, they provide detailed examples of deck plans of early 19th-century Great Lakes schooners (figs. VI.2 and VI.3).

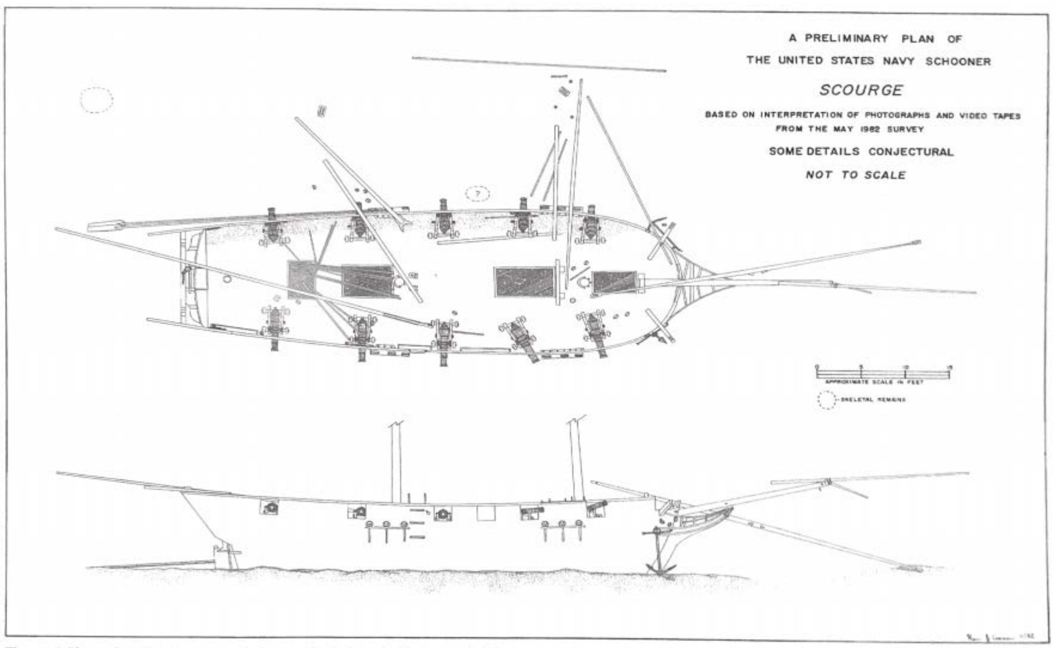

FIG. VI.2 Preliminary plan of *Scourge* by K.J. Crisman and K. Cassavoy (from Moore 2014, 135).

[82] Moore 2014, 123, 131-37.

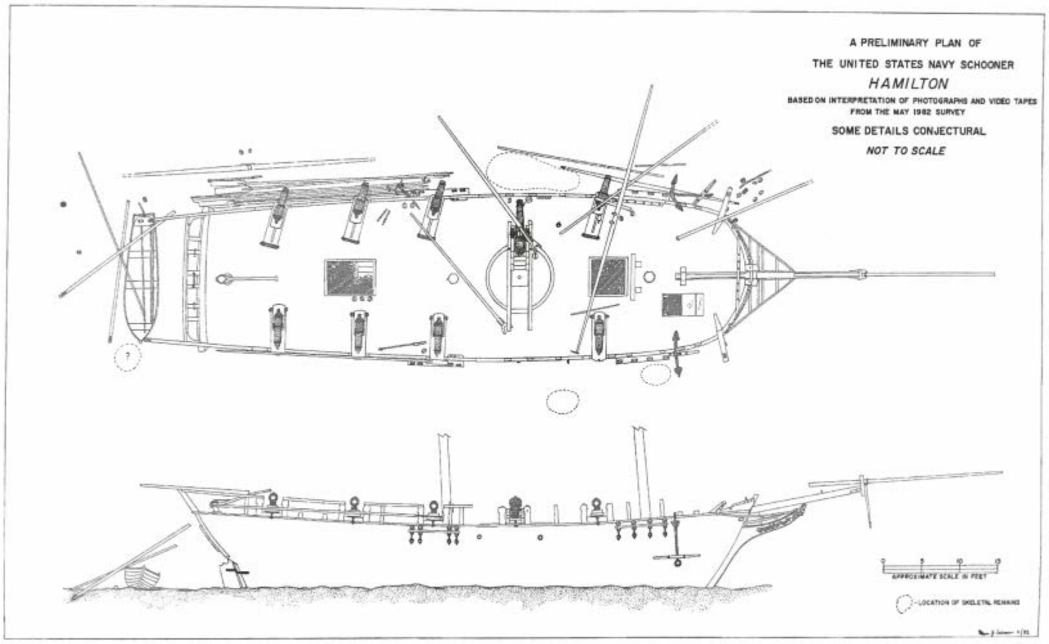

FIG. VI.3 Preliminary plan of *Hamilton* by K.J. Crisman and K. Cassavoy (from Moore 2014, 134).

Both vessels were slightly larger than the CityPlace schooner, with *Hamilton* having a length from knightshead to taffrail of 66 feet, 10.8 inches (20.39 m), a breadth at the main mast of 19 feet (5.79 m), and a minimum depth of hold of 7 feet, 2.4 inches (2.19 m), and *Scourge* having a length from knightshead to taffrail of 58 feet, 8.4 inches (17.89 m), a breadth at the main mast of 15 feet, 8.4 inches (4.79 m), and a minimum depth of hold of 5 feet, 10.8 inches (1.8 m).[83] Like *Nancy*, these schooners display certain characteristics common to early Great Lakes merchant vessels, including a shallow depth of hold and a maximum beam located forward of amidships. With finer entries and slack bilges, *Hamilton* and *Scourge* may have been faster sailors than the CityPlace schooner, however, their construction still favored carrying capacity over

[83] Underwater Archaeology Service 2011, 120-21.

speed, particularly in comparison to purpose-built naval vessels of the time.[84]

Newash and *Tecumseth* were sister schooners built on the Niagara River and launched on August 13, 1815. They were constructed as transports for the Royal Navy, but were designed to serve as warships as well. Consequently, their lines are sharper than most contemporary Great Lakes merchant vessels, including those of the CityPlace schooner. The ships were constructed with full hulls amidships, but had narrow entrances and fine runs to improve their sailing abilities. *Newash* and *Tecumseth* were somewhat larger than the CityPlace schooner. According to a draft made in April of 1815, they were each of 166 12/94 tons burden and had a length on deck of 70 feet, 6 inches (21.49 m), a beam of 24 feet, 5 inches (7.44 m), and when properly trimmed drew 6 feet (1.83 m) forward and 9 feet (2.74 m) aft. Both vessels were over 100 tons and could no longer be used on the Great Lakes following the enactment of the Rush-Bagot Agreement in 1817. In June of that year, the schooners were deposited in Penetanguishene Bay on Lake Huron and left to deteriorate. *Tecumseth* was raised and placed on display in 1953, while *Newash* remains at the bottom of the bay. The two wrecks were studied in the late 1990s and 2000s and a reconstructed lines drawing for the vessels was prepared by LeeAnne Gordon, based on the recorded information (fig. VI.4). The dimensions of the documented remains of the vessels correspond very closely to those in the original draft.[85]

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[84] Moore 2014, 137.
[85] Gordon 2009, 18-28, 81, 94-5.

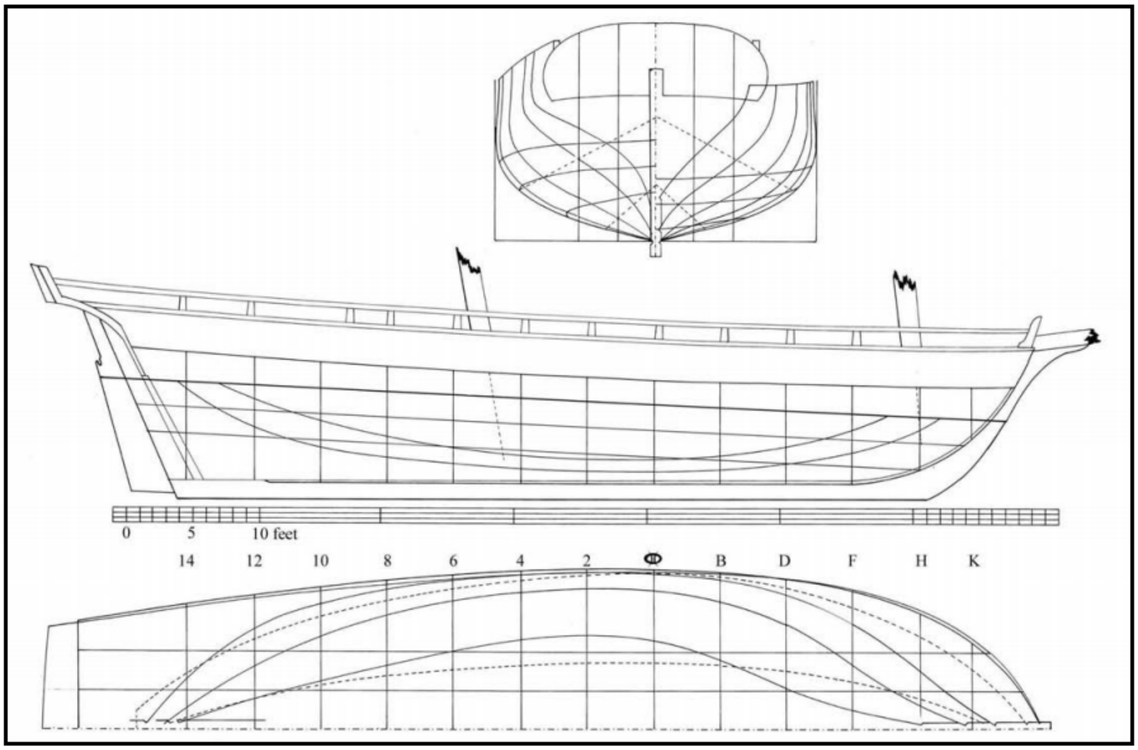

FIG. VI.4 Newash and Tecumseth lines drawings by L.E. Gordon (from Gordon 2009, 136).

The Millecoquins Wreck is thought to be a two-masted cargo vessel dating to the 1830s. Like the CityPlace schooner, its estimated construction date was based in part upon an 1833-dated United States cent found in one of its mast steps. The wreck was discovered in Michigan at the mouth of Millecoquins River, which flows into Lake Michigan. It was found in 1990 and was partially excavated and recorded by a team of graduate students from East Carolina University in 1991. The ship is very close in size to the CityPlace schooner, with a length of 62 feet (18.9 m), a beam of 17 feet, 5 inches (5.31 m), and a median depth of hold of 4 feet (1.22 m). There are no known lines drawings for the vessel, but a construction drawing detailing some of its internal features was prepared based on the data collected in 1991 (fig. VI.5). As none of the wreck's remains survived above deck level, the upper works of the vessel as depicted in this drawing are conjectural. [86]

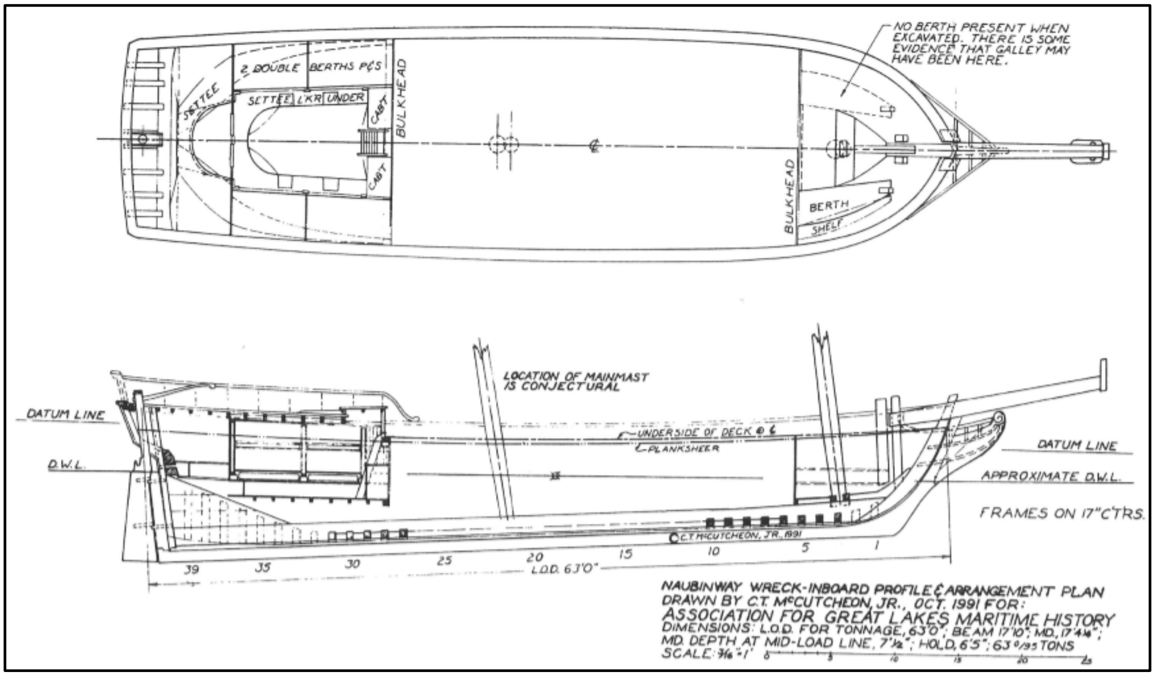

FIG. VI.5 Reconstruction of the Millecoquin’s wreck (from Barkhausen 1991, 9, with permission).

Reconstructed lines exist for a contemporary vessel similar in size and form to the CityPlace schooner. This was *Santiago*, a 67 feet, 3 inches (20.5 m) long centerboard schooner built in New York in 1833. It was a seagoing merchant vessel used to conduct trade between New Orleans and Cuba. Because it was constructed with a centerboard, *Santiago* had very flat floors, particularly for an oceangoing vessel, and its hull shape clearly indicates a desire to prioritize carrying capacity and the ability to navigate shallow waters over speed. As a result, the vessel has a shape more similar to that of the

[86] Barkhausen 1991, 1, 4, 10-11, 17.

CityPlace schooner than one would expect. *Santiago's* lines were reconstructed by Howard I. Chapelle, a naval architect and prolific 20th-century author (fig. VI.6).[87] His work represents one of only a few lines drawings for early centerboard schooners. Lines drawings of other contemporary, oceangoing, American-built vessels also serve as valuable resources for general information regarding the construction of 19th-century schooners. Those by Chappelle and M. Marestier, an early 19th-century French maritime engineer, proved to be particularly useful.[88]

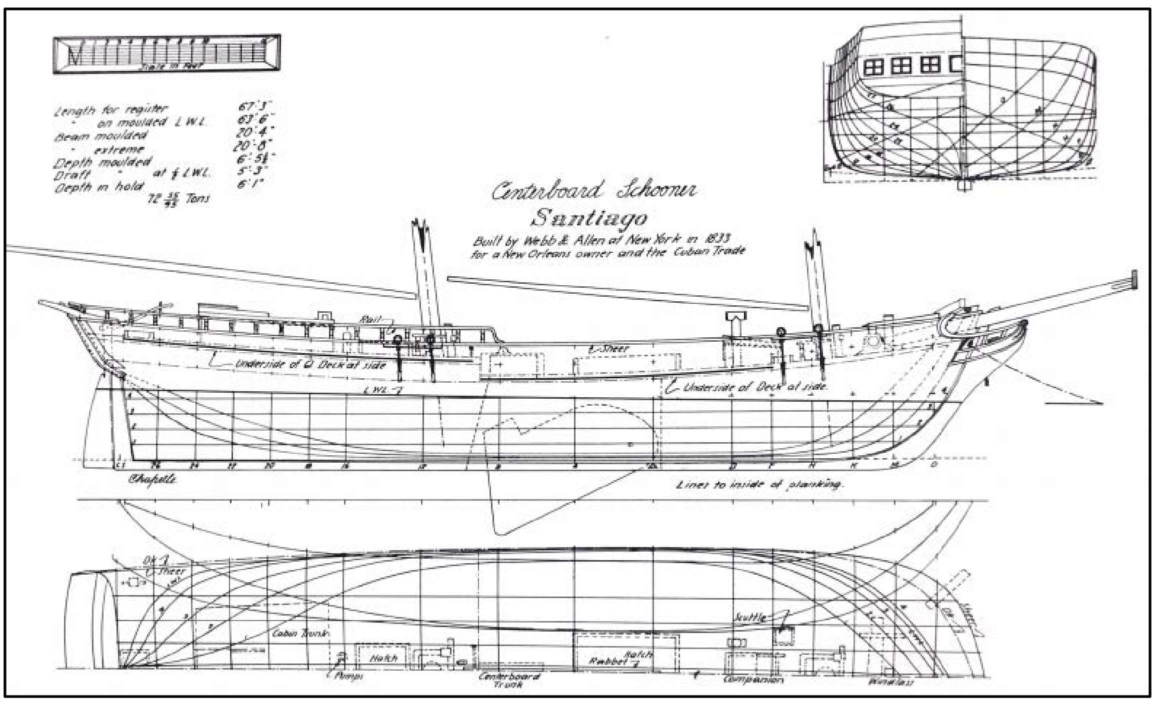

FIG. VI.6 Lines drawings of *Santiago* by H.I. Chapelle (from page 282 of THE SEARCH FOR SPEED UNDER SAIL 1700-1855 by Howard I. Chapelle. Copyright 1967 by W.W. Norton & Company, Inc. Used by permission of W.W. Norton & Company, Inc.).

[87] Chappelle 1967, 281-2.
[88] See Chappelle 1967 and Marestier 1824.

The wrecks of a number of other 19th-century schooners located in the Great Lakes have been explored, but not extensively documented. These include the vessels located by Jim Kennard and Dan Scoville, two shipwreck enthusiasts who use side scan sonar and ROVs to find wrecks throughout the Great Lakes (principally on Lake Ontario). Images of these vessels, which remain in situ, can be found on Kennard and Scoville's website, www.shipwreckworld.com. While many of the wrecks are unidentified, at least three similarly sized vessels are thought to date to the first half of the 19th century. Two of these vessels were fitted with daggerboards.[89] The wrecks (collectively referred to herein as the "Shipwreck World wrecks") provide useful illustrations of the deck arrangements and fittings of small, early Great Lakes vessels.

Another source consulted for the CityPlace schooner reconstruction was the information on dimensions and construction of 19th-century vessels on the Great Lakes compiled by the Wisconsin Maritime Museum. The museum obtained its data from newspapers and other historical records. It is useful in the identification of trends regarding the overall size, length-to-breadth ratios, and depths of hold of early vessels on Lake Ontario. Information in the database regarding the construction of vessels built in the United States is much more complete than for those built in Canada.[90]

Hull Form and Lines Drawings

The first step in reconstructing the hull of the CityPlace schooner was to recreate its profile. Its estimated length was obtained by examining the remains of the vessel's

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[89] Kennard 2008; Kennard 2013; and Kennard 2014.
[90] Wisconsin Maritime Museum.

upper and lower keels and its disarticulated stem and sternpost to determine the manner in which the timbers were likely fastened together. The curve of garboard rabbet was used to establish the rake of the stem, and the rake of the sternpost was determined by analyzing the angle of its base. The upper portions of the stem and sternpost were then recreated by continuing a fair curve of the existing remains and referencing the bow and stern assemblies of *Nancy*, *Hamilton*, *Scourge*, and *Santiago*. The result was a vessel with a relatively bluff bow, a near vertical sternpost, and a 51 feet, 8.5 inches (15.76 m) long lower keel. The schooner's rudder did not survive. It was likely of the plug-stock variety, similar to that found on *Hamilton*, as this type was in widespread use during the early 19th-century.[91] To complete the vessel's longitudinal profile, the sheer line (the height and curve of the hull's topside) was added. This was estimated through an analysis of the sheer lines of *Hamilton*, *Scourge*, and *Santiago* and the proportionality of these lines to these schooners' overall lengths.

The stem-to-stern contours of the hull were then recreated, beginning with the remains of the vessel's frames. Frame ⊗, which was the widest point of the schooner, was reconstructed first. As discussed in Chapter V, its location was identified by a change in the orientation of the vessel's floors and futtocks (forward of midships, the first futtocks were located aft of the floors and aft of midships, the first futtocks were located forward of the floors). Frame ⊗ was preserved up to the turn of the bilge. A minimum breadth and the curve of the bilge at that location could thus be inferred from

[91] Moore 214, 140.

the remains. After compensating for some distortion of the wreck (due to its resting position and the distortions caused by modern wooden supports), the shape of the midships section was determined by following the angle of the existing remains and completing the frame's upper portion with a fair curve. The plausibility of the resulting turn of the bilge and maximum beam were reinforced following a comparison of the estimated upper section against those of *Hamilton*, *Scourge*, and the vessels documented in the Wisconsin Maritime Museum's database, which confirmed that the curve resulted in a length-to-breadth ratio for the schooner that was congruent with contemporary hulls. The reconstructed maximum beam was 16 feet, 6 inches (5.03 m), giving the vessel a length-to-breadth ratio of 3.6: 1. Frames C, H, J, M, 3, 8, 11, and 15 were recreated using a similar methodology to form the contours of the rest of the hull. To do this, the schooner's partially-preserved Frames C, H, J, M, and 3 were relied upon heavily. The recreation of Frames 8, 11, and 15 required more informed conjecture (based upon the construction of other vessels) due to the minimal preservation in the stern.

It was necessary to determine the vessel's depth of hold to complete its overall form. The extant remains did not provide any evidence regarding the height of the deck. As discussed in Chapter II, however, historical records show that early lake vessels required shallow drafts to effectively operate in the unimproved harbors of the Great Lakes. This is reflected in the archaeological remains of *Nancy*, *Hamilton*, *Scourge*, *Newash*, *Tecumseth*, and the Millecoquin's Wreck and in the vessels recorded in the Wisconsin Maritime Museum's database (table VI-1). Based on an analysis of the proportions of these vessels, the CityPlace schooner's depth of hold was estimated to be 6 feet, 6 inches (1.98 m).

TABLE VI-1 Depths of hold of contemporary vessels.

Vessel	**Depth of Hold**
Nancy	7 feet, 6 inches (2.29 m) (estimated)
Hamilton	7 feet, 2.4 inches (2.19 m) (minimum)
Scourge	5 feet, 10.8 inches (1.8 m) (minimum)
Newash	9 feet (2.74 m)
Tecumseth	9 feet (2.74 m)
Millecoquin's Wreck	4 feet (1.22 m) (median)

The information described above was used to produce the schooner's reconstructed profile. The lines drawings were then completed by adding in buttock lines (to depict the longitudinal contours of the vessel) and waterlines (to give shape to the horizontal contours of the hull). This was done by drawing fair curves through reference to the lines of *Nancy*, *Newash*, *Tecumseth*, *Santiago*, and the vessels documented by Chappelle and Marestier. The result is set forth in figure VI.7.

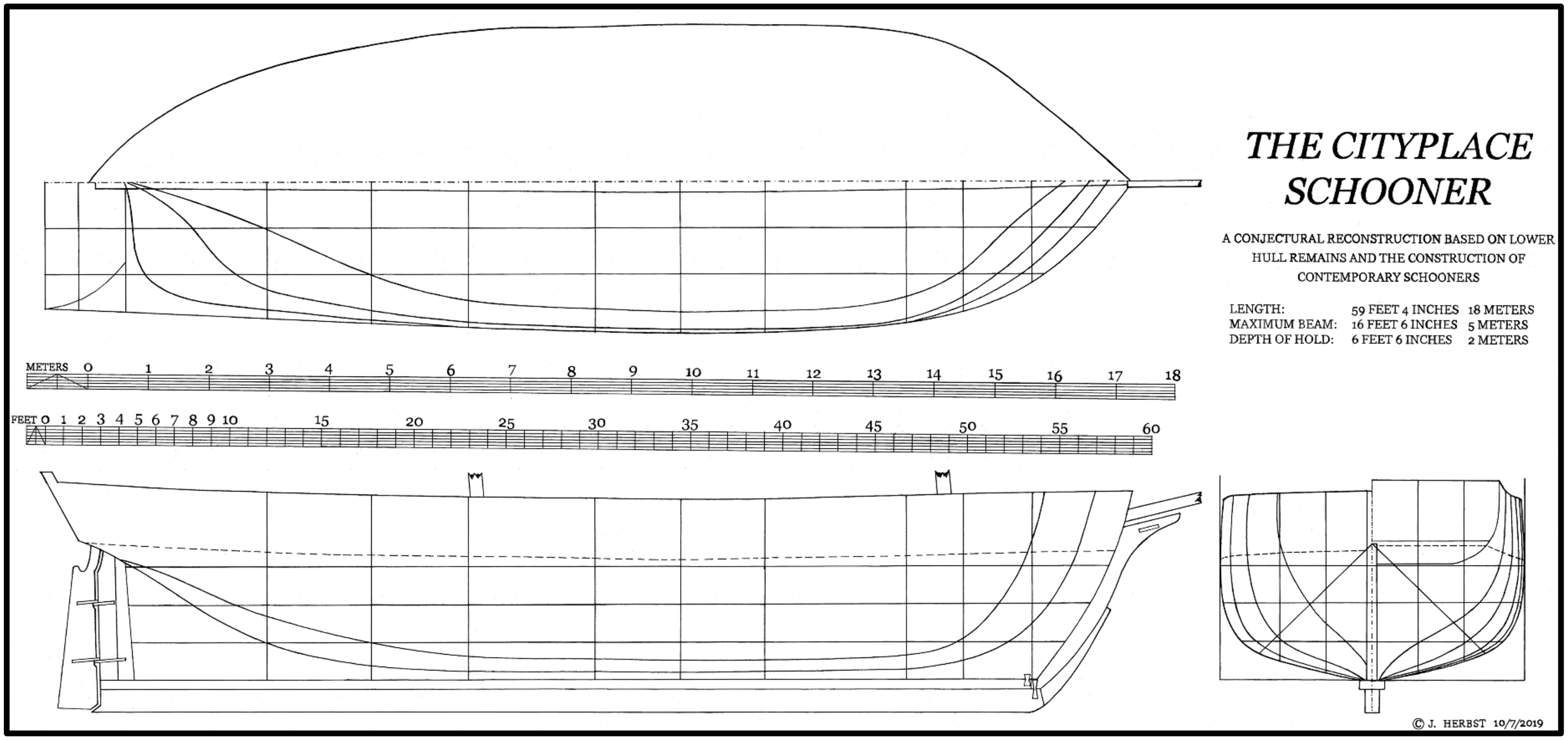

FIG. VI.7 Reconstructed lines drawings of the CityPlace schooner (drawing by J. Herbst).

Construction Drawings

The documented remains and reconstructed lines drawings formed the basis for the CityPlace schooner's construction drawings. Little conjecture was required for the recreation of the vessel's centerline pieces (including its upper and lower keels and keelsons), as these timbers were well preserved with the exception of their ends. The restoration of the centerline timbers was completed by continuing the timbers to their likely termination points based upon the surrounding construction features. As described above, the stem and sternpost were recreated based upon their extant remains and attached with reference to the similar bow and stern assemblies of *Nancy*, *Hamilton*, *Scourge*, and *Santiago*.

Some speculation was required to reconstruct the rest of the vessel's lower hull. The remains included the lower portions of the vessel's apron, which supported its stem, and stern deadwood, which supported the sternpost. The apron was completed by following the curve of the stem (atop which it was bolted) and terminating at the base of the bowsprit. The construction of the stern deadwood appeared similar to that found on the Millecoquins Wreck and *Jefferson* (a US brig built on Lake Ontario during the War of 1812).[92] The remains included two layers of deadwood laid parallel to the keel, with the base of the deadwood shaped from the upper keel. The lengths of two large bolts protruding above the upper existing layer of deadwood were used to estimate the molded

[92] Crisman 2014, 172 & 180. Because of the difference in the overall sizes of the two vessels (*Jefferson* had a length between perpendiculars of 122 feet, 11 inches [37.47 m]), the brig was not considered one of the primary references for the reconstruction of the CityPlace schooner, but proved informative in several respects.

dimensions of the timbers that did not survive. The remains did not give any indication of the presence of a stern knee joining the deadwood to the sternpost. Consequently, no such timber was added.

The locations of the schooner’s frames were identifiable by the extant remains of the floors and futtocks, notches in the apron, deadwood, and centerboard trunk, and by large bolts that passed through the centerline timbers. In most cases, the molded and sided dimensions of the frame floors and first futtocks could also be determined from the remains. In instances where the surviving timbers were too fragmentary, these dimensions were estimated based upon the dimensions of the adjacent floors and futtocks. The locations and diameters of the masts were determined based upon the location of the mortises in the upper keelson. Finally, the hull and ceiling planking in the lower hull were reconstructed based upon the vessel’s surviving plank strakes and continued up sides of hull in a manner that followed naturally from the surviving timbers.

Due to lack of any preserved structure, the reconstruction of the schooner’s upper works required much more conjecture and reliance on the construction of similar vessels than did the reconstruction of the lower hull. The hull remains did not include any deck beams, however, the locations of deck beam-supporting stanchions were determined based upon six impressions in the top of the upper keelson. The spacing of the stanchions was a useful indicator of the likely spacing of the deck beams in the central part of the vessel, as well as possible hatch locations. Fore-and-aft carlings reinforced the deck beams, which were also likely required for the structural integrity of the deck.

The size of the stanchions, deck beams, and carlings were determined based upon the size of similar timbers on *Hamilton*, *Newash*, and *Nancy* and reflected the lightly-built nature of the CityPlace schooner.

As mentioned in Chapter V, two disarticulated knees were found on the wreck. It is possible that these knees were used to support the deck beams, but they seem too large for this purpose. Additionally, few Great Lakes vessels had hanging knees to support their decks, as these timbers added significant weight above the waterline and were generally considered unnecessary due to the moderate conditions on the lake (as opposed to more extreme waves encountered on the open ocean).[93] Consequently, it is likely that the knees were used for other purposes (possibly to support a bitt for the windlass). For this reason, they were not included in the reconstruction of the midships section of the vessel. Instead, the deck was supported with light clamps in a manner similar to that seen on *Tecumseth* (fig. VI.8). The deck structure was completed by adding in 1.5 inch (3.81 cm) thick deck planking, which was assumed to be no thicker than the lower layer of ceiling planking. These planks are relatively narrow (averaging 6 inches [15.24 cm] wide), as this would have been more economical and less prone to leaking than wider planks.

[93] Bamford 2007, 154; Ford 2009, 148.

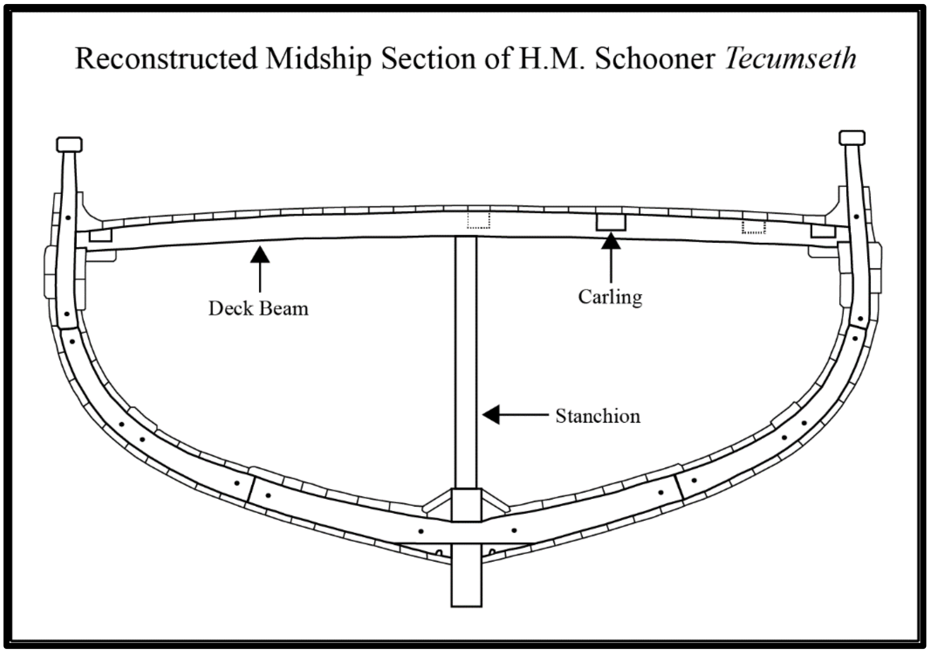

FIG. VI.8 Midships section of H.M. Schooner *Tecumseth* (after Gordon 2009, 123).

As with the deck structure, the reconstruction of the deck's fittings required conjecture. Hatch and companionway locations and lengths were determined primarily by stanchion placement, as the deck arrangements of *Hamilton*, *Scourge*, and the Shipwreck World wrecks did not reveal any trends with respect to hatch placement or size. The schooner's deck was recreated with one large hatch directly behind the mainmast used to load and unload cargo and two small openings between the masts to serve as companionways.

Although no evidence of it remains, the CityPlace schooner, like all other early 19th-century schooners, must have been equipped with a bowsprit. It was likely supported by bitts, similar to those supporting the bowsprits on *Hamilton* and *Scourge*.[94]

[94] Moore 2014, 143.

The size and rake of the bowsprit were recreated from the intact heading assemblies seen on *Hamilton* and *Scourge* and remained in proportion to the size of vessel's reconstructed mainmast and foremast. The upper bow, with a plain gammoning knee at the head of the stem, was reconstructed in a simple manner, similar to that on *Newash*, *Tecumseth*, and the Shipwreck World wrecks; by the second quarter of the 19th century similar North American merchant vessels appear to have dispersed with ornate figureheads like those seen on *Hamilton* and *Scourge*, opting instead for a more functional arrangement.

No evidence of the vessel's steering mechanism remains. Given the small size and early construction date of the schooner, it was likely steered with a tiller instead of a wheel. The location and size of the tiller was recreated through reference to that on *Hamilton*, *Scourge*, *Newash*, and *Tecumseth*. In all likelihood, the vessel had a windlass (a horizontal winch used to raise and lower the anchor) as well, as small merchant vessels typically did not carry enough manpower to easily recover the anchor without some kind of mechanical device. Its reconstructed size was determined based upon the windlasses seen on the Shipwreck World wrecks and it was placed directly behind the foremast, in the same location where historical records say *Nancy's* windlass was situated.[95] Finally, the deck was constructed without a raised quarter deck, a quarterdeck rail, or raised stern cabin housing, since the archaeological examples reviewed here and

[95] Sabick 2014, 84.

the historical evidence together show no clear trend for the presence of any of these features on small merchant vessels constructed in the first half of the 19th century.[96]

The resulting construction drawing is set forth in figure VI.9 and table VI-2 lists the dimensions of the vessel's reconstructed principle scantlings. As discussed above, because nothing remains of the CityPlace schooner's upper works, this is a best guess reconstruction intended to serve as a plausible representation of the post-modification appearance and design of the vessel based upon the construction and outfitting of the contemporary vessels previously described in this chapter.

[96] See Moore 2014, 139 (*Hamilton* and *Scourge* both originally had lightweight rails); Sabick 2014, 84 (*Nancy* had closed bulwarks); Kennard 2008 (an unidentified vessel with a taffrail); Kennard 2013 (unclear whether schooner built in 1838 has rails or bulwarks); Kennard 2014 (*Three Brothers* schooner had open rails).

TABLE VI-2 Primary dimensions of reconstructed scantlings.

Scantlings	Total Length	Molded	Sided
Upper Keel	50 ft., 7 in. (15.42 m)	1 ft. (30.48 cm) at midships (including centerboard trunk)	1 ft., 4.75 in. (42.55 cm) at midships
Lower Keel	51 ft., 8.5 in. (15.76 m)	1 ft., 3 in. (38.1 cm) at midships	9.25 in. (23.5 cm) at midships
Main Stem	10 ft., 2 in. (3.10 m)	3 ft., 10 in. (1.17 m) at base	-
Outer Stem	6 ft., 4.5 in. (1.94 m)	11.25 in. (28.58 cm) at base	-
Main Sternpost	7 ft. (2.13 m)	11 in. (27.94 cm) at base	-
Outer Sternpost	6 ft., 8 in. (2.03 m)	12 in. (30.48 cm) at base	-
Floors	10 ft., 6 in. (3.20 m) at midships	6 in. (15.24 cm) average	4.5 in. (11.43 cm) average
First Futtocks	-	4.75 in. (12.07 cm) average	4.5 in. (11.43 cm) average
Lower Keelsons	41 ft., 0.5 in. (12.51 m)	4 in. (10.16 cm) at midships	1 ft., 3 in. (38.1 cm) at midships
Upper Keelson	43 ft., 1.5 in. (13.14 m)	8.5 in. (21.59 cm) at midships	10.5 in. (26.67 cm) at midships
Hull Planking	-	1.5 in. (3.81 cm) average thickness	9 in. (22.86 cm) average width
Upper Layer Ceiling Planking	-	0.75 in. (1.91 cm) average thickness	11.75 in. (29.85 cm) average width
Lower Layer Ceiling Planking	-	1.5 in. (3.81 cm) average thickness	10.5 in. (26.67 cm) average width
Stanchions	4 ft., 9 in. (1.45 m) average	4 in. (10.16 cm)	4 in. (10.16 cm)
Deck Beams	15 ft., 3.75 in. (4.67 m) at midships	5 in. (12.7 cm)	5 in. (12.7 cm)
Deck Planking	-	1.5 in. (3.81 cm)	6 in. (15.24 cm) average width

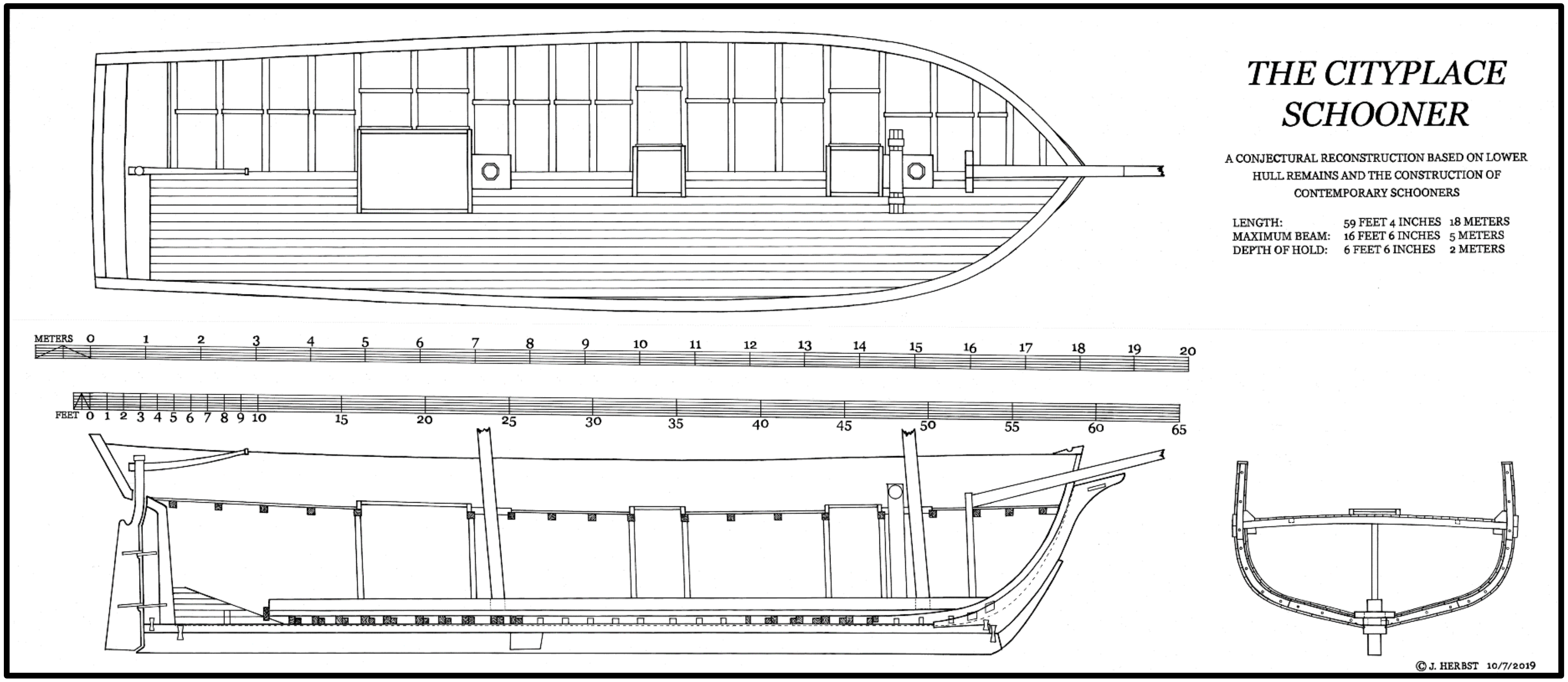

FIG. VI.9 Conjectural construction drawing of the CityPlace schooner (drawing by J. Herbst).

CHAPTER VII

CONCLUSION

Few documented archaeological examples of early 19th-century Great Lakes merchant vessels and few historical records regarding their construction have survived. As such, we cannot precisely determine the original or modified design and appearance of the CityPlace schooner. This thesis, however, presents a plausible reconstruction of the ship as determined through an analysis of its remains and the construction of similarly-sized contemporary vessels. The CityPlace schooner has provided valuable insights into an early and important vessel type on the Great Lakes in the 19th century, and into how the designs of Great Lakes vessels and the shipbuilding industry as a whole were impacted by the region's growth and conditions.

The CityPlace schooner was built at the start of the golden age of commercial sail on Lake Ontario, which was brought on by a period of increased immigration throughout the region, market expansion, and a lack of access to other forms of efficient and economical transportation. The remains exhibit many characteristics common to early 19th-century Great Lakes vessels. The wreck is that of a relatively small, two-masted vessel (likely a schooner given the popularity of the rig during this period). Its design emphasized carrying capacity over speed, with relatively flat floors and its fore mast placed close to the stem to maximize cargo space. This design may have been typical for the period, as many early lake vessels traveled over relatively short, intra-lake trade routes and did not have to be speedy to be profitable. The schooner was originally built with either a daggerboard or a centerboard, which features were added to commercial lake vessels in the post-War of 1812 period to allow ships to navigate shallow, unimproved harbors and waterways of the region as well as the open waters of the lake. Two layers of caulked ceiling planking suggest that the schooner spent at least part of its career transporting cargo that would have been damaged by a leaky hull. Given that wheat was the region’s top exported commodity for a large portion of the 19th century, it is likely that this cargo or other grains were frequently carried on the schooner.

The vessel’s daggerboard or centerboard was removed during its career and its loss was compensated for by the additional of a large standing keel attached to the underside of the original keel. The reasoning behind the modification is unknown. It is possible that it was done after the centerboard trunk began to leak, and that its removal was intended to prevent damage to cargo. It is also possible that the retractable keel was no longer deemed necessary as the century progressed (and the region’s waterways and harbors were deepened) and the design was altered to maximize the vessel’s cargo capacity.

The CityPlace schooner was mostly likely constructed on Lake Ontario. It could have entered Lake Ontario from Lake Erie through the Welland Canal as early as 1829, however, based on its reconstructed size, the schooner was too wide and had too deep a draft to fit into the locks of the Erie and Oswego canals prior to their expansions in the 1860s. By the 1870s, if not earlier, the vessel had reached the end of its usefulness, likely due to a combination of advanced deterioration and the growing popularity of steamboats and railroads, which combined to made commercial sail obsolete by the end of the 19th century. The vessel was disposed of next to the Queen's Wharf and became part of the fill that was used to expand Toronto's growing waterfront.

The identity of the CityPlace schooner remains unknown. There is still much more to be learned about the vessel through an in-depth analysis of its timbers (including dendrochronology and species testing) and the artifacts excavated in association with it. Further study may reveal additional information regarding the ship's date and location of construction and modification, which could help to specifically identify it. This information would provide valuable additional insight into the vessel, its construction and use, the integral role of vessels like the schooner in the development and success of the expanding settlements, and the impact that the growth of the region, its trade networks, and regional infrastructure had on shipbuilding practices on Lake Ontario.

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APPENDIX A

2018 FIELD SEASON ARTIFACT CATALOG

Artifact #	Quantity	Material	Description	Size	Location	Comments
1	1	Ceramic	Ceramic fragment with green pattern	1.31” x 1.63” x 1.13”	On ground near stern	Likely intrusive
2	1	Ceramic	Ceramic fragment with blue willow pattern	0.94” x 1” x 0.13”	Between frames 12 & 13	
3	1	Wood	Bark (possibly birch)	1.63” x 1.44” x 1.5”	Upper keel between frames 10 & 11	Possibly used as caulking material
4	1	Wood	Wood fragment with partial treenail hole	6” x 0.63” x 0.5”	Upper keel below frame 13 between 2 bolts	
5	1	Ceramic	Ceramic fragment with black stripe	0.5” x 0.5” x 0.06”	Between frames 2 & 3	
6	2	Metal and Organic	Iron square head nail and organic sample	3” x 0.13” x 0.13”	Between upper ceiling plank 3 and lower ceiling plank 3B	Slightly rusted
7	1	Metal	Iron nail	2.5” x 0.13” x 0.13”	On lower ceiling plank 3B	Bent and slightly rusted with a deformed head
8	1	Organic	Brown organic material with red pigment	-	On lower ceiling plank 4B, near frame 4	Caulking material (possibly lead based)

9	1	Organic	Brown organic material with yellow and red flakes	-	Forward edge of upper ceiling planks 3 & 4	Possible caulking material found between upper and lower layers of ceiling planking
10	1	Metal	Two nails welded together at head	2.63” x 0.25” x 0.25”	On ground near outboard end of frame 4 (port)	Possibly intrusive (found on ground away from the wreck and rust appears to be of a different color and texture than other nails)
11	1	Ceramic	Ceramic fragment with blue and white pattern	1” x 0.75” x 0.13”	On ground near frame 12 (port)	Similar appearance as ceramic artifacts recovered during 2015 excavation that were dated to the 1820s
12	1	Metal	Iron square head nail	5.88” x 0.33” x 0.33”	On frame K	Slightly rusted
13	1	Metal	Iron spike	4” x 0.25” x 0.25”	Joined first futtock in frame B with lower ceiling plank 5	Slightly rusted with small bend at mid-point
14	1	Metal	Iron spike	4.25” x 0.25” x 0.25”	On lower ceiling plank 2	Slightly rusted
15	1	Metal	Iron spike	3” x 0.25” x 0.25”	Joined first futtock of frame 3 with lower ceiling plank 5	Slightly rusted with odd expanded section $^{2}/_{3}$ of the way down
16	1	Metal	Iron square head nail	4.25” x 0.25” x 0.25”	Between frames I & J	Slightly rusted
17	2	Wood	Wood fragment	A: 3.75” x 1.5” x 0.33” B: 1.38” x 4.5”	Between frames I & J	
19	1	Organic	Caulking material	-	Between frames K & L	

20	1	Wood	Bark (possibly birch)	4.75” x 2.5” x 1.06”	Between frames I & J	Curled and soft
21	1	Metal	Iron nail fragment	1.94” x 0.5” x 0.38”	Between frames H & I	
22	1	Wood	Shaped wood	6” x 3.25” x 0.44”	Between frames H & I	Triangular
23	1	Metal	Iron nail fragment (head)	1.94” x 0.56” x 0.56”	Between frames F & G	
24	3	Metal	Iron nails	A: 4.63” x 0.63” x 0.63” B: 3” x 0.5” x 0.38” C: 2.44” x 0.34” x 0.34”	Between frames H & I	
25	4	Wood	Shaped wood	A: 3.5” x 2.5” x 0.69” B: 4.69” x 1.44” x 0.38” C: 5.06” x 1.44” x 0.19” D: 4.31” x 0.81” x 0.5”	Between frames H & I	
26	2	Metal	Iron nail fragments	A: 2.38” x 0.31” x 0.25 B: 2.12” x 0.31” x 0.25”	Between frames H & I	
27	1	Organic	Caulking material or decayed wood	-	Between frames H & I	
28	1	Organic	Caulking material or decayed wood	-	Between frames H & I	

29	1	Wood	Wood fragment	2.75” x 1.75” x 0.13”	Between frames G & H	Blackened (possibly from rot)
30	1	Wood	Bark (possibly birch)	3.5” x 2.5” x 0.06”	Between frames G & H	
31	1	Organic	Charcoal/slag	1” x 0.5” x 0.5”	Between frames G & H	
32	2	Organic	Charcoal	A: 2.5” x 1.5” x 1” B: 2.5” x 1.5” x 1”	Between frames F & G	
33	1	Organic	Charcoal	1” x 0.33” x 0.06”	Between frames E & F	
34	1	Metal	Iron nail fragment	1.25” x 0.25” x 0.25”	Between frames E & F	
35	7	Ceramic	Ceramic fragments with blue pattern	A: 0.25” x 0.5” x 0.31” x 0.38” x 0.13” B: 0.13” x 0.38” x 0.31” x 0.25” x 0.13” C: 0.25” x 0.38” x 0.38” x 0.13” D: 0.19” x 0.25” x 0.25” x 0.38” x 0.13” E: 0.31” x 0.38” x 0.25” x 0.25” x 0.13” F: 0.31” x 0.38” x 0.31” x 0.13” G: 0.13” x 0.33” x 0.33” x 0.13”	Between frames E & F	Possibly blue willow pattern

36	1	Organic	Charcoal	Less than 1”	Between frames F & G	
37	1	Organic	Charcoal	Less than 1”	Between frames E & F	
38	1	Wood	Bark (possibly birch)	0.88” x 1” x 0.06”	Between frames D & E	
39	5	Organic	Charcoal	All less than 1”	Between frames D & E	
40	2	Wood	Shaped wood	A: 8” x 1.25” x 0.25” B: 7.25” x 2” x 1.25”	Between frames D & E	
41	3	Organic	Animal bone	5” x 2.33” x 0.25” (largest piece)	Between upper and lower keel at stern	Possibly immature cow
42	1	Wood	Sheave	6” diameter; 1” thick	Between frames D & E	Rigging element
43	1	Metal	Iron square head nail	2” x 0.25” x 0.25”	Between frames D & E	Slightly rusted
44	3	Ceramic	Ceramic fragments with blue pattern	A: 0.63” x 0.56” x 0.13” B: 0.56” x 0.38” x 0.13” C: 0.25” x 0.19” x 0.13”	Between frames D & E	
45	4	Organic	Charcoal	Less than 1”	Between frames D & E	

46	2	Wood	Shaped wood	A: 2.33” x 1” x 0.25” B: 0.25” x 1.5” x 0.25”	Between frames D & E	
47	3	Wood	Wood fragments	A: 1.5” x 0.33” B: 2.5” x 0.75” C: 1.5” x 0.33”	Between frames D & E	Blackened
48	1	Wood	Bark (possibly birch)	1.5” x 1” x 0.13”	Between frames D & E	
49	4	Metal	Iron nail fragments	A: 1.5” x 0.33” B: 1.25” x 0.25” C: 0.25” x 2.33” D: 1.5” x 0.25”	Between frames D & E	Slightly rusted
50	1	Wood	Shaped wood	1.25” x 0.33” x 0.13”	Between frames D & E	
51	2	Ceramic	Ceramic fragments with grey and dark brown pattern	A: 0.75” x 1” x 0.88” x 0.13” B: 0.88” x 0.88” x 0.88” x 0.13”	Between frames C & D	Includes rims

52	4	Ceramic	Ceramic fragments with grey and dark brown pattern	A: 0.33” x 0.25” x 0.33” x 0.33” B: 0.5” x 0.5” x 0.75” C: 0.33” x 0.5” x 0.33” x 0.5” x 0.75” D: 0.25” x 0.75” x 0.33” x 0.69”	Between frames C & D	Two rim pieces
53	4	Metal	Iron nail fragments	A: 1.75” x 0.25” B: 0.25” x 2.25” C: 0.33’’ x 1.25” x 0.25” D: 1” x 0.13” x 0.25”	Between frames C & D	Rusted
54	2	Wood	Shaped wood	A: 3.13” x 0.25” x 0.75” B: 4.5” x 2.25” x 0.5”	Between frames C & D	
55	2	Wood	Wood fragments	A: 0.75” x 1” x 0.25” B: 0.5” x 0.5” x 0.33”	Between frames C & D	Blackened
56	1	Wood	Bark (possibly birch)	A: 2” long B: 1” long	Between frames C & D	
57	1	Metal	Iron nail	3” x 0.25” x 0.25”	Between frames C & D	Rusted with tapered tail end
58	2	Organic/ Wood	Charcoal or blackened wood	A: 2” x 1.75” x 0.25” B: 1.25” x 1” x 0.25”	Between frames C & D	

59	1	Ceramic	Ceramic with dark brown stripe down side	1.25” x 1.5” x 1.5” x 0.25” x 0.13”	Between frames C & D	
60	1	Ceramic	Ceramic fragment with blue pattern	0.31” x 0.25” x 0.13”	Between frames C & D	Enamel is cracking
61	1	Organic	Organic material	-	Between frames A & ⊗	Mossy appearance
62	3	Organic	Charcoal	All less than 1”	Between frames G & H	
63	2	Metal	Iron nail fragment	A: 0.5” x 0.25” x 2” B: 2.13” x 0.25” x 0.13”	Between frames G & H	Rusted with slight build up
64	4	Wood	Shaped wood	A: 4” x 1.75” x 1.75” 1” B: 2” x 2” x 0.5” x 1.25” C: 2.75” x 1.75” D: 6” x 4.5” x 2.75” x 1”	Between frames G & H	
65	18	Organic	Charcoal	All less than 1”	Between frames B & C	
66	4	Organic	Charcoal	All less than 0.5”	Between frames B & C	
67	1	Wood	Shaped wood	6.75” x 1.5” x 0.5”	Between frames B & C	

68	1	Organic/ Wood	Charcoal or blackened wood	2.5” long	Between frames B & C	Heavily degraded
69	8	Organic	Charcoal	All 1” or less	Between frames ⊗ & A	
70	1	Wood	Shaped wood	3.5” x 1” x 1.4”	Between frames ⊗ & A	
71	6	Organic	Charcoal	0.5” pieces	Between frames A & B	
72	1	Metal	Iron nail fragment (head)	1.5” x 0.33” x 0.13” at one end and 0.5” on the other	Between frames A & B	
73	1	Ceramic	Ceramic fragment with blue pattern	1” x 0.33” x 0.13”	Between frames A & B	Wear on one side with possible rim
74	1	Metal	Iron nail fragment	1.25” x 0.25” x 0.25”	On upper layer of ceiling planking	
75	2	Organic/ Wood	Charcoal or blackened wood	A: 3.5” long B: 1.5” long	Between frames 2 & 3	
76	4	Organic	Charcoal	All less than 0.5”	Between frames 4 & 5	
77	3	Organic	Charcoal	All less than 0.5”	Between frames 3 & 4	
78	2	Organic	Coal	A: 1.5” x 1” B: 0.5” x 0.33”	Between frames 2 & 3	
79	1	Ceramic	Ceramic fragment with blue pattern	1” x 1” x 0.33” x 0.13”	Between frames 1 & 2	Includes rim; enamel is cracked

80	2	Ceramic	Ceramic fragments (one blue and one white)	0.56” x 0.38”x 0.38” x 0.13”	Beneath first futtock in frame E, 4’ 5” out from keel	
81	1	Ceramic	Ceramic fragment (blue)	0.25”x 0.38” x 0.06”	Under floor of frame D	
82	1	Ceramic	Ceramic fragment (grey) with black stripe	0.75” x 1.5” x 1.13” x 0.13”	Under floor of frame F	
83	5	Ceramic	Ceramic fragments with blue and white pattern; ceramic fragment with green and white pattern	A: 0.25”x 0.75” x 0.5” x 0.66” x 0.13” B: 0.13” x 0.25” x 0.25” x 0.5” C: 0.13” x 0.25” x 0.5” x 0.25” D: 0.13” x 0.25” x 0.25” x 0.19” E: 0.13” x 0.13” x 0.13”	Under floor of frame E	

APPENDIX B

PRINCIPAL DIMENSIONS OF PRESERVED SCANTLINGS

Scantlings		Length	Sided	Molded
Upper Keel		49 ft., 4 in. (15.04 m)	5 – 16.5 in. (12.7 – 39.37 cm)	6 – 11 in. (15.24 – 27.94 cm)
Lower Keel		48 ft., 11 in. (14.91 m)	5 – 9.25 in. (12.7 – 25.4 cm)	14.5 in. (36.83 cm) average
Main Stem		6 ft., 7.75 in. (2.03 m)	3.5 – 6.75 in. (8.89 – 17.15 cm)	3 – 10 in. (7.62 – 25.40 cm)
Outer Stem		6 ft., 4.5 in. (1.94 m)	2.5 – 4 in. (6.35 – 10.16 cm)	2 – 10.5 in. (5.08 – 26.67 cm)
Apron		6 ft., 6 in. (1.98 m)	ca. 1 ft. (30.48 cm)	6 in. (15.24 cm) average
Main Sternpost		5 ft., 6 in. (1.68 m)	2.75 – 6 in. (6.99 – 15.24 cm)	2 – 9.75 in. (5.08 – 24.77 cm)
Outer Sternpost		5 ft., 3 in. (1.60 m)	6.5 in. (16.51 cm) maximum	10.5 in. (26.67 cm) maximum
Deadwood		5 ft., 3 in. (1.60 m)	4.75 – 10 in. (12.07 – 25.4 cm)	6.5 in. (16.51 cm) maximum
Floors	M	2 ft., 3 in. (0.69 m)	5 in. (12.7 cm) at keel	3 in. (7.62 cm) at keel
	L	3 ft., 6 in. (1.07 m)	5 in. (12.7 cm) at keel	3 in. (7.62 cm) at keel
	K	3 ft., 10 in. (1.17 m)	4 in. (10.16 cm) at keel	4.5 in. (11.43 cm) at keel
	J	4 ft., 8 in. (1.42 m)	3.5 in. (8.89 cm) at keel	5.5 in. (13.97 cm) at keel
	I	4 ft., 6 in. (1.37 m)	3 in. (7.62 cm) at keel	5 in. (12.7 cm) at keel
	H	3 ft., 10 in. (1.17 m)	4 in. (10.16 cm) at keel	5 in. (12.7 cm) at keel
	G	5 ft., 2 in. (1.57 m)	5 in. (12.7 cm) at keel	5 in. (12.7 cm) at keel
	F	6 ft., 6 in. (1.98 m)	6 in. (15.24 cm) at keel	5.5 in. (13.97 cm) at keel
	E	6 ft., 5.5 in. (1.97 m)	5 in. (12.7 cm) at keel	3 in. (7.62 cm) at keel
	D	6 ft., 9 in. (2.06 m)	4 in. (10.16 cm) at keel	5 in. (12.7 cm) at keel
	C	4 ft., 10 in. (1.47 m)	4 in. (10.16 cm) at keel	5 in. (12.7 cm) at keel
	B	4 ft., 11 in. (1.50 m)	4 in. (10.16 cm) at keel	5 in. (12.7 cm) at keel
	A	4 ft., 8 in. (1.42 m)	4 in. (10.16 cm) at keel	5 in. (12.7 cm) at keel
	⊗	4 ft., 7 in. (1.40 m)	4 in. (10.16 cm) at keel	5 in. (12.7 cm) at keel
	1	4 ft., 7 in. (1.40 m)	4 in. (10.16 cm) at keel	5 in. (12.7 cm) at keel
	2	5 ft. (1.52 m)	4 in. (10.16 cm) at keel	5 in. (12.7 cm) at keel
	3	5 ft. (1.52 m)	4 in. (10.16 cm) at keel	4.5 in. (11.43 cm) at keel
	4	5 ft. (1.52 m)	4.5 in. (11.43 cm) at keel	4 in. (10.16 cm) at keel
First Futtocks	K	4 ft., 0.5 in. (1.23 m)	4 in. (10.16 cm) at base	4.5 in. (11.43 cm) at base
	J	6 ft., 2 in. (1.88 m)	4 in. (10.16 cm) at base	4 in. (10.16 cm) at base
	I	5 ft., 8 in. (1.73 m)	4 in. (10.16 cm) at base	5 in. (12.7 cm) at base

	H	6 ft., 8 in. (2.03 m)	4 in. (10.16 cm) at base	5 in. (12.7 cm) at base
	G	7 ft., 3 in. (2.21 m)	4 in. (10.16 cm) at base	4.5 in. (11.43 cm) at base
	F	7 ft., 7 in. (2.31 m)	5 in. (12.7 cm) at base	4 in. (10.16 cm) at base
	E	7 ft., 0.5 in. (2.15 m)	3 in. (7.62 cm) at base	3.5 in. (8.89 cm) at base
	D	7 ft., 1 in. (2.16 m)	4 in. (10.16 cm) at base	4 in. (10.16 cm) at base
	C	6 ft., 11 in. (2.11 m)	4 in. (10.16 cm) at base	5 in. (12.7 cm) at base
	B	6 ft., 6 in. (1.98 m)	4 in. (10.16 cm) at base	5 in. (12.7 cm) at base
	A	6 ft., 11 in. (2.11 m)	4 in. (10.16 cm) at base	5 in. (12.7 cm) at base
	⊗	6 ft., 7 in. (2.01 m)	4 in. (10.16 cm) at base	5 in. (12.7 cm) at base
	1	6 ft., 8 in. (2.03 m)	4 in. (10.16 cm) at base	5 in. (12.7 cm) at base
	2	6 ft., 7 in. (2.01 m)	4 in. (10.16 cm) at base	4 in. (10.16 cm) at base
	3	6 ft., 5.5 in. (1.97 m)	4.5 in. (11.43 cm) at base	5 in. (12.7 cm) at base
	4	7 ft. (2.13 m)	4 in. (10.16 cm) at base	4.5 in. (11.43 cm) at base
Lower Keelsons		42 ft., 9 in. (13.03 m)	13.25 in. (33.66 cm) average	4 in. (10.16 cm) average
Upper Keelson		37 ft., 8.5 in. (11.49 m)	9.5 in. (24.13 cm) average	7.75 in. (19.69 cm) average
Hull Planking	1	-	12 in. (30.48 cm) at ⊗	1.5 in. (3.81 cm)
	2	-	13.25 in. (33.66 cm) at ⊗	1.5 in. (3.81 cm)
	3	-	14.25 in. (36.20 cm) at ⊗	1.5 in. (3.81 cm)
	4	-	10.25 in. (26.04 cm) at ⊗	1.5 in. (3.81 cm)
	5	-	12 in. (30.48 cm) at ⊗	1.5 in. (3.81 cm)
	6	-	10.5 in. (26.67 cm) at ⊗	1.5 in. (3.81 cm)
	7	-	7 in. (7.25 cm) at ⊗	1.5 in. (3.81 cm)
Lower Ceiling Planking	1A	4 ft., 8.5 in. (1.44 m)	5.65 in. (14.35 cm) average	1.5 in. (3.81 cm)
	1B	4 ft., 6 in. (1.37 m)	5 in. (12.7 cm) average	1.5 in. (3.81 cm)
	2	15 ft., 11 in. (4.85 m)	14.21 in. (36.10 cm) average	1.5 in. (3.81 cm)
	3A	3 ft., 11.5 in. (1.21 m)	7.5 in. (19.05 cm) average	1.5 in. (3.81 cm)
	3B	15 ft. (4.57 m)	17.22 in. (43.74 cm) average	1.5 in. (3.81 cm)
	4A	10 ft. (3.05 m)	5.87 (14.91 cm) average	1.5 in. (3.81 cm)
	4B	12 ft., 3 in. (3.73 m)	11.32 in. (28.75 cm) average	1.5 in. (3.81 cm)
	5	16 ft., 5 in. (5.00 m)	14.93 in. (37.92 cm) average	1.5 in. (3.81 cm)
Upper Ceiling Planking	1	9 ft., 3 in. (2.82 m)	10.55 in. (26.8 cm) average	0.75 in. (1.90 cm)
	2	9 ft., 11 in. (3.02 m)	9.68 in. (24.59 cm) average	0.75 in. (1.90 cm)
	3	11 ft., 11 in. (3.63 m)	10.95 in. (27.81 cm) average	0.75 in. (1.90 cm)

	4	11 ft., 11 in. (3.63 m)	10.94 in. (27.79 cm) average	0.75 in. (1.90 cm)
	5	9 ft., 4 in. (2.84 m)	7.5 in. (19.05 cm) average	0.75 in. (1.90 cm)
	6	10 ft. (3.05 m)	10.57 in (26.85 cm) average	0.75 in. (1.90 cm)

APPENDIX C

PRIMARY DIMENSIONS OF CONTEMPORARY SCHOONERS

Vessel	Construction Date	Length	Breadth	Depth of Hold
Nancy	1789	59 ft., 9 in. (18.21 m) keel	ca. 19 ft. (5.79 m) (reconstructed)	7 ft., 6 in. (2.29 m) (estimated)
Hamilton	1809	66 ft., 10.8 in. (20.39 m) from knightshead to taffrail	19 ft. (5.79 m) at main mast	7 ft., 2.4 in. (2.19 m) (minimum)
Scourge	1811	58 ft., 8.4 in. (17.89 m) from knightshead to taffrail	15 ft., 8.4 in. (4.79 m)	5 ft., 10.8 in. (1.8 m) (minimum)
Newash	1815	70 ft., 6 in. (21.49 m) length on deck	24 ft., 5 in. (7.44 m)	9 ft. (2.74 m)
Tecumseth	1815	70 ft., 6 in. (21.49 m) length on deck	24 ft., 5 in. (7.44 m)	9 ft. (2.74 m)
Millecoquins Wreck	1830s	62 ft. (18.9 m)	17 ft., 5 in. (5.31 m)	4 ft. (1.22 m) (median)
Santiago	1833	67 ft., 3 in. (20.5 m)	20 ft., 8 in. (6.30 m)	6 ft., 1 in. (1.84 m)