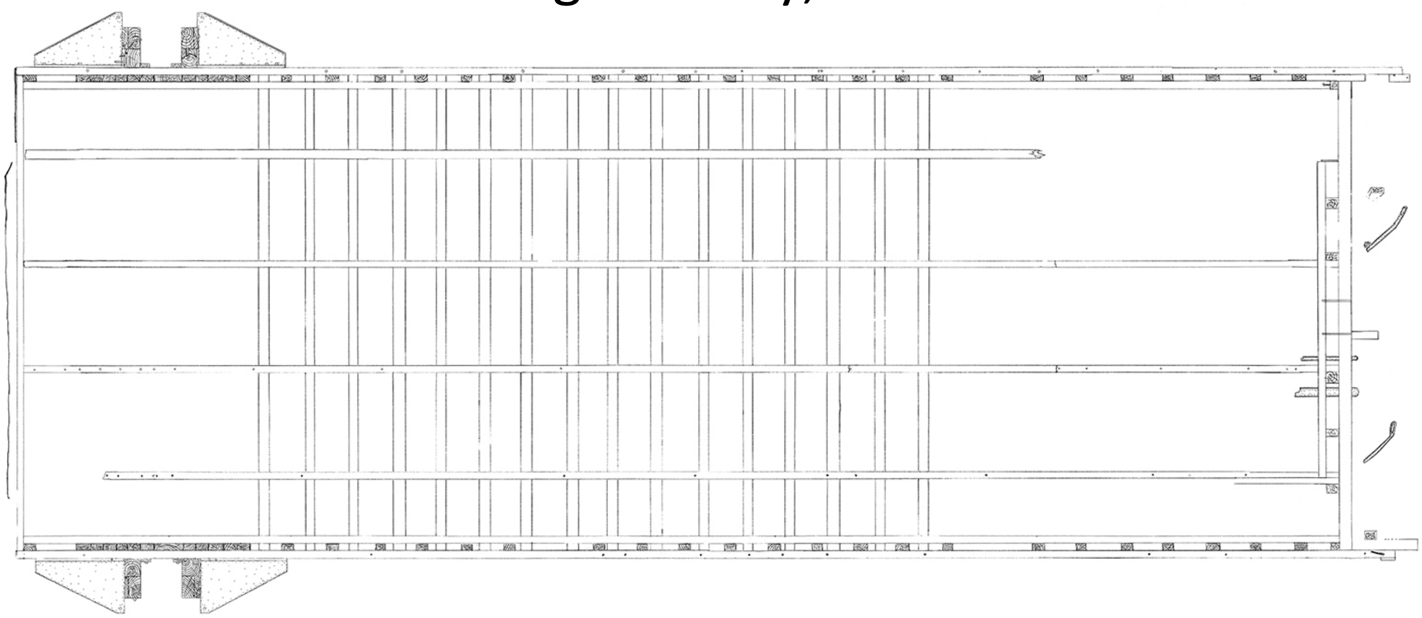
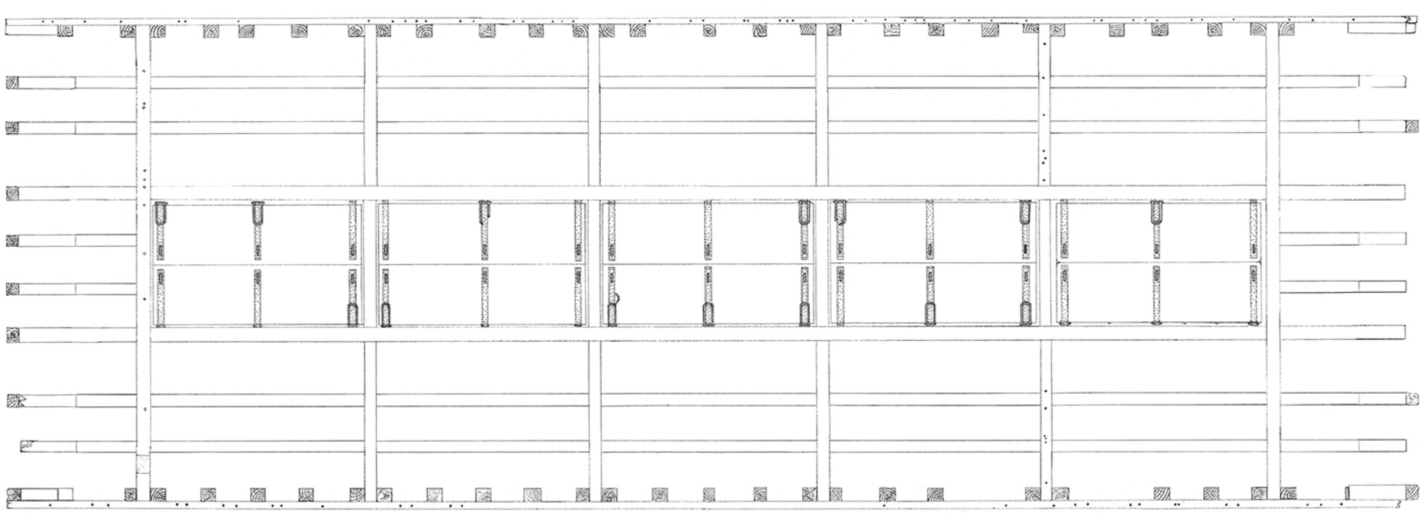
Phase 3 Underwater Archaeological Report for the Onondaga Lake Bottom,

Subsite of the Onondaga Lake Superfund Site,
Onondaga County, New York





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Lake Champlain Maritime Museum

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Phase 3 Underwater Archaeological Report for the Onondaga Lake Bottom, Subsite of the Onondaga Lake Superfund Site, Onondaga County, New York

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September 2014

EXECUTIVE SUMMARY

Since 2007, Lake Champlain Maritime Museum (LCMM) under subcontract to Parsons and on behalf of Honeywell, has been performing archaeological investigations of the Onondaga Lake bottom in support of the remedial activities of the Onondaga Lake Cleanup Plan. These have been detailed the *Phase 1B Underwater Archaeological Report for the Onondaga Lake Bottom, Subsite of the Onondaga Lake Superfund Site, Onondaga County, NY.*[1]

Recommendations from the Phase 1B work were compiled into a *Mitigation Plan*[2] which outlined a mitigation plan for six historically significant properties located within the Syracuse Maritime Historic District that will be impacted during remedial activities in Onondaga Lake (A1/2, A4, A7, A12, A45, and A53). During mitigation fieldwork performed in 2012 and 2013, four previously unknown shipwrecks were also located and documented (A2-1, A2-2, A2-3, and A2-4). This report presents the comprehensive results of the Phase 3 archaeological study of these ten sites.

The ten sites represent a variety of property types.

- Vessels
    - Dump scow (A4)
    - Dredge (A12)
    - Canal Boat (A53)
    - Steam tug/launch (A2-1)
    - Canal packet (A2-2)
    - Steam excursion vessel (A2-3)
    - Barge (A2-4)
- Salina Pier (A1/2)
- Concrete breakwater (A45)
- Aid to navigation: pilings (A7)

The documentation of the ten sites included several methods of data recovery including videography, photography, detailed measured drawings, and the recovery and analysis of wood samples. The archaeological activities complied with the NY State Office of Parks, Recreation and Historic Preservation's *Standards for Cultural Resource Investigations and the Curation of Archaeological Collections in NY State* and the Secretary of the Interior's *Standards and Guidelines for Archaeology and Historic Preservation,* as amended and annotated (48 FR 44716).

The detailed documentation of the maritime infrastructure and vessel remains found within the Syracuse Maritime Historic District represent a diverse and important collection of properties. The vessel remains represent several of the many watercraft types that operated on Onondaga Lake in the late nineteenth and early twentieth centuries. These vessels are now part of a small dataset of freshwater, inland, vernacular craft that played vital roles in the development and maintenance of the commerce throughout central New York and beyond. The documentation of the wreck remains has added a significant amount of valuable data about these under represented vessel types.

The maritime infrastructure remains located within the Syracuse Maritime Historic District are valuable records of the importance placed on the smooth operation of the waterborne commerce on Onondaga Lake. These remains include pilings demarking the navigable channel into the Syracuse Inner Harbor, a breakwater that protected the same area, and the Salina Pier that once hosted a bustling tourist trade.

Salina Pier also played a significant role in the years after the resort trade had ended by acting as a convenient place to dispose of boats that were no longer serviceable. This in turn has added significantly to the resource base of shipwrecks that were available for documentation.

ACKNOWLEDGEMENTS

So many individuals have contributed to the years of research and fieldwork represented in this report that there is not room enough to acknowledge every one individually. Lake Champlain Maritime Museum is particularly grateful for the hard work and dedication of the following individuals and organizations, without whom this study would not have been possible:

Ron Adams
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Kelly Miller, Parsons
Russell Andrews
NY State Museum
Syracuse University Special collections
University of Vermont Special Collections
The Salt Museum at Onondaga Lake Park
The staff of Candlewood Suites
Honeywell
Parsons
Sevenson

MANAGEMENT SUMMARY

SHPO Project Review Number:

Involved State and Federal Agencies:

NY State Department of Environmental Conservation
NY State Office of Parks Recreation and Historic Preservation
U.S. Environmental Protection Agency

Phase of Survey:

3

Location Information

Location: Onondaga Lake
Minor Civil Division: Towns of Salina and Geddes and City of Syracuse
County: Onondaga

USGS 7.5 Minute Quadrangle Map:

Syracuse West

Archaeological Documentation Overview:

This report presents the results of a Phase 3 underwater archaeological investigation of ten sites located within the Syracuse Maritime Historic District that will be impacted during remedial activities in Onondaga Lake. Twenty-nine days of fieldwork were executed in September and October 2012, and May 2013 by Lake Champlain Maritime Museum (LCMM) on behalf of Honeywell and under subcontract to Parsons, Inc.

Results of Archaeological Documentation:

Ten sites were examined during the Phase 3 documentation study. The documentation included several methods of data recovery including videography, photography, detailed measured drawings, and the recovery and analysis of wood samples. The results of this documentation include scale drawings of the wreck sites and a better understanding of all the sites and their relationship to the proposed Syracuse Maritime Historic District.

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Date of Report:
May 1, 2014

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INTRODUCTION

This report presents the results of a Phase 3 underwater archaeological documentation, executed under subcontract to Parsons, Inc. and on behalf of Honeywell, for the Onondaga Lake Bottom Subsite of the Onondaga Lake Superfund Site. The work was undertaken by Lake Champlain Maritime Museum (LCMM) to mitigate ten underwater cultural resources that will be impacted during remedial activities in Onondaga Lake (Table 1).

Table 1: Properties mitigated in the Syracuse Maritime Historic District

Wooden Watercraft	Marine Infrastructure
A4-1 Dump Scow	A1/A2 Salina Pier
A12 Dredge	A7 Piling Clumps
A53 Canal Boat	A45 Concrete Breakwater
A2-1 Steam tug/launch	
A2-2 Canal packet	
A2-3 Steam excursion vessel	
A2-4 Barge	

This documentation facilitates management and assessment of archaeological resources in Onondaga Lake consistent with Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended; the Secretary of the Interior's *Standards and Guidelines for Archeology and Historic Preservation*;[3] the NY Archaeological Council's *Standards for Cultural Resource Investigations and the Curation of Archaeological Collections in NY State;*[4] and the NY State Historic Preservation Office's *Phase I Archaeological Report Format Requirements*.[5]

The cultural resource assessments included in this report apply only to potential archaeological and architectural resources. LCMM understands that United States Environmental Protection Agency (USEPA) has initiated government-to-government consultations with the Onondaga Nation in compliance with 36 CFR Part 800.4(a)(b) regarding properties of religious and cultural significance. However, at this time, USEPA has not asked Honeywell, Parsons, or LCMM to address the task of identifying religious and cultural properties. Therefore, no analysis has been performed as to whether the remediation of the areas included in this report may have an effect on Properties of Cultural and Religious Significance.

PROJECT LOCATION AND DESCRIPTION

Onondaga Lake is located in Onondaga County, NY and is contained within the City of Syracuse, and the towns of Salina and Geddes (Figure 1 and Figure 2). The lake has an aerial extent of about 4.5 square miles (11.7km^2), with a drainage basin of approximately 233 square miles (603.5km^2).

The Onondaga Lake Superfund Site comprises the Onondaga Lake bottom, seven tributaries, and upland sources of lake contamination. The remedy for the Onondaga Lake bottom subsite was selected in accordance with the requirements of the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended (CERCLA) and documented in a Record of Decision.[6]

The documentation of the ten sites included several methods of data recovery including videography, photography, detailed measured drawings, and the recovery and analysis of wood samples. Fieldwork was executed by LCMM in September and October, 2012 and May 2013.

PREVIOUS ARCHAEOLOGICAL WORK

The basis of this report is found in the previous archaeological and geophysical work undertaken in and around Onondaga Lake. In 2004, the Public Archaeology Facility of SUNY Binghamton carried out a Phase IA cultural resources assessment of the Onondaga Lake Site.[7] This work recommended a Phase IB archaeological survey be executed in Onondaga Lake and along the shoreline due to the high potential that those areas may contain historic cultural resources.[8] In 2005, CR Environmental of Falmouth, Massachusetts, conducted a remote sensing survey of the lake bottom. The effort recorded side scan sonar, magnetometer, bathymetry, and sub-bottom profiler data primarily in support of the remedial design effort. The survey located 755 sonar targets and 1256 magnetic anomalies on the lakebed.[9] In 2011, LCMM submitted results from a Phase 1B research which further examined 60 of those anomalies and determined that 20 were recommended as eligible for the National Register of Historic Places (NRHP).[10] Additional documentation was recommended on selected sites within the newly designated Syracuse Maritime Historic District to mitigate the impact of remedial activities in the area.[11] This report is the outcome of that mitigation work.

REPORT ORGANIZATION

This report contains five chapters and eight appendices. The Introduction contains background material pertinent to the project. Chapter 2 presents the maritime context for Onondaga Lake. Chapter 3 contains the methodological approach used to gather the archaeological data. The project's results, including historic context information for specific archaeological properties, and the presentation of archaeological data is contained in Chapter 4. Chapter 5 presents LCMM's conclusions, which is followed by the Bibliography. Appendices 1 and 2 contain LCMM's Field Logs and Dive Logs, respectively. A list of the acronyms is included as Appendix 3, while a glossary defining the specialized terms used in the report is found in Appendix 4. The NY State Office of Parks Recreation and Historic Preservation's (NYSOPRHP) Resource Evaluation for the NYNY State Canal System is attached as Appendix 5. Appendix 6 is a statement by the Onondaga Nation on the spiritual and cultural history of Onondaga Lake. Resumes of key project staff are included as Appendix 7, while the protocol for the discovery of human remains is included as Appendix 8. Appendix 9 details the data for the wood samples that were recovered. The Endnotes are found at the end of the report.

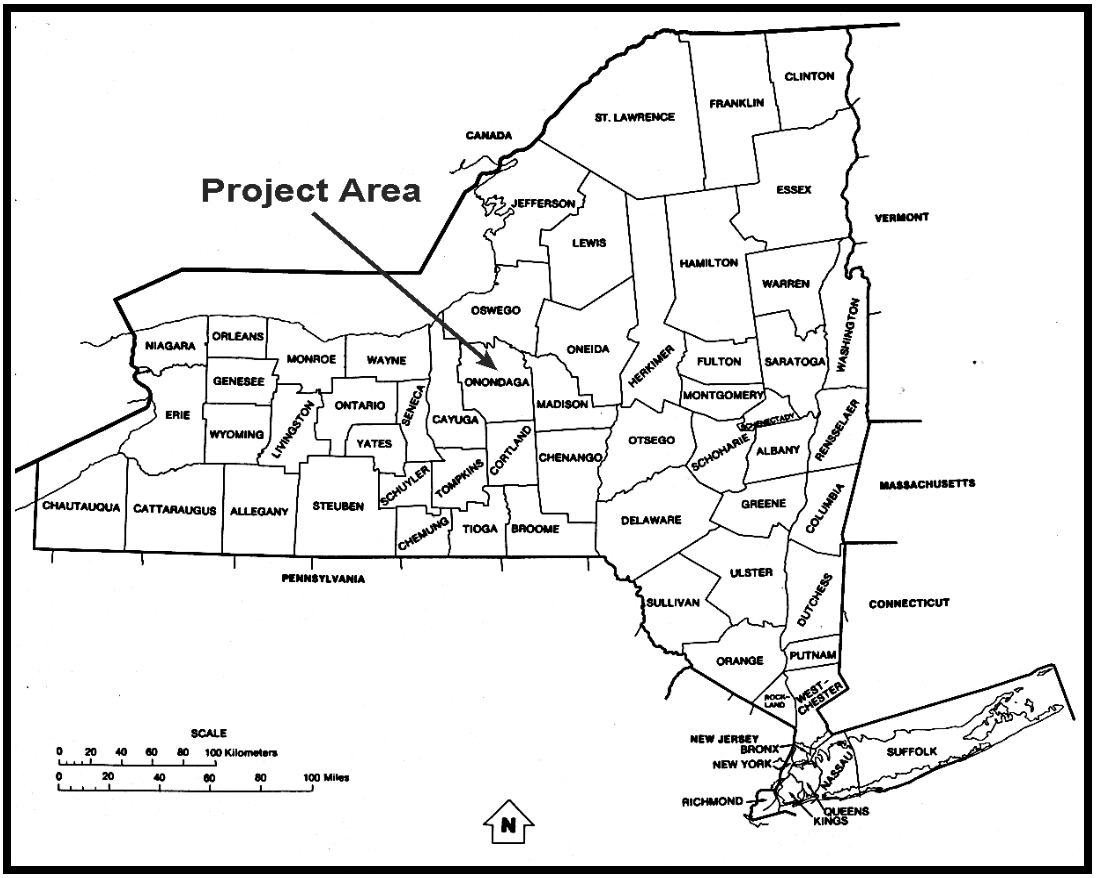

Figure 1: Map of NYNY State showing the Project Area.

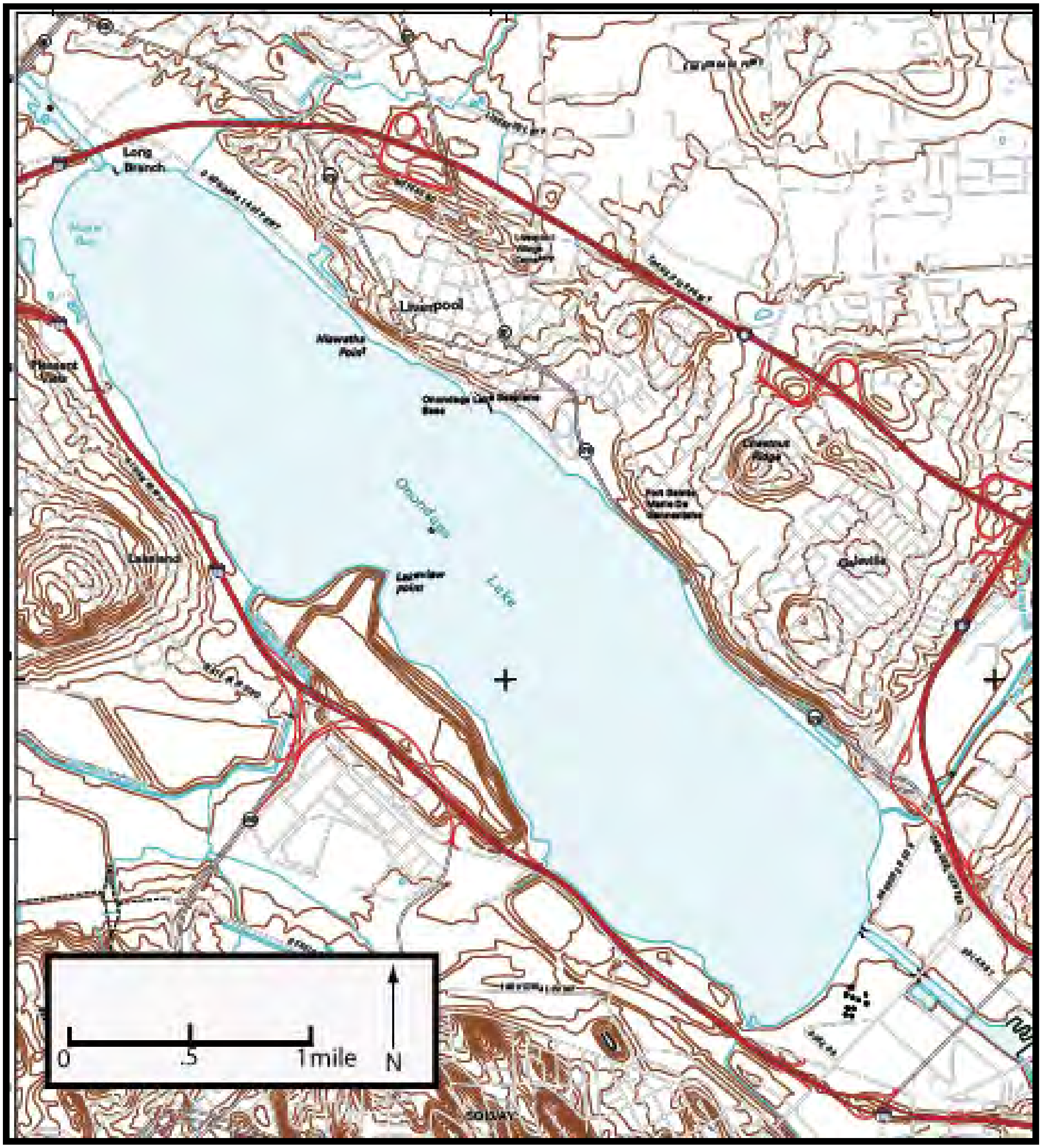

Figure 2: Excerpt from the Syracuse West 7.5 minute Quadrangle showing Onondaga Lake (United States Geological Survey, Syracuse, NYNY 7.5 Minute Quadrangle, 2010).

ONONDAGA LAKE MARITIME CONTEXT

Onondaga Lake was formed following the retreat of continental glaciers and proglacial Lake Iroquois approximately 10,000 to 8,000 years before present (BP). At a current elevation of 363 feet (110.6 meters [m]) above sea level (ASL) it is part of the Oswego River drainage that flows into Lake Ontario. The lake is currently 4.6 miles (7.4 kilometers [km]) long with a maximum width of one mile (1.6km). Onondaga Lake outflows to the Seneca River, which joins the Oneida River at the Three Rivers junction at Phoenix, NYNY, to form the Oswego River, a major tributary of Lake Ontario. Onondaga Lake has a surface area of 4.5 square miles (12 square kilometers [km^{2}]), a volume of 35 billion gallons (132.5 billion liters), and a maximum depth of 64 feet (19.5m).[12] The level and shoreline of Onondaga Lake have changed over the past 10,000 to 8,000 years due to climate fluctuations, human modifications and seasonal variations. It is important to understand these changes and how they influenced human habitation around Onondaga Lake in order accurately study the maritime context of this inland lake.

POST-GLACIAL LAKE LEVEL FLUCTUATIONS IN NORTHEASTERN NORTH AMERICA

As part of the larger Great Lakes drainage basin, Onondaga Lake was formed during the deglaciation of northern North America circa 12,000 BP. While similar post-glacial lakes and ponds in the northeastern United States have not been the subject of thorough archaeological study with regards to submerged precontact resources, many have been the subject of paleoenvironmental studies that evaluated the effects of Holocene climatic change on lake levels. These changes in the location and/or presence of shorelines and wetlands influenced precontact human settlement patterns and resource procurement strategies. Studies in the Great Lakes, Finger Lakes and smaller ponds of the northeastern United States and southern Ontario have demonstrated that climate change throughout the early and mid-Holocene (circa 10,000-4,000 BP) had diverse effects on lake level fluctuations in the Northeastern section of the continent, as well as the distribution and formation of wetlands along the margins of these lakes and their tributaries (Figure 3).[13]

Sediment core studies in the Finger Lakes have shown that during the Holocene Hypsithermal climatic period (9000 to 4000 BP) lake levels were relatively high when compared to the drought conditions proposed for the Great Lakes and Mid-West region.[14] This study also indicated that there were a series of low stands during the Hypsithermal in the Finger Lakes region every 1800 to 2200 years (approximately 9,800, 7,800, 6,000, 4,200 and 2,000 BP) with the highest relative lake levels occurring circa 8,800 and 7,000 BP.[15] Sediment core and subbottom profiler data analyses at small closed basin ponds in Maine suggest that there was a 7 to 20 foot (2 to 6m) decline in lake levels during the mid-Holocene, especially circa 6,000 BP.[16] Sediment cores from Crawford Lake in southern Ontario indicate the most significant lake low stand was between 4,800 and 2,000 BP, which is consistent with other sites in southern Michigan and Ontario.[17] Within the Great Lake Basins there were several phases of drier climate and lake low stands, including a major event that spanned ca. 9,000 to 4,000 BP.[18] During the Lake Stanley phase (7,900 BP) water levels in the Lake Huron basin were up to 230 to 328 feet (70 to 100m) *below* present and large areas of lake bed were exposed terrestrial landscapes.[19] While all of these studies demonstrate that lake level changes throughout the early to mid Holocene were prolific in the northeast, they also indicate that the impacts of climate change on lake levels varied depending upon the specific body of water in question.

To date, there has been no in-depth paleo-environmental study of Onondaga Lake to gauge how lake level fluctuation impacted precontact human settlement around the lake. Though the studies highlighted in this section indicate that Onondaga Lake, like other nearby lakes, likely experienced similar changes in lake levels, the timing and extent of these changes remain unclear.

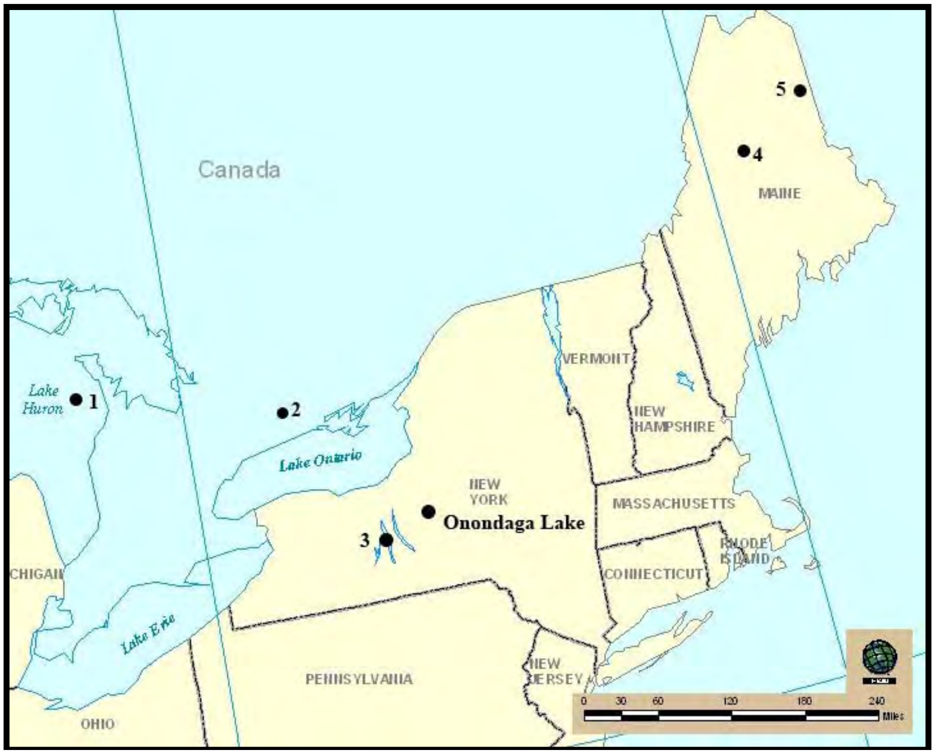

Figure 3: Map of the lakes and ponds discussed in this section: 1-Lake Huron; 2-Crawford Lake; 3-Finger Lakes; 4-Mattews Pond, Maine; 5-Whitehead Lake, Maine (after Environmental Systems Research Institute).

HISTORIC LAKE LEVEL CHANGES

The Phase IA report contained an extensive overview of historical records and maps regarding the changes in Onondaga Lake levels and alterations to the shoreline. The following synopsis is based primarily on those findings.[20]

Historically, Onondaga Lake experienced natural lake level fluctuations during times of spring runoff and dry summer spells, and this was likely true prior to European settlement. Much of the lake shoreline was once composed of soft spongy bog and marshland which was greatly affected by these seasonal lake level fluctuations.[21] When inland water travel became an important component to European expansion west during the early nineteenth century, engineers devised ways to control lake levels to benefit inland water travel. In 1822, Onondaga Lake was lowered approximately two feet (.61m) so that navigation between the lake and the Seneca River would be more easily attained. At the northern end of the lake, an outlet about 3,300 feet (1006m) long and five feet (1.5m) deep was cut, and a reef to the north was dynamited, allowing waters to more easily flow out of Onondaga Lake.[22] This resulted in a nearly 20 percent decrease in lake volume and in the drying up of marshy bogs along the lake shore.[23]

This northern outlet was eventually abandoned, allowing the lake to return to pre-1822 levels; however, in 1841 it was re-cut, and lake levels again may have dropped nearly two feet (.61m).[24] Hohman suggests that the lake may have been approximately 364 feet (111m) ASL at this time (1822 to circa

1898), and that prior to the nineteenth century the lake level may have been approximately 365 to 369 feet (113 to 112.5m) ASL.[25]

Construction of the Oswego Canal in the 1810s and 1820s along the eastern shore of the lake required the marshy shoreline to be reinforced with timber. Various mid-nineteenth and early twentieth century maps indicate that the reclaimed shoreline along the southern and southeastern part of the lake was anywhere from 200 to 3000 feet (61 to 914m) inland from the contemporary shoreline.[26] A 1908 Hopkins map identified areas of "reclaimed land," and the original shoreline of the southern part of the lake as approximately 300 to 1000 feet (91 to 305m) inland of the contemporary shoreline. The 1908 Hopkins map is also the first to indicate that the Solvay Process Company began placing waste into and along the shoreline of Onondaga Lake. Along Lake View Point, the Solvay Company had piled waste over 80 feet (24.4m) high in the mid-twentieth century, greatly altering the shoreline in that area.[27]

Other parts of the Onondaga Lake shoreline were greatly altered during the late nineteenth and early twentieth century. The construction of docks, wharves, roads and railroads, the dredging of basins, alterations made to river courses, and the placing of industrial waste along the shore all contributed to changes in the contours and depth of Onondaga Lake for well over a century. In particular, in 1915 Onondaga Lake level was raised to accommodate the construction of the NYNY State Barge Canal. In 1929, the mouth of Nine Mile Creek was moved west of Lake View Point. Additionally, in 1977, 3.7 acres (1.5 hectares) of the southwestern part of the lake were filled in by the county. Today, at an elevation of 363 feet (110.6m) ASL, it is proposed that Onondaga Lake is 2 to 3 feet (.61 to .91m) lower than the lake level prior to modifications which began in 1822.[28]

PRE-CONTACT PERIOD MARITIME CONTEXT

The Phase IA Archaeological Report provides an overview of the Pre-contact context for NYNY State and the primary patterns of pre-contact Native American land-use in the region.[29] The broader pre-contact period is divided into two eras based on subsistence practices: the hunter-gatherer/pre-agricultural subsistence era (12,000 BP to 1100 BP) and the agricultural/hunter-gatherer subsistence era (1100 to 350 BP). These pre-contact eras are further classified based on pre-contact periods established by Ritchie.[30]

Throughout all of the pre-contact eras, waterways of the Northeast were important landscape features in relation to subsistence (fishing and animal migrations), travel (watercraft) and settlement patterns. Native American groups relied on drainages and water courses during the highly mobile Paleoindian and Archaic periods, as well as during the sedentary periods when settlements were established near water courses and lakes or coastlines. What follows is a brief outline of the primary pre-contact periods identified for NYNY State, with a focus on the maritime context for each period. More specifically, this context will focus on the archaeological evidence for maritime resource procurement and the use of watercraft. For a more in-depth discussion of general material culture and settlement patterns see Hohman.[31]

Paleoindian Period (12,000 to 9,500 BP)

During the Paleoindian Period (12,000 to 9,500 BP) the Onondaga Lake area was submerged below pro-glacial Lake Iroquois. As the continental glaciers receded to the north, and Lake Iroquois drained, smaller lakes, like Onondaga Lake, Oneida Lake and the Finger Lakes were established in small lowland depressions within the Oneida Lake Plain. Throughout this time of major environmental transition, Paleoindian hunter-gatherers adapted their migrations and movements to this evolving landscape.

Fluted points, the most indicative artifact type related to the Paleoindian period have been recorded by Ritchie at numerous locations along the present day Seneca River to the north of Onondaga Lake.[32] This would imply that as Lake Iroquois receded, these river water courses were important travel corridors for both hunter-gatherer groups as well as the animals they hunted. The location of the points may also represent a relict shoreline of Lake Iroquois that was contemporary to the arrival of these groups of people to the region.

Paleoindian groups may have followed large megafauna before they went extinct, and in the later Paleoindian period, when the smaller lakes and ponds were established, they followed migrating elk and caribou herds. While a number of Paleoindian points have been recorded in Onondaga County, a lack of recorded Paleoindian projectile points in the immediate area of Onondaga Lake may be due the marshy nature of the land as Lake Iroquois receded. Also, as Onondaga Lake was established, the lake level may have been either extremely high, or extremely low, during the Paleoindian Period, and contemporaneous sites may now be submerged or many miles away from the present day shoreline. Additionally, historic era activities around the lake may have erased evidence of Paleoindian occupations. It is uncertain if Paleoindian groups used watercraft in the region of Onondaga Lake since the remains of watercraft have yet to be found in the archaeological record.

Early Archaic (9,500 to 5,500 BP)

Ritchie suggests that peoples of the Early Archaic period were still highly mobile, practicing a broad spectrum hunting and gathering strategy as the environment was still in a constant state of flux.[33] There is a lack of archaeological evidence relating to the Early Archaic period in northern NYNY. This could be a result of archaeological testing bias or Versaggi has suggested this may reflect that the environmental conditions in interior NYNY could not have supported long-term human occupation at this time.[34] Rather, she believes that smaller groups may have exploited "several small resource-rich zones, such as valley floors and upland bog margins, [that] could have provided the necessary resources for short-term occupations by small hunting and gathering groups migrating north from the warmer coastal regions."[35] Whether Early Archaic groups traveled via foot or in watercraft is still uncertain, but considering the predictability of fish and the numerous rivers, streams and lakes in central NYNY, it is highly likely that maritime activities played a major role in their subsistence and travel patterns.

The Late Archaic Period (5,500 to 3,500 BP)

The Late Archaic period in the Northeastern United States is characterized by a more hospitable and predictable environment, resulting in the establishment of resource rich deciduous forests and a climate that had annual changes in the form of four seasons.[36] Hunter-gatherer groups continued to follow seasonal migration of land animals and seasonal availability of aquatic resources.

The Lamoka Phase is well established based on archaeological findings as representing a fishing culture in central NYNY. Ritchie notes that during Lamoka Phase there was a preference for waterside locations, both as temporary and permanent habitation sites, particularly near shallow and weedy sections of larger lakes, small shallow lakes, the margins of large marshes near larger bodies of water, or large streams with weedy sections.[37] Various sites from this phase yielded large assemblages of fishing tools, particularly the Lamoka Lake site, located in Schuyler County, southwest of Onondaga Lake. Nearly 8,000 stone net weights and small projectile points were found, indicating that fishing and hunting of waterfowl were important activities. Additionally, a large collection of un-barbed bone fish hooks were recovered from the site, as well as some evidence that spear fishing may have been common. From this site it can be hypothesized that fishing with nets became prominent, as did the importance of the resources used to make these nets. A fishnet made of "Indian-hemp fiber" which was woven into a net with about a two inch (5.1cm) mesh, was found at the site.[38]

The Brewerton Phase is best represented by the Brewerton type site located at the outlet of Oneida Lake. People of this phase appear not to have placed as much importance on fishing as they did during the Lamoka Phase. Brewerton sites tend to yield a smaller number of notched sinkers (or stone plummets), barbed fishing hooks and spear fishing devices. The Brewerton site, however, is located near the rifts below Oneida Lake, an optimal location for the seasonal fish runs, where fish can be trapped and speared.[39] Also noteworthy at the Brewerton site was a large number of woodworking tools, such as grooved axes, gouges, and adzes.[40] Ritchie notes that the presence of gouges in site assemblages implies the construction and use of the dugout canoes.[41]

The Frontenac Phase is best represented by the Frontenac Island site located in Cayuga Lake. It is the only island in the Finger Lakes, about an acre (.4 hectare). Excavations unearthed various faunal remains, including birds, reptiles, mammals, mollusks and fish.[42] Fishing gear included notched stone net sinkers, bone fishhooks, bone gorges, fishing spears, and stone plummets. Ritchie suggests that stone plummets were used for line fishing, and to assess water depth. He also notes that unlike the Lamoka sites, there were no tools found that indicate the manufacture of nets.[43] Woodworking tools were also part of the site assemblage, and it can be assumed that some type of boat building was required at this island site.

The Transitional Period (3,500 to 3,000 BP)

The Transitional Period is characterized by hunting and gathering groups with an increased reliance on plant materials. Frost Island Phase sites are more common to the north of the Finger Lakes, such as the type site along the Seneca River. The assemblage from this site yielded notched pebble sinkers, suggesting that fishing with nets was likely.[44]

The Orient Phase appears to be centered on the southeastern part of NY; hence, much of what is known is based on sites near Long Island. However, recent discoveries have shown that this phase may have extended into the northern Hudson region. It appears that shellfish was an important food source, gathered from mudflats and shallow bays.[45]

The Early and Middle Woodland Period (3,000 to 1100 BP)

The Early and Middle Woodland periods are marked by the increased interaction between peoples in north and central NY with groups to the west in Ohio (i.e. Adena, Hopewell) and north and west in the Great Lakes region. The most important cultural factor during this broader period is the sharing and exchange of ideas and cultural materials with neighboring regions. It indicates that although regionally groups of people were becoming more sedentary and establishing permanent settlements, they were also highly mobile with the long distance movement of ideas and materials, most likely making use of canoes for inland waterway travel. Stylistically, material culture distinguishes the Early and Middle Woodland sites from one another, but Hohman notes that their land use patterns were both based on an "organized system where seasonal base camps with as many as 100 individuals were established in major river and lake valleys near streams confluences."[46] With a larger base camp established, daily or even weekly forays for nearby resources were carried out by smaller groups, and this type of logistical subsistence pattern resulted in various site types representing these time periods.[47] It is likely that during this period native peoples used dugout canoes, while innovative methods for constructing lighter craft may have been developed at this time.

The Early Point Peninsula Phase is represented by smaller campsites around the shores of streams and lakes, within coves and islands. These sites had a relative paucity of projectile points, suggesting that hunting was less important when compared to fishing and collecting of freshwater mussels. Additionally, extensive use of wild rice beds is suggested for this phase. Fishing gear found at sites of this phase includes grooved ovate pebbles, net sinkers, fishhook barbs, copper fishhooks and gorges, a conical antler toggle-head harpoon, and barbed bone points. No bone fishhooks, per se, have been identified for this phase. There is a lack of large pottery at sites from this phase, which suggests that bark and wooden artifacts were important for storage. Ritchie points out that people of this phase likely represent "small mobile, probably bark-canoe-traveling fisherman, hunters, wild rice gatherers, with little baggage."[48]

Late Woodland Period (1100 to 350 BP*)*

The Late Woodland period marks the transition between the pre-agricultural/hunter-gatherer subsistence and the agricultural/hunter-gatherer subsistence eras.[49] Archaeological evidence from the Late Woodland period clearly shows that maize agriculture was in place and groups of people began to settle down into permanent agricultural settlements. The Late Woodland is divided by two phases: the Owasco Phase and the Iroquois, or Haudenosaunee Phase. Both phases are marked by the establishment of a sedentary/agricultural subsistence base, with hunting and fishing still an important component.

Owasco Phase is the first phase in which corn, beans and squash were cultivated and the use of the bow and arrow became common. Ritchie suggests that fishing during this phase may have been the work of the women, older children or old men, since there appears to be less emphasis on this subsistence practice over time. Fish were captured by spearing with a barbed bone point fixed to a shaft and carried out at rift and rapids of rivers, using nets, or angling with hook and line with barbless and barbed fishhooks.[50] Interestingly, a trot-line was found that dates to this period. It was composed of "two-strand twisted Indian-hemp fiber equipped with nineteen dropper lines, each carrying a compound hook contrived from two hawthorn spines. It was baited, weighted with a flat sinker, and left over night on a favorable bottom."[51] The device could catch a number of fish at once.

By the fourteenth century, the Owasco people had become what we historically know as the Iroquois, or Haudenosaunee. They established large settlements clustered around the inland lakes of NY, and the Mohawk Valley.[52] Villages became large, housing up to 350 people and located along major drainages. The villages had to be moved every two decades due to localized resource depletion. The immense amount of wood used to build the palisaded villages, a sign of tribal warfare, and to support the population meant that wood became scarce over time.

Also during the Late Woodland period, it is supposed that the first bark canoes were constructed, resulting in quicker and easier travel along rivers and streams when compared to the dugout canoe that had been used for many millennia. Information about Haudenosaunee bark canoes comes primarily from early European accounts.

Native American Canoes

The three basic canoe types constructed by Native American groups in the Northeast over 11,000 years are skin boats, dugout canoes and birch bark canoes. Each of these vessels reflected the environmental conditions and technological innovations of its time. Paleoindians were probably the first to use watercraft beginning around 11,000 years ago. These hunter-gatherer groups likely hunted and fished along seashores and presumably built small skin craft to harvest the marine food resources. These forms of boats were popular among Native Americans of the northern latitudes, where the landscape is barren of trees and sea mammals played a major role in subsistence and cultural innovation.

As freshwater inland lakes were established by 10,000 years ago, forests of hard and soft wood species developed around the post-glacial lakes. Native Americans adapted their watercraft design to these environmental changes. The Archaic and Woodland peoples built small craft from tree bark, skins from terrestrial animals, or hollowed-out logs. Unfortunately, few examples of watercraft from these periods have been found, and little is known about their design, appearance, or use. Evidence of bark and skin boats has not been found in the archaeological record, since the organic materials from which they were made are not preserved well in the climate of the area. At least a dozen dugout canoes, however, have been uncovered in lakes and ponds throughout Vermont and Ontario. The archaeological examples of these simple boats probably date between the Late Woodland period (1100 to 400 BP) and the nineteenth century.

Watercraft made of dugout tree trunks, called dugout canoes, were the primary vessel form starting about 10,000 years ago.[53] Dugouts were heavy, weighing between 200 to 300 pounds when wet and were difficult to carry at portages. They therefore were primarily used on larger bodies of water, like lakes and ponds, though smaller, individual dugouts may have functioned well on rivers. Most of dugouts that survived in the archaeological record have been found submerged in ponds. It appears that these vessels were cached, or stowed, over seasons when semi-sedentary groups of hunter-gatherers would travel to their fall/winter camps. The dugouts would then remain protected for when the group returned and the lakes and ponds were no longer iced over.

By approximately 600 years ago bark canoes became the primary vessel type in the Northeast. An average bark canoe was approximately 16 feet (4.9m) long, but others could also be as small as 11 feet (3.4m) or as large as 30 feet (9.1m). Regardless of their size, bark canoes were easier to handle, as they were much lighter than dugouts, yet construction was more complicated and required more specialized tools and construction components. Bark was most easily harvested in the spring, when sap was running. Winter and summer bark was more difficult to harvest and inferior.[54] Gum or tallow was applied as a resin to make the vessels water tight. Unfortunately, the delicate nature of birch bark canoes has prevented any early specimens from surviving in the archaeological record. Anthropologists and archeologists agree that the bark canoe probably evolved out of the late Woodland period some 2000 or more years ago. However, none has survived from before the 1700s.

Haudenosaunee Canoes

Haudenosaunee bark canoes were typically built of elm bark as opposed to birch bark. Birch bark was available, but scattered and therefore elm and other barks were more common on Haudenosaunee canoes. They may have used white cedar for the ribs and roots of the white cedar, tamarack, or eastern larch for sewing the pieces of the bark together. For more temporary canoes, saplings and branches may have served for the ribs. Early accounts note Haudenosaunee canoes as being rather large and primarily labeled as war canoes. The war canoes may have been temporary canoes, constructed hastily for the task at hand and then abandoned. On large bodies of water within their territory, the Haudenosaunee used dugouts, but for navigating streams and for use in raiding their enemies they employed bark canoes (Figure 4).[55]

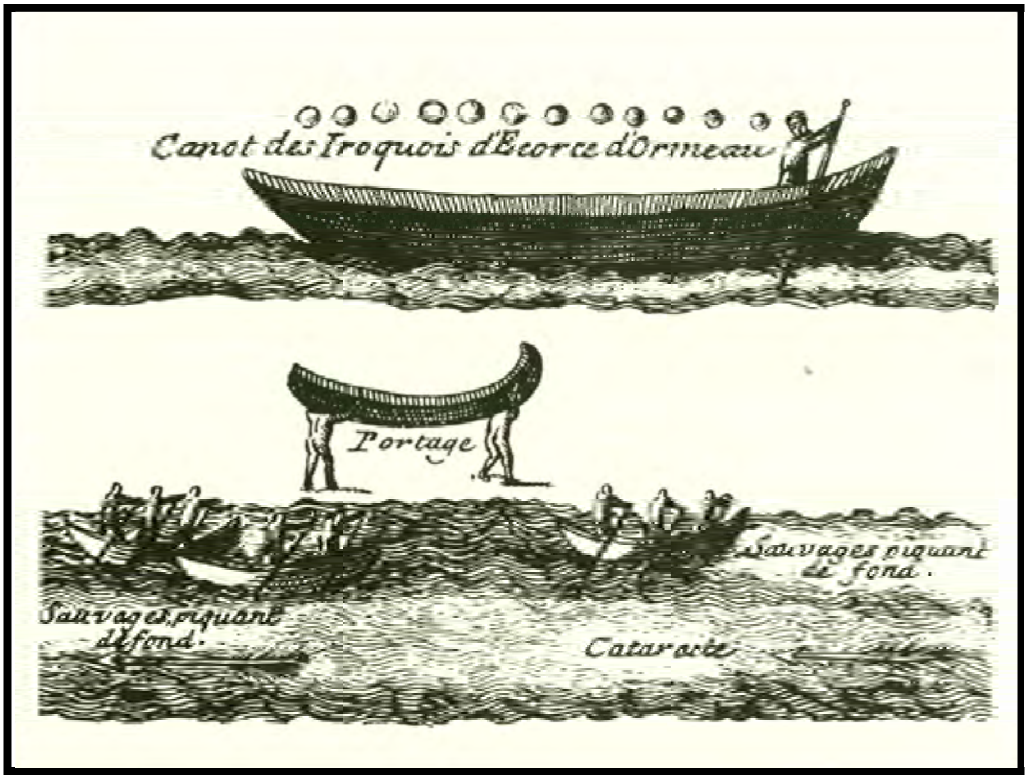

Figure 4: Excerpt of canoe imagery from French explorer LaHontan's notes (from Adney and Chappelle 2007).

Contact Period (350 to 200 BP)

The Owasco are believed to be the antecedents to the Onondaga people who came to call the area of Onondaga Lake home.[56] The Onondaga have long inhabited the area around Onondaga Lake, possibly dating back to the twelfth century. It is believed that the Haudenosaunee (or Iroquois) Confederacy was established at Onondaga Lake, a central location for the joining tribes, as far back at 1000 BP.[57] The Confederacy of the Haudenosaunee was established to bring peace to the region and to unite the native groups. The five original nations of the Haudenosaunee were the Mohawks, Oneidas, Onondagas, Cayugas and Senecas. The Tuscaroras joined the confederacy circa 300 BP. The Onondaga are considered the People of the Hill and the keepers of the fire and wampum.[58]

Archaeological sites affiliated with the Onondaga near Onondaga Lake are all located to the south along tributaries that flow into the lake.[59] Archaeological evidence and historic accounts note that Onondaga fishing villages were located at the mouth of lakes and rivers.[60] The Onondaga village of Kaneeda is said to have been located at the outlet of Onondaga Lake at Onondaga Creek. This fishing village site was recorded by amateur archaeologist Dr. William G. Hinsdale of Syracuse in the 1930s.[61] The site yielded Haudenosaunee pottery dating to the circa 400 BP, along with net sinkers, deer bones and flakes. These fishing villages may have been seasonal, as Snow describes Haudenosaunee fishing during Fishing Moon cycle as seasonal, taking place in the spring and involving the movement of whole families.[62] They would harvest the migrating fish by the thousands as they slowed down at the falls and rapids of rivers, "using cordage twisted from Indian hemp fiber…woven into nets and lines…The hollowed dried galls of goldenrod served as floats, while flat pebbles were notched to make sinkers."[63]

PRECONTACT/CONTACT PERIOD ARCHAEOLOGICAL SENSITIVITY FOR SUBMERGED SITES IN ONONDAGA LAKE

As noted in this section, inland lakes as well as their margins and inlets/outlets, offered diverse resources and areas for habitation for precontact and post-contact Native American groups in the Northeast. Onondaga Lake, one of the smaller Finger Lakes of NY State, was part of an interconnected system of waterways, all rich in aquatic and terrestrial resources. Adjacent dry land near riverine confluences offered ideal locations for short-term seasonal and/or long-term habitation sites. The lake itself and the surrounding environs (i.e. tributaries, wetlands, and forests) would have provided fish, game, wood, and plants that made habitation in close proximity to the lake ideal. Additionally, travel and fishing activities on the lake may have involved the use of dugout and bark canoes.

In support of this potential, there are 29 documented Precontact/Contact period archaeological sites within 1.6 km radius (1 mile) of the shoreline of Onondaga Lake. All of these sites are listed in the NY State SHPO database and are either near Onondaga Lake or along major tributaries that flow into or out of the lake.[64] The known Precontact and Contact era archaeological site types are varied (small campsites, mounds, burial places, contact era villages) and demonstrate that Native American land use around Onondaga Lake was substantial, especially on dry land near confluences or on spits of land jutting into the lake. The presence of ceremonial and spiritual land use shows the importance of the lake for activities other than resource procurement and settlement.

Climate changes may have greatly influenced the way precontact peoples used the land around the lake. Onondaga Lake was formed roughly 10,000 B.P. when glacial lake Iroquois retreated. Since that time, the shoreline of Onondaga Lake may have been altered as lake levels fluctuated due to episodic drought or periods of increased moisture. As discussed previously, it is not currently possible to state exactly how these climatic episodes impacted this particular body of water. However, given the historically known presence of wetland margins along the western shoreline of Onondaga Lake, and the presence of salt springs on the south and east portions of the lake, it is likely that Onondaga Lake was an important resource procurement area throughout the human history of the region.

None of the known Precontact archaeological sites identified in the area are located on the immediate shoreline of Onondaga Lake. An exception may be the Contact period Kaneeda village site on the south shore of the lake near the outlet of Onondaga Creek. The location of the outlet changed over the years and the exact location of the village is not known. The absence of recorded sites adjacent to the shoreline may be a result of the natural configuration of the shoreline. A great majority of the shoreline adjacent to the underwater APE for this project was once wetland and swamp, as noted on eighteenth and nineteenth century maps (Figure 5). Today, this land is composed of made lands created through the deposition of waste fill (typically Solvay waste) by infilling shallow water areas or marshes. These marshes and wetland were likely attractive for resource procurement by Native American groups, but they were less likely to be habitation areas.

A geomorphological study of the land portion of the APE conducted by Geoarchaeology Research Associates (GRA) indicated that "thick marl deposits (found below fill in Wastebed B) are indicative of basin and subaqueous shoreline deposits, which are neither conducive to prehistoric settlement, nor archaeological preservation."[65] The boring logs along the project APEs support the historic map information which noted a variety of swamps adjacent to the lake. This characterization can be extended to the drowned shoreline where portions of the swamps noted on the late eighteenth century map would have existed prior to the raising of the lake to current levels. Whether these swamp lands existed along the project APE shoreline of Onondaga Lake continuously over the past 10,000 years is, again, uncertain.

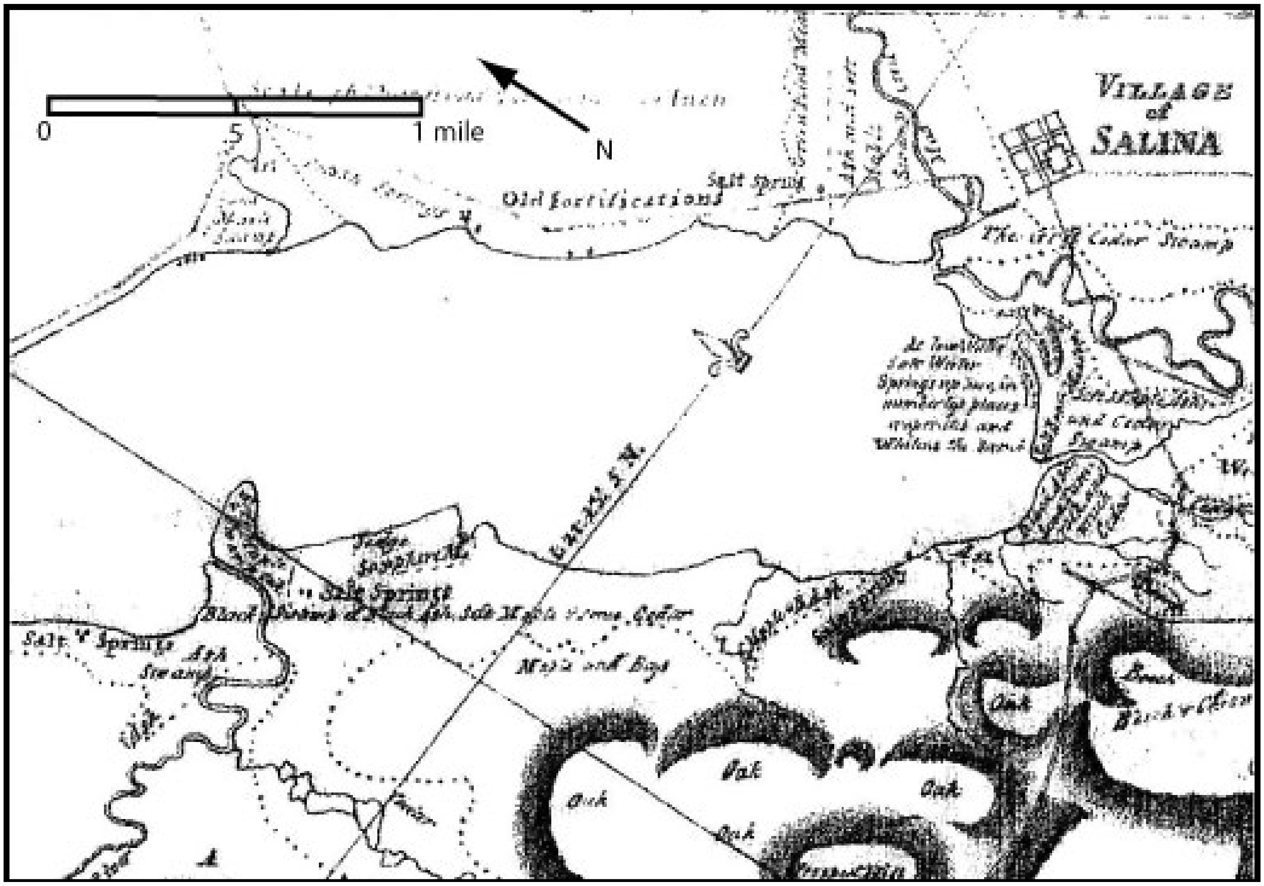

Figure 5: Late eighteenth century map of Onondaga Lake with the project shoreline APE labeled as swamps and springs.

HISTORIC CONTEXT

The arrival of European settlers around Onondaga Lake began in the early 1600s with the appearance of fur trade explorers and Jesuit missionaries to the region. The French adopted the bark canoe early on, realizing that it would be invaluable in the exploration and trade in the interior of the continent. Streams could be navigated and explored, and overland portages could be easily maneuvered. This implementation of the Native American bark canoe allowed the French, and the early fur trade, to quickly penetrate the heavily wooded areas of interior NY and around Onondaga Lake.

The Jesuit priest Simon LeMoyne visited Onondaga Lake and noted the salt springs at the southern end. The salt was recognized as an important resource in the area and Onondaga Lake was identified as “Salt Lake” on eighteenth century maps (Figure 6). The Jesuits established a mission on the east side of the lake in 1656, Ste. Marie de Ganeentah, which was vacated in 1658. The Onondaga welcomed the French presence since they felt in need of an ally, as the Mohawk had found in the Dutch traders. The disagreements and jealousy between the Mohawk and Onondaga led to a bloody dispute and inter-tribal warfare, much the result of European influence causing uneasiness among the Confederacy.[66] The French returned to Onondaga Lake in 1696 under the orders of the governor of New France, Count de Frontenac. Arriving in nearly four hundred boats via the Oswego River to Onondaga Lake, they established a fortification on the south shore en route to the main village of the Onondaga tribe to the south (Figure 6). According to Thomas, the remains of this 1696 fortification are currently located nearly 1,200 feet (366m) from the present day shoreline, a result of historic lake level changes and the addition of fill along the shoreline.[67]

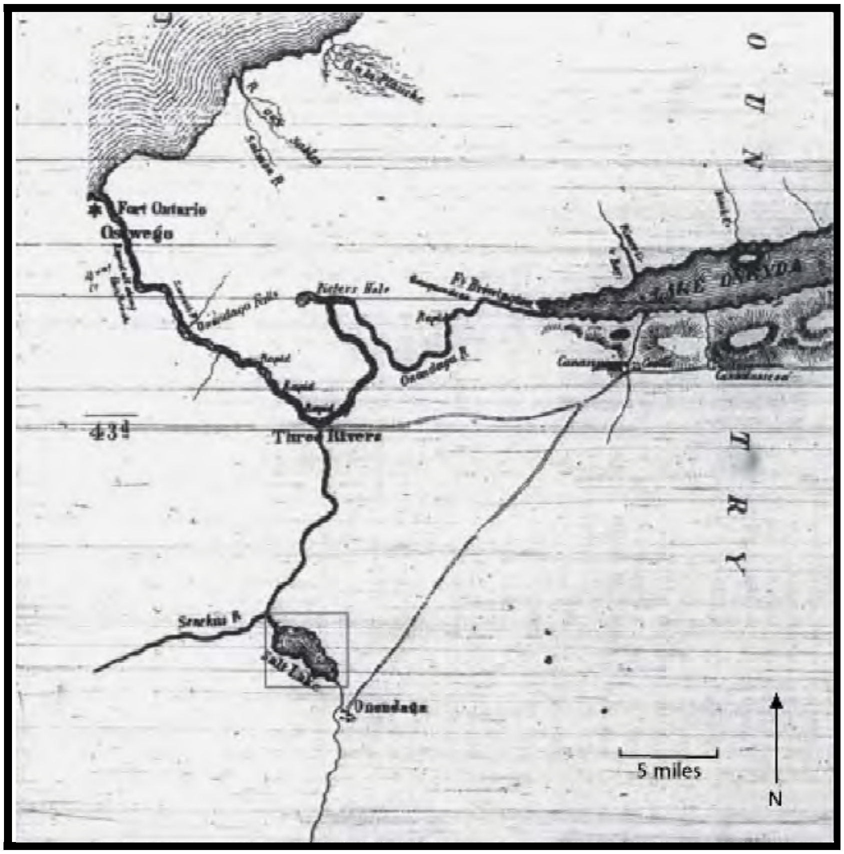

Figure 6: Eighteenth century map of Native American settlements in NY (from Bruce 1896, excerpted from Hohman 2004).

Throughout the 1700s, the Onondaga region, like most of the Northeast, was impacted by the myriad of wars between the French, British, Native Americans, and ultimately, the Americans. After the Revolutionary War, a slow trickle of European settlers made their way west, some settling in the Onondaga Lake region and establishing the salt industry. At this time, improvements were proposed to inland waterway travel, particularly westward to connect Albany with the Great Lakes. Rapids and shallow stretches of rivers and streams meant that boat travel was limited to light and small craft with less than a two foot (.61m) draft which could be lifted and dragged. Canoes and wooden bateaux were utilized.[68]

In 1786, Ephraim Webster was the first to officially settle on Onondaga Lake, establishing a trading post and camp at the mouth of Onondaga Creek on the east side. Upon his death, his estate, including the salt springs, became public lands of NY State. Onondaga County was established in 1796 and families began to settle around the lake. The towns of Salina, Geddes and Liverpool were all established prior to 1800. The marshy shorelines of the lake allowed for outbreaks of cholera and malaria in the region, making the immediate shoreline of Onondaga Lake a relatively inhospitable place.

The Canal Systems and Onondaga Lake

Just before the turn of the nineteenth century the Western Inland Lock and Navigation Company began to construct short canals connecting lakes and rivers, and deepening shallow areas. The NY State Commission also began prospecting for canal routes that would connect Albany to Buffalo, and in effect connect the Hudson River to the Great Lakes. James Geddes, a resident of Salina who lived on Onondaga Lake, was appointed the NY State Surveyor General. Geddes' involvement in the salt industry meant that he lobbied strongly, and successfully, for the canal to pass through the village of Syracuse. Construction of the Erie Canal began on July 4, 1817, and it officially opened October 25, 1825. At 343 miles (552km) long, it cost $352 million to build, and was completely funded by the State of NY. It was 4 feet (1.2m) deep and 40 feet (12.2m) wide, with 15 by 90 feet (4.6 by 27.4m) wide stone locks.

The Erie Canal did not run through Onondaga Lake; the actual canal segments needed to be protected since vessels were towed by mules and horses throughout its course, and a wide lake was not an optimal location logistically. Instead, the narrow canal ran through the center of Syracuse and then to the south of the lake. Extensions to the canal around the lake and into the lake were soon proposed, particularly to benefit the salt industry. In 1819, a law was enacted that authorized a navigable side-cut, approximately one mile long (1.6km), from the Erie Canal to the salt works in Salina.[69] Onondaga Lake at the time was accessible to smaller vessels via the northern and southern outlets at Onondaga Creek and the Seneca River. However, there was no direct route from the Seneca River and Onondaga Lake to the canal system. The salt industry petitioned for permission to connect the Salina side-cut and the Seneca River to lessen the expense of getting wood to the salt works. Areas around Onondaga Lake and the Seneca River were still covered in forested land, and the connection of these water routes made the movement of wood to the salt works more practical and economical.[70]

In 1820, the State of NY sold portions of the land they had acquired from the Webster estate, keeping their claims on the salt springs and appropriated the money to lower the level of Onondaga Lake to that of the Seneca River. By 1822, an outlet about 3,300 feet (1006m) long and five feet (1.5m) deep was cut, reducing the lake level 2 feet (.6m) and causing marshlands along the shoreline to eventually dry up.[71] This allowed improved navigation between the Erie Canal and the Seneca River via Onondaga Lake.

This project was the impetus for the development of the Oswego Canal, the first feeder canal constructed, which connected the Erie Canal at Syracuse to Lake Ontario. James Geddes was again the head surveyor for the project. The first section of the Oswego Canal, running along the eastern shore of Onondaga Lake and from the northern outlet to Three-mile rift, was completed in 1826 (Figure 7). On April 28, 1829 the Oswego Canal was opened to navigation throughout its entire extent. The canal bank along the eastern shore of Onondaga Lake was at times problematic. The soil was loose and prone to washing out, and it became necessary to secure it on both sides with a facing of timber.[72] Additionally, once the Liverpool portion of the Oswego Canal was completed, the Salina side cut to Onondaga Lake was abandoned as a navigable channel, as was the Onondaga outlet, causing sediment to build up and block the flow of water. Ultimately, Onondaga Lake attained its former pre-1822 elevation.

Figure 7: 1898 USGS Map of Syracuse showing the Oswego Canal on the east side of the lake (United States Geological Survey, Syracuse, NY 7.5 Minute Quadrangle, 1898).

In 1837, the state of NY took over the abandoned Salina side-cut, and in 1842 the Onondaga outlet was excavated to depth of 5 feet (1.5m); the lake level dropped to that of the Seneca River once again. This work was repeated in 1856 and the Salina side-cut was extended.[73] To access Onondaga Lake from the Oswego Canal vessels had to travel through Lock #15, or Mud Lock, originally built in 1828 and made of wood, to the Seneca River, and then into the lake via the northern outlet. Due to the unstable soils of the area, Mud Lock had to be completely rebuilt in 1836 of stone. It was then enlarged in 1862 and 1887, allowing even larger boats on the Oswego Canal, and in effect into the lake.

The significant amount of traffic on the Erie Canal resulted in proposed enlargements and improvements. In 1835, work began on expanding the entire canal route, both locks and prisms, and improving its navigability. It took until 1862 to complete this work, in addition to deepening the Oswego, Seneca and Cayuga, and Champlain Canals. The Erie Canal was straightened and increased in size to 7 by 70 feet (2.1 to 21m) and the locks enlarged to 18 by 110 feet (5.5 to 33.5m).

By the 1860s the railroad had become a major competitor for moving both people and goods west. To keep up with the competition, construction began on the second enlargement of the canal system. In 1903, survey work began for a new 1000 ton barge canal. The NY State Barge Canal opened in 1918 and made use of bodies of water like Onondaga Lake and Oneida Lake; the use of steam powered tugboats and steel canal boats lessened the concern for protected water travel and the need for towpaths.[74] The old Oswego and Erie canal systems adjacent to Onondaga Lake were then abandoned. The new Oswego Canal connects with the Erie Barge Canal north of Onondaga Lake at Three Rivers. The Erie Barge Canal system passes through Onondaga Lake as a route to Syracuse, where a southern harbor was constructed past the southern lake outlet (Figure 8, Figure 9 and Figure 10).

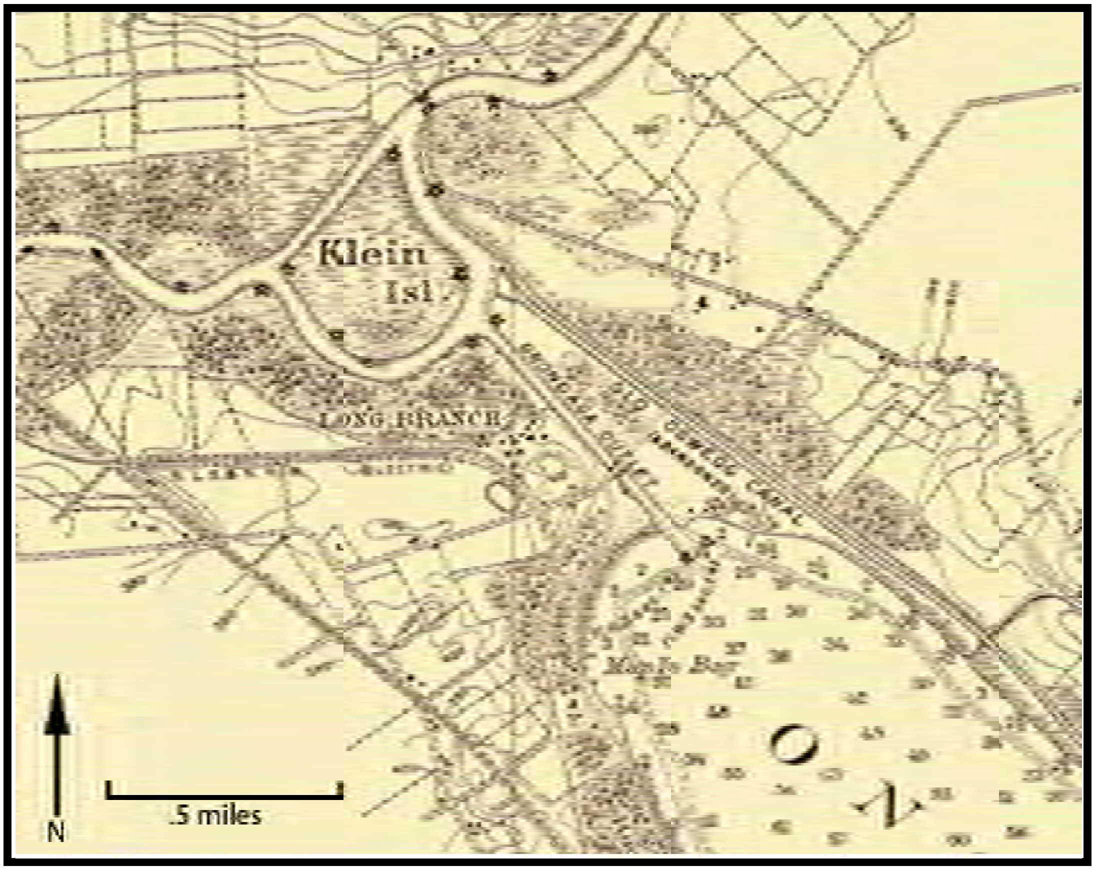

Figure 8: 1926 navigational chart showing the northern entrance to Onondaga Lake via the Onondaga Outlet. Barge Canal vessels could access the lake via the Seneca River, part of the Barge Canal, and through the Outlet (U.S. Lake Survey Office, *NY State Canals, Erie Canal, Brewerton to Cross Lake and Syracuse and Oswego Canal, Three River Point to Oswego*, 1926).

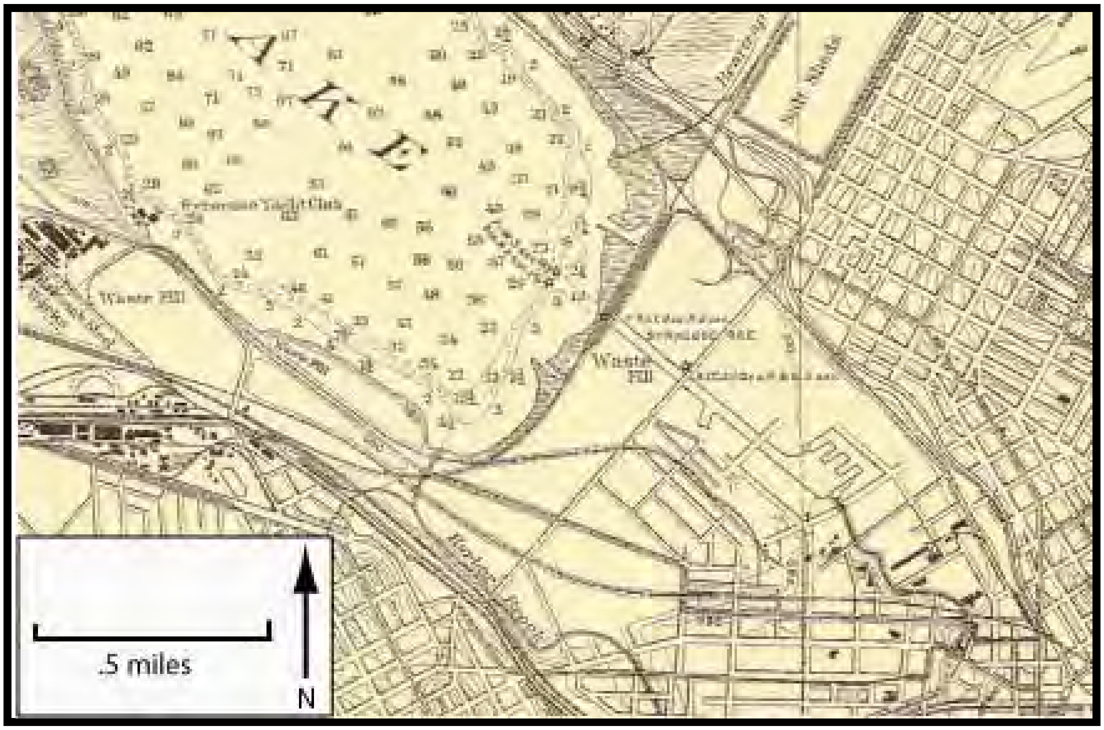

Figure 9: 1926 navigational chart of the southern part of Onondaga Lake, showing access to the harbor at Syracuse (U.S. Lake Survey Office, *NY State Canals, Erie Canal, Brewerton to Cross Lake and Syracuse and Oswego Canal, Three River Point to Oswego*, 1926).

Figure 10: Steel Barge at the southern terminal at Onondaga Lake (courtesy Onondaga Historical Association).

Industries and Pollution

The opening of the Erie Canal brought many immigrants west, and established a workforce in the region of Syracuse for agriculture and manufacturing. By 1784, James Geddes had founded a salt manufactory at the southern part of the lake. The state, however, had retained ownership of the salt springs on the southeastern part of the lake to prevent a monopoly on the salt industry. Instead, it levied taxes on each barrel of salt to pay for the construction of the canals.[75] An 1833 account of Syracuse describes it as a "thriving village [that] owes its importance principally to the immense quantity of salt produced in its neighborhood, the whole adjacent country being impregnated with it, and springs from which immense quantities are manufactured rising in various directions."[76] Syracuse became a city in 1848, and was coined "Salt City."

In 1833, there were about 100 salt factories at Salina, 30 at Syracuse, 26 at Liverpool and about 30 at Geddes.[77] The salt was manufactured through a process called solar evaporation, which made use of the sun by laying the salt out in large vats, as well as boiling it (Figure 11). The boiling process burned large amounts of timber which was transported from the Seneca River and Onondaga Lake to the manufactories, first via the Lake and the connecting side-cuts, and then through the Oswego Canal in 1826. The state-owned salt spring in Salina was thought to have "the strongest saline water yet discovered in the world, 40 gallons yielding about a bushel of pure salt."[78] The salt was shipped in barrels on the Oswego and Erie canals and about 1,600,000 bushels were produced in 1833.[79]

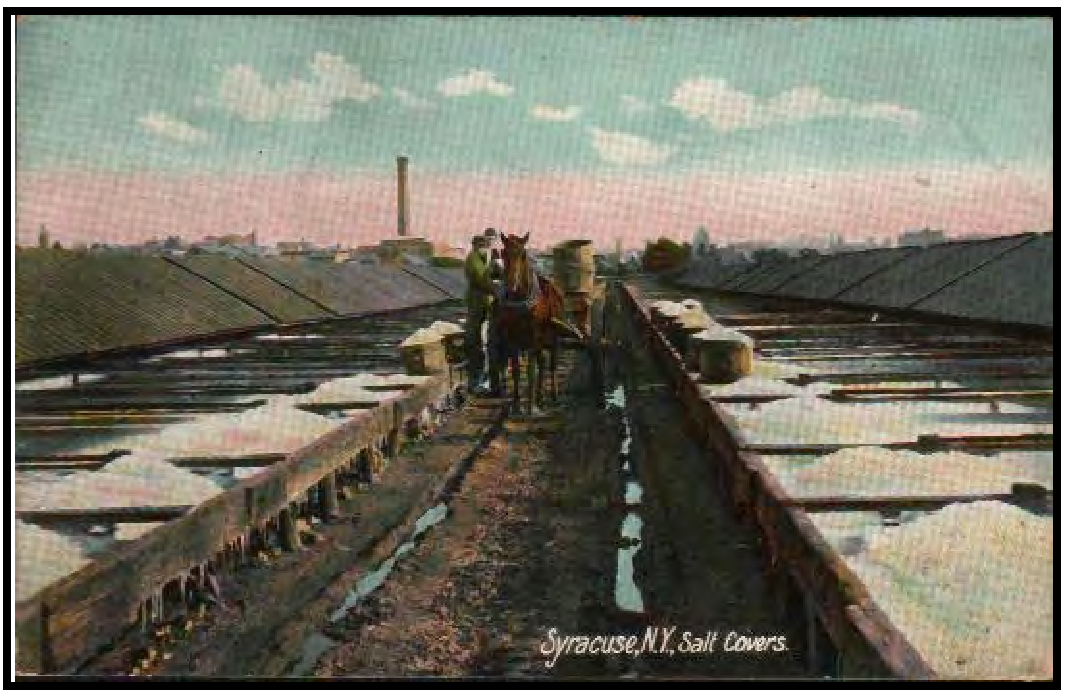

Figure 11: Postcard showing the solar evaporation method in the salt sheds near Syracuse (from www.vintageviews.org, n.d.).

Salt production remained the primary industry in the area, reaching peak production of over nine million bushels in 1862. The arrival of the railroad to the area provided a boost to the economy. Beer brewing began to replace salt as main industry around Syracuse as German immigrants arrived in the 1870s.

In 1884, the Solvay Process Company (SPC) came to Onondaga Lake to manufacture soda ash, a product with numerous applications, including the manufacture of glass and detergents (Figure 12). The area provided the ideal environment and resources needed for the Solvay process of creating soda ash: there was salt water from the nearby springs; calcium carbonate from the surrounding limestone bedrock; and easy disposal of waste product into and around Onondaga Lake. Millions of pounds of chloride, sodium, and calcium, were discharged into Onondaga Lake.[80]

SPC added a new plant in 1918 to produce chlorine and a variety of organic chemicals resulting in hundreds of thousands of pounds of mercury, among other various chemicals, being released into the lake. Between 1900 and 1940, a number of other industries were established in the region, including steel, pottery, pharmaceutical, air conditioning, appliance, and electrical manufacturing facilities, many of which contributed other solvents and organic chemicals such as benzene and polychlorinated biphenyls (PCBs). Allied-Signal (a successor to SPC) closed the soda ash production facility in 1986, and the company now operates under Honeywell International.

Figure 12: Postcard of the Solvay Process Works (from www.vintageviews.org, n.d.).

As the industrial revolution took hold and the population around the lake grew, the disposal of domestic and municipal waste into those waters became common. During the turn of the twentieth century, sewage waste was discharged directly into Onondaga Lake, as well as into Onondaga Creek and Harbor Brook.[81] This issue escalated in the 1920s when the city installed a 1700 foot (518m) long outfall sewer in to the lake. The excessive raw sewage in the lake led to increased nitrate and phosphorous concentrations in the water, which in turn led to algae blooms and fish die-offs.[82]

The environmental impact of the pollution was detrimental to other smaller commercial enterprises. In the 1800s, a viable commercial cold-water fishery was sustained by the various fish from the lake; whitefish, Atlantic salmon and sturgeon were particularly popular. However, by 1890 the fishery had closed and by 1898 the whitefish population in the lake had disappeared. Ice-harvesting, another profitable business, was banned in 1901 due to impurities in the water; swimming was banned in 1940, and fishing (due to mercury contamination) in 1970.[83]

Recreation on the Lake

Onondaga Lake became a recreational hub beginning in the 1870s, competing with such places as Saratoga, Lake George and the Thousand Islands. As described by one local writer in the *Syracuse Daily Journal* on July 31, 1871, it was "the most beautiful lake in the State … to indulge in the luxury of bathing, rowing, fishing, picnics, and chowders." Resorts and amusement parks sprung up all over the western and southern shores, offering entertainment, dining, swimming, boating, fishing and carnival like attractions (See Figure 7). The larger of these resorts included: Iron Pier (1890); White City (1906); Lake View Point (1872); Pleasant Beach Resort (1874); Rockaway Beach (1892); Maple Bay (1889); Long Branch Resort (1882); and Manhattan Beach (1880s). Visitors could access the resorts via the Erie Canal, either by taking a packet along the five mile route of the Oswego Canal on the west side of the lake to Mud Lock and then into the lake. Or, piers were constructed at the southern part of the lake (Salina Pier, Geddes Pier, Iron Pier) where steamers and naphtha launches frequently picked up passengers from the canal and the train and took them to the various resorts (Figure 13, Figure 14, and Figure 15) Each resort constructed a landing dock to accommodate the steamers. In 1887, a passenger steamer trip across the lake cost a visitor only 25 cents.[84] A published profile featuring the popular steamer *Milton S. Price* noted that one of the more popular excursions were leisurely weekend picnic cruises, which at the time were organized by local groups, including churches, in addition to those hosted by the transportation companies, clubs and resorts.[85]

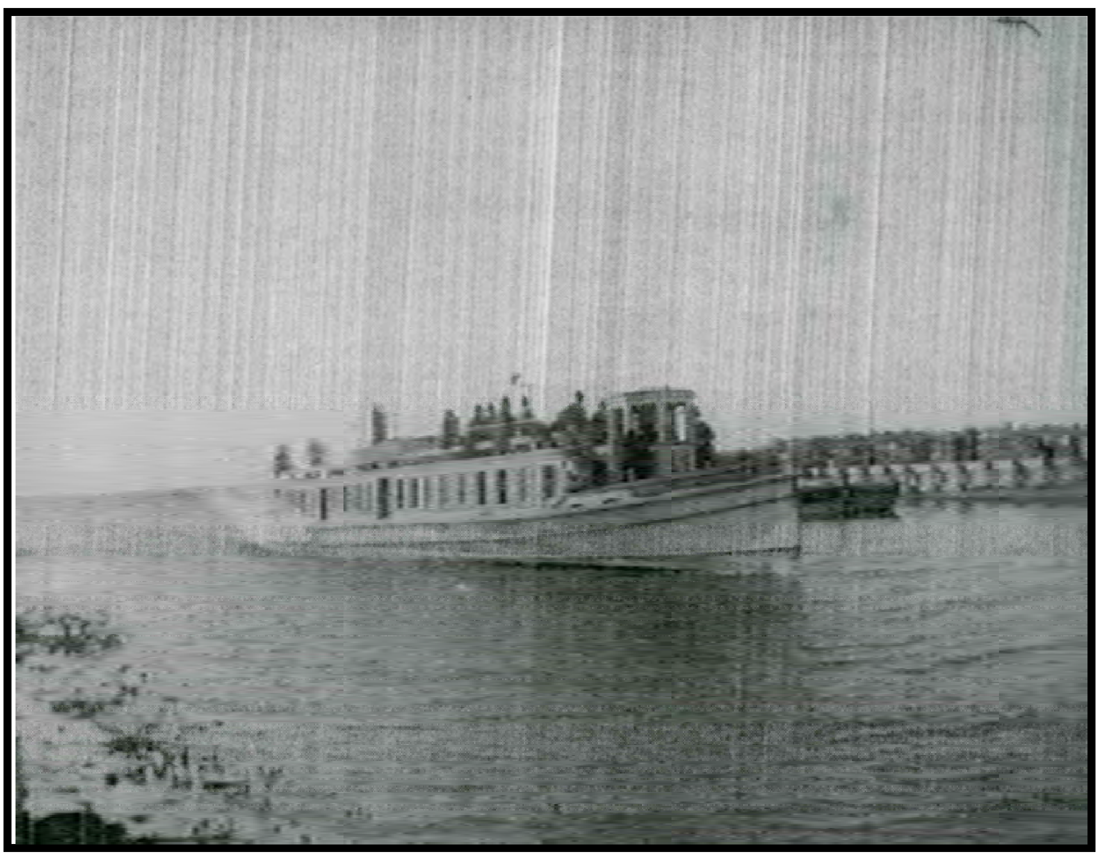

Figure 13: Steamer *Milton S. Price* entering the Iron Pier (courtesy Onondaga Historical Association).

Multiple access routes and methods of transport to the resorts were available by the 1890s, limiting the importance of the steamboats. The first lakeshore boulevard was constructed in 1894, but was abandoned by 1902 because it was built on unstable ground and flooded annually.[86] A trolley line was built along the western shores of Onondaga Lake in 1899, shuttling visitors from Syracuse to the resorts in a matter of minutes, and making canal passenger travel to the resorts less popular (**Error! Reference source not found.**Figure 15).

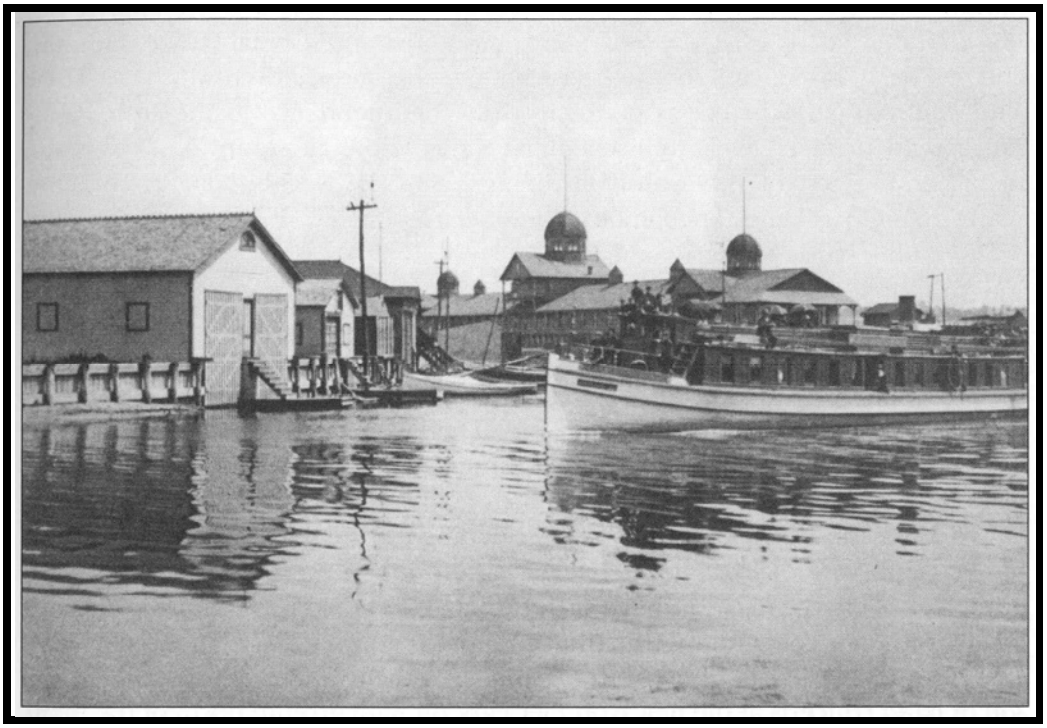

Figure 14: A steamboat loaded with guests approaches Iron Pier (1899, Onondaga Historical Association Collection).

The resorts era, however, was relatively short lived. Annual spring flooding frequently damaged these lakeshore properties, and many buildings had to be rebuilt on stilts. Other resorts closed due to growing competition as newer resorts opened. After closing, the Salina Pier was sold to the Syracuse Rapid Transit Company (SRTC), who attempted to use the grounds to lure the local baseball team away from their field at the Iron Pier resort.[87] The effects of pollution on the lake also contributed to the decline of Onondaga's vacation status, as swimming and fishing were ultimately outlawed. The lake level was raised 3 feet (.91m) in 1915 to accommodate the new Barge Canal, and this put many resorts underwater. Later in 1953, the construction of Route 690 along the western shore destroyed the last remaining resort, Pleasant Beach.[88]

Onondaga Lake was also a focal point for civic and community celebrations. In September 1877, a mock naval engagement was held to commemorate the victory by Oliver Perry during the Battle of Lake Erie. Steamers including *Milton S. Price* ferried passengers to a closer view of the action, while boats launched hourly from the Salina Pier and other locations to transport visitors amongst the festivities.[89] The featured events of the day were a pair of staged explosions, which sank two former canal boats.[90]

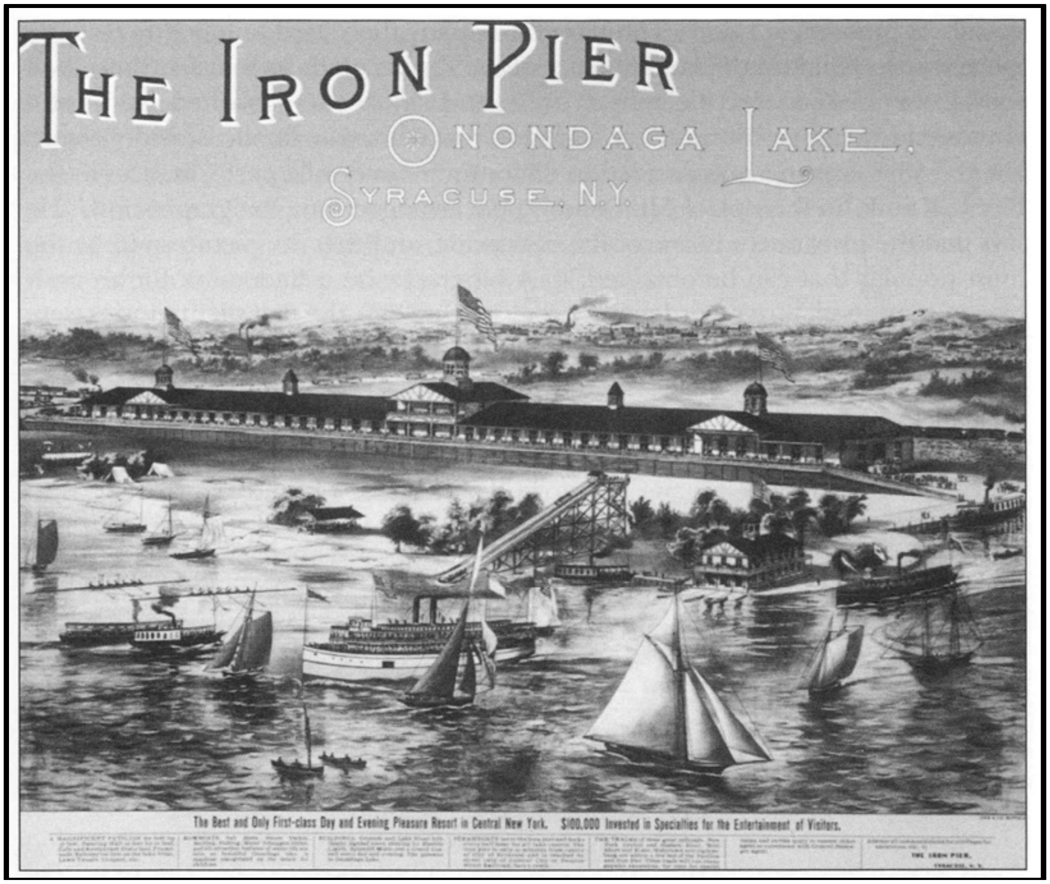

Figure 15: Advertisement for Iron Pier, 1890 (Lithograph by Gies and Co., Buffalo; Original image property of Helen Heid Platner).

Yacht Clubs on Onondaga Lake

The Onondaga Yacht Club, located at the outlet of Ley Creek on the southeastern shore of the lake, was founded in 1883, celebrating shortly thereafter with an Opening Regatta in 1887. The main buildings were constructed in 1938, and additions were completed in the 1950s. This yacht club has remained in service ever since, hosting annual regattas, and occasional speed boat races.[91]

Figure 16: Postcard of the Boulevard with the Syracuse Yacht Club on the right and a trolley on the left (from vintageviews.org, n.d.).

The Syracuse Yacht Club was built in 1898, just south of Lake View Point. This massive three-story building rested on piers out over the lake and included boathouses on its northern side (Figure 17). It quickly became one of the more popular clubs, with over 2,000 members and more than 150 launches and sailboats using its facilities on a given day. It featured a fleet of twelve steam-powered yachts when it first opened.[92] The Syracuse Yacht Club's clubhouse burned down on May 10, 1917, and was never rebuilt.

Figure 17: Postcard showing the Syracuse Yacht Club (from vintageviews.org, n.d.).

Ice Boating

Rockaway Beach became the headquarters of the Onondaga Ice Yacht Club in 1901. Though iceboating began on the lake in the 1890s with roughly 13 iceboats on the lake, by 1901 the number had nearly doubled to 25 vessels.[93] The sport remained popular until the 1920s. Each iceboat was unique: canvas sails varied from 20 to 30 feet (6 to 9m) long, vessel length ranged from 16 to over 35 feet (4 to 11m) (Figure 18). They were constructed of redwood, ash, walnut and various other wood types. The boats traveled at incredibly fast speeds, and spectators loved to come and watch the races on Sundays at Rockaway Beach. While accidents did happen, only one fatal iceboat crash on Onondaga Lake made significant headlines. On Christmas Day 1904, two iceboats, *Blitz* and *Warner*, collided on the lake. The accident claimed two lives, and *Blitz* was left to sink to the bottom when the lake thawed the following April.[94]

Figure 18: Ice boat *Best Girl* at Rockaway Beach circa 1900 (from Thompson, 2002).

1930s East Shore Revival

After the Great Depression, work relief programs were instituted that developed the east shore of the lake for tourism and recreation. Between 1931 and 1933, over one thousand men worked to create Onondaga County Park, which included the restoration of Mud Lock, the filling in of the abandoned Oswego Canal, the building of the Salt Museum and the Ste Marie Jesuit Mission, as well as the establishment of Danforth Salt Lake where the old salt springs had once been.[95] The Onondaga Lake Marina was constructed at Liverpool in 1940, providing slips for pleasure boats traveling the canals and local residents.

Contemporary Use

In 1941, the Onondaga County parks commission repurposed an abandoned barge canal boat, QB-13, for use by local groups of Sea Scouts for training and social events. The vessel, originally 80 feet (24.4m) long and modified to 125 feet (38.1) long, was mounted on cement trolley poles, and painted and furnished with tin can candle holders by the Scouts.[96] Today, Onondaga Lake is once again a popular recreation area. Catch and release fishing is making a comeback and recreation paths lining the lake are very popular with pedestrians and bicycles. While swimming is still not recommended, boaters frequent Onondaga Lake, and lakeside residents enjoy the view from the shoreline.

VESSELS LOST IN ONONDAGA LAKE

Onondaga Lake has claimed numerous watercraft over the last 150 years. A number of those vessels that were abandoned or lost remained a part of the working maritime landscape into the 1880s. Some were transformed into crude fishing platforms, or sunk to serve as foundations. One became a working boat shop, while others were simply left to float and rot.[97] The following is a list of the boats known to have been lost in the lake:[98]

- Iceboat *Blitz* 1904 to 1905: This vessel sank in April of 1905. On Christmas Day 1904, *Blitz* crashed into the iceboat *Warner. Blitz* was not recovered and sank when the ice melted the following spring.
- Tug *Stillwater:* Built in 1915, the tugboat *Stillwater* was scuttled in Onondaga Lake in February 1940.
- Unknown Vessel Type: sunk 1857
- Sailboat: sunk 1857
- Unknown Vessel Type: sunk 1858
- Two Canal Boats: A September 1877 *NY Tribune* article notes that "two large canal boats are to be blown up by torpedoes on Onondaga Lake next Monday on the anniversary of Perry's [1813] naval victory."
- Sailboat and/or Yacht: An August 1879 *Watertown Re-Union* article reports that "Dug Remington, book keeper for Warne & Cook, was drowned in Onondaga Lake to-day by the capsizing of a sailing yacht. His companion, Clarence Baumgras, was rescued shortly afterward. John Harwood and a party of three were also sailing in his yacht, and when near the middle of the lake the boat upset and sunk. All were rescued after being in the water an hour."[99]
- Steamboat *Lyttle*: burned 1892 according to a number of newspapers. The *NY Times* writes "The Lake steamer Lyttle was burned to the water's edge on Onondaga Lake Wednesday night. The craft had just been tied up to her dock at the iron pier after discharging a load of excursionists. The boat was worth $3,000."[100]
- Derelict vessels *Maud*, *Silver Cloud*, *Venus*, *Florence* and *Razzle Dazzle,* c. 1889: abandoned in the "graveyard on Bear Creek" which is now known as Ley Creek. The Syracuse Standard writes "The wreck of the Razzle Dazzle early in the season was deplored by all. Her crew shivered her timbers in trying to move Salina pier by running her head on while running before a gale. She has been taken to the grave yard on Bear creek where she lies with the Maud, Silver Cloud, Venus, Florence and a little cutter.[101]
- Steamboat *John Greenway*: Boiler exploded on Onondaga Lake in 1885 (but likely did not sink). The following is an account of the accident:

> Syracuse, May 24. -- The excursion steamer JOHN GREENWAY, which runs on Onondaga Lake and the canal, started yesterday afternoon from its landing in Geddes for a trip across the lake. The steamer had in tow the barge JUDGE RIEGEL, on board of which was about 20 residents of Geddes, who had been invited to take a ride. The steamer was commanded by CHARLES KINNE, the Captain and owner, who has run the boat on the lake for the past 12 years. The boat was to begin its Summer excursion trips today, and the Captain started out yesterday on a preliminary trip to test the machinery. A few minutes before 5 o'clock, when the steamer had reached a point about a mile east of the outlet, two sharp reports were heard, and the steamer was instantly enveloped in clouds of steam. The passengers on the barge heard a shout, and saw a form fling itself out of the cloud into the water. WILLIAM GRAUGH, a deckhand, seized the rope connecting the two boats and pulled them together. Capt. KINNE was found writhing in pain and struggling to get out of the suffocating steam. He was carried into the barge's cabin. ANTONIO KINNE, the engineer, who was picked up from the water into which he had thrown himself, was also taken to the barge. JACOB GRASSMAN, who had been sitting by the railing of the upper deck, had been burned on the hands and arms. Capt. KINNE was scalded from head to foot. In places the skin rolled itself

> up, and the man looked as if he had been flayed alive. DR. J. R. YOUNG, of Liverpool, and DR. J. W. KNAPP, of Geddes, were called as soon as possible. The helpless steamer and barge had drifted a quarter of a mile down the lake, toward the southern shore. A few rowboats put out from Liverpool and Salina and took away the passengers. Capt. KINNE lingered in great agony until 5 o'clock this morning, when he died. ANTONIO, the engineer, is badly burned, and it is thought fatally. The flue plates of the boiler and the steam chimney were blown out. The boiler had been declared to be unsafe a year ago, and was known by competent engineers to be in a bad condition. The Captain had been repeatedly warned that he was risking his own life and those of his passengers in running the boat, but he insisted that she was safe. The boat was run by an utterly incompetent engineer and a stubborn Captain. She had carried thousands of passengers every Summer, and experienced engineers express wonder that her boiler had not exploded long ago.[102]

- Two cabin cruisers: sunk 1971
- Fiberglass Boat: sunk 1985
- Air National Guard Plane: 1955

VESSEL TYPOLOGY

This vessel typology was created to provide a list of boat types that potentially traveled Onondaga Lake during the historic period (1700 to present day). This typology was compiled from two primary sources, unless otherwise noted.[103] A description of Native American watercraft can be found in the section on Native American watercraft.

Batteaux (1600s to 1820s)

These vessels were small, flat bottomed, and pointed at both ends, with a shallow draught. Typically about 30 to 40 feet (9.1 to 12.2m) long, they were rowed, poled or sailed by a crew of 2 to 4 boatmen. Batteaux were typically built without plans. They were able to haul cargo of 1½ to 2 tons (1,361 to 1,814kg).

Durham Boats (1790s to 1850s)

Durham boats were developed at the same time the canal systems were conceptualized around 1790. They had a shallow draft of 2 feet (.61m) but could carry seven times as much cargo as bateaux (Figure 19). They were the “tractor-trailers” of the era. In shallow water they were propelled using long poles with heavy iron tips pushed against the bottom. In deeper water like Onondaga Lake, they were rowed or sailed. Durham boats became the first type of boat used on the Erie Canal when it opened in 1825.[104] They could be as long as 60 feet (18.23m) and as wide as 8 feet (2.44m).

Mohawk River Boats (1700s to 1850s)

These are similar to Durham boats, but were developed on the Mohawk River. They were flat-bottomed with sharp bows, and measured 50 feet (15.2m) or longer, with a breadth of about 8 feet (2.4m). With decks at the bow and stern, they also had walkways along each side so they could be poled by a crew of five to seven boatmen. The boats were fitted with a single mast stepped in a tabernacle for ease of lowering.

Rafts (1700 to 1880s)

Rafts were used in the nineteenth century for timber transport. Crews lived on board in tents or crude cabins. They controlled the rafts with very long sweeps (oars) which also provided some propulsion. The railroad replaced timber rafts in the 1880s.

Canal Boats

Erie Canal boats were built by multiple small operations along the canal, each with its own unique style of vessel. Boatyards would produce just a few boats a year, initially putting a lot of detail into each boat. However, they evolved into "nothing more than floating boxes with square ends to minimize labor and maximize cargo capacity."[105] As the canal and its locks were enlarged, the sizes of canal boat grew to adapt to these changes (Figure 19 and Table 2). Prior to 1860, most canal boats were built plank-on-frame; however, the use of larger, cheaper wood led to the construction of slab sided (edge-fastened) vessels.

Table 2: Vessel dimensions as the canal size changed.

Year	Length (feet)	Width	Draft
Durham boat	50 to 60	10 to 8	2
1817 to 1862	78	14.5	3.5
1862 to 1915	97	17.5	6.5
1915	150	25	10

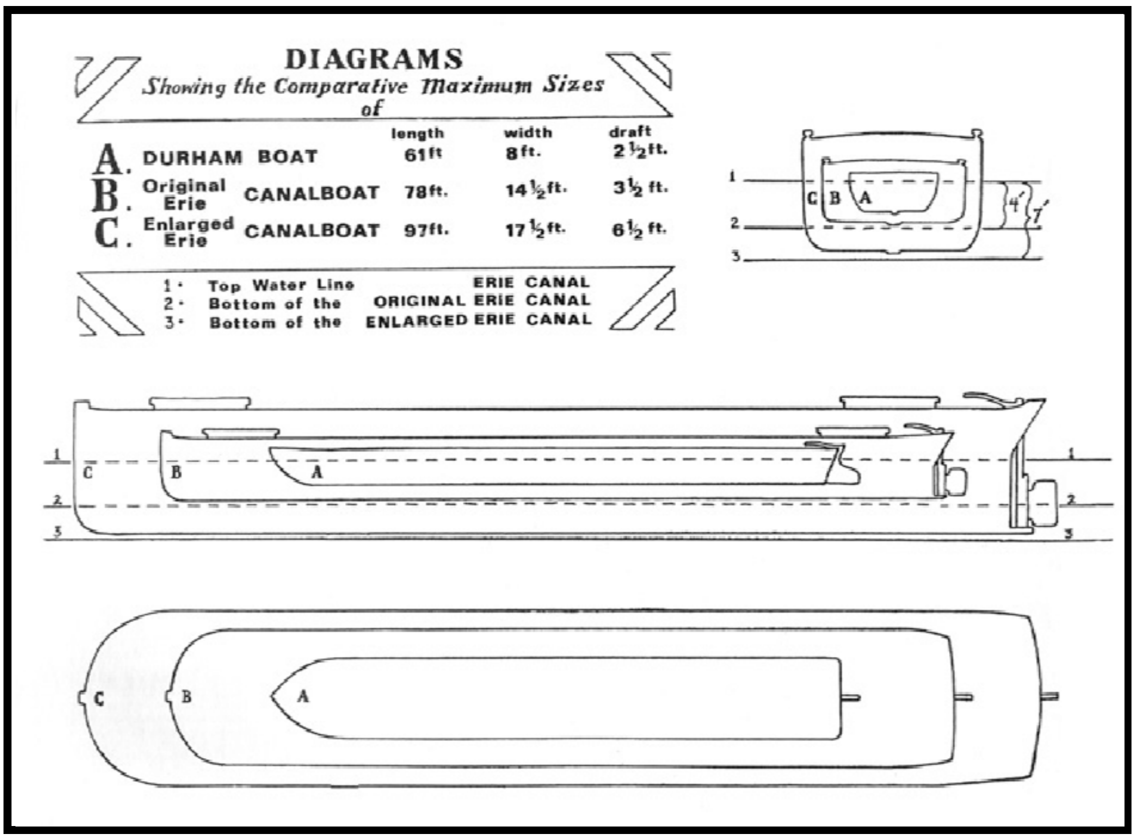

Figure 19: Diagrams showing the comparative maximum sizes of Durham boat [pre-Erie Canal], an original Erie canal boat and an enlarged Erie canal boat (from www.eriecanal.org).

After the completion of the canal expansion in 1862, state law mandated that all canal boats be built with rounded bows to minimize the impacts of accidents on the canal. Prior to this, canal boats were quickly constructed with squared bows and sterns which lead to damage to the canal prism as sharp cornered boats gouged into the canal embankment. Also, the corners were easily sheered-off allowing cargo to be dumped into the canal. In the 1860s quality lumber became scarce along the canal due to nearly 50 years of canal construction and local development. This resulted in many smaller shipyards abandoning boat building and instead focusing on canal boat repairs and maintenance. Places on the western end of the canal, such as Buffalo, Tonawanda and Lockport, became major boatbuilding hubs, since western lumber was more easily shipped to these ports. Along the Oswego Canal communities such as Rochester, Phoenix, Fulton and Syracuse remained viable canal boat building centers with lumber shipped in from Canada. Additionally, yards in Ithaca survived along Cayuga Lake.

The various types of Erie Canalboats reflected the primary cargo or purpose each would serve. Some carried goods; others carried passengers. Most Erie Canal boats contained crew/family quarters, a kitchen, a hold and a stable for horses or mules, and were steered by a large barn door rudder. They were pulled along the canals by teams of two horses or mules, typically housed in the bow (Figure 20). Each team would work six-hour shifts and the "Hoggee" or driver would sleep with his team. At the end of a wooden canal boat's life, it was common to abandon the vessel in a stream or feeder off the main canal.

Figure 20: Horse being taken out of its stable (courtesy Albert R. Stone Negative Collection, Rochester Museum & Science Center).

In the last decade or so of the 1800s, self-propelled canalboats, and tugs towing or pushing barges became more common on the canal. Construction of the NY State Barge Canal was completed in 1918 and steel barges and tugs replaced all older forms of canal boats.

Canal Packets (1819 to 1860)

Packets were boats that traveled the canal and carried passengers and their luggage. They had sharper lines than cargo boats. Average dimension for early packets were 71.9 feet (22m) in length, 12.7 feet

(3.9m) in breadth, and a depth of hold of 7.2 feet (2.2m). The passenger berth cabin took up most of the boat. They were replaced by the railroad in the 1850s.

Canal Line Boats (1819 to 1860)

Operated by freight lines, these vessels transported both passengers and freight. In 1833, more than half of the boats on the canal were of this type. These boats had deck houses running their entire length. They were primarily used for carrying general freight, and possibly a few passengers. They had fewer windows than packets and had one or more wide sliding doors on each side of the house for loading and unloading goods.

Lake Boats or Lakers (1820 to 1915)

These vessels had hatches running the entire length of the deck. They were the strongest built so they were sturdy enough to be towed across the lakes in the canal system. They had rounded bows, watertight decks and hatches, and when used on the lakes would be towed in a raft with other boats behind a steamer.

Bullhead Canal Boats (1819 to 1915)

One of the most expensive boats to build, the bullhead canal boat was used for cargoes of flour, grain, and other products requiring an absolutely dry cargo hold. Similar to packet and line boats, these also had full length deckhouses, though even fewer windows. The cargo was loaded through wide doors in the side of the house (as in a line boat). Bullhead boats were strongly built because of their heavy cargos and had holds well lined to prevent damage to the cargo from moisture.

Canal Scows (1819 to 1862)

Scows were primarily used to carry non-perishable cargoes on short trips within the canal system. They were also used as maintenance vessels, carrying building materials or dredge spoil. The scows had less freeboard than canal boats, and had ends with steeply raked or curved athwartship planking. Maintenance scows had cabins at each end that were only sunk 2 or 3 feet (.61 to .9m) into the main deck.

Canal Deck Scows (1819 to 1862)

These square-ended boats had a sloped bow and stern and were the prototype for the State repair scows. They were useful for hauling bulk cargo with minimum protection. They were more strongly built than the open scow and retained their flat square appearance. These vessels drifted out of existence when the state mandated rounded bows in 1862, although state repair deck scows were exempt.[106]

Canal Open Scows (1819 to 1915)

The hull shape was the same as the deck or repair scow, but these were the cheapest vessels to construct. They hauled heavy bulk cargos such as sand, gravel, construction stone, and coal. They were edge fastened with dimensions in 1880 of 98 feet (29.9m) long 17 2/3 feet (5.4m) wide and 9 to 10 feet (2.7 to 3m) depth of hold. The weight varied from 40 to 45 tons (36,287 to 40,823kg). They were originally small and flat but evolved with the enlargements to a more rounded and heavier size.[107]

NY State Repair Scows (1819 to 1918)

The state repair scows remained the same throughout the entire period of the Old Erie Canal; they were constructed under contract with state specifications. They were primarily deck scows, and maintained square bows despite the 1862 ban on this design. Their length remained 70 feet (21.3m) despite enlargements of the canal and in 1875 they were 14½ feet (4.42m) wide. These boats were designed to be fast, with a shallow draft and were always pulled by horses.

Steel Canal Barges (1918 to 1990)

Upon the 1918 enlargement of the Erie Canal, the advent of modern welding techniques prompted new canal boat construction techniques. A new line of 1,000 ton (907,184kg) steel barges and tugs were designed to make use of the enlarged canal. Some of these steel barges were self propelled; others were towed by steel tugs (Figure 21).

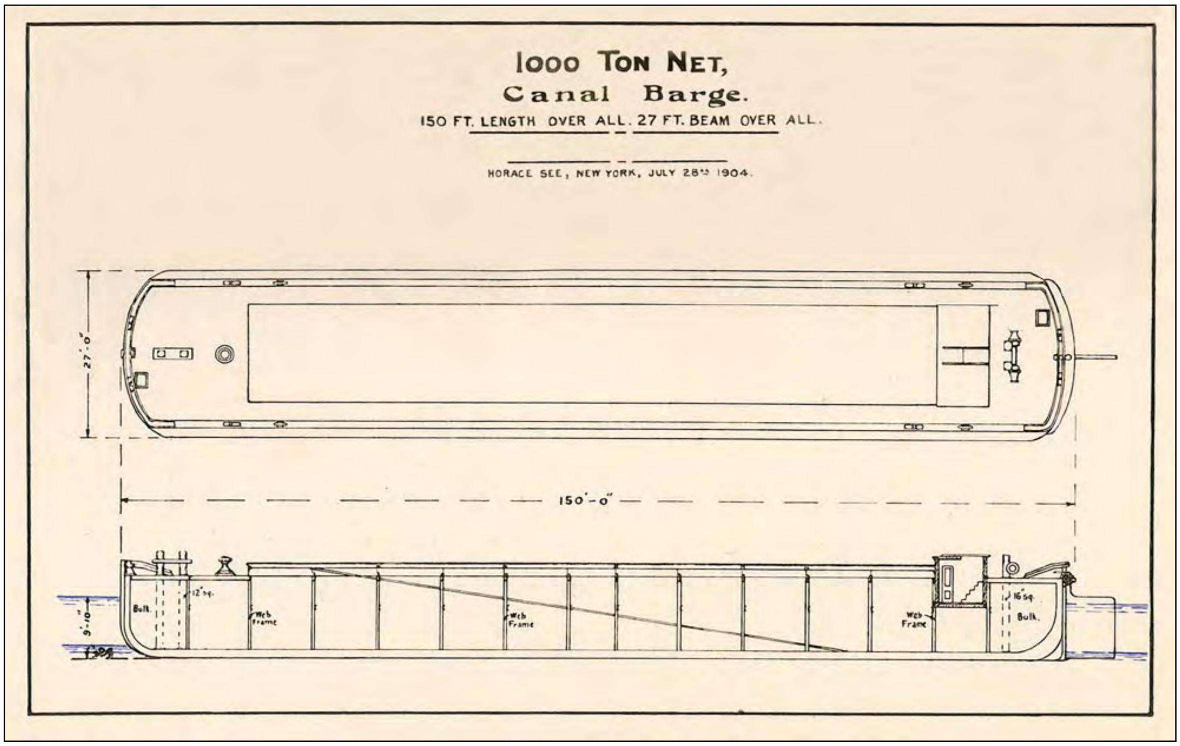

Figure 21: Diagram of a steel canal boat (from *Annual Report of the State Engineer and Surveyor of the State of NY, for the fiscal year ending September 30, 1904*, 1905).

Barges (1820 to present)

Barges, as a general vessel type, had rectangular shaped hulls, and were typically not self-propelled. This class of vessel was used throughout the nineteenth and twentieth centuries in North America for a wide variety of tasks. The number of barge varieties extant during this period was limited only by the different types of cargoes and tasks for which they were required. Currently there is no comprehensive typology for late nineteenth/early twentieth century barges, making their classification difficult. In a 1985 study, Norman Brouwer placed barges into three broad categories: hold barges, deck scows, and covered barges. Hold barges had hatches on the main deck to facilitate the storage of cargo in the hold. The hatches normally had covers so that perishable cargo could be protected from the elements. Deck scows did not have large hatches on the main deck; all of their cargo was stowed on the main deck. Canvas tarps, if necessary, were employed to protect the cargo. Covered barges also stowed their cargo on the main deck, but were fitted with a permanent deck house to shelter the cargo.[108] Within these broad categories there exist numerous subdivisions.[109] The barge categories below are the most common types, however, this list is by no means comprehensive. Other types not described here include, but are not limited to: excursion barges, ice barges, refrigerated and heated barges, concrete barges, floating grain elevators, car floats, livestock barges, piledrivers, and steam winch scows.

Deck Scows (1820 to present)

Open deck scows, also known as flat scows, had an unenclosed deck used to transport non-perishable goods that did not require protection from the weather, such as brick, stone, iron ore or coal. Most of the deck was open for cargo, although a small cabin was often located near the stern.[110] Open deck scows were also used as working platforms. The term scow is frequently used interchangeably with the term barge, but this is not technically correct. "Scow" denotes the shape of a vessel's hull, while "barge" implies that a vessel is not self-propelled. Many scows were also barges, but many barges were not scows. The hull shape of a scow was flat-bottomed with vertical sides, and sloping or raked ends. The ends were normally straight, but angled at about 45 degrees. Most scows were decked, with the hold serving as a buoyant pontoon that supported the cargo on the deck.[111] The hold contained a number of fore-and-aft and transverse structures used to support the deck and cargo above.

Rock Scows (1819 to present)

Rock scows, also known as bulkhead scows, were designed to carry large quantities of crushed stone, sand, and other loose materials. The materials were placed on the main deck and held in place by timber bulkheads at the bow and stern. These timber bulkheads were the defining feature of this vessel type, although they also tended to be built stronger than other scow types because of the heavy loads carried on deck.

Dump Scows (1820 to 1950s)

Various styles of dump scows were designed for the purpose of holding and dumping of fill. A basic description is a vessel with an internal flotation and a trap door bottom used in canal construction. Brouwer describes two primary types: the hopper barge and the side dumping scow. The hopper barge has dimensions of 133 feet (40.5m) long, by 35 feet (10.7m) wide, with a 14 feet (4.3m) depth of hold. The barge had curved ends forming one quarter of a circle from keel to deck. There is a hatch that is closed by a pair of timber doors that are held closed by chain bridles. Once the contents of the hopper were dumped, the doors could then be closed. The side dump scow is described as a standard scow hull with a raked bow and stern. It has three longitudinal bulkheads located at one-quarter, one half and three quarter points of the width of the vessel. The deck was sloped 45 degrees on either side, with four bays separated by bulkheads. Dumping would have been done by opening the bays.[112]

Derrick Lighters (1820 to present)

Derrick Lighters were structurally almost identical to open deck scows, but were fitted with hoisting equipment. This equipment was normally in the form of one or two spars. One spar was mounted in the stern just forward of the cabin, while the second was mounted in the bow. The spars were fitted with booms to facilitate the loading and unloading of cargo.[113]

Dredges

The canal system required continual waterway maintenance and deepening, making dredges a common sight on the canals from the 1820s into the mid-twentieth century (Figure 82 and Figure 83). Dredges were typically unpowered vessels with scow-shaped hulls. Many were equipped with spuds, vertical posts which could be raised and lowered to hold a vessel in place. Various dredging mechanisms, typically steam driven, were employed resulting in vessel types such as spoon dredges, wheel dredges, clam shell dredges, bucket dredges, ladder dredges and cutter head dredges.

Steamboats

The first steamboat on the canal was launched in 1823. Most canal boats moved throughout the canal with tow-horses or mules; however, on the open water of lakes and rivers, they needed to be towed by steamers. Most steamboats had a deck house and an engine below decks. They were powered by coal, with either a vertical beam engine or a crosshead engine. In the 1880s, propeller driven steamboats became more common than the sidewheelers, allowing more room on board. Also in the 1880s the United States instated a law that required all vessels with a steam engine to have a licensed steam engineer on board. This made it impractical for smaller entrepreneurs and private owners to operate such vessels. Steamboats varied in size from small steam yachts, to smaller day excursion vessels with two decks, to vessels over 100 feet (30.5m) in length.

Steam Towboats (1820 to 1950)

This vessel had a long, narrow, one-story deckhouse which contained crew spaces at both ends and the upper engine room and upper boiler room amidships. The wheel house was at the forward end, raised a few steps above the deck on smaller boats, or placed on top of the deck house. The decks had a noticeable sheer, rising higher at the bow than the stern. Heavy mouldings were placed around the sides at deck level to withstand buffeting by barges.

Excursion Steamboats (1800s)

This includes a wide variety of vessels types and sizes. Some excursion steamers were as large as 200 feet (61m) long, while smaller day trip boats were closer to 60 to 80 feet (18.3 to 24.3m) with a top deck and canopy. One example of an excursion steamboat was *Colonial* (Figure 22).

Figure 22: Steamer *Colonial* carrying passengers on Onondaga Lake, 1900 [detail] (The Erie Canal Museum, Syracuse, NY, eriecanalmuseum.org).

Steam Canal Boats (1880 to 1950)

Similar in construction and size to other canal boats, these vessels were self propelled with a steam engine below deck.

Steam Line Boats (1850s)

Similar to towed line boats, these vessels were some of the first to utilize steam commercially, with over 100 in use by 1862.

Tugboats

Steam Tugs (1820 to 1915)

Steam dugs were designed to pull multiple canalboats through open waters of lake and/or at times through the canal. Various styles developed.

Canal Tugs (1915-present)

These powerful vessels were designed with a low profile. Many were built with hydraulic systems for raising their pilothouses where heights were not restricted. Canal tugs were built with both wood and steel hulls. Originally steam powered, they eventually became gasoline and diesel powered (Figure 23).

Drill Tugs (1915-present)

These smaller tugs were used to shift barges within a terminal area. They averaged around 75 feet (23m) in length and 250 horsepower.

Pleasure Craft

Various forms of pleasure craft existed on Onondaga Lake over the past two centuries. Sailing vessels of all types, and motor boats made of wood and fiberglass. Row boats, canoes and small kayaks were common. In the mid-1800s steam propelled pleasure yachts were replaced by tube boiler engines and then gasoline engines for speed boats. Ice boats became popular in the late 1880s, as did naphtha launches.

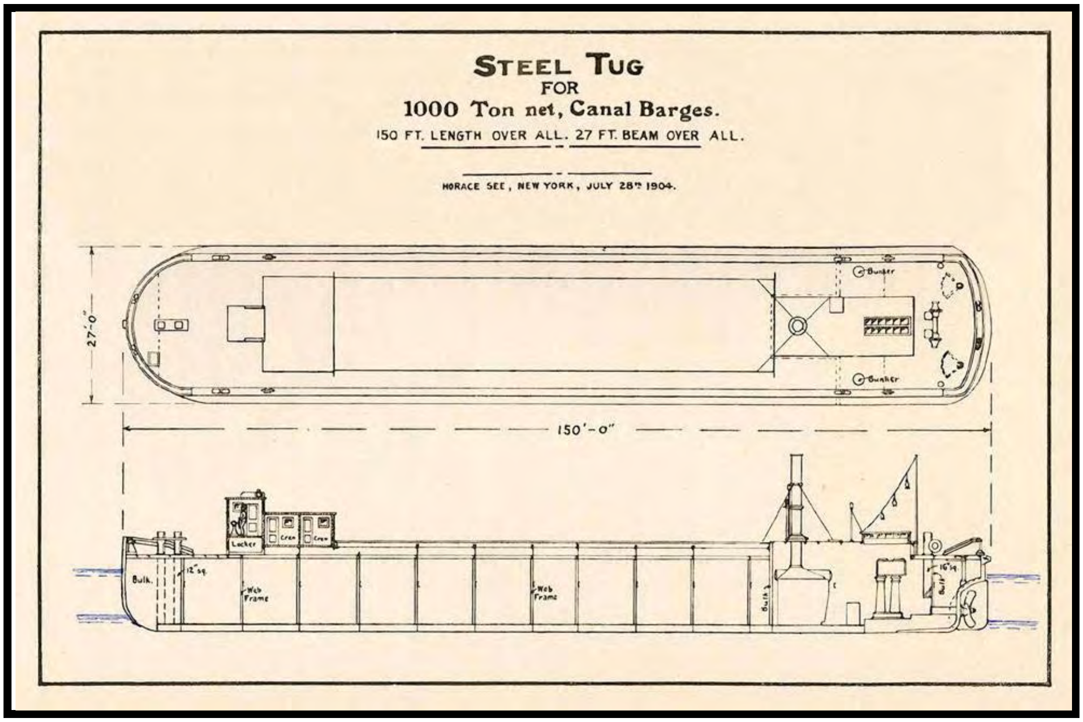

Figure 23. Diagram of a steel tugs (from *Annual Report of the State Engineer and Surveyor of the State of NY, for the fiscal year ending September 30, 1904,* 1905).

SYRACUSE MARITIME HISTORIC DISTRICT

The Syracuse Maritime Historic District is a proposed National Register district comprised of the remains of eleven wooden watercraft, six areas of marine infrastructure, and three rock mounds. The 20 contributing properties are listed in Table 3 below.

Table 3: Contributing Properties to the Syracuse Maritime Historic District

Wooden Watercraft	**Marine Infrastructure**	**Rock Mounds**
A2-1 (Steam Launch/Tug)	A1/A2 (Salina Pier)	A34 (Rock Mound)
A2-2 (Canal Packet)	A7 (Piling Clumps)	A75 (Rock Pile)
A2-3 (Steam Excursion Vessel)	A38 (Iron Pier Marine Infrastructure)	A76 (Rock Pile)
A2-4 (Barge)	A45 (Concrete Breakwater)	
A3 (Barge)	A72 (Pilings)	
A4-1 (Dump Scow)	A73 (Bulkhead)	
A4-2 (Dump Scow)		
A12 (Dredge)		
A35 (Unknown Boat Type)		
A53 (Canal Boat)		
A55 (Canal Scow)		

The District is contained in 58 acres (23.9 hectares) of Onondaga Lake bottom lands. The boundaries are delineated by the lake shoreline to the east and Salina Pier remnants to the north. The southern and western boundaries are lines drawn to encompass the extent of the contributing properties (Figure 24).

The 2010 remote sensing and dive verification efforts in the Syracuse Maritime Historic District located eleven archaeological sites. Upon completion of the 2010 field campaign there was concern that given the density of sites, there was the possibility that additional undiscovered sites could still remain within the District. Therefore, a methodological approach designed specifically for the District, comprising a re-examination and dive verification of magnetic anomalies, and systematic diver survey in waters within 200ft (61m) of the shoreline, was executed in 2011. Twenty two additional magnetic targets were identified from the extant geophysical data. None of these targets was identified as an archaeological site, 13 remain unidentified and nine were determined to be modern debris. The systematic shallow water survey located four previously unknown archaeological sites. During mitigation fieldwork in 2012, four more previously unknown archaeological sites were located near Salina Pier.

The Syracuse Maritime Historic District's development can be tracked on mid-twentieth century navigational charts. Charts from the U.S. Lake Survey Office from 1915, 1926, 1932 and 1937 show no wrecks or derelict vessels in this area.[114] However, the 1942 edition shows derelict vessels in the approximate locations of A3, A12, A4-1 and A4-2, Salina Pier A1/2 and adjacent wrecks A2-1, A2-2, A2-3, and A2-4 (Figure 31).[115]

The formation of the Syracuse Maritime Historic District is linked to the development of the Syracuse Inner Harbor and the NY State Barge Canal system. Prior to the establishment of the Barge Canal, the Oswego Canal paralleled the northeastern lakeshore with access to Onondaga Lake provided from the canal's "Mud Lock" on the Seneca River. From the river, the Onondaga Lake Outlet provided access to the lake. The 1915 barge canal expansion abandoned the canal adjacent to the lake in favor of a navigable channel through Oneida Lake and the Seneca River. With the re-routing, access to Syracuse was provided through the Seneca River into Onondaga Lake. A new inner harbor into Syracuse was constructed with an outlet into the southeastern corner of Onondaga Lake. With increased navigation on Onondaga Lake it became a convenient location to dispose of unwanted vessels. The State's Canal Laws had specific provisions designed to prevent obstructions to navigation in the canal. A person who obstructed canal navigation through any number of actions including "sinking a vessel" was fined a sum of $25 per obstruction, and the boat was subject to seizure and sale by the canal system.[116] However, the disposal of a boat in the open waters of Onondaga Lake yielded no such punitive actions.

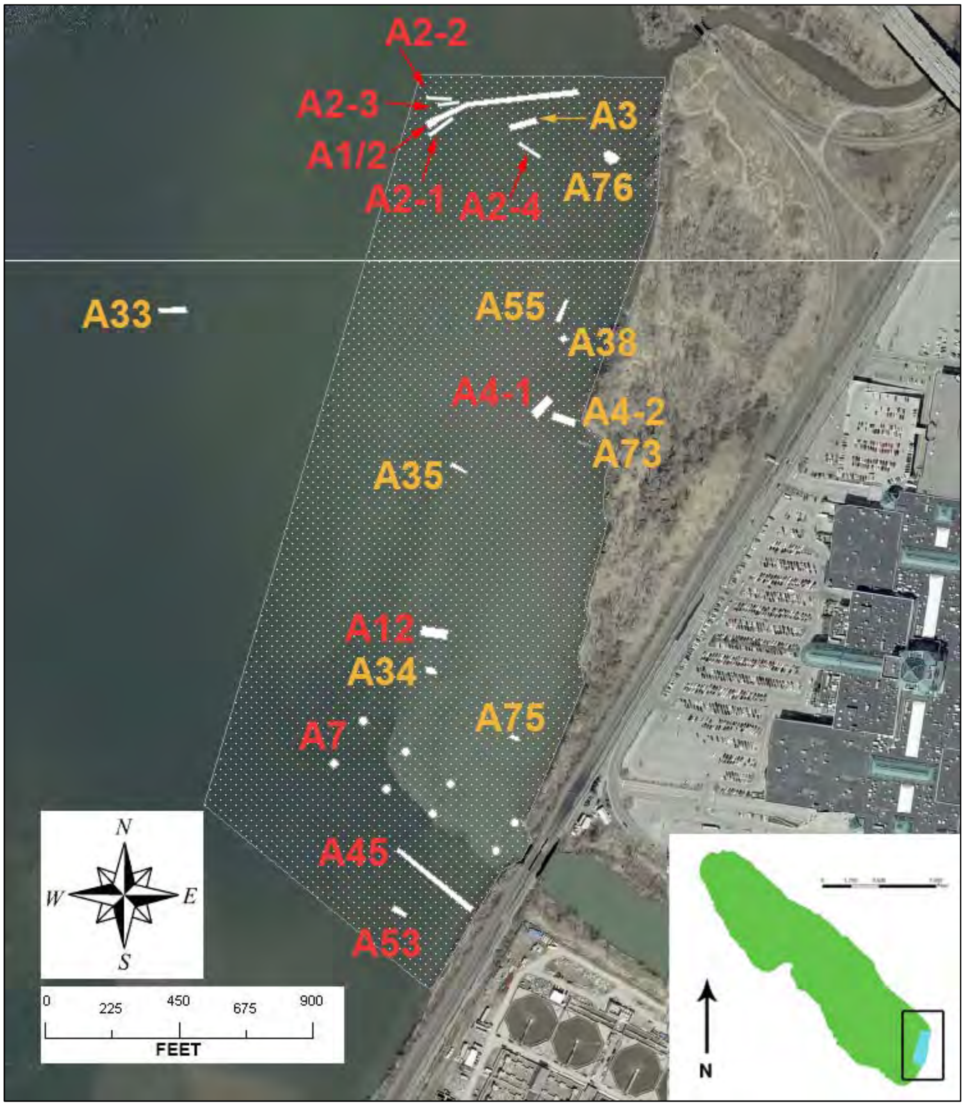

Figure 24: Map of the southeastern portion of Onondaga Lake showing the Syracuse Maritime Historic District. Sites in red were documented in the 2012-2013 field season, the results of which are presented in this report.

The rerouting of the canal and canal laws provided an important foundation for the District's origin, but other economic and cultural factors were also at work. From an economic point of view, the Syracuse Maritime Historic District's formation during and just after the Great Depression is not a coincidence. The 1930s were an era of declining commerce on NY State Barge Canal System. As demand declined, many wooden vessels were abandoned rather than being kept in service. Secondly, the establishment of the Barge Canal and its vastly increased lock size signaled the end of wooden canal boats. With the replacement of wooden boats with steel-hulled vessels, the unwanted watercraft were disposed of in backwater areas all along the canal route.

The final causal factor in the establishment of the Syracuse Maritime Historic District was the decline of Salina Pier and Iron Pier Resorts. Although the active use of the resorts predates the District (Salina Pier, 1870s to 1910s and Iron Pier, 1890 to 1906), their decline and abandonment were an important pre-requisite for the disposal of boats in this part of the lake. The disappearance of these resorts created an area of existing neglected marine infrastructure in a shallow water area abutting vacant lands. The disposal of watercraft in this ignored, swampy area was unlikely to warrant any demands for their removal.

Syracuse Maritime Historic District Significance Evaluation

National Register Evaluation		
Integrity of:	Location	The Syracuse Maritime Historic District remains at its original location, thus LCMM recommends it retains integrity of location.
	Design	The distribution of sites in the District lacks purposeful design. However, the individual contributing properties retain design elements such as spatial organization, technology and materials that are reflective of the builders' original activities. LCMM recommends that the Syracuse Maritime Historic District retains integrity of design.
	Setting	In the 80 years since boat disposal activities began at the site, the surrounding area retains a similar wetland/backwater setting which was one component of its formation. Additionally, the entrance to the adjacent Syracuse Inner Harbor and the Salina Pier and Iron Pier in-water remnants, both of which were causal factors in the district's formation, remain in place. LCMM recommends that the Syracuse Maritime Historic District retains integrity of setting.
	Materials	Significant portions of the sites in the Syracuse Maritime Historic District are buried beneath the lake bed. Although this makes the assessment of the configuration of those materials difficult, if not impossible, it is safe to conclude that those materials remain intact. Moreover, those buried materials will be in a better state of preservation than those exposed above the lakebed. The fabric of the barges can reveal the boatbuilders' construction preferences and (potentially) regional boat building traditions. LCMM recommends that the Syracuse Maritime Historic District retains integrity of materials.
	Workmanship	The sites in the proposed district have significant potential to yield information about the boatbuilders' skill and techniques. LCMM recommends that the Syracuse Maritime Historic District retains integrity of workmanship.
	Feeling	The District's feeling, or combination of its features with its setting, is conveyed by the sites which remain exposed above the lake's surface (A3, A4-1, A7 and A12) and the undeveloped shoreline. The district also has a similar viewshed to that of 50 to 80 years ago. LCMM recommends that the Syracuse Maritime Historic District retains integrity of feeling.
	Association	The contributing properties are sufficiently intact to convey to an observer that this is the area of the lake where boat disposal activities occurred. LCMM recommends that the Syracuse Maritime Historic District retains integrity of association.
Criterion:	A: Event	The Syracuse Maritime Historic District has a clear association with a pattern of events comprising the commercial use of the NY State Barge Canal. Areas of significance include commerce (all), transportation (all), engineering (dump scows A4-1 and A4-2), and government (canal scow

		A55). LCMM recommends that the Syracuse Maritime Historic District is eligible under Criterion A.
	B: Person	No known individually significant persons are associated with the Syracuse Maritime Historic District. LCMM recommends that the Syracuse Maritime Historic District is ineligible under Criterion B.
	C: Design/ Construction	The properties in the Syracuse Maritime Historic District represent a significant and distinguishable entity with features that both lack individual distinction and individually distinctive features. Contributing properties A3, A4-1, A7 and A12 because of their partial exposure serve as focal points for the district. They embody the distinctive characteristics of twentieth century barge construction (which include edge-fastening construction and longitudinal bulkheads); and marine infrastructure. LCMM recommends that the Syracuse Maritime Historic District is eligible under Criterion C.
	D: Information Potential	The sites in the Syracuse Maritime Historic District are likely to yield information about early twentieth century boatbuilding techniques and their operational history. The contributing properties are each likely to answer specific research questions that are not addressed in the archival record. What are the structural and mechanical requirements for wooden dump scows (A4-1 and A4-2)? What are the design and engineering considerations for the construction of dredges (A12)? LCMM recommends that the Syracuse Maritime Historic District is eligible under Criterion D.

LCMM's analysis suggests that the Syracuse Maritime Historic District retains integrity and is eligible for the NRHP under Criteria A, C and D.

METHODOLOGY

RESEARCH DESIGN

The National Park Service has produced numerous bulletins to provide technical information on the survey, evaluation, registration and preservation of cultural properties as it pertains to the NRHP. The bulletins used in the evaluation of Onondaga Lake's submerged cultural properties include: *How to Apply the National Register Criteria for Evaluation*, *Guidelines for Evaluation and Registering Archeological Properties*, *Guidelines for Evaluating and Documenting Historic Aids to Navigation*, *Nominating Historic Vessels and Shipwrecks to the National Register of Historic Places*, and *Guidelines for Evaluating and Registering Historical Archaeological Sites and Districts*. The archaeological study was non-destructive and no artifacts were recovered.

Specific research questions for each site, and the types of archaeological data required to address these questions, were developed and outlined in the *Mitigation Plan for Archaeological Properties in the Onondaga Lake Bottom, Subsite of the Onondaga Lake Superfund Site, Onondaga County, NY*.[117] These research questions are associated with NRHP eligibility criteria defined for each of the sites. They are presented in this report in the section Archaeological Results.

ARCHAEOLOGICAL METHODOLOGY

The investigation of the ten contributing properties on the bottom land of Lake Onondaga were carried out under an archaeological permit granted by the NY State Museum. The methods used in the archaeological examinations are standards in the field, and have been refined by Lake Champlain Maritime Museum (LCMM) staff over the past 25 years. The archaeological study was non-destructive and no artifacts were recovered.

Measured Documentation

The designated sites documented during this project represent historic vessels and marine infrastructure features.

A vessel's hull structure lends itself to use as a reference grid for recording the locations of features. Baselines, consisting of fiberglass reel tapes, were established on the site. Using multiple baselines and off-set measurements, archaeologists recorded where features were located. Small steel rulers were used to map smaller details of the shipwreck. Other recording tools included clipboards with drafting film, staplers, and awls. Recording of curved portions of a structure was aided by the use of a digital goniometer, a digital level set in a 1 foot (30.5 cm) wide waterproof housing. The level allows the curvature of a structural member to be recorded in a series of 1 foot (30.5 cm) increments as the goniometer is "walked" along a baseline. This methodology has been used dozens of times by LCMM archaeologists over the past twenty-five years on Lake Champlain, and has proven effective at accurately capturing the complex curves found in vessel hulls.

The documentation of the non-vessel properties also employed baselines, though these were placed to the side of the site or laid down the centerline of the feature. Off-set measurements were employed to tie in the notable features and delineate the extent of the site, while steel rulers were used for documenting details.

The field techniques implemented by LCMM archaeologists were designed to gather the data necessary to accurately reconstruct the vessel's or feature's structure. Data was gathered in a logical progression from general to detailed. Documentation initially focused on the site's overall construction or arrangement, with later dives devoted to filling in specific construction details. Because this project had the advantage of continuity of crew, individual team members were given large portions of each site to record in detail. All field measurements were recorded in feet and inches, which was the system of measurement by which the vessels and features were originally constructed.

Field notes were initially recorded on drafting film with the site name and number, date, area of investigation, the recorder's name, and the field note number. Immediately after the dive, archaeologists recopied their field notes onto graph paper. These recopied notes were also used to record observations too complex to note while working underwater. Recopied note numbers correspond with original field note numbers, and all were inventoried.

Each archaeologist converted his or her field measurements into scale drawings. Definitions of the different drawing types that were produced are below.

- <u>Plan View</u>: A drawing showing the site as if viewed from above looking straight down.
- <u>Port/Starboard Exterior Elevation:</u> A drawing showing the structure as viewed from the side.
- <u>Centerline Elevation:</u> A drawing showing a longitudinal section of the vessel or feature.
- <u>Cross Section:</u> A drawing showing a transverse section of the vessel or feature.
- <u>End Elevation:</u> A drawing showing the structure as viewed from the end.

Photographic Documentation

Overall site photographs and documentation of the piling clumps (A7) were carried out with a digital SLR camera with a resolution of more than six mega-pixels. Where appropriate and plausible a scale was placed in the photo. A detailed photographic log was maintained, recording the feature, the photograph orientation, and any feature details shown in the image. Management of the digital files after field work has followed the guidelines outlined in the *NRHP Photo Policy*.

Videographic Documentation

Videographic documentation of the contributing properties was gathered using a Sony HDR-HC3 HDV 1080i Mini DV Handycam in a Light and Motion Blue Fin housing. Archaeologists made sufficient passes with the video camera to insure thorough coverage of the site. Features of particular interest were documented thoroughly by videoing them from as many angles as possible. Some sites had very poor underwater visibility, making this technique ineffective.

Wood Sampling

A total of 108 samples of the wooden components of the sites were gathered and examined to determine what type of wood was used (see details in Appendix 9). Sampling was achieved using a chisel and hammer to extract a small piece of wood, approximately 1x1 inch (2.5x2.5 cm). Each wood sample was placed into a plastic zipper-lock bag with a small amount of water, and labeled with site name, date, archaeologist initials, and timber name/number. Examination and identification of each wood sample was undertaken by Roy Whitmore, Professor Emeritus of Forestry at the University of Vermont.

Datasets

Remote Sensing Data

Remote sensing data for Onondaga Lake was collected by CR Environmental, Inc. in 2005.[118] This survey recorded four datasets: 1) bathymetry to identify the lake bottom surface; 2) side-scan sonar to characterize debris, obstructions and other surficial features of the lake bottom; 3) sub-bottom profiling to supplement the assessment subsurface stratigraphy; and 4) magnetometer data to identify debris and obstructions containing iron within or on top of the lake sediments.

Aerial Surveys

Aerial imagery for Onondaga Lake from Google Earth® and Microsoft® Virtual Earth were examined to identify shoreline and shallow water features.

Previous Archaeological and Historic Research

In 2004, the Public Archaeology Facility conducted a Phase 1A archaeological resource assessment for the Onondaga Lake Superfund Site on the behalf of Honeywell.[119] In 2010, LCMM conducted a Phase 1B archaeological resource assessment on behalf of Honeywell.[120]

Additional Historic Research

Navigational charts of Onondaga Lake from 1915, 1926, 1932, 1937, 1942, and 1947 were examined for the locations of potential cultural resources.[121]

DIVE METHODOLOGY AND SAFETY PRACTICES

This section provides an outline of procedures which ensured the safety of project divers and facilitated the effective completion of project goals and objectives. The diving operations for this project met all federal requirements for safe diving. All diving activities were in accordance with the strictest provisions of U.S. Army Corps of Engineers and LCMM diving safety manuals and diving guidelines. The safety of project divers was given priority in all decisions and actions undertaken during diving operations. During all diving operations conducted as part of this project, all persons diving and working under the auspices of LCMM abided by this Dive Safety Plan.

Diving Operations
The primary dive platform was securely anchored or moored during all diving operations. All dive operations took place within 100 feet of a dive flag.

Dive teams consisted of four people: one diver, one standby diver, one tender, and one dive supervisor. Each diving member of a team helped the other diving member don, remove, and adjust equipment. The Diving Supervisor checked to ensure that all divers were properly rigged and adjusted immediately before the diver entered the water. No diver entered the water until clearance from the Diving Supervisor had been given. Each diver checked all equipment for proper function immediately upon submerging and upon reaching the bottom before conducting any work.

Schedule and Duration of Diving
Diving took place over 29 days in September and October 2012, and May 2013. Dives and divers were restricted to no-decompression limits. In calculating no-decompression limits the next greater time and next greater depth was be used on standard U.S. Navy Diving tables.

Environmental Conditions
Water depths in the project area did not exceed 35 feet, and currents were negligible. Underwater visibility was between 1 and 10 feet. Water temperatures varied between 50 and 65°F. Divers donned a range of dry suit undergarments according to that dive’s thermal conditions. Divers encountered dense mats of aquatic vegetation, including the invasive Eurasian watermilfoil (*Myriophyllum spicatum*) (Figure 25), requiring careful swimming to avoid entanglement, and systematic site clearing.

Figure 25: Divers encountered dense mats of vegetation, including the invasive Eurasian watermilfoil (*Myriophyllum spicatum*) on sites in the Syracuse Maritime Historic District (LCMM Collection).

Hazard Analysis

A range of hazardous chemicals are found in Onondaga Lake's bottom sediments. Mercury contamination is found throughout the lake, with the most elevated concentrations detected in sediments in the Ninemile Creek delta and in the sediments and wastes present in the southwestern portion of the lake. Other contaminants present within Onondaga Lake sediments include benzene, toluene, ethylbenzene, and xylenes (BTEX), chlorinated benzenes, polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and polychlorinated dioxins and furans (PCDD/PCDFs). The Human Health Risk Assessment for Onondaga Lake found that that contamination in Onondaga Lake presents risks to human health that are above EPA guidelines. In addition, the primary sources of these cancer risks and non-cancer health hazards are due to mercury, PCBs, and PCDD/PCDFs as a result of the consumption of Onondaga Lake fish. However, studies showed that reasonable maximum exposure cancer risks (3.7 × 10-6) for exposure to south basin sediments for construction workers exceeded the low end of the target risk range of 1 × 10-6. All other reasonable maximum exposures (RME) risks for future construction workers were less than the target range.

In general, LCMM divers did not impact the bottom sediments, except for occasional inadvertent contact. The diving equipment and techniques employed prevented any sediments or lake water from touching the diver's and other crew members' skin.

All divers were subject to a decontamination protocol:

1) Upon exiting the water, the diver was washed down with lake water from a high volume hose;

2) The diver was sprayed with a solution of Alconox and water and scrubbed with a brush (Figure 26);
3) The diver was rinsed with clean water;
4) The diver doffed his/her gear;
5) The diver was rinsed with clean water;
6) The dive gear was rinsed with clean water.

Figure 26: During the decontamination procedure, this LCMM diver is sprayed with a solution of Alconox and water (LCMM Collection).

Personnel

The dive team consisted of four individuals: a Diving Safety Officer (DSO), an Assistant Diving Safety Officer (ADSO), and two archaeological divers. Each dive team member met the training and qualification requirements established in USACE Safety and Health Requirements Manual (EM 385-1-1).

Dive Platform

Dive operations were staged out of Onondaga Lake Park Marina. This site was ideal due to its central location to the project area, ample space for equipment preparation and break-down, and access to restroom facilities. The dive platform utilized was a 30' (9.14m) pontoon boat (Figure 27). The dive vessel carried a spare parts kit, tool kit, first aid supplies, and potable water. The dive vessel conformed to U.S. Coast Guard specifications according to class, and had on board all required safety equipment. The vessel was equipped with a safe and secure dive platform/ladder used by divers, aided by their tender, when entering and leaving the water.

Figure 27: Dive platform at Onondaga Lake Park Marina, 2013 (LCMM Collection).

Diving Equipment

The SCUBA equipment was currently certified. A full set of back up equipment was available in the event of equipment malfunction. SCUBA equipment included:

1) Full face mask demand regulators;
2) A primary SCUBA cylinder (either a standard 80 cubic foot aluminum or a steel 95 or 104 cubic foot cylinder);
3) A pony bottle (30 or 18 cubic foot aluminum) with regulator;
4) The regulator attached to the primary cylinder will be equipped a submersible pressure gauge;
5) A depth gauge;
6) A bottom timer;
7) A buoyancy compensator device (BCD) capable of floating the diver;
8) A dive knife;
9) A dive light;
10) Drysuits equipped with dry gloves and latex hoods;
11) Surface to diver and diver to diver communications (Wireless OTS Aquacom);
12) An inflatable signal device; and
13) Dive Alert

Safety Considerations

All diving was performed in accordance with the U.S. Army Corps of Engineers "Safety and Health Requirements Manual" EM385-1-1 dated September 2008 and with the U.S. Navy Diving Manual. Safety was a primary goal of this project, and diver safety was given priority in all decisions and actions undertaken during diving operations. All dive operations were guided by the *Dive Safety Plan* created by LCMM specifically for the work carried out in Onondaga Lake, and by LCMM's *Safe Diving Practices Manual*.[122] Safety oversight was provided by Parsons.

A dive briefing preceded each day of diving. The briefing included an assessment of safety aspects, potential hazards, tasks to be undertaken, emergency procedures, and any necessary modifications to operating procedures. The DSO noted dive briefing attendees and topics discussed on the dive log. All dives were logged throughout the dive, and written comments for the dive log were required of the returning diver immediately upon completion of each dive. Upon completion of a dive and prior to the commencement of the next dive the returning diver informed the dive supervisor about diving conditions observed and specifically about any hazards or potential hazards encountered. Divers remained awake for at least one hour after a dive. Divers waited at least 12 hours before flying after any dive; this was extended to 24 hours following multiple days of diving.

An international diving flag (Alpha flag) and a civilian "diver-down" flag (red with white diagonal stripe) was raised on the diving platform prior to, and lowered following completion of, all diving operations. One crew member was designated as the traffic observer with the task of alerting passing craft of diving operations.

Accurate timepieces were carried by all diving personnel. Fire extinguishers were aboard the dive platform and in each vehicle used. The dive team had a 16 unit first aid kit, a spineboard with flotation, and oxygen on hand during all diving operations. All personnel were familiar with safety procedures and with the locations of safety equipment. There were no accidents or injuries during the fieldwork; if there were, they would have been reported to the diving supervisor immediately, and a report of injury form would have been completed.

Bottom times did not exceed two hours, and divers performed no more than two dives each day. Diving was conducted only on days that weather and conditions permitted safe diving. Diving was not conducted if any of the following conditions prevailed: high winds, thunderstorms, waves exceeding two feet, low surface visibility conditions (less than 100 feet of visibility), or currents exceeding 1 knot.

Fieldwork was executed by Pierre LaRocque (LCMM Archaeologist, Dive Safety Officer, and Vessel Captain), Adam Kane (LCMM Archaeological Director and Dive Safety Officer), Sarah Tichonuk (LCMM Archaeologist), and Christopher Sabick (LCMM Archaeologist).

ARCHAEOLOGICAL RESULTS

UNDERWATER WORKPLAN

This Phase 3 archaeological survey was based upon the *Mitigation Plan for Archaeological Properties in the Onondaga Lake Bottom,* which specifically outlined the archaeological sites to be investigated and the methodological approach to the fieldwork.[123] The *Mitigation Plan* noted six sites within Onondaga Lake that will be impacted by remediation efforts, to which another four sites were added during 2012 fieldwork. In all, the Phase 3 documentation examined ten archaeological sites within the Syracuse Maritime Historic District. The documentation of the ten sites included several methods of data recovery including videography and photography where feasible, detailed measured drawings, and the recovery and analysis of wood samples. The ten sites represent a variety of property types:

- Vessels
    - Dump scow (A4)
    - Dredge (A12)
    - Canal Boat (A53)
    - Steam tug/launch (A2-1)
    - Canal packet (A2-2)
    - Steam Excursion Vessel (A2-3)
    - Barge (A2-4)
- Marine Infrastructure
    - Salina Pier (A1/2)
    - Concrete breakwater (A45)
    - Aid to navigation: pilings (A7)

ANOMALY 1/2: SALINA PIER

Anomaly 1/2 Summary Table	
Anomaly Identification	Salina Pier; NY Site Number 06740.012292
Remedial Impact	Dredge and Cap
NRHP Eligibility Recommendation	Eligible as a Contributing Property to the Syracuse Maritime Historic District
Anomaly Dataset	
Side Scan (2005)	0345, 0346
Magnetometer (2005)	1013
Side Scan (2010)	6/3/10
Sector Scan (2010)	6/4/10
ROV Video Footage (2010)	6/9/10
Diver Observations	9-10/2012, 5/2013; 25 dives totaling 32.1 hours
Diver Videography	Yes
Maps/Charts	Yes
Aerial Imagery	Yes
Historic Accounts	Yes

Introduction

Salina Pier is 483 foot (147m) long pier built as part of Onondaga Lake's tourism era in the late nineteenth century. The site, which is largely constructed of stone-filled vertical planking bulkheads, is considered a contributing property to the Syracuse Maritime Historic District. The pier is in proximity to five vessels, or parts of vessels: A2-1, A2-2, A2-3, A-3 and A4-1. The pier's location was known from historic accounts and charts (Figure 28, Figure 29, Figure 30, and Figure 31), aerial images (Figure 32), and was located during CRE's 2005 remote sensing survey (Figure 33).

In the Phase 1B fieldwork, Salina Pier was a difficult site for recording sonar data or diver measurements due to dense aquatic vegetation and episodic turbid runoff from Ley Creek. The Phase 3 fieldwork focused on mapping the structure's extent and construction techniques. This work was undertaken using direct measurements and underwater videography. The fieldwork required 25 dives with a cumulative bottom time of 32.1 hours. Documentation conditions were variable depending on the turbidity of the runoff from Ley Creek but trended towards poor. Underwater visibilities were generally between 2 and 8 feet (0.6 to 2.4m) with dense aquatic vegetation along the western half of the pier and sparse vegetation inshore to the east.

Salina Pier Historic Context[124]

The Salina Pier (Figure 28) was initially constructed in the 1870s or 1880 at the mouth of Bear Trap Creek (now known as Ley Creek).[125] In 1881, the Central City Street Railroad Company built a hotel and car depot on the banks of the lake on the Salina side. The structures were constructed approximately 100 feet (30m) west of the present railroad terminus. The hotel was two stories high.[126] These structures may not be present on any of the historic maps, as it is noted that in the beginning of 1890, a windstorm destroyed Salina Pier and a saloon house at the end of it.[127] The pier is identified on the 1889 Sweet map. It was noted in the summer of 1890 that the water table was still high and that none of the pier was visible, suggesting that the pier was not being used for a lengthy portion of that year. Indeed, in 1889, the *Syracuse Standard* writes, "The old Salina pier is totally inadequate to the requirements."[128] In an attempt to compete with the Iron Pier resort, the Salina Pier company constructed a two-story pavilion, which also contained a concert hall and dining room, in 1890 south of the existing pier and north of the Iron Pier resort.

Figure 28: Salina Pier in 1888 (Courtesy Onondaga Historical Association, Syracuse, NY).

By the late 1890s, the Salina Pier resort had closed, probably due to the greater number of attractions at the Iron Pier. In 1899, the Iron Pier resort purchased the land of the Salina Pier pavilion and had Solvay soda ash refuse placed up to 4 feet (1.22m) in depth to build up the land in front of the Iron Pier.[129] The pier remained intact through 1898 and served boats that ran regularly to all lakeside resorts.[130] Because of the construction of a trolley line on the west side of the lake in 1899, and the earlier construction of railroads on the east and west sides of the lake, Salina Pier may have fallen out of use by the early twentieth century. By 1908, the Salina Pier was replaced by "Breakwater," which was likely a repurposing of the existing pier. By 1924, the Breakwater was abandoned and flooded over by the raising of the lake for the Barge Canal.

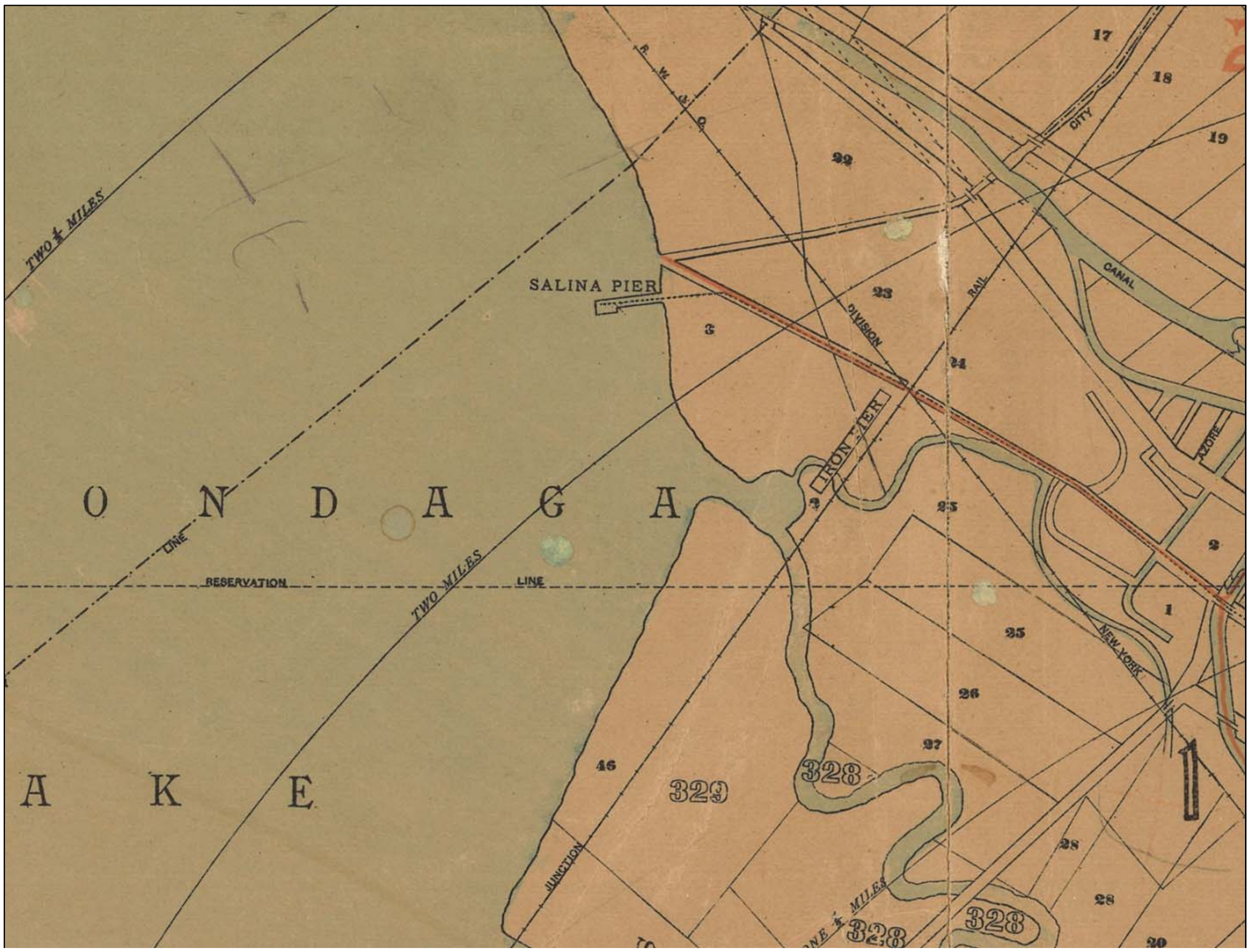

Figure 29: Salina Pier appears on this 1892 Map of the City of Syracuse, published by J.W. Vose & Co., NY [detail] (Courtesy Onondaga Historical Association, Syracuse, NY).

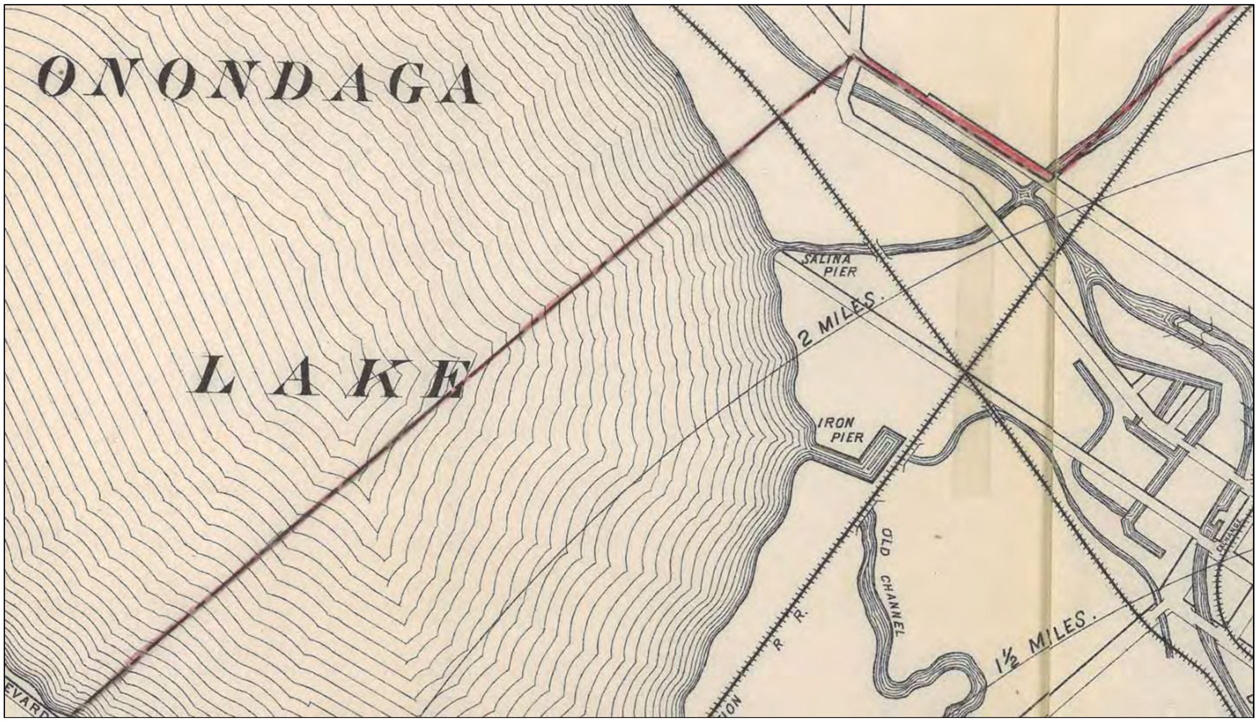

Figure 30: Salina Pier appears on this 1902 Map of the City of Syracuse by Sampson, Murdock & Co [detail] (Courtesy Onondaga Historical Association, Syracuse, NY).

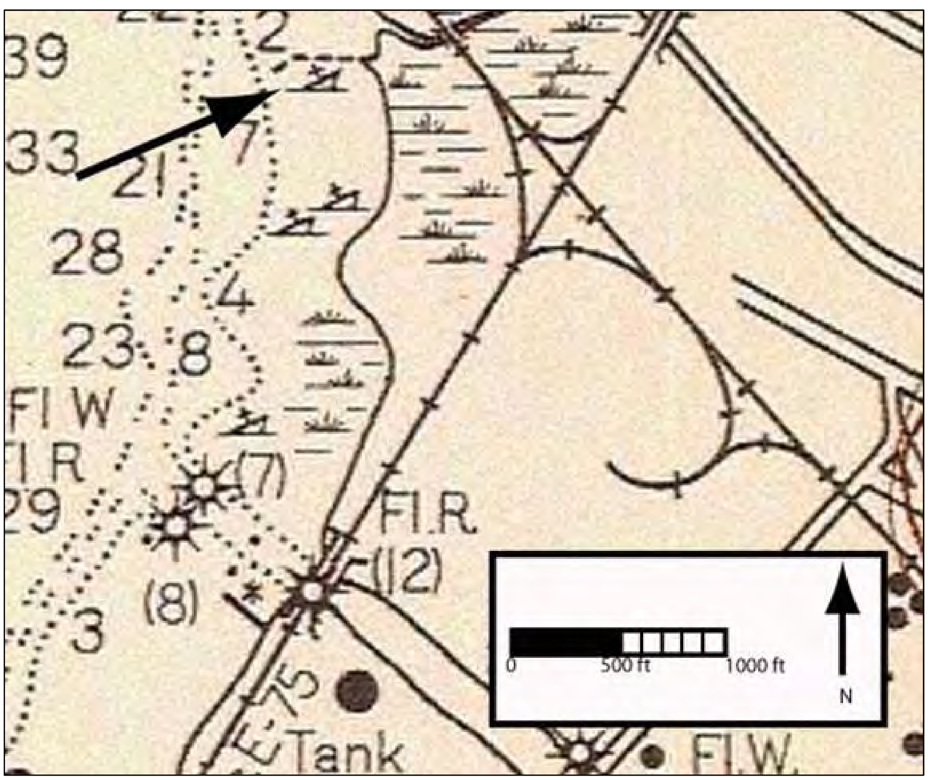

Figure 31: 1942 navigational chart showing the remnants of Salina Pier ([detail] U.S. Lake Survey Office, NY State Canals, Chart No. 185, 1942).

Figure 32. Underwater structure faintly visible at the location of Anomalies 1 and 2 with Anomaly 3 in the foreground (courtesy Microsoft® Virtual Earth).

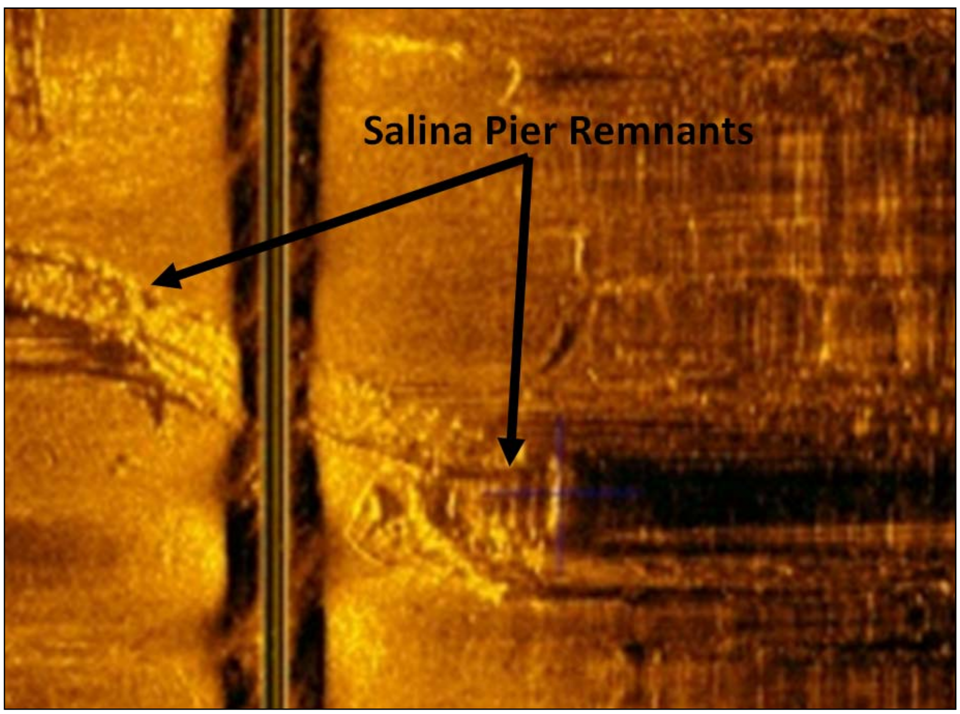

Figure 33. 2005 Sonar image of A1 and A2 (courtesy CRE).

Site Description

The extant pier remains are 483 feet (147m) long. The pier remnants are divided into four sections, A-D (Figure 34). Section A is the pier's central leg, while section B is an expansion that expands the inshore portion of Section A thereby increasing the width of the Pier. Section C represents poorly preserved inshore remains found north of the Sections A and B. Section D is the westernmost leg which extends furthest out into the lake. The archaeological data suggests that the building sequence is A to D; therefore that order will be used to describe the sections.

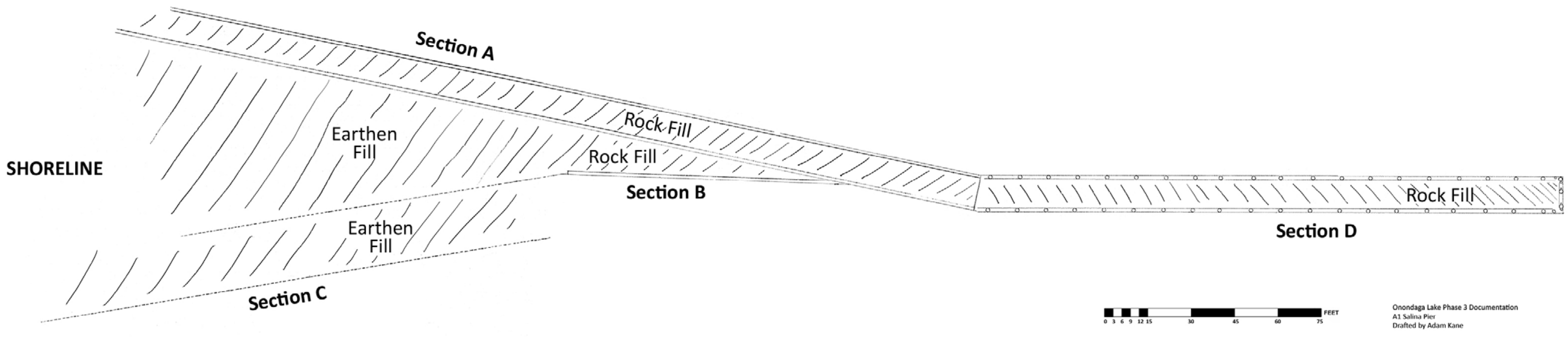

Figure 34: Site plan of Salina Pier (A1/2), drafted by Adam Kane (LCMM Collection).

Section A is the original finger of Salina Pier (Figure 35). The remains are 283 feet long (86m) and 8 feet (2.4m) wide, and stand 2 to 3 feet (0.6 to 0.9m) above the surrounding bottomlands. Each side of Section A is characterized by two rows of parallel vertical planks. The individual planks are 8 to 12 inches (20 to 30cm) in width and 1 inch (2.5cm) in thickness. These planking rows are separated by approximately a 12 inch (30.5cm) gap. The interior of the pier is filled with 2 to 6 inch (5.1 to 15.2cm) diameter rip-rap. The outside walls of the pier are buttressed by 8 to 12 inch (20 to 30cm) diameter rip-rap.

Figure 35: Water conditions occasionally permitted views of Salina Pier from the surface, looking east at Section A (LCMM Collection).

Section B is an expansion at the inshore end of Section A. It is 15.5 feet (4.7m) wide and 250 feet (76.2m) long. The western end of Section B tapers diagonally out from its intersection with Section A. The outboard (northern) side of Section B is defined by a 12 inch (30.5cm) square timber. This timber is clearly visible at the Section B's western end, and is sporadically visible further east depending on the timbers state of burial. The interior of Section B is filled with 2 to 6 inch (5.1 to 15.2cm) diameter rip-rap.

Section C is a T-shaped arrangement of single walled vertical planking in 2 to 3 feet (0.6 to 0.9m) of water (Figure 36). This planking formed the wall of a bulkhead. The vertical planking extends 1 to 2 feet (0.3 to 0.6m) above the bottom with individual planks 8 to 12 inches (20.3 to 30.5cm) in length and 1 inch (2.5cm) in width. The top of the T, which parallels the Sections A and B, is 93.5 feet (28.5m) long, while the portion which connects Section C to B is 23.5 feet (7.1m) in length. The interior of Section C was filled with mixed sediments including small cobbles, slag, coal ash and soil. Unlike all other section of the pier, this area was not filled with a specific rock matrix, rather its fill was a mix of soils and debris.

Figure 36: Sections of Salina Pier (A1/2) were characterized by vertical planking (LCMM Collection).

Section D is the westernmost leg of the pier and is angled at a 12° offset from Section A. Section D is 10 feet 4 inches (3.1m) wide, 200 feet long (61.0m) and stands 3 to 4 feet (0.9 to 1.2m) above the surrounding bottomlands. Each side of Section D is characterized by two rows of parallel vertical planks. The individual planks are 6 to 12 inches (15.2 to 30.5cm) in width and 1 inch (2.5cm) in thickness. These planking rows are separated by approximately a 12 inch (30.5cm) gap. The gap contains a sequence of pilings spaced at intervals of 8 to 12 feet (2.4 to 3.7m). The interior of the pier is filled with 8 to 16 inch (20.3 to 40.6cm) diameter rip-rap. The corners of the westernmost end of the pier are flanked by clumps of pilings (Figure 37).

Figure 37: Vertical pilings at Salina Pier held back rip-rap, cobbles, or other fill (LCMM Collection).

Conclusion

Salina Pier forms the northern boundary of the Syracuse Maritime Historic District and is considered a contributing property because of its causal relationship with the District. The abandonment of Salina Pier is important in the foundation of the District because that action (or lack thereof) created an environment without active human stewardship. Had Salina Pier still been in active use, it is highly unlikely that watercraft would have been abandoned in this area of the lake.

ANOMALY 2-1 STEAM LAUNCH OR TUGBOAT

Anomaly 2-1 Summary Table	
Anomaly Identification	Steam Launch/Tug, NY Site Number 06740.013167
Remedial Impact	Cap
NRHP Eligibility Recommendation	Eligible as Contributing Property to Syracuse Maritime Historic District
Dataset	
Side Scan (2005)	No
Magnetometer (2005)	No
Side Scan (2010)	No
Sector Scan (2010)	No
ROV Video Footage (2010)	No
Diver Observations	13 dives, 19.5 hours bottom time
Diver Videography	Yes
Maps/Charts	No
Aerial Imagery	No
Historic Accounts	No

Introduction

A2-1 represents the remains of the bottom hull of a wooden steam-powered tugboat or launch (Figure 38). The site rests in 8 to 12 feet (2.4 to 3.7m) of water abutting the submerged remains of Salina Pier (A1/2). It is unclear whether the vessel accidentally sank or was intentionally disposed of at this location. The vessel remains lean to starboard, exposing some of its port side features, but leaving much of its starboard side buried. Study of the vessel was limited to the remains exposed above the lakebed due to the potentially contaminated nature of the sediments. To date, archival research has yielded no historic accounts of this vessel or its deposition. The vessel construction likely dates to the late-nineteenth or early twentieth century based on construction details such as the iron rudder, and threaded bolt fasteners.

The Phase 1B report did not include site A2-1, as it had not been located at the time of that report's production. It did not appear on sonar signatures for the area, likely due to its close proximity to the pier, its disarticulated condition, and the area's dense aquatic vegetation including Eurasian watermilfoil (*Myriophyllum spicatum*). Due to the site's location in the proposed Syracuse Maritime Historic District however, it is deemed to likely be a contributing property and therefore eligible for the NRHP. The Onondaga Lake remediation design for the area of A2-1 is for capping, which, based upon the analysis of other nearby sites, was presumed to have an adverse effect. That field analysis led to the inclusion of site A2-1 in the Phase 3 field work despite its absence from LCMM's *Onondaga Lake Archaeological Mitigation Plan*.

A2-1 was located in 2012 during a visual survey of the bottomlands surrounding A1/2 Salina Pier. In the field seasons of 2012 and 2013, Phase 3 underwater archaeological documentation was undertaken which included direct diver measurements, videography and wood samples (12). The field effort required 13 dives, totaling 19.5 hours of diver bottom time. Documentation conditions were fair, with underwater visibilities of 3 to 8 feet and significant aquatic vegetation.

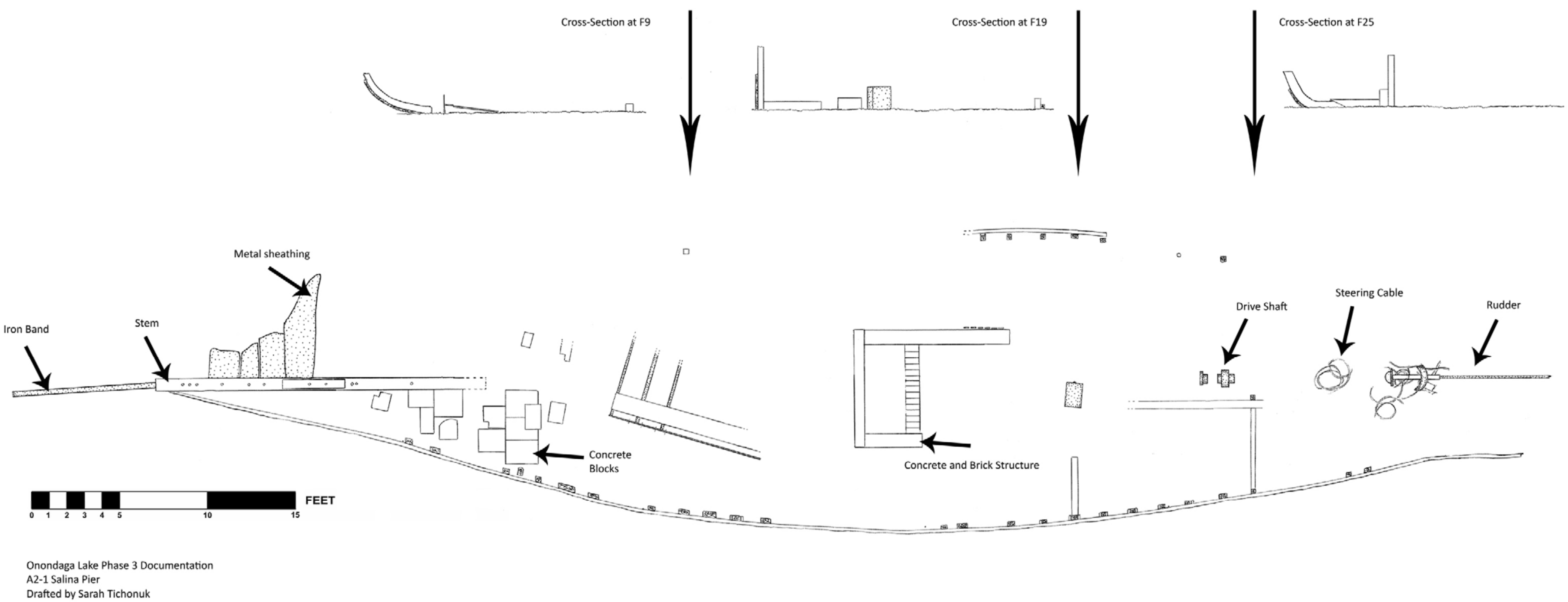

Figure 38: Plan and cross sectional views of A2-1 (LCMM Collection).

Site Description

The visible remains of A2-1 represent 15-20% of the vessel's original structure, which has resulted in an incomplete understanding of the site (Figure 38). Another 10% of the vessel is likely present below the sediment, which was not excavated due to the potential contaminants in the lake bottom. The visible remains are 88 feet 8 inches (27 m) in length and 20 feet 9 inches (6.3 m) in beam. The exposed vessel remains include portions of the stem and bow, port side frames and planking, scattered frame heads on the starboard side, and the rudder, rudder post, and portions of the steering mechanism were found in the stern. There are also several features of note in the interior hull of the wreck.

A2-1 rests in 8 to 12 feet (2.4 to 3.7m) of water in the southeastern corner of Onondaga Lake. The natural and cultural processes at this location have been a significant factor in its state of preservation. The site is deep enough so that it has not been subject to ice action; however, wave action and biological growth have been factors. This southeastern portion of the lake is subject to wave action due to the 4.5 miles (7.24km) of fetch which unfold to the northwest. The site is deep enough to avoid direct wave action; however, there is commonly water movement created by wave shoaling. Additionally, annual aquatic vegetation growth and die-off is another means of mechanical degradation to the site. Despite the sparse visible remains, however, it is reasonable to presume that the buried portion of the site is in excellent condition.

Bow

The stem is well-preserved on A2-1. The timber is made of White Oak (*Quercus alba*), approximately 7 inches (17.8cm) moulded and 8 inches (20.3cm) sided, and stands 42 inches (106.7cm) off the bottom at its highest and forward-most point. It extends for a length of 7 feet 10 inches (2.4m) before transitioning into a keelson chock, both of which are also composed of White Oak (*Quercus alba*). Iron bolts are present running down the stem; three of them 2 feet (0.6m) from the forward-most point clustered 5 inches (12.7cm) apart, and crossed. A 3 ½ inch (8.9cm) wide iron band, which originally protected the forward surface of the stem, which has fallen away from the timber, extends forward beyond the stem for a distance of 8 feet 4 inches (2.5m) (Figure 39).

Figure 39: Iron band in bow of A2-1 (LCMM Collection).

Run of the Hull

The starboard side had very little framing or planking visible, so the documentation of A2-1 focused on the port side of the vessel. Frames are present on the port side beginning approximately 12 feet (3.66m) aft of the stem. There are total of 27 extant frames on the port side, spaced approximately 2 feet (0.6 m) apart except where a 10 foot (3.0m) gap appears amidships. There are 7 frames visible on the starboard side. The recorded sided and moulded dimensions vary considerably based upon the preservation of each frame; however, the typical dimensions are 4 inches (10.2cm) sided and 6 inches (15.2cm) moulded. All wood samples of framing members were White Oak (*Quercus alba*).

A2-1's framing pattern has elements of a cocked-hat style. This technique uses a trapezoidal or triangular timber, known as a cocked-hat, to join the boat's bottom to its vertical sides. The technique removes the need for naturally grown compass timber to construct the turn-of-the-bilge. Of the 27 frames visible on the port side of A2-1, 9 have cocked-hats 2.5 inches sided (6.4cm) located both forward and aft of the frame.

One interesting feature of A2-1 is a group of 14 concrete blocks that appear to have been molded to, and fit snugly between, the port side frames as ballast (Figure 40). Eight of these blocks are T-shaped, between 15 and 18 inches (38.1 to 45.7cm) thick. Blocks are only present in the forward section of the vessel, and likely would have provided counter-ballast for the steam boiler and engine located amidships, and the iron rudder shaft assembly located in the stern.

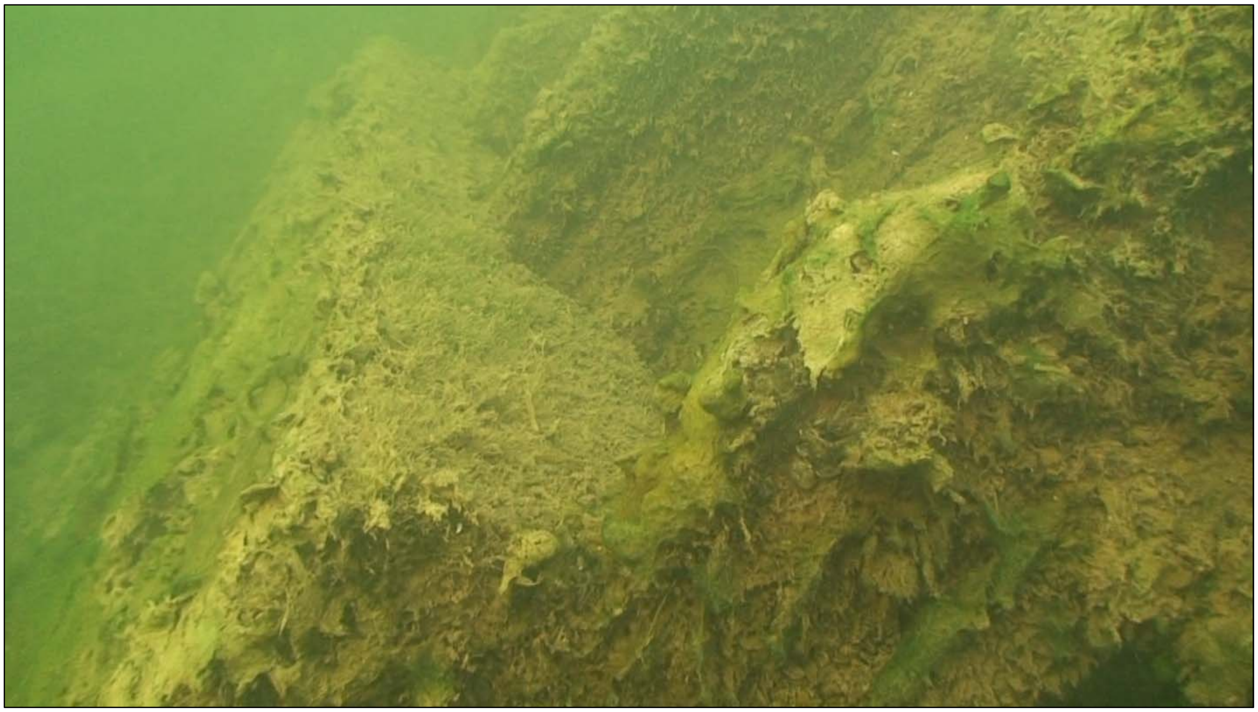

Figure 40: Concrete blocks in between frames on the port side of A2-1 (LCMM Collection).

Three pieces of thin iron sheathing are visible on the starboard side approximately 3 feet (0.9 m) aft of the stem. These iron sheets presumably protected the outer hull planking in the bow, each sheet measures 27 inches (68.6cm) wide, and approximately 0.25 inches (0.6cm) thick.

Hull planking measures 1.5 to 2 inches thick (3.8 to 5.1cm) and 5 to 7 inches wide (12.7 to 17.8cm). At most four strakes are present on the port side, more intact toward the stern of the vessel. There is very little planking visible on the starboard side, but where it is extant it is consistent in size with the port side planking. Wood samples taken from hull planking were White Oak (*Quercus alba*).

A metal structure was found amidships on the port side though it is likely not *in situ*: its purpose is unclear. It consists of thin iron and wood rectangular pieces assembled perpendicular to one another and forming a rectangle 5 feet (1.5m) wide and at least 9 feet (2.7m) long. This feature is oriented approximately 8 degrees off level, and plunges into the sediment just starboard of the center of the vessel. Much of it is likely buried in the sediment. Its relative location to the brick feature described below may suggest that this composite structure was a bedding element for the vessel's machinery, but without further excavation and examination it is impossible to state conclusively.

A brick and concrete structure is located amidships approximately 40 feet (12.19m) aft from the stem. This feature consists of four walls forming an uneven box structure. One wall is comprised of fire bricks made of yellow clay, each 2 inches by 4 inches by 8 inches (5.08 by 10.16 by 20.32cm) in size, with no mortar holding them together, standing 8 to 10 inches (20.3 to 25.4cm) off the bottom. The other three walls are made of concrete, measuring 10 inches (25.4cm) wide and coming 11 inches (27.9cm) off the bottom sediment. Six vertically oriented planks are outboard of the starboard longitudinal wall. While the original purpose of this feature cannot be verified conclusively from the fragmentary evidence, its centralized location in the hull, and the use of fire bricks in its construction, suggest that this is the location of the firebox for this vessel's steam power plant.

Stern

The remains of A2-1's stern assembly consist of a jumble of components including: the drive shaft, rudderpost, rudder, and steering cable and a number of disarticulated timbers.

The exposed portion of the drive shaft housing is located 9 feet (2.7m) forward of the rudderpost. The visible section stretches 24 inches (0.6 m) and consists of circular iron fittings 10 to 12 inches (25.4 to 30.5cm) in diameter.

A significant portion of the stern assembly is present on site, but it is canted forward approximately 35 degrees and jumbled with steering cable, stray planking, and other small construction fragments. The 8 inch (20.3 cm) diameter iron rudderpost is visible from the jumble, at a height of 4 foot 6 inches (1.4m) off the lake bottom (Figure 41). A portion of the wire rope steering cable is wrapped around the assembly and steering cog, and more coils of wire rope are visible farther forward (Figure 42). Half of the iron rudder is visible above the sediment, extending perpendicular from the rudderpost 46 inches (116.0cm), and measuring 60 inches (152.4cm) long. The deadwood remains extend forward from the rudderpost another 24 inches (61.0cm) before plunging into the sediment. Also present in this stern jumble is an iron towing bit that is 8 inches (20.3 cm) in diameter.

Figure 41: Top of rudder post in stern of A2-1 (LCMM Collection).

Figure 42: Metal cable (right) lay in a jumble at the stern of A2-1 (LCMM Collection).

Conclusion

A2-1 likely represents the remains of the bottom hull of a wooden steam-powered tugboat or launch. It is uncertain whether the vessel was intentionally scuttled, or whether it struck the submerged Salina Pier and sank. The vessel is stripped of all valuable machinery and cargo, which may have happened prior to its scuttling; or after its accidental sinking. The shallow water in this area would have made equipment salvage possible. The environmental conditions have accelerated the deterioration of exposed or near-surface elements such as decking, and runoff from nearby Lee Creek have buried much of the vessel in sediment.

The condition of the remains prohibits a conclusive determination of vessel type, though it was certainly powered by steam. Despite extensive archival research, no historic accounts of this vessel or its deposition have been found that would offer clues to its identity. The vessel construction likely dates to the late-nineteenth or early twentieth century. Due to the site’s historic nature, and its location in the proposed Syracuse Maritime Historic District, it was deemed to likely be a contributing property and therefore eligible for the NRHP.

ANOMALY 2-2: CANAL PACKET

Anomaly 2-2 Summary Table	
Anomaly Identification	Canal Packet, NY Site Number 06740.013168
Remedial Impact	Cap
NRHP Eligibility Recommendation	Eligible as Contributing Property to Syracuse Maritime Historic District
Dataset	
Side Scan (2005)	Yes
Magnetometer (2005)	Yes
Side Scan (2010)	No
Sector Scan (2010)	No
ROV Video Footage (2010)	No
Diver Observations	9-10/2012: 6 dives, 10 hours bottom time
Diver Videography	Yes
Maps/Charts	No
Aerial Imagery	No
Historic Accounts	Yes

Introduction

A2-2 is believed to be the remains of a late nineteenth century canal packet boat, although this identification is based upon only fragmentary evidence. The site rests in 8 to 10 feet (2.4 to 3.0m) of water, abutting site A2-3 and 30 feet (9.1 m) north of Salina Pier (A1/2). The site was found in September 2012 during a visual survey of the bottomlands surrounding the pier. The remains were scarcely visible amongst a dense growth of aquatic vegetation, particularly Eurasian watermilfoil (*Myriophyllum spicatum*). The majority of the boat's structure was buried below a layer of Solvay waste. The exposed remains consisted of bow framing, parts of the port and starboard sides and the stern (Figure 43).

The site's identification as a canal packet boat is based upon its hull structure and the incongruity of its length and beam measurements relative to the dimensions of the canal locks. The vessel has many characteristics of a typical cargo carrying canal boat such as vertical sides, a bluff vertical bow and a scow-shaped stern, however, its 80 feet 4 inch (24.5m) length and 15 feet 4 inch (4.7m) beam do not meet the dimensions of the canal locks. Freight carrying canal boats are built according to the dimensions of the canal locks to maximize cargo capacity. A2-2 would have been too large for the 1825 to 1861 canal locks, and undersized for those that existed between 1862 and 1915. This discrepancy is plausible for a canal packet where the transportation of passengers did not require the vessel to be built to the maximum possible size. Conclusive identification of the vessel type would require a level of excavation which was not possible within the constraints of imposed by Onondaga Lake working environment.

The absence of machinery and cargo, and its proximity to other abandoned boats indicates the vessel was intentionally disposed of at the end of its working life.

The Phase 1B report did not include site A2-2, as it had not been located at the time of that report's production. However, due to the site's location in the proposed Syracuse Maritime Historic District, it was deemed to likely be a contributing property and therefore eligible for the NRHP. The Onondaga Lake clean-up design for the area of A2-2 is for capping, which, based upon the analysis of other nearby sites, was presumed to have an adverse effect. That field analysis lead to the inclusion of site A2-2 in the Phase 3 field work despite its absence from LCMM's Onondaga Lake Archaeological Mitigation Plan.

In September 2012, Phase 3 underwater archaeological documentation was undertaken which included direct diver measurements, videography and wood samples (25). The 2012 field effort required 6 dives, totaling 10 hours of diver bottom time. Study of vessel was limited to the remains exposed above the lakebed due to the potentially contaminated nature of the sediments. Documentation conditions were fair to poor, with underwater visibilities of 4 to 8 feet (1.2 to 2.4m) and significant aquatic vegetation.

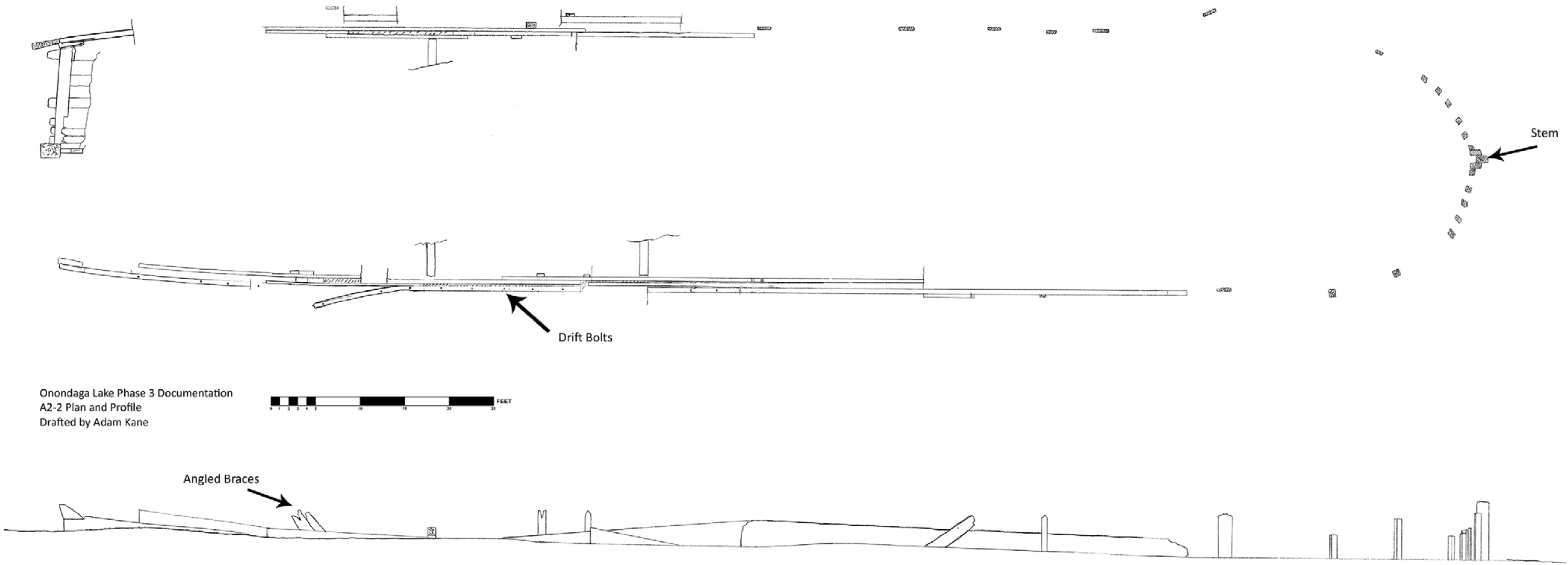

Figure 43: Plan and profile views of A2-2 (LCMM Collection).

Site Description

The visible remains of A2-2 represent only 5 to 10% of the boat's original structure, which has resulted in only a fragmentary understanding of the site (Figure 43). Although little of the site is visible, perhaps 50% of the boat's original structure is still present below a layer of loosely packed Solvay waste and coal ash. Due to the potential contaminates in the lake bottom sediments, these buried portions of the site were not investigated. The visible remains are 80 feet 4 inches (24.5m) in length and 15 feet 4 inches (4.7m) in beam.

A2-2 lies in 8 to 10 feet (2.4 to 3.0m) of water in the southeastern corner of Onondaga Lake. The natural and cultural processes at this location have been a significant factor in its state of preservation. The site is deep enough so that it has not been subject to ice action; however, wave action and biological growth have been factors. This southeastern portion of the lake is subject to wave action due to the 4.5 miles (7.2km) of fetch which unfold to the northwest. The site is deep enough to avoid direct wave action, however, there is commonly water movement created by wave shoaling. Additionally, annual aquatic vegetation growth and die-off is another means of mechanical degradation to the site. Despite the sparse visible remains, however, it is reasonable to presume that the buried portion of the site is in excellent condition.

Bow

A2-2's most prominent remains are the stem and bow framing which stand 1½ feet to 3 feet 2 inches (0.5m to 1.0m) above the lake bottom (Figure 44). The shape of the bow is delineated by the stem and the rounded arc of bow frames which radiate from it, all of which are hewn from white oak (*Quercus alba*). All of the bow components stand their full original height.

The stem is a composite structure of three timbers. The main stem is 6½ inches (16.5cm) moulded and 4 inches (10.1cm) sided, and rises 38 inches (96.5cm) above the lake bottom. The side stems, which are fastened to the port and starboard sides of the main stem and recessed from its forward face, are 5½ inches (14.0cm) moulded and 3 inches (7.6cm) sided and stand 31 inches (78.7cm) above the lake bottom. The visible portions of the composite stem are oriented vertically.

The trapezoidially shaped bow frames radiate port and starboard from the stem with their heights relative to the stem descending moving aft. The frames are 3 to 4 inches moulded (7.6 to 10.1cm) and 2 to 3 inches (5.1 to 7.6cm) sided. The visible portions are oriented vertically. The heights of the frame tops above the bottom decrease from 21½ inches (54.6cm) adjacent to the stem to 16 inches (40.6cm) moving aft as the bow frames meet the side of the hull. This decreasing height from forward to aft creates the upward sheer of the bow. The first frames are fastened directly to the port and starboard sides of the composite stem. The sides of the stem appear to lack a rabbet; this feature is created by the forward face of the first bow frames.

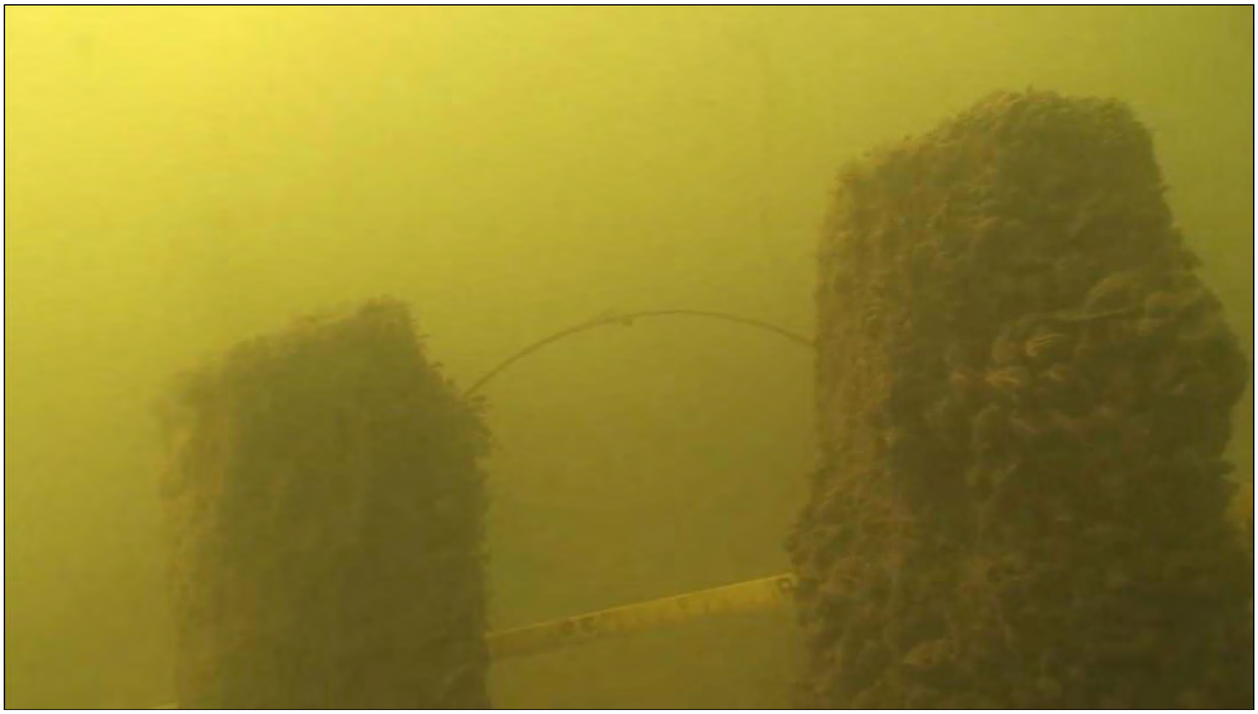

Figure 44: Bow frames characterize the bow of A2-2 (LCMM Collection).

Sides

The exposed remains of A2-2's sides were in some locations preserved up to just below deck level, although the visible remains were generally in poor condition and modest in extent. The starboard side had more structure exposed, therefore, documentation focused on that side.

A2-2's starboard side is edge-fastened. In this construction technique the slab sides of the hull are built of thick planks which are fastened together by vertically driven bolts. This construction technique creates a rigid hull using a minimum of lumber. A2-2's sides were built of 3 to 4 inch (7.6 to 10.2cm) thick hard pine planks fastened together by iron drift bolts placed every 1 to 2 feet (0.3 to 0.6m). In general, only the upper face of this timber was exposed above the lake sediments, which greatly limited the data available for recordation.

The interior of the hull's edge-fastened plank was fitted with an array of poorly preserved ceiling, trusses, and for lack of a better term, futtocks. The ceiling and trusses were of Hard Pine (Southern Yellow pine), while the futtocks were of birch. These timbers combined to create a laminated hull which bears little resemblance to the traditional caravel-type boat building techniques where planking and ceiling are fastened to framing.

The typical cross-section of the starboard side starting from outboard included the 3 to 4 inch thick edge fastened plank, a 1½ to 2 inch (3.8 to 5.1cm) wide futtock, two overlapping layers of 2 inch (5.1cm) thick angled truss planks, and vertically oriented framing planks on the interior. The resulting laminated hull structure is approximately 10 to 12 inches (25.4 to 30.5cm) thick. This unusual construction technique, particularly the overlapping trusses, may be the result of repair activities.

Although most of the hull was devoid of visible structural features, there were a series of three angled braces (Figure 45). These members were transversely oriented hard pine timbers that spanned from the side of the hull down into the sediment toward the boat's centerline. These braces are 5 inches (12.7cm) moulded and sided, and oriented downward at a 20° to 29° angle. Initially, these timbers were thought to be broken deck beams oriented downward toward the middle of the hull; however, their uniformity suggests that they are intact structural features designed to tie the side of the hull to the bottom similar to a standing knee.

Figure 45: One of three angled braces in A2-2 which provide structural support, similar to the function of a standing knee (LCMM Collection)

Stern

A2-2's scow-shaped stern is poorly preserved and largely buried. The assembly consists of a sternpost with transversely oriented framing and longitudinal planking and ceiling. The white oak sternpost is vertically oriented and stands 18 inches (45.7cm) above the bottom. In plan view the sternpost is 9 inches (22.9cm) sided and 12 inches (30.5cm) moulded. The post's after edge has a rabbet for accepting the stern planking. On the interior the sternpost is held in place by 3 inch (7.6cm) wide white oak stern knee.

The uppermost white oak (*Quercus alba*) stern frame was visible; it is 2½ inches (6.4cm) sided and 7½ (19.1cm) inches moulded. The 2 inch (5.1cm) thick longitudinally oriented white oak planking is fastened to the outboard face of the frame, while the longitudinally oriented 1 inch (2.5cm) thick ceiling is fastened to the interior. Although little ceiling and planking was visible, the rabbet on the sternpost a rounded but swift transition from the boat's horizontal underside to its vertical stern.

Conclusion

The archaeological evidence indicates that A2-2 was disposed of at the end of its working life. This conclusion is based upon the absence of cargo or other artifactual remains and its proximity to other scuttled boats.

Due to the paucity of exposed structural remains, it is not possible to conclusively identify the vessel type represented by A2-2. However, the hull shape with its bluff bow, vertical sides and scow shaped stern indicate it is a canal boat. The vessel, however, is undersized for the 1862-1915 locks, which is inconsistent with the economics of freight carrying canal boats which dictated that they be built to the maximum dimensions of the canal locks so that they could transport as much cargo as possible. However, canal packets, boats designed to carry passengers rather than cargo, did not have the same maximum size constraints. Therefore, the most likely vessel identification is a canal packet, although excavations well outside the boundaries of this mitigation would be necessary to fully confirm that identification.

ANOMALY 2-3: STEAM EXCURSION VESSEL

Anomaly 2-3 Summary Table	
Anomaly Identification	Steam Excursion Vessel, NY Site Number 06740.013169
Remedial Impact	Cap
NRHP Eligibility Recommendation	Eligible as Contributing Property to Syracuse Maritime Historic District
Dataset	
Side Scan (2005)	No
Magnetometer (2005)	No
Side Scan (2010)	No
Sector Scan (2010)	No
ROV Video Footage (2010)	No
Diver Observations	9/2012: 4 dives, 5.9 hours bottom time
Diver Videography	Yes
Maps/Charts	No
Aerial Imagery	No
Historic Accounts	No

Introduction

A2-3 appears to be the remains of a late nineteenth century steam excursion vessel, although this identification is based on fragmentary evidence (Figure 46). The site rests in 8 to 10 feet (2.4 to 3.0m) of water abutting site A2-2 and is 20 feet (6.1 m) north of Salina Pier (A1/2). The site was discovered in 2012 during the visual survey of the bottomlands surrounding the pier. The remains were barely visible amongst the dense growth of aquatic vegetation, particularly Eurasian watermilfoil (*Myriophyllum spicatum*). A large portion of the vessel remains are buried under sediment, Solvay waste, and piles of bricks and stone in the vessel's hull. The exposed remains consist of a portion of the stern including the end of the keel and keelson, several frames and planks on both port and starboard sides, and a number of frame heads that appear from the Solvay waste.

The site's identification as a steam excursion vessel is based on its hull structure and the presence of fire brick in the central portion of the hull. A2-3 has the long, narrow, lightly-built hull characteristics of a steam excursion vessel. The presence of fire bricks, some still laid in an organized pattern, are indicative of a vessel that had a firebox and operated on steam. Much of the hull's structure is obscured by the lake bottom, and by the piles of rock and brick found within the remains; conclusive identification of the vessel type would require a level of excavation not possible within the constraints of the Onondaga Lake working environment.

The absence of machinery or artifacts and the site's proximity to other abandoned vessels indicate that the vessel was intentionally disposed of at the end of its working life. Charring was noted on a number of the wreck timbers; this may indicate that the vessel was damaged by fire before it was abandoned, or that it was burned as a method of disposal.

The Phase 1B archaeological report did not include site A2-3, as it had not been located at the time of that report's production. However due to the site's location in the proposed Syracuse Maritime Historic District, it was deemed likely to be a contributing property and therefore eligible for the NRHP. The Onondaga Lake Clean-up design for the area of A2-3 is for capping, which, based upon the analysis of other nearby sites, was presumed to have an adverse effect. That field analysis lead to the inclusion of site A2-3 in the Phase 3 field work despite its absence from LCMM's Onondaga Lake Archaeological Mitigation Plan.

In September 2012, Phase 3 underwater documentation was undertaken which included direct diver measurements, videography and wood samples (14). The 2012 field effort required 4 dives, totaling 5.9 hours of bottom time. Study of the vessel was limited to the remains exposed above the lakebed due to the potentially contaminated nature of the sediments. Documentation conditions were fair to poor, with underwater visibilities of 4 to 8 feet (1.2 to 2.4m) and significant and dense aquatic vegetation.

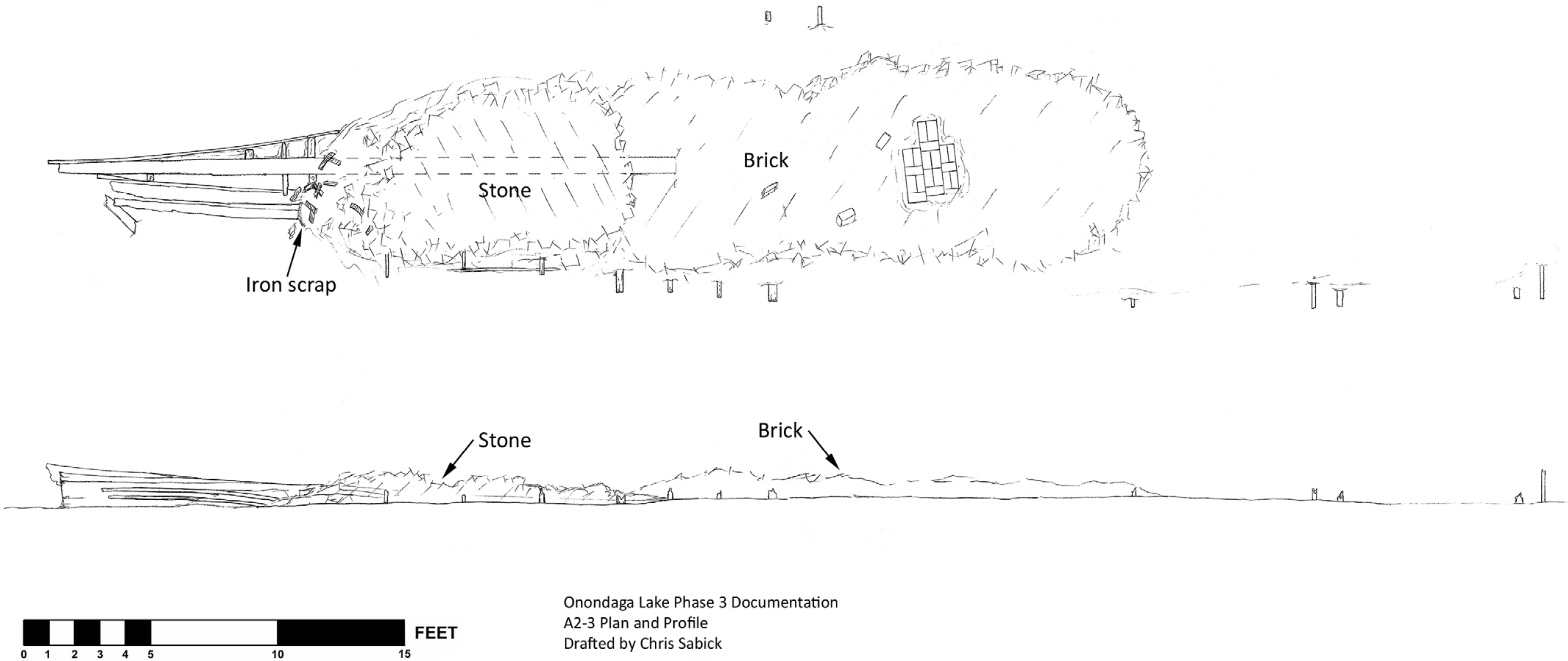

Figure 46: Plan and sectional views of A2-3 (LCMM Collection).

Site Description

The visible remains of A2-3 represent a very small portion of the vessel's original structure, perhaps 5-10% (Figure 46). This has resulted in a fragmentary understanding of the site. Substantial portions of the vessel are buried under the lake sediment and debris in the hull. Due to the potential contaminants in the bottom sediment, these buried portions were not investigated. The visible remains are 24 feet (7.3 m) in length and have a maximum width of 12 feet 9 inches (3.9 m), though frame heads are noted for a length of 43 feet (13.1m). The remains of the abutting site A2-2 obscure the remainder of A2-3.

A2-3 lies in 8 to 10 feet (2.4 to 3.0m) of water in the southeastern corner of Onondaga Lake. The natural and cultural processes at this location have been a significant factor in its state of preservation. The site is deep enough so that it has not been subject to ice action; however, wave action and biological growth have been factors. This southeastern portion of the lake is subject to wave action due to the 4.5 miles (7.2km) of fetch which unfold to the northwest. The site is deep enough to avoid direct wave action, however, there is commonly water movement created by wave shoaling. Additionally, annual aquatic vegetation growth and die-off is another means of mechanical degradation to the site. Despite the sparse visible remains, however, it is reasonable to presume that the buried portion of the site is in excellent condition.

Keel and Keelson

The central structural timbers of the exposed stern section of site A2-3 are its keel and keelson. Only a small portion of the keel is visible. It is mostly obscured by the keelson, hull planking, and the lake bottom sediments. The exposed portion is 12 inches (30.5cm) moulded and 6 inches (15.2cm) sided at the stern end, though presumably the sided dimension swells to approximately 8 inches (20.3cm) similar to that of the keelson. At the stern the keelson, constructed of white cedar, is also sided 6 inches (15.2cm) but swells to 8 inches (20.3cm) 2 feet (0.6m) forward of that and it retains this dimension for its remaining exposed length. The keelson extends forward and remains visible until it disappears under the lake bottom sediments 24 feet (7.3m) forward of the stern. It was noted that the last 2 feet (0.6m) of exposed keelson show evidence of extensive charring on it upper surface (Figure 47).

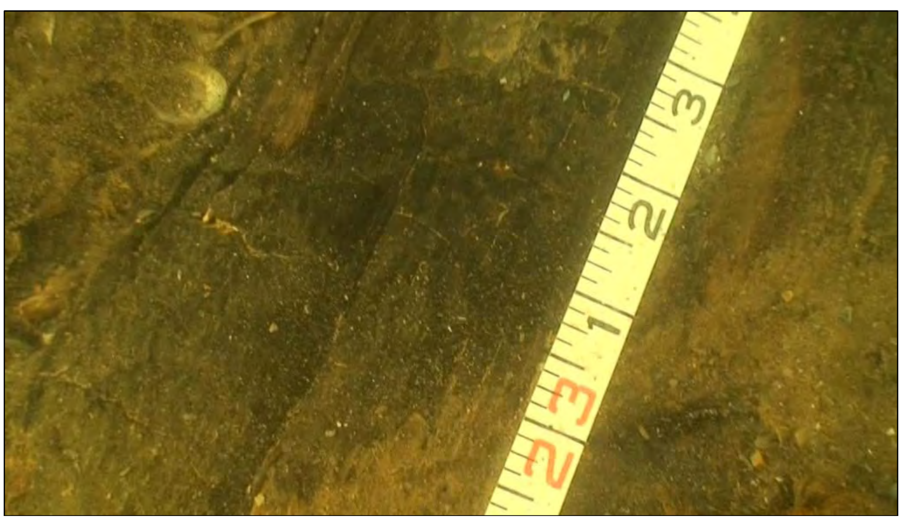

Figure 47: Evidence of charring was visible on the keelson of A2-3 (LCMM Collection).

Floors and Frames
Evidence of seventeen frames is visible along the length of the site; frame samples consisted of white cedar or white oak (*Quercus alba*). In the stern these frames are visible along the sides of the keelson and in relation to the exposed hull planking. However, forward of the Frame D (10 feet [3.0m] forward of the stern) the majority of the sited structure is obscured by piles of debris and bottom sediment. Evidence of the remaining frames (E through P) consists of the outboard end of the frame poking through the fill inside the wreck or the lake bottom sediments. The spacing of the extant frames does not seem to display a rigid pattern. In the stern the frame locations are 1 foot (0.3m) apart, forward of this the spacing increases to 2 to 3 feet (0.6 to 0.9m) between frames. This spacing seems quite large and likely indicates that there are frames that are no longer extant or visible which may fill these wide gaps. The dimensions of the frame timbers also vary widely. In the stern the frames are nearly square in section with a moulded dimension of 3½ inches (8.9cm) and a sided dimension of 2½ inches (6.4cm). Forward of this the frames grow taller with a moulded dimension between 3½ inches (8.9cm) and 5 inches (12.7cm) and sided dimensions of between 2 inches (5.1cm) and 3½ inches (8.9cm). The reasoning for this difference in size is not evident from the exposed remains.

Hull Planking
The hull planking is poorly preserved on site A2-3. On the port side only the garboard strake remains and it only extends for 11 feet 6 inches (3.5m) before disappearing under lake bottom sediment and fill. The port side garboard is 8 inches (20.3cm) wide and 1½ inches thick (3.8cm), and made of birch. Planking on the starboard side is slightly better preserved with extant remains of three planks; wood samples taken indicate white oak (*Quercus alba*). Mirroring the port side the garboard strake is 6 inches (15.2cm) wide and 1½ inches (3.8cm) thick. Plank 1 is also 6 inches (15.2cm) wide but only 1 inch (2.5 cm) thick. Plank 2 is less well preserved but it appears to have been only 4 inches (10 cm) wide and 1 inch (2.5 cm) thick. Planks 1 and 2 are splayed out and no longer in their original positions, they are both exposed for a length of approximately 7 feet (2.1m) before being obscured by fill and bottom sediments.

Other Site Features
The majority of the hull remains of A2-3 are obscured by large quantities of debris, stone, brick and sediment. Several dozen fragments of iron were discovered 6 feet (1.8m) forward of the stern. These ½ inch (1.3cm) thick pieces, which are 4 inches (10cm) wide and 8 to 12 inches (20.3 to 30.5cm) long, are found lying on the hull planking and keelson. Forward of this the debris transitions to mostly stone cobbles mixed with lake sediments. The stone deposit extends forward for approximately 11 feet (3.4m) at which point the fill again transitions, this time to a mix of red construction bricks and light yellow fire brick. The brick deposit extends forward for another 19 feet (5.8m) before becoming completely covered with sediment 43 feet (13.1m) forward of the stern. Beyond this point scattered bricks were found but sediment was the principal fill type. At one location approximately 35 feet (10.7m) forward of the stern there is a layer of nineteen fire bricks that are arranged in an organized fashion (Figure 48). This small feature may represent the location of the vessel's firebox or other machinery related to the steam engine that needed to be insulated to protect the wooden timbers of the hull structure. However, as this pattern is not noted elsewhere above the sediment, it is impossible to verify its purpose within the scope of this mitigation project.

Figure 48: Approximately 35 feet forward of the stern appears a layer of neatly arranged fire bricks (LCMM Collection).

Conclusion

The archaeological evidence indicates that A2-3 was disposed of at the end of its working life. This conclusion is based upon the absence of cargo or other artifactual remains and its proximity to other scuttled boats.

Due to the paucity of exposed structural remains, it is not possible to conclusively identify the vessel type represented by A2-3. However, the vessel's narrow hull shape and light construction, as well as the evidence suggesting the presence of a steam engine, indicate it is most likely a steam excursion vessel. These types of vessels were built for transporting people, so they could be built more lightly and with a narrower beam than those carrying heavy cargo; this allowed them to travel more efficiently through the water. However, this identification cannot be confirmed without extensive excavation of the buried portions of A2-3, which is well outside the scope of this mitigation.

ANOMALY 2-4: BARGE TIMBERS

Anomaly 2-4 Barge Timbers	
Anomaly Identification	Barge Timber , NY Site Number 06740.013170
Remedial Impact	Cap
NRHP Eligibility Recommendation	Eligible as Contributing Property to Syracuse Maritime Historic District
Dataset	
Side Scan (2005)	No
Magnetometer (2005)	No
Side Scan (2010)	No
Sector Scan (2010)	No
ROV Video Footage (2010)	No
Diver Observations	9/2012: 4 dives, 3.7 hours bottom time
Diver Videography	Yes
Maps/Charts	No
Aerial Imagery	No
Historic Accounts	No

Introduction

A2-4 is believed to be the fragmentary remains of a barge, although this identification is based upon minimal evidence (Figure 49). The site rests in 4 to 5 feet (1.2 to 1.5m) of water in close proximity to Salina Pier (A1/2) and a nearby barge wreck (A3). The site was found in September 2012 during a visual survey of the bottomlands surrounding the pier. The remains were scarcely visible amongst a dense growth of aquatic vegetation, particularly Eurasian watermilfoil (*Myriophyllum spicatum*). The exposed remains consist of fragments of vessel timbers, probably from a barge.

The site's identification as a barge is based on its construction features, though this assessment is based on only the minimal amount of remains that were located. The timber remains are 31 feet (9.4m) long and consist of two principal structural members fastened together.

The Phase 1B report did not include site A2-4, as it had not been located at the time of that report's production. However, due to the site's location in the proposed Syracuse Maritime Historic District, it was deemed to likely be a contributing property and therefore eligible for the NRHP. The Onondaga Lake clean-up design for the area of A2-4 is for capping, which, based upon the analysis of other nearby sites, was presumed to have an adverse effect. That field analysis led to the inclusion of site A2-4 in the Phase 3 field work despite its absence from LCMM's *Onondaga Lake Archaeological Mitigation Plan*.

In September 2012, Phase 3 underwater archaeological documentation was undertaken which included direct diver measurements, videography and wood samples (5). The 2012 field effort required 4 dives, totaling 3.7 hours of diver bottom time. Study of the vessel fragment was limited to the remains exposed above the lakebed due to the potentially contaminated nature of the sediments. Documentation conditions were fair to poor, with underwater visibilities of 2 to 4 feet (0.6 to 1.2m) and significant aquatic vegetation.

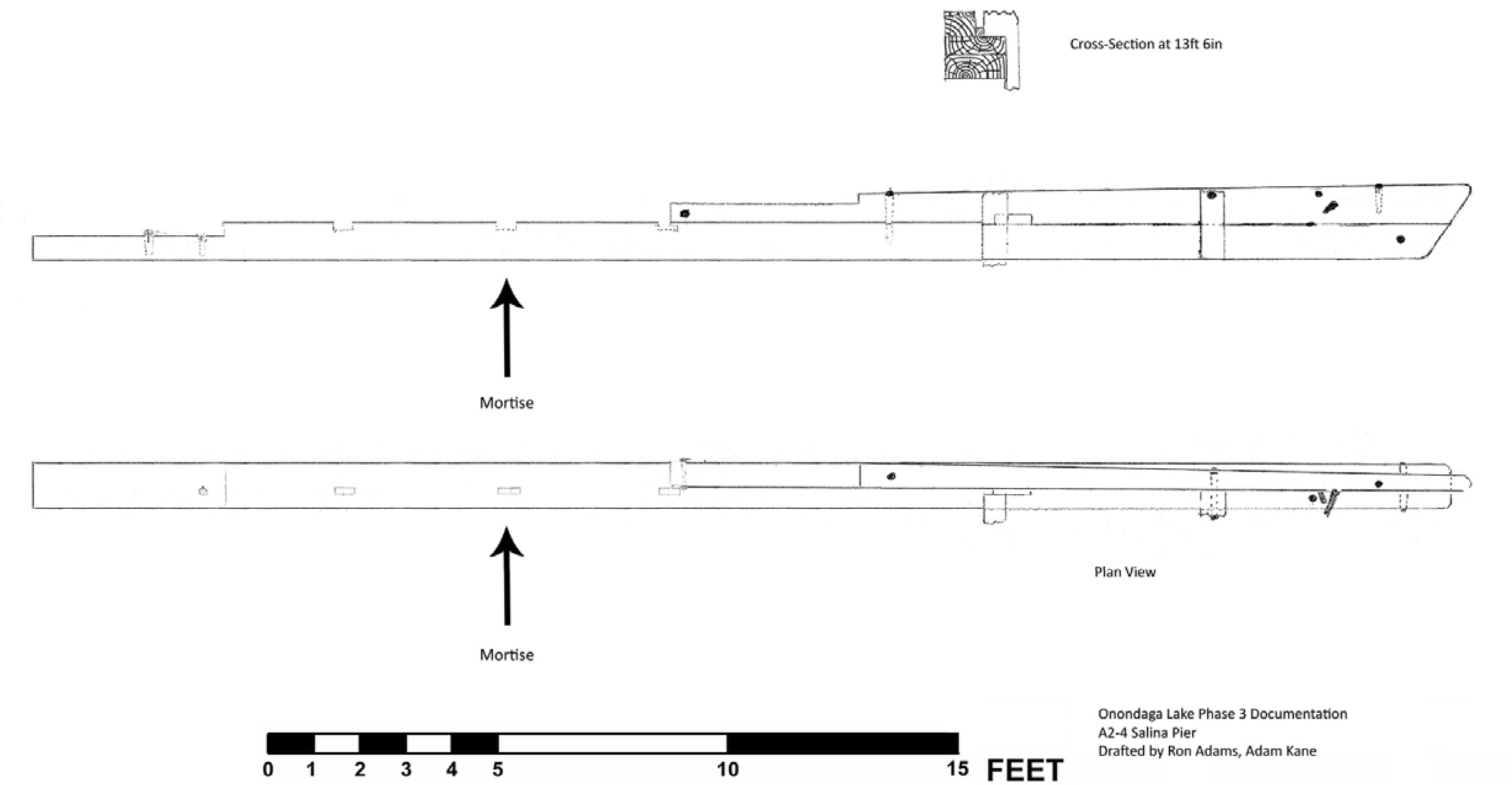

Figure 49: Plan and sectional views of A2-4 (LCMM Collection).

Site Description
The visible remains of A2-4 appear to be a portion of side structure from a work barge (Figure 49). The fragment is made up of two principal timbers, the largest of which is 30 feet 6 inches (9.3m) long, moulded 11 inches (27.9cm) and sided 12 inches (30.5cm). This timber has three 6 inch (15.2cm) long and 2 inch (5.1cm) wide mortises cut into it upper surface (Figure 50). A second timber is attached to the top of the larger structural element; it continues for 17 feet 3 inches (5.3m) before ending in an angled cut like the timber below it. The second timber is considerably smaller with a sided dimension of only 6 inches (15.2cm). The two timbers are fastened together with 1 inch (2.5 cm) iron bolts. All wood samples taken indicated Hard pine (Southern yellow pine).

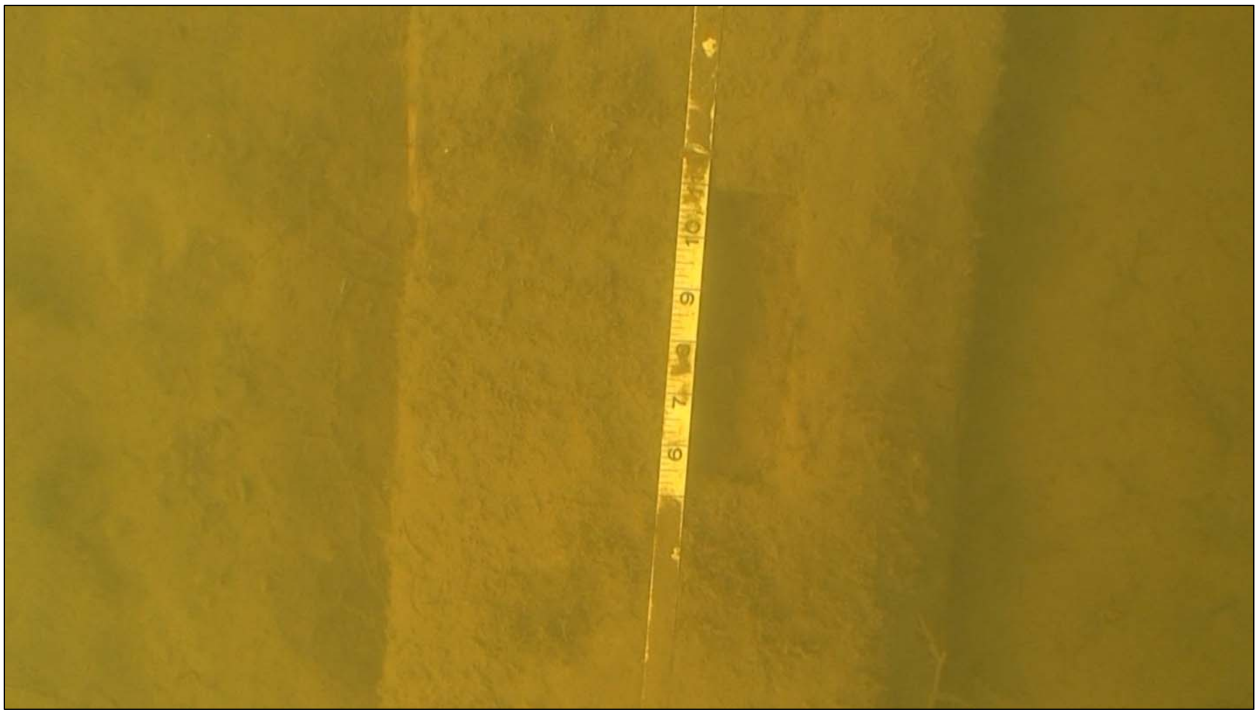
Figure 50: Mortises characterize a timber on A2-4 (LCMM Collection).

Conclusion
The archaeological evidence indicates that A2-4 is fragmentary timbers from a barge. The angled end on these timbers suggests that it came from a scow-ended vessel. The mortises in the upper surface of the principal timber were probably attachment points for the upright frames that supported the sides of the barge. However, this identification is based on a very minimal set of archeological data. Additional portions of this wreckage may be present under the sediments on the lake bottom, but the limitations imposed by working in Onondaga Lake preclude any bottom disturbance that may re-suspend potential contaminants. Site A2-4 may be a component of one of the nearby wrecks, A3 being the most likely candidate, but without additional examination and excavation of both A2-4 and A3 this cannot be conclusively stated.

ANOMALY 4-1: DUMP SCOW

Anomaly 4-1 Summary Table	
Anomaly Identification	Wooden Dump Scow; NY Site Number 06740.012294
Remedial Impact	Cap
NRHP Eligibility Recommendation	Eligible as Contributing Property to Syracuse Maritime Historic District
Anomaly Dataset	
Side Scan (2005)	0308
Magnetometer (2005)	743, 777
Side Scan (2010)	6/3/10
Sector Scan (2010)	6/4/10
ROV Video Footage (2010)	6/9/10
Diver Observations	10/2012: 8 dives totaling 13.1 hours bottom time
Diver Videography	No
Maps/Charts	Yes
Aerial Imagery	Yes
Historic Accounts	No

Introduction

A4-1 is the remains of an early twentieth century dump scow or hopper barge (Figure 51). This identification is based on the extensively preserved timbers of this vessel, which are extant up to deck level, though the deck itself is not present. The site rests in shallow water (3 to 5 feet [0.9 to 1.5m]) just off shore, and in close proximity to A4-2, another barge (**Error! Reference source not found.**Figure 52). The remaining structure of the barge consists of the well-preserved sides, and the internal system of bracing and bulkheads, including the dump bays in the center of the vessel (**Error! Reference source not found.**Figure 53). While the supporting elements of both the bow and stern are present, the planking of these portions of the barge is no longer extant.

The site's identification as a dump scow is based upon its hull structure, in particular the presence of a watertight dump bay in the center section of the vessel. The tall bulkheads which surround this central bay, and the doors that make up its bottom, allowed the scow to deposit large quantities of fill onto the lake bottom simply by opening the bay doors. This type of vessel was particularly useful in the construction of breakwaters, piers, and other in-water infrastructure projects, and also for disposing of dredge spoil or garbage.

The absence of any machinery, and the vessel's proximity to other abandoned vessels, indicate that this vessel was intentionally disposed of at the end of its useful working life.

Scanning sonar imagery was taken in 2010 (**Error! Reference source not found.**Figure 54 and **Error! Reference source not found.**Figure 55). In October 2012, Phase 3 underwater archaeological documentation was undertaken which included direct diver measurements, and wood samples (17). The 2012 field effort required 8 dives, totaling 13.1 hours of diver bottom time. Study of the vessel was limited to the remains exposed above the lakebed due to the potentially contaminated nature of the sediments. Documentation conditions were fair to poor, with underwater visibilities of 1 to 3 feet (0.3 to 0.9m) and significant aquatic vegetation. Videography was not possible on this site due to the extremely limited visibility.

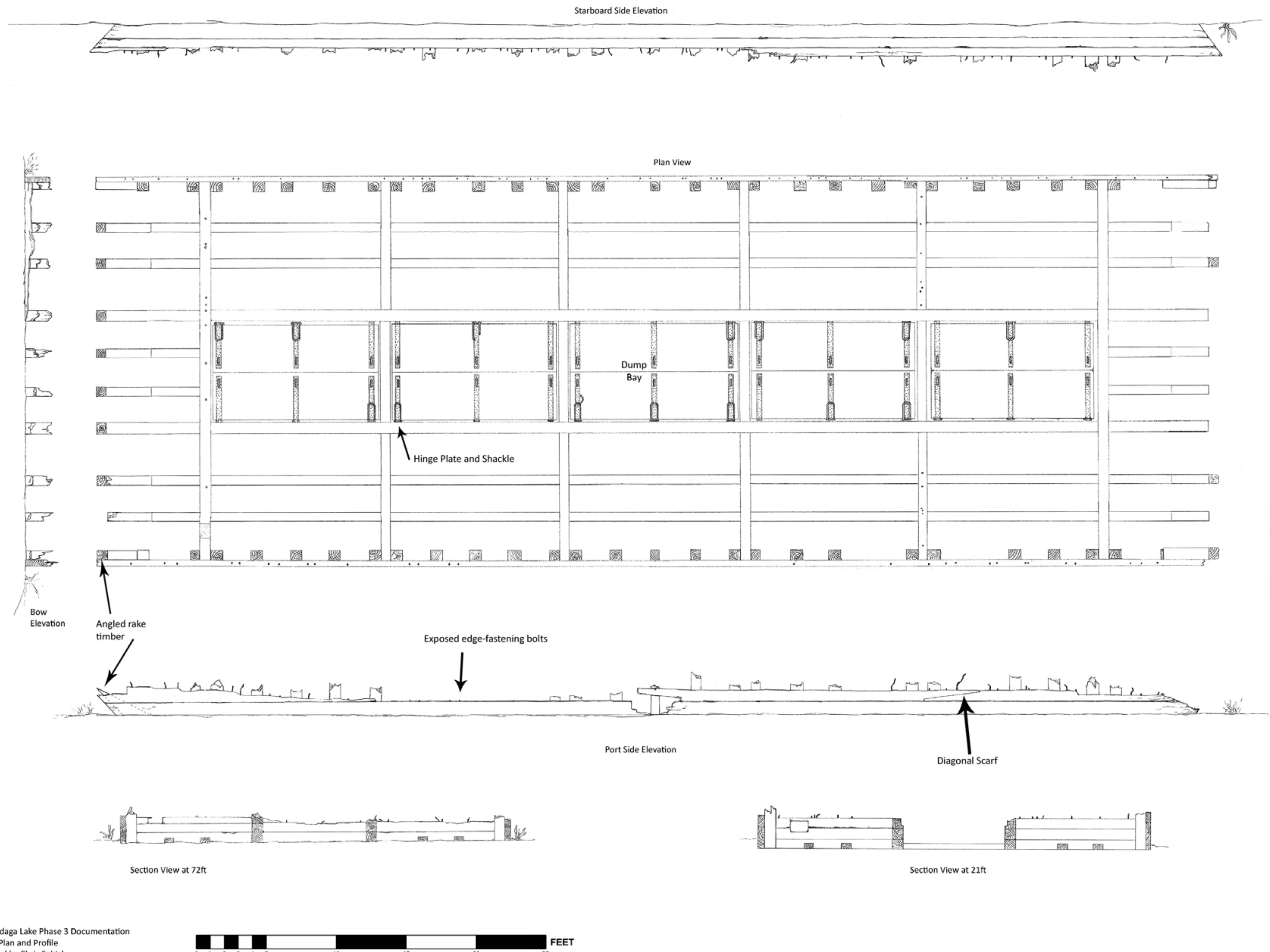

Figure 51: Plan and sectional views of A4-1 (LCMM Collection).

Site Description

The visible remains of A4-1 represent 60-70% of the vessel's original structure. Lake sediments cover the interior and bottom of the vessel obscuring some details of the bottom planking and structure; however this represents a small portion of the overall remains. Due to the potential contaminants in the lake bottom sediments, these buried portions of the site were not investigated. The visible remains are 79 feet 6 inches (24.2m) in length and 28 feet (8.5m) in beam.

A4-1 lies in 3 to 5 feet (0.9 to 1.5m) of water in the southeastern corner of Onondaga Lake. The natural and cultural processes at this location have been a significant factor in its state of preservation. The site is in shallow water and has therefore been subjected to damage from ice and wave action as well as from biological growth on the vessel remains. This southeastern portion of the lake is subject to wave action due to the 4.5 miles (7.2km) of fetch which unfold to the northwest. Direct wave action on the wreck has led to damage occurring on the upper portions of the remains which is exacerbated by impacts from ice flows during the winter months. Additionally, annual aquatic vegetation growth and die-off is another means of mechanical degradation to the site.

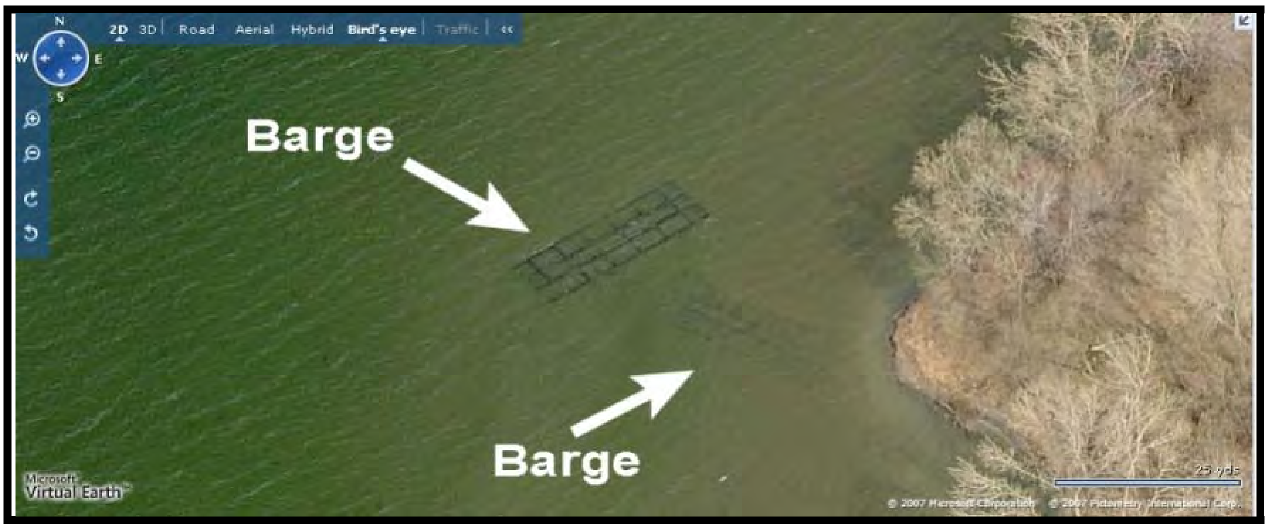

Figure 52: Aerial view showing barges A4-1 (left) and A4-2 (right). (courtesy Microsoft® Virtual Earth).

Figure 53: Photograph of Anomaly A4-1 during a period of excellent underwater visibility (LCMM Collection).

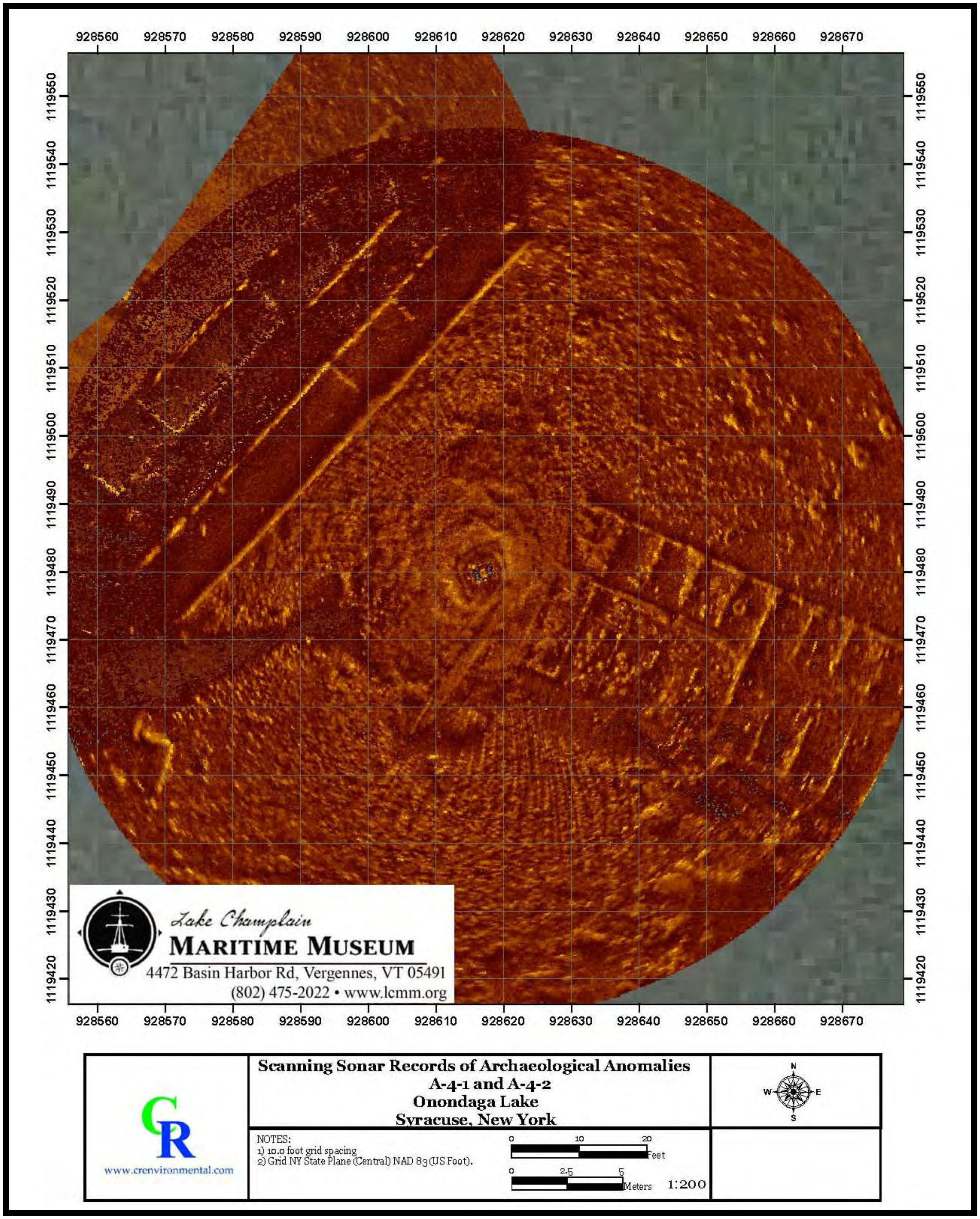

Figure 54: Scanning sonar image showing Anomaly A4-1 (left) and A4-2 (right).

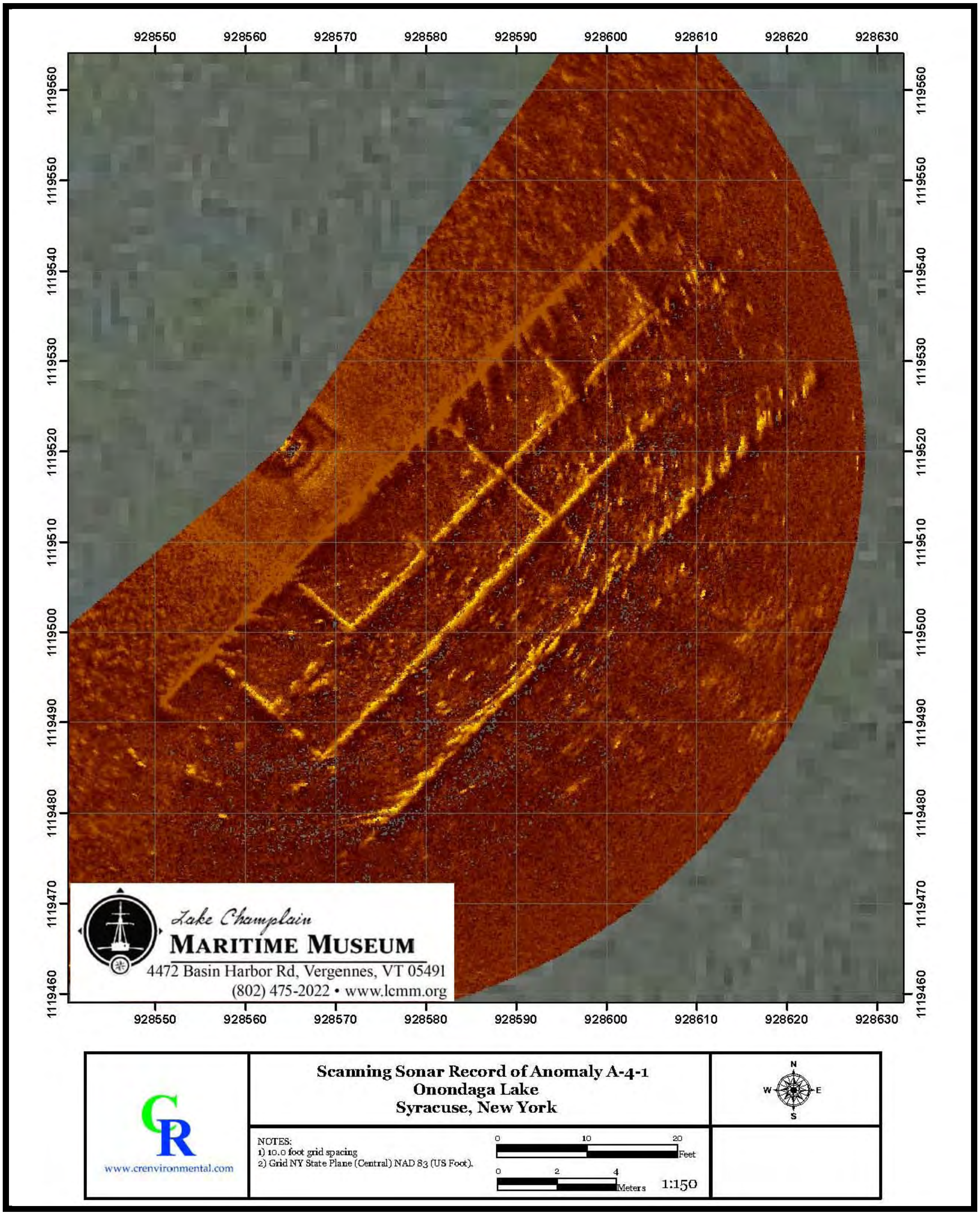

Figure 55: Scanning sonar image showing Anomaly A4-1.

Bow
Due to the identical construction features of both ends of this barge, it is unclear which had served as its bow and stern during the vessel's working life. To avoid confusion during the documentation process the decision was made that the inshore end be designated as the "bow" and the offshore end as the "stern."

The bow of A4-1 is heavily degraded with only the support structure and one plank fragment extant. The bow planking was attached to angled rake timbers which were in turn supported by either the ends of the sides, the two longitudinal bulkheads, or by large triangular chocks. The triangular chocks rest on the top of the end of the four sister keelsons which also run the length of the barge. The only extant evidence of the planking in the bow is a single fragment of the lowest bow plank located on the vessel's starboard corner. This Hard Pine plank fragment is 10 feet 6 inches (3.2m) in length, has a maximum width of 6 inches (15.2cm) and is 4½ inches (11.4cm) thick.

The fragments of nine of the original ten bow rake timbers are extant on the vessel remains. These Hard Pine (Southern yellow pine) timbers are 8 inches (20.3cm) square and originally extended up to deck level; however the documented timbers had been eroded to less than 1 foot (0.3m) in length. The rake timbers that were associated with the sister keelsons were supported by large triangular wooden chocks. These chocks sat atop the forward ends of the sister keelsons and measure 22 inches (55.9cm) on their two short sides and 42 inches (106.7cm) on their hypotenuse, they are made from Hard Pine. The chocks were attached to both the rake timbers and the sister keelsons with 1 inch (2.5cm) diameter iron trough bolts.

Two of the rake timbers were supported by the ends of the longitudinal water tight bulkheads that ran the length of the vessel and defined the dump bay. These bulkheads are composed of stacked 10 inch (25.4cm) square timbers and in the bow the ends are cut to an angle matching that of the triangular chocks found at the other locations.

Stern
The construction of the stern mirrors that of the bow, though less supporting structure is extant and there are no plank fragments present. Only four rake timbers are present and they are highly degraded. The supporting triangular chocks are present and their dimensions are the same as those found in the bow.

Sides
The sides of A4-1 are its most prominent features. Both port and starboard side hull planking is preserved up to the water's surface. On the starboard side there are extensive remains of two strakes and exposed bolts protruding from their upper surfaces suggest at least one more plank was originally present. The remaining planks are 5 inches (12.7cm) thick, made of Hard Pine (Southern yellow pine), and are fastened together internally by 1 inch (2.5cm) iron bolts that were driven vertically through them. This was a common construction technique in the late nineteenth and early twentieth centuries and has become known as "edge fastened construction." Edge fastening bolts were installed in pairs on A4-1, driven through the planking, and located between the upright frames which also provided support to the planking. Each strake is composed of several planks that are fastened together with diagonal scarfs. The ends of the sides are cut to an angle matching that of the rake timbers in both the bow and stern.

The port side planking is nearly identical to that of the starboard side though there is fragmentary evidence of a third strake on the port side. Like the starboard side, there are numerous edge fastening bolts protruding from the top surface of the extant planks suggesting that there had originally been more planking in the past.

Longitudinal Support

The box-like construction of A4-1 was supported by a number of structures on the interior of the hull. In the center of the boat are the two longitudinal bulkheads that define the dump bay. These structures enclose are area 7 feet (2.1m) wide and run the entire length of the vessel. The bulkheads originally extended from the bottom of the boat to the deck level. In conjunction with two athwartships bulkheads, they formed the bay through which material could be dumped. The longitudinal bulkheads are composed of 10 inch (25.4cm) square Hard Pine (Southern yellow pine) timbers that are stacked one atop another and fastened together with vertically driven bolts. In both the bow and the stern these bulkheads also support the rake timbers to which the external planking of the ends was attached.

In addition to the tall longitudinal bulkheads there are also four sister keelsons that run the entire length of the vessel. These are located outboard of the dump bay and unlike the aforementioned bulkheads, these keelsons consist of only a single structural member resting on top of the bottom planking. These timbers are 8 inches (20.3cm) sided and have a moulded dimension greater than 5 inches (12.7cm); the exact moulded dimension could not be ascertained without excavating into the contaminated bottom sediments.

Dump Bay

While the sides of the dump bay are defined by the longitudinal bulkheads, the ends terminate in two transverse bulkheads. These are located approximately 12 feet (3.7m) from either end of the barge and consist of a number of timbers stacked vertically and fastened with 1 inch (2.5cm) bolts. The transverse bulkheads are constructed from Hard Pine (Southern yellow pine), though one timber in the aftermost transverse bulkhead was made from Hemlock, an unusual choice of wood for vessel construction due to its tendency to rot quickly in damp environments. The bottom of the dump bay consists of five pairs of hinged white oak (*Quercus alba*) doors that fit between the athwartships floors making each bay 12 feet (3.7m) long and 7 feet (2.1m) wide.

Each pair of doors in a bay was connected to the longitudinal bulkheads by three hinges. These hinges are still extant and are evidenced by large iron hinge plates spaced along the length of each door, one near either end and one in the middle. On the hinge end of each plate there is a large iron shackle that measures 6 inches (15.2cm) wide and 17 inches (43.2cm) long. Several of these shackles have a short length of chain attached to them. On the inboard end of each hinge plate is located a substantial U-bolt which was presumably part of the mechanism for holding the doors closed when loaded. The timbers of each dump door are made of white oak (*Quercus alba*) 5 inches (12.7m) thick.

It is not readily apparent from the extant remains how the dump bay doors were opened, or how they were held closed when not in use. Research into other vessels of this type revealed a description of how this was achieved on a hopper barge built in 1927:

> The hatch is closed by a pair of timber doors. The doors are closed by chain bridles attached to single chains passing over sheaves on forward and aft bulkheads. These chains are in turn attached to cables on moving sheaves. The cables are taken in or released by turning a continuous shaft running along the top

> of the hatch coaming on one side. The shaft, probably operated by hand, closed the doors once the contents of the hopper had been dumped.[131]

From the fragmentary evidence available it is impossible to conclude if this was the same system that was employed on A4-1.

Conclusion

The identification of A4-1 as a dump scow is strongly supported the visible extant vessel remains. The vessel type and the types of fasteners and other hardware that were found on site suggest that this vessel was built and operated in the early twentieth century. It was most likely used in the construction of in-water infrastructure projects in the Onondaga Lake area. The archaeological evidence indicates that A4-1 was disposed of at the end of its working life, based upon the absence of machinery or other artifactual remains and its proximity to other scuttled boats.

ANOMALY 7: PILING CLUMPS

Anomaly 7 Summary Table	
Anomaly Identification	Piling Clumps; NY Site Number 06740.012295
Remedial Impact	Dredging and Capping
NRHP Eligibility Recommendation	Eligible as Contributing Property to Syracuse Maritime Historic District
Anomaly Dataset	
Side Scan (2005)	130, 169, 150, 191, 202
Magnetometer (2005)	819, 795, 220, 809, 794, 731
Side Scan (2010)	6/3/10
Sector Scan (2010)	6/5/10
ROV Video Footage (2010)	None
Diver Observations	No
Diver Videography	No
Maps/Charts	Yes
Aerial Imagery	Yes
Historic Accounts	No

Introduction

A7 is a series of eight piling clumps marking the entrance into Syracuse's Inner Harbor. The clumps consist of between three and eleven pilings driven into the lakebed and held together with cables or iron bands. The clumps are visible above the surface, and were previously documented with side scan sonar and sector scan sonar (Figure 56), and can be seen in modern aerial photographs (Figure 57).

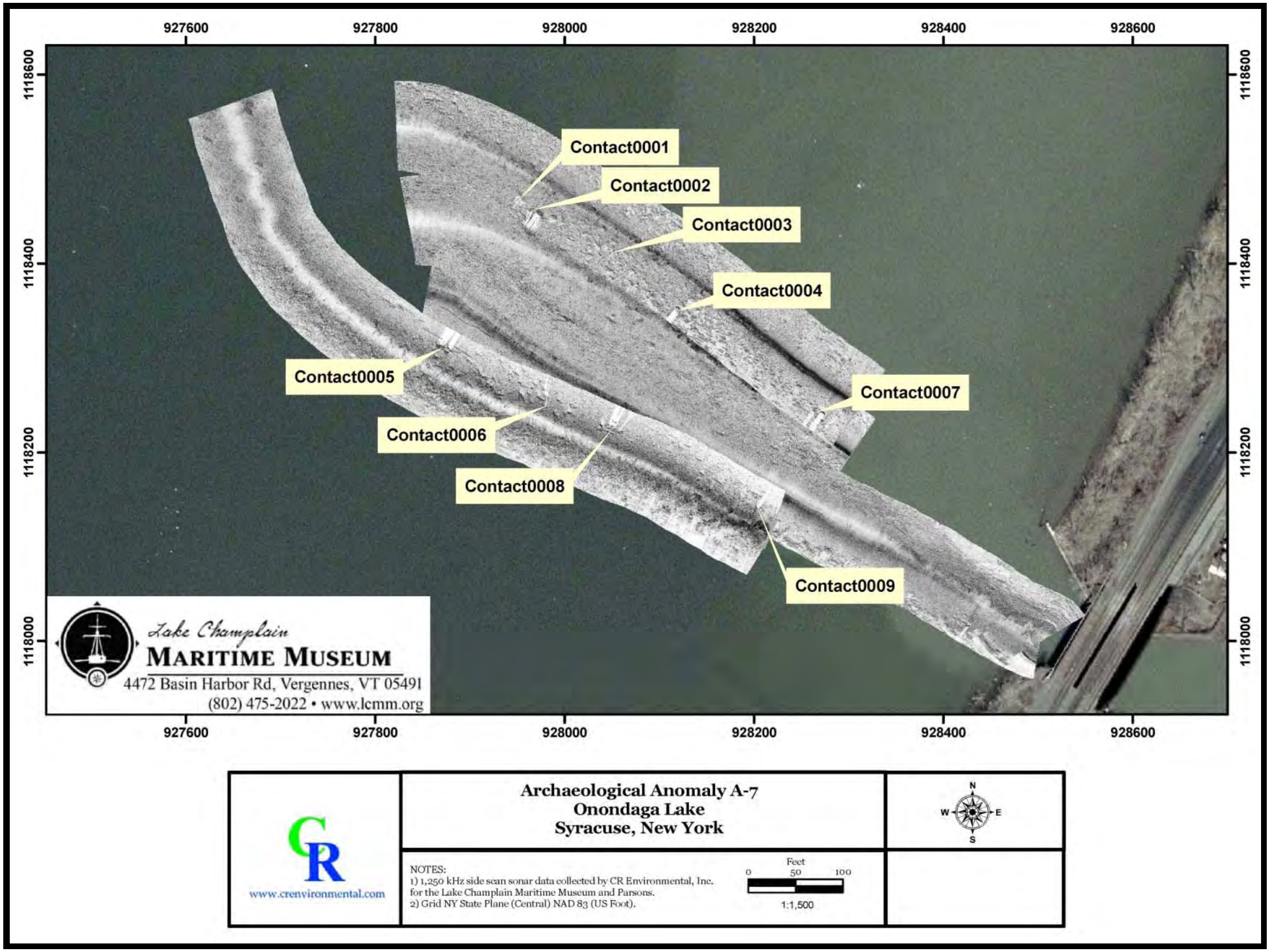

Figure 56: Side scan sonar mosaic of A7.

Analysis of historic navigational charts suggests that this channel was first marked with two lighted aids to navigation between 1915 and 1926, and an additional set of piling clumps was installed between 1937 and 1942.[132] The 1952 navigational chart shows four piling clumps; however, modern charts show the eight that currently exist.

Anomaly A7 was photodocumented during this Phase 3 fieldwork in May 2013 according to the NRHP Photo Policy[133].

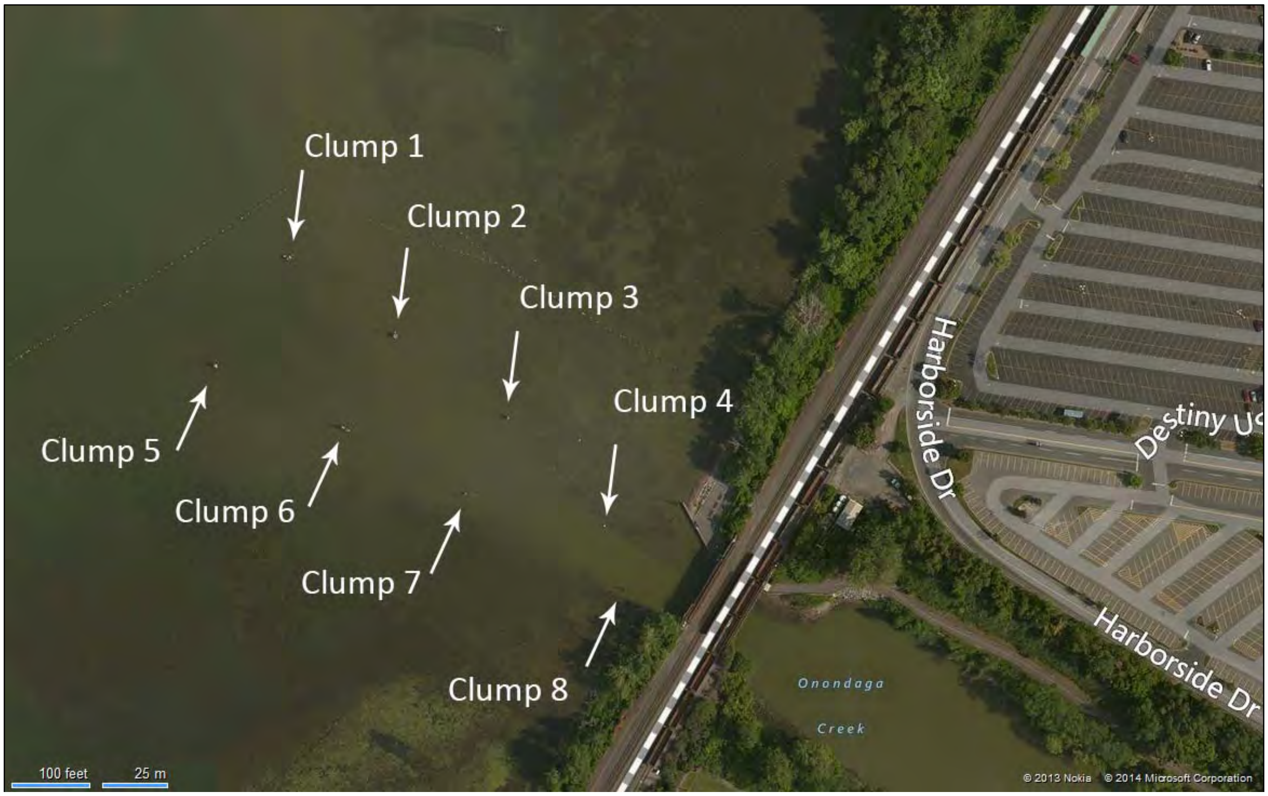

Figure 57: Aerial photograph showing A7 piling clumps 1 - 8 (courtesy Bing Maps, Microsoft® Corporation).

Site Description

A7 is a series of eight piling clumps marking the entrance into Syracuse's Inner Harbor, which can be seen in aerial photography (Figure 57). A wood sample was taken from each piling clump, and each was Hard Pine (Southern Yellow pine) (Figure 58).

Figure 58: LCMM researchers take wood samples at A7 using chisel (left) and drill (right) (LCMM Collection).

Clump 1: Clump 1 consists of ten pilings, most of which are tilted over into the channel. The clump has a green box, possibly for a battery. Two of the pilings are significantly taller than the others, and are bound together with cable (Figure 59 and Figure 60).

Clump 2: Clump 2 consists of ten pilings, seven of which are low, two of medium height, and one of which is significantly taller than the rest and which contains an electrical connection. At one time a cable connected them; it is now broken. There is a metal plate that may have held a box similar to the one on clump 5 (Figure 61 and Figure 62).

Clump 3: Clump 3 consists of eight pilings, six of which are low, one of which is of medium height, and one of which is taller than the rest and which contains an electrical connection. They are cabled together. An additional piling clump is submerged adjacent to these (Figure 63 and Figure 64).

Clump 4: Clump 4 is the closest clump to the inlet. It consists of three pilings cabled together with electrical connections on tallest pile. Two piles rest beside the main clump, and are tilted over (Figure 65 and Figure 66).

Clump 5: This is on the outermost clump into Onondaga Lake. It consists of eleven main pilings, two of which are taller than the others and cabled together, and which hold an electrical connection. The taller pilings are cabled together, and one holds a red navigation triangle. The Clump 5 assemblage also contains four older pilings that are tilted over, and four degraded pilings (Figure 67 and Figure 68).

Clump 6: This consists of eleven pilings, one of which is significantly taller than the rest, and which contains an electrical connection. One piling of this assemblage is tilted over (Figure 69 and Figure 70).

Clump 7: The seven pilings that make up Clump 7 are cabled together, and all tilted over. A red navigation light sits atop one of the shorter pilings. There are six pilings in the main clump, and one tall one to which is fastened an electrical connector. There is a smaller old clump adjacent to the main assemblage (Figure 71 and Figure 72).

Clump 8: This assemblage consists of three pilings, cabled together. An old electrical connection is fastened to the central piling, which is also the tallest (Figure 74 and Figure 73).

Figure 59: Piling Clump 1 (LCMM Collection).

Figure 60: Piling Clump 1 (LCMM Collection).

Figure 62: Piling Clump 2 (LCMM Collection).

Figure 61: Piling Clump 2 (LCMM Collection).

Figure 64: Piling Clump 3 (LCMM Collection).

Figure 63: Piling Clump 3 (LCMM Collection).

Figure 65: Piling Clump 4 (LCMM Collection).

Figure 66: Piling Clump 4 (LCMM Collection).

Figure 67: Piling Clump 5 (LCMM Collection).

Figure 68: Piling Clump 5 (LCMM Collection).

Figure 70: Piling Clump 6 (LCMM Collection).

Figure 69: Piling Clump 6 (LCMM Collection).

Figure 71: Piling Clump 7 (LCMM Collection).

Figure 72: Piling Clump 7 (LCMM Collection).

Figure 73: Piling Clump 8 (LCMM Collection).

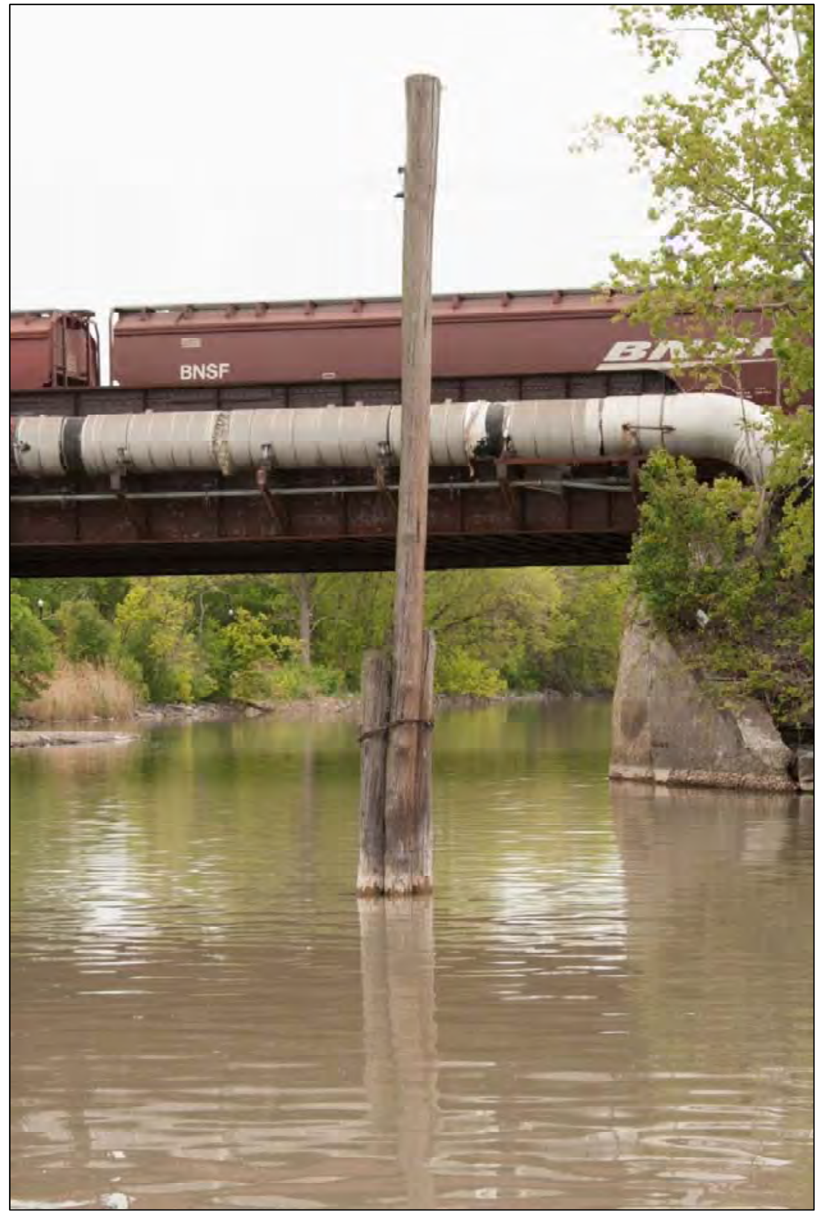

Figure 74: Piling Clump 8 (LCMM Collection).

Conclusion

The pilings that collectively make up A7 delineate the navigable channel into Syracuse's Inner Harbor. Although it is unlikely that anomaly A7 meets the minimum 50 year threshold for a contributing property to the NHRP, these pilings are a contemporary extension of historic transportation facilities and aids to navigation which were routinely replaced. It is therefore a contributing property to the Syracuse Maritime Historic District.

ANOMALY 12: DREDGE

Anomaly 12 Summary Table	
Anomaly Identification	Dredge; NY Site Number 06740.012296
Remedial Impact	Dredge and Cap
NRHP Eligibility Recommendation	Eligible as Contributing Property to Syracuse Maritime Historic District
Anomaly Dataset	
Side Scan (2005)	255
Magnetometer (2005)	684, 629, 253, 618, 646, 671, 659, 265
Side Scan (2010)	6/3/10
Sector Scan (2010)	6/4/10
ROV Video Footage (2010)	6/9/10
Diver Observations	9/2012: 12 dives totaling 18.8 hours of bottom time
Diver Videography	No
Maps/Charts	Yes
Aerial Imagery	Yes
Historic Accounts	No

Introduction

A12 represents the remains of an early twentieth century dredge. This identification is based on the extensively preserved timbers of this vessel, which are extant up to deck level, though the deck itself is not present. The site rests in shallow water (3 to 5 feet [0.9 to 1.5m]) just off shore, and in proximity to other abandoned vessels, clearly visible on modern aerial photographs (Figure 75). The remaining structure of the barge consists of the well preserved sides, stern, and spud boxes. The bow is not as well preserved, and portions of the interior structure are obscured by bottom sediments, though enough is exposed to gain an understanding of its construction.

The site's identification as a dredge is based on its hull structure, in particular the presence of the large spud boxes on either side of the stern which are a defining characteristic of dredge barges. These features would have been used to support two large posts (spuds) that could be driven into the lake bottom providing a very stable platform for the operation of the dredge head. Both bucket and hydraulic cutter head dredges were commonly used in the early twentieth century to clear and deepen navigational channels on inland waterways. The absence of any machinery, and A12's proximity to other abandoned vessels indicate that this vessel was intentionally disposed of at the end of its useful working life.

During the Phase 1B fieldwork, site conditions were ideal for recording sector scan (Figure 76) and side scan imagery (Figure 77), as well as a detailed visual inspection due to excellent water clarity. In September 2012, Phase 3 underwater archaeological documentation was undertaken which included direct diver measurements, and still photography. The 2012 field effort required 12 dives, totaling 18.8 hours of diver bottom time. Study of this vessel was limited to the remains exposed above the lakebed due to the potentially contaminated nature of the sediments. Documentation conditions were poor, with underwater visibilities of 1 to 3 feet (0.3 to 0.9m) and significant aquatic vegetation. Videographic documentation was not possible on this site due to the extremely limited visibility.

Figure 75: Anomaly A12 visible from aerial photography (courtesy Microsoft® Virtual Earth).

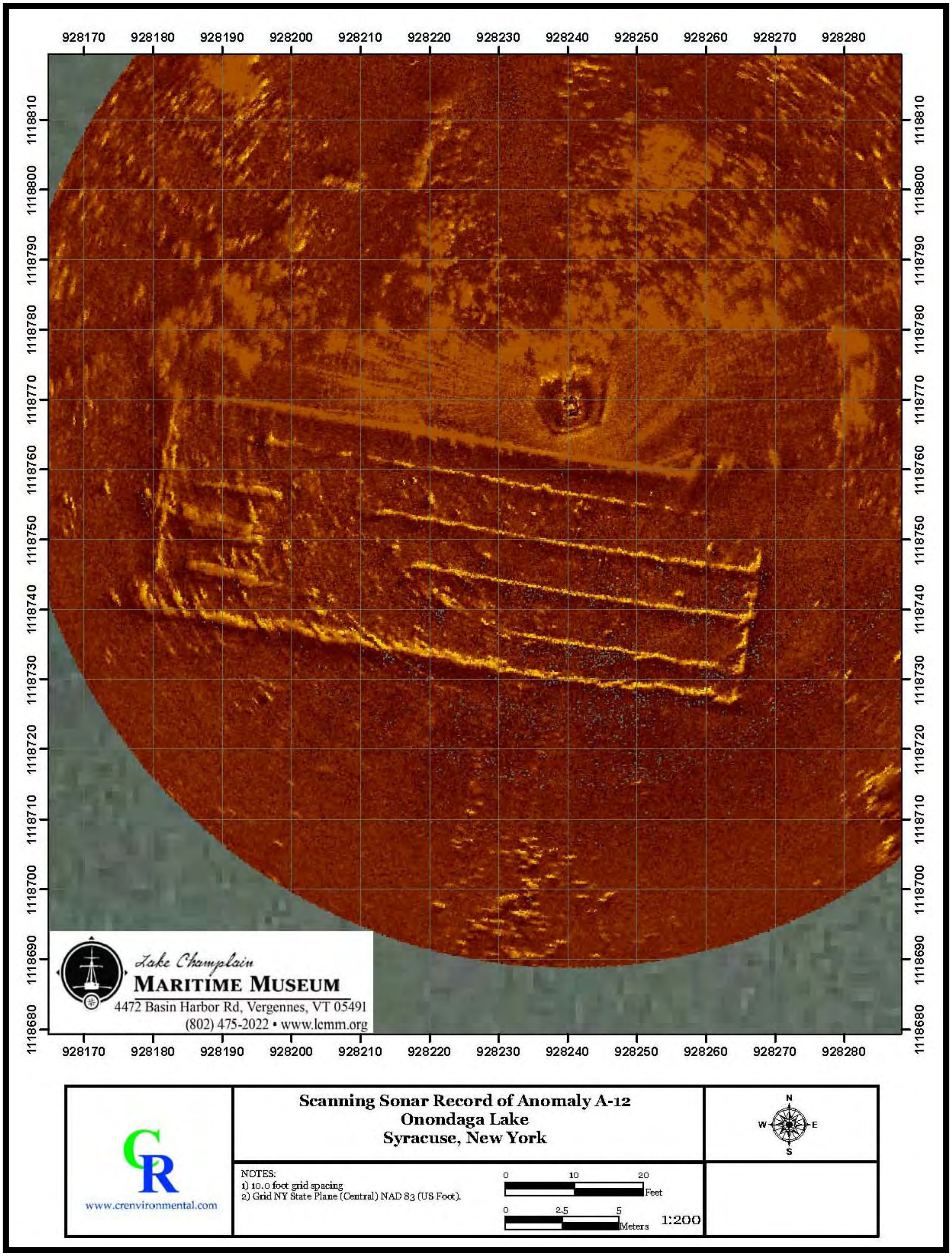

Figure 76: Scanning sonar image of A12.

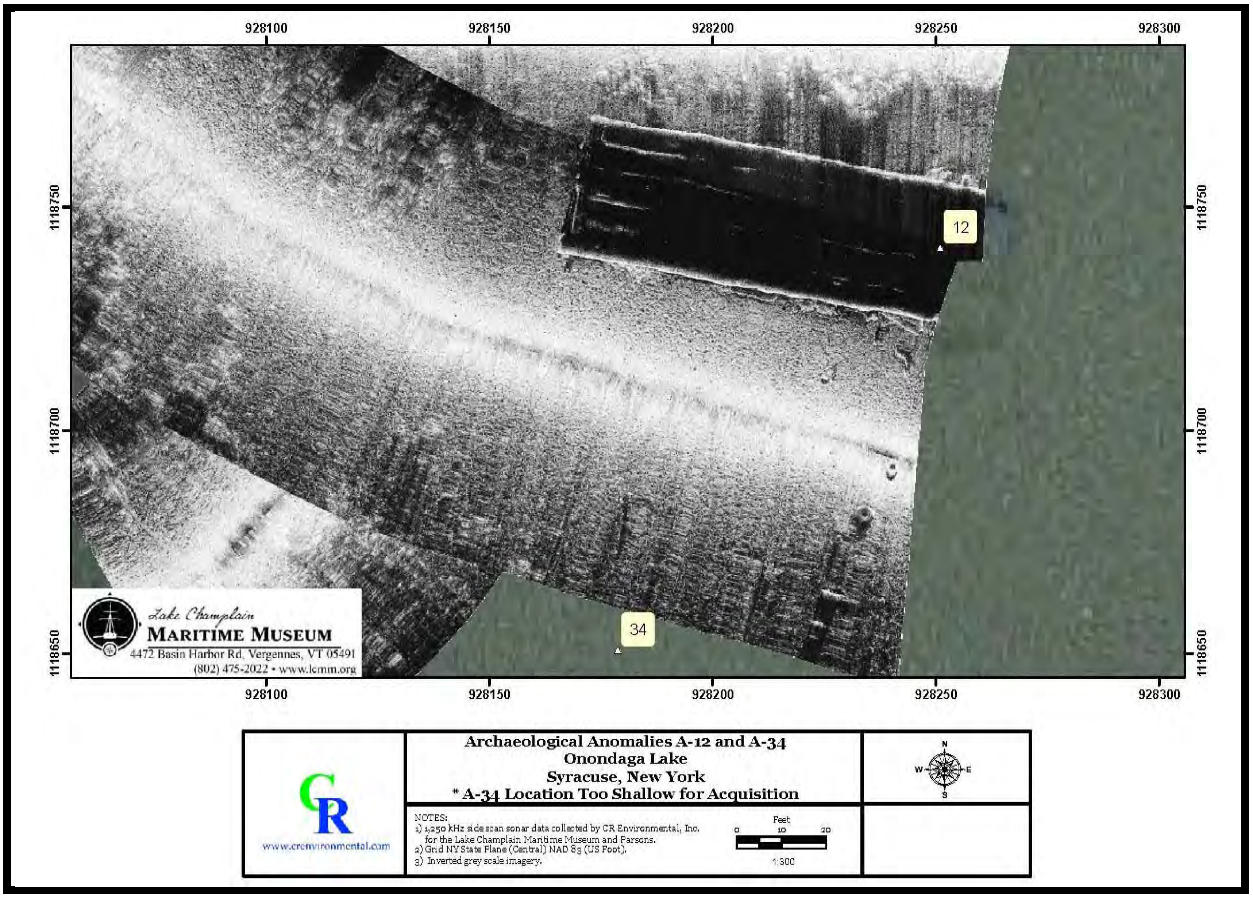

Figure 77: Side scan sonar mosaic of Anomaly A12.

Site Description

The visible remains of A12 represent 70-80% of the vessel's original structure (Figure 78). Lake sediments cover the interior and bottom of the vessel obscuring the details of the bottom planking and structure; this is particularly evident in the interior of the bow and stern. Due to the potential contaminates in the lake bottom sediments, these buried portions of the site were not investigated. The visible remains are 93 feet 8 inches (28.5m) in length with a maximum beam of 40 feet (12.2m), 32 feet 6 inches (9.9m) excluding the spud holders.

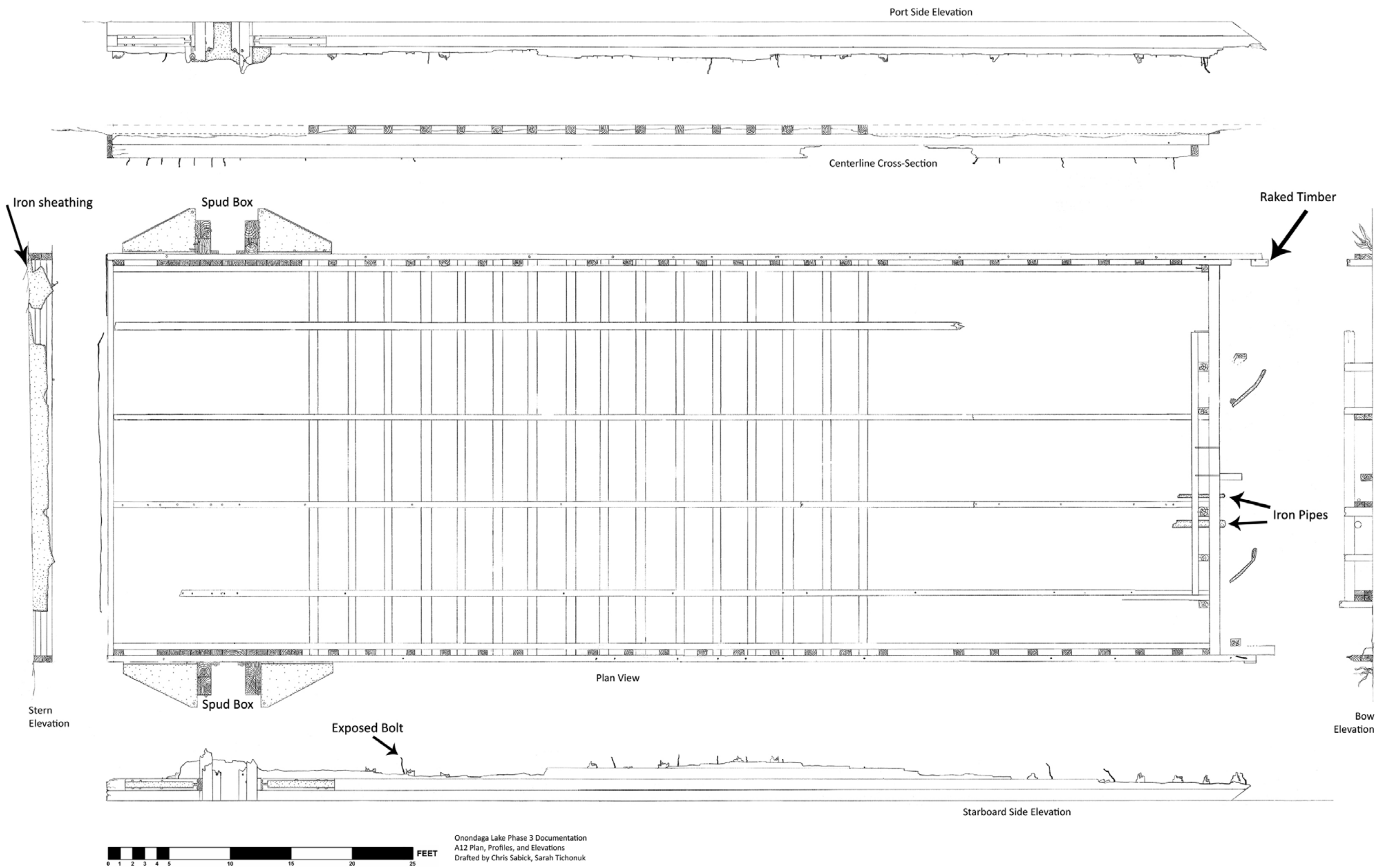

Figure 78: Plan and sectional views of A12 (LCMM Collection).

A12 lies in 3 to 4 feet (0.9 to 1.2m) of water in the southeastern corner of Onondaga Lake. The natural and cultural processes at this location have been a significant factor in its state of preservation. The site is in shallow water and has therefore been subjected to damage from ice and wave action as well as from biological growth on the vessel remains. This southeastern portion of the lake is subject to wave action due to the 4.5 miles (7.2km) of fetch which unfold to the northwest. Direct wave action on the wreck has led to damage occurring on the upper portions of the remains which is exacerbated by impacts from ice flows during the winter months. Additionally, annual aquatic vegetation growth and die-off is another means of mechanical degradation to the site.

Bow

The bow of A12 is heavily degraded with only portions of the support structure extant. No evidence of the bow planking remains. However, the presence of a single rake timber and the angle to which the bow ends of the side planking are cut demonstrate that this barge had a raked (angled) bow. The extant rake timber is on the starboard side of the bow and it is 8 inches (20.3cm) square. Other structures in the bow include a number of uprights, the ends of the bulkheads that run the length of the vessel, and two chain plates that were used to attach guy wires from the derrick for stability.

The six uprights that are present in the bow are situated approximately 6 feet (1.8m) aft of where the bow planking would have been located. These timbers vary in size from 6 to 8 inches (15.2 to 20.3cm) moulded and 12 inches (30.5cm) sided. All the uprights are 28 inches (71.1cm) in height and support an athwart ships timber that is 6 inches (15.2cm) by 9 inches (22.9cm) and 22 feet long (6.7m) The purpose of this timber is unclear, it may have been part of a bulkhead that delineated the angled bow from the rest of the barge. Alternatively the assembly of uprights and horizontal timbers in the bow may have been part of the structure that supported a third, center line, spud box. The location of a spud box in the center of the barge end opposite the dredge head was a common feature of dredges from this time period, though the fragmentary evidence remaining on this site makes this conclusion circumstantial.

Below the horizontal timber in the bow, two sections of iron pipe are suspended by metal brackets. One pipe is 6 inches (15.2cm) in diameter and the other is 3 inches (7.6cm) in diameter. Each of these pipe fragments is only 48 inches (121.9cm) long. The purpose of these pipes is hard to verify from the extant evidence, though they may suggest that this vessel was a hydraulic dredge rather than a bucket dredge. Hydraulic dredges used a cutter head suspended from a large boom to loosen sediment which was then sucked into a pipe located near the head that was attached to a large suction pump. The dredge spoil was pumped into waiting barges or through a floating pipeline to a location on shore. However, the identification of site A12 as a hydraulic dredge cannot be stated with any specificity due to the lack of additional supporting evidence.

Stern

The stern construction of A12 is well preserved in comparison with the bow. Unlike the bow, the stern is vertical, not raked. It is also sheathed with iron plating which would have protected the stern structure from impacts caused by the operation of the dredge equipment that was also situated at the stern of the vessel. The planking on the stern is supported by the four longitudinal bulkheads that run the length of the vessel as well as the ends of the sides. There are remains of three stern planks which are 3 inches (7.6cm) thick and range in width from 5 to 7 inches (12.7 to 17.8 cm). The iron plating that protected these planks is approximately ½ inch (1.3cm) thick and it has slumped away from the stern slightly leaving a gap of between 5 to 9 inches (12.7 to 22.9cm) from the planking. The iron plating displays significant damage and is missing entirely from the starboard 5 feet (1.5m) of stern structure.

Sides

The sides of A12 are its most prominent feature particularly as they include the large spud boxes. Both port and starboard side hull planking is preserved up to, and at times above, the water's surface. On the starboard side there are extensive remains of three strakes as well as a fragment of a fourth strake found amidships. There are exposed bolts protruding from the planks upper surfaces which suggest at least one more plank was originally present. The remaining planks are 10 to 11 inches (3.0 to 3.4cm) wide and 5 inches (12.7cm) thick. These thick planks are fastened together internally by 1 inch (2.5cm) iron bolts that were driven vertically through them. This was a common construction technique in the late nineteenth and early twentieth centuries and has become known as "edge fastened construction." These bolts do not appear to have been installed in any particular pattern with extant examples present at random along the length of both sides. Each strake is composed of several planks that are fastened together with diagonal scarfs. The bow ends of the sides are cut to an angle matching that of the rake timber found in the bow.

The port side planking is nearly identical to that of the starboard side though only three strakes are extant. Like the starboard side, there are numerous edge fastening bolts protruding from the top surface of the extant planks, suggesting that there had originally been more planking present during the vessel's operational life.

Both sides are supported internally by vertical frames. The frames are 9 inches (22.9cm) sided and 5 inches (12.7cm) moulded. These frames are spaced evenly along the sides with a room and space of 36 inches (91.4cm), except in the vicinity of the spud boxes. To support the spud boxes the framing on both sides is massively reinforced with a continuous "wall" of frames that runs for 12 feet (3.7m).

Spud boxes

A feature unique to A12 is the spud boxes which are located on both sides of the stern (Figure 79 and Figure 80). These substantial features once supported the large spuds that were used to hold the dredge in position while the derrick was in use. The remains of the spud boxes suggest that they could have accommodated spuds up to 32 inches (81.3cm) square. In order to support such massive anchoring posts, the spud boxes were extensively reinforced. The main upright timbers of each holder consist of a pair of timbers 12 inches (30.5cm) sided and 15 inches (38.1cm) moulded. These are additionally strengthened by timbers that are 12 inches (30.5cm) sided and 18 inches (45.7cm) moulded. The upright timbers also are supported by large iron buttresses that extend forward and aft of the spud holders. These roughly triangular buttresses extend 6 feet (1.8m) to either side of the holders and extend out from the sides 45 inches (114.3cm). These structures consist of a heavy iron plate approximately 2 inches (5.1cm) thick that is fastened to the sides of the vessel and spud holder uprights by flanges and numerous threaded iron bolts 1 inch (2.5cm) in diameter. The planking of the barge in the area behind the spud holders is protected by a ¼ inch (0.6cm) thick piece of sheet iron. This would have prevented the spuds from damaging the planking when they were raised and lowered through the spud holders. No evidence of the spuds themselves was found on the site.

Figure 79: Inboard side of Anomaly A12's spud box (LCMM Collection).

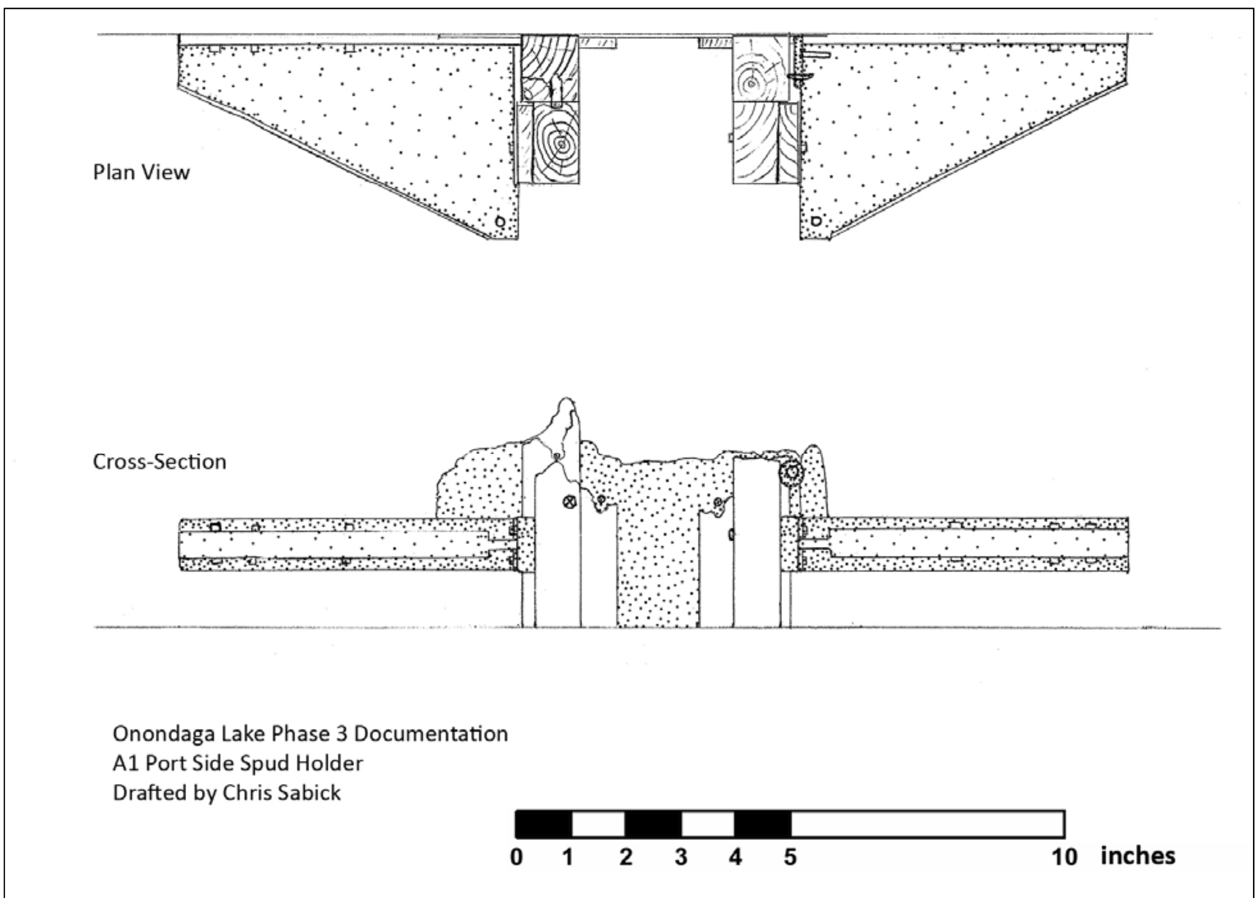

Figure 80: A12 Port Side Spud box (LCMM Collection).

Longitudinal Support

The box-like construction of A12 was supported by a number of structures on the interior of the hull. There are four substantial bulkheads that run the length of the vessel as well as two sister keelsons located just inboard of the frames that support the side planking. These latter pieces, which consist of two stacked timbers that are each 6 inches (15.2cm) sided and 10 inches (25.4cm) moulded, serve to significantly strengthen the juncture of the sides and bottom of the barge. These are fastened together with ¾ inch (1.9cm) iron bolts.

The longitudinal bulkheads are spaced evenly across the interior of the hull and rest atop the floors (Figure 81). The extant remains of the bulkheads consist of two timbers stacked vertically each of which are 6 inches (15.2cm) sided and 10 inches (25.4cm) moulded and fastened together with 1 inch (2.5cm) iron bolts that were driven through the timbers vertically. These structures provided significant support for the A-frames that supported the dredge head and pumping equipment which were positioned on deck. In addition to giving the barge a tremendous amount of longitudinal stiffening, the bulkheads also support the stern planking and would have given the decking significant strength.

Besides the tall longitudinal bulkheads the vessel was also strengthened by four sister keelsons that run the entire length of the vessel. These are located outboard of the dump bay and unlike the above mentioned bulkheads these keelsons consist of only a single structural member resting on top of the bottom planking. These timbers are 8 inches (20.3cm) sided and have a moulded dimension greater than 5 inches (12.7cm); the exact moulded dimension could not be ascertained without excavating into the contaminated bottom sediment.

Conclusion

The archaeological evidence indicates that A12 was disposed of at the end of its working life. This conclusion is based upon the absence of machinery, spuds, or other artifactual remains and its proximity to other scuttled vessels in the southeastern corner of Onondaga Lake.

The identification of A12 as a dredge barge is supported by the visible extant vessel remains, in particular the spud holders located on the stern end of the barge, which are a defining feature of this class of vessel. [134] While it is unclear if A12 was a bucket dredge or a hydraulic dredge, the remains of piping in the bow recommend the latter option but are not extensive enough to prove it conclusively. The vessel type and the types of fasteners and other hardware that were found on site suggest that this vessel was built and operated in the early twentieth century (Figure 82 and Figure 83). A12 was most likely used to create and maintain navigational channels and in the construction of other in-water infrastructure projects in the Onondaga Lake area.

Figure 81: Photograph showing Anomaly A12's longitudinal bulkheads with the spud box in the background (LCMM Collection).

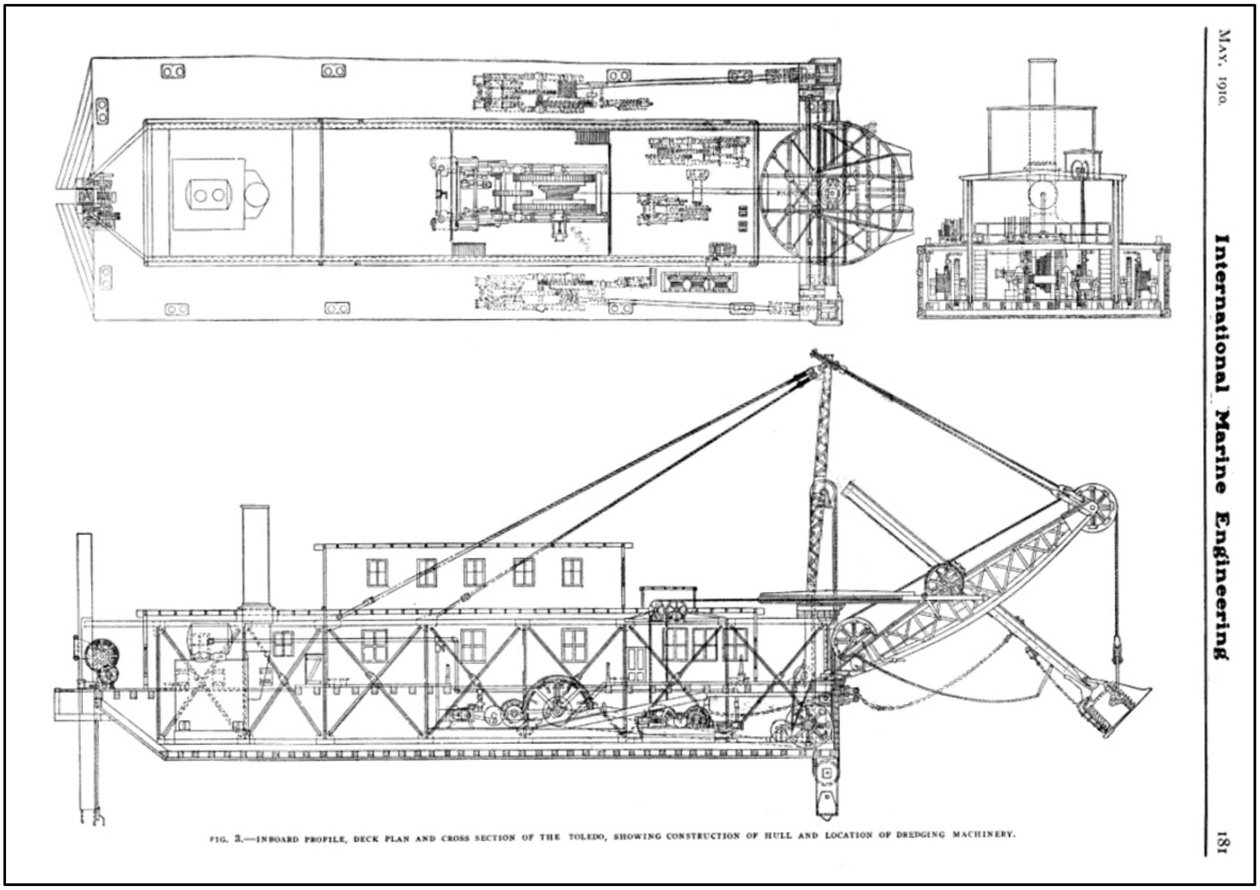

Figure 82: Inboard profile, deck plan, and cross section of *Toledo*, a wooden-hulled bucket dredge (*International Marine Engineering* 1910).

Figure 83: Photograph showing a bucket dredge with spuds excavating the barge canal in 1906 or 1907 with a dump scow in the foreground (LCMM Collection).

ANOMALY 45: CONCRETE BREAKWATER

Anomaly 45 Summary Table	
Anomaly Identification	Breakwater of Concrete Bags; NY Site Number 06740.012304
Remedial Impact	Dredge and Cap
NRHP Eligibility Recommendation	Eligible as Contributing Property to Syracuse Maritime Historic District
Anomaly Dataset	
Side Scan (2005)	No
Magnetometer (2005)	705, 796, 810, 817, 732, 773, 766, 712, 797, 811
Side Scan (2010)	6/2/10
Sector Scan (2010)	6/7/10
ROV (2010)	6/10/10
Diver Observations	6/26/11, 9/2012; 4 dives, 3.7 hours of total bottom time
Diver Videography	Yes
Maps/Charts	Yes
Aerial Imagery	Yes
Historic Accounts	No

Introduction

A45 is a breakwater situated southeast of the entrance to the Syracuse Inner Harbor (Figure 84). Analysis of navigational charts suggests that the structure was installed between 1937 and 1942 (Figure 85), and was abandoned/partially submerged by 1947. The breakwater is 20 feet wide (6.1m) and extends 250 feet (76.2m) from the shoreline. This anomaly appeared on side scan sonar (Figure 86) and scanning sonar imagery (Figure 87). Dive verification in 2011 showed the site to be made of concrete bags, likely constructed by placing bags of concrete in the water (Figure 88). Each concrete block was pillow-shaped with two indentations from circular bands. Given the breakwater's location, its intended purpose was likely to dampen wave action at the harbor entrance for entering and exiting boats. The structure is densely packed along the exterior walls of the breakwater with an open gap containing only sporadic concrete bags in between. Only one tier is visible. The site lies in 2 to 3 feet (.61 to .91m) of water, and can be seen in modern aerial photography (Figure 84). No timber crib or other wooden structures were noted, suggesting that the site is a breakwater and not a pier.

In September of 2012, Phase 3 underwater archaeological documentation was undertaken which included direct diver measurements, videography, photography and the recovery of some breakwater elements for documentation before re-deposition (Figure 89). The 2012 field effort required 4 dives, totaling 3.7 hours of diver bottom time. Documentation conditions were fair to poor, with underwater visibility of 3-5 feet and significant aquatic vegetation.

Figure 84: Aerial view showing A45 (courtesy Microsoft® Virtual Earth).

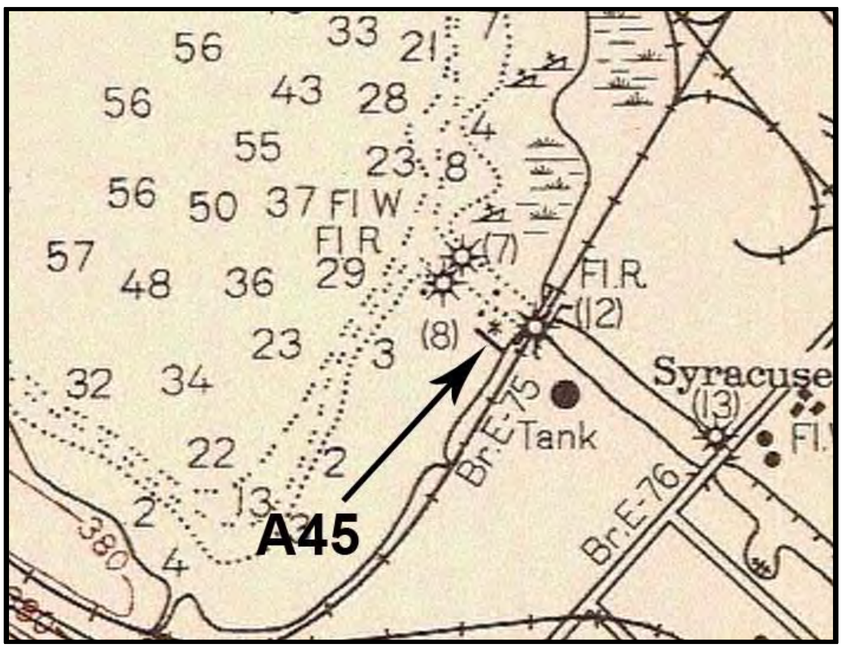

Figure 85: 1942 navigational chart of Onondaga Lake showing A45 (*NY State Canals, Chart No. 185,* 1942 (Detroit: U.S. Lake Survey Office, 1942).

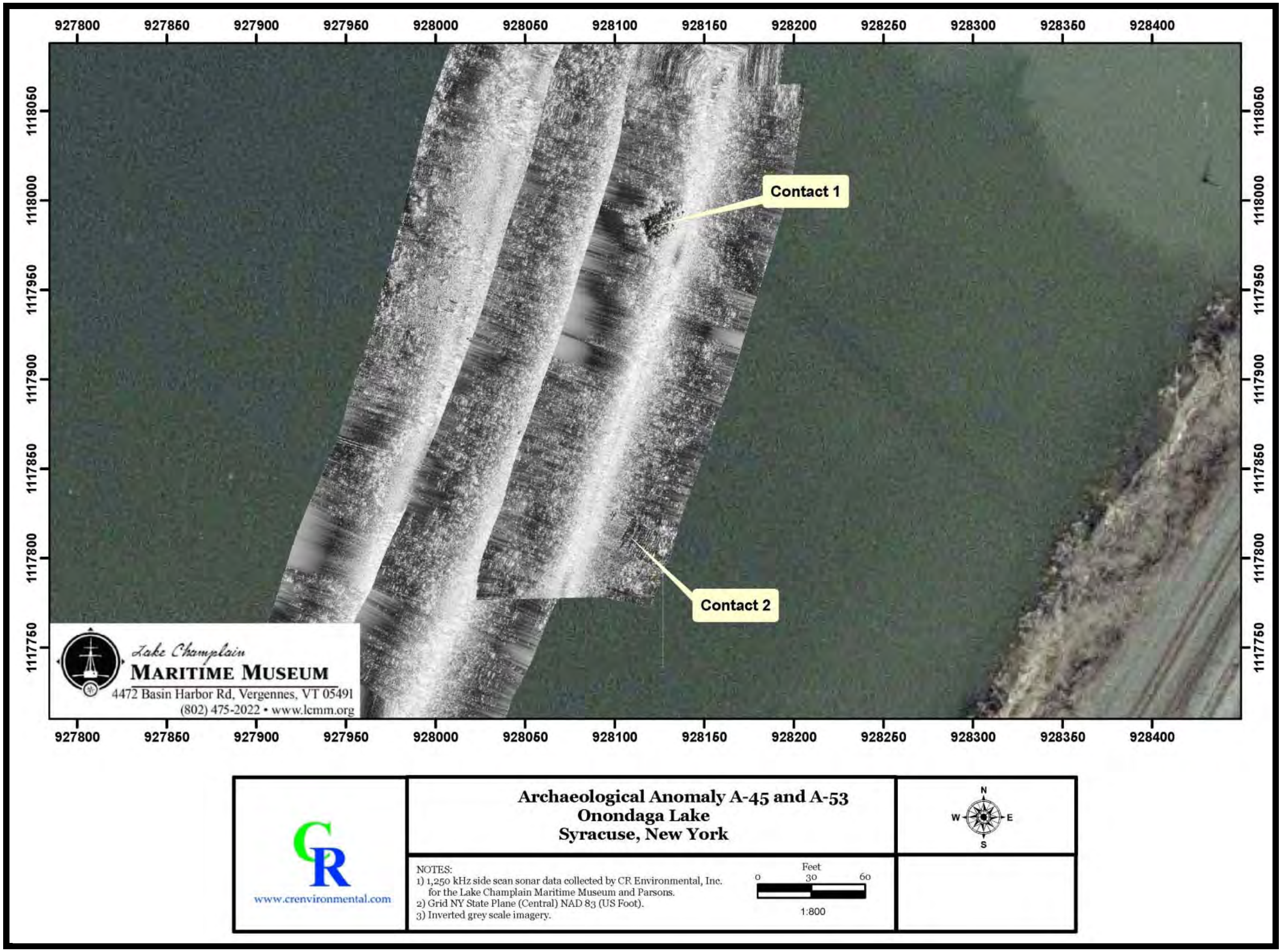

Figure 86: Side scan sonar mosaic showing A45 (Contact 1) and A53 (Contact 2).

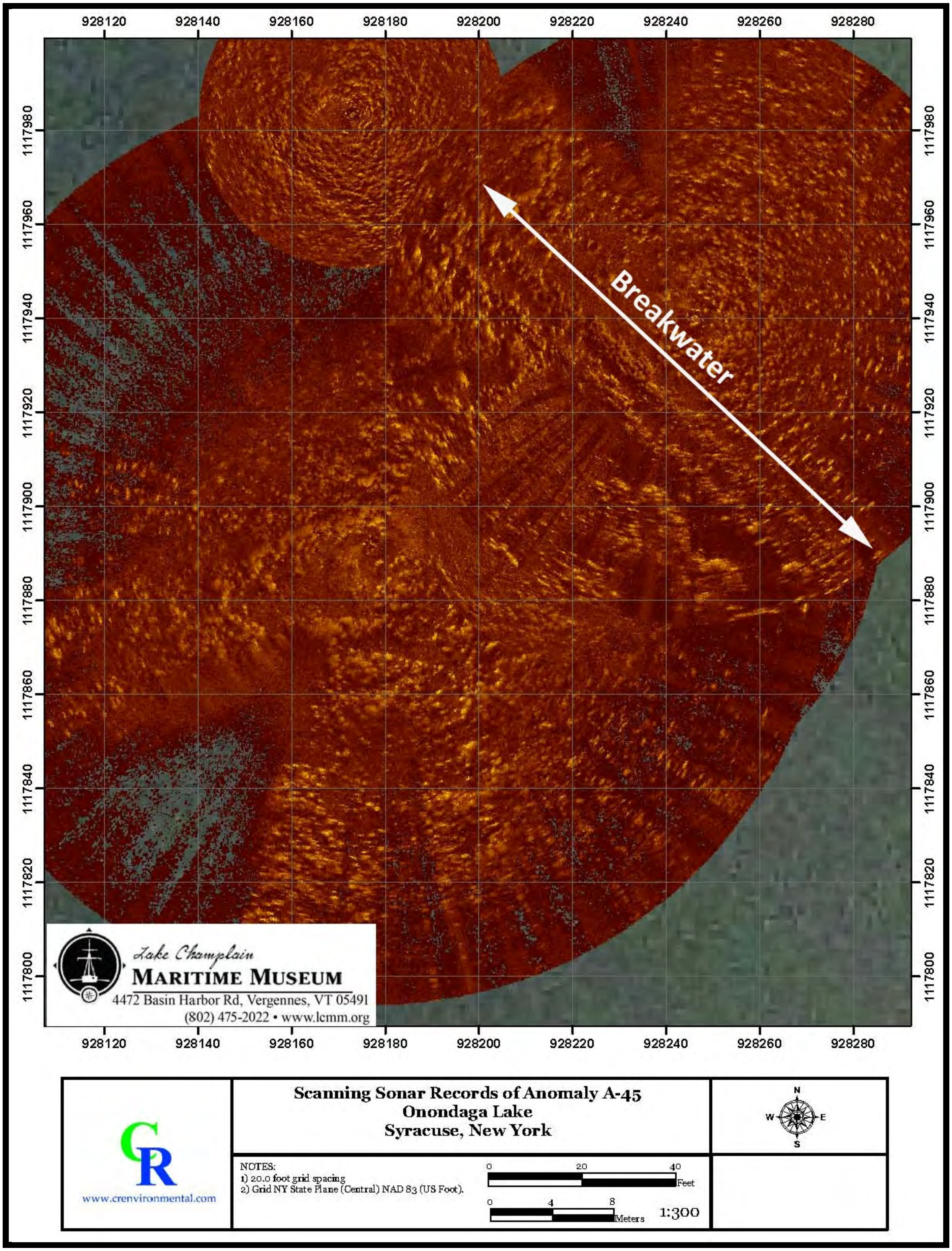

Figure 87: Scanning sonar image of A45.

Figure 88: A view of A45 from above the water's surface. Note the modern debris amidst the concrete pillows (LCMM Collection).

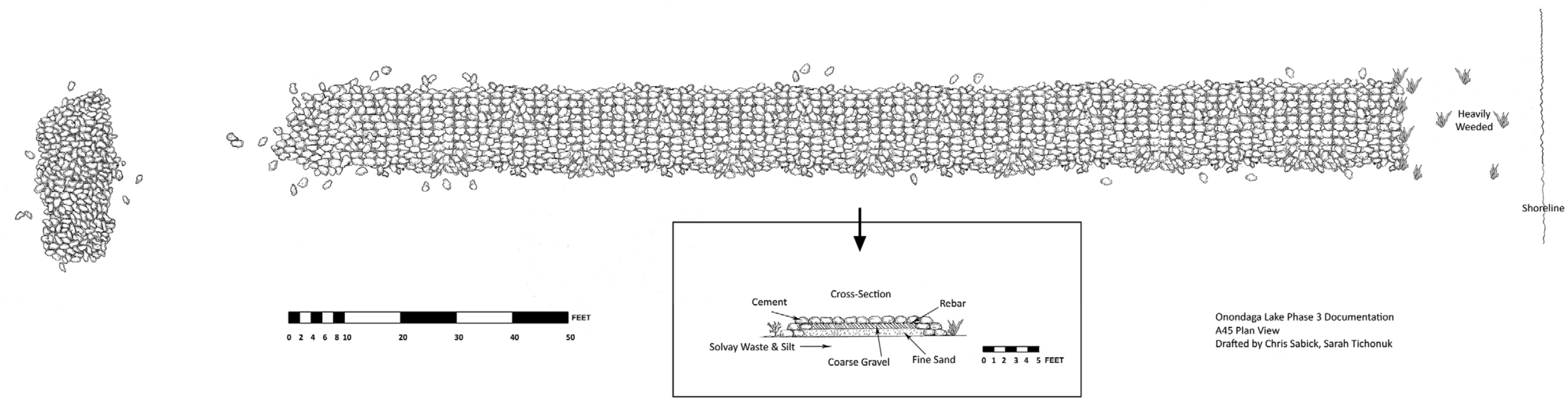

Figure 89: Plan and sectional views of A45 (LCMM Collection).

Site Description

The remains of A45 extend for a total of 250 feet (76.2m) and are roughly 20 feet (6.1m) wide (Figure 89). The breakwater extends for most of its length in a fairly uniform manner, except towards its lake side end where there is a 25 foot (7.6m) gap in the structure after which there is an additional section of structure that is 10 feet (3.0m) by 25 feet (7.6m). It is unclear whether this gap was built into the breakwater from its beginning or if it was modified at a later date.

One location along the main portion of breakwater was more thoroughly studied in order to gain an understanding of its interior construction. From the bottom up the breakwater was made up of three layers: 8 inches (20.3cm) of light gray brown sand, 4 inches (10.2cm) of coarse aggregate fill, and the visible surface of the breakwater of concrete "pillows" or blocks. The blocks were systematically positioned on top of the layer of aggregate which was also reinforced with 5 foot (1.5m) long sections of 1 inch (2.5 cm) rebar. The outer edges of the breakwater are delineated by a course of blocks two deep.

The blocks from this breakwater appear to have been created by filling burlap bags with wet concrete then placing them on the lake bottom to harden. This analysis is supported by the shape and appearance of the blocks. Three sample blocks were recovered from the site for detailed documentation above water, they were re-deposited on site afterward (Figure 90 and Figure 91). These three blocks all had slightly different shapes, though their rough dimensions were the same, 2 feet (0.6 m) long, 1 foot (0.3m) wide and 8 to 10 inches (20.3 to 25.4cm) thick. All three blocks displayed evidence that they had been formed in bags, with one (block 3) having a very clear impression of burlap fabric on its surface. All three blocks also contained impressions of the rebar support they had been placed on. The fact that the rebar was able to make an impression in the blocks supports the idea that they were placed in position before the concrete had fully hardened. Historic research has not revealed any other reports of this construction technique.

Conclusion

The archaeological evidence indicates that A45 is a breakwater constructed around 1940 that was positioned to offer protection to vessels entering and exiting Syracuse's Inner Harbor. The breakwater displays fairly common construction features including a stable foundation of sand and aggregate fill capped by concrete blocks. The design of the concrete "blocks" is unique however with no contemporary corollaries noted in the historic literature examined.

Figure 90: Sample concrete from A45 breakwater (LCMM Collection).

Figure 91: Details from two concrete masses from A45. Note the depressions in the concrete indicating that they were formed by using bags. The inset at right shows burlap-style markings. (LCMM Collection).

ANOMALY 53: CANAL BOAT

Anomaly 53 Summary Table	
Anomaly Identification	Canal Boat, NY Site Number 06740.012305
Remedial Impact	Dredge and Cap
NRHP Eligibility Recommendation	Eligible as Contributing Property to Syracuse Maritime Historic District
Dataset	
Side Scan (2005)	No
Magnetometer (2005)	No
Side Scan (2010)	6/2/10
Sector Scan (2010)	6/4/10
ROV Video Footage (2010)	6/10/10
Diver Observations	6/26/11 and 9/2012: 13 dives, 19.6 hours bottom time
Diver Videography	Yes
Maps/Charts	No
Aerial Imagery	No
Historic Accounts	No

Introduction

A53 represents the remains of a poorly preserved late nineteenth/early twentieth century wooden canal boat. The site rests in 2-3 feet of water southwest of the entrance to Onondaga Harbor. With a length of 96.5 feet (29.4m) and a beam of 17.5 feet (5.3m), A53 was built in accordance with the dimensions of the Erie Canal locks that existed between 1862 and 1915. The absence of cargo, its shallow-water location, and its proximity to other abandoned boats in Onondaga Lake indicates the vessel was intentionally disposed of at the end of its working life.

A53 was located in 2010 during the Phase 1B archaeological survey of Onondaga Lake. Due to the site's very shallow location and coverage with aquatic vegetation, it was not found during the initial geophysical survey in 2008; rather it was discovered visually from the research vessel during the investigation of adjacent site A45. Subsequent documentation immediately following its discovery included videography with an ROV and high frequency side scan and sector sonar imagery (Figure 92). The site was subsequently dive verified in June 2011.

The Phase 1B report included A53 as a contributing property to the Syracuse Maritime Historic District, which was found to be eligible for the NRHP. The Onondaga Lake clean-up design for the area of A53 includes dredging and capping, which was determined to have an adverse effect on portions of the Syracuse Maritime Historic District, including A53. Archaeological mitigation of A53 was recommended, and further elaborated in the LCMM's Onondaga Lake Archaeological Mitigation Plan.

In September 2012, Phase 3 underwater archaeological documentation was undertaken which included direct diver measurements, the recovery and surface documentation of selected vessel elements, videography and wood samples (26) (Figure 93). The 2012 field effort required 13 dives, totaling 19.6 hours of diver bottom time. Study of vessel was limited to the remains exposed above the lakebed due to the potentially contaminated nature of the sediments. Documentation conditions were fair, with underwater visibilities of 4 to 8 feet (1.2 to 2.4m) and modest aquatic vegetation.

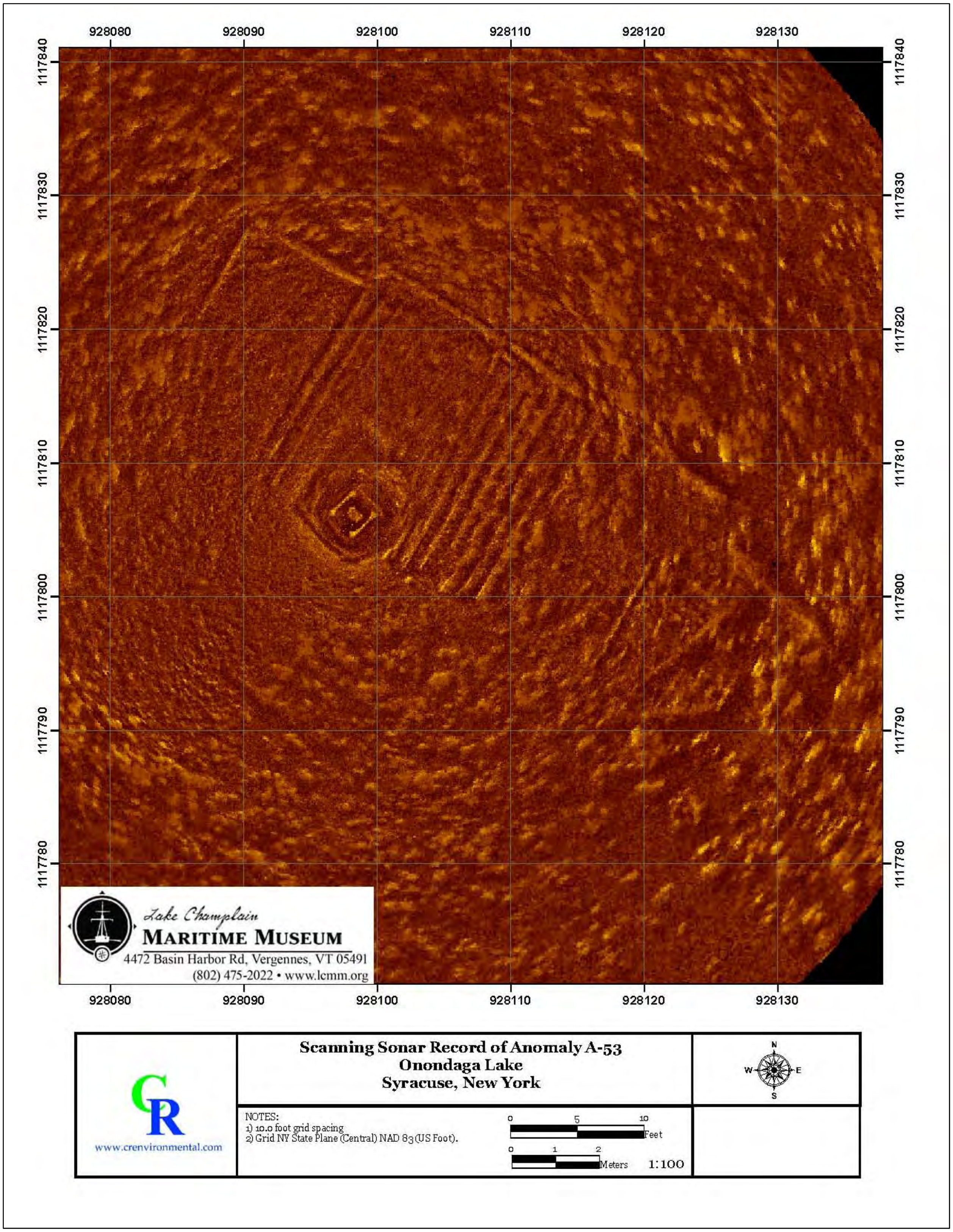

Figure 92: Scanning sonar image of A53 recorded in 2010.

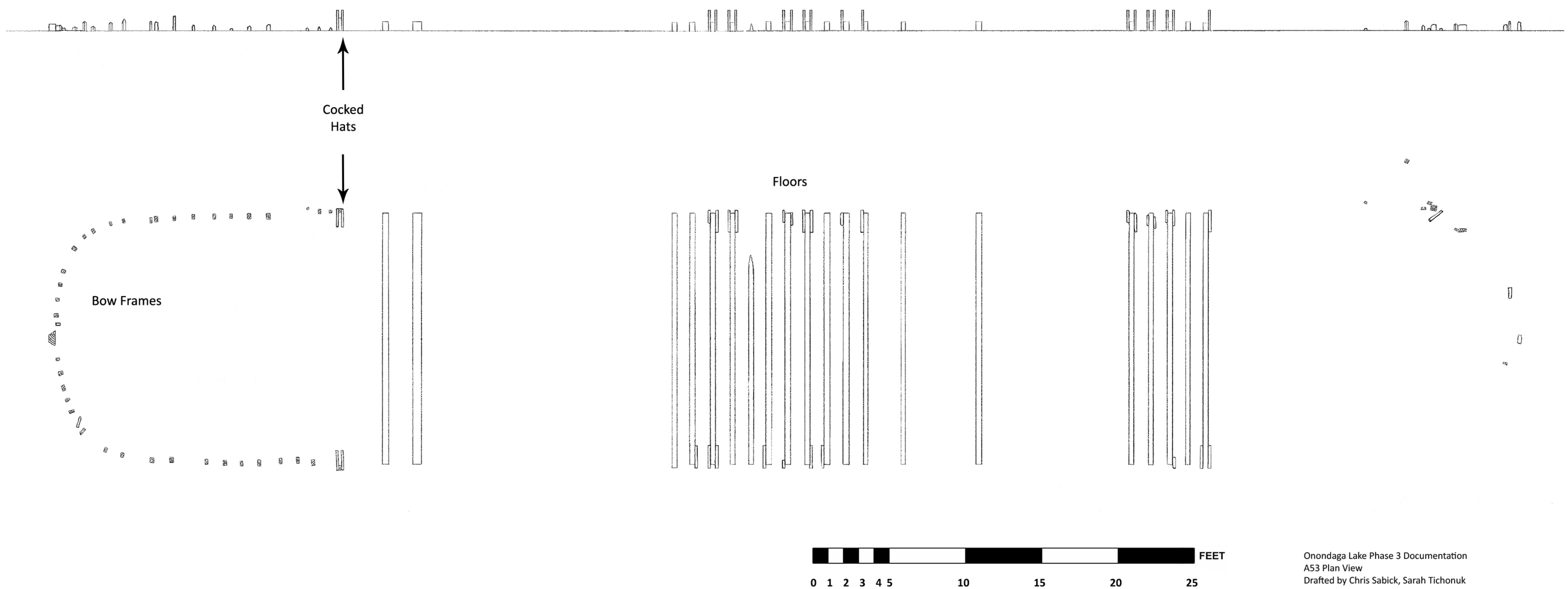

Figure 93: Plan and sectional views of A53 (LCMM Collection).

Site Description

The extant remains of A53 represent approximately 20% of the boat's original structure composed of the bottom of the hull up to the turn of the bilge, and the very lowest portions of the bow and stern framing (Figure 93). These scant remains are largely buried under 6 to 12 inches (15.2 to 30.5cm) of fine sand. The site is 96½ feet (29.4m) long and 17½ (5.3m) feet wide.

A53's shallow water deposition site is the most significant factor in its state of preservation. At the time of its abandonment approximately a century ago, A53 would have stood some 5 to 7 feet (1.5 to 2.1m) above the lake's surface. The remains were subject to continual wave action, particularly in this southeastern portion of Onondaga Lake due to the 4.5 mile (7.2km) of fetch which unfold to the northwest. This constant wave action and the movement of flotsam into, and eventually over, the site served to clip any above and near-surface remains. Moreover, although the surface of Onondaga Lake does not often freeze over entirely during the winter, the shallow waters do, which places A53 in an area of annual ice action. Abrasion from both the lake's frozen surface and ice elsewhere in the lake breaking up and being blow down the length of the lake have served to pull apart the vessel when it extended above the surface and abrade the below water remains in later years.

Bow

The shape of the bow is delineated by the stem and the rounded arc of frame tips which radiate from it. The stem is trapezoidal in plan; 10 inches (25.4cm) on its after face and 6 inches (15.2cm) on its port, starboard and forward faces. It stands 6 inches (15.2cm) above the bottom sediments and is composed of white oak. Due to its deteriorated conditions there is no longer any evidence of a rabbet on the stem.

The bow frames project 3 to 12 (7.6 to 30.5cm) inches above the bottom depending on their level of preservation. All represent only the bottommost portion of the frames. The recorded sided and moulded dimensions vary considerably based upon the preservation of each frame; however, the typical dimensions are 3 inches sided and moulded. All framing wood samples returned a species identification of white oak (*Quercus alba*).

The interior of the bow was devoid of intact visible structural remains. A toppled over futtock (A53-T1) was noted in this area; it was recovered and documented on the surface. It is a 5 feet (1.5m) tall futtock with a sided dimension of 2½ inches (6.4cm) and a maximum moulded dimension of 9¼ inches (23.5cm). The forward face of the futtock retained eight ¼ by ¼ inch (0.6 by 0.6cm) fastener holes. These now absent nails were used to secure the planking to the futtock. The profile of the frame shows a typical canal boat bow profile with vertical or near vertical sides and a rounded turn-of-the-bilge. The frame's rounded shape was cut from a straight-grained piece of lumber rather than from a naturally curved piece of compass timber. This is consistent with boat building in the late nineteenth/early twentieth century when stocks of shipbuilding timber, particularly hard to find compass wood, were dwindling.

The shape of the bow is characteristic of a canal boat. The frames outline a rounded, but very bluff bow. The transition from the bluff face of the bow to the run of the hull occurs within 8 feet (2.4m) of the stem; a sudden transition designed to maximize the cargo space inside the hull while complying with the canal rules which dictated that boats must have rounded bows to keep from digging into the canal prism.

Run of the Hull

The run of the hull contains much of A53's extant structure, beginning within 8 feet (2.4m) of the stem and ending within 10 feet (3.0m) of the stern. This stretch contains 78½ feet (23.9m), or more than 80%, of the overall 96½ feet (29.4m) of hull remains. However the forward and after transitions into the bow and stern were buried so the details as to how or where the hull structure transitions from flat bottomed with vertical sides to the rounded ends is not known. Moreover, only 20 floors were visible along the run of the hull; however, based upon the frame spacing the original number of floors in this area of the hull was approximately 65.

A53's framing pattern is known as a cocked-hat style. This technique uses a trapezoidal or triangular timber, known as a cocked-hat, to join the boat's flat bottom to its vertical sides. The technique removes the need for naturally grown compass timber to construct the turn-of-the-bilge. All wood samples of framing members returned a wood type of white oak (*Quercus alba*).

During the documentation, two floors were recovered and documented on the research vessel, providing a clear view of A53's framing technique (Figure 94). One floor was found dislodged at 58½ feet (17.8m) aft of the stem, while the second was removed from its *in situ* location 42 feet (12.8m) aft of the stem. They were 16½ feet (5.0m) long, sided 2½ to 2¾ inches (6.4 to 7.0cm), and moulded 7½ inches (19.1cm). The frames were dead flat across the width of the vessel, and spanned the entire boat width. The outboard ends were cut, top and bottom, at 45° angles; the bottom cut corresponds with the adjacent outboard face of the cocked hat.

Each floor had two limber holes; cut outs in the bottom of the floors to facilitate water movement from one part of the vessel to another (Figure 95). Each was cut within 2 feet (0.6m) of the outboard end of the floors, 3 inches (7.6cm) wide and ¾ inch (1.9cm) deep. These cuts were made by drilling holes at the corners of the limber holes, and then sawing out the rectangular holes.

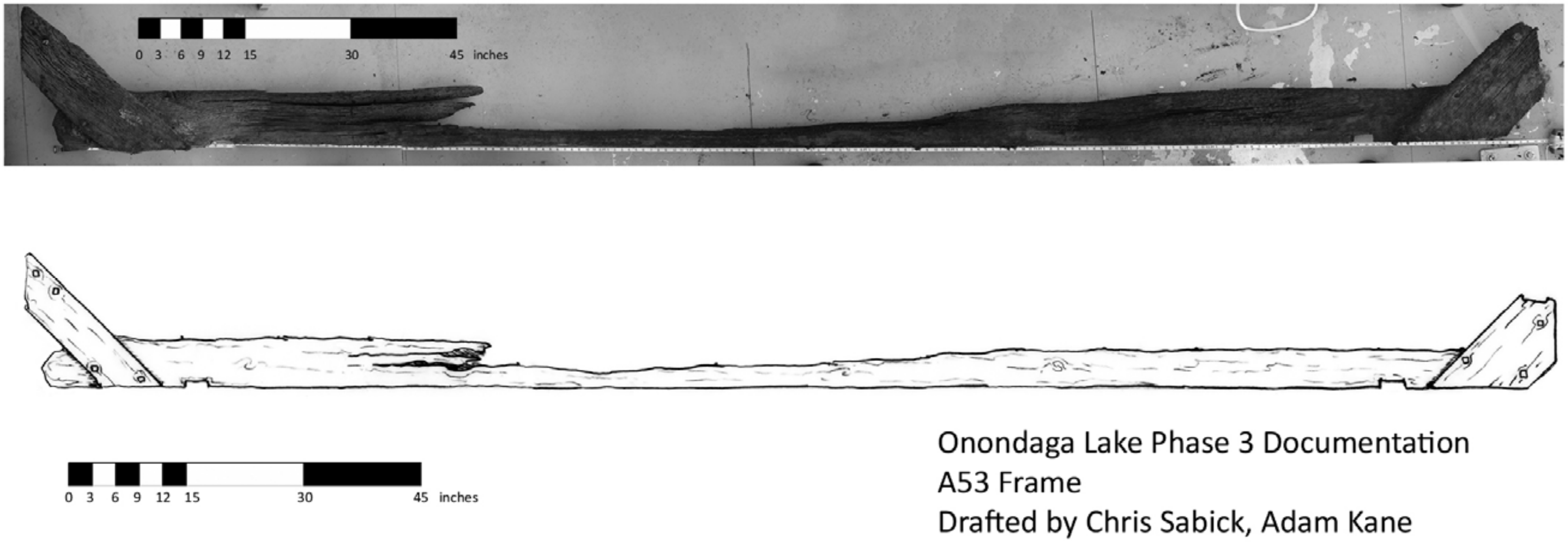

Figure 94: This dislodged frame from A53 was brought to the surface for documentation for photographs (top) and measured drawing (above). The image on the top was generated from twelve photographs stitched together, resulting in some minor distortion (LCMM Collection).

Figure 95: Limber hole of Timber 8 of A53. Note drilled holes in the corners, allowing for the rectangle to be sawn out (LCMM Collection).

A53's cocked hats were documented in detail; two were found lying dislodged from their frames and were documented on the surface (Figure 96 and Figure 97), while two additional cocked hats were recovered with the frame recovered 42 feet (12.8m) aft of the stem. Because the cross-section of the hull anywhere along the run of the hull is identical (flat bottom with vertical sides), these trapezoidal timbers have identical, or nearly identical dimensions. When viewed in section the interior face is 2 feet 2 inches (0.7m), the faces along the bottom and sides of the hull are 13 inches (33.0cm) and the chine face is 7½ inches (19.1cm). The sided dimension is between 1¾ and 2¼ inches (4.4 and 5.7cm). Each cocked hat is an isosceles right triangle with 90° corner cut off to form the chine. Each frame section consists of four cocked hats; two per side sandwiching the floor and first futtock. The run of cocked hats along each side of the hull was joined by a bilge keelson which is evidenced by a fastener consistently placed in the middle of cocked hat's interior face.

In a few places in the hull, spacers were noted spanning the distance between floors. These white oak (*Quercus alba*) timbers were longitudinally oriented, rectangular timbers. Their length was $11^{7}/_{8}$ inches (30.2cm) spanning the room and space between the floors. They were sided 2½ inches (6.4cm), and moulded 7½ inches (19.1cm), the same moulded dimension as the floors. The bottom side of each spacer had two 1 inch (2.5cm) square cut outs which served as limber holes. Due to the buried nature of the remains, it is not known how prevalent the spacers were in the hull.

A53's planking was almost entirely buried; however, the upper face of the chine plank was observed both port and starboard near the bow. The white oak (*Quercus alba*) plank was 1½ inches (3.8cm) thick, while its width could not be determined. On the outboard face of the chine plank there was a ½ inch (1.3cm) thick sacrificial plank made of beech. Beech is not a commonly used shipbuilding wood, but it does have durable characteristics if it is kept continually wet as would have been the case in A53's hull. The extent of the boat's sacrificial planking is not known, however, it was likely limited to this chine area which was subject to considerable wear and tear from contact with the canal prism and other submerged obstructions.

Inferred information about the planking and ceiling was recorded on the upper and lower faces of the two recovered floors. They were riddled with the remnants of square cut nails used to hold the ceiling and planking in place. Neither nailing sequence demonstrated a consistent enough pattern to determine the number of planks or ceiling. Moreover, the density of nail holes suggests that the boat had been re-planked during its career.

Figure 96: This cocked hat was found dislodged from its frame on A53 and was documented at the surface (LCMM Collection).

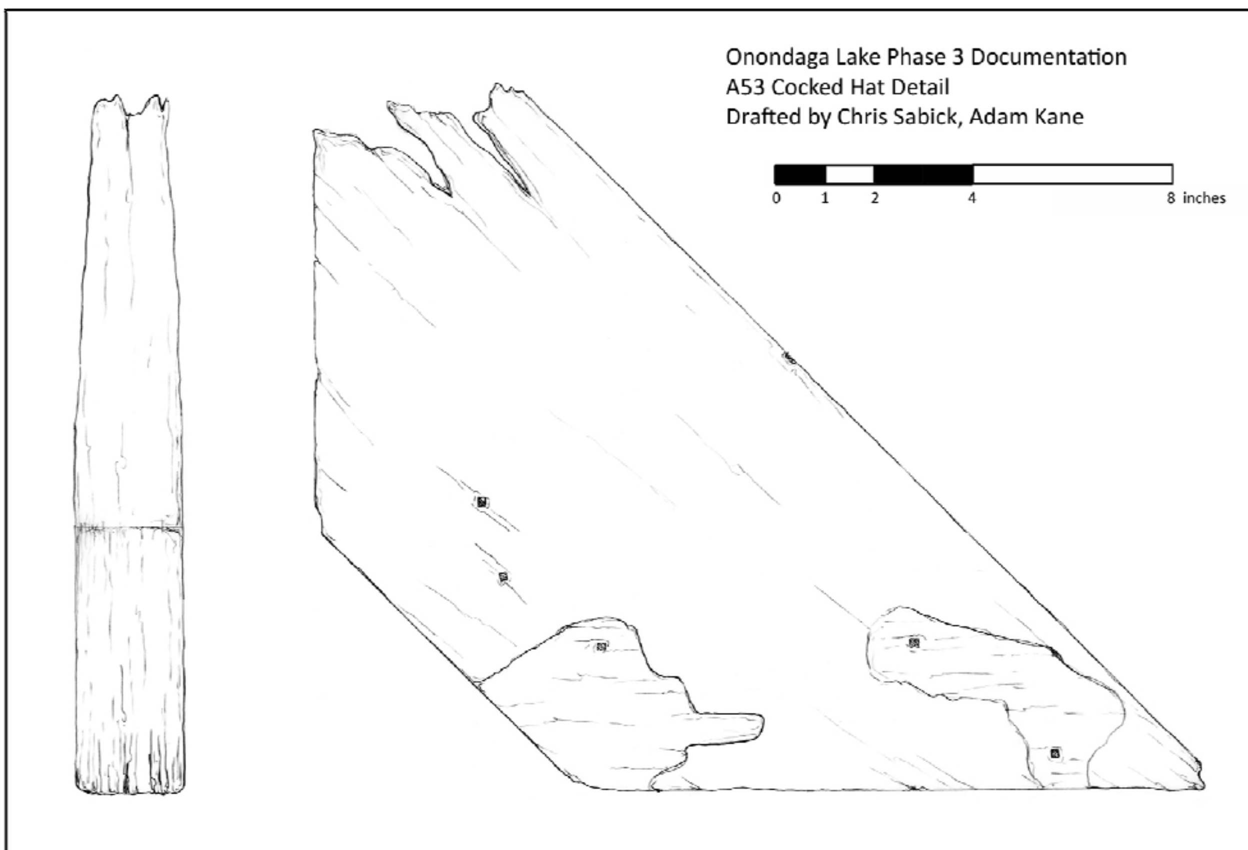

Figure 97: A53 cocked hat detail (LCMM Collection).

Stern

A53's stern was very poorly preserved, consisting of seven futtocks and four planks standing 2 to 12 inches (5.1 to 30.5cm) above the bottom; all constructed of white oak. From these scant remains, the shape of the stern was rounded. The planking, which rises near vertically out of the bottom, rather than horizontal or near horizontal, is typical of the upward sweep of stern planks in canal boats. There was no evidence of a sternpost or rudder.

Conclusion

A53's clear illustration of cocked-hat construction in a canal boat is an important contribution to the understanding of the late nineteenth/early twentieth century canal boat construction for NY's canal system. The vessel's standardized building technique with identical framing along the run of the hull suggests that the shipyard that built the vessel was replicating a well-established plan. Identical framing pieces were milled in volume and assembled in volume.

DATA ANALYSIS

INTRODUCTION

The following section will examine the research questions and archaeological results associated with this project in terms of NRHP-eligibility criteria for each of the six sites indicated in the Mitigation Report, as well as the types of data that are required to address these questions. Additionally, research questions and answers have been provided for the four sites found around Salina Pier during this project. The National Park Service has produced numerous bulletins designed to provide technical information on the survey, evaluation, registration and preservation of cultural properties as it pertains to the NRHP. The bulletins used in the evaluation of Onondaga Lake's submerged cultural properties include: *How to Apply the National Register Criteria for Evaluation*, *Guidelines for Evaluation and Registering Archeological Properties*, *Guidelines for Evaluating and Documenting Historic Aids to Navigation*, *Nominating Historic Vessels and Shipwrecks to the National Register of Historic Places*, and *Guidelines for Evaluating and Registering Historical Archaeological Sites and Districts*.

For a property to be included on the NRHP it must meet at least one of the following criteria:

A. Sites that are associated with events that have made a significant contribution to the broad patterns of our history; or
B. Sites that are associated with the lives of persons significant in our past; or
C. Sites that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic value, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
D. Sites that have yielded, or may be likely to yield, information important in prehistory or history.

In the case of the Syracuse Maritime Historic District, criterion A, C, and D can be applied to most of the properties and have acted as the basis for the research questions generated for each contributing property.

Anomaly 1 & 2: Salina Pier

Criteria A: Recreation, Commerce, Transportation

1. What role did the Salina Pier play in the development of the southern end of Onondaga Lake?

Dataset: Archival research into the maritime infrastructure of Onondaga Lake

Archival research in local and regional museums/historical societies revealed few sources about Salina Pier resort and its impact on the development of the southern end of Lake Onondaga. From the limited information available, it appears that its primary historical role was as a rival to the larger, and ultimately more successful, Iron Pier resort. This is not to say that the Salina Pier wasn't an important player in the southern end of the lake during its short operational life – it was; at one time it supported a saloon and a pavilion that housed a concert hall and dining room. The pier itself served vessels that operated thorough the lake up until the late 1880's. However, in 1890, the Iron Pier resort purchased the Salina Pier facilities, and covered the site with 4 feet (1.22m) of Solvay waste. This proved to be the end for what was regarded as a regional tourist attraction.

From the number of wrecks that were located around the pier during the survey work associated with the Onondaga Lake Superfund Site project, it is clear that, though it was no longer operational, the pier was used into the early twentieth century as a location were older vessels could be scuttled or disposed of without becoming obstructions to other forms of ongoing lake traffic.

Criteria D: Information Potential

1. What does the artifact scatter presumed to exist around the Salina Pier reveal about its use?

Dataset: Contextual mapping of the pier remains and the associated artifacts

An insufficient number of artifacts were located during the examination of the Salina Pier remains to allow any conclusions to be made.

2. How was the Salina Pier constructed and modified during its operational use?

Dataset: Detailed documentation of the construction of the pier; archival research into similar structures built during the same time period

The documented remains of Salina Pier suggest four phases of construction during its operational life (sections A-D), each of which represented an addition or expansion of the original pier structure (section A). As detailed in the site description, each of these phases displayed a slightly different construction technique, allowing one section to be clearly distinguished archaeologically from another. Phase A of the Pier construction consists of two rows of vertical planks, 1 inch (2.5cm) thick that are separated by 12 inches (30.5cm). The interior of this section is filled with rip rap 2-6 inches (5-15.2cm) in size. The outside of Phase A is further buttressed by 8-12 (20.3-30.5cm) inch rip rap outside of the timber structure. Phase B demonstrates a single layer of 1 inch (2.5cm) thick vertical boards and is filled with a mix of 2-6 inch (5-15.2cm) rubble. Phase C also consists of a single layer of 1 inch (2.5cm) thick vertical boards but is filled with a mix of sediment including cobbles, coal ash, and soil. Phase D of the Salina Pier construction consists two layers of vertical boards separated by 12 inches (30.5cm) and supported by vertical pilings every 8-12 feet (2.4-3.7m). This section of the pier is filled with large rip rap measuring 8-16 inches (20.3-40.6cm) in size. The fact that the original pier was lengthened and expanded on a number of occasions does support other evidence that, for a period of time prior its purchase by the Iron Pier resort, the Salina Pier was a thriving and critical element of the economic and social activities taking place at the southern end of Onondaga Lake in the late nineteenth century.

While detailed descriptions of piers located on inland waterways from a similar time period to Salina Pier are not well documented in the archaeological record, general pier construction practices are described in the historical documentation.[135] These sources classify the Salina Pier's construction style as a "solid filled pier[136]." This type of pier consists of a retaining wall made of wood planks or metal sheet piles that are filled with rip rap or mixed sediments. This style of pier is particularly favored for smaller, shallow bodies of water where the structure does not face the same types of forces that an ocean front pier would be exposed to. Other examples of this pier type mentioned in the literature include various ore docks located on the Great Lakes, and some of the pier structures of Bush Terminal located in Brooklyn, New York.[137]

Anomaly 4-1: Dump Scow

Criteria A: Engineering, Industry, Commerce, Transportation
1. What type of activities were dump scows employed on Onondaga Lake?

Dataset: Archival research into the development of the maritime infrastructure of Onondaga Lake

Archival research revealed no specific documented examples of the use of dump scows on Lake Onondaga. However as there were extensive and well-known in-water construction efforts and improvements carried out around the lake, it can be assumed that vessels like that represented by A4-1 were involved in those operations. This type of ship was capable of depositing a significant quantity of material onto the lake bottom quickly and efficiently, making it useful in the construction of piers, breakwaters, and other infrastructure projects. Dump scows like A4-1 would have also been employed in disposing of the large amounts of spoil generated by dredging operations around the lake and connecting waterways.

Criteria C: Design/Construction
1. How does the construction of Dump Scow 4-1 compare with other contemporaneous vessels that performed a similar function?

Datasets: Detailed examination and recording of the structure of the vessel remains; archival research into similar vessels from the same time period.

Examination of vessel remains and a comparison with examples noted in archival sources demonstrate that A4-1 shares many of the characteristics found on other vessels, while still possessing a few distinguishing features. The largest sample of dump scows and hopper barges that were studied for the project are those documented at Arthur Kill New York.[138] However those vessels were of a larger coastal variety, and while they were inventoried, they were not documented in significant enough detail to allow for a direct comparison of construction styles with A4-1. The hopper barges inventoried at Arthur Kill are considerably larger than A4-1 with vessel No. 238 measuring 150 feet (45.7m) in length with a beam of 30 feet (9.1m). This can be compared with the much small dimensions of A4-1, which measured 79 feet 6 inches (24.2m) in length and 28 feet (8.5m) in beam. Of the six dump scows inventoried by James at Arthur Kill, five of them featured six dump bays and one featured eight dump bays. In comparison, A4-1 had only five dump bays. Several of the Arthur Kill vessels were also noted as having rounded ends where A4-1 clearly has raked ends.

One photograph found at the Erie Canal Museum (Figure 98) depicts a dump scow with five bays similar in design to A4-1 though built partially of metal. This image, which was taken in the Syracuse Inner Harbor in 1914, shows a composite construction dump barge which has both metal and wooden components. The vessel is comparable in size to A4-1 though its hull appears to be made of wood that is clad in metal sheeting and the athwartships bulkheads are made entirely of metal.

The differences in construction style and size of the hopper barges surveyed in Arthur Kill and the one depicted in the photograph of the Syracuse Inner Harbor demonstrate that this is, overall, a poorly understood type of boat. The documentation of A4-1 will add considerably to our understanding of this vessel category, particularly as it is also the only known archaeological example from an inland waterway setting.

Figure 98: Dump Scow in Syracuse Inner Harbor 1914. This example displays composite construction instead of wooden construction but is otherwise similar to A4-1. (The Erie Canal Museum, Syracuse, NY, eriecanalmuseum.org)

Criteria D: Information Potential

1. Is Anomaly 4-1 a Dump Scow?

Dataset: Detailed examination and recording of the structure of the vessel remains

Yes, Anomaly A4-1 is a Dump Scow. The detailed examination of the vessel remains revealed features that are only present on vessels of this type, including the dump bay doors and the watertight bulkheads that surround them.

2. What are the structural and mechanical requirements for wooden dump scows?

Dataset: Detailed examination and recording of the structure of the vessel remains

While much of the structure of A4-1 is very similar to the other barges that were examined during the archaeological work carried out on Onondaga Lake, there are a few characteristics of this wreck that identify it as a dump scow. The principal feature is the central dump bay. This structure ran for a length of 55 feet (16.78m) and was 7 feet (2.3m) wide. The bay was defined by watertight bulkheads that are located along both sides and atwartships on either end. These bulkheads would have extended from the interior of the bottom planking to the underside of the decking creating the enclosing the bay, through which material could be deposited onto the lake bottom. Inside of this enclosure are five dump doors. These were held closed by a series of chains and pulleys until the vessel was appropriately located, at which time the chains were released and the door fell open - allowing the material to dump directly onto the lake bottom.

Anomaly 7: Piling Clumps

Criteria A: Engineering, Industry, Commerce, Transportation

1. What role did Anomaly 7 play in the development of the southern end of Onondaga Lake and its connections to the New York State Barge Canal?

Dataset: Archival research into the maritime infrastructure of Onondaga Lake

The piling clumps that make up Anomaly 7 are not mentioned specifically in any of the resources that describe the development and use of the southern end of Onondaga Lake. However, the location and the function of A7 marking the navigable channel and entrance to the Syracuse Inner Harbor helped to ensure that vessels could safely enter and exit this commercially important feature of Syracuse's waterfront. The depth of water to either side of the designated channel is extremely shallow and would not allow vessels of any size to traverse the entrance to the inner harbor. The channel was initially marked with two lights sometime between 1915 and 1926. Additional piling clumps were added between 1937 and 1942, and the system was expanded to the current number of eight piling clumps sometime after 1952. In this final configuration these pilings continue to aid vessels in safely transiting into, and out of, the Syracuse Inner Harbor.[139]

Criteria D: Informational Potential

1. What types of wood were used in the construction of the piling clumps?

Dataset: Wood sample analysis

A sample analysis determined that the wood utilized was Hard Pine (Southern Yellow pine).

Anomaly 12: Dredge

Criteria A: Engineering, Industry, Commerce, Transportation

1. What type of activities were Dredges employed in on Onondaga Lake?

Dataset: Archival research into the development of the maritime infrastructure of Onondaga Lake

Archival research revealed no historic records of dredges being employed on Lake Onondaga. However, as there are were extensive in-water construction efforts and infrastructure improvements carried out around the lake and in the associated canal system, it can be assumed that vessels like that represented by A12 were involved in those operations. In particular, the short canal that connects Onondaga Lake to the Inner Harbor of Syracuse would have needed regular dredging to ensure that it retained sufficient depth to allow cargo vessels to safely enter the harbor. This type of vessel would have also been useful in the construction of piers, breakwaters, and other infrastructure projects. Though no written accounts of these vessels being used was found, researchers did uncover one picture of a hydraulic dredge in the Syracuse Inner Harbor demonstrating that they certainly transited this area (Figure 99).

Figure 99: Ludington's Hydraulic Dredge at Syracuse Harbor in 1921 (courtesy of NY Canal Corp.)

Criteria C: Design/Construction

1. How does the construction of Dredge A12 compare with other contemporaneous vessels that performed a similar function?

Datasets: Detailed examination and recording of the structure of the vessel remains; archival research into similar vessels from the same time period

The construction details of both bucket and hydraulic dredges are not well represented in either the historic or archaeological record. In comparative terms, three vessels of this class were noted in the documentation carried out at Kill Van Kull, New York by Raber Associates[140] in 1996, but they were only inventoried and no details were recorded of their specific structure or design. The follow-up reporting of vessels in this area by Panamerican Consultants Inc. described[141] the three dredges in slightly more detail and identified them as one bucket dredge and two hydraulic suction dredges. While the details are few, this latter report does highlight a few features of these wrecks that are also present on A12. Vessel 3 is described as having spud boxes that measure approximately 3 feet squared (0.28m squared) which is similar in size to those on A12, though in the case of Vessel 3 they are built into the interior corners of the deck structure rather than being attached to the outside of the barge hull as on A12. Vessel 3 and Vessel 36 are described as having one vertical end (in conjunction with the spud boxes) and one raked end. This is the same arrangement that was noted on A12. Two chain plates used to support the dredge support frame were also noted on the raked end of Vessel 3, this identical arrangement was noted on A12 in Onondaga Lake.

The only other documentation of a dredge found was a set of basic drawings of the bucket dredge *Toledo* that were produced in 1910 (Figure 82). Unfortunately, these drawings were presented without a scale, and because of this are of limited use in obtaining comparable measurements with the A12 remains. These drawing do however give us some idea of what the upper works that are no longer extant on A12, may have looked like.

Criteria D: Informational Potential
1. What are the structural and mechanical requirements for a dredge?

Dataset: Detailed examination and recording of the structure of the vessel remains

The structural requirements for a dredge that were revealed during the documentation of A12 include the presence of spud boxes in combination with a vertical end; that identifies the end of the vessel as where the dredge itself operated. The spuds were located on the working end of the platform in order to ensure that the ship was very stable and properly positioned during dredging operations. The vertical end of the boat allowed the dredging operations to take place without fear of the bucket or cutter head snagging on the underside of a raked end. The interior of the barge on which the dredge is mounted was also heavily reinforced with longitudinal timbers that greatly increased the strength of platform and made it capable of supporting the large machinery that was needed to operate the dredge itself.

Anomaly 45: Stone Breakwater

Criteria A: Commerce, Transportation
1. What role did Anomaly 45 play in the development of the southern end of Onondaga Lake and its connections to the New York State Barge Canal?

Dataset: Archival research into the maritime infrastructure of Onondaga Lake

The placement of breakwater A45 on the southern shore of Onondaga Lake helped to protect the entrance to the Syracuse Inner Harbor from wave action that may have interfered with shipping entering and leaving the harbor. This added protection allowed commerce to continue even when wave action on the broad lake would have restricted safe vessel movement into and out of the Syracuse Inner Harbor.

Criteria C: Design/Construction
1. How were the concrete “pillows” that this feature is constructed from, made?

Dataset: Detailed documentation of the breakwater using measured drawings and underwater photography and videography

No description of how the concrete pillows (that were observed on A45) were made has been found. However, from examination of a number of the pillows in detail, it appears that a measured quantity of wet concrete was placed into burlap sacks and allowed to dry. In appears these pillows are very similar to sandbags associated with emergency flood control, except in this case they were filled with cement and hardened into permanent "armor" for the breakwater.

Criteria D: Informational Potential

1. Was the use of concrete "pillows" a common construction technique for breakwaters in the early twentieth century?

Dataset: Archival research into construction techniques for other contemporaneous breakwaters

Extensive archival research into the development and construction of breakwaters has not revealed any other descriptions of concrete "pillows" of the design discovered on A45 being used. However, the use of concrete blocks or rip rap as "armor" for a rubble filled breakwater is common practice in breakwater design and installation. In essence, the rubble mound contained under the concrete pillows is the real barrier to wave action, the concrete pillows that were used to encase the rubble mound act as armor to dissipate the force of the waves and protect the rubble mound from erosion.[142]

Anomaly 53: Canal Boat

Criteria A: Engineering, Industry, Commerce, Transportation

1. What role did canal boats play in the development of the maritime industry and commerce on Onondaga Lake before and after the opening of the New York State Barge Canal?

Dataset: Archival research into the maritime infrastructure of Lake Onondaga

Canal boats played a significant role in the development of the maritime industry on and around Onondaga Lake. The connection of the lake to the canal system allowed the industries along the lakeshore to ship their product out to a broad market at a reasonable cost. Canal boats were also able to bring in the raw material and equipment needed by these industries to operate in an efficient manner. For example, wood brought into Onondaga Lake on canal boats was used in the salt evaporation process. In turn, these same canal boats then carried the salt out of the lake, with more than 1,600,000 bushels of salt shipped in 1833 alone. This volume of salt only increased over time, and more than 9,000,000 bushels were shipped out in 1862.[143] In addition to their commercial uses, canal boats were also used to transport visitors to the growing resort industry along the shores of Onondaga Lake.

With the opening of the New York State Barge Canal in 1918, and the construction of the Syracuse Inner Harbor, Onondaga Lake became the route by which canal boats engaged with the industries of Syracuse. These vessels continued were active in the lake trade for at least a decade after the opening of the barge canal, but were soon replaced by larger steel barges that made more efficient use of the enlarged lock sizes on the barge canal.

Criteria C: Design/Construction

1. Why was “cocked hat” construction used on this vessel?

Dataset: Archival research into the construction of similar vessels from the same time period.

The reason that the builder of A53 chose to use the cocked-hat construction technique is not readily apparent and his decision most likely encompassed a number of considerations. First, this technique is an economical approach to joining the sides and bottom of a canal boat when compared to the use of naturally grown curved knees as would be expected in more traditional ship construction. Also, it is a fairly simple technique to master and therefore did not take particular skill to employ.

Criteria D: Informational Potential

1._ Was “cocked hat” construction used on other contemporaneous vessels?

Dataset: Detailed examination and recording of the structure of the vessel remains

The cocked-hat construction technique is not widely represented in the archaeological record, but there are examples worth noting. In particular, this technique appears to have been employed in the construction of some western river steamboats. The wreck of the stern wheel steamboat *Andy Gibson,* located in the upper Mississippi River, demonstrates the cocked hat technique. *Andy Gibson* was constructed in 1884 and sank in 1892 in Akin County, Minnesota, a timeframe that fits well with the estimated date range of A53. Beyond the realm of the western river steamboat, cocked hat construction was also documented in a number of Civil War Era wrecks like the Confederate gunboat *Cairo*.[144]

While the cocked hat construction technique was employed, and has been archaeologically identified, on a number of vessels contemporaneous to A53, those examples are all from the western river portion of the American Midwest. The presence of this technique on vessels located in Onondaga Lake suggests that its usage was more widespread than previously understood.

2. Was “cocked hat” construction an effective alternative to traditional shipbuilding techniques?

Dataset: Detailed examination and recording of the structure of the vessel remains

The effectiveness of the cocked hat construction technique in comparison to traditional ship building practices is difficult to assess from the remains present at the site of A53. The junction of the sides and bottom of watercraft that have a “hard” chine like A53 is known as a potential weak point in their construction. Perhaps this is best illustrated on A53 by the complete absence of any remains of the vessel’s sides. The lack of these structures, and the presence of the bottom timbers and associated cocked hats and floors, suggests that the sides broke away at the chine cleanly and either floated off or were removed as obstructions. These facts suggest that this construction method was not as effective as traditional techniques that employed naturally curved knees to form the chine junction. In all likelihood, the cocked hat construction technique was employed because it was quick and cheap in comparison to more established techniques. Shipbuilding is always a compromise between cost and durability. In the case of A53 it appears that lower cost and ease of construction outweighed the need for the vessel to be particularly long lived.

Anomaly 2-1: Steam Launch or Tugboat

Criteria A: Engineering, Industry, Commerce, Transportation
1. What type of activities were Steam Launches and Tugboats employed in on Onondaga Lake?

Dataset: Archival research into the maritime infrastructure of Onondaga Lake

As with most waterfronts, steam launches and tugboats were used as general purpose vessels on Onondaga Lake. Tugs were often employed towing other vessels, including canal boats and barges, throughout the lake and local canal system. Where tugboats were used to move vessels and goods, excursion boats were used to move people around Onondaga Lake. Undoubtedly, launches were used by the large resorts located on the lake's shoreline to expose their visitors to the sights around Onondaga Lake as well as general transportation for people to, from and between various waterfront establishments (Figure 22).

Criteria C: Design/Construction
1. How does the construction of Steam Launch of Tugboat A2-1 compare with other contemporaneous vessels that performed a similar function?

Dataset: Detailed examination and recording of the structure of the vessel remains

The construction of A2-1 has very few comparative examples in the archaeological record. Several other tugboats dating to the late nineteenth century have been studied in some detail but all of these examples are from salt water environments and most represent larger vessels than that demonstrated by A2-1.[145] The waters of Onondaga Lake and the associated canal system required particular attributes and construction techniques that allowed the vessels built for these environments to operate in confined spaces and to access shallow water areas without running aground. These attributes are achieved in A2-2 by limiting its size and depth of hold. The goal of being able to operate in shallow water necessitated that A2-2 have a relatively flat bottom and a hard chine; these are not attributes that a salt water vessel of this class would typically display.

Perhaps the best comparative vessel to A2-1 in the archaeological record is the tug *Edward E. Gillen* which was launched in 1928 in Sturgeon Bay, Wisconsin.[146] Though *Edward E. Gillen* was built to operate on the much larger waters of the Great Lakes, it was of comparable size to A2-1 measuring 73 feet in (22.3m) length and 19 feet (5.8m) in beam. Unfortunately this vessel is located in heavily contaminated sediments in the Kinnickinnic River near Milwaukee. Due to the contaminated nature of the site, it has not been documented thoroughly and therefore we do not have detailed information about its hull construction to compare with the remains found at A2-1.

Anomaly 2-2: Canal Packet

Criteria A: Engineering, Industry, Commerce, Transportation
1. What type of activities were Canal Packets employed in on Onondaga Lake?

Dataset: Archival research into the maritime infrastructure of Onondaga Lake

By definition a canal packet was designed and built to carry people on the canal system and its associated bodies of water, like Onondaga Lake (Figure 100). This is best displayed on A2-2 by the fact that though it shares many of the construction characteristics of a standard canal boat, its length is too short to take full advantage of the lock size within the canal system. As the construction of this vessel type was not trying to maximize its cargo capacity, it could be built to a shorter length than a standard canal boat and still perform its tasks adequately.

Figure 100: A Canal Packet Boat on the Erie Canal c.1895 (New York State Archives)

Criteria C: Design/Construction

1. How does the construction of Canal Packet A2-2 compare with other contemporaneous vessels that performed a similar function?

Dataset: Archival research into the construction of similar vessels from the same time period.

As A2-2 is the only known wreck believed to represent a canal packet, there are no contemporary vessels with which to compare its construction style. However A2-2 does share some characteristics with standard canal boats of the same time period.[147] The standard canal boats of the late nineteenth century have vertical edge fastened sides like A2-2 which allowed ship builders to construct a very rigid hull with a minimal amount of expensive timber. Additionally, A2-2 has a scow shaped stern which is also a common feature of standard canal boats. However, A2-2 does display a number of characteristics that are not found on canal boats of a similar age including its system of diagonal bracing and the laminated construction of its sides. Since there are no other known archaeological examples of a canal packet it is unclear if these features were common of this vessel type or unique to A2-2.

Anomaly 2-3: Steam Excursion vessel

Criteria A: Engineering, Industry, Commerce, Transportation

1. What type of activities were Excursion Vessels employed in on Onondaga Lake?

Dataset: Archival research into the maritime infrastructure of Onondaga Lake

Excursion vessels were used around Onondaga Lake for the transportation of passengers between establishments along the shoreline as well as for taking sightseeing tours of the lake. In this role they played an important part of the lakes transportation system (Figure 22).[148]

Criteria C: Design/Construction
1. How does the construction of Excursion Vessel A2-3 compare with other contemporaneous vessels that performed a similar function?

Dataset: Archival research into the construction of similar vessels from the same time period.

Research into the archaeological record has not revealed the study of any other steam excursion vessels to date. Additionally the scant remains of this vessel do not leave a lot of room for comparison with other contemporary watercraft. The construction of the exposed portion of A2-3's stern is similar to any number of late nineteenth or early twentieth century vessels and is fairly standard for freshwater boats of this period.[149] A2-3's scantlings are quite light and what can be determined about its length-to-beam ratio suggests that this was a very long and narrow vessel that would have allowed it to travel quickly through the water.

Anomaly 2-4: Barge Timbers

Criteria C: Design/Construction
1. How does the construction of Barge Timbers A2-4 compare with other contemporaneous vessels of this type?

Dataset: Archival research into the construction of similar vessels from the same time period.

The construction techniques displayed in the remains of the barge timbers at A2-4 suggest that they are the remains of the lower side structure of a barge, possibly representing the chine log of the vessel. The construction techniques displayed in this anomaly are fairly standard but this portion of a barge's construction is rarely accessible when additional structure is present (as is the case with the other barge sites on Onondaga Lake).[150] Therefore it is difficult to assess how this fragment compares with the chine log assemblies of other barges. The fact that this rarely seen portion of a barges construction is readily accessible with A2-4 adds to the significance of this otherwise mundane site.

Data Analysis Conclusions
As demonstrated by the answers to the research questions posited above, it is clear that the Syracuse Maritime Historic District encompasses a variety of historically important sites that offer a significant amount of information to our understanding of the maritime environment on Onondaga Lake, and the role it played within the larger canal system. The shipwreck properties that are contained within the historic district (A53, A12, A4-1, A2-1, A2-2, A2-3, A2-4) include a variety of vessel types that are demonstrative of the inland freshwater shipbuilding practices of the late nineteenth and early twentieth century. This was a time period when shipbuilding along the canal system, and its associated bodies of water, saw a number of new techniques being experimented with and deployed. The archaeological data set for vessels from this "niche" area of study is also quite small and poorly documented, making the data recovery that was carried out for this investigation even more valuable. In addition to the vessel remains, the marine infrastructure properties encompassed by the Syracuse Maritime Historic District (A7, A2, A45) highlight that fact that the northern end of Onondaga Lake was a vibrant and

important portion of the larger regional maritime traffic system. These structures were put into place to ensure that traffic could safely traverse and this portion of the lake in order to carry out the commerce that was vital to the continued vitality of Syracuse and the surrounding area. The use of the Salina Pier complex (A2) as a “ship graveyard” also demonstrated that these infrastructure components still had value and opportune usefulness beyond their commercial lives.

CONCLUSIONS

Since 2007, Lake Champlain Maritime Museum (LCMM) under subcontract to Parsons and on behalf of Honeywell, has been performing archaeological investigations of the Onondaga Lake bottom in support of the remedial activities of the Onondaga Lake Cleanup Plan. Recommendations from Phase 1B work were outlined in a mitigation plan for six historically significant properties located within the Syracuse Maritime Historic District that will be impacted during remedial activities in Onondaga Lake (A1/2, A4, A7, A12, A45, and A53). During mitigation fieldwork performed in 2012 and 2013, four previously unknown shipwrecks were also located and documented (A2-1, A2-2, A2-3, and A2-4).

In all, ten sites within the proposed Syracuse Maritime Historic District were documented in this Phase 3 work. In September and October 2012, and in May 2013, LCMM archaeologists carried out 29 days of archaeological fieldwork which included 89 dives totaling 126.4 hours of bottom time.

The archaeological activities complied with the NY State Office of Parks, Recreation and Historic Preservation's *Standards for Cultural Resource Investigations and the Curation of Archaeological Collections in NY State* and the Secretary of the Interior's *Standards and Guidelines for Archaeology and Historic Preservation,* as amended and annotated (48 FR 44716).

The ten sites represent a variety of property types, and were documented with a variety of techniques, including videography, photography, detailed measured drawings, and the recovery and analysis of wood samples.

- Vessels: Dump scow (A4), Dredge (A12), Canal Boat (A53), Steam tug/launch (A2-1), Canal packet (A2-2), Steam excursion vessel (A2-3), Barge (A2-4)
- Marine Infrastructure: Salina Pier (A1/2), Concrete breakwater (A45)
- Aid to navigation: pilings (A7)

Scant information is available in the historic record about these workaday vessels or the infrastructure that supported them: often the best resource is what lies underwater. The documentation of these ten sites as mitigation within the Onondaga Lake Cleanup Plan has added to our knowledge base about late nineteenth and early twentieth century vessel and infrastructure construction techniques. This Phase 3 documentation has allowed a better understanding of the vessels and infrastructure themselves, the manner of their construction, and the relationship they had to the interconnected waterways surrounding Syracuse. Ultimately, at the end of their working life, they took on another association as an archaeological resource, ultimately becoming part of a collection of vessels known as the Syracuse Maritime Historic District. Through historical research and intensive fieldwork, and a better understanding of the proposed district and its contributing properties has been gained.

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APPENDIX 1: FIELD LOGS

Field logs recorded by Adam Kane, LCMM Archaeological Director during the 2012-2013 fieldwork.

September 5, 2012

Mobilization day for Onondaga.

Rotation #1. This is the start of three ten day Onondaga Lake rotations to undertake Phase 3 archaeological on six sites.

9:30: Arrive LCMM. Finish up loading and prepping gear.

11:00 Depart LCMM. Crew: Adam Kane, Chris Sabick, Ron Adams and Pierre LaRocque. Left in PAL's and RA's trucks with Champlain Divers' pontoon boat and dive trailer in tow.

16:30 Arrive Onondaga Lake Marina in Syracuse, NY. Kelly Miller of Parsons is awaiting our arrival.

17:00 Safety orientation by Kelly Miller.

18:00 Launch pontoon boat. Safety inspection by Kelly Miller, followed by remediation operations tour by Kelly Miller out in the lake.

18:30 Tie up boat at slip. Secure gear and move trailers to an out-of-the way location.

19:00 Depart Marina for dinner.

19:30 Dinner with Russ and Linda Andrews at Dinosaur.

21:30 Check into hotel.

September 6, 2012

The plan for today is to take the first part of the morning and go through the dive gear. Everyone will need to swap over to Agas and new wrist seals. Before dive ops, we will do an orientation on the six sites and an analysis of the visibility at each. The visibility and incoming weather will be the primary variables in the order the sites are studied. Dive rotations to follow:

7:00 Meet in the hotel lobby. Crew: Adam Kane, Ron Adams, Pierre LaRocque and Chris Sabick. Breakfast.

7:40 Depart diner – stop at drug store to pick up supplies.

8:00 Spoke with Tom Drachenberg regarding other dive work that Parsons needs – there has been some slope collapse/shift during remedial work and they may need a diver to take a look.

8:40 Arrive Onondaga Lake Marina. Set up regs for Agas and switch drive gloves over to twist-seal dry gloves.

10:00 Safety briefing. Overview of dive logistic and safety, boat operations. Review of archaeological mitigation plan and strategy for examining sites based on turbidity spilling out of Ley Creek and Syracuse Inner Harbor.

11:00 Load boat.

11:45 Lunch

12:15 Depart Onondaga Lake Marina. Tour of the six sites to help define approach based upon current conditions. A1/2 is embedded in dense milfoil and other aquatic vegetations. The top of pier is composed of cobble-sized rocks held in place with vertically oriented planks. There were other parts of the structure that could not be easily defined with a surface inspection, but appeared more complex than the cobble/vertical plank portion. A4-1 looks relatively clear of vegetation outside the barge, but inside it is completely filled. We did not get a close look. The breakwater and A53 are both completely covered in vegetation. Visibility was 3-4ft. at all of the sites. All work will require one or more dives to clear vegetation prior to documentation.

13:50 Adam Kane into the water with Chris Sabick as safety diver on A53. First dive on A53 suggests that it has more structure than initially anticipated. The middle section of the boat consists of flat floors with cocked-hats at the turn of the bilge. The shoreward end has futtocks arranged in an elliptical pattern. There appears to be a sternpost/stem, but more investigation will be needed to determine that conclusively. The northwest end of the boat is not well understood at this time.

15:00 Adam Kane out of the water.

15:37 Chris Sabick into the water with Adam Kane as safety diver.

16:45 Chris Sabick out of the water.

17:10 Depart A53 for the Parsons' trailers to meet with Tom Drachenberg to discuss a dive to assist the remediation efforts. The plan for tomorrow will be to stage an early dive to assess an area of cap-slump and try to find some missing collection plans.

18:30 Depart Parsons' trailers for Marina.

18:45 Arrive Marina, offload gear and set up for Friday's dive.

19:10 Depart Marina.

September 7, 2012

Today's plan is to stage two dives in support of the remedial effort.

5:30 Meet in hotel lobby. Crew: Adam Kane (AK), Ron Adams (RA), Chris Sabick and Pierre LaRocque (PAL).

5:45 Breakfast

6:30 Arrive Onondaga Marina. Load boat, tool box. Safety briefing.

6:45 Depart Marina.

7:05 Arrive at Turnaround docks. Take on additional crew to assist with GPS work: Victoria Whritenour (Parsons) and Mark Williams (Thew Associates).

7:45 Depart Turnaround. Deploy four marker buoys to denote the center of the cap-sinking area.

8:30 Done setting marker buoys. PAL gears up for first dive.

8:40 PAL into the water. He surveys the area where the bathymetry suggests there has been slumpage. PAL reports that it appears as though the area has subsided with large cuts 4 – 5ft.deep where the bottom has pulled apart. The cap is jumbled with the underlying sediment. There is a clearly defined lip to the subsidence which shows the stratigraphy of the cap and bottom sediments. No evidence of pans or stakes which were formerly in the area.

9:08 PAL out of the water. Extensive review of video and description of findings. Dive 2 will be RA to continue inspecting the area and looking for lost caps/stakes (without video camera)

9:52 RA into the water. RA reports that the area where the slide took place looks like it has been dynamited.

10:25 RA out of the water.

10:40 Arrive at Turnaround docks. Discuss results with Dave Smith.

10:55 Depart Turnaround for Marina.

11:05 Arrive Marina.

11:20 Depart for hotel to retrieve the camera case so that the video recorded by PAL can be downloaded by Parsons. Lunch.

12:45 Arrive back at Marina. Load for afternoon rotation.

13:00 Depart Marina.

13:10 Arrive Turnaround.

13:20 Depart Turnaround for dive rotation on A53.

13:30 Arrive A53.

13:53 Chris Sabick (CS) into the water. Joined by Deidre Blankenship from Parsons as safety oversight. Kelly Miller departed at 11:00 from Marina. CS reports the A53 is 96.5 ft. long by 17ft. wide. CS laid a longitudinal baseline (BL) and took floor measurements along it. The site is still very weedy despite two dives focused on clearing yesterday.

14:59 CS out of the water.

15:20 Depart A53 for Turnaround.

15:25 Arrive Turnaround for conference on the morning dives' findings.

16:00 Conference with Parsons, Honeywell and DEC staff regarding slump.

17:10 Finish meeting. Depart Turnaround.

17:20 Arrive Marina.

17:50 Depart Marina. End of day.

September 8, 2012 – Weather Day

The plan for today is to continue working on A53. The weather may be an issue today with scattered thunderstorms in the morning followed by a strong front moving through between 4 and 6 p.m.

7:00 Depart hotel. Crew: Adam Kane, Ron Adams, Pierre LaRocque and Chris Sabick.

7:15 Arrive Onondaga Marina. Wind is 20 mph+ out of the SE. Call Kelly Miller to report that today is a weather day.

7:30 Depart Marina. This weather day was spent running errands.

September 9, 2012

The plan for today is to continue working on A53 with CS diving first to work on the plan-view, followed by AK. CS rotates with Sarah Tichonuk (ST) at lunch.

7:00 Meet in hotel lobby. Crew: Adam Kane, Chris Sabick, Ron Adams and Pierre LaRocque.

7:45 Arrive Marina. Load.

8:45 Tool box, dive briefing with Kelly Miller (KM).

9:00 Depart Marina for A53.

9:25 Arrive A53.

9:45 CS into the water to continue recording plan view measurements. CS recovered a cocked hat (A53-T2) which was lying on the bottom disarticulated from the wreck. This was documented on the dive vessel. A wood sample was not taken, but needs to be prior to the conclusion of work on A53. This cocked hat was found at the floor at 21'11" on BL. Report from CS's dive. The shore end frames show a relatively graceful curvature, which suggests they are at the bow. The outward end (stern) may be raked or is much bluffer. For the framing, each floor and first futtock appears to be sandwiched between two cocked hats. The stern has a "keelson" running along the CL. There appears to be a stern in the bow. In some areas the plan at the turn-of-the-bilge is visible. The stern is buried more than the bow.

11:29 CS out of the water.

12:00 Depart A53 for Marina.

12:15 Arrive Marina. Lunch. Sarah Tichonuk swaps out with Chris Sabick. Sarah Tichonuk gets orientation from KM.

13:50 Depart Marina.

14:00 Arrive A53.

1:24 AK into the water. This dive was spent documenting the bow frame arrangement. Measurements on frame location were taken by measuring the top of each frame from baselines attached to the stern and to the first visible floor (at 22ft. on the CL BL) Triangulating these locations took nearly two hours with additional time still needed to record moulded/sided and height on each futtock.

16:03 AK out of the water.

16:15 Depart A53 for Marina.

16:35 Arrive Marina. Break down gear. There is a possibility that Monday's work will consist of locating lost pan and stakes in the slump area.

17:15 Depart Marina.

17:30 Back at the hotel.

18:30 Drafting A53 notes. The bow measurements show a framing shape that is highly consistent with a canalboat bow. The sides are straight until a few feet from the bow where the framing wraps around into a bluff canal boat shape.

20:30 Done drafting. End of day.

September 10, 2012

5:30 Meet in hotel lobby. Crew Sarah Tichonuk, Adam Kane, Pierre LaRocque and Ron Adams. The plan today is either to continue working on A53 or to locate pans and stakes in the slump area. Awaiting direction from Parsons.

5:50 Arrive Marina. Load.

6:15 Breakfast

6:45 Depart diner. Arrive Marina.

7:35 Depart Marina for A53. Sarah Tichonuk and Adam Kane will stage in first with Adam Kane at the bow and Sarah Tichonuk at the stern.

8:12 Adam Kane into the water. Took moulded, sided and height above bottom measurements for all of the bow frames. Located one fallen over futtock A53-T1 with its upper end lying next to the starboard side futtock which intersects the stern BL at 9-3. The fallen over futtock was lying on its side, oriented transversely with the upper pointed end resting just inboard of the BL #2 9-3 futtock. The recovered futtock presents a good curvature for depicting the bow. A second cocked hat (A53-T2) was found lying immediately forward of the curved futtock and was also recovered for documentation (See FN-AK-4).

8:42 Sarah Tichonuk into the water.

10:03 Adam Kane out of the water

10:26 Sarah Tichonuk out of the water. Sarah Tichonuk reports that the stern framing remnants are lacking in a distinguishable pattern. More frames are preserved on the starboard side than port.

11:00 Depart A53 for A4-1. This site was extremely weedy inside the barge, so a dive is necessary to clean out the vegetation prior to documentation.

11:20 Ron Adams into the water at A4-1. The purpose of his dive is to pull the mat of aquatic weeds out of the hull to facilitate documentation. During this dive, the wind picked up considerably to 15-20 mph.

12:11 Ron Adams out of the water due to building wind.

12:20 Depart A4-1.

13:00 Arrive Marina. Break down gear and offload.

14:00 Lunch at Marina.

14:30 Depart Marina.

14:45 Arrive at hotel.

15:35 Start drafting today's notes on A53. Drafted the bow frames in plan view, while Sarah Tichonuk did the same for the stern.

16:45 Dinner

18:00 Back at hotel. Update JSA for diving to support remedial activities, budget and revised dive safety plan.

20:00 Done with dive document update.

September 11, 2012

5:30 Meet in lobby. Crew Sarah Tichonuk, Adam Kane, Pierre LaRocque and Ron Adams.

5:45 Depart hotel for breakfast.

5:55 Breakfast

6:30 Arrive Marina. Load for dive to recover cable used to moor spud barge. PAL as diver with Adam Kane as safety diver. Weather is clear and calm at 50 degrees this morning, warming into the 70s.

7:10 Off the dock heading for nitrate north buoy for cable recovery.

8:03 PAL into the water.

8:15 PAL out of the water. The lost buoy line was found suspended in 36ft. of water.

The plan for the rest of the day is to go back to A53. Adam Kane to record cocked hat arrangement on the floors. Also need to label components for wood sampling. Also need to take sections.

8:30 Make off line to buoy so that nitrate north buoy is in place.

8:45 Arrive at Marina.

9:00 Depart Marina for A53.

9:25 Arrive A53.

9:34 Adam Kane into the water. Recorded the presence/absence and state of cocked hats on all of the frames. One floor was noted that had fallen over (or been ripped out) which will be recovered for subsequent documentation. The framing through the center of the hull is flat on the upper surface, but the displaced frame suggests that the bottom may have some curvature. Toward the stern, spacers were noted between the frames running longitudinally. Two were located immediately forward of the frame at 71ft. on the BL. These were recovered for documentation.

Examination of the stern suggests that the sternpost is no longer present, but the two framing pieces on either side are still extant. The planking curves in a sweeping upward motion behind both of these framing pieces, but coming from opposite sides.

(sketch)

9:48 ST into the water on A53. ST recorded sections at 22ft. and 43’10.5” on CL BL.

11:40 ST out of the water.

11:55 Depart A53 for Marina.

12:05 Arrive Marina. Lunch. The plan for the afternoon is to have RA recover the two sections (frames) that had fallen over. ST will continue working on cross-sections.

13:50 Depart Marina for Nitrate South 2 to recover a buoy line.

1400 Arrive Nitrate South 2.

14:21 RA into the water. RA descended to the bottom (59ft.) followed the cable and ascended with the mooring line.

14:35 RA out of the water. The mooring line was spliced and a new shackle put into place. Done with Nitrate South 2.

14:50 Depart Nitrate South 2.

15:05 Arrive Nitrate South 1, north location.

15:10 RA into the water. At 45ft. the poly line was found floating in the water column.

15:20 RA out of the water.

15:40 Depart Nitrate South 1, north location. Head over to A13, a canal boat outside (but in proximity) to a remediation area. This site needs to be marked (as per the recommendation in the Underwater Phase 1B Report) so that it is not inadvertently damaged during the clean-up.

15:45 Arrive A13. The wreck site has a black pvc boom very close, if not on it. The site is in 44ft. of water and will require coordination with the remediation folks.

1600: Depart A13 for Turnaround to discuss issue with staff there.

16:15 Arrive at Turnaround. Meet with Dave Smith and Tom Drachenberg regarding A13. The floating pipes over A13 are from the dredging operation and should not impact the site. There is concern that the site may now be in a capping area. A13 is likely far enough outside of the remediation areas that it has not been damaged from spudding or anchoring. We will stage a dive to mark the site first thing tomorrow.

17:05 Depart Turnaround for Marina.

17:15 Arrive Marina. Offload gear and rig for tomorrow's dive on A13.

18:00 Depart Marina.

September 12, 2012

5:30 Meet in hotel lobby. Crew: Adam Kane, Ron Adams, Sarah Tichonuk and Pierre LaRocque. Today's plan is to place marker buoys on A13, a potential dive to locate a lost velocimeter, and continued documentation of A53.

5:45 Arrive at Marina. Load.

6:00 Depart for breakfast.

6:30 Back at Marina.

7:15 Tool box, safety briefing with Kelly Miller. Discussion with Anchor QEA staff regarding a missing turbidity meter. We will evaluate a potential dive to locate this equipment.

7:25 Depart Marina for A13.

7"40 Arrive A13. Cap/dredge pipes are directly over the site. Drop one marker buoy as an ascent/descent line. Prep for dive.

8:33 PAL into the water.

8:38 Diver locates the wreck (A13). Orientation is approximately 30 degrees. The vessel's stern is pointed out into the lake. Visibility plus/minus 2ft., water temp 52 degrees F. Two bitts(??) in the bow at 31ft., 41ft. at the bottom in the bow. Starboard side intact with 2 iron cleats, no windlass visible. Planking is vertical in the bow. Cabin structure is gone. Rudder in the stern is gone but the transom has three transom wales with the rudder going through the upper two. There is a cleat on the port side stern and starboard side a bit forward of the cabin. Partition with cabin window in cabin. Wainscoting in cabin.

Deck beams plus/minus 1ft. thick, 14 inches tall. Port side toward the bow is heavily damaged (not new damage).

9:01 PAL out of the water.

9:43 Ron Adams into the water to look at turbidity meter which seems to be draped over the wreck (the line for it, at least).

9:47 Adam Kane into the water to inspect A13 and video A13. Adam Kane dive observations: The vessel is a stave bowed canal boat which stands plus/minus 6ft. proud of the bottom. Along both gunwales there is clear evidence of abrasion from remedial activities. The iron tow bitts in the bow have had the rust concretion knocked off them from recent disturbance. Most of the fasteners above the gunwale have also been dragged against. In the stern the boat's port rubstrake has been bent out of place. The starboard stern rubstrake is also damaged.

Report from Ron Adams on turbidity meter: the line to the instrument was draped over the wreck. The buoy with solar panel was located on the bottom. This information was conveyed to Anchor QEA staff.

A13 Bow N 43 04.196, w 76 11.749 (32.8' wreck) Stern N 43 04.210, w 76 11.739

10:21 RA out of the water.

10:26 AK out of the water.

11:15 Depart A13.

11:20 Arrive Turnaround for meeting regarding A13 observations.

13:00 Meeting with Ed Glaza, Dave Smith, Kelly Miller, Caryn Kiehl-Simpson (phone) and LCMM crew regarding the observations on A13. Options for an impact mitigation were discussed.

13:40 Depart Turnaround for A53.

13:55 Arrive A53. Took surface photos and video taking advantage of good surface visibility and calm conditions. The plan is for RA to recover a displaced floor/cocked-hat while ST continues to take sections.

14:35 ST into the water.

14:36 RA into the water.

14:55 RA recovers frame at 42ft. on BL, which was lying displaced on its side. The frame consists of a floor and two cocked hats (port and starboard). This is designated T5-7 for wood sampling. A second floor is recovered at 58'6" on BL. This consists of just a floor. This timber designated T8.

15:36 RA out of the water.

15:50 ST out of the water having completed three sections (in total).

16:15 Depart A53 for Marina.

16:30 Arrive Marina. Break down gear and continue documentation of timbers recovered from A53.

17:30 Depart Marina. Dinner

20:00 Arrive hotel.

21:00 Draft up floors recovered today.

22:30 Done for the day.

September 13, 2012

The plan for today is to do some documentation on A 53's planking and take wood samples. With the exception of underwater video, this should complete A53. If we have time we will start on Salina Pier.

6:00 Meet in hotel lobby. Crew: Adam Kane, Sarah Tichonuk, Ron Adams, Pierre LaRocque.

6:30 Breakfast

6:50 Arrive at Marina. Load. Floor and cocked hat timbers recovered yesterday were photo-documented.

7:45 Tool box and dive briefing.

8:10 Depart Marina.

8:25 Arrive A53.

8:52 AK into the water. Took video and photos of A53. Relayed verbal description of chine planning. The chine planking had a layer of sacrificial planking on its outboard face. The gap in the forward third of the boat where there are no visible floors is because all of the floors are missing. Bottom planking was found throughout that area with no framing. The large plank on the starboard side that has sprung is a bottom plank, not ceiling. There may have been a thin layer of sacrificial planking in the bow as well, but this could not be conclusively verified. Eighteen wood samples were recovered on this dive. A total of 26 samples were taken – the first 8 were from timbers that were recovered and documented on the boat. Finished the dive by pulling up tape measures and documentation equipment off the site. Done with A53.

10:34 AK out of the water.

10:50 Depart A53 for Marina.

11:05 Arrive Marina. Lunch

12:45 Depart Marina for Salina Pier.

13:05 Spud at the pier. First dive will be ST and RA to assess the site so a documentation strategy can be generated.

13:30 ST into the water.

13:35 RA into the water.

ST reports that the pier remnants are extensive, including vertical timber wall located to the north of the main pier structure. RA located what seems to be part of a boat, including an iron rudder, immediately south of the end of the pier. In general, the pier remnants and associated sites are extensive and will require considerable dive to document.

14:48 ST out of the water.

14:58 RA out of the water.

15:10 Visual inspection from the surface at the end of the pier. RA likely boat (or boat fragment) can be seen from the surface.

15:30 End visual inspection.

15:45 Arrive Marina, off load.

16:05 Depart Marina.

16:20 Arrive hotel.

September 14, 2012

5:30 Meet in hotel lobby. Crew: Adam Kane Pierre LaRocque, Ron Adams and Sarah Tichonuk. The plan for today is to continue at Salina Pier, with the intent of having a clear sense of the site's spatial extent and components.

6:00 Breakfast

6:30 Arrive Marina. Sort through trailer and organize gear for departure later today.

8:15 Depart Marina for Turnaround dock, where we believe RA's regulator was knocked into the water several days ago.

7:30 Safety briefing/toolbox with Kelly Miller.

8:25 Arrive Turnaround.

8:38 PAL into the water. Recovered RA's pony regulator.

8:43 PAL out of the water.

8:50 Depart Turnaround.

9:00 Arrive Salina Pier.

9:11 PAL into the water with video camera. The vessel RA located yesterday is clearly visible from the surface.

9:19 AK into the water. Examination of RA's wreck (A2-1) shows it to be a wooden framed, 75ft. long vessel. He framing has cocked hats at the chine with a curved hull. The bow entrance and stern exit are fine. There is a bit post in the stern with cable wrapped around it. The rudder is iron, composed of a sheet of iron wrapped around the rudderpost. The bottom of the stern is extant with an iron strap which is preserved the full height of the stern (but bent over). The vessel is pointing toward shore with its port side resting against the pier.

For numbering purposes:

Salina Pier	A1
Ron' Wreck	A2-1
Sarah's Wreck	A2-2

The pier (A1) was visually examined. It is composed of two walls of vertical planks which are buttressed on the outside by pilings. The end of the pier has more pilings with the corners made of a series of pilings grouped together. The main finger of the pier is plus or minus 12ft. wide with the above mentioned construction. The entirety of the pier is filled with stones and cobbles.

A second vessel (A2-2) was located north of the end of the pier. Relatively little of the boat is exposed and its location is extremely weedy. Much of AK's dive was spent clearing weeds from the site. The boat seems to be lightly framed – possibly a sailing vessel or launch. In proximity to A2-2 there are vertical planks, indicative of more pier structure to the north, but this was not conclusively investigated during this dive.

For A2-2, one floor with a cocked hat was observed.

The Pier (A1) or at least the wooden structure holding it together seems to disappear toward shore. Rather than a clear linear structure framed by vertical planking and piling, it becomes a wide mound of stones.

For A2-2 a large quantity of firebricks were observed at the site.

9:57 PAL out of the water.

10:39 AK out of the water.

11:15 Depart A1, A2-1 and A2-2. End of field operations for the first rotation.

11:25 Arrive Marina. Break down.

12:30 Depart Marina with dive trailer and boat trailer.

12:45 Drop trailers off at Parsons/Honeywell lot.

13:15 Depart Syracuse for Vermont.

19:00 Arrive Vergennes, Vermont.

September 24, 2012

7:15 Depart Vergennes, VT. - Pierre LaRocque and Adam Kane. Ron Adams and Sarah Tichonuk depart separately, as does Ed Scollon.

11:30 Arrive Onondaga Lake Park Marina, Liverpool, NY. Conditions are marginal with 10-15 mph south winds. Kelly Miller gives ES orientation starting at 10:00. ES & KM retrieve trailer from Turnaround area. Arrange and work on gear.

13:20 Depart Marina for inspection of sites to determine the effect of recent rain events on visibility. Visibility will determine the order of sites to be worked on.

13:40 Arrive Salina Pier. Visibility at the end of the pier is plus or minus 5ft. with only 1 – 2ft. at the pier's mid-point. Conditions are suitable for documentation of the end of the pier and nearby sites. Conditions on A4-1 and A12 were 2-3 ft. of visibility. Much of the weed at in A4-1 has been blown out.

14:30 Arrive back at Marina. Offload.

15:00 Depart Marina.

15:15 Arrive hotel.

16:00 Depart hotel for hardware store and office store.

18:30 Arrive back at hotel. End of the day.

September 25, 2012

6:00 Meet in hotel lobby. Crew: Ron Adams, Ed Scollon, Pierre LaRocque, Adam Kane and Sarah Tichonuk. The wind forecast today looks poor with SSW wind 10 – 25 mph. The plan is to work at A1 and A2-1 and A2-2 (Salina Pier and associated sites).

7:00 Arrive at Marina. Winds south 15 mph.

7:15 AK & PAL motor down to sites to evaluate conditions. A45 – concrete breakwater is workable but the other sites will be too exposed if the wind moves to the SW.

8:00 Tool box with Kelly Miller and dive briefing.

8:45 Depart Marina.

9:00 Arrive at A13 for inspection. Both of the buoys set during the last rotation have been removed. Both the dredge tailpipe and capping pipe were directly over the site. The capping pipe was floated with sections of pipe – the ratchet straps holding the pipe looked new, suggesting a recent fix. The capping pipe had rub marks where the film on the pipe was removed in a regular pattern, which was approximately the same width as Abs gunwale. It is highly likely that there has been additional damage to the wreck since the 9/12 dive on it.

9:25 Depart A13.

9:30 Arrive A45.

9:50 RA into the water. RA reports that there is a gap between the blocks at the end and the main leg of the breakwater. Width for the main leg is about 10ft. wide.

10:00 ST into the water to measure A45. RA is recovering sample bags and excavating a profile trench by moving blocks out of the way. The main leg of the breakwater is open. Probing does not suggest that there are any additional bags below the sediment. RA reports that the main leg of the breakwater is constructed of two layers of bags with rebar and other scrap metal placed in between the layers. The bags were clearly placed in an orderly fashion, rather than being dumped from a boat.

11:17 RA out of the water.

11:24 ST out of the water. Lunch

12:40 AK into the water. Went to the area about 100ft. off the shoreline where RA had noted metal underneath the cement bags. Examination here showed that the breakwater consisted of a base of coarse gravel/stone laid on top of beach sand. Rebar was placed on the gravel and the cement bags on top of that. The breakwater is only one layer of bags deep. The impressions on the bags (which were thought to be from straps on the bags) are from the underlying rebar structure. Both the main finger of the breakwater and the detached offshore end show evidence of order in the arrangement of bags. This order indicated that the detached end was part of the original structure. However, it could not be determined if it was originally detached or if the section of breakwater between it and the main finger was removed.

13:03 ES into the water taking triangulation measurements and recovering blocks for on-surface documentation.

13:50 ES out of the water.

14:15 AK out of the water.

15:00 Depart A45.

15:15 Arrive Marina. Offload.

16:00 Depart Marina.

16:20 Arrive hotel.

Additional notes for A45: RA notes that the outer layer of bags were two deep, rather than just one.

September 26, 2012

6:00 Met in hotel lobby. Crew Sarah Tichonuk, Pierre LaRocque, Ed Scollon, Ron Adams and Adam Kane. The plan for today will be to either work on Salina Pier or A4-1. It rained last night so turbidity from Ley Creek may prevent work on the pier. Conditions this morning are breezy (south wind) with thunderstorms expected in the afternoon.

7:00 Arrive at Marina. Load gear.

7:50 Depart Marina

8:15 Arrive Salina Pier. Conditions are fair – 4-5ft. visibility.

8:55 RA into the water. He is pulling weeds at A2-2.

9:10 ES into the water, documenting the offshore end of the Pier (A-1) RA reports that there are two wrecks north of the pier.

10:26 ST into the water documenting A2-1.

10:43 AK into the water documenting A2-2 and A2-3. Overall sketch of the sites created during this dive.

11:47 ST out of the water.

12:18 AK out of the water. Lunch

13:15 RA into the water pulling weeds around A2-2 and A2-3 to make sure there are no other sites in the vicinity.

14:12 RA out of the water.

14:20 ST into the water documenting A2-1.

14:32 AK into the water documenting A2-2. The construction of the boat is difficult to determine because of its buried state and unusual build. The sides are edge fastened in parts, but also have an arrangement of planking/ceiling/framing in some areas. Volumes of clinker were found in A2-2, strongly suggesting it was steam powered. The bow is bluff with the frames preserved up to their full height, although all of the planking is gone.

16:14 AK out of the water.

16:26 ST out of the water.

16:40 Depart work site.

September 27, 2012

6:00 Meet in hotel lobby. Crew: Adam Kane, Sarah Tichonuk, Ed Scollon, Ron Adams and Pierre LaRocque.

7:00 Arrive Marina, load gear.

7:40 Tool box/dive briefing with Kelly Miller. The plan for the day is to continue working at Salina Pier and nearby sites. RA to continue pulling weeds near A2-2 and A2-3; ES to search for other sites; PAL to video. ST to document A2-1 and AK to document A2-2. Conditions are good, light north wind, highs around 70°F.

7:50 Depart Marina.

8:10 Arrive Salina Pier.

8:39 RA into the water – clearing more at A2-2 and A2-3 and searching for additional sites in the vicinity.

9:02 ES into the water, searching the area off the end of the pier and toward the north for additional sites.

9:56 RA out of the water.

10:23 ES out of the water.

10:18 ST into the water – documenting A2-1.

10:37 AK into the water documenting A2-2. Documentation of the starboard side revealed that the boat is preserved up to deck level. The unusual framing arrangement noted yesterday was because much of the exposed part is actually a railing rather than the hull. The hull is edge-fastened with vertical sides. The stern is scow-shaped with knees at the port and starboard corners and a sternpost amidships. The starboard side has a plank truss. The board-like vertical members protruding from the bottom are actually the "framing" along the inside of the railing. The hull is filled with clinker and burned bricks.

12:09 ST out of the water.

12:26 AK out of the water. Lunch

13:10 RA into the water - examining the area south of the pier for additional sites. RA reports that he located a site – possibly a barge – just west of A3. He pulled weeds so that it could be looked at tomorrow.

13:45 ES into the water searching the area north of the pier for additional sites. He located some areas of timber debris, but nothing conclusive.

14:32 RA out of the water.

14:29 ES out of the water.

15:00 Depart worksite.

15:20 Arrive Marina.

15:45 Depart Marina.

16:00 Arrive hotel.

1700-1900 AK drafting A53.

September 28, 2012

6:00 Meet hotel lobby. Crew: Sarah Tichonuk, Adam Kane, Ed Scollon, Pierre LaRocque and Ron Adams

6:45 Arrive Marina. The plan for today is to continue working at Salina Pier and associated sites. ST to continue on A2-1, AK on A2-2, RA to continue search around pier and clear wreck located yesterday. ES to continue searching, and PAL to document pier.

7:30 Toolbox/dive briefing with Kelly Miller.

7:40 Depart Marina.

8:00 Arrive Salina pier.

8:19 RA into the water clearing the site found yesterday near A3.

8:35 ES into the water searching the area north of A2-2 and A2-3.

9:27 RA out of the water.

9:43 ES out of the water. He located some timbers that will need more investigation, but no definitive site(s).

9:45 AK into the water documenting A2-2. Documentation focused on the starboard side. This side is preserved up to the gunwale for about 1/3 of the side. The edge-fastened side was used as the base for the gunwale. The gunwale has truss-planks that ran along the inside of it. The total length is 80ft. 6" while the beam is 15ft. 4" These dimensions are smaller than the typical canalboat - which amongst other data argues for this being a steamer.

10:01 ST into the water documenting A2-1.

11:28 AK out of the water.

12:15 RA into the water documenting A2-4 (vessel part near A3).

12:20 PAL into the water documenting Salina Pier (A1).

13:32 PAL out of the water.

13:35 RA out of the water.

Discussion with Ed Glaza and Dave Smith regarding additional dives. Dives are needed to assess A13 and to further examine slide area. Decided to dive A13 today and set up a meeting for later today to discuss slide dive.

13:55 Depart Salina Pier.

14:05 Arrive A13.

14:24 AK into the water at A13, with video camera. Examination did not show any additional damage other than that which was noted in the previous rotation . Shot video of the wreck. Video footage of the entire gunwale shot, plus examination of all of the deck beams for registration numbers (none found) and footage of the stave bow.

15:00 AK out of the water.

15:15 Depart A13, steady rain.

15:20 Arrive Dec Turnaround.

16:00 Phone conference with Parsons and Anchor QEA to discuss new series of dives in the slide area. This work will take place on Sunday 9/30/2012 (when there are no dredge/cap operations.)

17:15 Depart Turnaround.

17:30 Arrive Marina Break down gear – haul gear back to hotel to dry everything.

17:50 Depart Marina.

18:00 Arrive hotel.

September 29, 2012

6:00 Meet in hotel lobby. Crew: Sarah Tichonuk, Adam Kane, Ron Adams and Pierre LaRocque. Ed Scollon to depart this morning to take part in NYSP dive training. The plan for today is to continue working on Salina Pier and adjacent sites.

7:00 Arrive Marina. Work on suits and other gear for a bit this morning. Weather is clear 60^{o}F, light north wind.

9:30 Tool box /dive briefing with Kelly Miller.

9:45 Depart Marina for A1 and A2. AK first diver to video A2-1, A2-2 and A2-3, followed by ST on A2-1, RA on A2-4 and PAL on A1.

10:10 AK into the water. Conditions were not good enough for video (plus or minus 2ft. of visibility). Examined the timbers located by ES on 9/28. These we located east of A2-2 and A2-3. There are several timbers sticking vertically out of the bottom. They do appear to be related to a wreck.

Documentation of A2-2 focused on the stern. The stern has a rounded scow shape. The planking (and ceiling) are longitudinal, fastened to transversely oriented stern frames. The boat's sternpost is vertical and braced on the interior by a knee. There is a fishplate on the side of the sternpost. No gudgeons were noted on the sternpost. Sketch inserted here.

10:30 ST into the water on A2-2.

12:14 AK out of the water.

12:21 ST out of the water.

12:30 RA into the water on A2-4. RA completed measurements. Still need video and wood samples from A2-4.

13:32 PAL into the water documenting the pier (A-1).

14:54 PAL out of the water.

15:00 Depart work area for Turnaround.

15:20 Arrive Turnaround.

16:40 Depart Turnaround.

17:00 Arrive Marina. Offload gear.

17:30 Depart Marina for the day.

May 13, 2013 - Monday

Goals for today: Mobilize for Onondaga

9:00 Arrive LCMM. Load trailer with dive gear and equipment for Onondaga.

11:40 Depart LCMM with all gear loaded. Crew: Chris Sabick, Sarah Tichonuk, Pierre LaRocque, Adam Kane and Ron Adams.

11:45 Arrive at PAL's house. Hook-up boat, continue prepping.

12:55 Depart Ferrisburgh, Vermont.

17:35 Arrive Liverpool Marina, Liverpool, NY. Launch boat, meet with Kelly Miller.

19:00 Depart Marina.

May 14, 2013 – Tuesday

Crew: LCMM - Adam Kane, Ron Adams, Pierre LaRocque, Chris Sabick, Sarah Tichonuk. Kelly Miller (Parsons)

Plan: Assess the dredging operation and its impact on our work at Salina Pier. Ideally, ST & CS will begin work on A2- (Tugboat).

7:30 Meet in hotel lobby. Depart hotel.

7:50 Breakfast

8:45 Arrive Onondaga Lake Marina. Load boat with dive gear.

10:00 Site orientation by Kelly Miller. Signed all of the relevant forms.

11:00 Continue loading and prepping.

11:30 Depart Marina for A2 Salina Pier.

12:00 Arrive on site. Relocate the end of the pier. Chris Sabick & Sarah Tichonuk dress in to start work on A2-1.

12:45 CS & ST into the water on A2-1. Pulled old off-kilter baseline up, labeled port side frames, laid port side baseline and cleared weeds from the wreck.

13:59 ST out of the water.

14:10 CS out of the water.

14:20 AK into the water on A-1, Salina Pier. Marked the key points of the pier with fiberglass rods. Generally looked at the entire structure with the intent of working out the building episodes. Schematic (see drawing) is the first pass at trying to work out the significant parts.

15:34 AK out of the water.

15:50 Depart Salina Pier.

16:05 Arrive Marina, offload.

16:40 Depart Marina for the day.

May 15, 2013 – Wednesday

Crew: Adam Kane, Ron Adams, Pierre LaRocque, Chris Sabick, Sarah Tichonuk and Kelly Miller (Parsons)

Plan: Weather is questionable with building winds and thunderstorms later. We will try to document the pilings (A7) if possible. It is unlikely that we will be able to get back to Salina Pier.

6:30 Meet in hotel lobby.

6:50 Breakfast, American Diner.

7:30 Arrive Marina, load for photo documentation of pilings.

8:15 Depart Marina for A7.

A7 Piling Photo Documentation

Piling Clump 1

1 Facing NE

2 Facing NE

3 Facing SE

4 Facing SE

5 Facing SW

6 Facing SW

7 Facing NW

8 Facing NW

Piling Clump 2

1 Facing NE

2 Facing NE

3 Facing SE

4 Facing SE

5 Facing SW

6 Facing SW

7 Facing NW

8 Facing NW

Piling Clump 3

1 Facing NE

2 Facing NE

3 Facing SE

4 Facing SE

5	Facing SW
6	Facing SW
7	Facing NW
8	Facing NW
Piling Clump 4	
1	Facing E
2	Facing E (detail)
3	Facing E (detail)
4	Facing NE
5	Facing NE
6	Facing NNW
7	Facing NNW
Piling Clump 8	
1	Facing NW
2	Facing NW
3	Facing SW
4	Facing SW
6	Facing SE
6	Facing SE
7	Facing NE
8	Facing NE
Piling Clump 7	
1	Facing NE
2	Facing NE
3	Facing SE
4	Facing SE
5	Facing SW
6	Facing SW
7	Facing W
8	Facing W
Piling Clump 6	
1	Facing NW
2	Facing NW

3 Facing NE

4 Facing NE

5 Facing SW

6 Facing SE

7 Facing SW

8 Facing SW

Piling Clump 5

1 Facing NW

2 Facing NW

3 Facing NE

4 Facing NE

5 Facing SE

6 Facing SE

7 Facing SW

8 Facing SW

9:35 Done with photo-documentation of A7. Wind has come up, now 15 mph and building.

9:40 Head back to marina. Winds increasing.

10:00 Arrive Marina. Winds continue to build – now 20 + mph with higher gusts.

10:35 Depart for the day.

May 16, 2013

Crew: Adam Kane, Chris Sabick, Sarah Tichonuk, Pierre LaRocque, Ron Adams and Kelly Miller (Parsons)

Plan: The forecast is for building windy conditions (20+ mph). The plan is to get onto the lake and do some target/debris verification (non-archaeological) for Parsons. The next priority will be to go back to Salina Pier and A2-1.

6:30 Meet in the hotel lobby.

6:45 Breakfast, American Diner.

7:25 Arrive Marina. Load for diving.

8:10 Safety briefing/tool box.

8:30 Off the dock.

8:40 Arrive Salina Pier.

9:15 Sarah Tichonuk and Chris Sabick into the water documenting Tugboat A2-1.

9:51 Adam Kane into the water documenting Salina Pier.

10:26 Sarah Tichonuk out of the water.

10:42 Chris Sabick out of the water

10:56 Adam Kane out of the water. Wind has picked up. Underwater visibility is approximately 1ft. due to turbidity from capping.

11:15 Depart dive site for the day. Rough transit back, wind continues to build, now 20+ mph.

12:00 Arrive Marina, offload.

12:45 Depart Marina.

May 17, 2013

Crew: Adam Kane, Ron Adams, Sarah Tichonuk, Pierre LaRocque, Chris Sabick and Kelly Miller (Parsons).

Plan: The weather looks favorable. Document Salina Pier and A2-1.

6:45 Meet hotel lobby.

7:00 Breakfast, American Diner.

7:40 Arrive Marina, load.

8:30 Safety briefing.

8:45 Depart Marina for Salina Pier.

9:00 Arrive Salina Pier.

9:15 Adam Kane and Ron Adams into the water, AK triangulates in datum points.

9:43 Sarah Tichonuk and Chris Sabick into the water on A2-1, Tug.

10:40 Ron Adams out of the water.

10:54 Ron Adams into the water.

11:03 Adam Kane out of the water.

11:10 Sarah Tichonuk and Chris Sabick out.

11:27 Ron Adams out of the water, lunch.

12:40 Adam Kane into the water documenting Salina Pier.

13:04 Ron Adams into the water collecting wood samples.

13:19 Sarah Tichonuk into the water at A2-1.

13:32 Chris Sabick into the water at A2-1.

14:12 Ron Adams out of the water.

14:48 Adam Kane out of the water.

14:52 Sarah Tichonuk out of the water.

15:00 Chris Sabick out of the water. Break down gear.

15:22 Depart dive site for the day.

15:45 Arrive Marina. Break down gear.

16:30 Depart for the day.

May 18, 2013

Crew: Chris Sabick, Pierre LaRocque, Sarah Tichonuk, Ron Adams, Adam Kane, and Kelly Miller (Parsons)

Plan: Last day of archaeological work. Finish work on Salina Pier and A2-1 and take wood samples from A7.

6:45 Meet in hotel lobby.

7:00 Breakfast, American Diner.

7:50 Arrive Marina, load gear.

8:20 Safety briefing, dive plan for the day.

8:30 Depart Marina.

8:45 Arrive Salina Pier.

Pier Coordinates: Datum #1 N43 (See Page 16 in Adam's book)

9:54 Adam Kane into the water. Characterizing pier construction techniques.

10:16 Sarah Tichonuk into the water, A2-1.

10:18 Ron Adams into the water.

10:24 Chris Sabick into the water, A2-1

11:37 Adam Kane out of the water, pulled baselines and fiberglass rods.

11:42 Chris Sabick out of the water.

11:44 Sarah Tichonuk out of the water.

11:54 Ron Adams out of the water. These dives complete the archaeological fieldwork on Salina Pier and A2-1.

12:45 Depart Pier for A7 – wood samples.

12:50 Taking wood samples from all eight clumps. All of the samples appear to be from the same wood.

Clump 8: 3 pilings, cabled together. Old electrical connections on the central (tallest) piling.

Clump 4: Inner clump. 3 pilings, cabled together with electrical connections on tallest pile. Two tilted over piles beside the main clump.

Clump 3: 8 pilings – 6 low, one medium, one tall. Cabled together with electrical connections on the tallest pile. A submerged clump is located off the new clump.

Clump 2: 10 pilings, 7 low, 2 medium, 1 tall. Broken cable formerly connecting them. Electrical connections on tallest. There is a metal plate that may have held a box similar to the one on clump 5.

Clump 1: 10 piling all tilted over toward the channel. The clump has a green box – for a battery? Six low/medium pilings, two tall. The tall ones are cabled together.

Clump 5: Outer clump. 4 stubs, 4 old tilted over, main clump 11. Red triangle. The main clump has nine lower with two taller pilings cabled together. Electrical connections at the top of the tallest clump.

Clump 6: 11 pilings, one tall, nine medium and one tilted over. No cable left, electrical connection on the tallest piling.

Clump 7: Clump is tilted over – cabled together with red light. 7 pilings total, six in main clump and one tall one. There is an electrical connector on the tallest piling. The main clump is cabled together. There is an old clump next to this one.

13:50 Depart A7 – done with Onondaga Lake archaeology fieldwork.

14:00 Go over to A17 to look at the shoreline work and its impact on A17. The work has not gotten there yet.

14:40 Depart A17. Got a good look at the structure off the A17 barges. There appears to be one filled in barge – probably part of the pier construction.

14:50 Arrive Marina, offload boat.

15:05 Pulling the pier coordinates off the GPS and plugging in tomorrow's debris verification numbers.

May 19, 2013

Crew: Ron Adams, Pierre LaRocque, Sarah Tichonuk and Adam Kane. Kelly Miller (Parsons)

Plan: Debris verification, 3 targets. Diving done by Adam Kane and Ron Adams.

6:45 Meet hotel lobby.

7:00 Breakfast, American Diner.

7:30 Arrive Marina, load for diving. Swap over gear to pony bottles and RSV valves.

8:30 Safety briefing.

8:45 Off the dock, going to target (WP97) 377 (from CR Environmental's 2008 remote sensing survey).

9:00 Dropped marker on the coordinates. Several passes with the fathometer showed some low lumps in the area.

9:32 Adam Kane into the water. Depth 30ft., visibility 1.5 to 2ft. with soft, easily disturbed bottom. Did circle searches of the target area out to about 50ft. from the centerpoint, drop mark.

No clearly evident source of the anomaly. Several clumps of weeds were found – 2 to 8ft. around standing 8-12" above the bottom. One clump had many small zebra/quagga mussels attached which could have given a hard return on the sonar. However, this target verification would have to be considered unresolved.

10:24 Adam Kane out of the water.

10:40 Pull downline, move on to next target.

10:50 Drop new downline at Target 203. Fathometer runs suggest that the target is to the east plus or minus 50ft. New way point: 98.

11:11 Ron Adams into the water. 29ft. of water with 1.5ft. visibility. Found one large weed mat – 9ft. wide by 20ft. long, standing 2-3ft. off the bottom. No other features of note.

11:50 Ron Adams out of the water.

12:00 Move over to target 235??) Fathometer shows an undulating, disturbed-looking bottom profile.

12:29 Adam Kane into the water. The bottom is quite disturbed. There is one area where (presumably) an anchor has been set. The hole is plus or minus 10 x 10 feet, approximately 3ft. deep. From this hole there is a cable-scour running upslope. An area of cap material was located about 40ft. from the down marker. It was thin (plus or minus 2") and approximately 5-6ft. wide, laid down in a swath. One additional large hole, also 10ft. x 10ft., 3ft. deep, was found without any visible cable scour. Nothing was found that had an appearance similar to that of the sonar anomaly. Contact 235 was most likely weeds.

13:08 Adam Kane out of the water. Completed dive operations for the project.

13:30 Depart contact 235 for Marina.

13:45 Arrive Marina, offload boat, breakdown gear and wash and haul boat.

14:20 Depart Marina. Lunch.

15:30 Depart Syracuse for Vermont.

20:00 Arrive Vergennes, Vermont.

APPENDIX 2: DIVE LOGS

Dive Log • Lake Champlain Maritime Museum • 4472 Basin Harbor Road • Vergennes • VT • 05491

Date: 9/2/2012 DSO: Pierre LaRoche ADSO: Log No.:

Dive Site: Salina Pier

Reason for Dive:

Weather: Cloudy Depth Range: 8' Water: °F Air: °F UW Vis.:

		DIVE 1							DIVE 2						
Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
1	Chris Sabick	21%	2400	13:46	1516	800	8'	/							/
	Sarah T	21%	3000	14:06				/							/
Dive Notes:															
Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
2	Adam Kane	36%	1233	14:12	1458	450		/							/
								/							/
Dive Notes:															
Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
3								/							/
								/							/
Dive Notes:															
Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
4								/							/
								/							/
Dive Notes:															

DAN Emergency Phone Number: (919) 684-9111

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Date: 9/6/12	DSO: PIERRE LAROCQUE	ADSO: RON ADAMS	Log No.: 1
Dive Site: ONONDAGA LAKE SITE A53			
Reason for Dive: SITE - DOCUMENTATION			
Weather: FAIR W/ CHANCE OF T-STORMS	Depth Range: 0-10	Water: 75°F	Air: 85°F · UW Vis.: 3-5ft

		DIVE 1							DIVE 2						
Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
1	ADAM KANE	AIR	2250	1:50	15:00	300	3'	/							/
								/							/
Dive Notes:															
Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
2	Chris Sabick	AIR	2500	337	6:45	1000		/							/
								/							/
Dive Notes:															
Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
3								/							/
								/							/
Dive Notes:															
Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
4								/							/
								/							/
Dive Notes:															

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Date: 9/7/12	DSO: Pierre LaRocque	ADSO: Adam Kan	Log No.: 2
Dive Site: Onondaga Lake Area C-3, GMU9 & A53			
Reason for Dive: Cap Investigation			
Weather: Clear 70°F	Depth Range: 0-25	Water: 70 °F	Air: 70 °F	UW Vis.:

		DIVE 1							DIVE 2						
Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
1	Pierre LaRocque	NTRX	2946	8:40	9:08	1896	30'	/							/
	Ron Adams	NTRX	3400	9:52	1025	1496	42'	/							/

Dive Notes:

Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
2	Chris Sabick		2200	1353	1459	500	3'	/							/
								/							/

Dive Notes: A53

Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
3								/							/
								/							/

Dive Notes:

Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
4								/							/
								/							/

Dive Notes:

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Date: 9/9/12	DSO: Pierre LaRocque	ADSO: Adam Kane	Log No.: 3
Dive Site: Onondaga Lake A53			
Reason for Dive: Mitigation work			
Weather: Clear 70'F 5mp SW wind	Depth Range: 0-3	Water: 70 °F / Air: 70 °F	UW Vis.: 2'

		DIVE 1							DIVE 2						
Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
1	Chris Sabick	Air	2400	945	1129	500		/							/
	Adam Kane	Air	2860	14:24	16:03	700		/							/

Dive Notes: A53

Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
2								/							/
								/							/

Dive Notes:

Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
3								/							/
								/							/

Dive Notes:

Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
4								/							/
								/							/

Dive Notes:

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Date: 9/10/12 DSO: Pierre LaRocque ADSO: Adam Kane Log No.: 4

Dive Site: Onondaga Lake, Syracuse NY

Reason for Dive: Mitigation, Site A53

Weather: Clear 70° F Depth Range: 0-3 Water: 70 °F Air: 70 °F UW Vis.: 3-4'

		DIVE 1							DIVE 2						
Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
1	Adam Kane	Air	2950	8:12	1003	900	3'	/							/
	Sarah Tichonuk	Air	2800	8:42	1026	900	3'	/							/

Dive Notes: A53 AK - bow ST - Stern

Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
2	Ron Adam	Air	2692	1120	1211	1205		/							/
								/							/

Dive Notes: Weed cleaning from A4-1

Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
3								/							/
								/							/

Dive Notes:

Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
4								/							/
								/							/

Dive Notes:

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Date: 9/11/12 DSO: Pierre LaRocque ADSO: Adam Kane Log No.: 5

Dive Site: Onondaga Lake, Nitrate North Buoy & A53

Reason for Dive: Buoy recovery and A53 documentation

Weather: Clear 70°F Depth Range: 0 – Water: °F Air: °F UW Vis.:

		DIVE 1							DIVE 2						
Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
1	Pierre LaRocque	36%	2665	803	815	2100	36'	/							/
								/							/

Dive Notes: Nitrate North Buoy Recovery

Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
2	Adam		2690	9:34	1116	700	3'	/							/
	Sarah		2900	9:48	1140	1100	3'	/							/

Dive Notes: A53

Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
3	Ron Adams	36	2767	1421	1435	1696	59	/	36	1696	1510	1520	1205	45'	/
								/							/

Dive Notes:

Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
4								/							/
								/							/

Dive Notes:

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Date: 9/12/12 | DSO: Pierre LaRocque | ADSO: Adam Kane | Log No.: 6

Dive Site: Onondaga Lake, Syracuse NY

Reason for Dive: Dive services/ mitigation

Weather: Clear 85°F | Depth Range: 0 - 45 | Water: 55°F | Air: 85 °F | UW Vis.: 5'

		DIVE 1							DIVE 2						
Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
1	Pierre LaRocque	36	2000	833	901	700	43	/							/
								/							/

Dive Notes: Dive to set buoys on A13, canalboat just outside of remediation area.

Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
2	Adam Kane	Air	2677	947	1026	950	40'	/							/
	Ron Adams	36	3094	943	1021	915	40'	/							/

Dive Notes: AK: A13 inspection and video
RA: A13 inspection and marking of turbidity meter (which was draped over the wreck)

Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
3	Ron Adams		1527	1436	1536	827	3'	/							/
	Sarah T		3000	1435	1550	1300	3'	/							/

Dive Notes: A53 (I think)

Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
4								/							/
								/							/

Dive Notes:

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Date: 9/13/12	**DSO:** Pierre LaRocque	**ADSO:** Adam Kane	**Log No.:** 7

Dive Site: Onondaga A53 & Salina Pier

Reason for Dive:

Weather: Sunny - 80s	**Depth Range:** 18"	**Water:** °F	**Air:** °F	**UW Vis.:**

		DIVE 1							DIVE 2						
Team No.	**Name**	**Dive Gas**	**Tank PSI**	**Time In**	**Time Out**	**Tank PSI**	**Max. Depth**	**Rep. Group Out/In**	**Dive Gas**	**Tank PSI**	**Time In**	**Time Out**	**Tank PSI**	**Max. Depth**	**Rep. Group Out/In**
1	Adam Kane	21%	2730	8:52	1034	300	3'	/							/
								/							/

Dive Notes: A53 - wrap-up

Team No.	**Name**	**Dive Gas**	**Tank PSI**	**Time In**	**Time Out**	**Tank PSI**	**Max. Depth**	**Rep. Group Out/In**	**Dive Gas**	**Tank PSI**	**Time In**	**Time Out**	**Tank PSI**	**Max. Depth**	**Rep. Group Out/In**
2	Ron Adams	36	3384	1335	1458	350	10'	/							/
	Sarah Tichonuk	Air	3000	1330	1448	900	10'	/							/

Dive Notes: Salina Pier

Team No.	**Name**	**Dive Gas**	**Tank PSI**	**Time In**	**Time Out**	**Tank PSI**	**Max. Depth**	**Rep. Group Out/In**	**Dive Gas**	**Tank PSI**	**Time In**	**Time Out**	**Tank PSI**	**Max. Depth**	**Rep. Group Out/In**
3								/							/
								/							/

Dive Notes:

Team No.	**Name**	**Dive Gas**	**Tank PSI**	**Time In**	**Time Out**	**Tank PSI**	**Max. Depth**	**Rep. Group Out/In**	**Dive Gas**	**Tank PSI**	**Time In**	**Time Out**	**Tank PSI**	**Max. Depth**	**Rep. Group Out/In**
4								/							/
								/							/

Dive Notes:

DAN Emergency Phone Number: (919) 684-9111

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Date: 9/14/12	DSO: Pierre LaRocque	ADSO: Adam Kane	Log No.: 8
Dive Site: Onondaga Lake, Mitigation Work			
Reason for Dive:			
Weather: 75° F	Depth Range:	Water: °F Air: °F	UW Vis.:

		DIVE 1							DIVE 2						
Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
1	Pierre LaRocque	Air	2777	839	843	2450	18'	/	Air	2450	911	957	1245	8'	/
	Adam Kane	Air	2833	919	1039	500	8'	/							/

Dive Notes: PAL- Dive 1 - Recover Regulator at Turnaround, Dive 2 - Video Salina Pier
AK- Salina Pier & Wrecks A2-1 & A2-2

Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
2								/							/
								/							/

Dive Notes:

Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
3								/							/
								/							/

Dive Notes:

Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
4								/							/
								/							/

Dive Notes:

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Date: 9/25/12	DSO: Pierre LaRocque	ADSO: Adam Kane	Log No.: 9
Dive Site: Onondaga Lake			
Reason for Dive: Phase 3 Mitigation			
Weather: Clear 70°F S wind 10-20	Depth Range: 0 - 4	Water: 62 °F Air: 76 °F	UW Vis.: 4'

		DIVE 1							DIVE 2						
Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
1	Ron Adams	36	3153	950	1117	700	4'	/							/
	Sarah Tichonuk	Air	2900	1000	1124	500	4'	/							/
Dive Notes: RA: A45 ST: A45															
Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
2	Adam Kane	21%	2870	1240	1415	600	4'	/							/
	Ed Scollon	21%	2211	1303	1350	630	4'	/							/
Dive Notes: AK: A45 ES: A45															
Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
3								/							/
								/							/
Dive Notes:															
Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
4								/							/
								/							/
Dive Notes:															

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Date: 9/26/12 DSO: Pierre LaRocque ADSO: Adam Kane Log No.: 10

Dive Site: Onondaga Lake

Reason for Dive: Phase 3 work

Weather: overcast 70°F 5 wind Depth Range: Water: °F Air: °F UW Vis.:

		DIVE 1							DIVE 2						
Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
1	Ron Adams	36%	3160	0855	0958	500	8'	/	Air	2911	1315	1412	561		/
	Ed Scollon	21%	2859	0910	1019	500	8'	/							/
Dive Notes: ES: A1															
Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
2	Sarah T	21°	2490	1026	1147	1000	7'	/	21	3100	1420	1626	500		/
	Adam K	21°	2800	1043	1218	682	7'	/	36	2874	1432	1614	539		/
Dive Notes: ST: A2-1 AK: A2-2 + A2-3															
Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
3								/							/
								/							/
Dive Notes:															
Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
4								/							/
								/							/
Dive Notes:															

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Date: 9/27/12	DSO: Pierre LaRocque	ADSO: Adam Kane	Log No.: 11
Dive Site: Onondaga Lake			
Reason for Dive: Phase 3 Archaeology			
Weather: Clear 70°F light N wind	Depth Range: 0-8	Water: 62 °F	Air: 70 °F · UW Vis.: 5'

Team No.	Name	DIVE 1 Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	DIVE 2 Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
1	Ron Adams	36	3156	839	956	539		/	36	3164	1310	1432	500	6	/
	Ed Scollon	21	3475	902	1023	800		/	21	3145	1345	1429	1200	6	/
Dive Notes:															
2	Sarah Tichonuk	21	3600	1018	1209	900		/							/
	Adam Kane	21	2479	1037	1226	657		/							/
Dive Notes: ST: A2-1 AK: A2-2															
3								/							/
								/							/
Dive Notes:															
4								/							/
								/							/
Dive Notes:															

DAN Emergency Phone Number: (919) 684-9111

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Date: 9/28/12	DSO: Pierre LaRocque	ADSO: Adam Kane	Log No.: 12
Dive Site: Onondaga Lake Phase 3			
Reason for Dive: Mitigation			
Weather: Overcast 60°F, L&V winds	Depth Range: 0 - 8	Water: 60°F	Air: 60°F / UW Vis.: 5'

		DIVE 1							DIVE 2						
Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
1	Ron Adams	21	2129	819	927	500	8	/	21	2433	1215	1335	905	6	/
	Ed Scollon	21	2988	835	9:43	850	8	/							/

Dive Notes: ① → cap [illegible] A13 today → ② → Slide video → Not capping now – Done

Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
2	Adam Kane	21	2140	09:45	11:28	698	8	/	21	2884	1424	1500	1348	39'	3 min stop
	Sarah Tichonuk	21	2800	10:01	1154	600	8	/							/

Dive Notes: AR: A2-2 capping → None today → Tomorrow → 60' No cap Sun

Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
3	Pierre LaRocque	21	1900	1220	1332	650	8	/					5260966		/
								/							/

Dive Notes:

Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
4								/							/
								/							/

Dive Notes: Larissa, Ed Glaza Paul (Russel?)

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Date: 9/29/12	DSO: Pierre LaRocque	ADSO: Adam Kane	Log No.: 13
Dive Site: Onondaga Lake			
Reason for Dive: Mitigation			
Weather: Clear 65°F 5mph N wind	Depth Range: 6-8	Water: 60 °F / Air: 65 °F	UW Vis.: 4'

		DIVE 1							DIVE 2						
Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
1	Adam Kane	21%	2264	10:10	12:14	500	8	/							/
	Sarah T	21%	3000	10:36	1221	1200	8	/							/
Dive Notes: ST: A2-1 AK: A2-2															
Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
2	Ron Adams	21	2163	1230	1353	550	8	/							/
	Pierre LaRocque	21	2140	1332	1454	700	8	/							/
Dive Notes: PL: A1 RA: A2-4															
Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
3								/							/
								/							/
Dive Notes:															
Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
4								/							/
								/							/
Dive Notes:															

DAN Emergency Phone Number: (919) 684-9111

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Date: 10/2/12 | DSO: Pierre LaRocque | ADSO: Adam Kane | Log No.: 16

Dive Site: Onondaga Lake

Reason for Dive: Cap/Slide Inspection & A1 &

Weather: Overcast 70°F L&V Wind | Depth Range: 0-50 | Water: 60 °F | Air: 70 °F | UW Vis.: 2-6'

		DIVE 1							DIVE 2						
Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
1	Adam Kane	36	2814	858	941	697	48'	/							/
	Ron Adams	36	2958	858	939	350	48'	/							/

Dive Notes: Swim/video of slide area.

Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
2	Pierre LaRocque	36	3187	1027	1053	1950		/	36	1950	1058	1109	1400	50'	/
	Sarah Tichonuk	36	2800	1027	1053	1800		/							/

Dive Notes: Swim/video of slide area
Rigging of poly line from car/ stake

Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
3	Chris Sabick	21	2400	1346	1516	800	8'	/							/
	Sarah Tichonuk	21	3000	1406	1545	900	8'	/							/

Dive Notes: CS documenting A2-4
ST " " A2-1

Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
4	Adam Kane	36	1233	1412	1456	450	8'	/							/
								/							/

Dive Notes: Triangulating A1 & A2 sites

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Date: 10.3.12	DSO: Pierre LaRocque	ADSO: Sarah Tichonuk	Log No.:

Dive Site: Onondaga Lake

Reason for Dive: Archaeological Mitigation

Weather: Overcast 70°F L:V Winds	Depth Range: 0 - 3	Water: 60 °F	Air: 70 °F	UW Vis.: 3'

		DIVE 1							DIVE 2						
Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
1	Adam Kane	21	2928	1034	1049	2385	20"	/							/
								/							/
Dive Notes: Video of A45															
Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
2								/							/
								/							/
Dive Notes:															
Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
3								/							/
								/							/
Dive Notes:															
Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
4								/							/
								/							/
Dive Notes:															

DAN Emergency Phone Number: (919) 684-9111

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Date: 10-16-12	DSO: Pierre LaRocque		ADSO: Adam Kane		Log No.:
Dive Site: Onondaga Lake Salina Pier					
Reason for Dive:					
Weather:	Depth Range:	Water: °F	Air: °F	UW Vis.:	1-2'

Team No.	Name	Dive 1 Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive 2 Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
1	Adam K.		2899	9:01	1041	506	6'	/							/
	Chris S.		2200	9:09	1035	500	6'	/							/
Dive Notes:	AK- document A2-2 CS- document A2-3														
2	Ed Scollon		2815	1000	1008	2571	6'	/							/
	Ron Adams		3417	1110	1155	1834		/							/
Dive Notes:	ES- Glove failure- abort dive RA- Called dive early due to increasing wind 20-25 West														
3								/							/
								/							/
Dive Notes:															
4								/							/
								/							/
Dive Notes:															

DAN Emergency Phone Number: (919) 684-9111

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Date: 10-17-12 **DSO:** Pierre LaDouque **ADSO:** Adam Kane **Log No.:**

Dive Site: Onondaga Lake

Reason for Dive: Salina Pier

Weather: Clear, 65°F **Depth Range:** 0 - 7 **Water:** 60 °F **Air:** 65 °F **UW Vis.:** 3'

		DIVE 1							DIVE 2						
Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
1	Ron Adams	21	3325	9:11	10:25	849	7'	/	21	3573	1155	1320	1080	7'	/
	Adam Kane	21	2690	9:15	10:50	692	7'	/		2624	1341	15:24	633	7'	/
Dive Notes:	RA- Finish work on A2-4 AK- A2-2								RA- Dive 2 - search for additional sites in proximity to A1/2						
2	Ed Scallon	21	2564	9:49	1117	493	7'	/	21	2550	1247	1421	730	7'	/
	Chris Sabick	21	2150	1130	1311	500	7'	/	21	2800	1420	1510	1200	7'	/
Dive Notes:	Triangulate A1/2 sites CS: A2-3														
3								/							/
								/							/
Dive Notes:									1545 dep						
4								/							/
								/							/
Dive Notes:															

DAN Emergency Phone Number: (919) 684-9111

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Date: 10/18/12 **DSO:** Pierre LaRocque **ADSO:** Adam Kane **Log No.:**

Dive Site: Onondaga Lake

Reason for Dive: Mitigation - Salina Pier & A2 sites

Weather: Clear 65°F **Depth Range:** 0-7 **Water:** 60 °F **Air:** 70 °F **UW Vis.:** 3-4'

		DIVE 1							DIVE 2						
Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
1	Adam Kane	21	2887	9:21	10:49	900	7'	/	21	2739	1258	1358	1243		/
	Chris Sabick	21	2200	10:03	1124	550	7'	/							/

Dive Notes: CS: A2-3
AK: A4-1

Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
2	Ed Scollon	21	3210	10:36	1226	500	7'	/							/
								/							/

Dive Notes: ES: A1

Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
3	Ron Adams	21	2886	1127	1234	545	7'	/							/
	Pierre LaRocque							/							/

Dive Notes:

Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
4								/							/
								/							/

Dive Notes:

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Date: 10-19-12	DSO: Pierre LaRocque	ADSO: Adam Kane	Log No.:
Dive Site: Onondaga Lake			
Reason for Dive: A4T			
Weather: Rain in AM, Sunny PM	Depth Range: 0-2'	Water: 60°F / Air: 70°F	UW Vis.: 2'

		DIVE 1							DIVE 2						
Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
1	Adam Kane		2760	1234	1444	300	2'	/							/
	Ed Scollon		2880	1242	1421	744	2'	/							/
Dive Notes: ES: A4-1															
Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
2	Ron Adams		2666	1455	1615	548	2'	/							/
								/							/
Dive Notes:															
Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
3								/							/
								/							/
Dive Notes:															
Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
4								/							/
								/							/
Dive Notes:															

DAN Emergency Phone Number: (919) 684-9111

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Date: 10/20/12	DSO: Pierre LaRocque	ADSO: Adam Kane	Log No.:

Dive Site: Onondaga Lake

Reason for Dive: Mitigation - A4-1

Weather: Overcast 60°F | Depth Range: 0-3 | Water: 60 °F | Air: 60 °F | UW Vis.: 2-3'

Team No.	Name	DIVE 1 Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	DIVE 2 Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
1	Adam Kane	21	2979	924	1109	300	3'	/		600 (hooka)	1407	1514	1200 (hooka)	3'	/
	Chris Sabick	21	2050 (hooka)	1010	1140	600	3'	/							/

Dive Notes: CS: A4-1 AK: A4-1

Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
2	Sarah Tichonuk	21	700 (hooka)	1134	1417	2300 (hooka)	3'	/							/
	Ron Adams	21	2668	1231	1343	464	3'	/							/

Dive Notes: ST: A4-1

Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
3	Ac							/							/
								/							/

Dive Notes:

Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
4								/							/
								/							/

Dive Notes:

DAN Emergency Phone Number: (919) 684-9111

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Date: 10/21/12 DSO: Pierre LaRocque ADSO: Sarah Tichonuk Log No.:

Dive Site: A12 Onondaga Lake

Reason for Dive:

Weather: Sunny, high 50's Depth Range: 0 - 5' Water: °F Air: °F UW Vis.:

Team No.	Name	DIVE 1 Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	DIVE 2 Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
1	Chris Sabick	21%	2200	0925	1039	650		/							/
	Ed Scollon	21%	3106	0925	1037	1370		/							/

Dive Notes: CS: A12
ES: A12

Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
2								/							/
								/							/

Dive Notes:

Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
3								/							/
								/							/

Dive Notes:

Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
4								/							/
								/							/

Dive Notes:

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Date: 10/22/12	DSO: Pierre LaRocque	ADSO: Sarah Tichonuk	Log No.:
Dive Site: Onondaga - A12			
Reason for Dive:			
Weather:	Depth Range:	Water: °F Air: °F	UW Vis.:

		DIVE 1							DIVE 2						
Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
1	Ed Scollon	21	1100 hookah	948	1145	900 hookah	2'	/							/
	Chris Sabick	21	2200	1010	1150	300	2'	/							/
Dive Notes: CS: A12 ES: A12															
Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
2	Ron Adams	21	1000 hookah	1200	1337	1700 hookah	2'	/							/
	Sarah Tichonuk	21	2000 hookah	1313	1343	1000 hookah	2'	/							/
Dive Notes: RA: A12															
Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
3								/							/
								/							/
Dive Notes:															
Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
4								/							/
								/							/
Dive Notes:															

DAN Emergency Phone Number: (919) 684-8111

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Date: 10.23.12	DSO:	ADSO:	Log No.:

Dive Site: Salina Pier / A12

Reason for Dive: CR

Weather: 50° cloudy / Rain	Depth Range:	Water: °F	Air: °F	UW Vis.:

		DIVE 1							DIVE 2						
Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
1	Adam Kane		2753	9:23	10:50	500		/		2809	1352	1455	1494		/
	Ed Scollon		3062	9:32	10:56	580		/		Hooka	1320	1445	1500		/
Dive Notes: A2-2, A2-3 & A1 AR: A12															
Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
2	Ron Adams		2695	9:33	10:46	490		/		Hooka 1000	1140	1310			/
	Sarah Tichut		2800	1204 Hooka	Hookah 1357	440		/							/
Dive Notes: Dive on A12															
Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
3								/							/
								/							/
Dive Notes:															
Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
4								/							/
								/							/
Dive Notes:															

DAN Emergency Phone Number: (919) 684-9111

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Date: 10/24/12	DSO: Pierre LaRocque	ADSO: Adam Kane	Log No.:

Dive Site: Onondaga Lake

Reason for Dive: Mitigation — A12

Weather: Overcast, 55°F	Depth Range: 0-3	Water: 55°F	Air: 55°F	UW Vis.: 2-3'

		DIVE 1							DIVE 2						
Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
1	Sarah Tichonuk	21' hooka	1100	858	1026	1000		/							/
	Ed Scollon	↓	1000	905	1048	500		/							/
Dive Notes: ST: Bow & stern documentation. ES: Mast step															
Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
2	Adam Kane	21	2729	914	1056	640		/		640	1105	1110	430		/
								/							/
Dive Notes: AK: Cross sections & stbd spud holder, A12 Salina Pier															
Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
3								/							/
								/							/
Dive Notes:															
Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
4								/							/
								/							/
Dive Notes:															

DAN Emergency Phone Number: (919) 684-8111

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Date: 5/14/13	DSO: Pierre LaRocque	ADSO: Adam Kano	Log No.: 1
Dive Site: Onondaga Lake			
Reason for Dive: Mitigation Archaeology			
Weather: Clear 60°F	Depth Range: 10'	Water: 52 °F	Air: 60 °F / UW Vis.:

		DIVE 1							DIVE 2						
Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
1	Chris Sabick	[illegible]	150/3000	1245	1410	1700	8	/							/
	Sarah Tichonuk	[illegible]	150/3000	1245	1359	1800	8'	/							/

Dive Notes: Document A2-1

Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
2	Adam Kane	Air	2900	1420	1534	845.		/							/
								/							/

Dive Notes: Salina Pier

Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
3								/							/
								/							/

Dive Notes:

Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
4								/							/
								/							/

Dive Notes:

DAN Emergency Phone Number: (919) 684-8111

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Date: 5/16/13 | DSO: Pierre LaRocque | ADSO: Adam Kane | Log No.: 2

Dive Site: Onondaga Lake Salina Pier / AZ-1

Reason for Dive: Mitigation

Weather: Clear, breezy | Depth Range: 0 - 10 | Water: 52 °F | Air: 70 °F | UW Vis.: 3'

		DIVE 1							DIVE 2						
Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
1	Sarah Tichonuk	Air	Hooka	915	1026	1350		/							/
	Chris Sabick	Air	Hooka	919	1042	1000		/							/

Dive Notes: Tug, AZ-1

Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
2	ADAM KANE	AIR	2950	951	1056	500		/							/
								/							/

Dive Notes: Salina Pier

Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
3								/							/
								/							/

Dive Notes:

Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
4								/							/
								/							/

Dive Notes:

DAN Emergency Phone Number: (919) 684-8111

Dive Log • Lake Champlain Maritime Museum • 4472 Basin Harbor Road • Vergennes • VT • 05491

Date: 5/17/13	DSO: Pierre LaRocque	ADSO: Adam Kane	Log No.: 3
Dive Site: Onondaga Lake, Salina Pier & A2-1			
Reason for Dive: Mitigation			
Weather: Clear 60°F	Depth Range: 10	Water: 55°F / Air: 60 °F	UW Vis.:

Team No.	Name	DIVE 1 Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	DIVE 2 Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
1	Adam Kane	Air	2950	915	1103	500	8	/		3100	1240	1448	500	8'	/
	Ron Adams	36	2950	917	1040	517	8	/	36	3160	1054	1127	2136	8	/

Dive Notes: SALINA Pier

Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
2	Sarah Tichonuk	Hookah	750	943	1110	1700	8	/	Hookah	1500	1319	1500	750	8'	/
	Chris Sabick		300	948	1110	1500	8	/	Air	1300	1332	1452	800	8'	/

Dive Notes: A2-1

Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
3	Ron Adams	36	2145	1304	1412	475	8'	/							/
								/							/

Dive Notes: Salina Pier

Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
4								/							/
								/							/

Dive Notes:

DAN Emergency Phone Number: (919) 684-8111

Dive Log • Lake Champlain Maritime Museum • 4472 Basin Harbor Road • Vergennes • VT • 05491

Date: 5/18/13	DSO: Pierre LaRocque	ADSO: Adam Kane	Log No.: 4

Dive Site: Onondaga Lake, Salina Pier: A2-1

Reason for Dive: Mitigation

Weather: Clear, 70°F	Depth Range: 0-8	Water: 55°F	Air: 70 °F	UW Vis.: 3'

		DIVE 1							DIVE 2						
Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
1	Adam Kane	Air	2932	954	1137	600	8'	/							/
	Ron Adams	36	3150	1018	1154	540	8	/							/

Dive Notes: Salina Pier, A1

Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
2	Chris Sabick		2350	1024	1142	1100	8'	/							/
	Sarah Tichonuk		500	1016	1144	250	8'	/							/

Dive Notes: A2-1

Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
3								/							/
								/							/

Dive Notes:

Team No.	Name	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In	Dive Gas	Tank PSI	Time In	Time Out	Tank PSI	Max. Depth	Rep. Group Out/In
4								/							/
								/							/

Dive Notes:

DAN Emergency Phone Number: (919) 684-8111

APPENDIX 3: LIST OF ACRONYMS

A.B.: *Artium Baccalaureus* (Bachelor of Arts)
A.S.: Associates of Science
ASL: Above Sea Level
B.A.: *Baccalaureus Artium* (Bachelor of Arts)
BCD: Buoyancy Compensator Device
B.L.: Base Line
BP: Before Present
Bros.: Brothers
B.S.: Bachelor of Science
°C: Celsius
CA: cooperative agreement
c.: circa
CAC: Citizens Advisory Committee
CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR: Code of Federal Regulations
cm: centimeter
c/o: care of
CPR: cardiopulmonary resuscitation
CRE: CR Environmental, Inc.
CWA: Clean Water Act
DAN: Divers Alert Network
DC: District of Columbia
DGPS: Differential Global Positioning System
DSO: Diving Safety Officer
ed.: edition
EPA: Environmental Protection Agency
ESRI: Environmental Systems Research Institute
et al.: *et alii* (and others)
°F: Fahrenheit
ft: feet
FY: fiscal year
GIS: Geographic Information Systems
GPS: Global Positioning System
hp: horsepower
i.e.: *id est* (that is [to say])
in: inch
Inc.: incorporated
Inv.: inventory
kHz: kilohertz
km: kilometer
km^2: square kilometers
kmph: kilometers per hour
kW: kilowatt
LCMM: Lake Champlain Maritime Museum
m: meter

M.A.: *Magister Artium* (Master of Arts)
mi: mile
mi^2: square miles
mph: miles per hour
Ms.: manuscript
NAGPRA: Native American Graves Protection and Repatriation Act
NAUI: National Association of Underwater Instructors
n.d.: no date
No. or no.: number
NOAA: National Oceanic and Atmospheric Administration
NPS: National Park Service
NRHP: National Register of Historic Places
NY: NY
NYDEC: NY Department of Environmental Conservation
NYED: NY Department of Education
NYOGS: NY Office of General Services
NYOPRHP: NY Office of Parks, Recreation, and Historic Preservation
NYS: NY State
NYSM: NY State Museum
p.: page
PCBs: Polychlorinated biphenyls
Ph.D.: *Philosophiae Doctor* (Doctor of Philosophy)
pp.: pages
PM: *post meridiem* (after noon)
PO: Post Office
Re: regarding
Res.: resources
RFP: request for proposal
ROV: remote-operated vehicle
RV: research vessel
SCUBA: Self Contained Underwater Breathing Apparatus
SHPO: State Historic Preservation Office
SPC: Solvay Process Company
Tel: telephone number
US: United States of America
USACE: United States Army Corps of Engineers
USC: United States Congress
USEPA: United States Environmental Protection Agency
USGS: United States Geological Survey
USA: United States of America
UTM: Universal Transverse Mercator
VHF: very high frequency
Vol. or vol.: volume

APPENDIX 4: GLOSSARY

Aft Near or at the stern of a vessel.

Amidships The middle of a vessel.

Archaeological Site Locations where signs of human activity are found.

Archaeology A sub-discipline of anthropology involving the study of the human past through its material remains.

Artifact Any object used or manufactured by humans.

Athwartships From one side of a ship to the other.

Barge A large, unpowered, generally flat-bottomed boat towed by other craft and used as a freight-hauler or work platform.

Bateau (plural **bateaux**) A lightly built, flat-bottomed, double-ended boat.

Bathymetry The measurement of the depth of bodies of water.

Beam A dimension measured from side to side of a vessel.

Bedrock A mining term for the unweathered rock below the soil.

Bilge The lowest point of a vessel's interior hull.

Bilge Stringer A fore and aft timber located in the bottom of the hull that lends longitudinal strength to the hull and keeps the frames in line.

Bitts Strong wooden or metal uprights used for securing heavy ropes such as anchor cables.

Boat An open vessel, usually small and without decks, intended for use in sheltered water.

Bollard Short thick post of wood or iron (often mounted in pairs) used for securing mooring ropes, springs, or hawsers.

Bolt A fastener consisting of a threaded rod with a head at one end, designed to be inserted through a hole in assembled parts and secured by a mated nut that is tightened by a wrench.

Boom Spar used to stretch out the foot of a sail.

Bottom Planking In an edge-fastened vessel the planking that covers the flat bottom of the vessel, normally oriented transversely.

Bow The forward end of a vessel.

Bowsprit A spar projecting forward from the bow.

Breadth The measurement of a ship's width.

Breakwater A structure, usually made of stone or concrete, built to create a harbor or improve an existing one.

Breast Hook A large, horizontal knee fixed to the sides and stem to reinforce and hold them together.

Bulwark The side of a vessel above the its upper deck.

Bulkhead Vertical partition between two decks of a ship, running either lengthwise or across, forming and separating different compartments.

Cabin The living quarters of a vessel.

Canal A manmade waterway or artificially improved river used for navigation.

Canal Boat A boxy vessel designed to travel in a canal system. The vessel has no means of propulsion and must be towed or pushed by another vessel or animal.

Caprail A timber attached to the top of a vessel's frame.

Cargo hatch A deck opening providing access to stow cargo below.

Causeway A raised roadway across water or marshland.

Ceiling The internal planks of a vessel.

Chine log A longitudinal timber at the angular junction of the side and bottom of a flat-bottomed vessel.

Chock Wooden wedge used to prevent other structural members from moving.

Clamp A thick ceiling strake used to provide longitudinal support.

Cleat A T-shaped rigging fitting to which a vessel's lines are attached.

Coaming The raised lip with which openings in the deck such as hatchways are framed to prevent water on deck from running into the hold.

Cocked Hat Triangular wooden block used to brace the floors and futtocks where the bottom of the hull meets the sides.

Cultural Resource A nonrenewable prehistoric or historical resource such as archaeological sites, artifacts, and standing structures.

Deck A platform extending horizontally from one side of a ship to the other.

Decking The individual timbers that form the floor of the deck.

Deck beam A timber mounted across a vessel from side to side to support the vessel's deck and provide lateral strength.

Derrick Form of crane used to hoist cargo or their weights. It consists of a swinging boom supported by a topping lift and controlled sideways by guys.

Diagonal Bracing Angled bracing in the hull of a vessel used to resist fore-and-aft or athwarships distortion.

Draft The depth of a vessel's keel below the waterline when the vessel is loaded.

Drift bolt A cylindrical iron rod used to fasten ship timbers together; usually headed on one end and slightly larger in diameter than the hole into which it is driven.

Edge-fastened A shipbuilding technique used to attach the hull planks of a vessel together. The planks are set edge to edge and a hole drilled through them. Large iron bolts are driven through the planks to hold them together.

Fairlead A deck fixture used to lead a rope in a required direction.

Fender Timber designed to absorb the force from impacts with vessels or wharfs.

Floor Timber A frame timber that crosses the keel and spans the bottom of a vessel.

Fore Located at the front of a vessel.

Fore-and-Aft From stem to stern, from front to back, oriented parallel to the keel.

Frame A transverse timber or group of timbers that creates the skeleton of a vessel and to which the hull planking and ceiling are fastened.

Futtock A frame timber that continues where the floor timber leaves off and continues up the side of a vessel.

Gudgeon Device used to attach the rudder to the boat so that it can swing freely

Gunwale The timber above the sheer strake.

Hanging knee A vertical L-shaped timber attached to the underside of a beam and the side of a vessel; used to connect and reinforce the junction of a deck beam with the side of the vessel.

Harbor A safe anchorage, protected from most storms; may be natural or manmade; a place for docking and loading.

Hatch A deck opening in a vessel providing access to the space below.

Historic The period after the appearance of written records for a given region.

Hold The lower interior part of a ship in which cargo is stored.

Hull The structural body of a vessel, not including the superstructure, masts or rigging.

Hull Plank A thick board used to create the outer shell of a hull.

Inboard Toward the center of the vessel.

Keel The main longitudinal timber upon which the framework or skeleton of a hull is mounted; the backbone of a hull.

Keelson An internal longitudinal timber, fastened on top of the frames above the keel for additional strength.

Knee An L-shaped timber used to strengthen the junction of two surfaces on different planes.

Lighter A type of barge used to carry goods and equipment.

Longitudinal timber A long timber that runs parallel with the length of a vessel.

Magnetometer A scientific instrument used to measure the strength and/or direction of the magnetic field in the vicinity of the instrument. In archaeology this is used to identify metal objects.

Mast A large wooden pole that supports the sails of a vessel.

Mooring A permanent placement of an anchor, anchor chain, shackles and buoy necessary to anchor a vessel.

Mortise A cavity cut into a timber to receive a tenon.

Moulded Dimension The measurement of depth of a timber as seen in a cross-section view of a vessel.

Mud line The intersection of a shipwreck's hull with the bottom's surface.

Naphtha Launch: A small vessel that ran on the naphtha engine which did not use steam, but instead forms of gasoline and vapor.

Outboard Outside or away from the center of a vessel's hull.

Plank A thick board used as sheathing on a vessel.

Plank-on-Frame A shipbuilding technique, also commonly known as carvel built. Vessels of this type have planking running fore and aft with the planking laid edge to edge.

Port The left side of a vessel when facing forward.

Primary Source An artifact, document, or individual that provides information based on personal observations. A firsthand account.

Provenience The original location of an object, in reference to artifacts it is the exact location in which they were found.

Rabbet A concavity in the keel or chine log into which the planking is fit.

Rake The projection of a ship, at stem or stern, beyond the ends of the keel.

Rake timber Timber that acts as framing for the raked end of a scow.

Rider Interior frame mounted inside a ship's hold and bolted to other structural elements to strengthen the ship's structure.

Rigging The hardware and equipment that support and control the spars and sails of a vessel.

Rigging block A wooden pulley used to operate a vessel's spars and sails.

Room and Space The distance between the moulding edges of two adjoining frames.

Rub Plate A metal band placed on the forward end of the stem and bottom of the keelson to protect the underlying wood.

Rubwale See Rub Strake

Rub Strake: A rail on the outside of the hull of a boat to protect the hull from rubbing against piles, docks and other objects

Rudderpost A vertical timber in the stern of the vessel to which the rudder is attached

Scarf An overlapping joint to connect two timbers or planks without increasing their dimensions.

Schooner A fore-and-aft-rigged sailing vessel with two or more masts.

Scow Flat bottomed watercraft, normally rectangular in cross-section with outward sloping ends.

Secondary source An individual's description and interpretation of a historical event recorded at a different time and place. A secondhand account.

Sheer strake The top strake, or plank, of a wooden vessel next below the gunwale.

Sided dimension The measurement of width of a timber as seen in a plan view of a vessel.

Sloop A single-masted, fore-and-aft-rigged sail boat.

Spar A pole used to help support the sail of a vessel.

Spike A large nail.

Spud: Posts found on some barges which are lowered from the barge and pushed into the waterway floor to anchor the vessel in place.

Stanchion An upright supporting post.

Standing Knee A vertical L-shaped timber attached to the top of a deck beam, or decking; used to connect and reinforce the junction of a deck beam with the side of the vessel.

Starboard The right side of a vessel when facing forward.

Steamboat A vessel propelled by a steam engine.

Steamer A vessel propelled by a steam engine.

Stern The after end of a vessel.

Strake A continuous line of planks, running bow to stern.

Stringer A longitudinal timber fixed to the inside surface of the frames of a vessel to provide it with greater strength fore-and-aft.

Tenon a projection on a timber which fits into a mortise.

Tiller A handle attached to the rudderpost to steer a vessel.

Timber In a general context, all wooden hull members; specially those that form the framework or skeleton of the hull.

Top Log Longitudinally oriented timber which runs on top of the futtocks.

Towfish The torpedo-shaped unit that houses the transmitter and receiver of a side scan sonar and is usually towed behind a vessel.

Transverse Describes a component of a ship that runs side to side, not fore and aft.

Underwater archaeology The archaeological study of underwater cultural resources.

Underwater cultural resource A nonrenewable resource that partially or entirely lies below water, such as submerged prehistoric archaeological sites, artifacts, bridges, piers, wharfs and shipwrecks.

Vessel A watercraft, larger than a rowboat, designed to navigate on open water.

Wale A thick strake of planking located along the side of a vessel for the purpose of stiffening the outer hull.

Waterline The intersection of the vessel's hull and the water's surface.

Wharf A structure, parallel to the shore, for docking vessels.

APPENDIX 5: NY STATE CANAL SYSTEM RESOURCE ELIGIBILITY STATEMENT

RESOURCE EVALUATION **DATE:** 11/29/93 **STAFF:** L. Garofalini

PROPERTY: New York State Canal System **MCD:** Multiple
ADDRESS: ______ **COUNTY:** Multiple
PROJECT REF: ______ **USN:** ______
NR REF: ______ **Survey REF:** ______

I. ___ Property is individually listed on SR/NR.
Name of listing: ______

___ Property is a contributing component of a SR/NR district.
Name of district: ______

II. X Property meets criteria * A,C,D for inclusion in the National/State Register of Historic Places.
___ Property contributes to a district which meets criteria * ______ for inclusion in the National/State Register of Historic Places.
Post SRB: ___ **SRB date:** ______ **NR application pending** ____

* **Criteria for inclusion in the National Register:**

A. Associated with events that have made a significant contribution to the broad patterns of our history;

B. Associated with the lives of persons significant in our past;

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

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

STATEMENT OF SIGNIFICANCE:

The New York State canal system including the 1918 barge system and the extant remains of its predecessors (the Erie, Champlain, Oswego, Genesee, Chemung, Chenango, Black River and related private canals, i.e., Western Inland Navigation, Chenango Extension and Junction Canals) is the most extensive canal system in North America and is of national significance for the pivotal and varied roles which it has played in not only the historical growth and development of New York State and states of the upper Midwest, but also of the nation, primarily in areas of transportation, commerce, and engineering.

Since the construction of the first canal in New York State by the Western Inland Navigation Lock Co. in 1792, the canal system has undergone a constant evolution to arrive at its present day configuration as the New York State Barge Canal System. This system represents one of the greatest engineering achievements of the early 20th century, rivaled only by the building of the Panama Canal (1914).

The entire New York State canal system is 525 miles in length and consists of the major extant branches of the state system - the Erie, the Champlain, the Oswego and the Cayuga and Seneca canals, which since the creation of the Barge Canal in 1918, have been combined to provide an uninterrupted homogeneous navigation system linking the Atlantic Ocean with the Great Lakes and Lake Champlain via the Hudson River. The Erie is the main line and stretches across the state from Waterford (opposite Troy on the west bank of the Hudson River) to Tonawanda and Buffalo on the Niagara River; the Champlain runs north near the easterly boundary of the state from Waterford to Whitehall, at the southern end of Lake Champlain; the Oswego, from a point near Syracuse, connects the Erie canal with Lake Ontario; and the Cayuga and Seneca Canal, which leaves the Erie west of Syracuse, runs southward, connecting with Cayuga and Seneca lakes. The Hudson River links the entire system to the Port of New York and the Atlantic Ocean.

The significance of the Barge Canal's predecessors cannot be overstated, as all contributed to the establishment of an inland navigation system that spanned New York State, thereby securing New York City's position as the nation's leading Atlantic port and center of trade and commerce, as well as fixing upstate New York's geographic development patterns. The Western Inland Navigation Lock Company's construction of locks around the rapids in the Mohawk River at Little Falls (1792) was the first attempt to create a reliable water route into the state's western frontier territories. The construction and elaboration of the canal system between 1817 and 1862 [Old Erie Canal (1817-35), Old Champlain Canal (1819-1918), Enlarged Erie Canal (1836-1905), as well as the lateral canals; i.e., Oswego, Black River, Genesee, Chemung, Chenango, Junction Canal, Chenango Extension Canal, Cayuga and Seneca, Crooked Lake] allowed New York state to capture and maintain the largest share of east-west traffic in the country. By giving New York the first viable trans-Allegheny route to the interior, the Erie Canal and the Enlarged Erie allowed New York City in the second quarter of the 19th century to quickly and decisively eclipse the then-larger ports of Boston, Newport, Philadelphia and Baltimore to become the pre-eminent center for trade and commerce on the eastern seaboard; the canal's continued utility for the shipment of bulky, low-cost goods helped New York to maintain its edge over its rivals despite the development of rail, road and air connections to all these cities in the 19th and 20th centuries.

The New York State canal system and its predecessors satisfy National Register Criteria A, C and D with significance in the categories of: Architecture, Archaeology, Commerce, Community Planning and Development, Economics, Engineering, Settlement, Industry, Maritime History, Politics/Government, Social History, Recreation and Transportation. Additional categories of significance may be revealed in future research.

Under Criterion A the canal system is significant for the central role it has played in the 19th and 20th century growth and development of New York State and the states of the upper Midwest as well as for its impact on the development of civil engineering as a distinct profession and the development of engineering techniques in the United States.

Under Criterion C the canal system is significant as a distinguished navigation system incorporating a broad range of engineering features and the specific canal-related property types which evolved throughout the period of significance.

Under Criterion D the canal system is significant for its archaeological potential to yield important information on early engineering techniques, transportation corridors, maritime and social histories.

Assuming adequate integrity (according to National Park Service standards), any canal-related feature is considered potentially eligible as a contributing component to this significant historic resource. Contributing features of the canal system include, but are not limited to, any and all built engineering features such as channels, prisms, locks, dams, aqueducts, bridges, towpaths, retaining walls, berm banks, turning basins, feeders, weighlocks, waste weirs, culverts as well as navigational aids (i.e., lighthouses, buoys), maintenance fleet, boat wrecks, and terminals and/or built structures/buildings associated with the canals, whether publicly or privately constructed or owned.

The Period of Significance established for the New York State canal system begins in 1792 with the construction of the Western Inland Navigation Lock Company and, given that the entire system is still in use today as a navigable waterway, has a floating end date consistent with the National Park Service 50 year threshold. Features less than 50 years old must be considered exceptionally significant.

APPENDIX 6: ONONDAGA NATION'S SPIRITUAL AND CULTURAL HISTORY OF ONONDAGA LAKE[1]

The region of Onondaga Lake and the Onondaga Lake watershed has been our homeland since the dawn of time. We have been a steward of Onondaga Lake since time immemorial and will continue to do so forever, as that is what has been mandated from the Gayanashagowa, the Great Law of Peace. In the 1794 *Treaty of Canandaigua the United States government recognized Onondaga Lake as part of our aboriginal territory. The Lake is the spiritual, cultural and historic center of the Haudenosaunee Confederacy. Over one thousand years ago, the Peacemaker brought the Mohawk, Oneida, Onondaga, Cayuga, and Seneca Nations together on the shores of Onondaga Lake. At the lakeshore, these Nations accepted the message of peace, laid down their arms, and formed the Haudenosaunee Confederacy. The Confederacy was the first representative democracy in the West.*

To symbolize the Confederacy, the Peacemaker planted a white pine, the Tree of Peace, on the shore of Onondaga Lake. It is understood that the Peacemaker chose the white pine because the white pine's needles are clustered in groups of five, just as the five founding Nations of the Confederacy clustered together for strength. The boughs of the white pine represent the laws that protect all the people. An eagle was placed at the top of the tree to watch for danger from without and within. Four white roots of peace reach out in the four directions towards anyone or any Nation who wishes to come under this tree of peace.

As the birth place of the Confederacy and democracy, the Lake is sacred to the Haudenosaunee. The Onondaga Nation has resided on the Lake and throughout its watershed since time immemorial, building homes and communities, fishing, hunting, trapping, collecting plants and medicine, planting agricultural crops, performing ceremonies with the natural world dependent on the Lake, and burying our ancestors - the mothers, fathers and children of the Onondaga Nation. The Onondaga Nation views its relationship to this area as a place where we will forever come from and will return to.

It brings great sadness to the people of the Onondaga Nation that despite our long stewardship of the Lake and its watershed, it took only one hundred years of abuse to wreak havoc to the Lake, its tributaries and all the plants, animals and marine life that depend on the Lake and its watershed. Industry interfered with the Onondaga Nation's relationship to the land and disturbed the ancestors that were interred throughout the watershed - either by direct excavation or contamination, or indirect efforts such as construction on top of grave sites. We wish to bring about a healing between us and all others who live within our homelands around the Lake. We must in order to protect the future generations "whose faces are looking up from the earth."

We are one with this land and this Lake. It is our duty to work for a healing of this land, and all of its waters and living things, to protect them, and to pass on a healthy environment to future generations - yours and ours.

[1] The Onondaga Nation requested that the oral tradition concerning the significance of Onondaga Lake to the Onondaga and Haudenosaunee Confederacy be included in this report. The Onondaga Nation's statement may not necessarily reflect the views of the Lake Champlain Maritime Museum, Parsons or Honeywell International Inc. Further, the inclusion of the Onondaga Nation's oral tradition shall not constitute an admission of any fact or law in any judicial or administrative proceeding. In addition, the statement and findings made in this report by Honeywell, Parsons and the Lake Champlain Maritime Museum may not reflect the opinions and views of the Onondaga Nation, and do not constitute an admission by the Onondaga Nation of fact or law in any legal or other proceeding.

APPENDIX 7: RESUMES OF KEY PROJECT PERSONNEL

Arthur Bruce Cohn
Senior Advisor and Special Projects Director
Lake Champlain Maritime Museum
4472 Basin Harbor Road,
Vergennes, Vermont 05491
(802) 475-2022

Education
Doctor of Science, Honorary. Middlebury College – 2003
Doctor of Laws, Honorary. University of Vermont - 1996
JD Boston College Law School - 1974
BA University of Cincinnati (Sociology) - 1971

Professional Experience
Senior Advisor and Special Projects Director, Lake Champlain Maritime Museum, 2011 – present.
Executive Director, Lake Champlain Maritime Museum, 1984 – 2011.
Delegate, Member of the U.S. State Department Delegation to the United Nations Educational, Science and Cultural Organization's (UNESCO) Convention for the Protection of Underwater Cultural Heritage, June 2000 – present.
Committee Member, National Maritime Heritage Initiative Grants Advisory Committee. 1997 - present.
Proposal Evaluator, National Oceanographic and Atmospheric Administration (NOAA) Ocean Exploration Program, 2001.
Adjunct Assistant Professor, Texas A&M University, Nautical Archaeology Program. 1995 - present
Adjunct Assistant Professor, University of Vermont, Instructor of Maritime History, Nautical Archaeology and Historic Preservation, 1991 – present.

Diving Certifications
1974 - NAUI Instructor (3795)
TDI - Nitrox Instructor
1997- 2005 Diver's Alert Network, Member (Master Insurance)
2000 – Tri-mix certified, Crystal River, FL, active Deep Technical Diving, Mixed gases.
Current: CPR for the Professional Rescuer, First Aid, and Oxygen Administration.

Selected Publications
Books and Book Sections
Cohn, Arthur B.
1994 *Afterword*: *In Lake Champlain as Centuries Pass*, by A. P. Beach, pp. 107-115. Lake Champlain Maritime Museum, Ferrisburgh, VT.
1995a *Afterword:* Building and Sailing the Replica. In *The Gunboat* Philadelphia *and the Defense of Lake Champlain in 1776*, by P. Lundeberg, pp. 61-84. Lake Champlain Maritime Museum, Ferrisburgh, VT.
1995b *Epilogue:* Treasures Beneath an Inland Sea. In *Lake Champlain: Key to Liberty*, by R. N. Hill, pp. 283-299. Countryman Press, Woodstock, VT.

1997a *Forward, Afterword:* The Roaring '20s: Death by Automobile and Archaeology of Lake Champlain Steamboats. In *The Steamboats of Lake Champlain, 1809-1930*, by O. B. Ross, pp. ix-xi, 185-201, 202-207. Vermont Heritage Press, Quechee, VT.

1997b Lake Champlain. In *Encyclopedia of Underwater and Maritime Archaeology*, edited by J. P. Delgado, pp. 231-233. British Museum Press, London.

2003a Contributor: The Plenum Series in Underwater Archaeology *Submerged Cultural Resource Management: Preserving and Interpreting Our Maritime Heritage.* Kluwer Academic/Plenum Publishers.

2003b Contributor: The Vermont Encyclopedia. University Press of New England, New Hampshire.

2003c Author: Lake Champlain's Sailing Canal Boats: An Illustrated Journey from Burlington Bay to the Hudson River. Lake Champlain Maritime Museum, Basin Harbor, VT.

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MA Anthropology, Texas A&M University, College Station, Texas, 2001.
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Professional Experience
Executive Director, Fairbanks Museum and Planetarium, September 2013 – present.
Archaeological Director, Lake Champlain Maritime Museum, October 2000–2013.
Basin Harbor Site Manager, Lake Champlain Maritime Museum, May 2005 – October 2006.
Lake Champlain Underwater Historic Preserve Monitor, Vermont Division for Historic Preservation, May 2001 – present.
Nautical Archaeologist, Lake Champlain Maritime Museum. May 2000 – October 2000.
Nautical Archaeology Intern, Lake Champlain Maritime Museum. May 1999 - August 1999.
Archaeological Conservator, Texas A&M University Conservation Research Laboratory. August 1998 – May 2000.
Archaeological Consultant, R. Christopher Goodwin & Associates, Inc. August 1998 - May 2000.
Nautical Archaeologist, Remote Sensing Specialist, and Assistant Diving Safety Officer, R. Christopher Goodwin & Associates, Inc. October 1995 - August 1998.
Archaeologist, Cultural Heritage Resource Services, Inc. May 1995 - October 1995.
Archaeological Crew Chief, Millersville University, Archaeological Field School. June - July 1994.
Laboratory Assistant, Millersville University, Archeology Laboratory. February 1992 - May 1995.
Field Archaeologist, Delaware Department of Natural Resources and Environmental Control. June - August 1991 -1993.

Certifications/Memberships
New Haven Community Center Committee, member 2002 - 2005.
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- Archaeological Director, Sloop Island Canal Boat 3D Sonar Documentation Project. 2012-present.
- Instructor, Lake Champlain Maritime Museum Archaeological Field School. 2012 – present.
- Archaeological Diver, Onondaga Lake Cultural Resources Survey. 2010-present
- Archaeological Diver and Conservator, Sloop Island Canal Boat Documentation Project. 2002-2003
- Archaeological Conservator, Lake Champlain Maritime Museum. 1999 - 2000.
- Internship, Lake Champlain Maritime Museum. 1998.
- Archaeologist, *Newasha* Archaeological Project. 1998.
- Archaeological Project Manager, Camp Hearne Conservation Project, Texas A&M University. 1998.
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- Graduate Assistant, Conservation Research Laboratory, Texas A&M University. 1997 –1998.
- Archaeological Project Manager, Lake Huron Shipwreck Survey Phase I. 1997.
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APPENDIX 8: HUMAN REMAINS DISCOVERY PROTOCOL

NY State Historic Preservation Office/NY State Office of Parks, Recreation and Historic Preservation Human Remains Discovery Protocol

At all times human remains must be treated with the utmost dignity and respect. Should human remains be encountered work in the general area of the discovery will stop immediately and the location will be immediately secured and protected from damage and disturbance.

Human remains or associated artifacts will be left in place and not disturbed. No skeletal remains or materials associated with the remains will be collected or removed until appropriate consultation has taken place and a plan of action has been developed.

The county coroner and local law enforcement as well as the SHPO and the involved agency will be notified immediately. The coroner and local law enforcement will make the official ruling on the nature of the remains, being either forensic or archeological. If the remains are archeological in nature, a bioarchaeologist will confirm the identification as human.

If human remains are determined to be Native American, the remains will be left in place and protected from further disturbance until a plan for their protection or removal can be generated. The involved agency will consult SHPO and appropriate Native American groups to determine a plan of action that is consistent with the Native American Graves Protection and Repatriation Act (NAGPRA) guidance.

If human remains are determined to be Euro-American, the remains will be left in place and protected from further disturbance until a plan for their avoidance or removal can be generated. Consultation with the SHPO and other appropriate parties will be required to determine a plan of action.[151]

APPENDIX 9: WOOD SAMPLE DATA

Wreck A2-1 Wood Samples

Sample Number	Sample Location	Results	Species
1	Hull Plank 2, Near F17 Port Side	White Oak	*Quercus alba*
2	Cocked Hat, F22 Portside	White Oak	*Quercus alba*
3	Futtock Starboard side	White Oak	*Quercus alba*
4	Stanchion Near Shaft, Port	White Oak	*Quercus alba*
5	No Sample	No Sample	N/A
6	No Sample	No Sample	N/A
7	Hull Plank, Starboard side	White Oak	*Quercus alba*
8	Floor F16, Port	White Oak	*Quercus alba*
9	Keelson Chock	White Oak	*Quercus alba*
10	Futtock F7 Port	White Oak	*Quercus alba*
11	Hull Plank Near Stem, Port	White Oak	*Quercus alba*
12	Stem	White Oak	*Quercus alba*

Wreck A2-2 Wood Samples

Sample Number	Sample Location	Results	Species
1	Stern Post	White Oak	*Quercus alba*
2	Planking in Stern	White Oak	*Quercus alba*
3	Ceiling in Stern	White Oak	*Quercus alba*
4	Transon Frame, Port Side	White Oak	*Quercus alba*
5	Stern Knee	White Oak	*Quercus alba*
6	Stern Knee, Starboard Side	White Oak	*Quercus alba*
7	Hull Plank, Starboard Side	Hard Pine	Southern Yellow Pine
8	Frame Timber, Starboard Side	Hard Pine	Southern Yellow Pine
9	Frame Timber, Starboard Side	Hard Pine	Southern Yellow Pine
10	Rider, Starboard Side	Hard Pine	Southern Yellow Pine
11	Truss Timber, Starboard Side	Hard Pine	Southern Yellow Pine
12	Truss Timber, Starboard Side	Hard Pine	Southern Yellow Pine
13	Notched Frame, Starboard Side	Hard Pine	Southern Yellow Pine
14	Rider, Starboard Side	Hard Pine	Southern Yellow Pine
15	Gunnel, Starboard Side	White Oak	*Quercus alba*
16	Vertical Plank, Starboard Side	American Birch	*Betula papyrifera*
17	Stem	White Oak	*Quercus alba*
18	Frame 1, Starboard Side	White Oak	*Quercus alba*
19	Frame 2, Starboard Side	White Oak	*Quercus alba*
20	Frame 3, Starboard Side	White Oak	*Quercus alba*
21	Frame 4, Starboard Side	White Oak	*Quercus alba*
22	Frame 5, Starboard Side	White Oak	*Quercus alba*
23	Frame 7, Staboard Side	American Birch	*Betula papyrifera*
24	Vertical Plank, Port Side	American Birch	*Betula papyrifera*
25	Vertical Plank, Port Side	American Birch	*Betula papyrifera*

Wreck A2-3 Wood Samples

Sample Number	Sample Location	Results	Species
1	Garboard Plank, Starboard Side	American Birch	*Betula papyrifera*
2	Hull Plank, Starboard Side	White Oak	*Quercus alba*
3	Deadwood	White Oak	*Quercus alba*
4	Frame C, Port Side	White Oak	*Quercus alba*
5	Keelson @13ft. MBL	White Cedar	*Thuja occidentalis*
6	Frame E, Starboard Side	White Oak	*Quercus alba*
7	Frame G, Starboard Side	White Cedar	*Thuja occidentalis*
8	Frame I, Starboard Side	White Cedar	*Thuja occidentalis*
9	Frame K, Staboard Side	White Cedar	*Thuja occidentalis*
10	Hull Plank, Starboard Side	White Cedar	*Thuja occidentalis*
11	Frame L, Starboard Side	White Oak	*Quercus alba*
12	Frame N, Starboard Side	White Oak	*Quercus alba*
13	Frame T, Starboard Side	White Oak	*Quercus alba*
14	Hull Plank, Starboard Side	White Oak	*Quercus alba*

Wreck A2-4 Wood Samples

Sample Number	Sample Location	Results	Species
1	Unidentified timber	Hard Pine	Southern Yellow Pine
2	Unidentified timber	Hard Pine	Southern Yellow Pine
3	Unidentified timber	Hard Pine	Southern Yellow Pine
4	Unidentified timber	Hard Pine	Southern Yellow Pine
5	Unidentified timber	Hard Pine	Southern Yellow Pine

Wreck A4-1 Wood Samples

Sample Number	Sample Location	Results	Species
1	Stern Bitt Post, Port Side	Hard Pine	Southern Yellow Pine
2	Frame 1, Port Side	Hard Pine	Southern Yellow Pine
3	Frame 2, Port Side	Hard Pine	Southern Yellow Pine
4	Hull Plank, Port Side, Top	Hard Pine	Southern Yellow Pine
5	Hull Plank, Port Side, Mid	Hard Pine	Southern Yellow Pine
6	Floor Timber, Port Side	Hard Pine	Southern Yellow Pine
7	Transverse Bulkhead	Hard Pine	Southern Yellow Pine
8	Floor Timber, Center Bay	Hard Pine	Southern Yellow Pine
9	Transverse Bulkhead	Eastern Hemlock	*Tsuga canadensis*
10	Dump Door Timber	White Oak	*Quercus alba*
11	Bow Planking	Hard Pine	Southern Yellow Pine
12	Dump Door Timber	Hard Pine	Southern Yellow Pine
13	Dump Door Timber	Hard Pine	Southern Yellow Pine
14	Rake Timber, Bow	Hard Pine	Southern Yellow Pine
15	No Sample	N/A	N/A
16	Rake Timber, Bow	Hard Pine	Southern Yellow Pine
17	Triangular Chock, Bow	Hard Pine	Southern Yellow Pine
18	Transverse Bulkhead	Hard Pine	Southern Yellow Pine

Site A7 Wood Samples

Sample Number	Sample Location	Results	Species
1	Piling Clump 1	Hard Pine	Southern Yellow Pine
2	Piling Clump 2	Hard Pine	Southern Yellow Pine
3	Piling Clump 3	Hard Pine	Southern Yellow Pine
4	Piling Clump 4	Hard Pine	Southern Yellow Pine
5	Piling Clump 5	Hard Pine	Southern Yellow Pine
6	Piling Clump 6	Hard Pine	Southern Yellow Pine
7	Piling Clump 7	Hard Pine	Southern Yellow Pine
8	Piling Clump 8	Hard Pine	Southern Yellow Pine

Site A53 Wood Samples

Sample Number	Sample Location	Results	Species
1	Timber 1	White Oak	*Quercus alba*
2	Timber 2	White Oak	*Quercus alba*
3	Timber 3	White Oak	*Quercus alba*
4	Timber 4	White Oak	*Quercus alba*
5	Timber 5	White Oak	*Quercus alba*
6	Timber 6	White Oak	*Quercus alba*
7	Timber 7	White Oak	*Quercus alba*
8	Timber 8	White Oak	*Quercus alba*
9	Frame @ 21' MBL	White Oak	*Quercus alba*
10	Cocked Hat, Frame @ 21' MBL	White Oak	*Quercus alba*
11	Hull Planking, Starboard Side	White Oak	*Quercus alba*
12	Sacrificial Planking, Starboard Side	American Beech	*Fagus grandifolia*
13	Frame @ 9'3" on BL 2 Starboard Sid	White Oak	*Quercus alba*
14	Stem	White Oak	*Quercus alba*
15	Hull Planking, Starboard Side	White Oak	*Quercus alba*
16	Floor @ 43' MBL	White Oak	*Quercus alba*
17	Cocked Hat, Frame @ 43' MBL, Forv	White Oak	*Quercus alba*
18	Cocked Hat, Frame @ 43' MBL, Aft	White Oak	*Quercus alba*
19	Cocked Hat, Frame @ 43' MBL, Aft	White Oak	*Quercus alba*
20	Cocked Hat, Frame @ 43' MBL, Forv	White Oak	*Quercus alba*
21	Floor @ 71' MBL	White Oak	*Quercus alba*
22	Spacer Forward of Frame @ 71' MB	White Oak	*Quercus alba*
23	Cocked Hat, Frame @ 71', Aft	White Oak	*Quercus alba*
24	Cocked Hat, Frame @ 71', Forward	White Oak	*Quercus alba*
25	Hull Planking, Starboard Side	White Oak	*Quercus alba*
26	Knee, Starboard Side	White Oak	*Quercus alba*

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