PHASE I(a) MARINE ARCHAEOLOGICAL RECONNAISSANCE SURVEY

GREEN JACKET SHOAL MARINE DEBRIS REMOVAL PROJECT
PILOT STUDY AREA
EAST PROVIDENCE AND PROVIDENCE, RHODE ISLAND

by

David S. Robinson, M.A., R.P.A.

July 2016

Prepared for:

RHODE ISLAND SEA GRANT
University of Rhode Island, Graduate School of Oceanography
South Ferry Road
Narragansett, Rhode Island 02882

Prepared by:

COASTAL MAPPING LABORATORY
University of Rhode Island, Graduate School of Oceanography
South Ferry Road
Narragansett, Rhode Island 02882

EXECUTIVE SUMMARY

The Coastal Mapping Laboratory at the University of Rhode Island's Graduate School of Oceanography completed a Phase I(a) marine archaeological reconnaissance survey of approximately 30 acres of harbor floor centered on the shallow waters of Green Jacket Shoal. The shoal is serving as a pilot study area for a proposed marine debris removal project to be performed by the Rhode Island-based non-profit organization, Clean the Bay, Inc., with support from Rhode Island Sea Grant (RISG) and federal funding from the National Oceanic and Atmospheric Administration (NOAA). The debris being targeted for removal includes not only shoreline industrial flotsam, but also derelict pier piling stubs and abandoned wooden vessel remains.

The Green Jacket Shoal survey had three overall goals: a) locate and identify previously-recorded or known significant archaeological resources within the proposed debris removal pilot project area; b) assess the overall archaeological sensitivity of the study area and its potential for containing additional submerged cultural sites, including ancient Native American and Euro-American archaeological deposits dating from the pre- and post-contact period; and c) provide management recommendations regarding the potential need for an additional phases or phases of marine archaeological investigation. Achievement of the survey's research goals was met through a year-long study consisting of background research, non-disturbance archaeological survey, baseline documentation and mapping, and limited geological sampling of sediments to assess their condition (i.e., degree of disturbance, stratigraphy, depositional environment (terrestrial or marine), and grain size). The study's purpose as purely academic research, or as part of a formal cultural resource management review process, was not clearly defined at its inception by RISG. However, NOAA funding of Clean the Bay, Inc.'s RISG-supported larger debris removal project could be considered a federal undertaking, requiring compliance with Section 106 of the National Historic Preservation Act, and the consideration of the proposed debris removal project's impacts on submerged cultural resources. Therefore, in anticipation of the debris removal project's possible need for a formal cultural resource management review process, this study was performed utilizing the research guidelines defined by the Rhode Island State Historic Preservation Office as a "Phase I(a) marine archaeological reconnaissance survey."

This survey resulted in the assessment that the study area's location at the head of Narragansett Bay, one of the region's largest estuaries, and at the confluence of multiple rivers connecting tidewater to the interior, has made Providence Harbor and its surrounding environs a culturally important place for intensive human use and habitation for thousands of years spanning the entirety of the region's human history. These factors lead to an overall assessment of high archaeological sensitivity for the study area. The area is likely to contain as-yet unidentified pre- and post-European-contact period submerged cultural deposits. Additionally, the likelihood for such deposits to be disturbed seems to be generally low, in light of research conducted as part of this study on a sequence of historical maps, which indicated that the horizontal shoreline position on the west side of Bold Point (the eastern margin of the study area) has not changed appreciably since ca. 1700, and that harbor dredging operations do not appear to have extended beyond the margins of the Shoal within the study area.

Non-disturbance archaeological field survey performed for this study documented 29 wooden ships comprising six classes of vessel, including multiple types and sizes of scow-barges, sailing vessels, screw-propelled harbor steamers, large side-wheel bay and sound steamers, possible steam or

diesel-motor screw-propelled vessels and one unknown type of vessel that historical photographic evidence suggests may be a sailing vessel. Also documented as part of the study were the archaeological remains of the massive pier that served as the slip for Rhode Island's first floating dry dock, and other shoreline infrastructure related to the 35 year-long operation of the last shipyard in Providence to build wooden merchant sailing vessels – the Providence Dry Dock and Marine Railway Company at Bold Point. These vestiges of the shipyard were first identified in 1982 by researchers from the Department of the Army who assessed the structures in the water and along the shore, and the overall shipyard site, as one of "special importance" as the sole survivor of Providence's wooden sailing ship-building industry and the only one with extant surface remains where significant archaeological resources might be present (assessment of the area's derelict vessels was not included as part of the Department of the Army's 1982 reconnaissance). Representative of Providence's waterfront development in the late nineteenth century, the shipyard played an important role in the maritime history of Providence and East Providence, and, by extension, to the state, region and the nation. The Department of the Army researchers determined that the shipyard structures appeared to constitute important historic and archaeological resources that might qualify for nomination to and listing in the National Register of Historic Places (NRHP) as having "particularly great historic and potential archaeological significance," and recommended that further investigation, consisting of a Phase II (site evaluation) survey, be performed at a sufficient intensity to aid in the evaluation of the significance of each structure and the overall site by applying the NRHP's criteria of eligibility.

Combined field survey and archival research performed for this study has assembled evidence that the onshore activities of the Providence Dry Dock and Marine Railway Company influenced and may have directly resulted in the accumulation of most of the derelict vessels on Green Jacket Shoal. This varied assortment of derelict vessels, comprising the largest component of the submerged cultural resources identified thus far within the study area on Green Jacket Shoal, and the floating dry dock pier and other shipyard-related shoreline infrastructure on land and in the intertidal zone at Bold Point together form a unique "maritime cultural landscape" spanning land and water in which is preserved in a remarkably comprehensive way the maritime aspect of Providence's "Golden Era" just prior to and after the turn of the twentieth century. The cultural activities that took place at Bold Point, and in Providence and Providence Harbor, occurred at the height of the city's long-ascendant cultural, industrial, and economic development, and for this reason the archaeological vestiges of those activities that are preserved both on land and in the water represent a unique and significant situation and opportunity.

Consideration of the cultural resources present at Bold Point and on Green Jacket Shoal will benefit from an approach to the study of coastal heritage that is holistic. Rather than looking at terrestrial and submerged resources as separate domains, they should be considered as parts of a single integrated system. Using such a framework means that it is impossible to interpret the significance of cultural materials in the terrestrial, intertidal or sub-tidal zones without referencing the others. While this approach is relatively new to marine archaeology, its application to the interpretation of the significance of the Bold Point/Green Jacket Shoal maritime cultural landscape is essential. This study raised a number of questions, which were not possible to address within the time and budgetary constraints of this initial phase of archaeological investigation. Consequently, the preliminary archaeological assessment performed as part of this study should not be seen as an end unto itself, but instead as the basis for planning the more intensive archaeological work that this archaeologically extraordinary site warrants.

Although the archaeological deposits identified within the Green Jacket Shoal study area are not the oldest in the Providence/East Providence area, the collection of cultural resources comprising the site captures the city at its apex of cultural, industrial, maritime, and commercial development. In many ways, the Green Jacket Shoal/Bold Point site represents the last chapter in the development and growth of the region's industry, a history that extends along the Blackstone River Valley National Heritage Corridor and Historical Park and includes the birthplace of industry in the United States - Slater Mill. In light of these considerations and based on the results of the preliminary background research and field survey conducted for this Phase I(a) reconnaissance study, performance of a combined comprehensive Phase I(b)/Phase II marine archaeological identification survey and site examination to more fully assess the archaeological sensitivity for the Shoal to contain submerged ancient Native American cultural sites and to evaluate the National Register eligibility of the post-contact period submerged cultural resources located within the Green Jacket Shoal study area is recommended. This additional phase of archaeological investigation should involve multiple tasks, including: consultation/coordination; permitting; sediment sampling/geological and contaminants analyses; supplemental background research; magnetometer survey; supplemental side-scan sonar survey; data processing and analyses; detailed archaeological site mapping and recordation; and public outreach and reporting. This Phase I(b)/Phase II marine archaeological identification survey and site examination should be designed to collect enough information to assess the archaeological sensitivity for the Shoal to contain submerged ancient Native American cultural sites and to determine whether elements of the Green Jacket Shoal site's post-contact submerged cultural resources are eligible individually or collectively for listing in the National Register of Historic Places either as sites, or as an historic district composed of multiple contributing elements. The Phase II element of the investigation should reliably estimate the site's internal attributes and spatial boundaries to inform a determination of eligibility, and, if necessary, a Phase III data recovery plan. The survey should be performed under an archaeological permit from and in coordination with the Rhode Island Historical Preservation and Heritage Commission (RIHPHC), the Narragansett Indian Tribe, as per the RIHPHC permitting requirements, the Mashpee Wampanoag Tribe, the Wampanoag Tribe of Gay Head (Aquinnah), and the Nipmuc Nation. Coordination should also be initiated and maintained during the study with NOAA, USACE, RISG, CRMC, RIDEM, the Cities of Providence and East Providence, the Providence and East Providence Historic Commissions, the East Providence Waterfront Commission, the East Providence Historical Society, and the Blackstone River Valley National Historical Park.

Table of Contents

EXECUTIVE SUMMARY I

LIST OF FIGURES VI

1.0 INTRODUCTION 1
1.1 Project Location and Description 1
1.2 Project Inception and Jurisdictional Considerations 1
1.3 Project Personnel 8
1.4 Disposition of Project Materials 8

2.0 RESEARCH DESIGN AND METHODOLOGY 9
2.1 Background Research 9
2.2 Field Survey 10
2.2.1 Archaeological Diving 10
2.2.2 Kayak-Based Documentation 11
2.2.3 Geological Sediment Sampling (Biological [Surface] Coring and Vibracoring) 12

3.0 ENVIRONMENTAL CONTEXT 13
3.1 Geographic Setting 13
3.2 Geologic History 14
3.3 Contemporary Environmental Conditions 16
3.4 Anthropogenic Impacts 17

4.0 CULTURAL CONTEXT 19
4.1 Pre-contact Period Cultural Chronology 19
4.1.1 PaleoIndian Period (13,000 to 10,000 B.P.) 20
4.1.2 Archaic Period (10,000 to 3,000 B.P.) 22
4.1.2.1 Early Archaic Period (10,000 to 7,500 B.P.) 22
4.1.2.2 Middle Archaic Period (7,500 to 5,000 B.P.) 24
4.1.2.3 Late Archaic Period (5,000 to 3,000 B.P.) 25
4.1.3 Transitional/Terminal Archaic Period (3,600 to 2,500 B.P.) 27
4.1.4 Woodland Period (3,000 to 450 B.P.) 29
4.1.4.1 Early Woodland Period (3,000 to 1,600 B.P.) 29
4.1.4.2 Middle Woodland Period (1,600 to 1,000 B.P.) 30
4.1.4.3 Late Woodland Period (1,000 to 450 B.P.) 32
4.2 Contact/Post-contact Cultural Chronology 34
4.2.1 The Sixteenth and Seventeenth Centuries 34
4.2.1.1 Early Interactions between Native Americans and Europeans in Rhode Island 34
4.2.1.2 Expansion of European Settlement in the Providence Area 36
4.2.2 The Eighteenth Century 38
4.2.2.2 Maritime Commerce and Concurrent Waterfront Development 39
4.2.2.3 Conflict with Britain 41
4.2.3 The Nineteenth Century 44
4.2.3.1 Industrial Expansion 44
4.2.3.2 Maritime Commerce 46
4.2.3.3 Expansion of Transportation 48
4.2.3.4 Shipbuilding 49
4.2.3.5 Municipal and Coastal Development in the Green Jacket Shoals Area 52
4.2.4 The Twentieth Century to Present 55
4.2.4.1 Providence in the Early Twentieth Century 55

4.2.4.2 Providence During the Economic Depression and World War II 56
4.2.4.3 Suburbanization and Post-World War II Economic Transformation in Providence 57
4.2.4.4 East Providence 58
4.2.4.5 Shipbuilding 59

5.0 RESULTS 61
5.1 Background Research Results 61
5.1.1 Summary of Key Findings about the Study Area's Environmental and Cultural History and Character 61
5.1.2 Previous Investigations and Identified Sites 62
5.2 Field Survey 65
5.2.1 Site Mapping and Recordation 65
5.2.2 Geological Sampling 68

6.0 CONCLUSIONS AND RECOMMENDATIONS 70
6.1 Conclusions 70
6.1.1 Pre-Contact Period Archaeological Sensitivity 72
6.1.2 Post-Contact Period Archaeological Sensitivity 74
6.2 Recommendations for Future Archaeological Survey 74
6.2.1 Recommended Survey Area and Survey Tasks 75
6.2.1.1 Sediment Sampling and Contaminants Analysis 75
6.2.1.2 Supplemental Background Research 75
6.2.1.3 Phase I(b) Magnetometer Survey, Supplemental Sidescan Sonar Survey, Data Processing and Analysis 76
6.2.1.4 Phase II Detailed Archaeological Site Mapping and Recordation 76
6.2.1.5 Public Outreach and Reporting 76

BIBLIOGRAPHY 78

FIGURES 97

APPENDICES 155

LIST OF FIGURES

Figure 1-1. Location of the Green Jacket Shoal Phase I(a) marine archaeological reconnaissance survey study area (source: CML; basemap courtesy of ESRI ArcGIS Online, World Topographic).

Figure 1-2. High-resolution side-scan sonar survey data recorded by CML in 2013 showing six concentrations of wreckage on the harbor floor in the vicinity of Green Jacket Shoal (Source: King and LaFrance Bartley 2013).

Figure 1-3. NHPA Section 106 Compliance: Procedural Flow Chart outlining the process federal agencies must follow to consider the effects on historic properties of projects they carry out, assist, permit, license, or approve (undertakings) (source: after Advisory Council on Historic Preservation 2015).

Figure 2-1. Local informant and project volunteer, William Ewen, Jr. showing the project principal investigator, David Robinson, the locations of the remains of the steamers *Bay Queen* and *Mount Hope* (upper image); Project volunteer, Jack Albert, recording the GPS position of one of the 29 shipwrecks in the Green Jacket Shoal Study Area (source: upper photograph by Jack Albert; lower photograph by David Robinson, CML).

Figure 2-2. Project volunteer Glenn Anderson's donations of high-definition, low-altitude, quad-copter imaging to the project proved extremely effective for mapping the study area's submerged cultural resources (source: aerial photograph by Glenn Anderson; inset photograph by David Robinson, CML).

Figure 2-3. A seal was encountered by project researchers in August 2015 hauled-out on the wreckage of the nineteenth-century paddlewheel steamer, *Mount Hope* – evidence that the wooden vessel remains on Green Jacket Shoal provide habitat for marine mammals that are once again living in the Upper Bay and Providence River (source: photographs by David Robinson, CML).

Figure 2-4. CML's dive platform and full-face mask with hard-wired communications diving mode used for the project's URI-authorized marine archaeological diving operations (source: upper photograph by David Robinson, CML; lower photograph by Michael Dalton, CML).

Figure 2-5. Underwater visibility and water quality on-site in early May 2015 (top image) was acceptable for conducting marine archaeological diving operations and recording underwater video; however, by mid-May, unseasonably warm air and water temperatures had quickly reduced conditions to unacceptable levels (bottom image) (source: photographs by David Robinson, CML).

Figure 2-6. Kayak-based documentation of historical wooden vessel remains exposed on Green Jacket Shoal was conducted at periods of lower-low water during full-moon and new moon phases (source: aerial photograph by Glenn Anderson).

Figure 2-7. Project volunteers Peter Manning, measuring hull timber and overall hull length dimensions (upper images), and Tim Wasco, recovering a wood sample for species identification (lower image) from exposed vessel remains on Green Jacket Shoal (source: photographs by David Robinson, CML).

Figure 2-8. Limited geological sediment sampling consisting of biological coring and vibracoring was conducted in the Green Jacket Shoal marine archaeological study area in early May 2015 to assess the area's archaeological sensitivity and potential of the shoal to contain preserved elements of a formerly exposed submerged paleocultural landscape. URI-GSO CML graduate student, Brian Caccioppoli, monitors vibratory coring operations (left image); URI-GSO CML graduate students Casey Hearn and Brian Caccioppoli and URI-GSO professor and CML director, John King, taking a biological core (center image); John King labeling a recovered biological core (right image) (source: photographs by David Robinson, CML).

Figure 2-9. CML's lab manager, Danielle Cares, and project volunteer, Michael Robinson, splitting a core sample (upper image); core logging on CML's Geotek core logging machine (lower image) (source: photographs by David Robinson, CML).

Figure 3-1. Excerpt of the combined Providence/East Providence RI/MA USGS topographic quadrangles, 7.5 min series showing the location of the Green Jacket Shoal study area within Providence Harbor and relative to cities of Providence and East Providence, Omega and Central ponds, and the Moshassuck, Providence, Runnins, Seekonk, and Ten Mile rivers (source: after 2009).

Figure 3-2. Excerpt of the 2009 NOAA Chart #13224 – Providence River and Head of Narragansett Bay showing the Green Jacket Shoal study area (source: after NOAA 2009).

Figure 3-3. Map of the Providence River showing the study area's location relative to the surrounding communities and key features in the landscape referenced in the report (source: after Department of the Army 1982a).

Figure 3-4. Map depicting the study area's location relative to the reconstructed approximate positions of the Laurentide glacial ice margin (shown as a dark pink line) as it melted and retreated from between about 20,000 to 12,000 B.P. Based on these reconstructions, the study area would have been ice-free by about 16,000 B.P. Also depicted is the distribution of pro-glacial lakes throughout the region (the larger lakes are shown in black), including glacial Lake Narragansett (LN) (source: after Uchupi et al. 2001).

Figure 3-5. Submerged paleocultural landscapes where ancient Native American cultural deposits have been found preserved in the shallow waters off of the Rhode Island coast in Greenwich Bay (top image) and in Block Island Sound (bottom image) (source: photographs by David Robinson, CML).

Figure 3-6. Lithograph depicting extensive damages to shipping and buildings in Providence Harbor during the height of the Great September Gale of 1815. The storm, which struck on September 23, 1815, brought with it an 11 ft (3.4 m) storm surge into downtown Providence that left dozens of ships on the city's streets. At India Point, directly across the mouth of the Seekonk River from the study area, houses and wharves were destroyed. The Washington Bridge and the Central (Red) Bridge were also destroyed during the storm (source: David Robinson, CML [personal collection]).

Figure 3-7. Photograph showing some of the damage in Providence from the New England Hurricane of 1938 (September 21), which brought with it into the city a storm surge of 17.6-foot (5.4 m) (source: David Robinson, CML [personal collection]).

Figure 3-8. Excerpt from the 1865 U.S. Coast Survey Chart No. 8 – Port of Providence, Rhode Island – showing the location of the study area relative to the nearly unaltered natural channel and bathymetry within Providence Harbor and on what would later be known as "Green Jacket Shoal." According to King (1882), the shoal's name derives from its green color caused by an abundance of eel grass that once grew upon it, as noted on this chart. "Oyster Beds" are also noted near the bottom of the chart (source: after U.S. Coast Survey 1865).

Figure 3-9. Excerpt from the 1873 U.S. Coast Survey Chart – Narragansett Bay – showing the location of the study area. Surveying for the chart was done between 1864 and 1871. "Oyster Beds" are still noted on the east side of the channel and Bold Point remains essentially undeveloped (source: after U.S. Coast Survey 1873).

Figure 3-10. Excerpt from a 1936 Rhode Island State Planning Board map depicting a "Portion of the Town of Providence," including the "Great Salt River" (i.e., the Providence River) circa 1700. The modern (2014) shoreline (in green) projected onto the map shows that the shoreline in the study area (red line box) has remained essentially unchanged over the last 300 years, while the rest of the Providence Harbor shoreline has been altered and built-out significantly from its natural configuration (source: base-map depicting the circa 1700 shoreline is from Cady 1957:114).

Figure 3-11. U.S. Army Corps of Engineers plan from 1893 entitled "Proposed Work at Green Jacket Shoal, R.I. – Dredging." Plan is based on maps by N. W. Eayrs (1884) and W. C. Simmons (1891) and is the earliest-known depiction of a dry dock pier and marine railways at Bold Point. Areas dredged prior to 1892 are shown as cross-hatched; areas to be dredged are outlined with a solid line (map is shown tilted to maintain the north-south orientation of the study area on the page) (source: David Robinson, CML (personal collection).

Figure 3-12. Excerpt from the 1897 U.S. Coast and Geodetic Survey Chart No. 352 – Providence Harbor, Rhode Island – showing the location of the study area and the now-dredged and widened navigation channel into the harbor and deepened approaches to the dry dock pier and the Wilkesbarre Coal Co. pier. The chart also is the earliest of which "Green Jacket Shoal" is labeled (source: after USCGS 1897).

Figure 3-13. Excerpt from the 1901 U.S. Coast and Geodetic Survey Chart No. 352 – Providence Harbor, Rhode Island – showing the location of the study area and the expanded navigation channel and harbor turning basin created by the removal of significant material from the northern and western margins of Green Jacket Shoal (source: after USCGS 1901).

Figure 3-14. Excerpt from the 1915 U.S. Coast and Geodetic Survey Chart No. 352 – Providence Harbor, Rhode Island – showing the location of the study area and the now fully-expanded navigation channel limits out to its current "harbor lines" (source: after USCGS 1915).

Figure 3-15. Excerpt from the 1925 U.S. Coast and Geodetic Survey Chart No. 352 – Providence Harbor, Rhode Island – showing the location of the study area and the deepened area north of the

Wilkesbarre Coal Co. pier. Note the apparently resultant mounds of dredge spoil adjacent to and north of it, which remain present today (source: after USCGS 1925).

Figure 4-1. Transitional Archaic Period projectile point types (Orient Fishtail, Coburn, and Wayland Notched), and a steatite bowl recovered from Fort Hill in 1939 by Jess Welt. Fort Hill is located in East Providence at the southern end of Bold Point, just southeast of the Green Jacket Shoal study area. It is the closest of the previously-identified archaeological site in the area. A resident of East Providence, Welt and some of his family members had once been employed by the Providence Dry Dock and Marine Railway Company (source: after Fowler and Welt 1955).

Figure 4-2. Ticket for passage on Elijah Ormsbee's vessel, *Experiment*, one of the earliest boats to be driven by steam-power in the world. Experiment operated on the Seekonk River, traveling between Providence and Pawtucket for several weeks in 1792. The early steamer was a harbinger of the future direction of Providence's transportation system (source: Geake 2013:94).

Figure 4-3. Portrait of Tristam Burges (1770-1853) by Charles B. King. Burges was one of the first land-owners and settlers of Bold Point (previously called "Burges Point" while he was alive), who went on to become an early developer of the Watchemoket area, Chief Justice of Rhode Island, and a two-term U.S. congressman (source: Brown University Portrait Collection, 1857, http://library.brown.edu/cds/portraits/display.php?idno=207).

Figure 4-4. Excerpt from Henry F. Walling's (1850) Map of the Town of Seekonk showing early settlement of the Watchemoket area and "Burges Point" – the previous name of Bold Point. Tristam Burges was one of the earliest settlers and largest land-owners within the Watchemoket area (source: Boston Public Library, Norman B. Leventhal Map Center, http://ark.digitalcommonwealth.org/ark:/50959/79408311s).

Figure 4-5. Advertisement for the Providence Dry Dock and Marine Railway Company from the 1888 *Providence Directory and Rhode Island Business Directory* (upper image); and an 1898 photograph of the Providence River waterfront (south-looking view). The Providence Dry Dock and Marine Railway Company's floating dry dock and dry dock pier and the Wilkesbarre Coal Company pier are visible (circled) as the only significant harbor infrastructure on the harbor's east side (lower image) (source: Sampson, Murdock & Company 1888 [upper image]; Providence Public Library Rhode Island Collection [lower image]).

Figure 4-6. Rhode Island's first floating dry dock was established in East Providence at Bold Point in 1884 by the Providence Dry Dock and Marine Railway Company, and remained in operation until the business was dissolved in 1919 (35 years). The dry dock serviced vessels of all types, including the steamers *Bay Queen* and *Mount Hope*, the remains of which are in the Green Jacket Shoal study area. The upper image shows the dry dock slipped within the ends of the dry dock pier as viewed from the harbor, and the lower image shows it viewed from the dry dock pier (source: photograph by Jess Welt, William H. Ewen, Jr. Collection [upper image]; Providence Public Library Rhode Island Collection [lower image]).

Figure 4-7. Two views of the Providence Dry Dock and Marine Railway Company's shipyard at Bold Point near the beginning and end of the yard's 35-year operational history. The upper photograph is from 1890, just six years after the business was established. It provides a partial view of the marine railways, several buildings, and a "timber-pickling" pond in the foreground. The lower

image was taken by Archibald F. Ellis in 1910 after the company was in business for 26 years. The yard's infrastructure has been expanded with additional buildings and a rail spur visible on the property. Noteworthy are the absence of derelict vessels in the water or along shore in the 1890 image, and the presence of several derelict vessels in the 1910 image. This accumulation of derelict ships over the course of a 20-year period in the waters adjacent to the shipyard suggests a causal relationship between the vessel remains in the water today and the shipyard (source: Providence Public Library Rhode Island Collection [upper image]; Providence City Archives [lower image]).

Figure 4-8. Detailed depiction of the Providence Dry Dock and Marine Railway Company property in 1917. Note the unique "tuning-fork" shape of the dry dock pier and the shape of the floating dry dock slipped within the pier (source: Richards Standard Atlas 1917).

Figure 4-9. Construction plan and profile views of a "box" or "balanced" floating dry dock, similar to the Providence Dry Dock and Marine Railway Company's floating dry dock (source: Donnelly 1906).

Figure 4-10. Rhode Island Businessmen's Association's 1912 Providence-centered map typified the optimism that infected the local business community (source: Conley and Campbell 1982).

Figure 4-11. Map from 1910 showing the proposed removal of Bold Point and Green Jacket Shoal to create a basin at the mouth of the Seekonk River and the expansion of Providence Harbor's port facilities promoted by Grand Trunk Railroad president, Charles M. Hays (source: *Providence Journal* 1910).

Figure 4-12. Map from 1918 showing the proposed filling-in of Green Jacket Shoal (gray stippled area), the shifted location of the mouth of the Seekonk River (dark cross-hatched area), and the expansion of port facilities (dashed line) out to the eastern harbor line along the East Providence and Providence shorelines (source: *Providence Magazine* 1918).

Figure 4-13. During the first quarter of the twentieth century, the Wilkesbarre Coal Company pier was one of the largest piers used exclusively for the discharge of coal in the country with some 530 ships unloading upwards of a million tons of coal there in 1913 (source: *Providence Magazine* 1918 [upper image]; East Providence Historical Society archives [lower image]).

Figure 5-1. U.S. Army Corps of Engineers' 1932 plot of depth soundings, sediment types, and the locations of the remains of 24 derelict vessels and the Providence Dry Dock and Marine Railway Company's dry dock pier and wharf, as surveyed in 1931 and 1932 on Green Jacket Shoal. A comparison of this plot to vessel remains documented in the study area during this investigation indicates that 17 of them have been present since the 1931-32 survey, making these vessel remains a minimum of 84-85 years old (source: USACE 1932).

Figure 5-2. *Providence Journal* artist Frank W. Marshall's sketches of the "picturesque corners" of Bold Point and its "Harbor Graveyard" appeared in the newspaper in 1915. Marshall's description of the area as a 'harbor graveyard' and his detailed drawings of some of the vessels comprising it are the earliest published. Of particular interest are the different vessel types depicted, including three different kinds of scow-barges and a narrow-hulled sail- or steam-vessel, and Marshall's lament that the harbor graveyard is "threatened by port development plans" (source: Marshall 1915).

Figure 5-3. Green Jacket Shoal's submerged shipwrecks, exposed scow-barge hulks, and an area of general wreckage (circled here in red) were first depicted on navigational charts of Providence Harbor in 1932 (source: after USCGS 1932).

Figure 5-4. A 1982 Department of the Army cultural resources reconnaissance study assessed the Providence Dry Dock and Marine Railway Company site at Bold Point as having "special importance" as the sole survivor of Providence's wooden sailing ship-building industry with several structures identified on site (S-116, S-117, S-118 and S-119 highlighted in red) likely to have "particularly great historic and potential archaeological significance," making them worthy of archaeological investigation and National Register-eligibility evaluation. Derelict vessels were not included or considered as part of the overall research design of the 1982 reconnaissance investigation (source: after Department of the Army 1982:APPENDIX 7).

Figure 5-5. The shipwrecks in the Green Jacket Shoal study area provide important habitat for pioneer species of finfish, shellfish, birds and marine mammals returning to the Providence River as the water and habitat quality has improved (source: photographs by David Robinson, CML).

Figure 5-6. The presence of ship remains and shoreline infrastructure from the Providence Dry Dock and Marine Railway Company in the study area has not appeared to be a deterrent to the use and enjoyment of the Bold Point Park grounds and boat ramp by local and area residents (source: photographs by David Robinson, CML).

Figure 5-7. Different types of scow barges present in the study area – SW-2, a large modern (less than 50 years old) ocean-going barge (note curved end) (upper image) and an historical (more than 50 years old) inland waterway work-barge (SW-7) with centerline framing designed to help support weight on deck, rather than to carry bulk cargoes inside its hull (source: photographs by David Robinson, CML).

Figure 5-8. SW-12 is the remains of a large schooner-barge representing the last chapter in the history of America's merchant sailing vessel developmental chronology. The reduced sailing rig of a schooner-barge required a smaller crew and was less costly to operate. The rig was intended primarily for auxiliary purposes and could be used in the event of a break in the tow-line to the steam-tug that would have pulled a string of several schooner-barges joined together. Schooner-barges were employed in the bulk-cargo carrying trade and most-often carried stone, grain, lumber and coal. The after-half of SW-12's hull remains is full of rough-cut logs that may be unused pier piles that were discarded in the hulk (source: aerial photographs by Glenn Anderson; image of the schooner-barge underway from Morris 1984).

Figure 5-9. The well-preserved remains of the 1865 side-wheel steamer *Bay Queen* (SW-18) consist of the full-length of the entire bottom of its hull and a significant portion of the framing from its overhanging main deck (sources: A. base photograph by Glenn Anderson; B. William H. Ewen, Jr. Collection; C. photograph by David Robinson, CML).

Figure 5-10. The preserved remains of the 1888 side-wheel steamer *Mount Hope* (SW-16) are less extensive than those of *Bay Queen*. They consist of the nearly the full-length of the bottom of its hull with portions of the sides of the hull also preserved forward of amidships. However, except for the steamer's sides, most of the forward half of the hull is largely buried and was inaccessible for documentation. At lower-low tides, *Mount Hope*'s massive keelsons, iron-reinforced 'A'-frame

timbers, engine bed-timbers, framing and planking are all usually visible extending above the water's surface (sources: uppermost aerial photograph by Glenn Anderson; lower photographs by David Robinson, CML).

Figure 5-11. Plot of the locations of CML-identified and mapped submerged cultural resources, and the locations of CML's geological sampling completed in 2015. The identities and histories of just two of the 29 shipwrecks in the study area are presently known – those of the side-wheel steamers *Bay Queen* (SW-18) and *Mount Hope* (SW-16).

Figure 5-12. The Narragansett Bay excursion steamer, *Bay Queen* (1865-1902), had an operational lifespan of 37 years and was one of the most popular vessels on the bay during steam-boating's late 1800s heyday. *Bay Queen* was built in Brooklyn, New York in 1865 for the American Steamboat Company. It was sold at the end of its service life for conversion into a barge in 1901. In 1902, *Bay Queen* was stripped of its machinery and upper-works at the Providence Dry Dock and Marine Railway Company's dry dock pier at Bold Point. The planned conversion into a barge never proceeded, so *Bay Queen* was moved to the north side of the pier and abandoned (source: Providence Public Library Rhode Island Collection).

Figure 5-13. 1878 "Bird's Eye or Balloon View of Rock Point" with *Bay Queen* at the park's pier (source: Library of Congress Prints and Photographs Division, Washington, D.C., (http://loc.gov/pictures/resource/pga.08408/).

Figure 5-14. *Mount Hope* was built in the Chelsea, Massachusetts shipyard of Montgomery and Howard in 1888 and designed by master naval architect George Pierce. Pierce would go on to design a number of the Fall River Line's more famous Providence-to-New York "Night Boats" (sources: David Robinson, CML, personal collection; RI Historical Society - RHiX36992 (lower right image).

Figure 5-15. *Mount Hope* was Rhode Island's best-known and most heavily-traveled steamboat. It served on the Providence-to-Block Island Route (with stops at Newport) for 47 years. *Mount Hope*'s passenger capacity was 2,000 persons for transits within Narragansett Bay; 1,300-plus for transits out to Block Island. *Mount Hope* was taken out of service in 1934 and left to decay in Providence's upper harbor before it was eventually moved to the dry dock at Bold Point where it was stripped of its valuables and abandoned (sources: Cram 1984 [upper left image]; Providence Public Library, Rhode Island Collection; W. Warren Collection; and W. H. Ewen, Jr. Collection [all other images]).

Figure 5-16. The Narragansett Bay excursion steamer *Bay Queen* (SW-18) at the Providence Dry Dock and Marine Railway Company dry dock pier in the process of being cut-down prior to its abandonment on the north side of the pier. These photos confirm the practice of the shipyard dismantling vessels for their valuable hardware or lumber prior to their disposal in the shallow waters of Green Jacket Shoal close to the dry dock pier and the marine railways (sources: William H. Ewen, Jr. Collection [upper image]; RIHS RHiX38351 [lower image]).

Figure 5-17. The remains of the Providence Dry Dock and Marine Railway Company's dry dock pier consist of fragmentary decking framing pieces and nearly all of the partially preserved piles and pile dolphins whose distribution maintains the unique "tuning-fork-like" footprint of the dry dock pier (sources: A. photograph by David Robinson, CML; B. William H. Ewen, Jr. Collection; C. base aerial photograph by Glenn Anderson; and D. Richards Map Company 1917).

1.0 INTRODUCTION

1.1 Project Location and Description

This report presents the results of a Phase I(a) marine archaeological reconnaissance survey of an approximately 30-acre (ac) (12 hectare [hc]) submerged area centered on "Green Jacket Shoal" (GJS). The shoal is situated at the head of Narragansett Bay in Providence Harbor at the northeastern corner of the tidal Providence River, adjacent to and west of East Providence's Bold Point Park, within the city boundaries of Providence and East Providence, Rhode Island (Figure 1-1). This investigation was conducted by the Coastal Mapping Laboratory (CML) at the University of Rhode Island's Graduate School of Oceanography (URI-GSO). CML performed the study with funding from Rhode Island Sea Grant (RISG), in support of RISG's mission to enhance the understanding and management of Rhode Island's coastal and marine ecosystems. RISG is working with the Rhode Island-based non-profit organization, Clean the Bay, Inc. (Clean Bays), to remove industrial marine debris that has accumulated in the upper bay, including on and around Green Jacket Shoal. This debris consists of shoreline industrial flotsam, as well as derelict pier piling stubs and abandoned wooden vessel remains that have long been considered "eyesores" and hazards to boating traffic, as well as hindrances to the City of East Providence's plans for developing and improving the aesthetics of their waterfront, and expanding its use and enjoyment by local residents and the general public (Department of the Army 1982a; Prosnitz 1975, 1976; *Providence Journal* 1933, 1956, 1965, 1973, 1975, 1976; Robadue, Jr. 1983; Schumacher 1975). The overall goals of the Green Jacket Shoal Phase I(a) marine archaeological reconnaissance survey were to: 1) locate and identify previously recorded or known significant archaeological resources within the proposed debris removal project area; 2) assess the overall archaeological sensitivity of the study area and its potential for containing additional submerged cultural sites, including ancient Native American and Euro-American archaeological deposits dating from the pre- and post-contact period; and 3) provide management recommendations regarding the need, or absence thereof, for any additional phase or phases of marine archaeological investigation.

1.2 Project Inception and Jurisdictional Considerations

Marine debris removal from the Providence River and Harbor and the Seekonk River has been a topic of federal study since 1966 (Department of the Army, New England District, Corps of Engineers [Department of the Army] 1982a:7). The Department of the Army published a major study in 1982 to assess the engineering feasibility and economic justification for federal participation in a one-time cleanup program to rid the Providence Harbor Area of its sources of floatable debris, including dilapidated shorefront structures and derelict (wrecked) vessels, loose onshore debris and halt debris emanating from shorefront dumps (Department of the Army 1982a:1). Debris removal was also listed as a priority action item in the Providence Harbor Special Area Management Plan (Providence Harbor SAMP) that was adopted by the Rhode Island Coastal Resource Management Council (CRMC) in 1983 (Robadue, Jr. 1983). Abandonment of vessels, piers, wharves or other related structures is prohibited within Rhode Island waters. At the time of the Providence Harbor SAMP's publication in 1983, approximately 27,000 cubic yards (yd^3) (20643 cubic meters [m^3]) of shoreline debris was estimated to litter the Providence River.

Subsequent to the Department of the Army's and Providence Harbor SAMP's respective 1982 and 1983 publications, the Abandoned Shipwreck Act of 1987 (ASA 1987) was passed into federal law in 1988 (Pub. L. 100-298; 43 U.S.C. §§ 2101-2106) as a means of protecting historic shipwrecks

from damages and destruction caused by treasure-hunters and salvors. The law established government ownership over a majority of abandoned shipwrecks located in United States waters within 3 mi (5 km) of the United States coastline and in the internal navigable waters of the United States, and it created a framework for their management. The ASA 1987 affirmed the authority of state governments to claim and manage abandoned shipwrecks on state submerged lands, and made the laws of salvage and finds non-applicable to any shipwreck covered under the act. The law also asserted that shipwrecks are multiple-user resources. The law provides that any wreck that lies embedded in a state's submerged lands is property of that state and subject to that state's jurisdiction, if the wreck is determined to be abandoned. Abandoned shipwrecks include those that are embedded in a state's submerged lands, in coralline formations protected by a state, and those that are on state submerged lands and included in or determined eligible for inclusion in the National Register of Historic Places (NRHP) (National Park Service [NPS], U.S. Department of the Interior [USDOI], 2015).

The State of Rhode Island is the owner of shipwrecks and associated materials and artifacts lying on or within the submerged bottoms under state jurisdiction (Rhode Island Antiquities Act, R.I.G.L. 42-45.1, and the Abandoned Shipwreck Act, P.L. 100-298). Exceptions to state ownership may be: 1) vessels wrecked after the passage of the Rivers and Harbors Act of 1899 – for these wrecks the United States Coast Guard and the United States Army Corps of Engineers (USACE) should be contacted to determine ownership; 2) a shipwreck that may be entitled to U.S. sovereignty – for these shipwrecks, the Office of the Judge Advocate General, United States Department of Navy, and the General Services Administration should be contacted to determine ownership; 3) a shipwreck representing a foreign flag warship or other foreign flag vessel entitled to sovereign immunity – for these shipwrecks, the Bureau of Oceans and International Environmental and Scientific Affairs and the United States Department of State should be contacted. A state permit is required for any project that involves the disturbance of sediment or the removal or displacement of cultural materials, whether or not the state is determined to be the owner of the cultural materials (RIHPHC 2013). All of the Green Jacket Shoal study area is located within Rhode Island state waters, outside of the boundaries or "harbor line" demarcating the federal navigation channel within the port of Providence.

While the study area is located in Rhode Island state waters, "the limits of federal authority extends to the entire 'bed' of the stream, which includes the lands below the ordinary high water mark" (as per the court's decision in United States v. Chicago, Milwaukee, St. Paul & Pacific Railroad Co., 312 U.S. 592 [Department of the Army 1982a:APPENDIX 8:8]). The U.S. Army Corps of Engineers (USACE) is the primary federal agency with jurisdiction over sources of debris (e.g., dilapidated waterfront structures, abandoned vessels, and dumping and disposal operations in the Providence and Seekonk Rivers and Providence Harbor). Under the Rivers and Harbors Appropriation Act of 1899, the USACE has jurisdiction over:

> *…any obstruction to the navigable capacity of any of the waters of the United States, any structure extending into, onto or over the navigable waters, and also over the discharge or deposit into navigable waters of any refuse matter other than that floating in a liquid state from streets and sewers (Department of the Army 1982a: APPENDIX 8:1)*.

Since its creation through legislative action by the Rhode Island General Assembly in 1971, the Rhode Island Coastal Resource Management Council (CRMC) has been charged with explicit powers and duties, and is the primary regulatory authority at the state level for the management of

resources within Rhode Island's coastal region. This region of CRMC's authority generally extends from three miles (mi) (5 kilometers [km]) offshore to 200 feet (ft) (60 meters [m]) inland from any coastal feature (R.I.G.L. 46-23, § 46-23-6 (2)(B)(iii)).

The eastern side of Providence Harbor, including Green Jacket Shoal and the adjacent western shoreline of Bold Point, were selected by RISG and Clean Bays as a "pilot" location for focusing their initial efforts of the proposed debris removal project, and for the testing of the "Aqualogger" debris removal technology Clean Bays plans to use for the clean-up effort. The pilot area represents a small portion of a larger (14 mi- [22.5 km-] long) overall project area extending along the East Providence shoreline from Bullock's Point to Pawtucket for which Clean Bays has received initial permitting from the CRMC to remove debris. Clean Bays recently received federal funding to perform the larger project through a $194,800 grant from the National Oceanic and Atmospheric Administration's (NOAA) Marine Debris Program.

Early in the planning process of the debris removal pilot project, RISG also provided funding for a high-resolution side-scan sonar survey of the pilot area. This survey was completed in August 2013 by URI-GSO Professor of Oceanography and CML Director, John King, Ph.D., and CML Marine Research Assistant and geophysical survey specialist, Monique LaFrance Bartley, M.S. Survey data acquired by the CML researchers on Green Jacket Shoal recorded approximately six different areas of debris, several of which were clearly identifiable as the remains of different types of wooden vessels (Figure 1-2). The concentration of submerged vessel and pier remains was found to be so dense during the side-scan sonar survey that access to portions of the Green Jacket Shoal for survey was impeded. Complicating the situation further were the extremely shallow water depths over the shoal at low tide, the opaqueness of the water, and several piles of rock presumed to be dredge spoil encountered along the survey area's southeastern boundary. These submerged obstacles and conditions made navigating the shoal during survey operations extremely difficult and resulted in incomplete coverage of the shoal.

Unfunded aerial photography analysis and historical map research working with publically-available online sources was also initiated at this time by this report's author, CML Marine Archaeologist, David Robinson. As a result of CML's side-scan sonar survey and preliminary background research, the remains of an historical floating dry dock pier and 17 wooden vessels, several of which were clearly not barges, were identified.

The results of the side-scan sonar survey, as well as the preliminary aerial photography and historical map analyses, were provided to RISG Director and URI Professor, Dennis Nixon, RISG Assistant Director, Alan Desbonnet, and Clean Bays Executive Director, Kent Dresser. Nixon and Desbonnet met with Robinson in October 2013 to discuss the results of CML's preliminary investigation and the possible need for a marine archaeological assessment of the Green Jacket Shoal area to address RISG's and Clean Bay's concerns that potentially historically significant submerged maritime heritage resources worthy of consideration for preservation could be present among the debris targeted for removal. During this meeting, Nixon related a story to Robinson that he had heard that the iconic Rhode Island sidewheel passenger steamboat, *Mount Hope*, was lost on the shoal in the Great New England Hurricane of 1938 and that its remains could be among the shipwrecks identified by CML in the debris removal project pilot area. Consequently, confirming this story and determining which of the shipwrecks could be *Mount Hope* were seen as priorities of any future RISG-funded marine archaeological research at Green Jacket Shoal. A RISG Senior Advisory Council (RISG-SAC) meeting held on June 27, 2014 resulted in "strong support" for

conducting a marine archaeological assessment of the debris removal pilot area (Nixon to Robinson, personal communication, June 27, 2014).

On August 5, 2014, Nixon, Dresser and Robinson met at RISG to discuss technical details about the debris removal project and define the limits of a possible marine archaeological assessment study area. At this meeting Robinson advised RISG and Clean Harbors to engage in early consultation with the Rhode Island State Historic Preservation Office (RI-SHPO), which operates out of the offices of the Rhode Island Historical Preservation & Heritage Commission (RIHPHC), in order to solicit RIHPHC's comments on the debris removal project and any concerns they may have regarding known historic resources within the Green Jacket Shoal debris removal area, as well as to obtain guidance regarding recommended next steps for the project relative to historic preservation law compliance (e.g., Section 106 of the National Historic Preservation Act [NHPA] of 1966, as amended [Public Law 89-665; 16 U.S.C. 470 et seq.]). Robinson also advised RISG and Clean Bays that because of the involvement of federal funding from NOAA for the planned larger debris removal project, the debris removal project, including the removal of debris from Green Jacket Shoal, likely constituted a federal "undertaking" for which NOAA's compliance with the NHPA would be required. Likewise, because the planned debris removal work will take place in a navigable waterway (Providence Harbor) where the Department of the Army, acting through the U.S. Army Corps of Engineers (USACE), has authority to permit such work under Sections 9 and 10 of the Rivers and Harbors Act of 1899, it would also constitute a federal undertaking under Section 106.

The NHPA became law in response to the destruction of older buildings and neighborhoods in the years immediately following World War II. The NHPA is demonstrative of the federal government's commitment to preserving national heritage resources through the consideration of the value of heritage properties or resources of federal, state, local and international significance. Section 106 of the NHPA requires federal agencies to consider the effects of their proposed federal, federally-permitted or federally-funded undertakings under their jurisdiction on historic properties in any state, including the state's submerged lands and waters as determined by the Submerged Lands Act of 1953 (SLA) (Varmer 2014). Additionally, under Section 106, federal agencies must provide the Advisory Council on Historic Preservation (ACHP) an opportunity to comment on such projects prior to the agency's decision on them.

Section 106 review encourages, but does not mandate, preservation. Sometimes there is no way for a needed project to proceed without harming historic properties. Because of Section 106, federal agencies must assume responsibility for the consequences of the projects they carry out, approve, or fund on historic properties and be publically accountable for their decisions. Regulations issued by the ACHP spell out the Section 106 review process, specifying actions federal agencies must take to meet their legal obligations (Figure 1-3). The regulations are published in the Code of Federal Regulations (CFR) at 36 CFR Part 800, "Protection of Historic Properties."

Federal agencies are responsible for initiating Section 106 review, most of which takes place between the agency, the state and Tribal organization officials. Appointed by governors, the SHPO (i.e., the RIHPHC in Rhode Island) coordinates the state's historic preservation program and consults with agencies during Section 106 review. Agencies also consult with officials of federally-recognized Indian Tribes when projects have the potential to affect historic properties on Tribal lands or historic properties of significance to such Tribes on Tribal lands. Some Tribes, such as Rhode Island's only federally-recognized Tribe, the Narragansett Indian Tribe (NIT), have officially-

designated Tribal Historic Preservation Officers (THPOs). In the case of the NIT, their THPO is within the Narragansett Indian Tribal Historic Preservation Office (NITHPO), based in Charlestown, Rhode Island. At the time of the preparation of this report, it remained unclear as to when or if the Section 106 review process was going to be initiated by NOAA as a result of their federal funding of the debris removal project.

RISG issued a Request for Proposals (RFP) for a marine archaeological assessment of the debris removal project pilot area late in 2014. Robinson submitted a successful proposal and CML was awarded a grant from RISG in November 2014 to complete the preliminary marine archaeological assessment.

An informational meeting to discuss the debris removal project and CML's planned marine archaeological assessment was held at RIHPHC on October 8, 2014. Nixon, Dresser and Robinson made presentations to RIHPHC Principal Archaeologist, Timothy Ives, and RIHPHC Senior Archaeologist, Charlotte Taylor. Ives and Taylor indicated their general support of the debris removal effort and for the preliminary archaeological assessment of the project area. They offered their office's assistance in assessing the history and potential significance of the submerged resources on Green Jacket Shoal, and invited Robinson to review the maps, cultural resource management reports, archaeological site-file records and other information sources in their archives. Taylor advised that the type or phase of cultural resource management study that would be most appropriate for the project was a preliminary Phase I(a) reconnaissance marine archaeological survey, and that while a formal permit to conduct the essentially non-disturbance assessment would not be required, the study should be carried out in conformance with the RIHPHC's *Performance Standards and Guidelines for Archaeology in Rhode Island* (2013). Taylor also noted during the meeting that while historical barge wrecks were generally of little interest to RIHPHC, the remains of other types of historical vessels that may be present on Green Jacket Shoal would be of interest to them and other stakeholders in the area.

The different phases of archaeological investigation (Phase I identification survey, Phase II site evaluation, and Phase III data recovery) reflect preservation-planning standards for the identification, evaluation, registration, and treatment of archaeological resources (National Park Service [NPS] 1983). An essential component of this planning structure is the identification of historic properties (i.e., in the case of an archaeological investigation – archaeological and traditional cultural properties) that are eligible for inclusion in the National Register of Historic Places (National Register), the official federal list of properties that have been studied and found worthy of preservation. Archaeological properties can be a district, site, building, structure, or object, but are most often sites and districts (Little et al. 2000).

Traditional cultural properties are defined generally as ones that are eligible for inclusion in the National Register, because of their association with cultural practices or beliefs of a living community that: a) are rooted in that community's history; and b) are important in maintaining the continuing cultural identity (Parker and King 1998). The results of professional surveys and consultation with Native American or other ethnic communities are used to make recommendations about the significance and eligibility of archaeological and traditional cultural properties.

An archaeological property may be pre-contact, post-contact, or contain components from both periods. Pre-contact (or what is often termed "prehistoric") archaeology focuses on the remains of

indigenous American societies as they existed before substantial contact with Europeans and resulting written records (Little et al. 2000). In accordance with the NPS guidelines, the term "pre-contact" instead of "prehistoric" is used, unless directly quoting materials that use the term "prehistoric." The date of contact varies across the country and in the New England region. There is no single year that marks the transition from pre-contact to post-contact. Post-contact (or what is often termed "historical") archaeology is the archaeology of sites and structures dating from time periods since significant contact between Native Americans and Europeans. Documentary records, as well as oral traditions, can be used to better understand these properties and their inhabitants (Little et al. 2000). Again, for reasons of consistency with the NPS guidelines, the term "post-contact," instead of "historical," is used when referring to archaeological sites, unless directly quoting materials that use the term "historical."

The NPS has established four criteria for listing significant properties in the National Register (36 CFR 60). The criteria are broadly defined to include the wide range of properties that are significant in American history, architecture, archaeology, engineering, and culture. The quality of significance may be present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association. The criteria allow for the listing of properties:

A. that are associated with events that have made a significant contribution to the broad patterns of our history; or

B. that are associated with the lives of persons significant in our past; or

C. 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 values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

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

Archaeological and traditional cultural properties can be determined eligible for listing in the National Register under one or any combination of all four criteria (Little et al. 2000; Parker and King 1998). Significance under any of these criteria is determined by the kind of data contained in the property, the relative importance of research topics that could be addressed by the data, whether these data are unique or redundant, and the current state of knowledge relating to the research topic(s). A defensible argument must establish that a property "has important legitimate associations and/or information value based upon existing knowledge and interpretations that have been made, evaluated, and accepted" (McManamon 1990:15). Generally, the minimum age for National Register eligibility is 50 years, although there have been rare occasions when sites less than 50 years old have been listed.

These criteria are applied in relation to the historic contexts of the resources. A historic context is defined as follows:

> *A historic context is a body of thematically, geographically, and temporally linked information. For an archaeological property, the historic context is the analytical framework within which*

> *the property's importance can be understood and to which an archaeological study is likely to contribute important information (Little et al. 2000).*

For traditional cultural properties, a historic context is further defined as follows:

> *A historic context is an organization of available information about, among other things, the cultural history of the area to be investigated, that identifies "the broad patterns of development in an area that may be represented by historic properties" (48 FR 44717). The traditions and lifeways of a planning area may represent such "broad patterns," so information about them should be used as a basis for historic context development. Based on federal standards and guidelines, groups that may ascribe traditional cultural values to an area's historic properties should be contacted and asked to assist in organizing information on the area (Parker and King 1998).*

The formulation of historic contexts is a logical first step in the design of an archaeological investigation and is crucial to the evaluation of archaeological and traditional cultural properties in the absence of a comprehensive survey of a region (NPS 1983:9). Historic contexts provide an organizational framework that combines information about related historic properties based on a theme, geographic limits, and chronological periods. A historic context should identify gaps in data and knowledge to help determine what significant information may be obtained from the resource. Each historic context is related to the developmental history of an area, region, or theme (e.g., agriculture, transportation, waterpower), and identifies the significant patterns of which a particular resource may be an element. Only those contexts important to understanding and justifying the significance of the property must be discussed.

Historic contexts are developed by:

- identifying the concept, time period, and geographic limits for the context;
- collecting and assessing existing information within these limits;
- identifying locational patterns and current conditions of the associated property types;
- synthesizing the information in a written narrative; and
- identifying information needs.

"Property types" are groupings of individual sites or properties based on common physical and associative characteristics. They serve to link the concepts presented in the historic contexts with properties illustrating those ideas (NPS 1983; 48 FR 44719).

The following research contexts have been developed to organize the data relating to the pre- and post-contact period cultural sites identified within the Green Jacket Shoal study area:

- pre-contact and contact period land use and settlement patterns in the Providence and Seekonk river drainages, circa (ca.) 12,500 to 450 years before present (B.P.); and

- post-contact period land use and settlement patterns of East Providence and Providence ca. A.D. 1650 to present.

The research design and objectives of this study are presented in Chapter 2. Environmental and cultural contexts, along with expected property types and locational patterns, are discussed in detail in Chapters 3 and 4. Results from the background research and field survey conducted for this study are included in Chapter 5. The potential research value of the known and expected archaeological resources identified within the Green Jacket Shoal study area is evaluated in terms of the historical contexts, and this evaluation, along with management recommendations, is presented in Chapter 6.

1.3 Project Personnel

URI-GSO CML Marine Archaeologist, David Robinson, served as the Principal Investigator for the study, and was responsible for the supervision and performance of all aspects of the investigation and preparation of project deliverables. Robinson's professional qualifications meet standards established for professional archaeologists by the National Park Service (36 CFR Part 66, Appendix C). He has 25 years of professional supervisory and applied marine archaeological experience conducting similar types of submerged cultural resource management investigations in Rhode Island and elsewhere throughout the Northeast. RISG funded the study. RISG's Director, Dennis Nixon, and Assistant Director, Alan Desbonnet, provided their guidance and feedback throughout the investigation. Robinson was assisted in completing the study's research tasks by the following individuals: URI Professor of Oceanography and CML's Director, John King and CML staff Monique LaFrance Bartley, Danielle Cares, Michael Dalton, Carol Gibson, and Clifford Heil; URI-GSO graduate students Brian Caccioppoli, Casey Hearn, and Cameron Morissette; project volunteers Jack Albert, Glenn Anderson, William Ewen, Jr., Peter Manning, Michael Robinson, Noah Robinson, and Timothy Wasco; and the archaeologists, archivists, historians and reference librarians at the East Providence Historical Society, East Providence – Weaver Memorial Public Library, the Providence City Archives, the Providence Public Library's Rhode Island Collection, the RIHPHC, the Rhode Island Historical Society (RIHS), and the URI Robert L. Carothers Main Campus and Pell Marine Science libraries.

1.4 Disposition of Project Materials

All project-related materials are currently being stored at the CML. CML serves as a temporary curation facility until all project materials are transferred to RISG for permanent curation.

2.0 RESEARCH DESIGN AND METHODOLOGY

The overall goal of the Green Jacket Shoal preliminary Phase I(a) marine archaeological reconnaissance survey was to locate and identify previously recorded or known significant archaeological resources located within the proposed debris removal project area, and to assess the overall archaeological sensitivity of the Green Jacket Shoal study area and its potential for containing intact pre-contact period submerged archaeological sites. To accomplish these objectives, two research strategies were used:

- archival research, including a review of existing cultural resource management reports, literature, historical newspapers, photographs and maps, low-altitude aerial photographs provided by a project volunteer, and information from local informants, as well as;

- field investigations consisting of archaeological diver inspections and preliminary documentation of select vessels, kayak-based inspection of vessels accessible for preliminary inspection and documentation at times of lower low-tide, and sediment sampling via vibracoring.

The archival research and field survey provided the information needed to develop environmental and historical contexts and assess the archaeological sensitivity of the study area. Archaeological sensitivity is defined as the likelihood for cultural resources to be present and is based on various categories of information:

- locational, functional, and temporal characteristics of previously- and newly-identified cultural resources in the project area or vicinity; and

- local and regional environmental data reviewed in conjunction with existing project-area conditions documented during the walkover survey, and archival research about the project area's land-use history and degree of disturbance.

This report section describes the methods used during each of the archival research and field activities.

2.1 Background Research

Historic background research on regional and local geology, geography, ecology, sediments, land-use patterns, and histories of maritime and land-based human activity (including pre-contact and post-contact periods) was performed in the collections and archives at the East Providence – Weaver Memorial Public Library, the Providence City Archives, the Providence Public Library's Rhode Island Collection, the Rhode Island Historical Society Research Library, and URI's CML, Robert L. Carothers Main Campus and Pell Marine Research libraries. The cultural resource site files, site maps, and management reports held at the RIHPHC were also consulted to identify the locations of recorded cultural sites and the survey boundaries of previous archaeological investigations, as well as to review their holdings of historic maps, charts and atlases, and local histories. A review of National Register files archived at the RIHPHC, including (but not limited to) those sites that are listed, potentially eligible for listing, and determined eligible for listing in the National and State Registers of Historic Places was also completed. Research was conducted, as

well, in the archives of local informant, William Ewen, Jr., of Providence, and in this report author's personal research library. Informal interviews with local informants were also conducted to obtain information that assisted in the identification and histories of several of the sunken vessels located within the study area.

2.2 Field Survey

Field survey was initiated with a series of onshore reconnaissance site visits that were performed after snow-melt at periods of low-water in March and April of 2015. The purpose of these initial site visits was to assess conditions at the site, to record photographs of exposed cultural resources, and to obtain GPS locations of vessel remains located in the intertidal zone that were accessible from shore. Robinson was joined during one of these site visits by local informant and steamboat historian, William Ewen, Jr., a Providence resident who provided an orientation to the site based on his extensive knowledge of its history and that of two of the vessels whose remains he knew were there – the steamers *Bay Queen* and *Mount Hope* (Figure 2-1). Jack Albert, a high school senior at Prout Memorial High School in South Kingstown, was also present on this particular site visit with Ewen and assisted with the documentation of one of the intertidal ship remains as part of his community service graduation requirement (see Figure 2-1). Another local project volunteer, Glenn Anderson, participated in these site visits and began to obtain low-altitude, high-definition photographs and video imagery of the site using his quad-copter, which he then shared with Robinson and the CML (Figure 2-2). These initial site visits were followed by additional field investigations that included archaeological diving and kayak-based documentation of the site's submerged cultural resources and geological sediment sampling (i.e., biological [surface] coring and vibracoring). Geophysical survey with a swept-frequency CHIRP sub-bottom profiler that was planned as part of the field survey program was eliminated from the research plan after coring indicated the sediments on the shoal would either be too shallow, too gassy, or too hard to obtain useable data. An additional reason for not performing the sub-bottom profiling survey was concern for the safety and well-being of marine mammals that we now know inhabit the study area as a result of an unexpected encounter we had with a seal in August of 2015 during a kayak-based site visit. The seal, which was observed to be hauled-out and sunning itself on the remains of the steamboat *Mount Hope*, left its perch to swim out to and investigate us before returning to its previous position hauled-out on the wreck (Figure 2-3).

2.2.1 Archaeological Diving

Non-disturbance archaeological diving was conducted within the Green Jacket Shoal study area on May 2, May 6 and May 7, 2015. The initial dive on May 2 was a brief reconnaissance made from shore out to the shallow remains of the steamer *Bay Queen* as a recreational (un-authorized by URI) dive by Robinson and project-volunteer Peter Manning. The dual-purpose of the dive was to complete an in-water assessment of site conditions that would inform preparation for authorized project diving operations, while also video-documenting the submerged remains of *Bay Queen*. Authorized project diving operations were conducted by Robinson on May 6 and 7 with the assistance of CML staff and URI graduate and undergraduate students. A Dive Operations & Accident Management Plan was submitted to and approved by URI's Diving Safety Officer (DSO) and Diving Safety Control Board (DCSB) prior to the initiation of the authorized diving activities. Diving operations were performed from CML's 28-ft (9-m) pontoon boat by Robinson, who served as Lead Diver. Robinson was equipped with an OTS Guardian full-face mask to minimize contact with Providence Harbor's urban waters, and every effort was made during the dives to minimize

contact with the harbor's potentially contaminated bottom sediments. The full-face mask was fitted with an integrated hard-wired communications strength-member (i.e., a "comm line") that was tended from the surface by CML's Brian Caccioppoli to provide an added measure of safety for the diver by maintaining both voice and physical contact between him and the dive platform at the surface. The communications link between diver and surface personnel also facilitated the recording of the observations made and measurements taken underwater by the diver. A fully dressed-in safety diver (project volunteer and URI scientific diver, Michael Robinson) remained on standby throughout the diving operations (Figure 2-4). Data recorded during the dives included underwater high-definition video and written descriptions of diver observations and select representative timber measurements.

More extensive diving operations had been planned, but were limited by a brief window of safe and workable diving conditions within Providence Harbor in 2015. An exceptionally cold and snowy winter-spring kept water temperatures prohibitively cold and produced a higher volume and longer duration than normal of post-thaw snow-melt run-off that adversely affected underwater visibility and water quality during most of the early spring. These conditions were followed almost immediately thereafter by unusually warm air temperatures in mid-May that produced a concomitantly rapid rise in water temperatures. These warmer water temperatures, in turn, led to a rapid increase in the density of bacteria and microorganisms living in the water column, which visibly reduced water quality and underwater visibility from the approximately 15 ft (5 m) that was experienced on May 2 to about 1.5 ft (0.5 m) that was observed on May 7 (Figure 2-5). The combination of very low underwater visibility that made underwater filming impossible and health concerns for the diver because of diminished water quality led to a suspension in diving operations after the May 7 dives and a transition to a kayak-based documentation methodology.

2.2.2 Kayak-Based Documentation

Kayak-based documentation of the submerged cultural resources within the Green Jacket Shoal study area was initiated in late May 2015, following the cessation of diving operations, and continued throughout the duration of the year-long field program (Figure 2-6). This mode of documentation was limited, however, to just a few hours at a time during the several days of each month that coincided with times of lower-low tides during new moon and full-moon periods. At these times, the upper portions of a significant percentage of the otherwise submerged vessel remains were temporarily exposed above the surface of the water and available for photo- and video documentation, as well as the recording of hull and select timber dimensions and their GPS locations (Figure 2-7). For vessel remains that were never exposed even at lower-low water, the shallower water meant they were at least more accessible to probing from the surface. Using a telescoping, blunt-ended fiberglass painter's pole, the ends of the submerged vessel remains were located and their GPS positions recorded. When visibility and light conditions allowed, these sub-tidal ship remains were video-documented to the extent possible by extending the underwater camera into the water below the kayak from a short pole. Much of the kayak-based documentation was guided by the low-altitude images that were recorded by project volunteer Anderson earlier in 2015. These images, along with historical aerial ortho-photographs, historical charts and maps, and the field-recorded GPS locations and dimensions of the study area's documented submerged cultural resources, were then imported into ESRI's ArcGIS (ArcInfo license level) geospatial analysis computer software, and georeferenced to modern charts, topographic quadrangles, and orthophographs to create maps of the site and its cultural resources.

2.2.3 Geological Sediment Sampling (Biological [Surface] Coring and Vibracoring)

Limited geological sediment sampling consisting of two biological (surface) cores and two Rossfelder vibracores (only one of which was recoverable) was conducted in May of 2015 as part of the field survey to assess the potential for elements of the now submerged, but formerly subaerial, paleocultural landscape with ancient Native American archaeological sensitivity to be preserved within the study area (Figure 2-8). This potential, as well as the geological conditions on the shoal and the degree to which the shoal's naturally deposited sediments have been disturbed, were assessed while the cores were being acquired and by examining their contents.

Following their recovery, the geological sediment samples were transported to the CML and split in half along their long axis using a custom-built core-splitter (Figure 2-9). One-half of the split core was saved as an archive half-core, while the other half was designated as the working-half and was used to log down-core physical properties, and for subsequent sampling for detailed paleoenvironmental analysis and radiometric dating, as warranted based on the core's contents. The URI Geotek automated core logger (see Figure 2-9) was used to obtain continuous high-resolution digital images of the cores and to measure at a 1-inch (in) (2-centimeter [cm]) resolution, the down-core physical properties, wet bulk density and magnetic susceptibility of the sediments. These parameters often reflect changes in lithology that in turn reflect paleoenviromental changes. Following their Geotek logging, each of the cores was visually examined by King and Robinson for evidence of archaeologically sensitive paleosols and descriptions of the contents of each core were prepared. Correlation of the geological sediment sampling results with the sub-bottom profiler survey results was originally planned as part of this study's research design; however, as noted above, acquisition of sub-bottom profiler data was eliminated from the field program for several reasons.

3.0 ENVIRONMENTAL CONTEXT

Environmental settings, conditions, and natural resources are important factors to consider when assessing the potential for archaeological deposits to be present within a research area. In the case of the Green Jacket Shoal study area, such deposits could include submerged and intertidal early pre-contact and contact period Native American settlements, watercraft and fishing gear inundated by eustatic or glacially-related sea level rise, as well as submerged and intertidal post-contact period shipwrecks and shoreline infrastructure. As Renfrew (1976) states, "because archaeology recovers almost all of its basic data by excavation, every archaeological problem starts as a problem in geoarchaeology." The complexity and variability of geological processes make every region or site unique, and sediments comprising the harbor floor of Green Jacket Shoal are no exception. Understanding the evolving and dynamic submerged geomorphic landscape within the study area, all of which was once exposed land available for human habitation prior to its subsequent inundation, and the area's development into a focus of waterborne human activity and commerce is essential for assessing its archaeological sensitivity and interpreting the field survey data acquired within it.

3.1 Geographic Setting

Rhode Island, the "Ocean State," possesses 418 mi (673 km) of coastline, representing nearly a third of its 1,500 square miles (mi^2) (2414 square kilometers [km^2]). Providence, the State's capital city and major population center, lies approximately 50 mi (80 km) south-southwest of Boston, Massachusetts, and approximately 180 mi (290 km) northeast of New York City, New York. Situated between the cities of Providence and East Providence, Green Jacket Shoals is part of Narragansett Bay, a large tidal estuary, and the predominant water body in the state. As a 28 mi- (45 km) long-x-3 to 12 mi- (5 to19 km-) wide all-water highway to the Atlantic Ocean that essentially bisects the state into western and eastern halves, the Bay has played a central role in Rhode Island's development, history and culture (Department of the Army 1982a). Physiographically, this region is part of the New England Seaboard Lowland zone, which separates New England Uplands and the inundated seabed of the Coastal Plain. As a portion of the Seaboard Lowland physiographic section, elevations around the Providence and Seekonk rivers are generally low – less than 200 ft (61 m) above mean sea level. The highest elevation in proximity to the Green Jacket Shoal study area is East Providence's 75 ft- (23 m-) high Fort Hill, situated approximately 1,300 ft (400 m) southeast of the study area.

The Green Jacket Shoal study area is located within Providence Harbor, at the head of Narragansett Bay in the northeastern corner of the Providence River, adjacent to and contiguous with Bold Point's western shoreline (see Figure 1-1). Green Jacket Shoal and Bold Point are situated at and just outside of the southern corner of the mouth of the Seekonk River. The Seekonk and Providence rivers and the study area lie on the Providence/East Providence RI/MA U.S. Geodetic Service (USGS) topographic quadrangles, 7.5 min series and on NOAA Chart # 13224 – Providence River and the Head of Narragansett Bay, and are included within the Narragansett Bay drainage system (Figures 3-1 and 3-2).

The Providence River drains into the head of Narragansett Bay between Nyatt Point and Conimicut Point approximately 8.5 mi (14 km) south of Providence. The main portion of Providence Harbor extends two-and-one-half to three mi (4 to 5 km) south of its head at Fox and India Points and

constitutes a modern commercial harbor serving the cities of Providence and East Providence. All land and shore facilities servicing the Port of Providence are located within this section of the Providence River (Figure 3-3). The Port of Providence is one of the busiest ports in America's northeast, and one of only two deep-water (40 ft [12 m] at mean low water) ports in New England with on-dock railways, multiple rail spurs, and open and enclosed cargo storage spaces. Most of the present waterfront development around the harbor consists of oil storage and processing, as well as bulk freight loading and transportation, a large metal scrap yard, and other related industrial businesses.

The Seekonk River, located in the northeast corner of Rhode Island, is a tributary of the Providence River. Tributaries to the Seekonk are the Blackstone River, of which the Seekonk is the tidal portion, and the Ten Mile River. These two rivers are the main freshwater sources of the Seekonk River. The Seekonk River extends southward five mi (8 km) from Pawtucket Falls and the Main Street Bridge in Pawtucket to its mouth between Bold and India Points in East Providence and Providence, where it empties into the Providence River and Harbor. The Providence River is at the head of Narragansett Bay; therefore, the Seekonk River has direct access to Rhode Island Sound and the Atlantic Ocean. The Seekonk River is quite shallow with only the dredged central channel navigable by larger vessels. Green Jacket Shoal, a large mud and gravel bank at Bold Point, has posed a challenge to commercial maritime use of the river since the settlement of Providence, despite repeated dredging of its outer edges, which once extended into the navigation channel (King 1882:51; Department of the Army 1982b:2).

3.2 Geologic History

The modern Narragansett Bay drainage system is the result of fluvial erosion that carved a series of deep, north-south river valleys into the softer rocks of the underlying sedimentary basin during the Tertiary period roughly 30 to 70 million years ago (McMaster 1984). Major drainages emptying into the head of the Bay include the Woonasquatucket and Blackstone rivers. As noted above, the Blackstone River becomes the tidal Seekonk River below the Pawtucket Falls.

During the Pleistocene, multiple periods of glacial advance and retreat reshaped the landscape. The most recent of these glaciations, known as the Wisconsinan, occurred between about 75,000 and 10,000 years ago. Terminal moraine deposits on Long Island, south of Block Island and on Martha's Vineyard and Nantucket mark the maximum southern advance of the glacial ice sheet at around 26,000 B.P. (Oakley and Boothroyd 2012). Sea level at that time is estimated to have been about 394 ft (120 m) lower than today at the last glacial maximum and sea level low-stand and the location of the oceanic shoreline would have been located out near the edge of the outer continental shelf, approximately 130 mi (209 km) southeast of the Green Jacket Shoal study area (Oakley and Boothroyd 2012). Over several thousands of years after the last glacial maximum, the massive lobes of glacial ice began to melt. Large volumes of glacial meltwater returned to the sea, flooding the coastal plain before it.

Rhode Island's topography is a result of glacial, fluvial and coastal dynamics. As glacial ice melted and retreated, Rhode Island became glacier-free by about 18,000 years ago (Oakley and Boothroyd 2012; Uchupi et al. 2001) (Figure 3-4). A dense assortment of silt, sand, gravel and boulders or "till" was left behind by the glacier. A fresh water proglacial lake, "Lake Narragansett," formed about 15,500 B.P., impounded behind terminal moraines of till. The lake persisted for about 500 years, before draining down the north-south-oriented Narragansett Bay paleo-valley system. The basic

structure of Narragansett Bay consisted of three drowned river valleys created during the Tertiary Period and now marked by the Eastern and Western Passages and the Sakonnet River. Prior to inundation, the rivers and streams that flowed down these three river valleys were separated by high ground, presently marked by islands within the bay, such as Conanicut, Prudence, and Aquidneck. The current structure of the Bay was created by the erosion of sediments during glacial melting and secondary processes of relative sea level rise, modern wave and tidal erosion and the concomitant active sorting and transport of sediments that have transformed the Bay's coastal margin and helped create Green Jacket Shoal in its present configuration.

The chronology, rate, and magnitude of relative sea level rise is a function of the interplay between eustatic flooding, sedimentation and isostatic rebound as a result of glacial melting (McMaster 1984). Initially, the rate of sea level rise was relatively fast. At about 11,500 B.P., sea level was estimated to have reached a point about 165 ft (50 m) lower than today. Just 1,500 years later, sea level had risen more than 65 ft (20 m) to a level about 98 ft (30 m) lower than present. By about 9,000 B.P., rising sea level brought the ocean's shoreline to the entrance of the present mouth of Narragansett Bay (McMaster 1984; Oakley and Boothroyd 2012). Salt water began to fill-in the deep river valley of today's East Passage and the estuary that is Narragansett Bay began to form.

The general trend of rapid sea level rise during this period did not follow a smooth curve, but instead fluctuated and was punctuated by episodes of still-stand and negative sea level oscillations during times of climatic cooling and glacial advance (Rampino and Sanders 1980). As glacial ice volumes decreased, the rate of sea level rise gradually slowed.

By about 5,000 B.P., sea level would have been approximately 33 ft (10 m) lower than today's level (Pelletier and Fairbanks 2006). Most of Narragansett Bay would have been flooded, with salt water extending as far north as the lower Providence River. Recent research has suggested that estuarine/tidal flat conditions forming suitable habitats for shellfish beds were probably not common in upper Narragansett Bay until after 4,000 years ago (Rainey and Ritchie 1998). The northern extent of salt water flooding had reached the Green Jacket Shoal study area and the lower Seekonk River between about 3,500 and 3,800 B.P., based on McMaster's (1984) projection of sea level and results from the analysis of soil borings taken in 1981 for both pollen analysis and radiocarbon dating from near the former Great Salt Cove in Providence, at the confluence of the Woonasquatucket and Moshassuck Rivers (Artemel et al. 1983; Rainey and Ritchie 1998). The pollen records from these borings indicated that by about 3,800 B.P., the area had a diversified environment composed of upland forests, fields, freshwater marshes and meadows, tidal marshes and coastal beaches (Rainey and Ritchie 1998). Over the course of the last four centuries the rate of sea level rise has begun to accelerate again with landward migration of the shoreline threatening both coastal population centers and cultural resources.

Generally speaking, episodes of marine transgression are essentially periods of erosion, a destructive process that creates less than ideal depositional sequences from an archaeological perspective. Marine transgression can be thought of as proceeding in one of two basic ways: by "shoreface" retreat, when the coastline slowly regresses inland, or by "stepwise" retreat, when in-place drowning of coastal features occurs (Waters 1992). Shoreface retreat describes the erosion of previously deposited sediments by wave and current processes as the shoreline transgresses and is the dominant inundation regime during the marine transgression process (Waters 1992). As the glaciers melted and sea level rose, shoreface erosional zones sequentially passed across the subaerially exposed portions of the harbor floor. Older sediments that had been deposited in

coastal and terrestrial environments inland of the shoreline would have been reworked, first by the swash and backwash processes of the beachface, then by the waves and currents. The erosion of the shoreface associated with transgression would have reworked these deposits into a thin unconformable geological unit of transgressive lag (i.e., gravel and coarse sand deposits) forming the top of a time-transgressive geological unit known as a "marine unconformity" (i.e., the surface defined by the top of the buried paleosol and the base of the overlying marine deposit). Reworking terrestrial and coastal sediments are referred to as "palimpsest sediments" (Swift et al. 1971), and the erosional surface, marked by the depth of the maximum disturbance by transgression, is called the "ravinement" surface. This surface often shows up quite clearly in sub-bottom profiler data and can be a useful indicator for the potential presence of relict paleolandforms below it (Waters 1992). Shoreface retreat is usually the prevailing marine transgressive regime, especially during stillstand episodes, and after about 5,000 years ago, when the regional rate of sea level rise appears to have slowed considerably.

Alternatively and to a lesser extent, marine transgression also occurs by the process of stepwise retreat, which is the sudden inundation or in-place drowning of coastal landforms and sediments. Stepwise retreat most commonly occurs at times and in areas of rapidly rising sea level, where the coast is quickly subsiding and the gradient of the transgressed surface is shallow. In this case, instead of the waves and currents of the shoreface sequentially reworking older sediments during transgression, the shoreline zones jump from the active shoreline to a point farther inland, submerging the older coastal landforms and sediments in an area seaward of the more destructive shoreface zones. The shoreface's wave zones then stabilize and develop a new shoreline farther inland. Instances of in-place drowning during stepwise retreat, preserving forested topographic lows, river and pond margins, marshes and swamps, and other relict paleolandscape features, have been documented in a variety of places along the Atlantic coast, including here in Rhode Island by this report's author off of Cedar Tree Beach in Greenwich Bay and in nearshore waters off of the west side of Block Island (Figure 3-5). Utilizing a combination of non-disturbance remote sensing survey methods (e.g., sub-bottom profiling, side-scan sonar and magnetometer survey) and non-disturbance visual reconnaissance by marine archaeological divers (i.e., the underwater equivalent to walkover survey on land), as well as limited-disturbance selective underwater archaeological augering and excavation and sediment sampling (i.e., geotechnical coring), has proven effective for assessing archaeological sensitivity and determining presence/absence of submerged paleocultural landscapes likely to hold pre-contact period ancient Native American cultural deposits.

3.3 Contemporary Environmental Conditions

Since its submergence, the formerly exposed land of Green Jacket Shoal been shaped by natural and anthropogenic forces. Water movement generated by wind-blown waves and currents, tidal floods and ebbs, spring freshets coming down the Seekonk River, ice formations, and major storm events (historically documented in 1719, 1761, 1807, 1815 [the "Great September Gale"] [Figure 3-6], 1869, 1938 [the "Great New England Hurricane"] [Figure 3-7], 1944 [a hurricane], and 1954 ["Hurricane Carol"]) have all actively reworked, re-suspended, transported, and re-distributed existing surficial sediments on the shoal. These natural forces would have also likely deposited, re-deposited, destroyed or removed the pre- and post-contact period submerged cultural deposits buried within or embedded on the harbor floor sediments.

The mean tidal range in Providence Harbor is 4.6 ft (1.4 m), with a spring tide range of 5.7 ft (1.7 m). Currents generated by these tides are generally weak, except for in the constricted portions of

the Seekonk River, especially near its mouth around the north end of Bold Point where an ebb tidal current speed of up to three knots has been estimated, and across Green Jacket Shoal.

Prevailing winds in the area are northwesterly, except in July when southwesterly winds also occur. Gales are generally from the northwest. Fog is most frequent with easterly and southerly winds and is most common in the winter and spring. The harbor is generally ice-free, except during severe winters, when the upper harbor will freeze occasionally.

3.4 Anthropogenic Impacts

In their natural state prior to the Industrial Revolution, which began in America at Slater Mill near the head of the Seekonk River just five mi (8 km) north of the Green Jacket Shoal study area, and before the urbanization of Providence and East Providence – that is up until the mid-nineteenth century, the environment and water quality of the Providence and Seekonk rivers and their environs supported rich finfish, shellfish and wildlife resources. Located at the confluence of multiple fresh water rivers and a large estuary, the environmental resources present at and in the vicinity of Bold Point and Green Jacket Shoal in the late pre-contact period would have offered some of the same incentives to utilization, habitation and settlement that attracted European colonists to settle in the area during the post-contact period. The presence of these resources is evident in the earliest bathymetric charts of the Port of Providence published by the U.S. Coast Survey in 1865 and 1873 (Figures 3-8 and 3-9), which show most of the natural contours of the Providence and Seekonk river channel and their margins as they existed prior to extensive dredging, as well as the annotations “Oyster Beds” and “Eel Grass” in areas along the edges of the channels. These areas are noteworthy, as their presence indicates that the requisite relatively healthy and non-turbid water conditions must have continued to prevail to some extent up to that point, as they appear and were worthy of noting on the maps.

As a result of the post-contact period settlement, industrialization and urbanization of Providence and East Providence, the former of which began with colonization in 1636, and the latter of which started in 1793 and intensified during the nineteenth century, water and habitat quality suffered significantly and the character of the Providence and Seekonk rivers and humanity’s interaction and usage of them changed dramatically. By 1854, Providence, then the seventh largest community in the United States, was suffering its second cholera epidemic in five years with new deaths reported daily, and three out of every five occurring in a section of Providence bordering the Moshassuck River, a branch of the Providence River. Dr. Edwin Snow, the Superintendent of Health for the city at the time, described the river as "filthy as any common sewer, and the stench arising from it at times pervades the whole neighborhood... at any time, dogs, cats, and hogs may be seen in the water in every stage of decomposition...." (Narragansett Bay Commission 2016).

Efforts were subsequently made to improve the water quality of Providence Harbor and the Upper Bay. In 1901, the Providence Sewage Treatment System, then the largest of its kind in the nation, was put into operation. This and various later attempts throughout the first three-quarters of the twentieth century to improve water quality in the Upper Bay proved mostly unsuccessful. By 1967, both the Providence and Seekonk Rivers were classified as “SE” or “nuisances,” and considered “unsuitable for most uses” (Department of the Army 1982a:APPENDIX 1:B-9). Heavy metals and other types of environmentally toxic industrial discharge from the area’s jewelry and metal plating industries, as well as untreated storm and sewer runoff that flowed into the rivers during periods of heavy rains, combined to make the water quality in both bodies of water poor and unhealthy for

any human uses other than navigation (commercial and recreational boating) and industrial cooling (Department of the Army 1982a:APPENDIX 1:B-9; Doerring and Oviatt 1990; Needham and Robadue, Jr. 1990; Nixon 1991). Although water quality has been improving for the past several decades, particularly since the 2011 initiation of the latest phase of the Combined Sewer Overflow (CSO) system, the Seekonk and Providence rivers have remain closed to shell-fishing for human consumption and the rivers sediments still contain abnormally high concentrations of heavy metals, organic residuals and numerous other pollutants (Corbin 1988; Department of the Army 1982a:APPENDIX 1:B-11; Hinga 1992; Murray et al. 2007; Needham and Robadue, Jr. 1990). The likely presence of industrial pollutants and biological hazards in the sediments and water in the study area are important factors to consider when contemplating site health and safety issues associated with debris removal activities, conducting further phases of marine archaeological field investigation that involve diving, geological sediment sampling and archaeological excavation, and any public education and outreach that may occur along the shore at Bold Point and in the water on Green Jacket Shoal.

In addition to water quality degradation, repeated dredging and filling during the late nineteenth and early twentieth centuries have altered the harbor's natural bathymetry and shoreline locations significantly, something that is clearly evident from an examination of the historical maps and charts that were obtained and reviewed as part of the research conducted for this study. Examination of published maps of Providence Harbor and a comparison of its 1700 shoreline with its present (2014) shoreline indicates strongly, however, that the location of Bold Point's western shoreline that forms the eastern limit of the Green Jacket Shoal study area remains essentially unchanged from the 1700 position (Figure 3-10). Furthermore, examination of historical navigation charts depicting Green Jacket Shoal's bathymetry also indicate negligible changes to the charted water depths or contours of the majority of the shoal with the exception of the outer edges of the shoal at the mouth of the Seekonk River and in the dredged approach to the former location of the floating dry dock pier (Figures 3-11 through 3-15).

4.0 CULTURAL CONTEXT

A regional understanding of long-term human settlement and interaction with the environment is critical to predicting how these activities may be manifested in the archaeological record within the Green Jacket Shoal study area. The following section provides an overview of the cultural chronology of the Providence and East Providence region from the pre-contact through post-contact period from archaeological and historical perspectives. This review is by no means exhaustive; instead, it is intended to provide a basic framework for predicting and interpreting historic significance of the types of pre- and post-contact period cultural deposits that could be or are present within the study area. The information for this context has been drawn from a variety of sources, which includes documents prepared as part of previous cultural resource management investigations conducted in Rhode Island, Providence and East Providence (e.g., Rainey and Cox 1995, Rainey and Ritchie 1998, the Rhode Island Ocean SAMP [URI 2010], and Robinson et al. 2012), as well as maps and site files, and published and unpublished primary and secondary historical sources on file at the RIHPHC and in the archives, special collections, and research libraries that are listed in Chapter 1.0 of this report.

4.1 Pre-contact Period Cultural Chronology

Local Native peoples in southern New England believe that their ancient ancestors originated in the Americas and have been here since "time immemorial." Archaeological research conducted to date throughout the region, and in the Narragansett Bay drainage in particular, has documented over 12,000 years of human habitation in the terrestrial terrain of New England (Leveillee 2012). This material culture record of ancient Native American life in the Northeast is commonly organized by archaeologists into three general temporal periods: 1) PaleoIndian (13,000 to 10,000 B.P.); 2) Archaic (10,000 to 3,000 B.P.), and; 3) Woodland (3,000 to 450 B.P.). A "Late" period is sometimes included in discussions about the PaleoIndian period, and the Archaic and Woodland periods are both further subdivided into "Early," "Middle" and Late categories. In addition, the Late Archaic and the Early Woodland periods are separated by a distinct transitional period referred to as the "Transitional" or the "Terminal" Archaic (3,600 to 2,500 B.P.). Each division among the general periods of the ancient Native American cultural chronology is based on interpretations and inferences made from the archaeological record. These periods are distinguishable within the archaeological record on the basis of observed differences in the material culture, specific land use patterns inferred from the archaeological remains of the material culture, and, occasionally, by other indicators, such as the preserved archaeological remains of mortuary practices. The Green Jacket Shoal study area was subaerially exposed or intertidal, and therefore available for human habitation and use, between approximately 13,000 and 2,500 B.P., encompassing the PaleoIndian through Transitional Archaic periods.

Up until a little over a decade ago, ancient Native American artifacts and/or documented archaeological sites dating from the PaleoIndian and Early and Middle Archaic periods along the coastal plain were quite rare. Archaeological investigations in southern New England over the last 25 years have dramatically increased our existing knowledge about ancient Native American settlement patterns and resource procurement strategies. These archaeological data indicate that there was a complex transition of cultures from the time of the earliest appearance of PaleoIndian culture in the archaeological record. Increasingly, evidence of lowered water levels and an emergent correlation between large wetlands and major water bodies and ancient Native American archaeological sites suggests that water (inland and coastal) and its associated food resources were

critical factors in site selection. Hypotheses are now proposed that assert large pre-contact period archaeological sites in proximity to large lakes, rivers and extensive wetlands with inlets and outlets flushing their respective systems may have been more common on the Coastal Plain, but were submerged by the rising sea level, and, thus, are not represented in the terrestrial archaeological record. It is perhaps for this reason that certain site types (especially large coastal occupations) seem to be lacking or are very rare in the terrestrial archaeological record.

It is just within the last decade that proven methodologies have been developed for both the prediction and detection of intact submerged paleocultural landscapes off of the coast of southern New England and in Rhode Island in which contextually intact, submerged pre-contact period archaeological deposits have been found. Site preservation underwater appears to be generally dependent on site burial in topographically protected terrestrial environments (i.e., in topographic lows adjacent to paleo-water bodies, especially) prior to their transgression by rising seas. Recognizing the current limitations of western science and the archaeological record's abilities for interpreting holistically and fully the complexities of the lives and cultures of the ancient Native peoples who inhabited this region for over 12,000 years, the settlement pattern information that follows is provided to establish only a general context, or framework from which initial predictions regarding archaeological sensitivity may be made and within which archaeological field data acquired within the Green Jacket Shoal study area may be interpreted for the purposes of this particular study.

4.1.1 PaleoIndian Period (13,000 to 10,000 B.P.)

Archaeological research conducted to date has led most archaeologists to conclude that following the retreat of thick glacial ice from the region between 18,000 and 16,000 years ago, the then subaerially exposed land, if inhabited, was probably initially populated by bands of highly-mobile people collectively referred to by archaeologists as PaleoIndians. The timing of the initial population of the Eastern Seaboard and present-day Rhode Island by PaleoIndian peoples is presently debated by archaeologists. Members of the Native American community, as noted above, believe that their ancient origins are in the Americas, rather than as colonizers from northwest Asia as is asserted by the archaeological research community. Contributing to this debate are the discovery of apparent cultural strata and artifacts predating the PaleoIndian "Clovis Culture" or fluted point tradition, such as those at the "Topper Site" in South Carolina and the "Cactus Hill Site" in Virginia. The latter of these two sites is situated on a river terrace within the Coastal Plain, highlighting the fact that environments such as these were attractive for PaleoIndian occupation. Similarly, an averaged date of 15,960 radiocarbon years B.P. from reported cultural strata at the Meadowcroft Rock Shelter Site in Pennsylvania predates accepted Clovis dates in the Northeast by nearly 3,000 years (Adovasio 1993). Nevertheless, the earliest unequivocal published evidence for human occupation in New England is associated with the Clovis Culture, which dates to as early as 11,120 ± 180 radiocarbon years B.P. at the Vail Site in Maine (Gramly 1982). The advance, and then the subsequent retreat, of thick glacial ice across southern New England ca. 16,000 to 18,000 years ago is often assumed to have destroyed any archaeological evidence for "Pre-Clovis" human occupation of the region, and no such Pre-Clovis finds are known from New England.

Traditional interpretations of PaleoIndian settlement and subsistence systems are that nomadic hunters exploited large migratory game such as mastodon, caribou, bison, or elk (Dragoo 1976; Kelly and Todd 1988; Snow 1980; Waguespack and Surovell 2003). PaleoIndian subsistence data from the New England-Maritimes (Meltzer and Smith 1986; Spiess et al. 1998) and the Great Lakes

(Stothers 1996) regions indicate PaleoIndians exploited large migratory game, namely caribou. The relative absence of migratory or megafaunal animal remains from PaleoIndian archaeological contexts in southern New England has caused some to question the "specialized subsistence model" in the region (Dincauze 1993; Ogden 1977). Dincauze (1990) argues that southern New England PaleoIndians were more generalized in their subsistence regimes, hunting and gathering opportunistically available animal and plant species. Jones and Forrest (2003) concur, arguing that the higher abundance of small PaleoIndian encampments relative to larger base camps in the region may be characteristic of the PaleoIndian settlement system wherein hunters and foragers adjusted to resource unpredictability. Resource-rich freshwater glacial ponds and wetlands were widely distributed across the deglaciated New England landscape and likely supported a diversity of plant and animal species suitable for human consumption. Following the thinking of Jones and Forrest, smaller groups would have been better equipped than larger groups, via adaptive flexibility, to exploit available resources in southern New England.

Diagnostic PaleoIndian artifacts found in Rhode Island and southern New England include fluted Clovis-like (Bull Brook, Neponset, or Nicholas type) and Eden-like projectile points. Other stone tools associated with this period include scrapers, gravers, and drills. Southern New England PaleoIndian tool assemblages typically include non-local (chert and jasper) lithic materials and extra-regionally (e.g., Massachusetts, New Hampshire, and Maine) available rhyolites.

Archaeological evidence indicates Rhode Island's postglacial landscape was infrequently occupied between 12,500 and 5,000 B.P. PaleoIndian artifacts are quite rare, but their places of recovery suggest the PaleoIndian settlement and/or exploitation was focused along interior postglacial wetlands, glacial lakes, and riverine settings. Diagnostic artifacts, such as fluted and unfluted lanceolate points, have been recovered from submerged contexts in dredge spoil redeposited on "replenished" beaches in coastal New Jersey (i.e., at Egg Harbor and Little Egg Harbor), while fossil animal remains have been dragged and dredged up in the gear of offshore fishermen from locations correlating with now inundated relict landforms, such as estuaries and shorelines, as far out on the continental shelf as George's Bank (Merrill et al. 1965; Whitmore et al. 1967; Edwards and Emery 1966, 1977).

Isolated fluted points or fluted point fragments have been discovered by avocational archaeologists within the upper Narragansett Bay region, including in East Providence (Ide Farm) and Barrington (Noble Farm). A fluted point find was also recorded at the Twin Rivers Site in a nearby interior upland location in Lincoln, Rhode Island (Fowler 1952). The Seekonk Archaeological District, located along the lower Ten Mile River in Seekonk, was considered a likely setting for PaleoIndian activities, although no fluted points were found when the site was investigated (Rainey and Cox 1995; Rainey and Ritchie 1998). At the Seekonk 2 Site, an unusual reworked chert biface found in proximity to an Early Archaic bifurcate point may have originated as a fluted point, and several chert edge tools from the same activity area exhibited parallels to known PaleoIndian assemblages. Thousands of years of repeated human land-use in the Seekonk Archaeological District precluded the confirmation of the presence of an isolated, intact PaleoIndian component at the site, although the stable geomorphology of the post-glacial landform there would make a likely place for an early encampment (Rainey and Cox 1995; Rainey and Ritchie 1998).

The Upper Bay landscape at and around the Green Jacket Shoal study area contains environmental settings, such as elevated river terraces and glacial outwash features, which would have been conducive to PaleoIndian settlement. Some of these locations were undoubtedly inundated by sea

level rise that has occurred over the last 12,000 to 3,000 B.P. Southern New England was clearly traversed by small groups of hunter–gatherers during the PaleoIndian Period. In the course of their travels across the region, it is likely that people during this period made encampments along the Providence area's rivers as they encountered their relatively resource-rich environments. The paucity of evidence for these sites may simply be a reflection of the low-visibility of early sites, many of which have been affected by changing sea levels, or by the repeated use of favorable site locations through time (Rainey and Ritchie 1998).

4.1.2 Archaic Period (10,000 to 3,000 B.P.)

The Archaic Period represented a time of increased familiarization and settlement within the southern New England woodlands. The Archaic has been subdivided into Early, Middle, and Late periods. Paleoenvironmental and archaeological evidence indicates increased diversification of food resources, the generalized usage of faunal and floral species, and the establishment of tribal territories throughout the Archaic Period. In general, Archaic Period peoples are conceptualized as having subsisted primarily through hunting and gathering with a settlement pattern characterized by exploratory forays and seasonal relocations within circumscribed territories (Dincauze 1975). The largest assemblage of ancient Native American cultural material recovered to date from the Atlantic OCS dates from the Archaic Period, and consists of over 200 lithic artifacts and projectile points that were dredged up from the upper 5 ft (1.5 m) of sediments in the Weeks 1 Borrow Area, located in 30 to 40 ft (9 to 12 m) of water in the North Atlantic Ocean approximately one mi (1.6 km) east of the southern portion of Sandy Hook, New Jersey. The artifacts were discovered on and collected from a recently re-nourished beach in Monmouth, New Jersey where the dredged materials from the Weeks 1 Borrow Area had been deposited. The discovery of buried pre-contact period archaeological resources in the Atlantic Ocean off of the New Jersey coast supports the hypothesis that the Green Jacket Shoal study area may also contain pre-contact period archaeological sites submerged by rising sea level (Merwin 2001; Merwin et al. 2003).

4.1.2.1 Early Archaic Period (10,000 to 7,500 B.P.)

The Early Archaic Period coincided with the commencement of the Holocene epoch, ca. 10,000 years ago. The early Holocene was marked by warmer and drier conditions than the preceding Pleistocene epoch. Early Archaic peoples continued to have a generalized subsistence base, hunting available game and harvesting woodland and wetland vegetation and nuts (Dumont 1981; Forrest 1999, Kuehn 1998; Meltzer and Smith 1986; Nicholas 1987). Early Archaic occupations in southern New England and Rhode Island have typically been identified based on the recovery of diagnostic bifurcate-based projectile points. Concentrations of bifurcate-based projectiles are known around the perimeters of ponds, marshes, and wooded wetlands and at the headwaters of major rivers in southeastern Massachusetts (Taylor 1976), Connecticut (Pfeiffer 1986), and Rhode Island (Turnbaugh 1980). The association of Early Archaic sites with wetland locations implies that wetland environments were important loci of activity during the Early Archaic Period (Jones and Forrest 2003; Nicholas 1987).

A virtually exclusive association of Early Archaic bifurcate-based projectiles with non-local and extra-regionally available lithic materials suggests a highly mobile subsistence strategy for the Early Archaic bifurcate-based producers in the region (Waller and Leveillee 2002). Recent archaeological data from Connecticut (Forrest 1999) and the Gulf of Maine region of northern New England (Robinson 1992) suggest that some southern New England early Holocene populations

utilized a distinct quartz lithic technology producing quartz "microliths" for use in composite tools (Forrest 1999). The ubiquitous nature of quartz in regional artifact assemblages raises the possibility that some Early Archaic sites and assemblages are being misidentified as later occupations.

The settlement system of the microlith manufacturers appears markedly different from that of the bifurcate-based producers in that it includes "residential" base camps with subterranean pit houses occupied for extended periods of time (Forrest 1999; Jones and Forrest 2003). Small, short-duration sites resulting from logistical forays undoubtedly supplemented larger residential sites in the Early Archaic settlement system. Jones and Forrest (2003) interpret the Early Archaic semi-residential settlement pattern in southeastern Connecticut as an adaptive response to predictable, readily abundant resources. The identification of a semi-subterranean pit house associated with a LeCroy Bifurcate complex at the Weilnau Site in Ohio (Stothers 1996) and more recently two pit houses dated to 7,830 ± 130 and 8,110 ± 90 B.P. at the Whortleberry Site in Dracut, Massachusetts (Dudek 2005) may imply a previously unknown degree of sedentism for the Early Archaic bifurcate producers in portions of the Northeast and Great Lakes regions. Botanical remains (acorns, hazelnuts, blackberry/raspberry and goosefoot) from the Whortleberry Site suggest a summer occupation that possibly extended into the winter. Apparent differences in identifiable artifact assemblages (quartz microlith composite tools vs. bifurcate based projectile points) and settlement systems suggests the possibility that two distinct Early Archaic populations occupied the southern New England landscape during the early Holocene (Forrest 1999). Archaeological evidence of Early Archaic habitations in the region is scarce. The low frequency of Early Archaic finds is suggestive of brief occupations by highly mobile peoples (Waller and Leveillee 2002).

The largest Early Archaic assemblage in the Upper Narragansett Bay area is from the Read Farm Site (19–BR–75), located in South Seekonk, Massachusetts. The Read Farm property is situated on a terrace overlooking the Runnins River and extensive tidal marshes to the south. It is known to be a complex, multicomponent site from the avocational collecting activities of Charles Read and through later excavations conducted by students and faculty of Rhode Island College, Providence College, and members of the Massachusetts Archaeology Society (Barnes 1975). Read Farm appears to have been an important Early Archaic site that may have been visited on a seasonal basis, or returned to periodically for some specific reason. Unfortunately, there is no information about features or activity areas associated with the bifurcate assemblage (Rainey and Ritchie 1998).

Elsewhere in the Upper Bay study area, Early Archaic finds are generally mixed with materials on multi-depositional sites. Along the lower Ten Mile River, a bifurcate–base point preserved in two pieces and made from a tan felsite was found at the Seekonk 2 Site (Rainey and Cox 1995). Associated with the point was a low-density scatter of matching chipping debris that probably resulted from sharpening the blade. Radiocarbon–dated Early Archaic features were not discovered there however. Just across the Seekonk River and north from the mouth of the Ten Mile River, a LeCroy–like chert bifurcate point was found at a site identified on the grounds of Butler Hospital in Providence (RI 929). This point, along with additional chipped and ground stone tools including a possible ground stone axe, was recovered in a disturbed context by a local collector following the construction of a parking lot on the hospital grounds (RIHPHC site files). Along the west side of the Providence River, the Field's Point Site contained a grey felsite bifurcate base point (Roger Williams Museum collections). Most of the upper bay bifurcate–base points were made from felsites likely to

be from sources in the Boston Basin, although locally available materials, such as Attleboro red felsite and quartz, were also used to a lesser degree (Rainey and Ritchie 1998).

4.1.2.2 Middle Archaic Period (7,500 to 5,000 B.P.)

The Middle Archaic period is generally correlated with the beginning of a warmer and wetter Atlantic climatic phase and a broadening of ecosystems at about 7,500 B.P., which, based on the comparatively larger numbers and visibility of Middle Archaic sites in southern New England, appears to have been a time of increased colonization and firmly established settlement in the region, as the appearance of oak, hickory, beech, and chestnut forests provided more predictable and stable plant and animal food resources. The archaeological data from the period attests to an increased diversification of food sources and generalized exploitation of faunal and floral species throughout the period. Overall, the Archaic culture is conceptualized as having a primarily hunting and gathering subsistence economy with more permanent residential bases from which foraging activities were conducted within circumscribed territories that may have coincided with major river drainage systems. A riverine adaptation is inferred from the density of Middle Archaic sites around waterfalls, river rapids, major river drainages, wetlands, and coastal settings with large base camps established along extensive wetland systems, and the appearance of heavy chipped stone woodworking tools (possibly used for making log boats) and net sinkers, and common presence of fish remains in the archaeological record of Middle Archaic sites (Bunker 1992; Dincauze 1976; Doucette 2005; Doucette and Cross 1997; Jones 1998; Maymon and Bolian 1992).

Models of settlement for the Middle Archaic suggest two types of sites. The first reflects large group activities sited on flood plains and low terraces of major rivers and streams and in association with marsh, swamp, and estuarine environments to maximize access to a diverse and abundant resource base. The second reflects small group activities, such as hunting and gathering forays from base camps or staging areas that are located in a broader range of environmental settings.

Smaller logistical camps and exploitation sites supplemented the base camps. Subsistence activities reflected at these sites included the harvesting of anadromous fish, hunting and foraging, and fishing and shellfish collection. An increase in the complexity of seasonal rounds is conjectured based on the broad range of resources available throughout the period (McBride 1984).

Southern New England Middle Archaic occupations are typically recognized by the recovery of Neville, Neville-variant, Stark, and Merrimack style projectile points (Dincauze 1976; Dincauze and Mulholland 1977). Adzes, gouges, and axes suggest heavy woodworking and possibly the manufacture and use of dugout canoes and other wooden structures. A preference for regionally available lithic raw materials (quartzite and rhyolite) with lesser amounts of locally available materials, namely argillite, is reflected in the site database. The correlation between regional lithic material types and Middle Archaic materials has led Dincauze (1976) to theorize that Native American band or tribal territories were established within major river drainages, and that the scheduling of subsistence activities such as the seasonal pursuit of anadromous fish species may have developed in response to territoriality (Dincauze and Mulholland 1977). The recovery of Middle Archaic lithic materials predominantly derived from outside the present-day geopolitical borders of Rhode Island indicates a Middle Archaic settlement system that resulted in small limited-duration logistical camps (Waller and Leveillee 2002). The location of many of Rhode Island's known Middle Archaic sites indicates the region's interior wetland environs were targeted for settlement.

Documented Middle Archaic sites are more numerous in Rhode Island and settlement of the Upper Narragansett Bay during this period is archaeologically more visible than that of the preceding periods. Non-local and extra-regional lithic materials, such as quartzite and varieties of rhyolite, dominate Middle Archaic assemblages. The recovery of relatively few Middle Archaic tools, most of them projectiles, from sites in the region is consistent with small occupations of limited focus, representative of short-duration task-oriented locations associated with the acquisition and limited processing of game or other resources (Waller and Leveillee 2002).

The Walker Point Site (RI 653) on the Seekonk River in East Providence has enhanced our understanding of the Middle Archaic Period in this region and has an assemblage that included Neville and Stark projectile points, as well as a ground stone tool collection indicative of a well–established local economy. The Middle Archaic component at the Seekonk 2 Site also confirmed the general area as a logistically appealing environment for these early populations (Rainey and Cox 1995). Rainey and Cox (1995) interpreted the Middle Archaic component documented at the Seekonk 2 Site as representing short–term and task–specific activities, rather than as a reflection of an intensive riverine focus at this location (Rainey and Ritchie 1998).

The Neville and Stark point styles that are characteristic of Middle Archaic cultural deposits have been found in low-to-moderate densities at a number of other locations throughout the upper Narragansett Bay area. Many of the nineteenth and twentieth century collecting sites contained these tool types in low densities, including Field's Point, Boldwater Point, and Old Maid's Cove, along the west side of the bay in Providence. On the lower Runnins River, it appears as though the Read Farm Site continued to be used through the Middle and Late Archaic periods. Argillite, quartzite, and felsite are the most common lithic materials represented in the collection from the site. The argillite is a high quality, blue–green material, and may have been derived from a source on Conanicut Island, in the lower Narragansett Bay. The Read Farm collection is by far the largest assemblage of Middle Archaic tools in one location for the upper Narragansett Bay region (Rainey and Ritchie 1998)

Cultural resource management surveys conducted in Providence and East Providence have also discovered Middle Archaic components, including at the Bullock's Cove (Stokinger 1979) and the Providence Cove Lands sites (Artemel et al. 1984). At the Cove Lands Site, the Middle Archaic component was interpreted as a minor element of the occupational sequence, with a focus on hunting and faunal processing. The classic ground stone tool forms often associated with Middle Archaic sites were absent, although associated artifacts included Neville projectile points, a crystal quartz scraper, a large bifacially flaked quartzite knife, and a number of unifacial scraping tools (Artemel et al. 1984:III–E.2). The authors also note the use of both locally available materials and Boston Basin felsites for the Middle Archaic component (Rainey and Ritchie 1998).

4.1.2.3 Late Archaic Period (5,000 to 3,000 B.P.)

The Late Archaic correlates with a period of adjustment to environmental change and apparent population increase with associated sites from the period both larger and more numerous. The climate continued its warming trend and became somewhat drier, reaching a period of maximum oscillation between about 5,000 and 3,000 B.P. Vegetation is dominated by a fully temperate deciduous forest that included more hickory and pine and less oak, which resulted in a more open forest canopy with a higher carrying capacity. The period also correlates with the marked decrease

in the rate of sea level rise, which appears to be associated with increased populations of shellfish, anadromous fish, and other riverine, estuarine, and marsh resources. As a result, the archaeological record from the Late Archaic reflects a more intensive focus on the high yield and highly predictable food resources associated with riverine and estuarine environments, particularly the collection of oysters and clams. This focus on fishing and shellfish gathering is evident in the large shell middens found along the coast (Kraft 1985). This apparent transition to a coastal focus could be the result of the stabilization of sea levels and coastlines (relative to earlier periods) and a concomitant establishment of resource-rich marshes and estuarine systems with extensive shellfish beds that were attractive to Late Archaic populations. Alternatively, it could also be the result of a data filtering bias. This data filtering bias can be attributed to the preferential preservation of shell as compared to other resources, such as fish bone. It could also be attributed to the current terrestrial bias in the archaeological data due to the comparative lack of archaeological research and underwater subsurface testing and excavation conducted to date within the former coastal areas that were exposed during earlier cultural periods, but are now submerged (Westley and Dix 2006).

Late Archaic Period archaeological sites are well represented in Rhode Island. The density of Late Archaic deposits and an apparent reliance on locally available lithic materials (quartz, quartzite, and argillite) is suggestive of increased Native American sedentism for the period (Dincauze 1975). Seasonal and multi-occupation Late Archaic campsites were created as a result of procurement of an expansive variety of resources. Shellfish exploitation, first observed during the Middle Archaic, intensified as the rate of coastal inundation decreased and estuaries, salt marshes, and tidal mud flats were established (Braun 1974; Lavin 1988). The overlapping mosaic of archaeological sites created during generations of land use attest to intensive utilization of the Northeast's swamps and wetlands and occupation along regional waterways beginning approximately 4,200 years ago. The high density of Late Archaic sites in a wide range of habitats, coupled with the large number of artifacts attributed to the period, is suggestive of a large population exploiting an extremely broad spectrum of resources (Dincauze 1975; McBride 1984).

The Late Archaic Period includes three cultural traditions: the Laurentian, Small Stemmed, and Susquehanna. Each tradition is associated with specific periods of time, distinct lithic technologies, and/or ceremonial or cultural practices that can be discriminated archaeologically.

The Laurentian tradition is the earliest expression of the Late Archaic in the Northeast. Materials associated with Laurentian occupations include woodworking tools (chisels and adzes), ground slate points and knives, ulus, simple bannerstones, and broad-bladed and side-notched Vosburg, Otter Creek, and Brewerton type projectile points (Ritchie 1980:79). Lithic materials used in Laurentian tradition tool manufacture include quartzites, volcanics, and some argillites. Laurentian tradition site distributions imply an interior settlement focus associated with a hunter-gatherer subsistence economy. A focus on the uplands led Ritchie (1980) to suggest an essentially interior riverine adaptation for Laurentian groups.

The Small Stemmed tradition continues as an accepted Late Archaic cultural manifestation, although the duration of the tradition appears to extend into the Woodland Period (Mahlstedt 1985). The Small Stemmed lithic tradition may be a regional development out of the Middle Archaic Neville/Stark/Merrimack sequence (Dincauze 1976; McBride 1984). Diagnostic elements associated with the tradition include Squibnocket Stemmed, Wading River, and a host of small or narrow stemmed projectile points (Dincauze 1975). Small, basally-ground Squibnocket triangles

appear to be contemporaneous with Small Stemmed occupations for southern New England (Ritchie 1969) and have been radiocarbon dated to 3,950 ± 70 radiocarbon years B.P. at the Bear Swamp 2 Site in Exeter (Waller and Leveillee 2002). Regional archaeological data indicates Small Stemmed producers relied on a quartz tool technology (McBride 1984). Quartz cobbles from glacial outwash, riverbeds, or coastal contexts were the most common sources of raw material for Small Stemmed chipped-stone tools. In addition to quartz, there is a noticeable reliance on Narragansett Basin argillite for the production of Small Stemmed projectile points in Rhode Island.

The database of Late Archaic Small Stemmed tradition sites in Rhode Island is quite extensive, consisting of thousands of Small Stemmed projectiles. The distribution of these points suggests that the Small Stemmed producers occupied an environmental niche focused on the region's interior wetlands (Waller and Leveillee 2002). The Small Stemmed tradition remnant settlement pattern is consistent with that described by McBride (1984) for Connecticut with large base camps concentrated along the well-drained, resource-rich banks of streams, ponds, and interior wetlands, supplemented by task-oriented, short-duration sites that targeted specific resources (Waller and Leveillee 2002). The occurrence of Narragansett Bay argillite at Small Stemmed tradition Native American archaeological sites in the region indicates the importance that this lithic raw material played in the Late Archaic Small Stemmed settlement system.

Late Archaic (Laurentian, Small Stemmed, Susquehanna tradition) cultural materials are all known from the region. Although all three traditions have been documented in the region, they occur at different relative frequencies. Laurentian Tradition materials are distributed on many sites throughout the Upper Narragansett Bay area. Laurentian tradition cultural materials have been recovered from the Walker Point Site. In comparison to the later Archaic deposits, Laurentian components of sites tend to be small and contain relatively few artifacts of a limited technological range, resulting from short-duration stays by peoples targeting specific resources. Small Stemmed projectiles or Squibnocket Triangles affiliated with the Small Stemmed tradition of southern New England are particularly common and indicate an intensive exploitation of Near Interior wetlands and associated floral and faunal resources by the producers of Small Stemmed tradition projectile points. The database of Small Stemmed tradition archaeological sites in Rhode Island reflects the presence of numerous small, short-duration sites of limited focus, contrasted by larger base camps of multiple family groups. The Bluff section of the Walker Point Site was particularly noted for its Small Stemmed and Squibnocket elements. As part of the original East Providence Industrial Highway corridor survey, both Laurentian (Brewerton) and Small Stemmed elements were found at the Fram Site (RI 59), also along the Seekonk River (Simon and Gallagher 1981:26). Excavations at the Read Farm Site in 1974 successfully identified over twenty features, two of which were radiocarbon-dated to the Late/Transitional Archaic Period (3475±70; 3145±65). Small Stemmed Points were found at the Providence Cove Lands Site in Providence (Artemel et al. 1984). The Seekonk 2 Site on the lower Ten Mile River contained a single felsite Otter Creek point, a Brewerton–like variant, four Squibnocket Triangle points, and 17 Small Stemmed points. A single Laurentian radiocarbon–date was obtained from a shallow firepit feature (4,640±100 B.P.), and four other radiocarbon dates fell into the Late/Transitional phase, between 3,600 and 4,000 B.P. Small Stemmed components were also found at the Seekonk 3 Site (Rainey and Ritchie 1998).

4.1.3 Transitional/Terminal Archaic Period (3,600 to 2,500 B.P.)

The Transitional Archaic Period bridges the Archaic and Woodland periods and is recognized in southern New England through Susquehanna tradition cultural materials and sites. An extensive

trade network, increased burial ceremonialism, and stone tool making technologies markedly different from the antecedent Late Archaic traditions characterized the Transitional Archaic. Radiometric and stratigraphic information from some southern New England archaeological sites indicate the Susquehanna tradition was temporally contemporaneous with the Late Archaic Small Stemmed tradition sites (Filios 1989, 1999). The Susquehanna tradition in southern New England commenced with the Atlantic Phase (ca. 3,600 B.P.) and terminated with the Orient Phase (ca. 2,600 B.P.) coincident with the beginning of the Early Woodland Period (Dincauze 1972; Ritchie 1980). The peoples associated with these phases, although differing in some ways from one another, shared similar cultural commonalities (lithic technologies, cultural materials, and/or settlement and subsistence data) to place them within the collective Susquehanna archaeological tradition.

New technological developments associated with the Susquehanna tradition included the manufacture of steatite vessels and broad-bladed tool forms (e.g., Atlantic, Susquehanna Broad, Coburn, and Orient Fishtail projectile points/knives) that either developed out of the local populations or were introduced to the region by peoples migrating to New England. Steatite bowl use, technology, and trade had its beginnings approximately 3,600 years ago following the Atlantic Phase, peaked between 3,400 and 2,900 B.P., and fell into disuse by the end of the Orient Phase (Sassaman 1999). Regionally available steatite outcrops included the Oaklawn Steatite Quarry in Cranston, the Manton Avenue Quarry in Providence, and the Ochee Springs Steatite Quarry in Johnston. Broad and thin Susquehanna tradition bifaces were ideally suited for knives and possibly woodworking implements and are in marked contrast to the more linear, elongated, narrow, and thicker piercing Small Stemmed projectiles. Susquehanna tradition chipped-stone tools were commonly manufactured from a variety of lithic materials that included regionally available rhyolites, quartzite, and non-local cherts. A reliance on readily available lithic materials such as quartz, argillite, and some rhyolites is apparent by the final Orient Phase of the Susquehanna tradition. The manufacture and use of heavy steatite vessels by Susquehanna tradition peoples may imply a trend toward increased sedentism by resident populations. However, the predominance of non-local lithic materials in Susquehanna tradition cultural assemblages implies a relatively mobile settlement strategy.

The Transitional Archaic settlement pattern was essentially oriented toward coastal or riverine settings with a subsistence base focused on the acquisition of riverine or estuarine flora and fauna that included fish, nuts, and small- to medium-sized mammals (Pagoulatos 1988). Susquehanna tradition sites are markers of the Transitional Archaic Period and are best known from regional cremation cemetery complexes such as the Vincent, Watertown Arsenal, and Millbury III sites in Massachusetts (Dincauze 1968; Leveillee 2002) and the Bliss and Griffin sites in Connecticut (Pfeiffer 1980). Transitional Archaic Period burials in Rhode Island are reported in the Pawtuxet River drainage from the Flat River Site in Coventry (Fowler 1968) from Charlestown (Fowler 1964), and at the West Ferry Site in Jamestown (Simmons 1970). Transitional Archaic sites are also prevalent around noted steatite quarries such as the Furnace Hill Brook and Phenix Avenue sites near the Oaklawn steatite quarry in Cranston (Waller and Leveillee 1998).

It was during the Transitional Archaic Period that the lower Seekonk River became a tidal/estuarine environment with complex resource potential. Sites with Transitional Archaic components are distributed throughout the upper Bay territory, although classic cremation burials associated with the Susquehanna have yet to be identified. The Robbins Museum in Massachusetts holds in its collections what has been called by the Massachusetts Historical Commission “the largest assemblage of Susquehanna Tradition projectile points from any other single site in the

southeastern Massachusetts region" (Anthony et al. 1980:23). This assemblage was collected from the Narragansett Race Track site in East Providence. Although the nature of the Narragansett Race Track Site will never be known, the presence of large numbers of Susquehanna projectile points seems to reflect a large habitation site, rather than that of a burial complex. A cache of stylistically related Transitional Archaic projectile point types, including Orient Fishtail, Coburn, Wayland Notched, and a steatite bowl were also recovered from a site at nearby Fort Hill, located in East Providence, just southeast of and closest to the Green Jacket Shoal study area of all the previously-identified archaeological sites (Figure 4-1) (Fowler and Welt 1955). According to Ritchie (1983), the assemblage from Fort Hill resembles the contents of Transitional Archaic burials identified at sites in southeastern Massachusetts and Rhode Island (Lord 1962; Simmons 1970). Archaeological investigations at the Bedrock Point Site, also located in East Providence in the Kettle Point area along the Providence River, produced an Orient Fishtail point base and associated chipping debris (Pagoulatos and Ritchie 1987). An Orient Fishtail projectile point was also found at RI 929 within the Butler Hospital property in Providence (RIHPC site files). The nearby multicomponent Ledge Road Site, previously mentioned for its Middle Archaic occupation, contained Squibnocket, Small Stemmed and Susquehanna components with such locally derived lithic materials as Attleboro red felsite and quartz. The Seekonk 2 Site yielded an Atlantic point, seven Susquehanna Broad blades, a Mansion Inn blade, and two Orient points, all signifying occupations during the Late/Transitional phase (Rainey and Ritchie 1998)

4.1.4 Woodland Period (3,000 to 450 B.P.)

The Woodland Period is interpreted by archaeologists as a time of dynamic development for southern New England's indigenous peoples and, based on archaeological evidence, seems to have involved a general transition from a foraging way of life toward a comparatively more sedentary existence. The Woodland Period has traditionally been interpreted as reflecting an abandonment of the Archaic subsistence pattern of hunting/gathering/fishing, replacing, or supplementing it with the adoption of horticulture and ceramic technology (Snow 1980). Maize was introduced into southern New England from the Midwest during the Woodland Period, although the cultivation of indigenous plant species had probably begun long before that. Archaeological evidence from the region has suggested that certain local plants, such as goosefoot (*Chenopodium sp.*), sumpweed (*Iva annua*), sunflower (*Helianthus annus*), pigweed (*Amaranthus sp.*), and knotweed (*Polygonum sp.*), were brought under cultivation well before the introduction of tropical cultigens (Streuver and Vickery 1973; McBride 1978; Smith 1987). The transition from the Archaic Period into the Woodland Period does not reflect a strictly linear evolution from one stage to the next. The archaeological record supports a continued diversification of food resources, an increased reliance on shellfish and maritime resources, refinement in pottery manufacturing, the maintenance of long-distance trade and exchange networks, and eventually year-round coastal or riverine settlement with evidence for horticulture. Like the Archaic Period, the Woodland Period has been subdivided by archaeologists into Early, Middle, and Late periods.

4.1.4.1 Early Woodland Period (3,000 to 1,600 B.P.)

Early Woodland settlement patterns were characterized by limited use of upland areas and more intensive use of coastal and estuarine resources and locales. Coastal habitation sites and shell midden deposits from along the saltwater and estuarine margins of Maine to New York seem to reflect an increasing dependence on shellfish and other marine resources during the Early Woodland Period. Interior site locations that contain artifacts diagnostic of the Early Woodland

Period are not as numerous as the preceding periods. This observation may be related to the problem of determining what constitutes diagnostic artifact assemblages for the period.

Early Woodland archaeological deposits have traditionally been identified through the presence of Meadowood, Lagoon, and Rossville type projectile points, as well as grit-tempered, cord-marked Vinette I ceramic styles in the absence of radiocarbon assays. Early Woodland Period occupations, however, are generally underrepresented in the regional archaeological record. This observation has led to speculation that there was a population decline for the period (Dincauze 1974; Lavin 1988). Fiedel (2001) hypothesizes that either climatic or environmental changes, sociocultural change, or epidemics may have contributed to an "Early Woodland collapse." Conversely, others argue that the apparent underrepresentation of Early Woodland sites may stem from the difficulty in determining what constitutes diagnostic artifact assemblages for the period (Juli and McBride 1984). The positive association of some Small Stemmed projectile points with Early Woodland radiocarbon dates indicates that some Early Woodland assemblages are being misidentified as older Late Archaic materials. Nevertheless, the regional database appears to support the idea of a population decline for the period (Fiedel 2001), with settlement intensified along the estuary margins of Narragansett Bay with decreased coastal inundation and the stabilization of shorelines approximately 3,000 years ago.

The strongest evidence to date for Early Woodland Period activities in the vicinity of the Green Jacket Shoal study area comes from the Seekonk Archaeological District along the lower Ten Mile River. Although the site has yielded evidence for nearly 9,000 years of occupation, seven radiocarbon dates obtained from charcoal samples indicated repeated site use throughout the Early Woodland (Rainey and Ritchie 1998). Intermittent discoveries of Early Woodland ceramics and chipped stone tools have also occurred to the west along smaller tributaries, streams, and brooks (e.g., the Ledge Road Site on the Runnins River, Massachusetts Archaeological Society-identified sites along the Coles Brook), while several other nearby sites exhibit an apparent abandonment during this period (e.g., the Cove Lands Archaeological District). Meadowwood and Rossville projectile points have been collected from sites including Read Farm, Fields Point, Old Maid's Cove, and at nearby Fort Hill. In addition, Early Woodland sites have been identified based on shell and ceramic deposits found at the Jones Pond Shell Heap and Johannis Peninsula sites.

There does appear to be an obvious change in terms of the numbers and sizes of sites dating between 1600 and 3,000 B.P. Some sites, like the Seekonk 2 Site, show continuity of occupation while others are abandoned, and overall there is an obvious drop off in the actual numbers of dated occupations from the second millennium. The Small Stemmed Tradition may well have persisted at least through part of this period, although the available data is too patchy for a settlement pattern reconstruction. The changes described above for the Early Woodland Period archaeological record could relate to changes in seasonal rounds, a reduction in the availability of seasonally reliable foods, and the need for an increase in mobility as a result of undependable food sources (Rainey and Ritchie 1998).

4.1.4.2 Middle Woodland Period (1,600 to 1,000 B.P.)

Regionally, Middle Woodland site distribution reflects a continued focus on coastal or riverine ecosystems. Interior Middle Woodland sites particularly targeted major river bends and confluences. Small hunting camps were contrasted with larger residential habitations, and small

"nodal" sites specialized in the circulation of cultural materials through a formalized trade network may have been part of the regional Middle Woodland settlement system (Hecker 1995).

Traditionally the introduction, adoption, and subsequent intensification of horticulture in the Northeast has been perceived as substantially altering previously established settlement and subsistence patterns of Archaic Period hunters and gatherers (Snow 1980). Horticulture had important impacts on the Native American subsistence and settlement base for southern New England, as it initially supplemented and later supplanted the pre-existing focus on hunting and gathering during the Middle Woodland Period. However, the earliest evidence of domesticated agricultural products in the region dates to around A.D. 1000, coincident with the end of the period suggesting a "late" reliance on horticulture (Bendremer and Dewar 1994).

Artifacts diagnostic of the period include Jack's Reef Pentagonal and corner-notched, Fox Creek type projectile points, and rocker and dentate-stamped ceramics. Middle Woodland occupations in southeastern New England are commonly marked by a high occurrence of non-local chert, jasper, and various amounts of hornfels from the Blue Hills area south of Boston (Luedtke 1987; Ritchie and Gould 1985). The use of Boston Basin lithics and exotic cherts and jaspers is in contrast to the almost exclusive use of quartz and argillite Small Stemmed materials and Terminal Archaic Orient Phase materials dating to the Early Woodland Period. The relative frequency of "exotic" raw materials from Middle Woodland sites implies the existence of long-distance exchange networks extending from Labrador to Pennsylvania and beyond (Dragoo 1976; Fitting 1978; Snow 1980). Through established trade networks, the southern New England Native American cultures remained peripheral to, though influenced by, the prominent Hopewell culture situated in the Midwest (Kostiw 1995). Middle Woodland components are known from both interior and coastal settings in Rhode Island but are more common along the coast.

It appears that archaeological sites dating to the Middle Woodland are more visible in the Upper Narragansett Bay area than are Early Woodland sites. Diagnostic cultural material and radiocarbon dates from the Middle Woodland were recovered from the North Terrace and Bluff sections, respectively, of Walker Point Site. The Middle Woodland Period is also represented in the Seekonk Archaeological District by a radiocarbon-dated feature (1590±80 B.P.) and a substantial hornfels workshop with Jack's Reef Tradition tools and tool fragments (Rainey and Cox 1995). Based on the analysis, these activity areas are believed to be the result of more than one visit to the site. Hornfels chipping debris was recovered at the Seekonk 2 Site in unusually high quantities, concentrated in small, dense layers overlying older debitage deposits. Twelve percent of the total assemblage from the Seekonk 2 Site was comprised of hornfels, or over 1,100 pieces. Depositional analysis resulted in additional Middle Woodland associations relative to the dated feature mentioned above. A concentrated complex of features, including hearths, post molds, refuse pits and storage pits, was suspected to be associated with the Middle Woodland Period component on this site. In addition, a cluster of cobble hammerstones, a sandstone whetstone, and a felsite chopper were considered elements of the same occupational episode, during which food processing was a significant activity.

Recent archaeological investigations at the Red Slipper Site in Providence, also along the Seekonk River, produced evidence for a Middle and Late Woodland seasonal occupation where food procurement, processing, storage and disposal were ongoing activities. The Middle Woodland component included hornfels chipping debris, which comprised a large part of the artifact assemblage from site examination level excavations. Charcoal collected from this deposit was radiocarbon–dated at 1160±70 B.P. (Beta-41304) falling in the Middle to Late Woodland

Transitional Period (Glover and Harrison 1991:83). The Squantum Woods Site in East Providence also included a Middle/Late Woodland Period component – a shell midden investigated by avocational archaeologists. Diagnostic cultural materials recovered from the midden consist of a smoking pipe made of antler, a biface/knife of jasper, bone awls, antler tine flaking tools and projectile points, and shell or mineral tempered ceramics with incised line decoration (Fowler 1976). Shellfish remains and associated hornfels chipping debris was collected from the Bedrock Site at Kettle Point along the east bank of the Providence River in East Providence, also suggesting Middle Woodland Period activity (Pagoulatos and Ritchie 1987:37). A number of other smaller sites located along the coastal territory of upper Narragansett Bay contained evidence for Middle Woodland activity, including occasional Jack's Reef points at Read Farm and Field's Point and Greene points at the Pear Tree/A. Woods Site (Rainey and Ritchie 1998).

4.1.4.3 Late Woodland Period (1,000 to 450 B.P.)

The distribution of Late Woodland Period archaeological deposits appears to be a continuation of the Middle Woodland pattern with Late Woodland sites common in coastal environments, around interior freshwater ponds and wetlands, and adjacent to large tributary streams and rivers. Late Woodland settlement types included specialized exploitation sites (shell middens, hunting and processing camps, lithic workshops, etc.), small domestic sites, and larger hamlets or villages. By the Late Woodland Period maize horticulture continued to gain in importance. With intensive maize horticulture came the need, refinement, and advances in storage technology to ensure that ample maize would be available through the winter months and that a sufficient supply of seed crop would be available for the next season. With an increased reliance on storage, people became more tethered to specific site areas or localized regions. The result was decreased mobility, where residential mobility was abandoned in favor of logistical mobility. Logistical mobility involved task-specific groups of fewer individuals to set out for exploitative purposes. Coastal sites were contrasted with interior hunting sites where individuals exploited and hunted terrestrial animal species such as deer and gathered predictable botanical resources such as nuts and berries.

Increasing populations and the reduction in communal mobility influenced the development of formative Late Woodland territories and increasingly complex social structures. Social complexity, the formation of political alliances, and the establishment of tribal territories appear to have developed during the period (Mulholland 1988). Many researchers believe “intensive” maize horticulture must have been inextricably linked with population growth and Native American sedentary settlement reasoning that only such a productive subsistence economy could reliably support large communal populations. McBride and Dewar (1987) have countered, arguing that large settlements could have developed independently of horticulture, especially in ecologically rich settings such as coastal environments and estuaries, where there is a rich and reliable maritime or estuarine (fish and shellfish) base.

The Late Woodland Period is associated with an improvement in ceramic technology and production. Late Woodland artifacts represented in the regional archaeological record include triangular Madison and Levanna type projectile points and cord-wrapped, stick-impressed, and incised ceramics. Diagnostic Levanna projectile points were most often manufactured of quartz, argillite, as well as rhyolites derived from the Lynn Volcanic Suite and Blue Hills Area of northeastern Massachusetts and the Boston Basin, respectively; or coastal cobbles that were carried in glacial drift. The Midwestern trade in cultural items continued into the Late Woodland.

However, the importance of the Late Woodland's Midwestern trade had diminished relative to that of the preceding Middle Woodland.

The Late Woodland Period is well represented along the margins of southern Rhode Island's salt-water estuaries. Native American settlements that arguably qualify as "villages" have recently been the focus of archaeological investigation near Ninigret Pond in Charlestown and along the upper Point Judith tidal estuary in Narragansett (Leveillee et al. 2006). Low-density recoveries of Late Woodland projectiles are also reported from southern Rhode Island's interior. Nevertheless, the relatively fewer Woodland sites and low-density recoveries from the interior might be reflective of seasonal relocations of peoples for hunting and collecting purposes as the ancestral Narragansett Indians began to establish their characteristic coastally based settlement pattern (Waller and Leveillee 2002). The recently identified cluster of Late Woodland Period Native American archaeological sites that includes domestic village and ceremonial mortuary sites (Leveillee and Harrison 1996; Leveillee et al. 2006; Waller 2000) apparently represents the formation of an ancestral Narragansett homeland situated at the headwaters of the Point Judith Pond saltwater estuary of South Kingstown and Narragansett during the Late Woodland Period.

Intensive exploitation of shellfish and other estuarine resources is evident at many Middle to Late Woodland Period archaeological sites in the upper Narragansett Bay. Many shell midden sites have been studied or reported in coastal settings in the area, and the characteristic Late Woodland Levanna projectile points appear in a variety of settings throughout the Ten Mile, Seekonk and Providence River drainages. Within these drainage basins, the most complex Late Woodland and Early Contact Period occupation has been documented along the former shore of a natural cove which once existed at the confluence of the Moshassuck and Woonasquatucket rivers in downtown Providence. The data recovery program conducted at the Providence Cove Lands Site Archaeological District, referenced earlier, identified 24 features that were radiocarbon-dated between 930 B.P. and 250 B.P. Oyster and quahog were the most common species represented in the archaeological shell samples collected there. Seasonality studies conducted on one sample of the shell from the site resulted in the conclusion that this resource was harvested during the midsummer season between July and August (Artemel et al. 1984:III–C.30). In addition to shellfish collecting and processing during the Late Woodland, icthyofaunal remains from the north shore of the cove indicated that Atlantic cod, striped bass, white perch, menhaden, bluefish, porgy/scup, tautog, and blackfish were all being harvested and consumed by the Late Woodland groups in this area (Rainey and Ritchie 1998).

Levanna projectile points diagnostic of the Late Woodland Period have been found throughout the Ten Mile River drainage as a result of artifact collecting by avocational archaeologists during the early twentieth century. Many other sites that contain these tools have been discovered through cultural resource management surveys. Several Levanna points were found at the Seekonk 2 and 3 sites, and despite the lack of shell midden features, two probable hearth features were radiocarbon-dated to the Late Woodland (730±110 B.P. Beta–46924; and 850±90 B.P. Beta–46361).

The Kettle Point Site in East Providence represents a significant Late Woodland Period occupation containing a lithic workshop area, hearths, trash pits, and sherds from a large incised, shell–tempered ceramic vessel.

In view of the cumulative evidence for Late Woodland Period activity, the upper Narragansett Bay coastal region and the vicinity of the Green Jacket Shoal study area was clearly a dynamic setting in

which Native populations flourished. Seasonal rounds may have occurred in a restricted geographical zone, but they were not necessarily tied into a scheduled shellfish harvest. It seems more likely that spring fish runs in the smaller tributaries of the upper bay, such as the Woonasquatucket, Moshassuck, Runnins, and Ten Mile Rivers would have been a significant event influencing seasonal movements among local groups during the Late Woodland Period. In addition, the nature of settlement along the larger river banks may have been influenced by scheduled social events related to trading, reinforcement of kinship ties, or territoriality, among other things.

4.2 Contact/Post-contact Cultural Chronology

Native American settlement and subsistence patterns established during the Late Woodland were disrupted beginning in the early sixteenth century by foreign cultural contact, initially with European explorers and then with settlers. Sixteenth- and seventeenth-century Native American settlements were focused within traditional coastal tribal territories that developed prior to and during the Late Woodland Period. Some aspects of the Native culture patterns remained unchanged, some intensified, while others were adapted from European practices as a result of contact (Robinson et al. 1985; Rubertone 1989, 2001). The subsistence economy of the resident Native Americans eventually changed as a result of the increasing reliance on and partial adaptations to, the European commodity-based economic system (Turnbaugh 1993a, 1993b). Local Native Americans began to sell off their land or the rights to the resources supported by them as they became increasingly reliant upon European items and were involuntarily coerced into a "life of enforced dependency" (Bourne 1990).

4.2.1 The Sixteenth and Seventeenth Centuries

4.2.1.1 Early Interactions between Native Americans and Europeans in Rhode Island

European exploration and colonization of New England was a "vast maritime enterprise," as explorers and colonists traveled vast distances across the ocean and were sustained by its resources (St. Martin and Hall-Arber 2008; URI 2010). European contact with the indigenous peoples of Narragansett Bay was initiated when Giovanni de Verrazano and his crew of 50 sailed into Narragansett Bay on his vessel the *Dauphine* in 1524. Verrazano's account appears to report an encounter with the Narragansett peoples off Point Judith, in the town of present-day Narragansett at the mouth of Narragansett Bay. In his journal Verrazano recorded:

> *We weied Ancker, and sayled towarde the East, for so the coast trended, and so always for 50. leagues being in sight thereof wee discovered and Ilande in forme of a triangle [Block Island], distant from the maine lande 3. leagues . . . And wee came to another lande being 15. leagues distant from the Ilande, where wee founde a passing good haven, wherein being entred [the mouth of Narragansett Bay] we founde about 20. small boates of the people which with divers cries and wondrings came about our ship (Hakluyt cited in Chapin 1919).*

Over the course of his voyage, Verrazano recorded his impressions of the indigenous people he encountered and the lands in which they lived. His observations provide the first documented account of Narragansett Indian society and culture in Rhode Island with the exception of the lands between the Pawcatuck River and Weekapaug Brook (Potter 1835). Smaller groups of Narragansett, such as the Cowesett, Pawtuxet, Potowomut, and Shawomet were settled within localized areas within the larger Narragansett territory. The Narragansett settlement system

involved seasonal relocations related to the cultivation of corn and beans, the hunting of game in wooded valleys of the interior, as well as the seasonal harvesting of marine and freshwater resources (Simmons 1978). The Narragansett were distinguished from the other New England tribes by their political structure, religious beliefs, and their ability to participate in trade with the Europeans. A duel sachemship, involving two leaders of succeeding generations, with inheritance passing through patrilineal bloodlines, was in place as early as the sixteenth century (Boissevain and Roberts 1974; Simmons 1978).

The Seekonk River served as an important territorial boundary between Native American groups during the seventeenth century (RIHPC 1976:5; RIHPC 1986). To the east, the federation of Wampanoag Indians led by the sachem Massasoit occupied territory on the eastern side of Narragansett Bay through southeastern Massachusetts, Cape Cod, and the Islands (RIHPC 1976). The Narragansett Tribe occupied the lands on the west side of Narragansett Bay. The Seekonk River and several minor tributaries to the north were part of the Contact Period Native American transportation network, linking upper Narragansett Bay with Massachusetts Bay. Governor John Winthrop used the river during his 1645 explorations through the region. Early descriptions refer to the Seekonk River as part of the regular route from Providence to Boston at that time (Carlton 1940:508).

Contagious diseases, many of which the resident Algonquian Indians had not had sufficient time to build up natural immunities to, were introduced by European explorers and settlers to the Americas during the initial contact period. The result was a series of seventeenth-century epidemics that decimated southern New England's indigenous populations. Governor William Bradford of Massachusetts noted in 1621 that while the Massachusetts Indian tribes had been severely decimated by the first wave of epidemics in 1619, the Narragansett "had not been at all touched with this wasting plague" (Bradford 1981). However, the Narragansett were not spared a second wave of epidemics from 1633 to 1636. These plagues had the effect of opening large tracts of land that European settlers viewed as "vacant" and available for settlement.

In the 1620s, Dutch shallops (coastal vessels) from New Amsterdam (later New York) regularly entered Narragansett Bay. In 1625, Dutch traders established a short-lived base on "Dutch Island" in lower Narragansett Bay where they conducted a lucrative trade with the area's native peoples. Narragansett Indian access to the coast afforded the opportunity to produce wampum, which was readily adopted as a storable medium of exchange by both the Dutch and English. The wampum trade brought wealth and power to the Narragansett and the Pequots, who controlled its production along the Connecticut coast. Narragansett control of wampum production and distribution contributed to their domination over surrounding groups. Hostilities between the Pequots and the Connecticut settlers escalated following the death of Captain John Stone in 1634. On August 24, 1636, a contingent of English under the command of John Endicott arrived at Block Island to detain the killers of John Stone and trader John Oldham, who had been recently attacked and killed during a trading venture to the island on July 20, 1636. Here they killed 14 and burned the Indian's village and crops. In May of 1637, the English court at Hartford formally declared war against the Pequot. Captain John Mason and 90 men proceeded down the Connecticut River with a band of Mohegans under the Sachem Uncas toward the Pequot territory. The Niantic Indians, residing at Fort Ninigret in present-day Charlestown, were at first reluctant to join the war. However, sachem Ninigret eventually sent approximately 150 Niantics along with Captain Mason's army after receiving instructions to do so from Narragansett sachem Miantonomi (Chapin 1931). The combined Connecticut, Rhode Island, and Massachusetts colonial and Narragansett, Mohegan,

and Eastern Niantic contingent assaulted the Pequot's fort in Mystic on May 26. The result of hostilities directed at the Pequots during the Pequot War of 1636–1637 effectively neutralized the Pequot's influence in the region.

4.2.1.2 Expansion of European Settlement in the Providence Area

The radical 'separatist' beliefs of the Puritan, Roger Williams, led to the first European colonial settlement in Seekonk and eventually in Providence. Church and government leaders of Massachusetts Bay and Plymouth colonies exiled Williams from Massachusetts in 1635 for his opposition to their policies (Conforti 1976). With the support of a small group of followers, he began a settlement on the northern side of the Seekonk Cove (Omega Pond) in the area of present day Roger Williams Avenue, just north of the Green Jacket Shoal study area. Williams purchased land in this area from the Indians.

The settlement was called "Seacunke" (Seekonk) after the Indian word for the black geese that thrived in the marshlands of the Seekonk Cove. Within a few months of arriving, Governor Winthrop informed Williams and his followers that they had settled in territory that was under the Plymouth colony's jurisdiction and were not welcome (Conforti 1976; RIHPC 1976). Williams purchased more land from the Narragansett sachems Canonicus and Miantonomi in 1636 and moved his group to a new location outside the Plymouth colony's authority on the west side of the Seekonk River to a location they called, "Providence."

During the next few years, with the support of Roger Williams, an influx of Puritan pioneers attempted to re-establish the Seekonk settlement, although most joined Williams in Providence, as the newly-founded settlement accepted anyone fleeing religious persecution regardless of one's personal religious convictions. In 1641, Governor Winslow of the Plymouth Colony and John Brown, acting as an assistant, purchased between "eight and ten square miles" (i.e., actually closer to 100 mi^2 (259 km^2) or 64,000 acres in today's measurement) of land from Massasoit, chief of the Wampanoags. The area encompassed the present–day communities of Rehoboth and Seekonk, Massachusetts, most of East Providence and parts of Pawtucket (RIHPC 1976:5). Preparations for a permanent settlement were soon thereafter underway, including survey of the land, establishment of a form of local government, and determination of lot sizes for each household. By far the largest portions of land were reserved as woodlands or commonly owned meadowlands with 503 acres laid out as house lots and salt marsh areas set aside (RIHPC 1976).

These lands began to be occupied by European settlers beginning in 1643, when some 200 Puritans led by 58 proprietors arrived to settle the area. In 1645, the new township of Seekonk's name was changed to 'Rehoboth,' a biblical name for a place set next to a river on a broad, level plain (Simon and Gallagher 1981:36).

The most significant developmental aspect of the community was the configuration of house lots, which bordered the Ten Mile River to the east and south and the land of the earlier settlers along the cove to the west in the area that is present-day Rumford. Each of these 6, 8 and 10-acre parcels were assigned to proprietors based on their proportionate wealth. The lots were long and finger-like with their ends facing an enormous 200-acre town common. Collectively, these properties were referred to as the "Ring of the Greene" or the "Ring of the Towne" (RIHPC 1976). Agriculture provided the economic base for Rehoboth (i.e., Seekonk, and later East Providence), and would remain the dominant activity for the next 200 years, and one that still had importance into the

twentieth century. Grist mills, which were connected directly to agricultural activities, began to appear within the first ten years of settlement. Despite Providence's position at the head of Narragansett Bay, the commercial development of the colonial settlement at Newport during this early period was more rapid on land and in the water than was that of Providence.

During the first 40 years of Providence's existence, it remained exclusively a fishing and farming village that was laid out along a single dirt road called "the Towne Street," which followed the route of present-day North and South Main streets. Local fishing and shellfish gathering were practiced, but long-distance trade and fishing voyages were not undertaken from Providence until the 1680s, after Pardon Tillinghast built a wharf just north of present-day Transit Street (Cady 1957:1,13; Conley and Campbell 1982; Department of the Army 1982b:APPENDIX7:3).

While Providence's contribution to Rhode Island's maritime trade during the seventeenth century was limited, maritime traffic in Narragansett Bay did develop in the Rhode Island colony between Newport and other colonial ports in Massachusetts and New Amsterdam. Some of the first English cargoes of Indian-grown maize were shipped out of Rhode Island to Boston. Although Rhode Island's merchants embraced and sought to expand commercial connections with Massachusetts, they also fostered links with New Amsterdam. This latter connection with Manhattan resulted in increasing numbers of Rhode Island merchant vessels engaged in trade (Bridenbaugh 1974). Vessels of the period plying the region's waters and built in the colony for trade and fishing included small skiffs, pinnaces, shallops, and ketches, ranging from 16 to 30 tons. In 1649, Captain Jeremiah Clarke built the barque, *Sea Flower*, which was the first Rhode Island merchantman larger than a shallop. Generally speaking, barques ranged from 30 to 50 tons in size (URI 2010).

During the 1640s, Rhode Islanders cultivated modest amounts of tobacco, which they exchanged for English manufactured goods, including textiles and ironware. William Coddington and William Withington were two of the earliest pioneers in this regard (Bridenbaugh 1974). An influx of Quakers into Rhode Island, which began in 1657 and accelerated after 1672, had a significant impact on the patterns of trade and transportation in Rhode Island's waters, as the Quakers bought with them extensive regional and international commercial connections. Rhode Island Sound soon became their principal commercial thoroughfare (URI 2010).

The commercial fisheries of Rhode Island have origins dating back to the seventeenth century (Hall-Arber et al. 2001). Colonial fishermen in Rhode Island operated a "hook and line" fishery utilizing small skiffs, or set seine nets along the shore. The small fish caught with seines were used primarily as manure in the fields (Olsen et al. 1980). Indian fishing is also historically documented during the late seventeenth century – on Block Island, where archaeological examples of native fishing technology in the form of heavy grooved stone net sinkers are periodically found by people walking the island's shores (Livermore 1877).

The steady infusion of colonists into Narragansett Country throughout the mid- to late seventeenth century was facilitated by a series of complex and confusing land transactions between the Narragansetts, other Native groups, and Europeans. The Pettaquamscutt Purchase of 1658 initiated inland colonial expansion (RIHPHC 1984) and set the stage for the future plantation-style settlement pattern of the early eighteenth century.

By 1674, friction had increased significantly between the English colonists and the region's native peoples, mainly as a result of the gradual expansion of English control over the land, which

"push[ed] the Indians into an ever decreasing extent of territory" (Leach 1958). Perceived and real social and economic injustices on behalf of the English colonists, as well as the resident indigenous peoples, contributed to deteriorating relations between the two groups throughout the seventeenth century. Worsening relations eventually culminated with an all-out Wampanoag Indian assault on the settlement of Swansea, Massachusetts in June 1675. This attack marked the first assault of King Phillip's War (1675 to 1676), and hostilities soon spread throughout New England. Although the Narragansett initially attempted to remain neutral during the outbreak of the war, they acted contrary to an agreement with the English prohibiting the sheltering of Wampanoag war refugees. The colonies viewed this as act of aggression and planned a pre-emptive strike against the Narragansett fearing they would openly side with Metacom (King Phillip) and join in hostilities against the English (Robinson et al. 2012).

Combined colonial troops, with the aid of a Narragansett named Peter, marched from Richard Smith's garrison in Wickford to Jireh Bull's garrison at Tower Hill and then onward to the Narragansett palisaded fort concealed in the Great Swamp of South Kingstown on December 19, 1675. There, the colonists defeated the Narragansetts by killing hundreds of men, women, and children and destroying their village (Leach 1958). Many Narragansett survivors fled to the "Queen's Fort" of squaw sachem Quiapen along the borders of present-day North Kingstown and northeastern Exeter, while the English returned to Richard Smith's garrison at Cocumscussoc. Many colonial soldiers died on the trail from the Great Swamp to Cocumscussoc with 40 of the English dead being buried in a common grave on the Cocumscussoc trading post grounds. Seventy men stayed at Cocumscussoc after the assault as a garrison to guard against retaliation by surviving Narragansett. In March of 1677, when the soldiers departed, the Narragansett retaliated by burning down Smith's Garrison block house. Hostilities associated with King Phillip's War eventually ended with Phillip's capture and death at the hands of Benjamin Church in Bristol on the morning of August 12, 1676. King Philip's War effectively diffused Native American power in southern New England, but destroyed nearly all of what had existed of the original Providence and Rehoboth (i.e., East Providence) settlements (Simon and Gallagher 1981:36-37).

4.2.2 The Eighteenth Century

4.2.2.1 Expansion of European Settlement

The century following King Phillip's War and up to the American Revolutionary War (1776–1784) was defined largely by rapid expansion and development of the Rhode Island colony. Large farms situated along the coastal plain with smaller, dispersed farms in the hilly uplands characterized much of Rhode Island's late-seventeenth/early-eighteenth-century settlement. At the time of the first colony-wide census in 1708, Providence's population was just 1,446 (Conley and Campbell 1982:12). By 1760, that number had increased to approximately 4,000 (Conley and Campbell 1982:12). Most of these settlers moved to farm the "outlands" around Providence (i.e., initially in present-day Scituate, Gloucester, Smithfield, and later in Cranston, Johnston and North Providence). Those who stayed in town, settled around the Providence and Seekonk Rivers and "the Cove."

Generally good soil conditions, temperature, climate, and easy access to water transportation all contributed to economic prosperity in the Rhode Island colony in the late-seventeenth and early-eighteenth-centuries. Large plantations, aided by African slave and Native American indentured servant labor, derived their wealth from agricultural rather than from mercantile trade (Miller 1934). Many of the plantations were stock and dairy farms that marketed large quantities of live

animals, such as cattle and sheep, and bred horses and hogs. Pork, butter, cheese, and wool were important trade items. Staple field crops included native corn, hay, tobacco, rye, wheat, oats, and barley.

Larger plantations were focused in coastal areas, while smaller subsistence farms tended to be located in the interior. Roads were built to connect plantations with ports along Narragansett Bay, further stimulating agricultural and commercial growth. Small commercial and industrial hamlets grew up along these roads. Saw and gristmills established along interior streams, helped to fortify the local economy.

4.2.2.2 Maritime Commerce and Concurrent Waterfront Development

For the region as a whole, maritime trade prospered during this period. Following the Peace of Utrecht (1713), which ended the War of Spanish Succession and gave England dominance, the seas became a relatively safe place for merchant vessels. As Rhode Island's economy grew during the early eighteenth century, Newport emerged as the colony's principal port with Providence following close behind (Providence's pre-eminence would not come until after the American Revolution).

The overall increase in the amount and types of maritime trade being conducted during the period necessitated an increase in shipbuilding and the development of more specialized vessel types. In 1708, Rhode Island merchants owned a total of 24 vessels. By 1731, that number had increased to 80 vessels, then to 120 vessels by 1740, and more than 500 by 1763 (McLoughlin 1986; URI 2010). By the early eighteenth century, an increasing number of sloops began to be produced by Rhode Island's shipbuilders (Bridenbaugh 1974). In 1713, the first American schooner was launched and would remain a significant part of the eastern seaboard commercial fleet well into the twentieth century.

The most common coastal vessels utilized of the period were small shallops, sloops, ketches and pinnaces, used mostly by fishermen. These coastal vessels generally measured 30 to 40 ft (9.1 to 12.2 m) in length with a displacement of between 25 and 40 tons, and possessed just a quarterdeck, if any deck at all (Bauer 1988; Weeden 1890).

The oceangoing vessels of the period were generally ships, barks, and pinks. These vessels were small by today's standards, typically measuring 60 ft (18.3 m) or less from bow to stern with the largest seldom exceeding 100 ft (30.5 m) (Kemp 1976). As cargo capacity was more important to merchants of the period than speed, ocean-going ships tended to be relatively wide-beamed with length-to-breadth ratios of approximately 3:1. Vessels of this period were also typically ballasted with river-worn stone, although some, particularly those inbound from Europe, carried brick or other materials as ballast that could be sold in the colonies at their journey's end. As piracy remained a constant threat to ocean-going vessels, nearly all types were typically armed with four- to six-pound guns.

In the decades before the American Revolution, Providence was transformed from a fishing-and-farming village into a commercial town with a flourishing maritime trade (Conley and Campbell 1982:23). The settlement's character also became increasingly cosmopolitan. In 1704, there were 12 wharves and warehouses on the Providence River (Kimball 1912). By 1760, Providence possessed a merchant aristocracy, a few important industries, a body of skilled artisans, a

newspaper and printing press, a stagecoach line, and several impressive public buildings (Conley and Campbell 1982:12).

Ships built in Providence were now engaged in coastal trade from Boston to Savannah and in international trade with the West Indies, South America, and West Africa. It was during the eighteenth century that the infamous "Triangle Trade" network developed through which molasses and sugar, rum, and slaves were shipped between the North American colonies, the islands of the Caribbean, and Africa. Rhode Island's merchants played an active role in this trade, and shipped sugar, molasses, rum, whale oil, spermaceti candles, livestock, fish, lumber, wheat, and slaves to ports all around the Atlantic (URI 2010).

Among Providence's major exports were lumber, naval stores, fish, dairy products, horses, sheep, corn, and tobacco. Sugar and molasses were imported from the West Indies and distilled into rum. This valued commodity was, in turn, bartered for slaves on the western coast of Africa. The West Indies trade was the most important throughout much of the eighteenth century, and several Providence families rose to wealth and prominence because of it. Providence merchants, such as John Brown, and merchants from Rhode Island's other port towns (i.e., Bristol, Warren and Newport) made Rhode Island the most prominent American colonial participant in the slave trade (Conley and Campbell 1982:23). Of 54 ships owned in Providence in 1764, 40 were used in the West Indies trade, while the remaining vessels were coasters (Department of the Army 1982a:3).

A small number of the vessels involved in the West Indies trade were also employed in small-scale whaling carried out in Narragansett Bay in the early eighteenth century, and later in the whaling conducted in the South Atlantic. In 1785, there were six whaling vessels owned in Providence (Department of the Army 1982a:3). Privateering was another highly profitable, but highly-risky, trade in which Providence mariners engaged, particularly in the 1740s, during the wars between France, Spain and Great Britain, but also during the American Revolution, as well.

Extensive shore-based trades related to maritime commerce also developed in Providence during this time. Distilleries were established at the ends of wharves. Ropewalks and spermaceti candle works also appeared. Several shipyards were built along the waterfront, particularly in "the Cove" area of the upper Providence River (i.e., in the vicinity of the present-day locations of the Providence Place Mall and the Providence train station). The first shipyards in Providence appeared in 1712, and their numbers and the tonnage of ships produced increased throughout the century. Production of these early Providence shipyards concentrated on coasters – schooners, sloops, brigantines, and brigs, with some larger vessels also built (Cady 1957:21; Department of the Army 1982b:4).

On the eastern side of the Seekonk River, low population density marked the settlement pattern of the town throughout the eighteenth century (Simon and Gallagher 1981:37). Considerable decentralization occurred in Rehoboth (i.e., East Providence) during the first half of the eighteenth century, as no provisions were made for new settlers in the apportionment of properties around the Ring. As a result, several new outlying areas began to seek autonomy. Attleboro broke away first (1694), followed by Cumberland in 1747, and then parts of the original Rehoboth settlement. New communities emerged in what remained of Rehoboth, while the Ring continued to be the focus for the township's civic and religious activities.

Wharves and stores located on the Seekonk River at Seekonk Cove served as distribution points for wood and other products. People regularly traveled across the river from Providence to purchase goods (Simon and Gallagher 1981:37).

While lands encompassing Bold Point adjacent to the Green Jacket Shoal study area were among the earliest to be settled in the old Rehoboth settlement, they remained sparsely inhabited through the eighteenth and most of the first half of the nineteenth centuries. Access to these lands from Providence was improved, however, during the period with the opening of two rival toll bridges in 1793 at former ferry crossings across the Seekonk River just north of Bold Point – the Washington (India Point) Bridge (built by John Brown) and the Central (later Red) Bridge (built by his brother, Moses). These bridges created important new links between the two communities on either side of the river, and strengthening their ties. The village of Watchemoket would eventually develop at the eastern terminus of the Washington Bridge. With other improvements in over-land routes, Rehoboth's (East Providence's) geographic position became increasingly important, traversed as it was by stage roads connecting Providence with Bristol, Warren, Fall River and Boston. This favorable geographic location would lead to development that followed in the nineteenth century that permanently changed the area's physical character (RIHPC 1976:18).

4.2.2.3 Conflict with Britain

Facing an immense war debt that threatened its national economy following the French and Indian War (1754 to 1763), British authorities sought increased revenues from its American colonies through increased taxation. These increased taxes threatening the semi-autonomy and finances of Rhode Island and the other American colonies and ultimately led to the War for Independence. Rhode Island's maritime-based economy meant that its merchants felt the sting of increased taxes sooner and more significantly than in the other British North American colonies. Consequently, the coastal margins and islands of Narragansett Bay were among the first places to experience the pressures of inevitable conflict, as British ships and goods became targets of the earliest acts of colonial rebellion.

Armed resistance to British authority in America began on Rhode Island waters, and ultimately led to the development of the United States Navy (URI 2010). In December 1763, the British vessel HMS *Squirrel*, sailed into Narragansett Bay to enforce new regulations. Seven months later in July 1764, at the orders of two members of the governor's council, gunners fired eight shots at a tender from *Squirrel* after a British-sparked mobbing incident at Newport. This incident was followed by the burning of the HMS *Gaspee* in the Bay by disgruntled Rhode Island colonists in 1772 – an event that, along with the Boston Tea Party and the Stamp Act Crisis, represented a significant step towards revolution (Bartlett 1858; McLoughlin 1986; URI 2010).

Rhode Island became the first of the American colonies to take up arms against Great Britain, as the Rhode Island General Assembly began provisioning Rhode Island's towns with guns, powder, lead, and flint for the inevitable conflict by 1775. During the war, University Hall in Providence was used as a barracks and hospital for troops and the Brick School House served as an ammunition arsenal. Beacons were erected at the corners of Prospect and Meeting Streets on College Hill and Beacon and Point Streets. Fortifications and batteries were established at the Prospect Street beacon, Fox Point, the entrance to the Seekonk River, Field's Point, Robin Hill, and at Fort Sullivan (Woodward and Sanderson 1986:45).

Rhode Island was also the first to propose a Continental Congress, the first to formally sever ties with the British monarchy, and the first to create a navy (URI 2010). In June of 1775, the Rhode Island legislature established America's first navy with the commissioning of the *Washington* and the 12-gun sloop *Katy* (later renamed the sloop *Providence*). Within a few days of its commissioning, the crew of *Katy* captured the Royal Navy's tender *Diana* (tender to the HMS *Rose*) off of Jamestown, Rhode Island, which, in some respects, represented the first naval battle of the Revolution (Fowler 1976; URI 2010).

In October 1775, the Continental Congress passed a Rhode Island-proposed resolution by Stephen Hopkins to create a Continental Navy. Rhode Island supplied two of thirteen new ships, including the 28-gun frigate *Providence* (a different vessel from the sloop *Katy/Providence)*, and the 32-gun frigate *Warren*. The following month, Hopkins's brother Esek, a Rhode Island sea captain, became the Continental Navy's first commander-in-chief (Fowler 1976; URI 2010).

Some of the fledgling United States Navy's earliest actions took place in Rhode Island waters. In April 1776, Commander-in-Chief Esek Hopkins, captaining the *Providence*, captured the British tender *Hawk* off Block Island, as well as the brig (bomb vessel) *Bolton*. On April 6, Hopkins's squadron engaged, but did not capture, the HMS *Glasgow* off Point Judith. The following month, John Paul Jones, the "father of the American Navy," became the captain of the sloop *Providence* (the former *Katy*) (McLoughlin 1986).

Recognizing Newport's importance as one of the colonies' principal ports and acknowledging Rhode Island's leading position as a hotbed of colonial insurrection, the British took Newport in an amphibious assault in December of 1776 following the outbreak of the Revolutionary War. The subsequent three-year British occupation had dire consequences for Rhode Island and the city's maritime economy, ending forever the glory days of a Newport-owned commercial fleet. Many colonial merchants fled, taking their trade and shipping with them. As a result, Rhode Island's center of political and economic influence shifted from Newport to Providence, where it would forever remain following the conclusion of hostilities (URI 2010).

By cutting off Rhode Island's customary access to the sea, the British naval control of Rhode Island Sound and Narragansett Bay brought serious hardship for Rhode Island's inhabitants. Despite the superiority of Britain's occupying imperial forces, Rhode Island maintained an offensive strategy on its waters through privateering, and commissioned a total of 65 privateers in 1776. The new frigates *Providence* and *Warren* along with the sloop *Providence*, which had been trapped in Narragansett Bay as a result of the British occupation, slipped the blockade in early 1778. The Continental ship, *Columbus*, however, failed in its bid for the open sea, and ran aground and was burned near Point Judith (URI 2010).

In March 1778, France recognized the United States of America and entered the war as an ally, thereby broadening a colonial rebellion into a European and Atlantic conflict. The French king sent a fleet under French Admiral d'Estaing, to assist the Continental forces, and its first actions involved supporting an unsuccessful American effort to liberate Newport in the summer of 1778 (URI 2010).

The French fleet comprised 12 ships-of-the-line, four frigates and 2,800 marines, a force far more powerful than the British frigates and smaller vessels stationed in Rhode Island. Faced with certain capture, the British forces sunk, scuttled or burned all of their vessels between July 29 and August 8, 1778. English losses including the sloops *Kingsfisher* and *Falcon*, the galleys *Alarm* and *Spitfire*,

and the frigates *Lark*, *Cerberus*, *Orpheus*, *Juno* and *Flora* as well as 13 transport ships in Newport Harbor (Abbass 2000; URI 2010).

In response to the attempt to liberate Newport, a British fleet under the command of Lord Howe approached Narragansett Bay in August of 1778 to engage the French and Americans. Caught by surprise, the French began a defensive engagement with Howe's ships. As the sea battle was underway off Point Judith, a nor'easter came in and battered both fleets for four days. The ships were widely separated by the storm with no decisive outcome to the battle.

The war effectively ended on October 19, 1781 with the British surrender under command of Lord Charles Cornwallis to Major General Benjamin Lincoln at Yorktown, Virginia. By the close of the Revolutionary War, the trajectory of Rhode Island's history had been altered permanently and its economy reshaped, with the focal point of Rhode Island's political and financial affairs having shifted from Newport to Providence. The cessation of slavery, division of estates, curtailment of trade with the West Indies, and ultimately the Revolutionary War all contributed to the end of the plantation lifestyle during the latter eighteenth century (Miller 1934). Large plantation tracts began to be subdivided into smaller farmsteads. The fighting that had occurred at sea during the Revolution also resulted in the deposition of at least 33 historically significant shipwrecks in Rhode Island waters (URI 2010).

The three-year occupation of Newport by British troops and the British blockade of Narragansett Bay had a profound and lasting effect on the distribution of population, wealth and power in Rhode Island. The pattern of 1676 seen during King Philip's War was reversed along with the relative importance of the colony's two principal towns, as Newport's inhabitants were forced to abandon the port town and take refuge in Providence.

Although war unquestionably had an overall negative impact on Rhode Island's commerce, Providence entrepreneurs who continued to do business during the war years, importing their wares through the ports of New London and New Bedford, actually prospered by selling cannon and other weapons, ships, naval stores and provisions to American and French forces (Conley and Campbell 1982:26; Woodward and Sanderson 1986:45). In addition, privateering (i.e., the use of private ships-of-war authorized to harass British shipping by capturing and selling enemy cargo vessels as "prizes") also proved lucrative for a number of Providence's ship captains. When the blockade was lifted in 1781, 129 Providence-registered vessels returned to their home-port. Unlike Newport, Providence emerged from the war with its ships, fortunes and merchant ranks intact (Woodward and Sanderson 1986:45).

After the war ended, Providence resumed its pattern of pre-war commerce and attained new economic levels of growth. When the shipping of local merchants was barred from the British West Indies in 1784, new routes of trade with ports in Latin America and the Orient were developed by Providence merchants and the highly profitable East Indies trade was opened. When the first federal census was taken in 1790, Providence's population was 6,380 (Conley and Campbell 1982:28). When the next federal census was taken in 1800, Newport's population was surpassed by that of Providence, which became the state's largest town with 7,614 inhabitants (Cady 1957:57). When Elihah Ormsbee's vessel, *Experiment*, one of the earliest boats to be driven by steam-power in the world, appeared on the Seekonk River traveling between Providence and Pawtucket for several weeks in 1792, it was a harbinger of the future direction that Providence's transportation,

commerce, and industry would take in the following century (Figure 4-2) (Bordon 1957; Dayton 1925; Kelly 1958).

4.2.3 The Nineteenth Century

4.2.3.1 Industrial Expansion

Following the cessation of hostilities at the conclusion of the United States' second war with Great Britain, the War of 1812, America emerged with a strong sense of nationalism that found expression in economic policy and culture as the United States transformed itself from a colonial culture of agrarian simplicity into an increasingly industrialized world empire, at the heart of which was Rhode Island where America's industrial era began. Contributing to this transformation, among other improvements, was the improvement of the country's national transportation infrastructure for the nation's growing population. The availability of cheap land, regular and inexpensive trans-Atlantic packet service between the United States and Europe, and hard times in the Old World, combined to provide strong incentives for immigrating to the United States. Between 1819 and 1850, the number of immigrants coming into America increased from 7,000 to more than 300,000 per annum, and Providence's population had risen to 16,836 by 1830 (Tindall 1984; Woodward and Sanderson 1986:45).

The nineteenth century also brought with it new technologies that greatly assisted Rhode Island's economic stability, counterbalancing the decreasing importance of agricultural pursuits in some areas. The introduction of mechanized cotton textile manufacturing by Samuel Slater near the start of the nineteenth century led to the development of mill villages along major waterways throughout the state, many of which were located on the sites of earlier saw and gristmills. By 1815, three-fifths of the southern New England cotton mills were located in Rhode Island. By 1830, manufacturing had replaced maritime activity as the dynamic element of Providence's economy and industry had become the principal outlet for venture capital and the primary source of the city's wealth. Providence's four main areas of manufacturing were: 1) base metals and machinery; 2) cotton textiles; 3) woolen textiles; and 4) jewelry and silverware. Capitalizing on its superior financial resources and banking facilities, its geographical location as the hub of southeastern New England's growing transportation network, and its skilled workforce of newly emigrated inhabitants, pursuit of these four manufacturing foci made Providence the industrial leader of the nation's most industrialized state during the nineteenth century (Conley and Campbell 1982:86).

The American Civil War (1861 to 1865) stimulated a national full-scale expansion of established manufacturers. In Rhode Island, the base metal industries profited from the sales of rifles, steam engines and machinery. War also provided incentives for the expansion and mechanization of other industries, such as the manufacture of cotton and wool textiles. Staffing of these expanded manufacturers' plants took advantage of the flood of immigrants from England, Scotland and English-speaking Canada, many of whom were already skilled textile workers. The Irish immigrants who also came to American in record numbers had mostly been farm laborers prior to emigrating, so they performed most of the unskilled work in Providence, such as railroad construction and earth-moving to fill in the Cove in 1848, prior to moving into factory work (Woodward and Sanderson 1986:53).

During the war, there were eight calls for troops and Rhode Island exceeded the requisition for all but one call-up, furnishing the Union with a total of 23,236 fighting men when the quota was only

18,898. Of the 23,236 Rhode Islanders who went off to war, 1,685 died of wounds or disease. As the largest population center in the state, Providence alone provided nearly half of the total number of Rhode Island troops (Conley and Campbell 1982).

In addition to providing human resources to the defense of the Union, Providence played a prominent role in the North's manufacture of supplies for the war effort, the latter of which has been cited as one of the principle reasons that the North was victorious in the conflict. Providence's woolen mills, especially the Atlantic and Wanskuck mills, supplied federal troops with uniforms, overcoats, and blankets stitched on sewing machines made by Brown & Sharpe. Providence's metal factories (e.g., Providence Tool, Nicholson and Brownell, and the Burnside Rifle Company) provided guns, sabers, and musket parts, and its foundries produced large numbers of cannon. The Providence Steam Engine Company built engines for two Union sloops-of-war – *Algonquin* and *Contoocook*. The Union military was provided with iron bars, bands, hoops, and horseshoes by Congdon and Carpenter (Conley and Campbell 1982: 86).

Providence's metals firms, which had expanded dramatically during the Civil War, reorganized for peacetime production. The Burnside Rifle Company was transformed into the Rhode Island Locomotive Works, and Nicholson and Burnside, who had produced parts for Springfield muskets, became the Nicholson File Company. By the close of the nineteenth century, Providence was the third largest manufacturer of all types of machine tools. The city was also recognized as the national leader in wool and worsted goods production. The 1,933 firms doing business in Providence produced $200 million in manufactured goods in 1904 - $40 million in woolens and worsteds; $26 million in cotton goods; $17 million in jewelry and silver; $13 million in machines; $10 million in rubber goods; $5 million in electrical supplies; and $1.5 million in silks (Woodward and Sanderson 1986:57).

While Providence's foreign maritime trade had essentially ended by the time of the American Civil War, the total value of trade in Providence actually increased during the second half of the nineteenth century due to the growth in the coastal trade. In 1881, 100 (mostly foreign-owned) foreign trade vessels and 5,094 coastal traders were documented entering the port of Providence. The primary coastal imports were coal, flour, lumber and other building materials, grain, cotton, wool, and flax (King 1882). These bulk goods, especially the raw materials, for cloth manufacture, and the coal and lumber relate to the increased industrialization and urbanization of southern New England during this period.

Coal was the most important of these imported products. Prior to the 1830s, most of the coal coming into the port was from England. By mid-century, the coal was coming into the port from Canadian and domestic sources. Shortly after the turn of the twentieth century (1909), coal made up 47 percent of all imports, general steamer freight made 13 percent, lumber 4 percent and oil 3 percent. Importation of lumber and building materials from Canada and the west coast increased sharply in the early twentieth century (800 percent in the 1920s).

The transition to peacetime economy was complicated by the Panic of 1873, which had a more devastating effect than previous national economic depressions because of the extent and rate of expansion during and after the Civil War. Recovery was essentially complete by 1879, and the remaining decades of the nineteenth century and up until World War I saw spectacular growth, progress, and prosperity in Providence. The optimistic tone of the era is evident in the promotional

pieces published by the Board of Trade at that time, which described the city in 1895 as:

> *Providence, built like Rome upon its seven hills, fanned by gentle breezes from the ocean, with its freedom from serious epidemics, its great wealth, large banking facilities, large and varied industries, its nearness to other great commercial centers, its society, schools, churches, beautiful surroundings and splendid streets, is not excelled by any other city in the U.S. for residence and business purposes (Woodward and Sanderson 1986 quoting the 1895 Board of Trade Journal*).

By the close of the century, Providence was the nation's third largest manufacturer of all types of machine tools, and was purported to have the world's largest tool factory (Brown & Sharpe), file factory (Nicholson file), engine factory (Corliss Steam Engine Company), screw factory (American Screw), and silverware factory (Gorham) (Woodward and Sanderson 1986:56). By the end of the nineteenth century, Providence also was the nation's leading producer of jewelry and wool and worsted goods (Woodward and Sanderson 1986:55).

4.2.3.2 Maritime Commerce

The last two decades of the eighteenth century had witnessed the opening and growth of the highly-profitable China and East India trade. This trade continued to factor prominently in the development of Providence as a port during the first half of the nineteenth century. Large oceanic vessels owned by Providence's most prominent trading companies engaged in this commerce and sailed to Europe, South America, the North American west coast, and Australia *en route* to China. Goods from these areas were sold in China and other Asian markets, and the ships returned to Providence with tea and luxury products. Members of Providence's Brown family were the primary owners and investors in the vessels known as "East Indiamen," most of which were built and operated between 1787 and 1831. Trade with China from the port of Providence began when John Brown and his son-in-law, John Francis, sent their ship, *General Washington*, to China with a cargo of rum, cheese, spermaceti candles, and locally-forged cannon from Hope Furnace. The ship returned with a cargo of nearly 800 chests of tea, gunpowder, silk, flannel, chinaware and a small fortune in profits for its investors (Conley and Campbell 1982:39).

Significant harbor-side infrastructure was needed to support Providence's burgeoning East India trade. Brown & Francis and Brown & Ives built wharves, warehouses, and shipyards along the city's southern shoreline between Fox and India points, directly across the mouth of the Seekonk River from Bold Point and the Green Jacket Shoal study area. In the 1790s, the Brown companies owned more than half of the ship-rigged vessels registered in the port of Providence (Department of the Army 1982b). Between 1787 and 1828, Providence merchants averaged a total of three voyages to China annually, and a single voyage could realize a profit of $400,000 on a $200,000 investment (Woodward and Sanderson 1986:46).

An embargo preceding the War of 1812 and the effects on shipping from the war itself between 1807 and 1815 had a sharply negative impact on Providence's East India trade. Although the trade resumed after the war's end, competition with larger clipper ships from Boston, New York and other better-situated and improved harbors led to a sharp decline in the trade beginning in 1828. By 1841, Providence's role in the East India trade had ended.

Providence's involvement in the slave trade also ended during the early nineteenth century. A commodities trade with Africa emerged subsequently, and was profitable during the 1830s and 1840s. Trade with Europe generally followed the same patterns of growth and decline as the West Indies trade, as result of each warring nation's colonial connections there. On average, 60 Providence ships per year traded with South America and the West Indies, and 30 per year traveled to and traded with European ports. Manufactured goods and coal were the primary imports in Providence's European trade. The latter product was used for powering factories in Providence and Pawtucket, both of which became industrial centers during the nineteenth century.

As the volume of maritime traffic increased following the cessation of hostilities between the United States and Great Britain early in the period, regularly scheduled service between American ports for freight, passengers, and mail developed aboard medium-sized (i.e., around 300 tons and 90 to 125 ft [27 to 38 m long]), square-rigged vessels, called "packets" after their cargo of subsidized packets of mail (Bass 1988). A great number of these ships were employed during this time carrying waves of immigrants and freight traveling from ports in Europe to the United States.

Vessels engaged in the deepwater trade of the period were much larger than anything built previously and were among the strongest and most durably constructed vessels in the annals of merchant sail. Virtually all were fully rigged ships growing from 350 tons at the outset to more than 1,000 tons by the mid-1840s. Their length-to-beam ratio averaged a capacious 4:1 with "frigate-built" full bows and two decks for passengers and cargo. To provide their hulls with additional strength, many of the oceanic packets had caulked inner planking.

The coastal packet trade, although less lucrative than the long-distance international trades, provided the bulk of Providence's maritime commerce throughout the first half of the nineteenth century. In the 1840s and 1850s, there were about 4,200 coasting packets and freight carriers entering the harbor each year carrying a variety of products (e.g., raw materials for Providence and Pawtucket's factories, lumber from Canada, and coal from American mines). While in the early 1820s, the proportion of vessels engaged in coasting and foreign trade was about equal, by the end of the decade, the majority of vessels registered in Providence were the small schooner or sloop types, averaging 50 ft (15 m) in length, that were used primarily for coastal transport (Department of the Army 1982b:5).

Although statistical tracking of domestic shipping in the United States was inconsistent during the period, it is clear that that overall vessel traffic levels through Rhode Island waters climbed exponentially during the nineteenth century, and that the State maintained a strategically important maritime sector. At the very time that Rhode Island's foreign maritime commerce was declining, growing numbers of steamboats and coastal merchant vessels transformed the waters off Rhode Island's coast into a maritime highway equivalent in commercial significance to the modern I-95 interstate (URI 2010). In 1893, more than 60,000 vessels carrying coal alone passed by Point Judith (URI 2010). Most of this vessel traffic (34,000) consisted of schooners; barges accounted for approximately 9,000 transits.

The whaling trade continued to be a relatively minor element of Providence's waterborne trade up until the 1820s. It peaked in the 1840s, and then declined again in the 1850s. Even at its peak, Providence vessels engaged in whaling only constituted less than one-fifth of all of the port's registered vessels. The last whaler left Providence in 1854.

4.2.3.3 Expansion of Transportation

Critical to Providence's transformation into an industrial city was the growth and expansion of the local, regional and national transportation systems during the second and third quarters of the nineteenth century connecting the city with agrarian and industrial production centers in the interior and with the larger regional ports. Known nationally as the "Transportation Revolution," the term describes a period of intensive activity involving the development and construction of turnpikes, canals, steamboats and railroads (Woodward and Sanderson 1986:50). Roads were improved first, and 11 new or upgraded turnpikes were chartered between 1803 and 1825 in the region. The interior city of Worcester, Massachusetts was pulled into Providence's commercial orbit with the 1828 completion of the Blackstone Canal. The canal remained in operation for 20 years and played a key role in stimulating industry and commerce between Providence and Worcester and the towns and villages along the Moshassuck and Blackstone Rivers before being supplanted by local and regional railroads by 1848.

Steam navigation became an increasingly regular part of Rhode Island's maritime fabric from the early 1820s onward and grew in importance over the century. Rhode Island's first regular steamboat service was provided briefly by the paddle-steamer *Firefly*, which was operated between Newport and Providence in 1817. More significantly, however, was establishment of steam-packet service between New York and New England by way of Long Island Sound. The first Long Island Sound-style steamboat, *The Fulton*, was launched in 1814 by Elihu Bunker, and by the early 1820s, all passengers traveling to or from Boston by steamboat passed through Providence. By 1822, there was a line of steamers in regular service to Newport. By the 1830s, regular steamboat service had been extended to Boston, Fall River and New York. Vessels on these lines carried both passengers and freight and were initially in direct competition with the early railroads. The railroads eventually bought most of the steamboat lines and continued the steamers mainly as freight carriers. A rail yard at India Point in 1837 and later at Fox Point, provided connecting service for the steamers. Many of the other wharves also began to have rail line connections by the middle nineteenth century. The steamboat trade saw a decline in the 1840s due to competition from the railroads, but steamer freight traffic revived in the 1850s (Department of the Army 1982:APPENDIX 7:7). After 1847, Fall River, Massachusetts replaced Providence on the New York/Boston route (Albion 1972; URI 2010).

In 1869, there were reportedly 31 steamboats constituting about 27,000 tons of the Rhode Island fleet, a figure that compared favorably with neighboring New England states (i.e., trailing Connecticut and Massachusetts, but surpassing Maine and New Hampshire) (URI 2010). In addition, many of the Rhode Island steamboats were larger and reflected interregional rather than local routes (URI 2010). This pattern was more pronounced in 1879, a year that Providence and Fall River each rivaled Boston in the tonnage of steamboats calling at their wharves. When combined, the volume of coastwise steamboat traffic entering Providence and Fall River reached an estimated 1,800,000 tons, surpassing New York port by nearly 300,000 tons (URI 2010). By 1873, Providence steamers were providing connections to ports as far away as Baltimore, Maryland, Norfolk, Virginia, and Wilmington, North Carolina.

The combination of a desire for speed with primitive harbor facilities and other navigation hazards led to a significant number of steamboat disasters. Included among them were the burning of *Lexington* in 1840; the grounding and destruction of the *Atlantic* on the northern end of Long Island Sound in 1846; the steamboat *Metis*'s collision with a schooner and sinking in Rhode Island off

Watch Hill in 1872; the *Rhode Island's* 1880 grounding and break-up near Bonnet Shores within the West Passage of Narragansett Bay. In 1907, the *Larchmont* was destroyed in a collision southeast of Watch Hill. These were major disasters; many smaller steamboats, including tugs and cargo vessels also suffered accident and loss in Rhode Island waters (URI 2010). While the tonnage of existing steam-driven vessels did not surpass that of sail-powered vessels until the 1880s (Gould 2000), large wooden vessels survived into the twentieth century. This time was the period when steel and steam began to assert their dominance.

Concomitant with Rhode Island's industrial growth was the development of a socioeconomic order that included a class of wealthy landowners and the new concept of leisure. Development of beach-front hotels, resorts, and planned residential communities intensified greatly in the decade after the Civil War for the newly emergent middle class that had disposable income and valued leisure time As a result, "excursion steamers" began to do a brisk trade in the late 1860s and subsequent decades through the end of the nineteenth century. These steamers provided service to Newport, Block Island, Rocky Point, and Narragansett, as well as to local resorts on the Bay at Pawtuxet, Fields Point, Bullocks Point, Silver Spring and Riverside. Shore dinner halls were built at these places during this period and hotels and seaside cottages followed quickly thereafter. Large amusement parks, such as Rocky Point, Crescent Park and Vanity Fair, built at some of these locations, attracted large crowds that arrived by steamer, rail and trolley (Department of the Army 1982:APPENDIX 7:7). With the economic downturns caused by World War I and the Great Depression, and the competition from railroads and automobiles, the latter of which through mass-production had become affordable for more people, these excursion lines eventually went out of business during the 1930s and 1940s. Only one steamer to Block Island remained in service after 1942.

4.2.3.4 Shipbuilding

Shipbuilding in Providence reached its overall peak between the late eighteenth and early nineteenth centuries, when shipyards proliferated in response to the demand for vessels to engage in the East Indies trade, and in the European, coastal and West Indies trades. With the exception of the Brown-owned shipyards situated between Fox and India Points, all of the other shipyards in Providence during most of the nineteenth century were located in what is now filled-in or "made-land" on the West Side of Providence harbor. Shipbuilding in Providence during the nineteenth century revived somewhat in the 1830s and 1840s, primarily in support of whaling, but the industry never really fully recovered from the decline it suffered during the embargo and war years of 1807 to 1815. Land-based industries related to maritime commerce in Providence also reached their peaks and declined during the first half of the nineteenth century.

Not surprisingly, the dramatic technological and economic changes that occurred during the latter part of the century were reflected in significant changes and developments in ship design and construction, chief among which are the "Golden Age" of sail and the rise of the steamship. Naval warfare and the threat of seizure by enemy vessels during the eighteenth and early nineteenth centuries led ship owners to place a higher premium on speed over cargo space. Interruption of regular maritime commerce during periods of war, such as during the Revolutionary War and War of 1812, led many of the region's merchants to turn to privateering in an attempt to recoup their losses. Morison (1979) states that more than 600 letters of marquee, the official government commission authorizing reprisal against enemy merchant vessels, were issued by the Continental Congress to vessel owners in the years leading up to and during the Revolutionary War. Coastal

Rhode Island was no exception. This need for speed was met with changes to hull form and rig designs that led eventually to the nineteenth century development of the swift "Baltimore Clipper," and the short-lived, record-setting, transoceanic Clipper ships. Clipper ships in many ways were the apogee of the sailing ship era (1846 to1859), which is well represented by famous vessels, such as the 229-ft- (70-m-) long *Flying Cloud*. The drawback of the clipper design, however, was that their speed came at the cost of capacity. The sleek design of the clipper ship hull-form below the water-line sacrificed approximately one-third of their potential cargo space relative to their length. Additionally, their expansive rigging required a large crew, which further added to their operational costs (Albion et al. 1994). Within a period of less than ten years, the need for and popularity of the clipper ship dropped off dramatically, as the U.S. economy faltered during the Panic of 1857, the Gold Rush era ended, and steam-power became a practical mode of vessel propulsion.

Throughout the nineteenth century, shipbuilding became increasingly more centralized in a few large shipyards located in the larger urban centers. The centralization of shipbuilding occurred as the vessels became increasingly larger and more technologically complex. No longer could a single individual master most of the skills necessary to build a vessel. Now, boiler-makers, punch operators, and ironworkers were needed in addition to shipwrights. This truly was the period when the "Industrial Revolution" went to sea (Gould 2000).

Making their first appearance at the end of the previous century (1790) as a means of transporting passengers and freight on the Delaware River, the improved feasibility of the marine steam plant led to its increasingly common use as the primary means of propulsion in both wooden and iron vessels during the second half of the nineteenth century. Paddle-wheel steamers were the most common steamship type in the region's coastal waters, while screw-propelled steamships gained in popularity since their introduction to the United States in the early 1840s. The hull-designs of the early steamers were similar to those of sailing vessels, but the steamers' decks were wider amidships to accommodate the paddle-wheels that extended from both sides of the ships (Bauer 1988; Robinson 1999).

During the transition from ships made from wood to iron and steel that began in the middle nineteenth century in the United States, large numbers of composite ships were constructed with wooden planking secured over steel frames during the second half of the century. This construction technique was eventually supplanted by the use of riveted plates instead of wooden planks. Many of the steel and iron vessels of this period were propelled by sail rather than steam, and were generally 250 ft (76 m) or less in length (Bass 1988; Gould 2000). By the middle of the next century and World War II, iron and steel had supplanted wood as the construction material of choice for large ships (Bass 1988).

Large three- to seven-masted schooners with displacements ranging from 500 to 900 tons were used to transport coal and ice to various points. Additionally, lime mined from Penobscot Bay, near the towns of Thomaston and Rockland, Maine was transported to Providence, Boston, New Jersey, New York, and Europe in schooners of various sizes up until the early decades of the twentieth century (Bauer 1988). Granite carriers, also originating from Maine, traveled up and down the coast, as well. These vessels were easily identifiable by their low sides and heavy booms needed for loading the stone. Many of the coal, ice, marble, and lime vessels of the time had a donkey steam engine on the deck, which aided in hauling on lines. Most of these working schooners did not see

the end of the period, especially the colliers, as iron-hulled steam-powered bulk carriers eventually replaced them.

In addition to the bulk carriers, this era saw the first widespread use of barges for transporting raw materials and goods. Like canal boats of previous periods, barges do not supply their own propulsion. While oxen could be used to tow a canal boat, barges (with the exception of sailing canal boats and schooner-barges) had to await the advent of steam-driven "tug" boats to venture out onto uncontrolled rivers and the unprotected waters along the Rhode Island coast. Generally, the barges were heavily timbered, or, later, steel-hulled, square-sided, flat-bottomed vessels used for hauling bulky or heavy loads.

The size and morphology of barges depended upon the task(s) for which they were intended. Some were designed with an open hull with decking only around the sides for carrying items such as trash or coal, while others had full decks designed for carrying items, such as building supplies, or for holding deck equipment, such as a derrick (Basnight 1996; Kane 2001). Barges were, and are, used on the open ocean and on the more protected waters of bays and rivers. Historically, though, the rougher open waters of the ocean required the use of schooner-barges rather than barges (Bauer 1988). Paralleling the development of barges was the evolution of the tugboat, which provided the propulsion and made it possible for barges to venture into open waters. Initially these vessels were wooden, but quickly changed over to metal hulls as the technology became available.

Naval vessels, transoceanic and coastal freighters and passenger ships, tugboats, barges, ferries, commercial fishing boats, and recreational craft all plied the waters of Upper Narragansett Bay and Providence Harbor at this time. The establishment of the U.S. Life Saving Service and the advent of modern telegraphic communications greatly improved the accuracy of information associated with recorded shipwrecks. Regular annual reports on shipwrecks began being issued by individual stations beginning in 1876.

Shipbuilding was still carried out in the harbor during the closing decades of the nineteenth century. The Providence Dry Dock and Marine Railway Company, which was established at Bold Point in 1884 and operated up until 1919, built schooners and other sailing vessels for the coastal trade, and repaired and serviced steamers and sailing vessels up to 1,800 tons burden (Department of the Army 1982:APPENDIX 7: 6-7).

While each of the different modes of transportation had periods of prominence, it was the railroads' linkage to shipping and canal transportation networks that made it preeminent. By the middle of the nineteenth century, America had more railroad track than any other nation in the world and most of it was laid in New England and New York (Woodward and Sanderson 1986). The Providence and Boston Line (1835) had its southern terminus at Fox Point on Providence Harbor, and the Providence and Stonington Line (1837) connected to steamboat service between Stonington and New York and its northern end at Burgess Cove in South Providence. Passengers and freight were ferried across the harbor to Fox Point to connect with the Providence to Boston Line. Expanded service was provided in 1848 by the Providence and Worcester and the New York, Providence and Worcester lines. In the same year, the Cove in the center of Providence was partially filled and tracks were constructed to a new passenger station at Exchange Place. The station was called Union Station, as all of the lines converged at its location in the center of the city. The station has been call the first major railroad station in the United States.

4.2.3.5 Municipal and Coastal Development in the Green Jacket Shoals Area

In 1862, when Seekonk became East Providence, the area that included Bold Point was the oldest inhabited part of town. In previous decades, prior to the Civil War, the section of Rehoboth around and including Bold Point was sparsely populated with only a few farms appearing on maps of the area. Bold Point, up until 1853, was named "Burges Point" after one the area's more prominent land-holders and figures in Rhode Island business and politics at the time (i.e., Tristam Burges, a lawyer and politician who had retired to a farm on Bold Point [Figure 4-3]). In 1845, Joshua Mauran, an affluent Providence merchant, platted a large portion of his property near the Washington Bridge, immediately northeast of Bold Point, into a subdivision encompassing 22 blocks (Figure 4-4). Burges followed Mauran's initiative and also had several large sections of his land platted. Thus began the community within Rehoboth (today's East Providence) known as the "Watchemoket" District. Watchemoket was a result of the enormous influx of people into the Providence area during the second half of the nineteenth century. Most who eventually settled in Watchemoket either worked in Providence, or were involved in business activities directly linked to its economy. Watchemoket's population rose very quickly from about 800 people in 1865 to over 6,000 by 1895. By the 1880s, it had become the most populous area in East Providence. By 1890, Watchemoket also held the town's central business district. The development of Watchemoket that came quickly thereafter was hardly uniform, and aside from Mauran, Burges and a few other large property owners, most of the people who owned the subdivided land in East Providence were small property owners. In the decades preceding the Civil War, Watchemoket was little more than a farming and fishing area with at most a few hundred residents. Situated directly across the Seekonk River from Providence, its location led it to become the hub of the new town of East Providence after the war.

By the 1860s, tolls were no longer being collected to cross the Washington and Central bridges. The completion of the Red Bridge in 1869 and the new Washington Bridge in 1885 accommodated the expanding traffic between Providence and East Providence. The two railroad trestles that crossed the Seekonk River provided transportation facilities required for the development of industry on the East Providence side of the river. Even more important was the river itself, which provided a natural water route for cargo ships traveling to and from ports on the bay as well those on the Atlantic seaboard and abroad. In addition to being at a rail and water crossroads, Watchemoket was also at a highway crossroads, with the heavily-traveled Boston Post Road running between Pawtucket Avenue and the Washington Bridge, and highways to Taunton (Route 44), Fall River (Route 6) and Barrington, Warren and Bristol all intersecting there (Conforti 1976:75).

Transformation of Watchemoket from a relatively quiet fishing and farming area to the vital core of a bustling town came rapidly after the incorporation of East Providence. Among the first businesses in the area were inns for travelers passing through the area. One of the principal commercial developers of the area was the Ingraham family, who owned much of the farmland in the 1860s. They built the first substantial structure in Watchemoket (the Ingraham Building), which served as a satellite town hall to the original one in Rumford as the population center of East Providence shifted toward Watchemoket.

East Providence's maritime history is quite similar to that of Providence, except that most of its development did not occur until the second half of the nineteenth century. Shoal waters and numerous bridges on the Seekonk River limited its development potential for commercial shipping;

however, numerous oyster processing plants and coal and oil shipping facilities did appear on the river in the later decades of the nineteenth century.

Development of the area around Bold Point followed a similar timeline, and began with the construction of the Lehigh & Wilkes-Barre Coal Company Pier there in 1874. Located just south of the study area's southern limit, the pier stretched about 1,000 ft (300 m) along the shore and along with the railroad yard built inland of and directly adjacent to it made Bold Point a major shipping and receiving point for the lucrative coal and bulk freight business of the Providence and Worcester Railroad for more than 50 years. In 1880, 473 cargoes were unloaded at the pier and over 256,000 tons of coal was transported by rail all over New England.

Immediately northeast of the Wilkes-Barre pier on Bold Point and in Watchemoket was a diversified business and manufacturing district that included two large oyster houses and the Providence Dry Dock and Marine Railway Company. Remains of the dry dock's pier, consisting of piling stubs and partially intact dolphins at the pier's seaward ends, are located within the Green Jacket Shoal study area.

The Providence Dry Dock and Marine Railway Company was established on the west side of Bold Point in East Providence in 1884 with Asa T. Stowell as its first superintendent (Cady 1957:175) (Figures 4-5, 4-6 and 4-7). Its facilities were designed primarily for hauling and repairing sailing vessels and steamboats and included two 1,800-ton capacity marine railways located at the northeast corner of Bold Point and a 200 ft- (60 m-) long, 800 ton-capacity floating dry dock that slipped into the end of a long, bifurcated pier (resembling a giant tuning-fork if viewed from above) extending from the west side of Bold Point just north of the Wilkes-Barre Coal Company's pier. The three-masted schooner, *Asa T. Stowell*, named for the company's superintendent, was built in the company's yard and launched on October 13, 1891. It is not known whether or how many other vessels were built at the site. The company continued operations for 35 years before finally closing in 1919 when the reduced number of vessels of a size small enough to be accommodated by its dry dock, and the deaths of all but one of the company's shareholders (superintendent, Merrill R. Coombs) led him to liquidate the company (Cady 1957:175; Welt 1957). The floating dry dock was sold to a dredge firm, and then purchased for use at the site of another marine railway that reportedly went out of business shortly thereafter. The dock was then towed to East Boston, where, as of 1957, it was still in service, 73 years after it was built (Welt 1957).

John Hamlin Cady (1838-1914), a prominent Providence businessman who supplied provisions and warehouse storage to merchant vessels, owned shares in several merchantmen, and served as a director and the treasurer of the Providence Dry Dock and Marine Railway Company from its 1884 founding until his death in 1914 (Cady 1957:175). His late son, John Hutchins Cady (1881-1967), was the author of one of the seminal histories of Providence – *The Civic and Architectural Development of Providence: 1636-1950*, which provides a brief account of the history of the company and was one of the published sources referenced for this study.

The diaries of John Hamlin Cady for the years that he was a director and treasurer of the Providence Dry Dock and Marine Railway Company are part of the extensive Cady Family Papers collection archived in the RIHS library, and were the last source of historical information on the firm that was reviewed as part of this study's research. Unfortunately, the diaries were discovered literally in the final hour of the archival research performed for this investigation, which allowed for only an initial review of just a few of the diaries from the first years that the company was in existence. The

earliest diary entry that was found pertaining to the floating dry dock was recorded on Wednesday November 11, 1885 and read: "*Went to RWay office. Very dull down there. Went to E.Prov office of the property tax assessor about Squantum & Dry Dock taxes"* ["Squantum" refers to the Squantum Club, of which John Hamlin Cady's father, Shubael Hutchins Cady (1806-1883), was one of its founders and first president]. A sample of subsequent entries from April of John Hamlin Cady's 1888 diary provides some indication of the kind of primary documentary information about the company's operation that a future focused and thorough review of Cady's diaries could produce:

- Monday April 2, 1888: *Stmr* What Cheer *is in the dock*;
- Friday April 6, 1888: *Went to dry dock w/Stowell* [the company superintendent] *in aft. & finished balance. Busy there now*;
- Tuesday April 10, 1888: *I went to the Dry Dock to file statement of year Apr. to Apr*; and
- Wednesday April 11, 1888: *Stockholders of Dry Dock had annual meeting at 3½ pm.*

Jess Welt (1890-1981), a resident of East Providence, worked for the Providence Dry Dock and Marine Railway Company and was a carpenter and mill-man on the firm's floating dry dock. Welt is the source of multiple large format photographs of the Bold Point waterfront, including the dry dock, and the author of the *Providence Journal* article entitled, "The Old Dry Dock – It Cradled Lots of Ships," published in 1957. In the article, he provided a unique first-hand recollection of the floating dry dock's history, its place of construction, its dimensions, a candid account of the excitement and challenges of its operation, as well as an accounting of some of the vessels that it cradled for repairs, which included the excursion steamers *Bay Queen* and *Mount Hope*, the remains of both of which are also located within the Green Jacket Shoal study area. The article also provided information on the disposition of the floating dry dock after the company's liquidation. Welt's brother, father, uncle and father-in-law also worked on the floating dry dock.

While a basic representative footprint of the floating dry dock's pier is rendered as a solid structure in navigation charts of the "Providence River and Head of Narragansett Bay" dating from between 1897 and 1944, and in maps of East Providence as early as 1895, Richards's 1917 *Standard Atlas of the "Providence Metropolitan District"* (Volume 2) provides the most detailed, to-scale, contemporary map of the Providence Dry Dock and Marine Railway Company property, its associated on-shore structures, and marine railway and floating dry dock facilities, including an accurate rendering of the floating dry dock's pier, structures on the pier and the plan-view shape of the floating dry dock itself (Figure 4-8)

Mechanical Engineer, William Donnelly's 1905 Brooklyn Engineers' Club paper, "Floating Drydock Construction," which appears as a chapter in Sven Anderson's edited volume, *Floating Drydocks* (Anderson 1907), provides an illustrated narrative outlining the early history, need for, and evolutionary development of dry docks in America, as well as the technical details and scale-drawings of the design, construction and operation of a "Box" or "Balanced" dry dock – the same type of floating dry dock that was employed at the Providence Dry Dock and Marine Railway Company's Bold Point facilities (Figure 4-9).

Another dry dock capable of handling larger vessels was built in 1918 by the Marine Engineering and Dry Dock Company on the west side of the harbor at Allen's Avenue, north of "Harbor Junction Pier," between Thurber's Avenue and Lehigh Street (in the present approximate location of Rhode Island Recycled Metals). Unlike the Providence Dry Dock and Marine Railway Company, the Marine

Engineering and Dry Dock Company's operations were short-lived and the company went out of business just a few years after it was started. It is possible that the Marine Engineering and Dry Dock Company was the one that the Providence Dry Dock and Marine Railway Company's floating dry dock was sold prior to its transfer to East Boston.

Numerous smaller docks and piers also extended into the Seekonk River from Watchemoket. Intensive summer cottage and resort development took place during the second half of the nineteenth century along the East Providence shoreline south of Providence Harbor. This development consisted of numerous shore dinner halls, hotels, and cottage developments, such as Vue de L'eau, Squantum Club, Ocean Cottage, Camp White, Silver Spring and Cedar Grove. Only the Squantum Club remains in operation. The cottage developments grew into year-round villages during the next century. Other Watchemoket businesses included the Huntington Maple Syrup and Refinery, the Narragansett Milling Company, the Eastern Bolt and Nut Company, and the Bullard Automatic Wrench Company, as well as a number of small repair shops, markets and dry-goods stores (Conforti 1976:75-79). With its population and commercial center in Watchemoket by the mid-1880s, the village next became East Providence's political center with the completion of the new town hall there in 1888.

4.2.4 The Twentieth Century to Present

4.2.4.1 Providence in the Early Twentieth Century

The twentieth century opened with Providence being optimistically perceived as a city moving forward to the future with "a full head of steam" (Connelly and Campbell 1982:143). The Rhode Island Businessman's Association and Board of Trade termed Providence in 1912 "the City of Fascination," "the Centre of Northern Industries," and "the Metropolis of Southern New England," and they saw Narragansett Bay as the "Southern Gateway to New England" (Conley and Campbell 1982:147) (Figure 4-10). The center of Providence's trade and industry was located in its downtown. The city had 31 banks, 130 insurance offices, 16 theaters performing repertory drama, opera, vaudeville, burlesque, and the newest fad – movies. There were four daily newspapers and 26 weeklies and monthlies published. A total of 300 passenger and freight trains stopped in Union Station every day (Woodward and Sanderson 1986:59). At the turn of the century, Providence had 1,933 firms doing business in the city, and its businessmen boasted that "Providence manufactures everything from a carpet-tack to a locomotive." In 1904, the city produced $200 million in manufactured goods; $40 million in woolens and worsteds; $26 million in cotton goods; $17 million in jewelry and silver; $13 million in machines; $10 million in rubber goods; $5 million in electrical supplies; and $1.5 million in silk. In 1912, Providence's Board of Trade Journal reported that the city stood second in the country in *per capita* wealth (Woodward and Sanderson 1986:57).

The downtown was served by a public transit system that shuttled people to its jobs and stores from locales outside the city that were beyond walking distance. Preceded by horse-drawn trolleys (i.e., "horsecars") of the nineteenth century, by 1912, 435 electric trolley cars travelled along 82 mi (132 km) of track and carried more than 135 million passengers a year in Providence (Woodward and Sanderson 1986:60). First in woolen production, third in the manufacture of machinery and machine tools, and the jewelry capital of the nation, the optimism seemed justified.

This optimism, however, proved short-lived, as the foundation of Providence's economy was undercut by competition from textile producers in the South who used non-unionized labor, had

low energy and transportation costs, tax incentives and modern facilities. Except for a brief reprieve that World War I's demand for goods provided, by the middle 1920s, Providence was showing signs of being an aging, physically-saturated, city in decline. Even prior to the start of the Great Depression in 1929, Providence's unemployment figures were rising. Only the jewelry industry provided an economic bright spot. It continued to grow and absorbed some of the economic burden caused by the sharp decline of the city's textile industry.

It was during the early twentieth century that the Providence skyline gained most of its current appearance, with the additions of the Union Trust (1902), the Turk's Head (1913), the twin-towered Hospital Trust (1919), the Biltmore Hotel (1922), and the Industrial Trust (1928) buildings. It was also during this time that the "horseless carriage" or automobile evolved from a luxuriously curious plaything of the wealthy in 1900 to an affordable necessity of the middle class by 1929, primarily as a result of Henry Ford's development of a system of mass production (Conley and Campbell 1982:144). To accommodate this new mode of transportation, ambitious programs of tax payer-funded building, paving and widening of roads were undertaken throughout the city, state, and region.

It was also at this time that J. P. Morgan and Charles S. Mellon established a monopoly over local rail, steamboat, streetcar and interurban transit with their New Haven Railroad. This monopoly was challenged for a time by the Grand Trunk Railroad and its president, Charles M. Hays, who sought to make Providence the Atlantic terminus of a railroad network that would tap the production and trade of interior Canada – a proposition that would have radically changed the configuration of the lower Seekonk River and the East Providence shoreline, including in the study area (Figure 4-11). This proposition and its primary proponent, Hays, were both said to have been lost in the 1912 sinking of *Titanic*, on which Hays was a passenger. Mellon was later indicted for his role in pressuring the Grand Trunk to halt the construction of one of its rail lines into Providence, and the New Haven Railroad was forced to relinquish control of Rhode Island's urban and interurban lines, but the planned Grand Trunk line into the city and the ambitious changes that continued to be proposed for Providence Harbor (Figure 4-12) never progressed. Instead, less ambitious, although still major, improvements were made – a modern state pier was constructed at the foot of Public Street on the west side of the harbor (1913), and a municipal wharf with a 3,000 ft (914 m) quay was built at Field's Point (1916). It was also during this period that a series of major harbor dredging projects were undertaken: 1902 (dredging to 25 ft [8 m] and widening); 1910 (dredging to 30 ft [9 m] and widening); 1920s (dredging to 35 ft [11 m] south of Fox Point; 1927 (dredging to 20 ft [6 m] in the Providence River north of Fox Point and re-dredging the Seekonk River to 16 to 18 ft [5 to 6 m]) (Department of the Army 1982:APPENDIX 7:11).

4.2.4.2 Providence During the Economic Depression and World War II

With the October 1929 crash of the Wall Street Stock Market, the economic bubble of the late nineteenth through early twentieth century burst and a new era was at hand for the city. At the Depression's height, Providence saw unemployment run as high as 40 percent in its major industries. With a staggering economy, Rhode Island and Providence were dealt another heavy economic blow – the Great New England Hurricane of 1938. The storm inundated parts of downtown under 7 ft (2.5 m) of water, damaged buildings and their contents, destroyed hundreds of automobiles, demolished wharves and shoreline infrastructure, stranded and sunk vessels, and took the lives of 311 Rhode Islanders, including four persons who drowned in the center of downtown Providence.

By the late nineteenth and early twentieth centuries, coastal trade in bulk goods, primarily fuels and building materials, became the major factor in the city's maritime trade. The harbor at that time served as an *entrepot* for these materials for all of southeastern New England, as well as locally for the cities of Providence and Pawtucket. While the coal wharves were virtually all abandoned or converted into other uses, oil-receiving facilities continue to play a dominant role in Providence's maritime economy. Statistics for 1935 indicate that only 9.9 percent of Providence's total trade comprised foreign imports and only one percent of its exports; however, these percentages represented the bulk of the totals for all of southern New England. By the 1930s, oil had begun replacing coal for heating and for fueling vessels, and was being used in automobiles. It constituted the major foreign import into Providence, with coal second and lumber third. Export to foreign ports consisted exclusively of scrap iron, shipped from scrap iron companies that had begun appearing along the harbor in the late 1800s. Coastal imports in 1935 constituted 76.2 percent of Providence's total volume of trade and coastal exports amounted to 12.2 percent of it. Crude oil was 36.9 percent, coal 29.9 percent, and lumber 1.3 percent of the coastal imports. Exports consisted of refined oil, coal, coke, and textiles. Local trade (1.6 percent of the total volume) was also primarily oil and coal. Shipyards continued providing servicing and repair business in Providence Harbor into the twentieth century. In 1918, a company began operating a repair facility on the west side of the harbor. The venture proved short-lived, however, and closed in the 1920s. During World War II, another yard was opened at Fields Point, south of the study area, to construct "Liberty Ships" and other vessel types. The yard opened in 1942 and closed in 1945. While in operation, it was the largest yard producing the largest ships in the harbor. As of 1982, only small boat yards providing repairs were still in operation in the harbor.

This period of economic instability during the late 1920s and 1930s was followed by a period of increased productivity in manufactured goods and military construction stimulated by World War II. Immigrants, including Portuguese, Italians, and Southeast Asians, continued to settle in the region. Protection from attack by the Axis powers during World War II led to the development of a comprehensive Narragansett Bay defensive network. Elements of the former Narragansett Bay harbor defense network included bunkers, subterranean artillery sheds, battery mounts, fire suppression stations, and watchtowers. A total of 92,027 Rhode Islanders either enlisted, or were drafted into military service during the war. Providence was selected by the federal government's Maritime Commission in 1942 as the site for a shipyard for building Liberty Ships and larger combat-cargo vessels. A total of 62 ships, about half of them Liberty class and the other half a larger combat-cargo vessel type, were built by a local workforce, which numbered 21,000 at the height of the war, between 1942 and 1945. This temporary shipyard constituted the last major shipbuilding operation in Providence and on the Upper Bay (Conley and Campbell 1982).

4.2.4.3 Suburbanization and Post-World War II Economic Transformation in Providence

During the second half of the twentieth century, following World War II, the character and population of Providence underwent yet another transformation as Providence's residents left the aging city for the surrounding suburbs, and the once thickly-populated downtown and its immediate environs became a central city surrounded by a group of smaller satellite cities around it. Between 1950 and 1970, Providence's population decreased by 28 percent (248,674 to 179,116) – at the time the largest proportionate decrease of any major city in the United States (Conley and Campbell 1982:191). Movement between the city and the surrounding suburbs, and in and around the city, was made possible by automobile travel and the area's new freeways and expressways

(e.g., interstate routes I-95 and I-195 through Providence in the mid-1960s). Urban renewal projects saw "industrial parks" replace run-down housing, and old factories be converted into upscale shops and housing. Providence's big five industries of the Gilded Age began going out of business or moving operations out of the city – Corliss was gone, American Screw departed for Willimantic, Connecticut (1949), Nicholson File went to Indiana (1959), and Brown and Sharpe went to North Kingstown (1964). Only Gorham remained. Additionally, the local textile industry – cotton and woolens – collapsed entirely. By the late 1960s, many of the smaller manufacturers, as well as retailers, had also left for the surrounding suburbs. Trolley service downtown ended during this period leaving only gas and diesel buses as part of the downtown mass transit fleet. The New Haven Railroad and its successor, Penn Central, both curtailed freight and passenger service into Providence, leaving only the Providence-Worcester road for freight rail service (Conley and Campbell 1982).

At the start of the 1970s, the future economic path of Providence started to reveal itself, as service industries within the city began to increase while the manufacturing and retail trades were dramatically down. Financial, educational, health, and transportation services all showed signs of promise. By 1980, service industries, primarily in health care and education, had supplanted manufacturing, long the financial life-blood of the city, as Providence's leading category of business activity. Major city-enhancement projects undertaking during the 1990s and 2000s have greatly improved the character of the city. Rivers once buried beneath asphalt have been exhumed and lined with walkways and an amphitheater. Railroad tracks that divided the financial district from the state's historic, white-marble statehouse have been moved and placed underground, opening 60 acres for office buildings and apartments. The addition of the Providence Place Mall retail center and Providence Convention Center, as well as ground-level gardens and restaurants alongside the Woonasquatucket River, has provided shoppers and visitors to the downtown with new view of a remarkably improved and enhanced cityscape. Most noteworthy is that the make-over has been achieved without sacrificing the city's considerable architectural heritage (Conley and Campbell 1982).

In addition to the enhancements that were made to revitalize Providence's downtown, the Port of Providence also experienced a resurgence during the 1970s and 1980s with the deepening of the channel leading into the port from 35 to 40 ft (11 to 12 m) in 1971, and the expansion of its cargo handling capabilities at a new marine terminal, including fixed-arm cranes for loading/offloading containers that opened in 1981. Freight volumes handled annually by the port from the shipment of oil, gasoline, cement, steel, lumber, automobiles and liquefied propane consistently exceed $1-million in value and have made it the third largest in New England (behind Portland and Boston) (Conley and Campbell 1982). Innovations in business, culture, and government, combined with revitalization and redevelopment of the downtown have brought Providence back to life.

4.2.4.4 East Providence

During the twentieth century, East Providence's population increased four-fold, from 12,138 to 48,207 in 1970. As of 2013, the city's population stood at 47,149. Watchemoket continued to grow during the first three decades of the twentieth century in much the same way as it had during the previous years. The biggest growth period for the area was prior to World War I. Watchemoket's growth actually had changed little between the 1860s and the 1930s. The reason for this lack of growth appears to have been because the area lay just outside the primary northeast-southwest axis of Providence's commercial and industrial growth extending from Pawtucket to Cranston. It

was here that the major transportation lines ran connecting the region to Boston and New York. This slow development may have been a different story, were it not for the sharp bend in the Seekonk River formed by Bold and India points, and the northern extension of Green Jacket Shoal into the channel at the mouth of the river. This configuration, as well as the strong currents that flowed out of the river, were major obstacles to easy navigation and prevented more intensive usage of the Seekonk River as a commercial waterway (RIHPC 1976:41-42). As noted above, the very ambitious proposal during the 1910s to change the Seekonk River and the eastern side of Providence Harbor's configuration by cutting a new river channel through Fort Hill and using the removed soil to fill Providence Harbor in a straight line from Kettle to Fox Points with slips and piers added along the entire run would have altered the character and commerce of East Providence dramatically, making it one of the east coast's largest commercial ports. Some development did continue, however, as oil storage facilities were expanded along the shore. The most impressive commercial facility on the East Providence shoreline during this period remained the Wilkes-Barre Pier at Bold Point. Enlargements and improvements to the pier made during the opening decades of the 1900s made it one of the largest piers used exclusively for the discharge of coal in the country (Figure 4-13). Some 530 ships unloaded upwards of a million tons of coal there in 1913. The pier and the oil storage tank fields and refinery that were added to the shoreline south of it formed a major source of tax-revenue for East Providence (RIHPC 1976:42).

Watchemoket Square at the center of the village continued to be the commercial focus of East Providence up until the 1920s; however, its importance began to wane after the new Washington Bridge was completed in 1938, completely bypassing the Square, and then ended after most of what remained was demolished to make way for approach ramps to I-195 (Conforti 1976:26).

While portions of the Rumford and Phillipsdale sections of East Providence became heavily industrialized during the second half and late nineteenth century, the portion of East Providence south of Wachemocket and Wannamoisett continued to support large agricultural and dairy farms through the twentieth century. The shoreline of East Providence became a focal point of the summer resort era. Along with this trend, canoe houses and amusement parks sprang up along the Ten Mile River and Omega Pond, providing recreational outlets for the town residents. Most of the recreational facilities from this period no longer exist. After World War I and prior to the Great Depression of the 1930s, East Providence experienced a population boom, and much of Riverside became the site of a large oil refinery owned by the Socony Company. Oil tanks lined the shores of southern East Providence. Rumford and Philipsdale remained relatively unchanged (Conforti 1976:137). East Providence in the 1960s and 1970s was a leading manufacturing and industrial center for Rhode Island. Industries that drew in and supported a growing population at that time were mainly associated with the manufacturing of metals, machinery, jewelry, textiles, paper products, and chemicals (Conforti 1976). Today, a variety of small industries and oil companies continue to support the economic base of East Providence.

4.2.4.5 Shipbuilding

For the ships working in coastal Rhode Island and throughout the region, the twentieth century period is characterized by the eventual disappearance of large, wooden, commercial sailing vessels. Large vessels of the period were primarily built of iron and steel and were assembled initially with rivets, and later, with welded joints or seams (Bauer 1988). These large ships were initially propelled by reciprocating steam engines, which were replaced by steam turbines and diesel engines by World War II. Additionally, in the middle part of the century, turbo-electric and diesel-

electric engines began to be used in large vessels with varying levels of success (Bauer 1988). An increasing number of merchant vessels of the period were built for specific cargos and can be identified by hull shape, position of the superstructure, and the types and placement of cargo handling machinery (Basnight 1996).

Developments in design and construction during this period also affected small vessels. Steel, wood and fiberglass hulls became prevalent in small commercial vessels during the second half of the twentieth century. By the late twentieth century, 90 percent of small craft, including dinghies, yachts and other vessels up to 75 ft (22.9 m) in length, were fabricated from wood sheathed in fiberglass (Kemp 1976). Although diesel engines were available to the civilian market during the 1920s, their use did not become widespread until after World War II. Both gasoline and diesel were used to fuel the engines of wooden, steel and fiberglass commercial and recreational craft. The use of sails continued through the period, but was increasingly limited to their exclusive use on private recreational craft and commercial charter operations.

The use of barges has continued through the period, as well. Most were constructed of heavy timbers until the 1920s, or were converted from obsolete schooners. By the end of World War II however, steel-hulled barges were commonly in use (Basnight 1996).

5.0 RESULTS

Background research and field survey conducted for this preliminary Phase I(a) Reconnaissance survey recorded information useful for: a) determining if the Green Jacket Shoal study area had been subjected to any previous archaeological investigations and contained any previously recorded pre- and post-contact period archaeological sites, or any unrecorded sites that could be seen extending above the harbor floor and mapped with GPS; b) evaluating the character of the sediments on the shoal and informing predictions concerning the presence or absence of archaeological sites and the area's potential to contain additional (undiscovered) sites; and c) assessing whether any additional phase or phases of archaeological investigation (e.g., Phase I(b) [intensive] survey or Phase II [site examination]) is warranted for the study area, and, if so, developing recommendations about where and how it should be conducted. This report chapter (Chapter 5.0) presents the results of the background research and field survey. Recommendations for additional phases of investigation are included in the final chapter of the report (Chapter 6.0).

5.1 Background Research Results

5.1.1 Summary of Key Findings about the Study Area's Environmental and Cultural History and Character

Background research conducted for this study resulted in several key findings regarding the study area's environmental and cultural history and character that also factor significantly into the management recommendations presented in the subsequent chapter. These findings may summarized as follows:

- Green Jacket Shoal is part of a larger glaciated environment that has undergone significant natural changes over the last 22,000 years. As glaciers retreated, land became accessible for human habitation and use until sea level rose to a point where the land that is now the shoal was submerged and no longer inhabitable by humans. The formerly exposed land surface would likely have been mostly or completely eroded by the marine transgression process. After becoming subtidal, any surviving elements of the paleocultural landscape would have then been impacted by the redistribution of sediments on the shoal associated with wind-driven waves, tidal currents, and the flow of the Seekonk River – which would have removed or buried any paleosols and the ancient Native American cultural deposits they may have contained.

- Map evidence indicates that the horizontal shoreline position on the west side of Bold Point adjacent to Green Jacket Shoal has not changed significantly since around the time of Providence and Rehoboth's (East Providence's) colonization, as evident in a comparison between the 1700 shoreline with that of today. Historical map evidence also indicates that dredging operations do not appear to have extended onto the central portion of Green Jacket Shoal, but instead were limited to the margins of the shoal where it extended into the navigation channel and in the approach to the slip at the channel-side end of the floating dry dock pier.

- Being at the head of Narragansett Bay, one of the region's largest estuaries, and at the confluence of multiple rivers connecting tidewater to the interior, has made Providence a

culturally important place for intensive human settlement and use for thousands of years, resulting in a generally high pre- and post-contact period archaeological sensitivity for the overall area.

- Providence is one of America's oldest colonial settlements and port-cities whose period of cultural prominence and the height of its industrial, technological, and commercial development converged during the late 1800s and early 1900s.

- Watchemoket, which rose to prominence as the cultural center of East Providence during the late 1800s and early 1900s, had a direct link to the development and activities that took place during the same period at Bold Point where the Providence Dry Dock and Marine Railway Company and the Wilkesbarre Pier were located. These harbor-side facilities at Bold Point were among the most important centers of commercial maritime activity in Providence Harbor at that time.

- The late 1800s and early 1900s was a time of great technological advancement. These advances were manifested on the water, as well as on shore, in the design, fabric, and propulsion systems of American merchant ships. Significantly, it was during this period that the merchant sailing ship era ended as sailing vessels were replaced by vessels driven by paddlewheels and screw-propellers powered by steam, diesel and gas engines and the cargo-carrying scow- and schooner-barges that they sometimes towed.

5.1.2 Previous Investigations and Identified Sites

Background research conducted for this study in the archives at the RIHPHC, as well as at the GSO's Pell Marine Science Library, the Providence City Archives, the Providence Public Library, and the RIHS library, revealed that while the State has no pre- or post-contact period archaeological sites or historic properties determined eligible for or listed in the National Register of Historic Places inventoried within its site files in the Green Jacket Shoal study area, previous investigations have been conducted in the study area that have identified derelict vessels and potentially significant cultural resources. Numerous professional and avocational archaeological investigations have been conducted on shore in Providence and East Providence; however, only two investigations by the Department of the Army (today's USACE) have been conducted to date within the Green Jacket Shoal study area.

The first of these studies was completed between 1931 and 1932. It involved the detailed mapping of the "Pawtucket River" (i.e., the Seekonk River) and its charted water depths, surficial sediment types, and derelict vessels, including 24 abandoned vessels on Green Jacket Shoal (Figure 5-1). The results from this mapping effort represent the earliest and most detailed plan-view depiction of the derelict vessels on Green Jacket Shoal. Other early representations of these abandoned vessels on the shoal include: a) a 1915 *Providence Journal* pictorial piece by newspaper artist Frank W. Marshall presenting sketches of the abandoned vessels and shoreline infrastructure as seen by Marshall within what he described as the "picturesque corners of the 'harbor graveyard' threatened by port development plans" at Bold Point (the first published mention of a ship graveyard there) (Figure 5-2); b) the remarkably detailed large-format photographs taken of Bold Point in 1890 and 1910 (see Figure 4-7); and c) the 1932 "Providence Harbor" U.S. Coast and Geodetic Survey navigation chart depicting three submerged shipwrecks, three abandoned scow barges, and a large area labeled simply as "wreckage" (Figure 5-3). These sources, plus a 1933 *Providence Journal*

newspaper article describing the ship graveyard at Bold Point and explaining the reason for its existence, together provide an indication that a majority of the ships abandoned in the Green Jacket Shoal study area pre-date the 1931-1932 Department of the Army mapping project. A comparison of the 24 shipwrecks plotted on Green Jacket Shoal by the U.S. Army Corps of Engineers in 1931-1932 to the 29 shipwrecks mapped there by CML in 2015 indicates that at least 17 of the 29 newly-mapped vessel remains are present in the earlier map, thus, they pre-date 1931, making their minimum age, if they were abandoned when they were new, 85 years old. Because vessels are typically abandoned at the ends of their useful service lives, when the cost of repairs outweighs their value, the majority of shipwrecks at Green Jacket Shoal would likely all be in excess of 100 or more years old (i.e., at least twice as old as the 50-year minimum age threshold for most historic properties to be National Register-eligible).

The other study was a cultural resource reconnaissance investigation that was conducted by the Department of the Army in 1982. Consisting of a literature survey only, this 1982 study identified several potentially significant cultural resources within the current Green Jacket Shoal study area and recommended additional phases of investigation, including an examination of National Register eligibility (Department of the Army 1982:APPENDIDX 7). Consequently, the results and recommendations of the 1982 Department of the Army cultural resource reconnaissance study are directly relevant this study, and help to inform and support its conclusions and management recommendations.

As discussed earlier in this report, the 1982 Department of the Army study was carried out to determine the engineering feasibility and economic justification for Federal participation in a one-time cleanup program to rid the Providence Harbor area of its "sources of floatable debris, such as dilapidated shorefront structures and derelict (wrecked) vessels, loose onshore debris and halt debris emanating from shorefront dumps" (Department of the Army 1982:APPENDIX 7:1). It is noteworthy that derelict vessels were not examined during the 1982 Department of the Army's [cultural] reconnaissance, and instead were to be considered in a separate study, if the debris removal project they were considering at the time proceeded to the design stage [it did not] (Department of the Army 1982:APPENDIX 7:1). Thus, prior to the 2015 preliminary archaeological reconnaissance by CML, the derelict vessels included among the Providence Harbor elements targeted for removal in the 1982 Department of the Army study, in the 1983 Providence Harbor SAMP, and now by Clean Bays have never been investigated archaeologically, or considered and assessed for their potential historic significance.

In regards to the cultural resources that were considered and identified as part of the 1982 Department of the Army study, the following conclusions were drawn:

- pre-contact period archaeological resources may exist, but the heavy disturbances by natural and human agents within the tidal zone has undoubtedly greatly disturbed the context of any archaeological materials there;

- the structures in the water and along the shore, including several of those identified at Bold Point, are all representative of period and types of late nineteenth century construction relating to waterfront development. They played an important part in the history of the area and in many cases the nation as a whole. These structures appear to constitute important historic and archaeological resources which may qualify for nomination to the NRHP;

- several of the Department of the Army-identified structures and groups of structures at Bold Point have "particularly great historic and potential archaeological significance." These structures include the following, the locations of which are shown highlighted in a figure from the report included here as Figure 5-4:

    - **S-116** – an element of shoreline infrastructure consisting of a series of pilings arranged in a rectangular pattern ca. 300-x-75 ft (90-x-23 m) in size that may be the remains of a wharf, probably associated with the remains of the Providence Dry Dock and Marine Railway Company's floating dry dock pier (S-117) and marine railways (S-119) (S-116 does not appear on maps of 1895 or 1937);

    - **S-117** – pile remains outlining the shape of the Providence Dry Dock and Marine Railway Company's floating dry dock pier;

    - **S-118** – a structure represented by a rectangular group of pilings ca. 60 ft (20 m) square that was probably part of a wharf associated with the Providence Dry Dock and Marine Railway Company (as noted above – it does not appear on the maps of 1895 or 1937); and

    - **S-119** – remains of the marine railways built on the Providence Dry Dock and Marine Railway Company property in 1884, or sometime prior to 1919 (Cady 1957:175).

- the Providence Dry Dock and Marine Railway Company site is one of "special importance" as the sole survivor of Providence's shipbuilding industry, the last shipbuilding yard in Providence Harbor to build wooden sailing ships and the only one of which surface remains exist. Significant archaeological resources may be present here, as it is one of the few nineteenth century shipyards in the northeast that was not built upon following its closing. Features S-117 and S-119 were part of the Providence Drydock & Marine Railway Company's infrastructure. Structures S-116 and S-118 may also be related to the shipyard operation;

- the [Department of the Army] debris removal program will involve removal of all or portions of several structures and dump sites within the survey area. This will constitute an adverse effect upon any significant archaeological or historical resources represented in these dumps or structures;

- "While all of these structures described above may be considered 'historic' in date, their degree of significance in terms of National Register criteria remains to be assessed at the next stage of the study. The partial and total demolition to be undertaken in the case of the other structures is a threat to the historic and archaeological integrity of the structures as it would greatly alter their appearance from that during their use," and;

- "The removal of many of the structures noted…may constitute an adverse impact upon the historic character of Providence Harbor. Most of these structures are nineteenth century wharves, dating from the period of the greatest maritime prosperity of the area.

> The wholesale removal of these structures will visually alter the waterfront in such a manner that the region's historic relationship with the sea may become obscured" (Department of the Army 1982:APPENDIX 7:18, 19, 40-44).

Based upon these conclusions, the 1982 Department of the Army study then recommended that "because of the apparent architectural, archaeological and historic value of individual structures and adjacent sites, it is desirable that further intensive [Phase II] survey be performed…of sufficient intensity to aid in the determination of significance for each site or structure, applying the National Register criteria of eligibility (Department of the Army 1982:APPENDIX 7:40-44).

5.2 Field Survey

Background research done for the study was complemented by field survey conducted over multiple site visits on a nearly monthly basis throughout 2015 (see Chapter 2.0 for a description of field methods). The field survey was performed to evaluate environmental conditions and the physical integrity of the study area, as well as to preliminarily map and assess the potential significance of identified submerged cultural resources for the purpose of determining the area's overall archaeological sensitivity.

5.2.1 Site Mapping and Recordation

Field surveying to map and record the submerged cultural resources in the study area led to some unanticipated and interesting results. First, the high-resolution quad-copter images provided by project volunteer, Glenn Anderson, made it possible to see for the first time in extraordinary detail the submerged wrecks that were otherwise invisible in the existing mapping and aerial photography. As a result, it quickly became obvious that there were many more wrecks than originally anticipated at the start of the study (i.e., 29 instead of 17), based on what was seen in the publically-available Bing Maps' Bird's-Eye View of the area that was examined by CML in 2013. Second, the dives made on the wrecks revealed that while the preservation of exposed hull remains was variable and ranged from those with little relief above the harbor floor sediments to those with elements of their entire hull structure preserved to the deck level and exposed above the water, the overall condition of the examined sites appeared to be remarkably undisturbed. This lack of disturbance was evident from the numerous small wooden hull fragments that were visible lying on the surface of the sediments around the wrecks and the ship hardware-related artifacts that are typically attractive to collectors that are still present on the examined sites. The undisturbed quality of the abandoned vessel sites at Green Jacket Shoal is particularly remarkable considering the relatively shallow depth of water over the shoal and the exposed and close proximity to and accessibility from shore of many of the wrecks. This exposure and accessibility make them susceptible to damages from natural agents (e.g., wind-blown waves, spring river freshets, and winter ice) as well as from human ones (e.g., vandalism [burning and artifact collecting]). From an archaeological preservation perspective, while waterlogged and degraded, the preserved wooden timbers comprising each ship's hull are in most cases in relatively good condition, and, in some cases, very sound with little or no evidence of damage to the wood from colonization by "ship worms" (i.e., the mollusk *Toredo navalis*). Cursory inspection indicated that white oak (*Quercus alba*) and southern yellow pine (*Pinus palustris*) were wood species commonly used in the construction of the ships that were abandoned in the study area. The relatively undisturbed and good condition of the wrecks and their wooden hull timbers is likely, in part, a result of the long-polluted condition of the waters and sediments on site, which has made the Providence River and

Green Jacket Shoal unattractive to people who might have otherwise been curious and considered exploring or diving on the wrecks. Third, the diving and kayak-based documentation that was done during the field survey encountered much more marine and avian life than was anticipated and gave the impression that the ship remains on site provide important habitat for the "pioneer species" of marine mammals, birds, finfish, shellfish and plants that are moving back into the increasingly clean waters of the Providence and Seekonk rivers (Figure 5-5). Fourth, and finally, the public's use of the Bold Point Park grounds and boat ramp was much heavier than anticipated during the warmer months that fieldwork was conducted on-site. On days when the weather was nice, the parking lot at the park was usually full of vehicles with boat trailers and the park itself frequented by people exploring the shore, fishing (from shore and from kayaks), and walking and picnicking (Figure 5-6). Other less socially-acceptable activities were also observed in the parking lot at the park, and would likely be reduced by a more regular presence of local law-enforcement on-site. Regardless, any concerns that Bold Point Park and its boat ramp are not being used by local and area residents seem unfounded.

As noted above, the remains of a total of 29 vessels were documented and mapped by CML in the study area. A catalog of information recorded at each shipwreck location is included as Appendix A of this report. The locations of the remains of shoreline infrastructure consisting of piles and decking framing timbers from the floating dry dock pier, and from a pier at the northwest corner of Bold Point, both of which were associated with the late nineteenth and early twentieth century operations of the Providence Dry Dock and Marine Railway Company, were also mapped on site.

The documented vessel remains ranged in size from approximately 40 to 200 ft long (12 to 60 m), and included six different classes of ships (scow-barges of varying sizes, designs and purpose [n=17] [Figure 5-7]; sailing vessels, including one that appears to have been a large schooner-barge that is partially filled with large rough-cut logs [n=4] [Figure 5-8]; possible screw-propelled harbor steamers [n=3]; the identified Narragansett Bay/Rhode Island Sound side-wheel steamers *Bay Queen* [Figure 5-9] and *Mount Hope* [Figure 5-10] [n=2]; possible screw-propelled steam or diesel-marine vessels [n=2]; and one large unknown vessel type that may be an additional sailing vessel [n=1]). The number of abandoned vessels at Green Jacket Shoal makes it, by far, the largest ship graveyard in Rhode Island (Figure 5-11).

The oldest confirmed vessel in the assemblage is 151 years in age (*Bay Queen* [1865]), while the majority of the other vessels are estimated to be 75 to 125 years old. The only other vessel in the group with a confirmed age is the 128-year old Narragansett Bay/Rhode Island Sound side-wheel steamer *Mount Hope* (1888). Field examination and a review of newspaper articles and publicly-available aerial photographs and aerial orthophotographs from the RIGIS website indicate that two barges at the northeastern corner of the study area are recent additions to the site (i.e., ca. late 1960s and 1990s), and are likely to be less than 50 years old.

The Narragansett Bay excursion steamer, *Bay Queen* (1865-1902), had an operational lifespan lasting 37 years (Figure 5-12). *Bay Queen* was built in Brooklyn, New York in 1865 for the American Steamboat Company, which later became the Continental Steamboat Company. It ran the Providence-to-Newport line and made excursions trips to the Bay resorts at Fields Point, Crescent Park, Rocky Point, Prudence Park, Conanicut Park, and Narragansett Pier (Figure 5-13). The steamer measured 184 ft, 3 in (56 m) long and 29 ft, 7 in (9 m) wide (excluding its overhanging deck), and had a depth of 9 ft, 6 in (3 m). It had a Gross Tonnage of 679; a Net Tonnage of 556.

The American Steamboat Company reorganized in 1876 as the Continental Steamboat Company. Continental Steamboat Company then absorbed the Providence & Fall River Steamboat Company and the Shore Transportation Company. The Continental Steamboat Company became the Providence, Fall River, and Newport Steamboat Company in 1901. *Bay Queen* was sold for conversion into a barge in 1901 and stripped of its machinery and upper-works at the Providence Dry Dock and Marine Railway Company's dry dock pier in 1902. The planned conversion into a barge never proceeded, however, and *Bay Queen* was moved to the north side of the pier and abandoned at Bold Point. Over the course of its nearly four decades of service, Bay Queen was one of the most popular on the bay during steam-boating's late 1800s heyday. It held the speed record for long time for the Newport-to-Providence transit (1 hr, 25 mins), which it made during the 1877 Harkness Court Fire response.

The excursion steamer *Mount Hope* (1888-1934) enjoyed an operational career spanning nearly half of a century (46 years). It was built in the shipyard of Jabez K. Montgomery & A. L. Howard, in Chelsea, MA, for the Fall River and Providence Steamboat Company. *Mount Hope*'s dimensions measured 193 ft, 1 in (59 m) long, 58 ft, 8 in (18 m) (including the main deck's overhang), and had a depth of hold of 11 ft, 5 in (3.5 m). Its gross tonnage was 880 and its net tonnage was 440. *Mount Hope* was designed by master naval architect, George Pierce. Pierce went on to become Supervisor of Steamboats for the Fall River Line and the "most notable naval architect of the Long Island Sound steamers." Pierce was renowned for having developed a "new generation" of steamers between 1883 and 1905 – the same period in which he designed *Mount Hope* (1888). Pierce's *Priscilla* (1894) has been called the "supreme example of American steamboat design at the close of the nineteenth century" (Hilton 1968) (Figure 5-14). *Mount Hope* was Rhode Island's best-known and most heavily-traveled steamboat. A summer-only steamer, it served the Providence to Block Island Route (with stops at Newport). *Mount Hope*'s passenger capacity was 2,000 persons for transits within Narragansett Bay. For transits out to Block Island, its capacity was limited to 1,300-plus on transit out to Block Island. Excursion steamers like *Mount Hope* were eventually finished off by competition from trolley's, affordable automobiles, and the Great Depression (Figure 5-15).

The distribution of a majority of the vessel remains within the study area appears to be non-random and bi-modal (see Figure 5-11). There are two concentrations of wrecks – one just north of the channel-side end of the floating dry dock pier, and the other west of the northern end of Bold Point, close to the locations of the wharf that once extended from the northwest corner of Bold Point and the locations of the Providence Dry Dock and Marine Railway Company's two marine railways that were located just around the end of the point on its east side. The distribution pattern of vessel remains on Green Jacket Shoal is noteworthy, as it suggests that their deposition was non-random and had some association with the shore-side infrastructure and onshore operations of the Providence Dry Dock and Marine Railway Company at Bold Point. The liklihood of a possible association appears to be confirmed by historical photographs obtained during this study's background research of the side-wheel steamer *Bay Queen* positioned along the south side of the floating dry dock pier, stripped of its valuable machinery, its upper works being dismantled and removed (Figure 5-16). Following its cutting-down, *Bay Queen* was moved around to the even shallower and unused waters on the north side of the dry dock pier and left to rot. Its remains are visible in intermediate stages of decay in historical photographs of the Bold Point waterfront taken in the early decades of the twentieth century (see Figure 4-7).

The remains of the Providence Dry Dock and Marine Railway Company's floating dry dock pier consist of three long parallel lines of piles that once supported the edges and center of the pier's

decking framing that formed the long and narrow part of the pier that extended from the shoreline within the shipyard property on the Bold Point out to a broader section of the pier whose channel-side ends were separated into two narrow piers of unequal length that ended in large pile dolphins. These two narrow piers created the slip space for the floating dry dock (Figure 5-17). The large pile dolphins helped protect the ends of the floating dry dock pier from being damaged when vessels were moved in and out of the dry dock. Displaced pieces of the pier's decking framing, miscellaneous debris associated with the use of the pier, as well as what may be ballast dumps of stone are all present in and around the floating dry dock pier remains. When viewed from above, the distribution of piles clearly defines the unique "tuning fork-like" shape of the floating dry dock pier that makes it different from the pile distributions of most wharves or finger piers. It was observed in the field that the pile remains of the dry dock pier act somewhat like a protective fence to the shipwrecks that lie north of it. The clear navigational hazard the piles represent to alert recreational boaters is additional inducement to stay off the shoal and within the marked navigational channel, thereby reducing the risk of impacts to the wrecks and damages to the modern recreational boats from unintended hull-strikes with the shoal or its submerged cultural resources.

5.2.2 Geological Sampling

Preliminary evaluation of the character of the sediments within the Green Jacket Shoal study area was accomplished through direct observations made while diving and performing kayak-based surveying, as well as through a limited program of geological sampling consisting of two "biological cores" and one vibracore recovered from the shoal (see Chapter 2.0 for a detailed description of the geological sediment sampling methods). An attempt to recover a second vibracore proved unsuccessful due to the presence of coarse materials (i.e., coarse sand, gravel, and shells) on the shoal's surface that the corer could not penetrate. The two general locations on the shoal that were selected for geological sampling included an area in the nearshore, approximately 125 ft (38 m) west of the shoreline on Bold Point, where Vibracore (VC) 2015-1 and Biological Core (BC) 2015-1 were taken, and an area mid-shoal, approximately 500 ft (152 m) west of the Bold Point shoreline, where BC 2015-2 was taken and VC 2015-2 was attempted (see Figure 5-11).

Direct visual observations made while diving and performing the kayak-based surveying indicated that the marine sediments closer to shore were thicker and siltier and consistent with a more depositional environment, while those mid-shoal were thinner and coarser and included silt, but with a higher percentage of sand, and significant amounts of gravel and large shell hash, more typical of an erosional environment. The geological sampling results (Appendix B) seem to confirm the impressions from the direct visual observations.

Biological core BC 2015-1, taken in the nearshore environment, consisted of a sandy-silt sample with a 19 in (49 cm) recovery depth ranging in color from black (5Y 2.5/1) to very dark gray (5Y 3/1) between 0 to 1.5 inches below surface (inbs) (0 to 4 centimeters below surface [cmbs]) and 1.5 to 19 inbs (4 to 49 cmbs), respectively. All of the sediments recovered in BC 2015-1 were marine in nature, and contained inclusions of soft-shelled clams (*Mya arenaria*), mussels (*Mytilus edulis)*, a coal clinker, small rocks, pebbles and small shell-hash throughout. No evidence of a formerly-terrestrial land surface or paleosols was encountered.

Vibracore VC 2015-1, also taken in the nearshore environment, was acquired about 50 ft (15 m) north of BC 2015-1 and recovered 9.6 ft (2.93 m) of sediment ranging in color from black (5Y 2.5/1)

from 0 to 3 inbs (0 to 8 cmbs) to very dark gray (5Y 3/1) from 3 inbs to 9.6 ft below surface (ftbs) (8 cmbs to 2.93 meters below surface [mbs]). All of the sediments recovered in VC 2015-1 were sandy-silt and marine in nature with inclusions of mud snails (*Ilyanassa obsoleta*), eastern oyster (*Crassostrea virginica*) shell, small shell-hash, small gravel, small bits of wood, a small linear piece of shale, and occasional pebbles. No evidence of a formerly-terrestrial land surface or paleosols was encountered.

Biological core BC 2015-2 was taken in the mid-shoal area and recovered 3.2 ft (98 cm) of sediment ranging in color from black (5Y 2.5/1) 0 to 5 inbs (0 to 13 cmbs) to very dark gray (5Y 3/1) 5 inbs to 3.2 ftbs (13 to 98 cmbs). The upper sediments (0-5 inbs [0-13 cmbs]) consisted of silty-fine sand with abundant pebbles and shell-hash (soft-shelled clams [*Mya arenaria*] and hard clams [*Mercenaria mercenaria*]). The remaining sediments (5 inbs to 3.2 ftbs [13 to 98 cmbs]) consisted of silt with a minor sand fraction and occasional shells and pebbles. All of the sediments recovered in BC 2015-2 were marine in nature. No evidence a formerly-terrestrial land surface or paleosols was encountered.

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

The Phase I(a) marine archaeological reconnaissance survey of the Green Jacket Shoal study area located and inventoried previously-identified and unidentified archaeological resources within the study area and assessed its overall archaeological sensitivity and potential to contain additional, as-yet unidentified, submerged cultural sites. Achievement of the survey's research goals were met through a year-long study consisting of background research, non-disturbance archaeological survey, baseline documentation and mapping, and limited geological sampling of sediments to assess their condition (i.e., degree of disturbance, stratigraphy, depositional environment [terrestrial or marine], and grain size). Although the purpose of the study as purely academic research or as part of a formal cultural resource management review process was not clearly defined at its inception by RISG, federal funding by NOAA of Clean Bays' RISG-supported larger debris removal project could be determined to be a federal undertaking requiring compliance with Section 106 of the NHPA, and the consideration of the proposed debris removal project's impacts on submerged cultural resources. In anticipation of the debris removal project's possible need to be subjected to a formal Section 106 review process and its impacts to cultural resources assessed, this study and the recommendations provided herein, were performed and developed referencing the NPS and RIHPHC's guidelines for Phase I(a), Phase I(b) and Phase II archaeological investigations. This chapter presents the conclusions that have been drawn from the results of the background and field research conducted for this study and provides management recommendations regarding the need for additional marine archaeological investigation that are based on these conclusions.

The Green Jacket Shoal study area's location at the head of Narragansett Bay, one of the region's largest estuaries, and at the confluence of multiple rivers connecting tidewater to the interior, has made Providence Harbor and its surrounding environs, including Green Jacket Shoal and Bold Point, a culturally important place for intensive human use and habitation for thousands of years spanning the entirety of the region's archaeologically-documented human history. During this time, Green Jacket Shoal's environment underwent a dramatic transformation, from a glacial outwash plain, to a flood plain within a major river valley, to a marsh, then an intertidal mud flat, and finally a sub-tidal shoal. Most of the shoal's formerly exposed land surface would have been altered significantly by the marine transgression process and subsequent erosional impacts associated with wind-driven waves, tidal currents, and the flow of the Seekonk River, which would have destroyed, disturbed, or buried most paleosols that were present and any ancient Native American cultural deposits they may have contained. Geological evidence from the limited sediment sampling that was conducted for this study seems to be consistent with this characterization. The central area of the shoal is an actively eroded and reworked sedimentary environment as a result of its inundation, while sediments on the eastern margin of the shoal have accumulated under depositional conditions. Map evidence indicates that the horizontal shoreline position on the west side of Bold Point adjacent to Green Jacket Shoal has not changed significantly since ca. 1700 and that the harbor's repeated and extensive dredging operations did not extend onto the central portion of Green Jacket Shoal, but were, instead, limited to the western and northern margins of the shoal. These factors suggest that there is a greater likelihood for cultural deposits, especially larger ones associated with the post-contact period, such as shipwrecks, to have remained essentially undisturbed since their deposition into the archaeological record. However, this is not to say that they have not been impacted by the industrialization of Providence and East Providence. The

health of the water and sediments in Providence Harbor and the Seekonk River degraded dramatically beginning in about the middle nineteenth century. Although water quality in the Upper Bay is improving, concerns about contaminants in the sediments within the study area are significant, especially when sediment disturbances potentially associated with debris removal, and that which is clearly associated with archaeological excavation, or long-duration, repeated exposures during diving operations are considered. While the degraded biological health of the sediments and waters of the study area are a concern, they are also part of the reason the identified sites on the shoal and along the shoreline of Bold Point have been preserved. Situated outside of the navigation channel in essentially unnavigable waters for commercial water traffic, in an area long-neglected after the Providence Dry Dock and Marine Railway Company's dissolution, with polluted water and sediments that were long unattractive for use or development, the submerged cultural resources of Green Jacket Shoal and Bold Point have received very little notice or attention as anything other than harbor clutter and debris. The extraordinary preservation of the wooden fabric of the ship's hulls may be because the poor water quality prevented their colonization by wood-boring animals that normally thrive in healthier temperate inland waters.

With multiple ancient Native American cultural sites identified in multiple locations all around the Upper Bay and Blackstone River Valley area spanning the entire archaeologically-defined 12,000 years-plus pre-contact period, and Providence and East Providence being among the United States' earliest Euro-American colonial settlements with maritime activity dating back to the early 1600s, the range of archaeological site types and dates that could be present within the study area is noteworthy. Equally noteworthy is that the submerged cultural resources identified thus far on Green Jacket Shoal all seem to date from, with a couple of more modern exceptions, the middle nineteenth century to the first quarter of the twentieth century. This later date for the identified resources, as compared to the early date of the area's colonial settlement, is directly tied to the developmental history of East Providence and the Watchemoket area. It was during the nineteenth century that Providence and its surrounding communities grew to become cities of national and regional prominence and important centers of cultural, financial, technological, commercial, industrial and maritime activities. This development reached its zenith during the late 1800s and early 1900s – precisely the same time period from which a majority of the submerged cultural resources in the study area date. East Providence's village of Watchemoket rose to prominence as the city's cultural center during this period as well, and had a direct link to the development and activities that took place at Bold Point. The establishment of the Wilkes-Barre Coal Company pier and the Providence Dry Dock and Marine Railway Company's shipyard on Bold Point after resolution of the 1862 state border dispute settlement between Rhode Island and Massachusetts brought significant maritime activity to this area and were among the most important harbor-side facilities and centers of commercial maritime activity in Providence Harbor at that time.

Major components found within the study area include: a) the 29 wooden ships comprising six classes of vessel including multiple types and sizes of scow-barges, sailing vessels, screw-propelled harbor steamers, large side-wheel bay and sound steamers, possible steam or diesel-motor screw-propelled vessels; b) archaeological remains of the massive pier that served as the slip for Rhode Island's first floating dry dock; and c) other associated infrastructure related to the 35 year-long operation of the last shipyard in Providence to build wooden merchant sailing vessels – the Providence Dry Dock and Marine Railway Company at Bold Point. The vast majority of these finds were engaged in the work and commerce that led to Providence's development into a regionally and nationally important port city. The diverse collection of vessel types are reflective of the broad range of port activities, commerce, transporation and recreation that was being conducted at the

time and of the rapid and transformational technological advancements that were happening in transportation and in shipbuilding and ship propulsion at that time.

Analysis of historical photographs and field survey performed for this study provided compelling evidence that the onshore activities of the Providence Dry Dock and Marine Railway Company influenced and may have directly resulted in the accumulation of most of the derelict vessels on Green Jacket Shoal. Absent from Green Jacket Shoal's waters in a photograph taken just six years after the shipyard was established, within 20 years of the shipyard's operation there were multiple derelict vessels visible in subsequent photographs, including the steamer *Bay Queen*, for which photo-documentation exists of it being cut-down at the shipyard's dry dock pier prior to its abandonment alongside the pier on the shoal.

This apparent relationship between the varied assortment of derelict vessels comprising the largest component of the submerged cultural resources identified thus far on Green Jacket Shoal, and the floating dry dock pier and other shipyard-related shoreline infrastructure on land and in the intertidal zone at Bold Point, together form a unique "maritime cultural landscape" spanning land and water in which is preserved in a remarkably comprehensive way the maritime aspect of Providence's "Golden Era" just prior to and after the turn of the twentieth century. The cultural activities that took place at Bold Point, and in Providence and Providence Harbor, occurred at the height of the city's long-ascendant cultural, industrial, and economic development, and for this reason the archaeological vestiges of those activities that are preserved both on land and in the water represent a unique and significant situation and opportunity.

Although the archaeological deposits identified within the Green Jacket Shoal study area are not the oldest in and around the Providence/East Providence area, the collection of cultural resources comprising this site, captures the city at its apex of cultural, industrial, maritime, and commercial development. In many ways, the Green Jacket Shoal/Bold Point site represents the last chapter in the development and growth of the region's industry, a history that extends along the Blackstone River Valley National Heritage Corridor and Historical Park and includes the birthplace of industry in the United States - Slater Mill.

Consideration of the cultural resources present at Bold Point and on Green Jacket Shoal will benefit from an approach to the study of coastal heritage that is holistic. Rather than looking at terrestrial and submerged resources as separate domains, they should be considered as parts of a single integrated system – a maritime cultural landscape. Using such a framework means that it is impossible to interpret the significance of cultural materials in the terrestrial, intertidal or sub-tidal zones without referencing the others. While this approach is relatively new to marine archaeology, its application to the interpretation of the significance of the Bold Point/Green Jacket Shoal maritime cultural landscape is essential. This study raised a number of questions, which were not possible to address within the time and budgetary constraints of this initial phase of archaeological investigation. Consequently, the preliminary archaeological assessment performed as part of this study should not be seen as an end unto itself, but instead as the basis for planning the more intensive archaeological work that this archaeologically extraordinary site warrants.

6.1.1 Pre-Contact Period Archaeological Sensitivity

The development of predictive models for locating cultural resources onshore may be broadly applicable for assessing the potential for pre-contact archaeological sites to be present submerged

within the Green Jacket Shoal study area, as well. Archaeological research has repeatedly demonstrated that the region's pre-contact period Native peoples sought out and utilized the most optimally productive areas within their landscape, especially those areas that offered diverse resources available on a seasonally consistent or year-round basis. Coastal zones, including the bays, marshes and rivers comprising the Upper Narragansett Bay, are particularly productive environments, as they contain a wide range of habitat for plant and animal life to be harvested or hunted. Consequently, the land surrounding the Green Jacket Shoal study area was a desirable locale for pre-contact habitation and settlement. The formerly exposed land that is now Green Jacket Shoal, which was inundated by rising sea level, would have also been desirable land for pre-contact utilization.

Archaeologically sensitive areas where pre-contact sites are often present include river terraces and mouths, such as those of the Seekonk and Providence rivers, and along the perimeters of protected embayments, such the Upper Narragansett Bay and Providence Harbor. Submerged geological features such as these can be observed in geophysical and geotechnical data, and, if desired and necessary, can be subjected to subsurface archaeological testing in a way that is analogous to shovel testing on land. Remote-sensing survey and coring in submerged settings will reveal whether or not such inundated features are present.

As noted earlier in this report, generally, the prerequisite for preservation of inundated sites is burial in terrestrial or low-energy marine sediments prior to the transgression of the ocean's rising waters (Waters 1992). In such cases, sites will be preserved if they remain below the depth of shoreface erosion during and after the marine transgression process and if they are in an area that has not undergone substantial sediment reworking post-inundation.

Archaeological site file research performed for this study at the RIHPHC revealed that there no recorded pre-contact period archaeological deposits are located within the boundaries of the Green Jacket study area; however; there are pre-contact period archaeological deposits that have been identified and inventoried onshore nearby in Providence and East Providence.

Pre-contact archaeological deposits in the study area would most likely be related to Woodland Period fishing activities (e.g., shell middens, fishing gear, log boats, etc.) or pre-inundation human occupation sites dating from earlier periods. Review of available environmental data and sea level rise curves for Rhode Island waters indicates that the study area was exposed land available for human occupation from the beginning of the PaleoIndian Period (ca. 13,000 to 10,000 B.P.) until sometime during the Early Woodland Period (ca. 3,000 to 1,600 B.P.), at which point the area was submerged by rising sea level. Based on these estimates, the study area only has potential for containing formerly terrestrial pre-contact archaeological sites dating from earlier than ca. 3,000 B.P. This potential, however, is likely limited by the study area's exposure to modern erosion and reworking sediment regimes resulting from wind-blown waves washing over the shoal and spring-time freshets from the multiple rivers, particularly the Seekonk, that flow over Green Jacket Shoal and into Providence Harbor, which is not conducive to the preservation of archaeologically sensitive intact paleosols or pre-contact period sites. ***The combination of an absence of significant dredging within the study area, the high frequency of pre-contact period archaeological deposits onshore in Providence and East Providence, the highly favorable paleoenvironmental conditions that would have prevailed for thousands of years at the site prior to and just after European contact, and the importance of the confluence of multiple fresh water rivers from the interior with the tidal estuarine waters at the head of Narragansett Bay***

would strongly indicate a high archaeological sensitivity for the sediments of the study area to contain submerged ancient Native American cultural deposits. However, the results of the geological sampling, which failed to encounter any evidence of archaeologically sensitive, contextually intact, stratified paleosols suggests that these former terrestrial sediments were either eroded away, particularly from the central portion of the shoal, or are deeply buried beneath marine sediments that have accumulated along the shoal's inshore margin. Based on the results of the background research and limited geological field sampling, without further geological investigation, the assessment of the archaeological sensitivity of the portion of Green Jacket Shoal within the study area must be considered preliminary at present. Recommendations for additional geological investigation to further assess the study area's sensitivity are presented below.

6.1.2 Post-Contact Period Archaeological Sensitivity

Background research performed for this study demonstrated that the waters of Providence Harbor and the Seekonk River have been utilized by Euro-American peoples for more than three centuries. ***An assessment of high archaeological sensitivity for containing additional submerged post-contact period archaeological deposits*** is based on several factors: a) the long period of use and the relatively high levels of vessel traffic in Providence Harbor and on the Seekonk River, particularly over the 225 year period of Providence's ascendence as Rhode Island's principal port; b) the periodic hurricanes that have done extreme damage and destroyed many vessels in the Upper Narragansett Bay over the last 300 years; and c) the 29 shipwrecks and post-contact period shore-side infrastructure associated with the Providence Dry Dock and Marine Railway Company's operations that have been identified during this preliminary investigation within the boundaries of the study area.

6.2 Recommendations for Future Archaeological Survey

Based on the results of the preliminary background research and field survey conducted for this Phase I(a) reconnaissance study, performance of combined comprehensive Phase I(b)/ Phase II marine archaeological identification survey and site examination to evaluate the National Register eligibility of the submerged cultural resources located within the Green Jacket Shoal study area. This recommended additional phase of archaeological investigation should involve multiple tasks, including: consultation/coordination; permitting; sediment sampling to further characterize the shoal's geologic history and stratigraphy and to analyze and characterize the sediments' contaminants; supplemental background research; magnetometer survey; supplemental side-scan sonar survey; data processing and analyses; detailed archaeological site mapping and recordation; and public outreach and reporting. This Phase I(b)/Phase II marine archaeological identification survey and site examination should be designed to collect enough information to fully assess its archaeological sensitivity for containing submerged ancient Native American cultural sites, and to determine whether elements of the Green Jacket Shoal site's post-contact period submerged cultural resources are eligible individually or collectively for listing in the National Register of Historic Places as either individual sites or as an historic district composed of multiple contributing elements. The Phase II element of the investigation should reliably estimate the site's internal attributes and spatial boundaries to inform a determination of eligibility, and, if necessary, a Phase III data recovery plan. The survey should be performed under an archaeological permit from and in coordination with the RIHPHC, the Narragansett Indian Tribe, as per the RIHPHC permitting requirements, the Mashpee Wampanoag Tribe, the Wampanoag Tribe of Gay Head (Aquinnah), and

the Nipmuc Nation. Coordination should also be initiated and maintained during the study with NOAA, USACE, RISG, CRMC, RIDEM, the Cities of Providence and East Providence, the Providence and East Providence Historic Commissions, the East Providence Waterfront Commission, the East Providence Historical Society, and the Blackstone River Valley National Historical Park.

6.2.1 Recommended Survey Area and Survey Tasks

The recommended survey area should include the area where the currently proposed, federally-funded (NOAA), debris removal activities are anticipated to have an effect (i.e., the undertaking's APE), which in this case would be the same area as investigated during this study.

6.2.1.1 Sediment Sampling and Contaminants Analysis

Prior studies at nearby Fox Point (Corbin 1989) indicate that sediments from the Green Jacket Shoal project study area likely contain significant levels of metals and organic compound contaminants. For this reason, sediment core sampling and contaminants analysis is recommended as one of the first tasks to be completed as part of any additional phases of archaeological investigation at the site. The purpose of this analysis is to screen for contaminants of concern (COCs) according the protocol established by the US EPA's "Guidance for Developing Ecological Soil Screening Levels (2003)". Screening values of contaminants can be used in a preliminary ecological risk assessment framework to investigate potential human health risks. These risks would be relevant to and need to be incorporated in any planning of extensive research diving operations or possible underwater archaeological excavation that would be done to expose ship hull components for recordation that could be necessary as part of the recommended Phase I(b)/Phase II marine archaeological work. An assessment of the potential health risks posed by sediments within the survey area would also be useful in the future planning of public recreational and educational uses of the area. Results from sediment sampling and contaminants analysis conducted at the Green Jacket Shoal site would also inform ongoing EPA studies being conducted in the EPA Narragansett Laboratory at sites north (Seekonk River) and south (Fields Point) of the Green Jacket Shoal study area. As part of the analyses done to characterize the sediments' contaminants, additional analysis should be conducted to characterize the geologic history and sediment conditions in order to assess archaeological sensitivity of the shoal for containing submerged ancient Native American cultural sites.

6.2.1.2 Supplemental Background Research

Background research conducted as part of CML's Phase I(a) reconnaissance study provided general environmental and cultural context information for Providence, East Providence and the Green Jacket Shoal area, as well as specific information concerning the Providence Dry Dock and Marine Railway Company and the excursion steamboats *Bay Queen* and *Mount Hope*, the remains of which are all present within the study area. Supplemental research at area archives, and at the RIHS library, in particular, is recommended to more fully examine the library's collections of historical photographs of the waterfront, as well as to examine in detail the diaries that were found belonging to John Hamlin Cady (1838-1914), one of the directors of the Providence Dry Dock and Marine Railway Company. Informal informant interviews also identified a number of residents of East Providence and the surrounding area who had first-hand experience either traveling on board *Mount Hope*, or who had grown up nearby, were familiar with the Bold Point/Green Jacket Shoal area, and had explored its abandoned vessels as adolescents or young adults. Additional research

time is recommended to enable following-up on leads developed during the Phase I(a) investigation, and to delve more deeply into the histories of the *Bay Queen*'s designer and builder. Specific archival research attention should also be focused on trying to identify the 27 other identified vessel remains whose identities, histories and significance remain presently unknown. Recommended repositories for conducting additional research include the Providence Public Library Rhode Island Collection, Providence City Archives, RIHS research library, and the files at the RIHPHC.

6.2.1.3 Phase I(b) Magnetometer Survey, Supplemental Sidescan Sonar Survey, Data Processing and Analysis

In order to more fully map the nature and extents of the shipwreck sites and any other cultural deposits present in the Green Jacket Shoal study area, the low-altitude aerial photography from 2015 and the high-resolution side scan sonar data recorded in 2013 should be supplemented by conducted a close-interval (50 ft [15 m] line spacing or less) magnetometer survey using a high-sensitivity marine magnetometer. The data should be post-processed and used to create ArcGIS representations of magnetic contour data for interpretation, site identification and site boundary delineation purposes. Supplemental sidescan sonar survey should also be performed to acquire fill-in data necessary to achieve comprehensive coverage of the entire Green Jacket Shoal study area, as well as to obtain more detailed images of individual shipwrecks.

6.2.1.4 Phase II Detailed Archaeological Site Mapping and Recordation

Based on the results of the sediment contaminants testing, detailed non-disturbance underwater visual reconnaissance survey and documentation of all 29 shipwrecks to the extent possible is recommended. In the event that diving operations are precluded due to the presence of significant sediment contaminants, high-resolution remote underwater video recorded using a GoPro video camera mounted on a telescoping pole that can be extended underwater and reach the shallowly submerged wrecks to obtain complete photo and videographic coverage of each wreck could be conducted, so that 3D photographic models of each wreck could be produced for archaeological interpretation and public outreach purposes. Mapping conducted for the study could also be used to develop a more detailed description of the study area, as well as individual site maps with delineated boundaries, topographic features, benchmarks or datum points. It is also recommended that descriptions of the spatial, structural, and contextual characteristics of each site be developed. Obtaining images of representative features, scaled profile views, complete documentation of all subsurface test units, and scaled photographs or line drawings of hull features used to assess age or function should also be obtained. All information necessary for completion of a National Register nomination for the overall site, and for the individual sites/contributing elements comprising it, should be recorded and updated onto an RIHPHC site inventory form that will be prepared for site(s).

6.2.1.5 Public Outreach and Reporting

3D photographic models of a select number of wrecks produced as part of the detailed site mapping process should be made available to RISG for use on their website and in theirs and other organizations' (e.g., East Providence Historical Society) public education materials. Quarterly progress reports should be produced and submitted to RISG for the duration of the project. Recommendations regarding the historical significance and National Register eligibility of the

overall Green Jacket Shoal site as a historic district should be included in a report document prepared for the study. National Register nominations and RIHPHC site forms should be included in the site report.

The anticipated benefits and impacts of the Phase I(b)/Phase II marine archaeological identification and site examination survey include:

- continued facilitation of the marine debris removal project's planning process and compliance with Section 106 project review requirements;

- identification of any areas of archaeological sensitivity for containing submerged ancient Native American cultural sites; and

- supplemental survey to attain comprehensive survey coverage of the Green Jacket Shoal study area, identification of submerged cultural resources located within the study area, and the evaluation of the site's National Register eligibility as an historic district.

BIBLIOGRAPHY

Abbass, D. K. , 2000, *Naval History and the Submerged Cultural Resources of Rhode Island* (Vol. I). Rhode Island Marine Archaeology Project, Newport, RI.

Adovasio, J. M., 1993, The Ones that Will Not Go Away. In *Kostenki to Clovis: Upper Paleolithic-PaleoIndian Adaptations* (Soffer, O., and N. D. Praslov, eds.), pp. 199-218. Plenum Press, New York, NY.

Albion, Robert G., William A. Baker, and Benjamin W. Larabee, 1972, *New England and the Sea.* Mystic Seaport Museum, Mystic, CT.

Anthony, David W., Frederick M. Carty, and Linda A. Towle, 1980, *State Reconnaissance Survey, Interim Report*. Report on file, Massachusetts Historical Commission, Office of the Secretary of State, Boston, MA.

Artemel, Janice G., Edward J. Flanagan, Elizabeth Crowell, and Louise Akerson, 1984, *Providence Cove Lands, Phase III Report*. DeLeuw, Cather/Parsons. Submitted to the Federal Railroad Administration, U.S. Department of Transportation, Washington, D.C.

Artemel, Janice G., Edward J. Flanagan, W. Sandy, and V.G. Baker , 1983, *Providence Cove Lands, Phase II Report.* DeLeuw, Cather/Parsons. Submitted to the Federal Railroad Administration, U.S. Department of Transportation, Washington, D.C.

Barnes, Ruth Carol, 1975, *Report of Excavations at Read Farm, From April 1 to December 30, 1974*. Report on file, Massachusetts Historical Commission, Office of the Secretary of State, Boston, MA.

Barr, Bradley W., n/d, Observations on Developing a Maritime Cultural Landscape Approach to Managing US National Marine Sanctuaries. Unpublished paper. National Oceanic and Atmospheric Administration's Office of National Marine Sanctuaries, Scituate, Massachusetts

Bartlett, John Russell, 1858, *Records of the Colony of Rhode Island and Providence Plantations in New England.* Knowles, Anthony & Co., Providence, RI.

Bartos, Nick, 2013, *The Decline of Maritime Activity at India Point (Providence, Rhode Island): A Study of the India Point Ship and its Port Context*. Unpublished senior thesis. Brown University, Providence, RI.

Bauer, K. Jack, 1988, *A Maritime History of the United States: The Role of America's Seas and Waterways*. University of South Carolina Press, Columbia, SC.

Bendremer, J. C. M., and R. A. Dewar, 1993, The Advent of Maize Horticulture in New England. In *Corn and Culture in the Prehistoric New World*, edited by S. Johannssen and C. Hastorf. Westview Press, Boulder, CO.

Bernstein, David J., 1993, *Prehistoric Subsistence on the Southern New England Coast: The Record from Narragansett Bay*. Academic Press, Inc., New York, NY.

"Bigger Harbor Plan Put Before Congress: Chief of Army Engineers Approves Project." *Providence Journal* 3 Feb. 1910:1, 2.

"Bird's Eye or Balloon View of Rocky Point, Narragansett Bay, RI," 1878, Sunderland & Peck Publishers, Providence, RI. Library of Congress Prints and Photographs Division, Washington, D.C., (http://loc.gov/pictures/resource/pga.08408/).

Björdal, Charlotte G., and David Gregory, 2011, WreckProtect: Decay and Protection of Archaeological Wooden Shipwrecks. Archaeopress, Ltd., Oxford, UK.

Boissevain, Ethel, and Ralph Roberts, III, 1974, The Minutes and Ledgers of the Narragansett Tribe of Indians, 1850-1865: An Intimate Glimpse into the Economic and Social Life of an Acculturated Indian Tribe on the Threshold of Detribalization. *Man in the Northeast* 7:3-28.

"Bold Point Park Plans Outlined." *Providence Journal* 27 Feb. 1974:A1+.

Borden, Philip, D., 1957, *Steamboating on Narragansett Bay*. Steamship Historical Society of America. Publication No. 7.

Bourne, Russell, 1990, *The Red King's Rebellion: Racial Politics in New England 1675-1678.* Oxford University Press, New York, NY.

Bradford, William, 1981 [1647], *Of Plymouth Plantation 1627–1647*. Reprinted. Modern Library College Editions, New York, NY.

Braun, David P., 1974, Explanatory Models for the Evolution of Coastal Adaptation in Prehistoric Eastern New England. *American Antiquity* 39(4):582-596.

Bridenbaugh, Carl, 1974, *Fat Mutton and Liberty of Conscience, Society in Rhode Island, 1636–1690.* Brown University Press, Providence, RI.

Brouwer, N.J., 1985, Recording of Selected Barges Lying at Edgewater, New Jersey. Supplement to *Survey of Cultural Resources in the Form of Derelict Ships and Barges: Hudson River Shoreline to Edgewater, New Jersey, New York Harbor Collection and Removal of Drift Project*. South Street Seaport Museum, New York, NY.

Bunker, Victoria, 1992, Stratified Components of the Gulf of Maine Archaic Tradition at the Eddy Site, Amoskeag Falls. In *Early Holocene Occupation in Northern New England* (Robinson, Brian, James Peterson, and Ann Robinson, eds.), pp. 135–148. Occasional Publications in Maine Archaeology, No. 9, Maine Historic Preservation Commission, Augusta, ME.

Bureau of Navigation, 1919, *Merchant Vessels of the United States (1918)*, U.S. Government Printing Office, Washington, DC.

Cady, John H., 1957, *The Civic and Architectural Development of Providence: 1636-1950*. The Book Shop, Providence, RI.

"Can't E. Providence Clear the Bay?" *Providence Journal* 6 Jan. 1976:A18.

Carlton, William R., 1940, Overland to Connecticut in 1645: A Travel Diary of John Winthrop, Jr. *The New England Quarterly* 13(3):494–510.

Chapin, Howard, 1919, *Documentary History of Rhode Island* (Vol. 2). Preston and Rounds, Co., Providence, RI.

Chapin, Howard, 1931, *Sachems of the Narragansetts.* Rhode Island Historical Society, Providence, RI.

"Cleaning Up the Harbor." *Providence Journal* 15 Feb. 1933:10.

Committee on Harbor, 1900, *Report of the Committee on Harbor on a Resolution Appropriating $100,000 for the Purchase of Land for the Improvement of the Harbor*. The Providence Press, Providence, RI.

Conforti, Joseph, 1976, *Our Heritage: A History of East Providence*. Monarch Publishing, Inc., White Plains, NY.

Conley, Patrick T., and Paul R. Campbell, 1982, *Providence: A Pictorial History.* Donning Company Publishers, Norfolk, VA.

Conley, Patrick T., and Paul R. Campbell, History of the City of Providence: 375 Years at a Glance. Providence City Archives (https://www.providenceri.com/print/archives/history/cityhistory?page=0%2C1 2/). Downloaded from http://www.providenceri.com. Site accessed April 6, 2015.

Corbin, J., 1988, Recent and Historical Accumulation of Trace Metal Contaminants in Narragansett Bay Sediments, R.I. Graduate School of Oceanography, University of Rhode Island, Unpubl. M.S. Thesis.

Covell, William King, 1947, *A Short History of the Fall River Line: The Story of an Era in American Inland Water Transportation*. A. Hartley G. Ward, Newport, RI.

Cram, W. Bartlett, 1980, *Picture History of New England Passenger Vessels*. Burntcoat Corporation, Hampden Highlands, ME.

Crandall Dry Dock Engineers, Inc., 1940, *A Short History of Railway Dry Docks Since their Inception in 1854 with Methods of Tonnage and Blocking Determination*. Crandall Dry Dock Engineers, Inc., Cambridge, MA.

Crisman, Kevin J., 1993, An Archaeological Approach, Chapter 12, pp. 303-320, in *Boats: A Manual for their Documentation* (Paul Lipke, Peter Spectre, and Benjamin A. G. Fuller, eds.). The American Association for State and Local History and the Museum Small Craft Association, Nashville, TN.

Dayton, Fred E., 1939, Steamboating on Providence River and Narragansett Bay, Chapter X, pp. 176-233, in *Steamboat Days*. Tudor Publishing Company, New York, NY.

Dayton, Fred E., 1939, Block Island Steamboats, Chapter XI, pp. 234-236, in *Steamboat Days*. Tudor Publishing Company, New York, NY.

Department of the Army, 1982a, *Providence River and Harbor and Seekonk River Feasibility Report for Debris Removal*. New England Division, Corps of Engineers, Waltham, MA.

Department of the Army, 1982b, *Providence River and Harbor and Seekonk River Feasibility Report for Debris Removal*. APPENDIX 7: Cultural Resource Reconnaissance, New England Division, Corps of Engineers, Waltham, MA.

Dincauze, Dena F., 1968, Cremation Cemeteries in Eastern Massachusetts. *Papers of the Peabody Museum of Archaeology and Ethnology* 59(1). Peabody Museum, Harvard University, Cambridge, MA.

Dincauze, Dena F., 1972, The Atlantic Phase: A Late Archaic Culture in Massachusetts. *Man in the Northeast* 4:40-61.

Dincauze, Dena F., 1974, An Introduction to the Archaeology of the Greater Boston Area. *Archaeology of Eastern North America* 2(1):39-67.

Dincauze, Dena F., 1975, The Late Archaic Period in Southern New England. *Arctic Anthropology* 12(2):23-34.

Dincauze, Dena F., 1976, *The Neville Site: 8,000 Years at Amoskeag, Manchester, New Hampshire.* Peabody Museum Monographs 4. Harvard University, Cambridge, MA.

Dincauze, Dena F., 1990, A Capsule Prehistory of Southern New England. In *The Pequots in Southern New England: The Fall and Rise of an American Nation* (Hauptman, Laurence M., and James D. Wherry, eds.), pp. 19-32. University of Oklahoma Press, Norman, OK.

Dincauze, Dena F., 1993, Fluted Points in the Eastern Forest. In *From Kostenki to Clovis: Upper Paleolithic Paleo-Indian Adaptations* (Chapter 20) (Soffer, Olgo, and N. D. Praslov, eds.), pp. 279-292. Plenum Press, New York, NY.

Dincauze, D. F., and M. Mulholland, 1977, Early and Middle Archaic site distributions and habitats in southern New England. *Annals of the New York Academy of Sciences* 288:439-456.

Doerring, P. F., and C. A. Oviatt, 1990, *Characterizing Late Summer Water Quality in the Seekonk River, Providence River and Upper Narragansett Bay*. NBP Report 90-49. A report submitted to the Narragansett Bay Estuary Program, Providence, RI. University of Rhode Island Graduate School of Oceanography, Narragansett, RI.

Donnelly, William T., 1905, "Floating Drydocks Construction." A paper presented to the Brooklyn Engineers' Club, Brooklyn, NY. In Anderson, Sven (ed.), 1907, *Floating Drydocks*, pp. 312-346, The Maryland Steel Company, Sparrows Point, MD.

Doucette, Dianna, 2005, Reflections of the Middle Archaic: A View from Annasnappet Pond. *Bulletin of the Massachusetts Archaeological Society* 66(1):22-33.

Doucette, Dianna, and John R. Cross, 1997, *Annasnappet Pond Archaeological District, North Carver Massachusetts. An Archaeological Data Recovery Program*. The Public Archaeology Laboratory, Inc. Report No. 580. Prepared for US Department of Transportation, Federal Highway Administration and Massachusetts Highway Department, Boston, MA.

Dragoo, Don W., 1976, Some Aspects of Eastern North American Prehistory: A Review of 1975. *American Antiquity* 41:3-27.

Dudek, Martin G., 2005, The Whortleberry Hill Site: An Early Holocene Camp in Dracut, MA. *Bulletin of the Massachusetts Archaeological Society.* 66:12-21.

Dumont, John, 1981, The PaleoIndian–Early Archaic Continuum: An Environmental Approach. *Archaeology of Eastern North America* 9:18-37.

Dunbaugh, Edwin L., 1996, *Whistles Echo on the Bay*. Rhode Island Historical Society, Providence, RI.

East Providence Historic Properties Designation and Study Commission, 2003, *Historic East Providence: An Illustrated Tour*. East Providence Historic Properties Designation and Study Commission, East Providence, RI.

"East Providence to Remove Riverside Pier." *Providence Journal* 6 Sep. 1988:B3.

Edwards, Robert L. and K. O. Emery, 1977, Man on the Continental Shelf. In *Amerinds and Their Paleoenvironments in Northeastern North America. Annals of the New York Academy of Sciences, 288* (Newman, W. S., and B. Salwen, eds.), pp. 245-256. The New York Academy of Sciences, New York, NY.

Edwards, R. L., and K. O. Emery, 1966, Archaeological Potential of the Atlantic Continental Shelf. *American Antiquity* 31:733-737.

ENSR Corporation, 2008, *Providence River and Harbor Maintenance Dredging Project Synthesis Report*, Contribution # 178, Report No. ENSR-9000-417-330. Final Report. Submitted to the New England District U.S. Army Corps of Engineers, Concord, MA. Prepared and submitted by ENSR Corporation, Medford, MA.

Fiedel, Stuart J., 2001, What Happened in the Early Woodland? *Archaeology of Eastern North America* 29:101-142.

Field, Edward, 1902, Sea Trade and Its Development, Chapter IV, pp 387-560, in *State of Rhode Island and Providence Plantations at the End of the Century: A History*, vol. 2, The Mason Publishing Company, Boston, MA.

Filios, Elena L., 1989, The End of the Beginning or the Beginning of the End: The Third Millennium in Southern New England. *Man in the Northeast* 38:79-93.

Filios, Elena L., 1999, Critical Theory in the Backwater of New England: Retelling the Third Millennium. In *The Archaeological Northeast* (Levine, M. A., K. E. Sassaman, and M. S. Nassaney, eds.), pp. 125-138. Bergin & Garvey, Westport, CT.

Firth, Antony, 2015, *The Social and Economic Benefits of Marine and Maritime Cultural Heritage. Towards Greater Accessibility and Effective Management*. Fjordr Limited for Honor Frost Foundation. London, UK.

Fitting, J. E., 1978, Regional Cultural Development, 300 B.C. to A.D. 1000. In *Handbook of North American Indians -Northeast* (Vol. 15) (Trigger, Bruce G., ed.), pp. 44-57. Smithsonian Institution, Washington, D.C.

Ford, Benjamin L., 2009, *Lake Ontario Maritime Cultural Landscape*. Unpublished PhD thesis. Texas A&M University, College Station, TX.

Ford, Benjamin L. (ed.), The Archaeology of Maritime Landscapes. *When Land Meets Sea Series* (Vol. 2). Springer, Verlag, NY.

Forrest, D. T., 1999, Beyond Presence or Absence: Establishing Diversity in Connecticut's Early Holocene Archaeological Record. *Bulletin of the Archaeological Society of Connecticut* 67:79-99.

Fowler, William S., 1952, Twin Rivers: Four–Culture Sequence at a Rhode Island Site. *Bulletin of the Massachusetts Archaeological Society* 14:1–18.

Fowler, William S., 1964, A Birdstone Recovery in Rhode Island. *Bulletin of the Massachusetts Archaeological Society* 26(3-4):39-43.

Fowler, William S., 1968, Archaic Discoveries at Flat River. *Bulletin of the Massachusetts Archaeological Society* 29(2):17-36.

Fowler, William S., 1976, A Rare Pipe Discovery. *Bulletin of the Massachusetts Archaeological Society* 37(3-4):42–4.

Fowler, William S., and Jess W. Welt, 1955, "A Significant Find." *Massachusetts Archaeological Society Bulletin* 17(1):9-12.

Garman, James C., Beth P. Miller, and Stephen J. Mrozowski, 1997, *Phase I(b) Archaeological Survey Phase II Site Examinations, Interstate Route 195 Improvements, Providence, Rhode Island.* RIDOT Archaeology Series No. 117. Prepared for the Rhode Island Department of Transportation, in cooperation with the U.S. Department of Transportation Federal Highway Administration. Prepared by the Public Archaeology Laboratory, Inc., Pawtucket, RI.

Geake, Robert A., 2013, *A History of the Providence River with the Moshassuck, Woonaskquatucket & Seekonk Tributaries*. The History Press, Charleston, SC.

Glover, Suzanne, and Burr Harrison, 1991, *Phase I Archaeological Survey of the Bulter Hospital Interceptor Sewer Project Area and Phase II Site Examination of the Red Slipper Site (RI 1877) and the*

Shaded Seekonk Site (RI 1876). The Public Archaeology Laboratory, Inc. Report no. 357. Submitted to Metcalf and Eddy, Inc., Wakefield, MA

Gramly, Richard Michael, 1982 *The Vail Site: A Palaeo-Indian Encampment in Maine.* Bulletin of the Buffalo Society of Natural Sciences Vol. 30, Buffalo, NY.

Hale, Stuart O., 1988 (2nd ed., orig. publ. 1980), *Narragansett Bay: A Friend's Perspective*. Rhode Island Sea Grant, University of Rhode Island, Narragansett, RI.

Hall, H., 1884, *Report on the Shipbuilding Industry of the United States.* Final Section of Volume 8 of the Tenth Census, U.S. Department of the Interior, Census Office, Washington, DC.

Hall-Arber, M., C. Dyer, J. Poggie, J. McNally, and R. Gagne, 2001, New England's Fishing Communities. Cambridge (MA): MIT Sea Grant 01-15 (http://seagrant.mit.edu/cmss/).

"Harbor Clean Up." *Providence Journal* 19 Jun. 1973:29.

Harbor Commissioners Annual Reports for 1879, 1887-90, 1892, 1898, 1900-06, 1912.

"Harbor Dredging Contract is Let." *Providence Journal* 19 Dec. 1939:17.

"Harbor Dredging Task Completed" *Providence Journal* 1 Feb. 1924:4.

Harley, C. K., 1972, On the Persistence of Old Techniques: The Case of North American Wooden Shipbuilding. British Columbia Discussion Paper, Vol. 78, Issue 78, Department of Economics, University of British Columbia, Vancouver.
Hilton, George W., 1968, *The Night Boat*. Howell-North Books, Berkeley, CA.

Hecker, Howard M., 1995, Jasper Flakes and Jack's Reef Points at Adams Point: Speculations on Interregional Exchange in Late Middle Woodland Times in Coastal New Hampshire. *The New Hampshire Archaeologist* 35(1):61-83.

Hinga, Kenneth R., 1992, *Contaminated Sediments in Narragansett Bay: Severity and Extent*. NBP Report 92-107. A report submitted to the Narragansett Bay Estuary Program, Providence, RI. University of Rhode Island Graduate School of Oceanography, Narragansett, RI.

Jagolinzer, Bob, "E. Providence Gets Grant to Build New Pier, Remove Old One." *Providence Journal* 19 Feb. 1988:O3.

James, Stephen R., 1999, *Cultural Resources Survey, New York Harbor Collection and Removal of Drift Project, Arthur Kill, Richmond County, New York Reach; and Kill Van Kull, Richmond County, New York Reach*. Panamerican Consultants, Inc., Memphis, TN.

Joint Committee on the Harbor, 1875, *City Document No. 18: Report Concerning a Scheme of Harbor Improvement for Providence Harbor and Adjacent Basins with Proposed Harbor Lines.* Angell, Burlingame & Co., Printers to the City, Providence, RI.

Jones, Brian D., 1998, *Human Adaptation to the Changing Northeastern Environment at the end of the Pleistocene: Implications for the Archaeological Record*. Unpubl. Ph.D. dissertation, University of Connecticut, Storrs, CT.

Jones, Brian D., and Daniel T. Forrest, 2003, Life in a Postglacial Landscape: Settlement-Subsistence Change during the Pleistocene-Holocene Transition in Southern New England. In *Geoarchaeology of Landscapes in the Glaciated Northeast* (Cremeens, David L., and John P. Hart, eds.), pp. 75-89. University of the State of New York, Albany, NY.

Juli, Harold D., and Kevin McBride, 1984, Early and Middle Woodland Periods of Connecticut Prehistory: Focus on the Lower Connecticut River Valley. *Bulletin of the Archaeological Society of Connecticut* 47:89-98.

Kane, Adam (ed.), 2001, *Underwater Barge Documentation for the Alburg-Swanton Bridge Replacement Project, BRF 036-1(1), Alburg, Grand Isle County, Vermont*. Lake Champlain Maritime Museum, Vergennes, VT.

Kelly, A. Livingston, 1958, "Steamboating on Narragansett Bay." Unpublished manuscript on file at the Rhode Island Historical Society, Providence, RI.

Kelly, Robert L., and Lawrence C. Todd, 1988, Coming into the Country: Early PaleoIndian Hunting and Mobility. *American Antiquity* 53(2):231-244.

Kemp, Peter (ed.), 1976, *The Oxford Companion to Ships and the Sea*. Oxford University Press, New York, NY.

Kimball, Gertrude S., 1912, *Providence in Colonial Times*. Houghton Mifflin Company, Boston, MA.

King, Moses (ed.), 1882, *King's Pocket-Book of Providence, R.I.* Moses King, Cambridge, MA.

Kraft, John C., 1985, Marine Environments: Paleogeographic Reconstructions in the Littoral Region. In *Archaeological Sediments in Context* (Stein, Julie K., and William R. Farrand, eds.). Peopling of the Americas Edited Volume Series (Vol. 1), Center for the Study of Early Man, Institute for Quaternary Studies, University of Maine at Orono, Orono, ME.

Kuffner, Alex, "Providence, Seekonk Rivers Due for a Massive Cleanup." *Providence Journal* 27 Nov. 2015:A4

Kuehn, Steven R., 1998, New Evidence for Late PaleoIndian-Early Archaic Subsistence Behavior in the Western Great Lakes. *American Antiquity* 63(3):457-476.

Laurence, Richard D., 1985, *Underwater Archaeological Sites in the Wilmington Historical District.* Addendum. Underwater Archaeology Unit, North Carolina Department of Natural and Cultural Resources, Raleigh, NC.

Lavin, Lucianne A., 1988, Coastal Adaptation in Southern New England and Southern New York. *Archaeology of Eastern North America* 16:101-120.

Leach, Douglas Edward, 1958, *Flintlock and Tomahawk: New England in King Philip's War*. W.W. Norton, New York, NY.

Leveillee, Alan, 2002, *An Old Place, Safe and Quiet: A Blackstone River Valley Cremation Burial Site.* Bergin & Garvey, Westport, CT.

Leveillee, Alan, 2012, The Waters Around You Have Grown: What's New About What's Old in the Narragansett Bay Drainage. Paper presented as part of the symposium "Recent Advances in PaleoIndian Research of the Northeast and Maritimes" (Richard Boisvert, chair). 77th Annual Meeting of the Society for American Archaeology, Memphis, TN.

Leveillee, Alan, and Burr Harrison, 1996, An Archaeological Landscape in Narragansett, Rhode Island, Point Judith Upper Pond, RI 110. *Bulletin of the Massachusetts Archaeological Society* 57(2):58-63.

Leveillee, Alan, Joseph N. Waller, Jr., and Donna Ingham, 2006, Dispersed Villages in Late Woodland Period South-Coastal Rhode Island. *Archaeology of Eastern North America* 34:71-89.

Little, Barbara, Erika Martin Seibert, Jan Townsend, John H. Sprinkle, Jr., and John Knoerl, 2000, *Guidelines for Evaluating and Registering Archeological Properties*. National Register Bulletin. U.S. Department of the Interior, National Park Service, National Register, History and Education, Washington, DC.

Livermore, S. T., 1877, *A History of Block Island from Its Discovery in 1514 to the Present Time 1876.* The Case, Lockwood & Brainard Co., Hartford, CT.

Lord, Arthur C., 1962, The Hawes Site: A Burial Stone Bowl Complex. *Bulletin of the Massachusetts Archaeological Society* 23(3–4):21–23.

Lovell, L. N., 1897, "Steamboats, American Sound and River." *Cassier's Magazine* 12:459-482.

Luedtke, Barbara E., 1987, The Pennsylvania Connection: Jasper in Massachusetts Archaeological Sites. *Bulletin of the Massachusetts Archaeological Society* 48(1):37-47.

Lydecker, Andrew D. W., 2013, Anatomy of a Floating Drydock: Archaeology of Working Vessels in New York Port. *ACUA Underwater Archaeology Proceedings 2012* (Brian Jordan and Troy J. Nowak, eds.), pp. 87-92. Advisory Council on Underwater Archaeology, Society for Historical Archaeology, Germantown, MD.

Lydecker, Andrew D. W., and Stephen R. James, Jr., 2002, *Remote Sensing Survey New York and New Jerseu Harbor Navigation Study, Upper and Lower Bay, Port of New York and New Jersey, Kings, Queens, New York and Richmond Counties, New York, and Essex, Hudson, Monmouth and Union Counties. New Jersey*. Final Report. Prepared for the Environmental Analysis Section, US Army Corps of Engineers, New York District, New York, NY. Prepared by Panamerican Consultants, Inc., Memphis, TN, under subcontract to Barry A. Vittor and Associates, Inc., Mobile, AL.

Lydecker, Andrew D. W., and Stephen R. James, Jr., 2004, *Target Investigations in Connection with the New York and New Jersey Harbor Navigation Project, Upper and Lower Bay, Port of New York and*

New Jersey, Kings, Queens, New York and Richmond Counties, New York, and Essex, Hudson, Monmouth and Union Counties. New Jersey. Final Report. Prepared for the Environmental Analysis Section, US Army Corps of Engineers, New York District, New York, NY. Prepared by Panamerican Consultants, Inc., Memphis, TN, Under Subcontract to Matrix Environmental and Geotechnical Services, Inc., Florham Park, NJ.

Lydecker, Andrew D. W., and Stephen R. James, Jr., 2013, The Ship Graveyards of New York Harbor: Damaging Drift or Vanishing Resource? In Richards, Nathan, and Sami K. Seeb (eds.), 2013, *The Archaeology of Watercraft Abandonment*, pp. 137-152. Springer, New York, NY.

Mair, A. Peter, 2005, *Phase I(a/b) Archaeological Sensitivity Assessment Improvements to I-195/Taunton Avenue/Warren Avenue Interchange, East Providence, Rhode Island.* PAL Report No. 1724-01. Prepared for the City of East Providence, RI. Submitted to Gordon R. Archibald, Inc., Pawtucket, RI. Submitted by the Public Archaeology Laboratory, Inc., Pawtucket, RI.

Mahlstedt, Thomas F., 1985, *The Massachusetts Historical Commission Prehistoric Survey: Artifact Collections from Cape Cod.* Massachusetts Historical Commission, Office of the Secretary of State, Boston, MA.

Marshall, F. W., 1915, "Bold Point from an Artist's Notebook: Picturesque Corners in the 'Harbor Graveyard' Threatened by Development Plans." *Providence Sunday Journal*, June 6, 1915:10.

Mather, Rod, and John Jensen, 2010, Investigations into Block Island's Submerged Cultural Sites and Landscapes for the Rhode Island Ocean Special Area Management Plan 2010, Chapter 5 in *Rhode Island Ocean Special Area Management Plan* (Volume 2), Rhode Island Coastal Resources Management Council, Wakefield, RI.

Mayhew, Dean Raymond, 1963, *The Wooden Sailing Barges of Maine, 1886 to 1945 (Maine Vessels in the Coastal Coal Trade)*. Unpublished master's thesis, University of Maine, Orono. Special Collections, University of Maine, Orono Research Library, Orono, ME.

Maymon, Jeffrey H., and Charles E. Bolian, 1992, The Wadleigh Falls Site: An Early and Middle Archaic Period Site in Southeastern New Hampshire. In *Early Holocene Occupation in Northern New England* (Robinson, Brian S., James B. Petersen, and Ann K. Robinson, eds.), pp. 117-134. Occasional Publications in Maine Archaeology, No. 9, Maine Historic Preservation Commission, Augusta, ME.

McAdam, Roger W., 1955 (rev. ed., orig. publ. 1937), *The Old Fall River Line*. Steven Daye Press, New York, NY.

McBride, Kevin A., 1978, Archaic Subsistence in the Lower Connecticut River Valley: Evidence from Woodchuck Knoll. *Man in the Northeast* 5:124–131.

McBride, Kevin A., 1984, *Prehistory of the Lower Connecticut River Valley*. Unpubl. Ph.D. dissertation, Department of Anthropology, University of Connecticut, Storrs, CT.

McBride, Kevin A., and Robert E. Dewar, 1987, Agriculture and Cultural Evolution: Causes and Effects in the Lower Connecticut River Valley. In *Emergent Horticultural Economies of the Eastern*

Woodlands (Keegan, William F., ed.), pp. 305-328. Center for Archaeological Investigations, Occasional Papers No. 7, Southern Illinois University, Carbondale, IL.

McErlean, Thomas, Rosemary McConkey, and Wes Forsythe, 2002, *Strangford Lough: An Archaeological Survey of the Maritime Cultural Landscape*. Northern Ireland Archaeological Monographs No. 6. Blackstaff Press, Limited, Belfast, UK.

McLaughlin, Scott A., 1998, *Alburg-Swanton Proposed Bridge Replacement Project, BRF 036-1(1), Underwater Archaeological Phase I Survey, Franklin County, Vermont*. Lake Champlain Maritime Museum, Vergennes, VT.

McLoughlin, William G., 1986, *Rhode Island, A History*. W. W. Norton & Co., New York, NY.

McManamon, Francis P., 1990, A Regional Perspective on Assessing the Significance of Historic Period Sites. *Historical Archaeology* 24(2):14–22.

McMaster, Robert L., 1984, Holocene Stratigraphy and Depositional History of the Narragansett Bay System, Rhode Island, USA. *Sedimentology* 31:777-792.

Meltzer, David J., and Bruce D. Smith, 1986, PaleoIndian and Early Archaic Subsistence Strategies in Eastern North America. In *Foraging, Collecting, and Harvesting: Archaic Period Subsistence and Settlement in the Eastern Woodlands* (Neusius, Sarah W., ed.), pp. 3-31. Center for Archaeological Investigations Occasional Papers No. 6, Southern Illinois University, Carbondale, IL.

Merrill, A., K. O. Emery, and R. Meyer, 1965, Sea Levels during the Past 35,000 Years. *Science* 147:398-400.

Merwin, Daria, 2001, *Archaeological Potential of the Continental Shelf in the Northern Middle Atlantic and Southern New England*. Paper presented at the 68th Annual Meeting of the Eastern States Archaeological Federation, Watertown, NY.

Merwin, Daria, Daniel P. Lynch, and David S. Robinson, 2003, Submerged Prehistoric Sites in Southern New England: Past Research and Future Directions. *Bulletin of the Archaeological Society of Connecticut* 65:41-56.

Meyer, Zachary L., 2014, *A Cultural Landscape Approach to Submerged Cultural Resource Management: Cultural Heritage Ecotourism Opportunities for the Shipwrecks of Lake Union, Seattle, Washington*. Unpublished master thesis. University of Washington, Seattle, WA.

Miller, William Davis, 1934, *The Narragansett Planters.* American Antiquarian Society, Worcester, MA.

Morra, Tyler, 2011, *The Evolutionary Development of Floating Dry Docks*. Unpublished master's thesis. East Carolina University, Greenville, NC.

Morris, Paul C., 1984, *Schooners and Schooner Barges*. Lower Cape Publishing Co., Orleans, MA.

Mulholland, Mitchell T., 1988, Territoriality and Horticulture: A Perspective for Prehistoric Southern New England. In *Holocene Human Ecology in Northeastern North America* (Nicholas, George P., ed.), pp. 137-164. Plenum Press, New York, NY.

Murray, D. W., W. L. Prell, C. E. Rincon, and E. Saarman, 2007, *Physical Properties and Chemical Characteristics of Surface Sediment Grab Samples from Narragansett Bay and the Providence and Seekonk Rivers.* NBEP Report 07-127. A report submitted to the Narragansett Bay Estuary Program, Providence, RI. Brown University Department of Geological Sciences, Providence, RI.

National Park Service, 1983, *Archaeology and Historic Preservation: Secretary of the Interior's Standards and Guidelines.* Federal Register 48(190). National Park Service, Department of the Interior, Washington, DC.

National Park Service, U.S. Department of the Interior, Abandoned Shipwreck Act Guidelines. https://www.nps.gov/archeology/submerged/intro.htm. Accessed December 2, 2015.

Needham, Brian, and Donald Robadue, Jr., 1990, *Historical Review of Water Quality Management and Pollution Abatement in Narragansett Bay*. NBP Report 90-45. A report submitted to the Narragansett Bay Estuary Program, Providence, RI. University of Rhode Island Graduate School of Oceanography, Coastal Resource Center, Narragansett, RI.

Nicholas, George P., 1987, Rethinking the Early Archaic. *Archaeology of Eastern North America* 15:99-123.

Nixon, Scott W., 1991, *A History of Metal Inputs to Narragansett Bay.* NBP Report 91-52. A report submitted to the Narragansett Bay Estuary Program, Providence, RI. University of Rhode Island Graduate School of Oceanography, Narragansett, RI.

Nye, David E., 1998, *Consuming Power: A Social History of American Energies*. The MIT Press, Cambridge, MA.

Oakley, Bryan A., and Jon C. Boothroyd, 2012, Reconstructed Topography of Southern New England Prior to Isostatic Rebound with Implications of Total Isostatic Depression and Relative Sea Level. *Quaternary Research* 78(1):110-118.

Ogden, J. Gordon, 1977, The Late Quaternary Paleoenvironmental Record of the Northeastern North America. *Annals of the New York Academy of Sciences* 288:16–34.

"Oil Firm Plans to Enlarge Pier." *Providence Journal* 18 Jan. 1979:A7.

"Old Salts Recall Change in Providence Harbor." *Providence Journal* 17 Jul. 1921: S5-1.

Olsen, S., D. Robadue, and V. Lee, 1980, *An Interpretive Atlas of Narragansett Bay*. Marine Bulletin 40. Coastal Resources Center, University of Rhode Island, Narragansett Bay Campus, Narragansett, RI.

Pagoulatos, Peter, 1988, Terminal Archaic Settlement and Subsistence in the Connecticut River Valley. *Man in the Northeast* 35:71-94.

Pagoulatos, Peter, and Duncan Ritchie, 1987, *Phase II Archaeological Survey, Kettle Point Project, East Providence, Rhode Island*. The Public Archaeology Laboratory, Inc. Report no. 149. Submitted to Transcontinental Development Corporation, Boston, MA.

Parker, Patricia, and Thomas F. King, 1998, G*uidelines for Evaluating and Documenting Traditional Cultural Properties*. National Register Bulletin. U.S. Department of the Interior, National Park Service, National Register, History and Education, Washington, DC.

Peltier, W. R., and Fairbanks, R. G., 2006, Gloabal Ice Volume and Last Glacial Maximum Duration fron an Extended Barbados Sea Level Record. *Quaternary Science Reviews* 25:3,322-3,327.

Pfeiffer, John, 1980, The Griffin Site: A Susquehanna Cremation Burial in Southern Connecticut. *Man in the Northeast* 19:129-133.

Pfeiffer, John, 1986, Dill Farm Locus I: Early and Middle Archaic Components in Southern New England. *Bulletin of the Archaeological Society of Connecticut,* 49:19-35.

"Port Tonnage of City Drops." *Providence Journal* 14 Feb.1956:19.

Potter, Elisha R., Jr., 1835, The Early History of Narragansett. *Collections of the Rhode Island Historical Society*, III. Marshall, Brown and Company, Providence, RI.

Prosnitz, Franklin S., "East Providence Protests Barges." *Providence Journal* 6 Nov. 1975: A15.

Prosnitz, Franklin S., "Army Says Barges Are Not Its Job." *Providence Journal* 5 Jan. 1976:B1.

Providence Chamber of Commerce, 1918, *Providence Magazine* 30:1.

"Providence Harbor Debris Study Ordered." *Providence Journal* 12 Oct. 1965:10.

"Providence in Lead in Coal Distribution." *Providence Journal* 24 Nov. 1909:8.

Raber, Michael S., *Marine Railways of Southeast Connecticut: Historical Survey and Inventory*. Final Report. Prepared for the Connecticut Department of Environmental Protection Office of Long Island Sound Programs, Hartford, CT. Prepared by Raber Associates, South Glastonbury, CT.

Rainey, Mary Lynne, and Deborah C. Cox, 1995, *Intensive Archaeological Survey of the Algonquin Gas Transmission Company's 1.6 Mile 24" G–12 Pipeline Loop in Seekonk, Massachusetts and East Providence, Rhode Island, Archaeological Site Examinations of the Seekonk 1 (19–BR–344), Seekonk 2 (19–BR–72) and Seekonk 3 (19–BR–345) Prehistoric Sites, A Data Recovery Program at the Seekonk 2 and Seekonk 3 Archaeological District of Prehistoric Activity*, vol. I. The Public Archaeology Laboratory, Inc. Report no. 400. Submitted to Algonquin Gas Transmission Company, Boston, MA.

Rainey, Mary L., and Duncan Ritchie, 1998, *A Data Recovery Program at the Walker Point Site (RI-659), Bluff and North Terrace Sections, East Providence, Rhode Island* (Vol. I). PAL Report No. 490. Submitted to Maguire Group, Inc., Providence, RI. Submitted by The Public Archaeology Laboratory, Inc., Pawtucket, RI.

Rampino, Michael R., and John E. Sanders, 1980, Holocene Transgression in South-Central Long Island, New York. *Journal of Sedimentary Petrology* 50:1,063-1,080.

Renfrew, Colin, 1976, Archaeology and the Earth Sciences. In *Geoarchaeology: Earth Science and the Past*, D. A. Davidson and M. L. Shackley (eds.), pp. 1-5. Duckworth, London, UK.

Read, Martin and Pollyanna Magne, 2013, Abandoned Watercraft as a Teaching Resource. In Richards, Nathan, and Sami K. Seeb (eds.), 2013, *The Archaeology of Watercraft Abandonment*, pp. 337-354. Springer, New York, NY.

Rhode Island Coastal Resources Management Council, Rhode Island Sea Grant, and the University of Rhode Island, 2010, *Rhode Island Ocean Special Area Management Plan* (Vols. 1 and 2), Rhode Island Coastal Resources Management Council, Wakefield, RI.

Rhode Island Coastal Resources Management Council, Rhode Island Sea Grant, and the University of Rhode Island, 2010, Cultural and Historic Resources. Chapter 4 in *Rhode Island Ocean Special Area Management Plan* (Vol. 1) Rhode Island Coastal Resources Management Council, Wakefield, RI.

Rhode Island Department of Transportation and State Planning Council, 1998, *Rhode Island Watermorn Passenger Transporation Plan*. Report Number 95, State Guide Plan Element 651. Providence, RI.

Rhode Island Development Council, 1955, P*ort of Providence: An Economic Survey*. Prepared for the City of Providence and the Town of East Providence. Rhode Island Development Council, Providence, RI.

Rhode Island Historical Preservation Commission, 1976, *East Providence, Rhode Island Statewide Preservation Report, P-EP-1*. Rhode Island Historical Preservation & Heritage Commission, Providence, RI.

Rhode Island Historical Preservation Commission, 1984, *Historic and Architectural Resources of South Kingstown, Rhode Island: A Preliminary Report*. Rhode Island Historical Preservation and Heritage Commission, Providence, RI.

Rhode Island Historical Preservation Commission, 1986 *The Rhode Island Historical Preservation Plan*. Providence, RI.

Rhode Island Historical Preservation and Heritage Commission, 2013, *Performance Standards and Guidelines for Archaeology in Rhode Island*. Rhode Island Historical Preservation & Heritage Commission, Providence, RI.

Richards, Mrs. Clarence, n/d, "The East Providence Shore." Unpubl. mss. (5 pp.) on file at the East Providence Public Library, East Providence, RI.

Richards, Nathan, 2013, Abandoned Ships and Ship Graveyards: Exploring Site Significance and Research Potential. In Richards, Nathan, and Sami K. Seeb (eds.), 2013, *The Archaeology of Watercraft Abandonment*, pp. 1-16. Springer, New York, NY.

Ritchie, Duncan, 1983, *Phase II Archaeological Survey of the East Providence Industrial Highway*. Prepared for CE Maguire, Inc., Providence, RI. Submitted by the Public Archaeology Laboratory, Inc., Pawtucket, RI.

Ritchie, Duncan, and Richard A. Gould, 1985, Back to the Source: A Preliminary Account of the Massachusetts Hill Quarry Complex. In *Stone Tool Analysis: Essays in Honor of Don E. Crabtree* (Pavesic, Max, James Woods, and Mark Plew, eds.), pp. 35–53. University of New Mexico Press, Alburquerque, NM.

Ritchie, William A., 1969, *The Archaeology of Martha's Vineyard*. Natural History Press, Garden City, NY.

Ritchie, William A., 1980, *The Archaeology of New York State* (rev. ed.). Natural History Press, Garden City, NY.

Robadue, Jr., Donald, 1983, *Providence Harbor: A Special Area Management Plan*. Coastal Resources Management Council. The Coastal Resources Center, Graduate School of Oceanography, University of Rhode Island, Narragansett, RI.

Robinson, Brian S., 1992, Early and Middle Archaic Period Occupation in the Gulf of Maine Region: Mortuary and Technological Patterning. In *Early Holocene Occupation in Northern New England* (Robinson, Brian S., James B. Petersen, and Ann K. Robinson, eds.), pp. 63–116. Occasional Publications in Maine Archaeology, No. 9, Maine Historic Preservation Commission, Augusta, ME.

Robinson, David S., Jeffrey D. Gardner, Margaret Sano, and Jeffrey J. Hall, 2008, *Preliminary Assessment Searsport Harbor Shipwreck, Searsport, Maine*. Final Report. Prepared for the U.S. Army Corps of Engineers, New England District, Concord, MA. Prepared by the Public Archaeology Laboratory, Inc., Pawtucket, RI.

Robinson, David S., Jeffrey D. Gardner, Joseph N. Waller, Jr., Katharine Johnson, Ella Sekatau, John Brown, III, and Douglas Harris, 2012, *Phase I Marine Archaeological Remote Sensing Identification Survey, Block Island Transmission System Submarine Cable Route, New Shoreham to Narragansett, Rhode Island.* Prepared for The Public Archaeology Laboratory, Inc., Pawtucket, RI, Tetra Tech EC, Inc., Boston, MA, and Deepwater Wind Block Island Transmission, LLC, Providence, RI.

Robinson, Paul A., Marc Kelley, and Patricia E. Rubertone, 1985, Preliminary Biocultural Interpretations from a Seventeenth-Century Narragansett, Indian Cemetery in Rhode Island. In *Cultures in Contact* (Fitzhugh, William M., ed.), pp. 107-130. Smithsonian Institution, Washington, D.C.

Rockoff, Jonathan D., "City Launches Plans to Build New Boat Ramp." *Providence Journal* 4 Sep. 1997:C1-3.

Rubertone, Patricia E., 1989, Archaeology, Colonialism and Seventeenth-Century Native America: Towards an Alternative Interpretation. In *Conflict in the Archaeology of Living Traditions* (Layton, Robert, ed.), pp. 32-45. Unwin Hyman, Winchester, MA.

Rubertone, Patricia E., 2001, *Grave Undertakings: An Archaeology of Roger Williams and the Narragansett Indians.* Smithsonian Institution Press, Washington D.C.

Sampson, Murdock & Company, 1888, *The Providence Directory and Rhode Island Business Directory*. E. A. Johnson & Company, Providence, RI.

Sarle, O. Perry, 1915, *General Plan and Suggestions in Reference to the Development of Providence Harbor*. Submitted and approved by the Harbor Commissioners of the State of Rhode Island.

Sassaman, Kenneth E., 1999, A Southeastern Perspective of Soapstone Vessel Technology in the Northeast. In *The Archaeological Northeast* (Levine, M. A., K. E. Sassaman, and M. S. Nassaney, eds.) pp. 75-96. Bergin & Garvey, Westport, CT.

Seeb, Sami K., 2013, Cape Fear's Forgotten Fleet: The Eagles Island Ship Graveyard, Wilmington, North Carolina. In Richards, Nathan, and Sami K. Seeb (eds.), 2013, *The Archaeology of Watercraft Abandonment*, pp. 193-214. Springer, New York, NY.

Sekatau, Ella W., n/d, "Providence's Original Inhabitants." Downloaded from https://www.providenceri.com/archives/providences-original-inhabitants. Site accessed July 23, 2015.

Schumacher, Eugene F., "The Tide Seems to be Turning for the Waterfront." *Providence Journal* 23 Nov. 1975:B8.

Schumann, Sarah, 2015, *Rhode Island's Shellfish Heritage: An Ecological History*. Coastal Resources Center, Coastal Institute, Rhode Island Sea Grant, University of Rhode Island Graduate School of Oceanography, Narragansett, RI.

Sharpe, Mary E., "Providence could be a Beautiful City." *Providence Journal* 19 Apr. 1962:25.

Simmons, William Scranton, 1970, *Cautantowwit's House: An Indian Burial Ground on the Island of Conanicut in Narragansett Bay*. Brown University Press, Providence, RI.

Simmons, William Scranton, 1978, Narragansett. In *Handbook of North American Indians – Northeast* (Vol. 15), (Trigger, Bruce G., ed.), pp. 190-197. Smithsonian Institution, Washington, D.C.

Simon, Brona, and Joan Gallagher, 1981, *Phase I Archaeological Survey of the East Providence Industrial Highway.* Final Report. Prepared for CE Maguire, Inc., Providence, RI. Prepared by the Public Archaeology Laboratory, Brown University, Providence, RI.

"Sink the Barge Graveyard." *Providence Journal Bulletin* 8 Nov. 1975:11.

Smith, Bruce D., 1987, Origins of Agriculture in Eastern North America. *Science* 246:1566–1571.

Snow, Dean, 1980, *The Archaeology of New England*. Academic Press, New York, NY.

Spiess, Arthur, Deborah Wilson, and James Bradley, 1998, PaleoIndian Occupation in the New England-Maritimes Region: Beyond Cultural Ecology. *Archaeology of Eastern North America* 26:201-264.

Steffy, J. Richard, 1994, *Wooden Shipbuilding and the Interpretation of Shipwrecks*. Texas A&M University Press, College Station, TX.

Steamship Historical Society of America, n/d, *History of Steam Navigation between New York and Providence from 1792-1877*. Reprint Series No. 2. Peabody Museum, Salem, MA. Originally compiled in 1877 by Charles H. Dow, *Providence Journal*, Providence, RI, under the direction of D. S. Babcock, president of the Providence & Stonington Steamboat Company.

Stokinger, William A., 1979, *Cultural Resource Reconnaissance Survey, Bullocks Cove, East Providence, RI.* Report of The Public Archaeology Laboratory, Department of Anthropology, Brown University, Providence, RI.

Stothers, David M., 1996, Resource Procurement and Band Territories: A Model for Lower Great Lakes PaleoIndian and Early Archaic Settlement Systems. *Archaeology of Eastern North America* 24:173-216.

Streuver, Stuart, and Kent Vickery, 1973, The Beginnings of Cultivation in the Midwest-Riverine Area of the United States. *American Anthropologist* 75:1197–1219.

St. Martin, K., and M. Hall-Arber, 2008, Creating a Place for 'Community' in New England Fisheries. *Human Ecology Review* 15(2): 161-170

Swift, D. J. P., D. J. Stanley, and J. R. Curray, 1971, Relict Sediments on Continental Shelves: A Reconsideration. *Journal of Geology* 79:322-346.

Taggart, Robert, 1983, *Evolution of the Vessels Engaged in Waterborne Commerce of the United States*. National Waterways Study, U.S. Army Engineer Water Resources Support Center, Institute for Water Resources.

Taylor, William B., 1976, A Bifurcate Point Concentration. *Bulletin of the Massachusetts Archaeological Society* 37(3-4):36-44.

"The Story of the Fall River Line,"1916, *Fall River Line Journal* 37(7):2-9, 15, 19.

"The Rotting Barges Off Bolt Point Present a Challenge." *Providence Journal* 15 Oct. 1956:13

"This Was Chelsea." http://www.tritec-inc.org/becomingamerica/chelsea-unit/dlafontana/process-d4.html. Accessed 15 October 2015.

Tindall, George Brown, 1984, *America: A Narrative History*. W. W. Norton & Company, Inc., New York, NY.

Turnbaugh, William A., 1980, Early and Middle Archaic Elements in Southern Rhode Island. In *Early and Middle Archaic Cultures in the Northeast* (Starbuck, David R., and Charles F. Bolian, eds.), pp. 59-

71. Occasional Publications in the Northeastern Anthropology No. 7. Department of Anthropology, Franklin Pierce College, Rindge, NH.

Turnbaugh, William A., 1993a, Assessing the Significance of European Goods in Seventeenth Century Narragansett Society. In *Ethnohistory and Archaeology Approaches to Postcontact Change in the Americas* (Rogers, J. Daniel, and Samuel M. Wilson, eds.), pp 133-160. Plenum Press, New York, NY.

Turnbaugh, William A., 1993b, Community, Commodities, and the Concept Property in Seventeenth Century Narragansett Society. In *Archaeology of Eastern North America Papers in Honor of Stephen Williams* (Stoltman, James B., ed.). Mississippi Department of Archives and History, Jackson, MS.

"Tyler Starts Move to Clean Up River: Harbor Master Asks Police to Prevent Rubbish Throwing." *Providence Journal* 19 Jul. 1928:26.

University of Rhode Island, 2010, *Rhode Island Ocean Special Area Management Plan* (Vol. 1). Prepared for the RI Coastal Resource Management Council. Prepared by the Coastal Resource Center, University of Rhode Island, Narragansett Bay Campus, Narragansett, RI.

"Upper Harbor Virtually Abandoned." *Providence Sunday Journal* 30 Jul. 1950:4.

U.S. Department of Commerce, U.S. Coast and Geodetic Survey, 1918, *United States Coast Pilot, Atlantic Coast, Section B – Cape Cod to Sandy Hook*. U.S. Government Printing Office, Washington, DC

U.S. Environmental Protection Agency, 2007, Northeast Estuary Program Coastal Condition, Narragansett Bay Estuary Program. Chapter 3 in *National Estuary Program Coastal Condition Report* (pp 97-107). Downloaded from http://www.epa.gov/owow/oceans/nepccr/index.html. Site accessed May 9, 2015.

"U.S. to Spend $1,580,000 Dredging Providence Harbor." *Providence Journal* 28 Aug. 1937:1.

Varmer, Ole, 2014, *Underwater Cultural Heritage Law Study*. OCS Study BOEM 2014-005. Prepared under BOEM-NOAA Interagency Agreement Number M11PG00050. Prepared for the U.S. Department of the Interior Bureau of Ocean Energy Management, Herndon, VA. Prepared by the U.S. Department of Commerce National Oceanic and Atmospheric Administration, Washington, DC.

Waguespack, Nicole M., and Todd A. Surovell, 2003, Clovis Hunting Strategies, or How to Make Out on Plentiful Resources. *American Antiquity* 68(2):333-352.

Waller, Joseph N., Jr., 2000, Late Woodland Settlement and Subsistence in Southern New England Revisited: The Evidence From Coastal Rhode Island. *North American Archaeologist* 21(2):139-153.

Waller, Joseph N., Jr., and Alan Leveillee, 1998, Archaeological Investigations at site RI 2050 in Cranston, Rhode Island: A Native American Steatite Processing Site. *Bulletin of the Archaeological Society of Connecticut* 61: 3-16.

Waller, Joseph N., Jr., and Alan Leveillee, 2002, Archaic Period Land Use and Settlement in the Pawcatuck River Watershed of South-Central Rhode Island. *Northeast Anthropology* 63:71-82.

Walling, H. F., 1850, "Map of the Town of Seekonk."

Warren, Wilfred E., 1979, *SW ¼ W: A Short History of Transportation on Narragansett Bay and Its Environs*. Self-published by the author, Jamestown, RI.

"Waterfront Park Eyed in East Providence." *Providence Journal* 17 Sep. 1972:C3.

Waters, Michael R., 1992, *Principles of Geoarchaeology: a North American Perspective.* The University of Arizona Press, Tucson, AZ.

Weeden, William B., 1890, *Economic and Social History of New England, 1620-1789* (2 vols.). The Riverside Press, Cambridge, MA.

Welt, Jess, "The Old Dry Dock: It Cradled Lots of Ships." *Providence Journal* 15 Dec. 1957: M14.

Westerdahl, Christer, 1992, The Maritime Cultural Landscape. *International Journal of Nautical Archaeology* 21(1):5-14.

Westley, Kieran, and Justin Dix, 2006, Coastal Environments and Their Role in Prehistoric Migration. *Journal of Maritime Archaeology* 1(1):9-28.

Whitmore, F. C., Jr., K. O. Emery, H. G. S. Cooke, and D. J. P. Swift, 1967, Elephant Teeth on the Continental Shelf. *Science* 156:1477-1481.

Windsor, Richard D., "I Remember the Queen of the Bay and Her King." *Providence Journal* 17 Aug. 1958:M18.

Woodward, Wm McKenzie, and Edward F. Sanderson, 1986, *Providence: A Citywide Survey of Historic Resources*. Rhode Island Historical Preservation Commission, Providence, RI.

FIGURES

Figure 1-1. Location of the Green Jacket Shoal Phase I(a) marine archaeological reconnaissance survey study area (source: CML; basemap courtesy of ESRI ArcGIS Online, World Topographic).

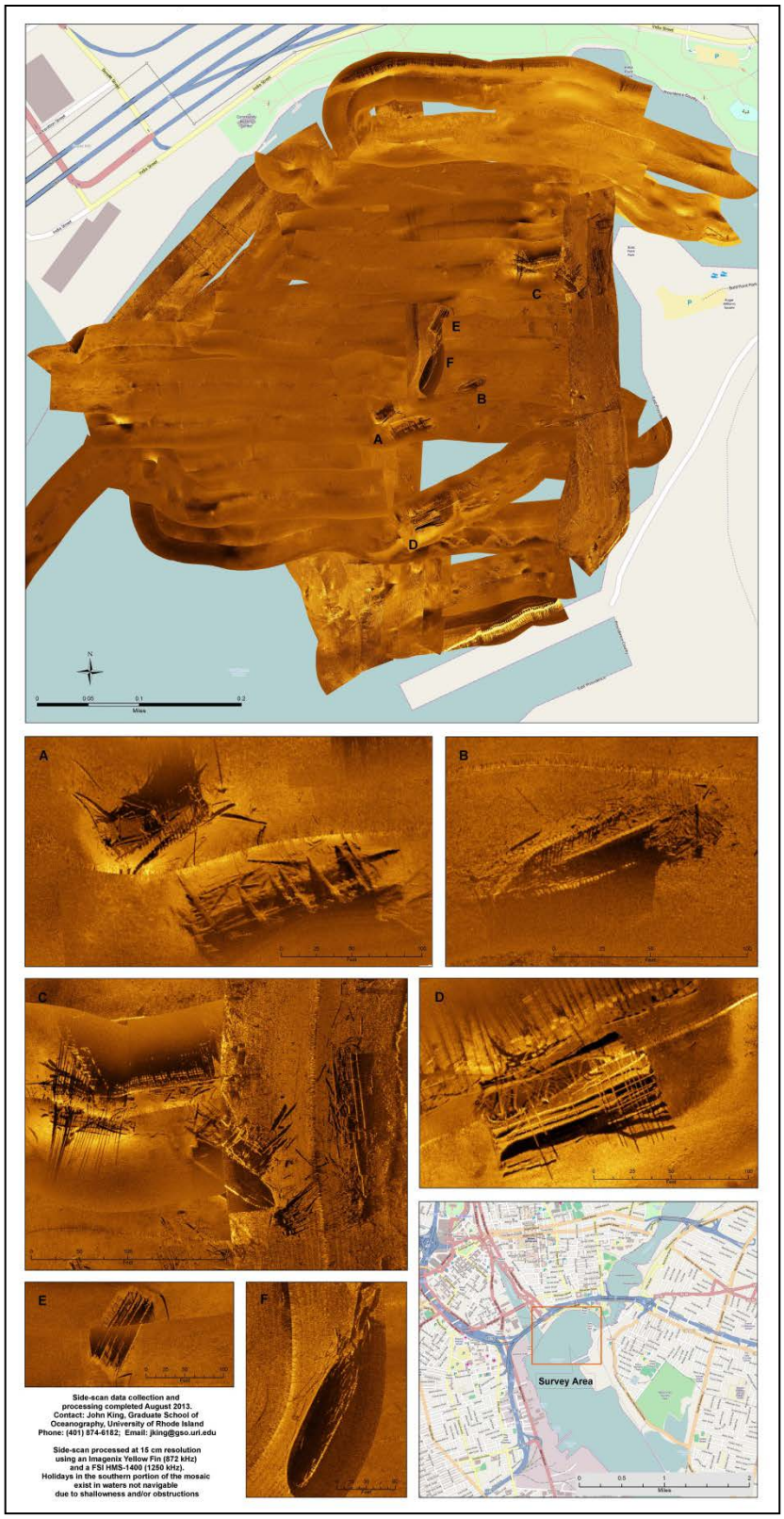


Figure 1-2. High-resolution side-scan sonar survey data recorded by CML in 2013 showing six concentrations of wreckage on the harbor floor in the vicinity of Green Jacket Shoal (Source: King and LaFrance Bartley 2013).

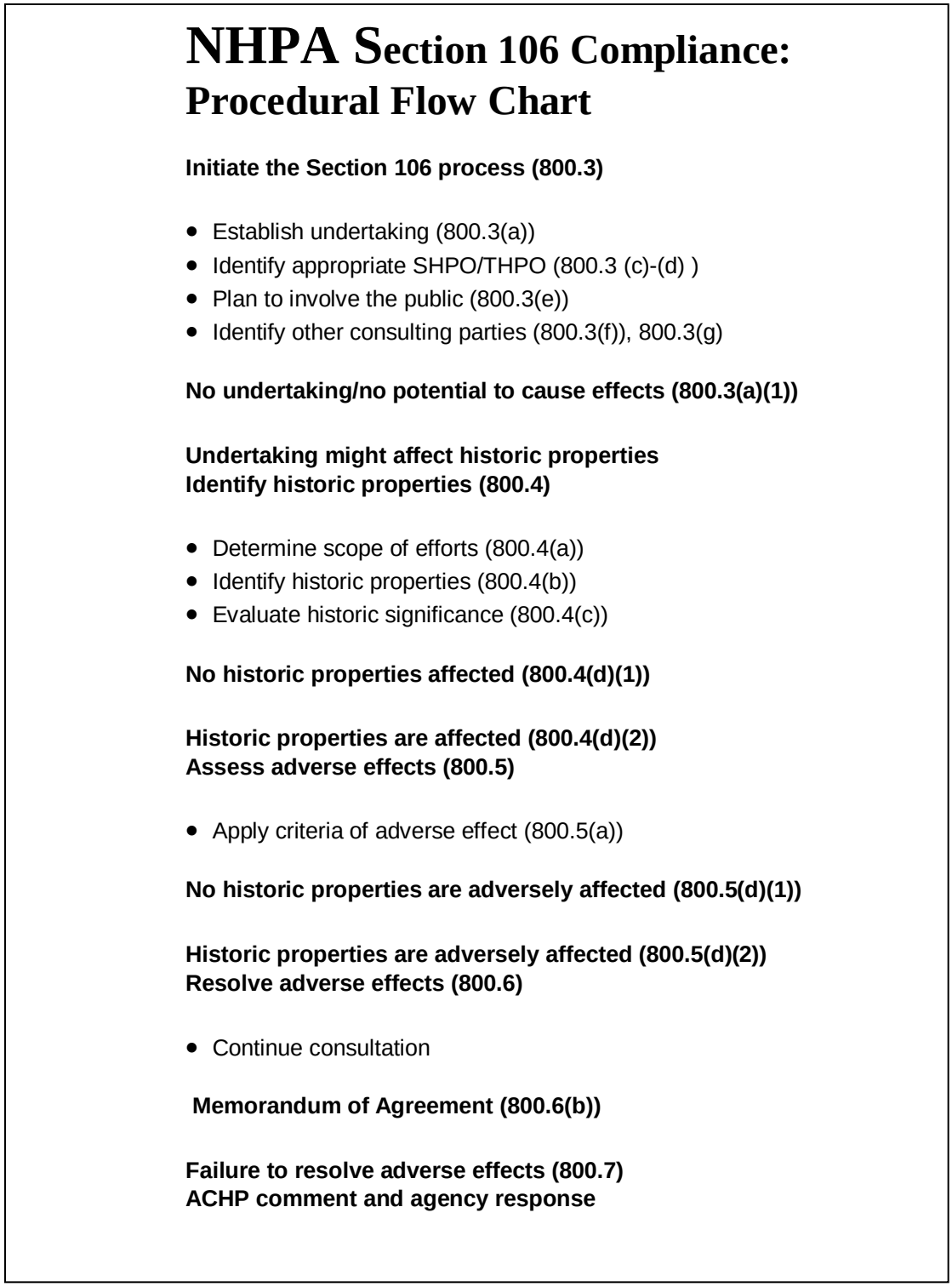


Figure 1-3. NHPA Section 106 Compliance: Procedural Flow Chart outlining the process federal agencies must follow to consider the effects on historic properties of projects they carry out, assist, permit, license, or approve (undertakings) (source: after Advisory Council on Historic Preservation 2015).

Figure 2-1. Local informant and project volunteer, William Ewen, Jr. showing the project principal investigator, David Robinson, the locations of the remains of the steamers *Bay Queen* and *Mount Hope* (upper image); Project volunteer, Jack Albert, recording the GPS position of one of the 29 shipwrecks in the Green Jacket Shoal Study Area (source: upper photograph by Jack Albert; lower photograph by David Robinson, CML).

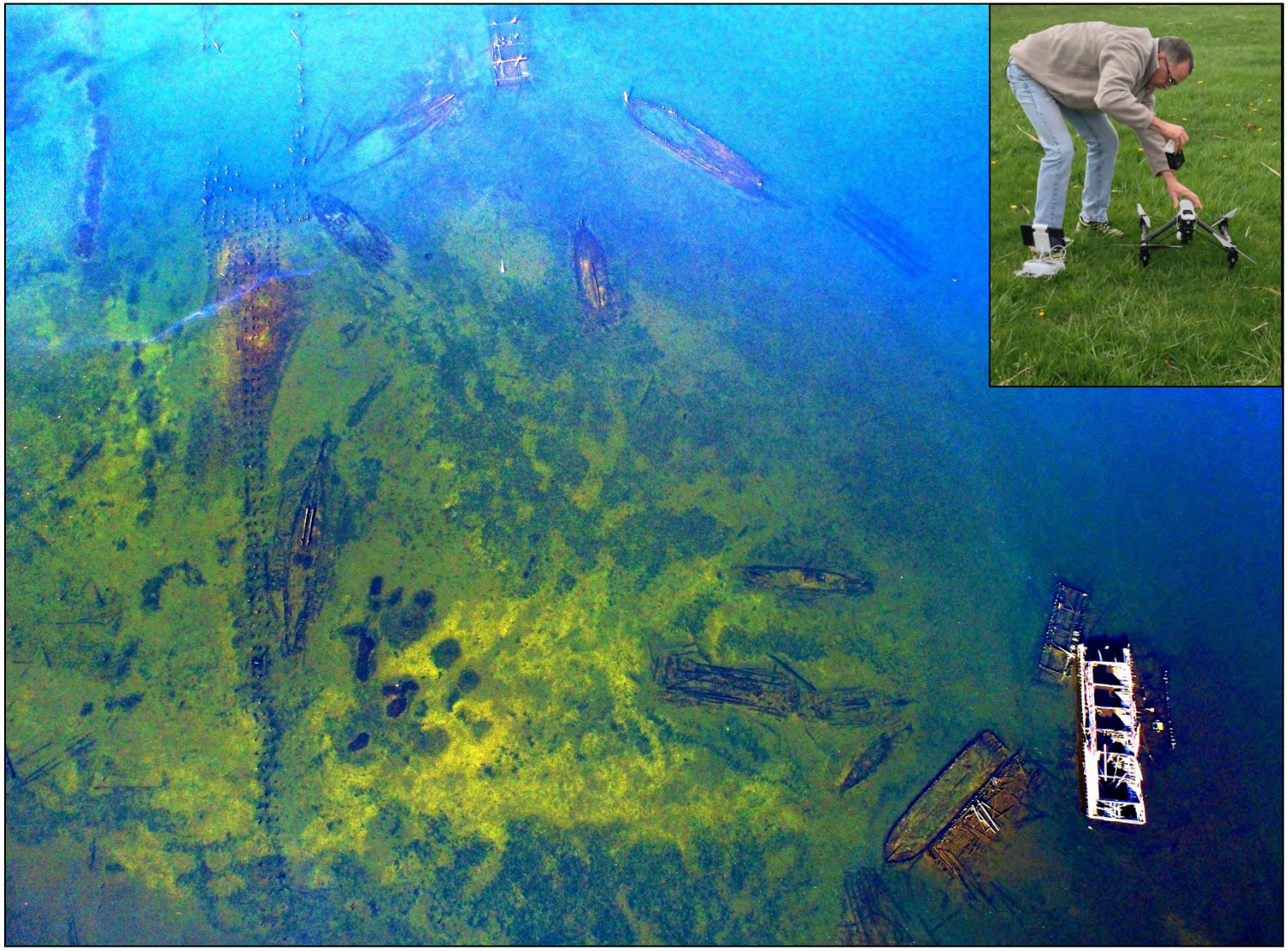


Figure 2-2. Project volunteer Glenn Anderson's donations of high-definition, low-altitude, quad-copter imaging to the project proved extremely effective for mapping the study area's submerged cultural resources (source: aerial photograph by Glenn Anderson; inset photograph by David Robinson, CML).

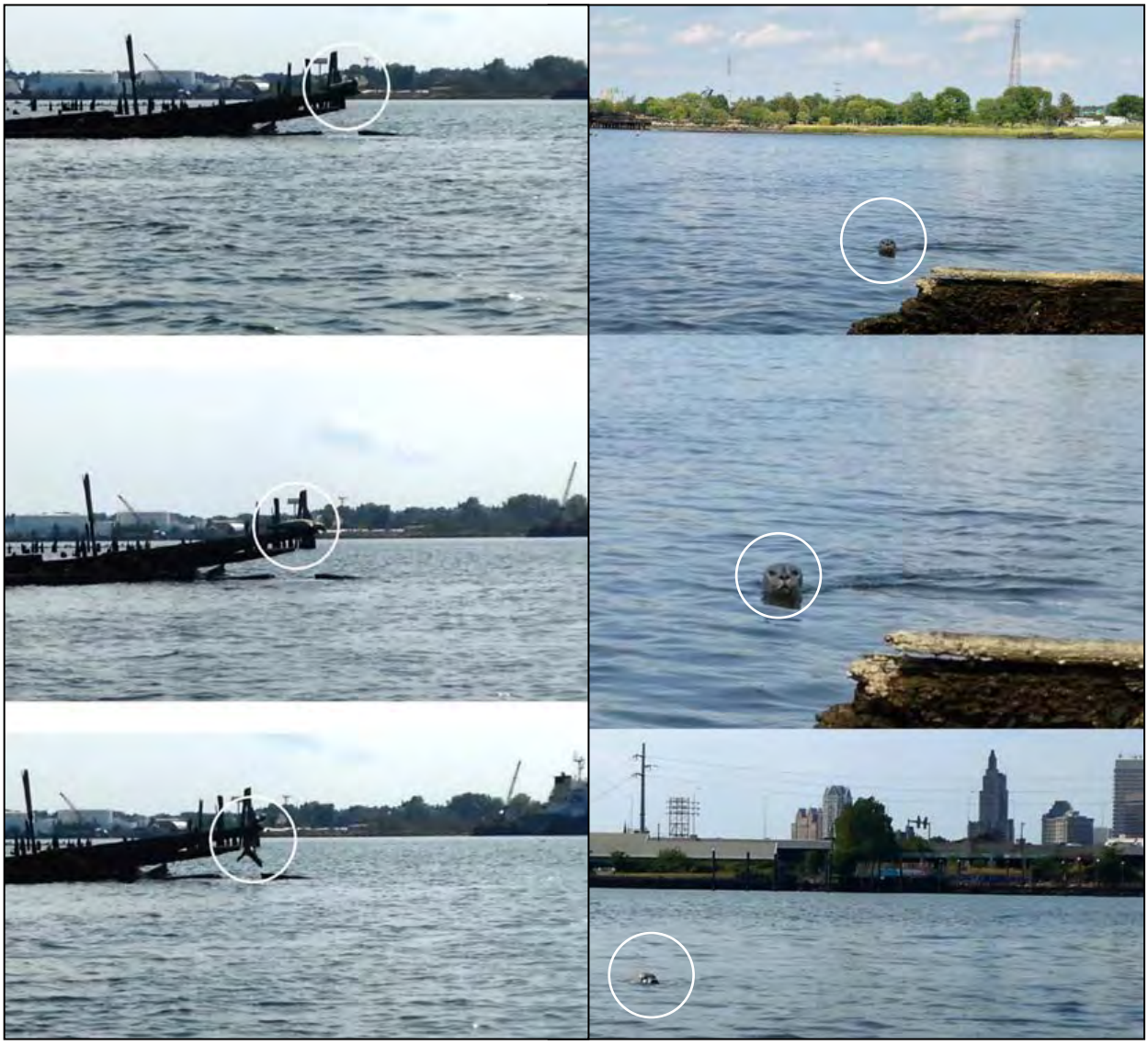


Figure 2-3. A seal encountered by project researchers in August 2015 hauled-out on the wreckage of the nineteenth-century paddlewheel steamer, *Mount Hope* – evidence that the wooden vessel remains on Green Jacket Shoal provide habitat for marine mammals that are once-again living in the Upper Bay and Providence River (photographs by David Robinson, CML).

Figure 2-4. CML's dive platform and full-face mask with hard-wired communications diving mode used for the project's URI-authorized marine archaeological diving operations (source: upper photograph by David Robinson, CML; lower photograph by Michael Dalton, CML).

Figure 2-5. Underwater visibility and water quality on-site in early May 2015 (top image) was acceptable for conducting marine archaeological diving operations and recording underwater video; however, by mid-May, unseasonably warm air and water temperatures had quickly reduced conditions to unacceptable levels (bottom image) (photographs by David Robinson, CML).

Figure 2-6. Kayak-based documentation of historical wooden vessel remains exposed on Green Jacket Shoal was conducted at periods of lower-low water during full-moon and new moon phases (source: aerial photograph by Glenn Anderson).

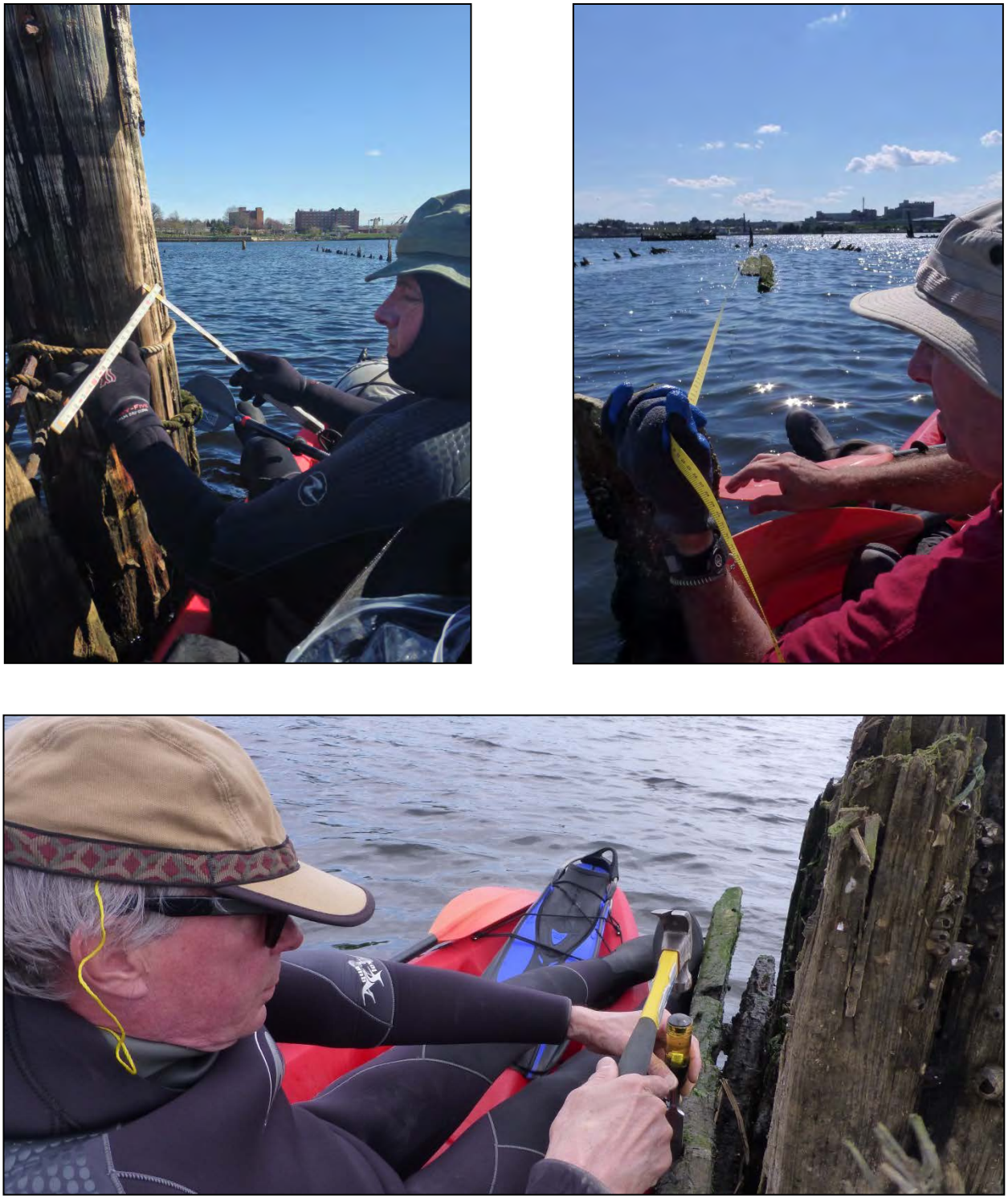


Figure 2-7. Project volunteers Peter Manning, measuring hull timber and overall hull length dimensions (upper images), and Tim Wasco, recovering a wood sample for species identification (lower image) from exposed vessel remains on Green Jacket Shoal (photographs by David Robinson, CML).

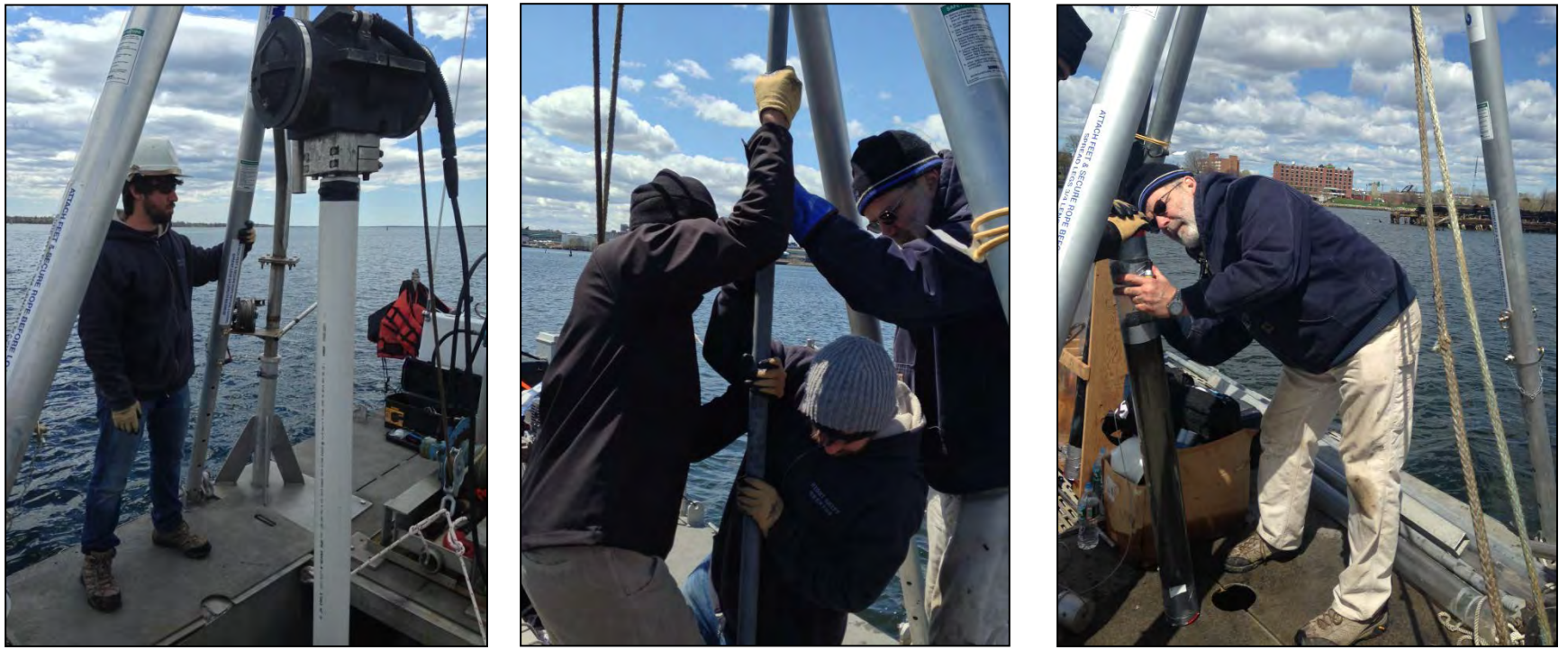


Figure 2-8. Limited geological sediment sampling consisting of biological coring and vibracoring was conducted in the Green Jacket Shoal marine archaeological study area in early May 2015 to assess the area's archaeological sensitivity and potential of the shoal to contain preserved elements of a formerly exposed submerged paleocultural landscape. URI-GSO CML graduate student, Brian Caccioppoli, monitors vibratory coring operations (left image); URI-GSO CML graduate students Casey Hearn and Brian Caccioppoli and URI-GSO professor and CML director, John King, taking a biological core (center image); John King labeling a recovered biological core (right image) (source: photographs by David Robinson, CML).

Figure 2-9. CML's lab manager, Danielle Cares, and project volunteer, Michael Robinson, splitting a core sample (upper image); core logging on CML's Geotek core logging machine (lower image) (source: photographs by David Robinson, CML).

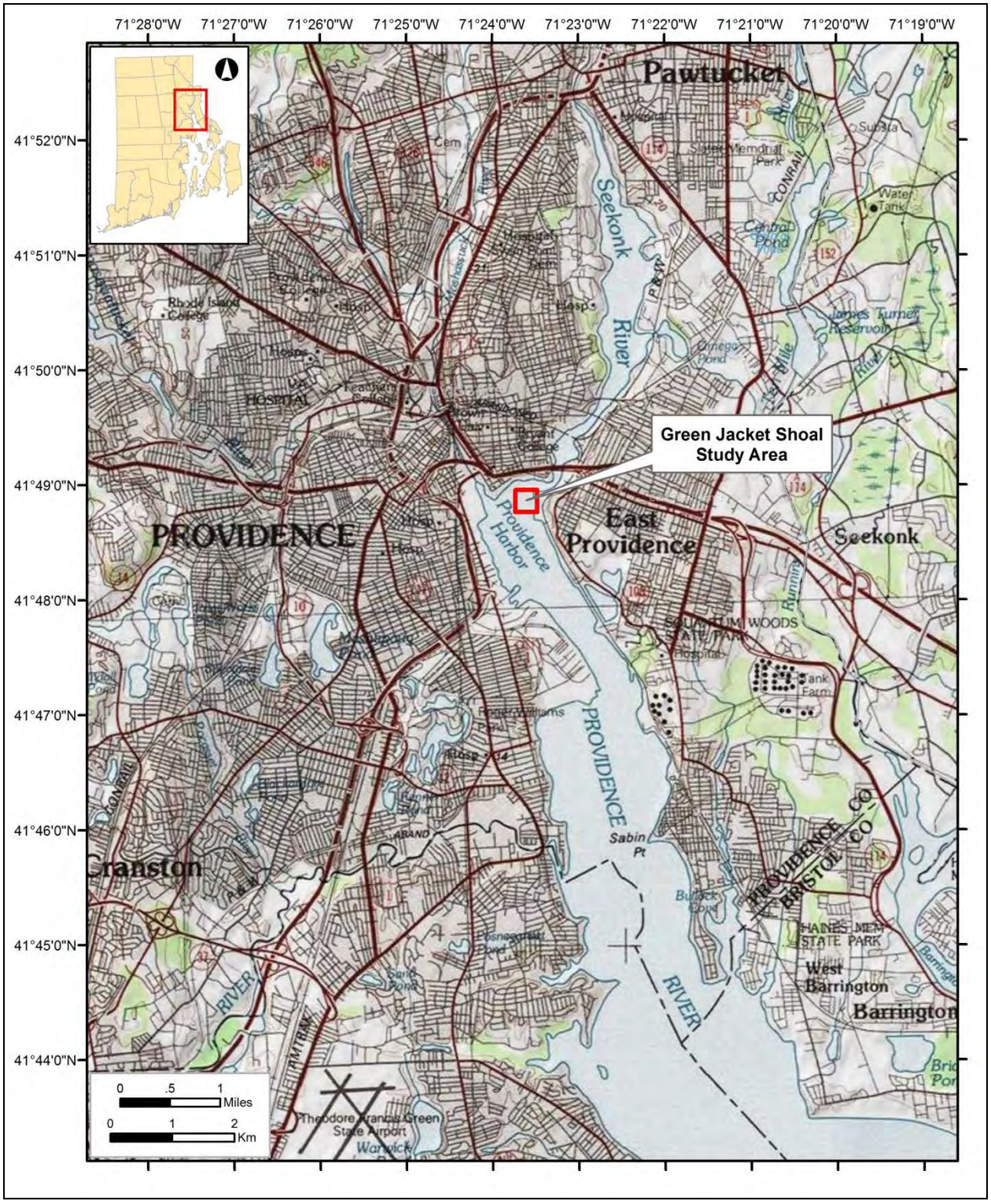


Figure 3-1. Excerpt of the combined Providence/East Providence RI/MA USGS topographic quadrangles, 7.5 min series showing the location of the Green Jacket Shoal study area within Providence Harbor and relative to cities of Providence and East Providence, Omega and Central ponds, and the Moshassuck, Providence, Runnins, Seekonk, and Ten Mile rivers (source: after 2009).

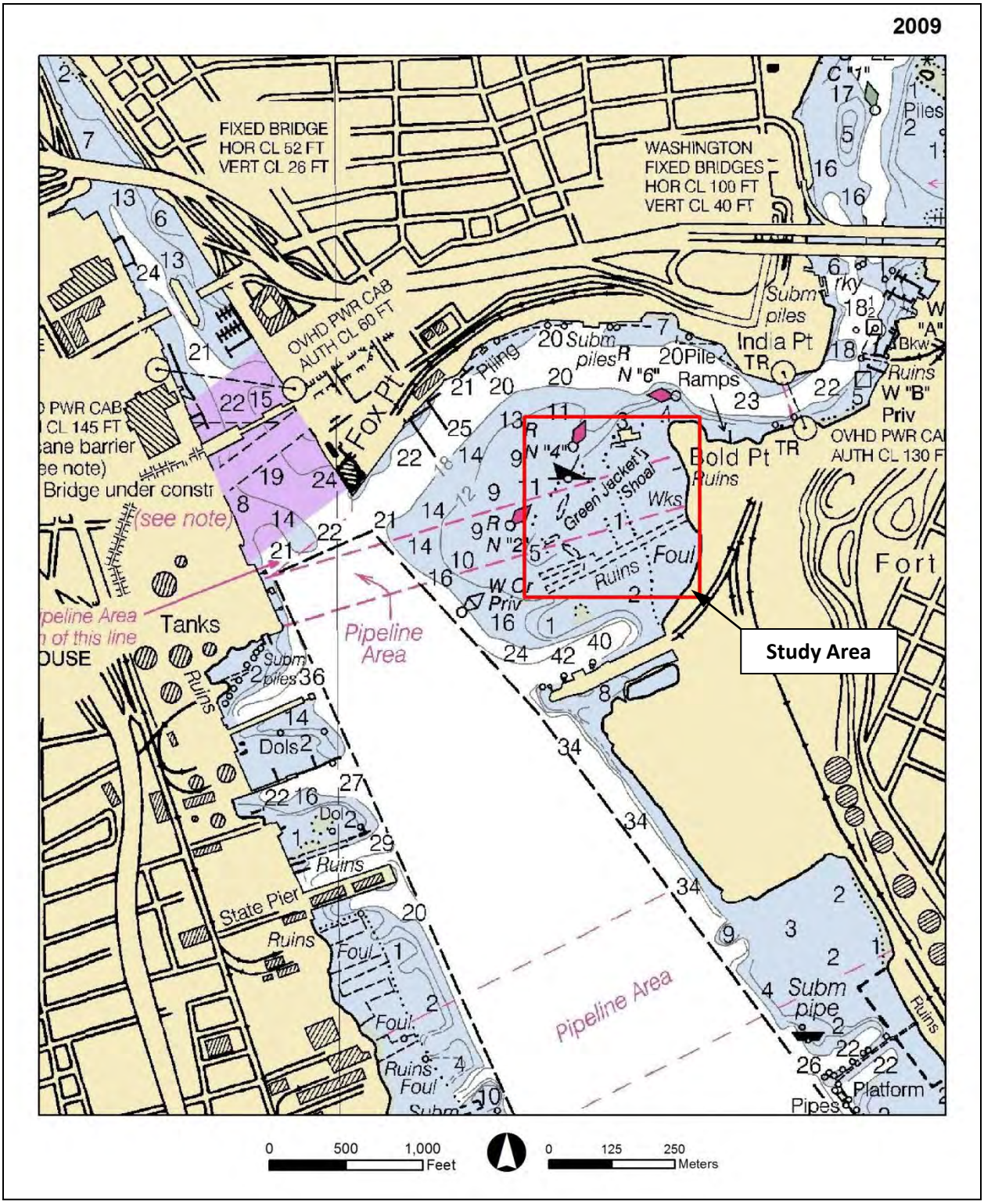


Figure 3-2. Excerpt of the 2009 NOAA Chart #13224 – Providence River and Head of Narragansett Bay showing the Green Jacket Shoal study area (source: after NOAA 2009).

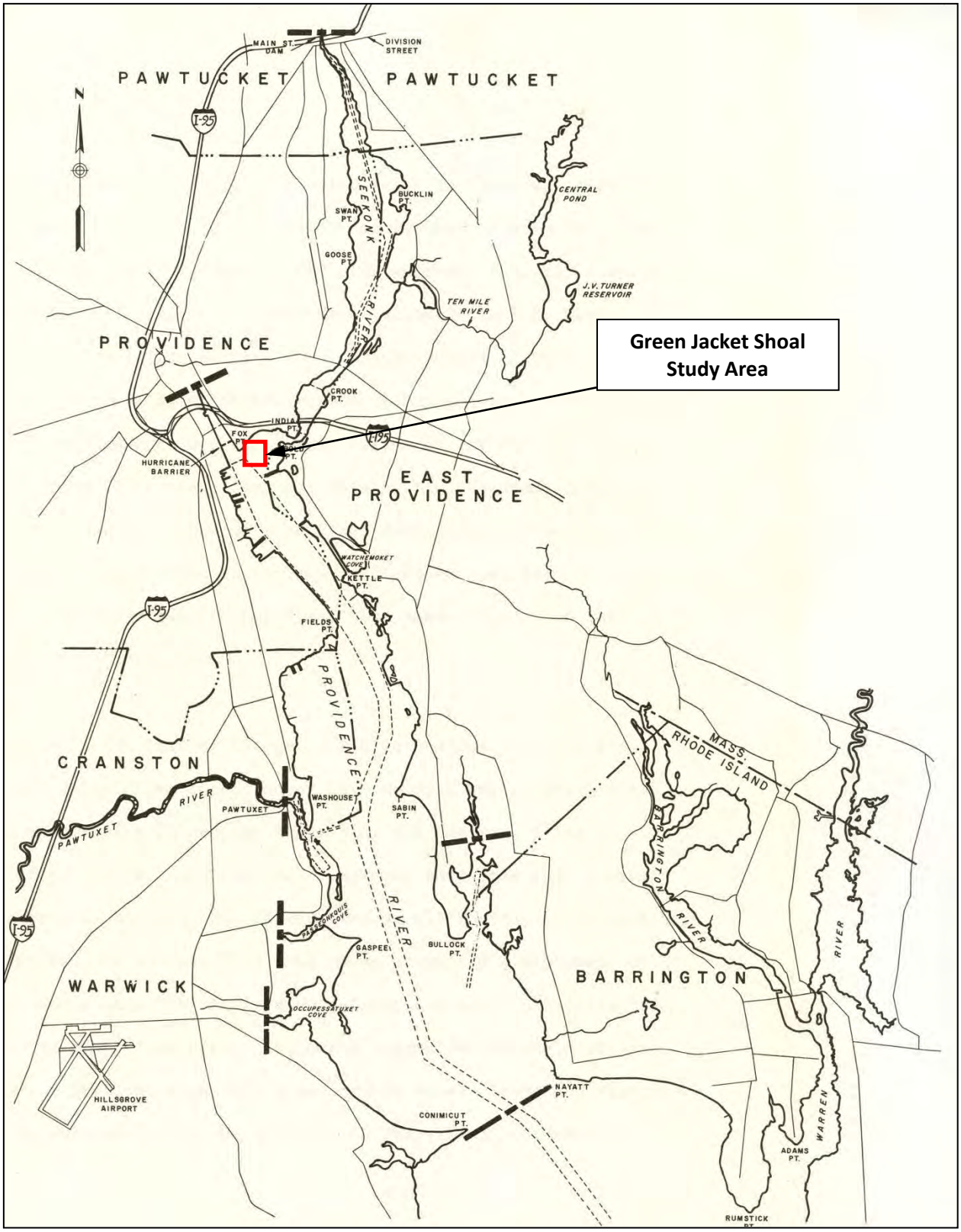


Figure 3-3. Map of the Providence River showing the study area's location relative to the surrounding communities and key features in the landscape referenced in the report (source: after Department of the Army 1982a).

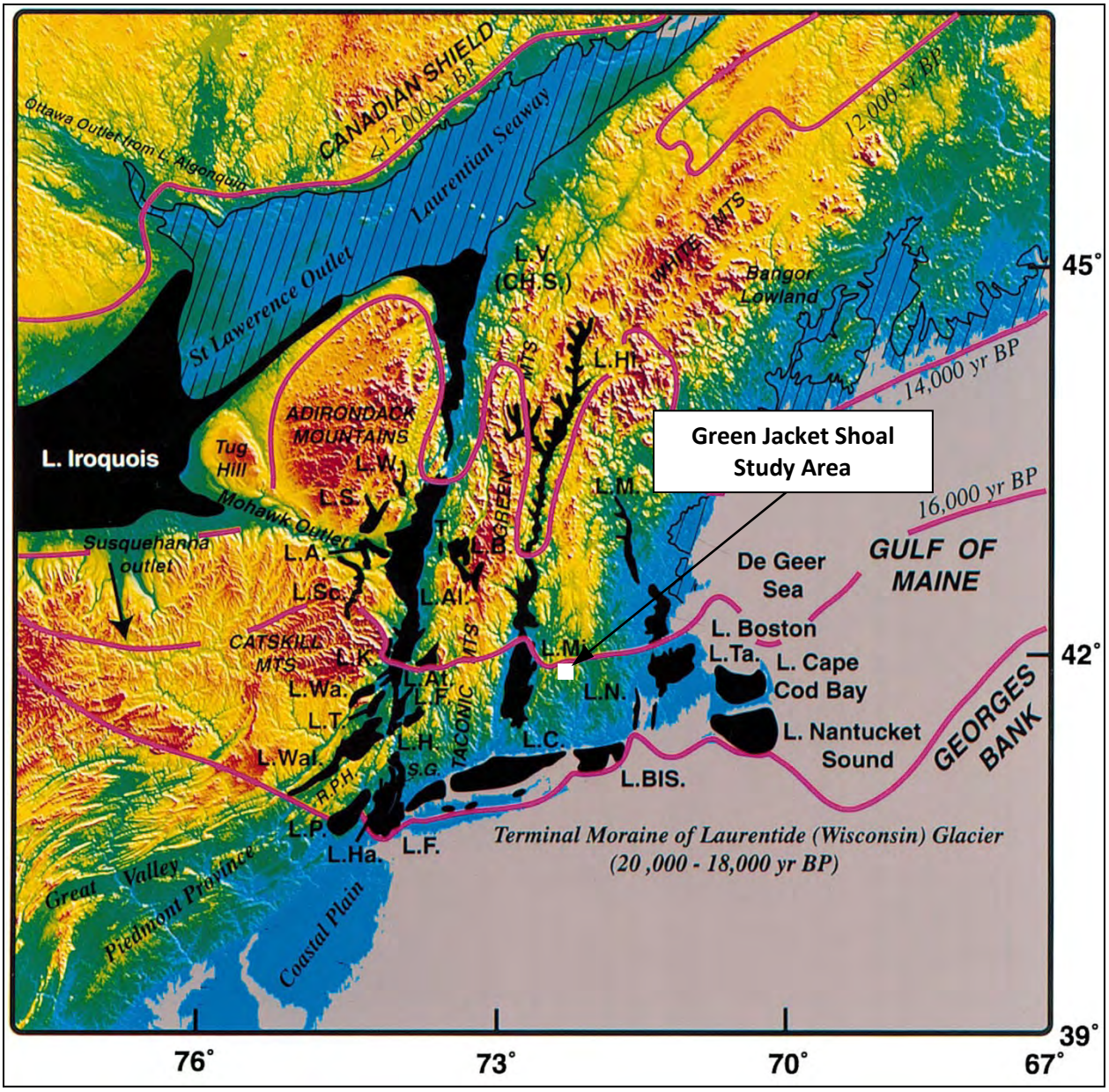


Figure 3-4. Map depicting the study area's location relative to the reconstructed approximate positions of the Laurentide glacial ice margin (shown as a dark pink line) as it melted and retreated from between about 20,000 to 12,000 B.P. Based on these reconstructions, the study area would have been ice-free by about 16,000 B.P. Also depicted is the distribution of pro-glacial lakes throughout the region (the larger lakes are shown in black), including glacial Lake Narragansett (LN) (source: after Uchupi et al. 2001).

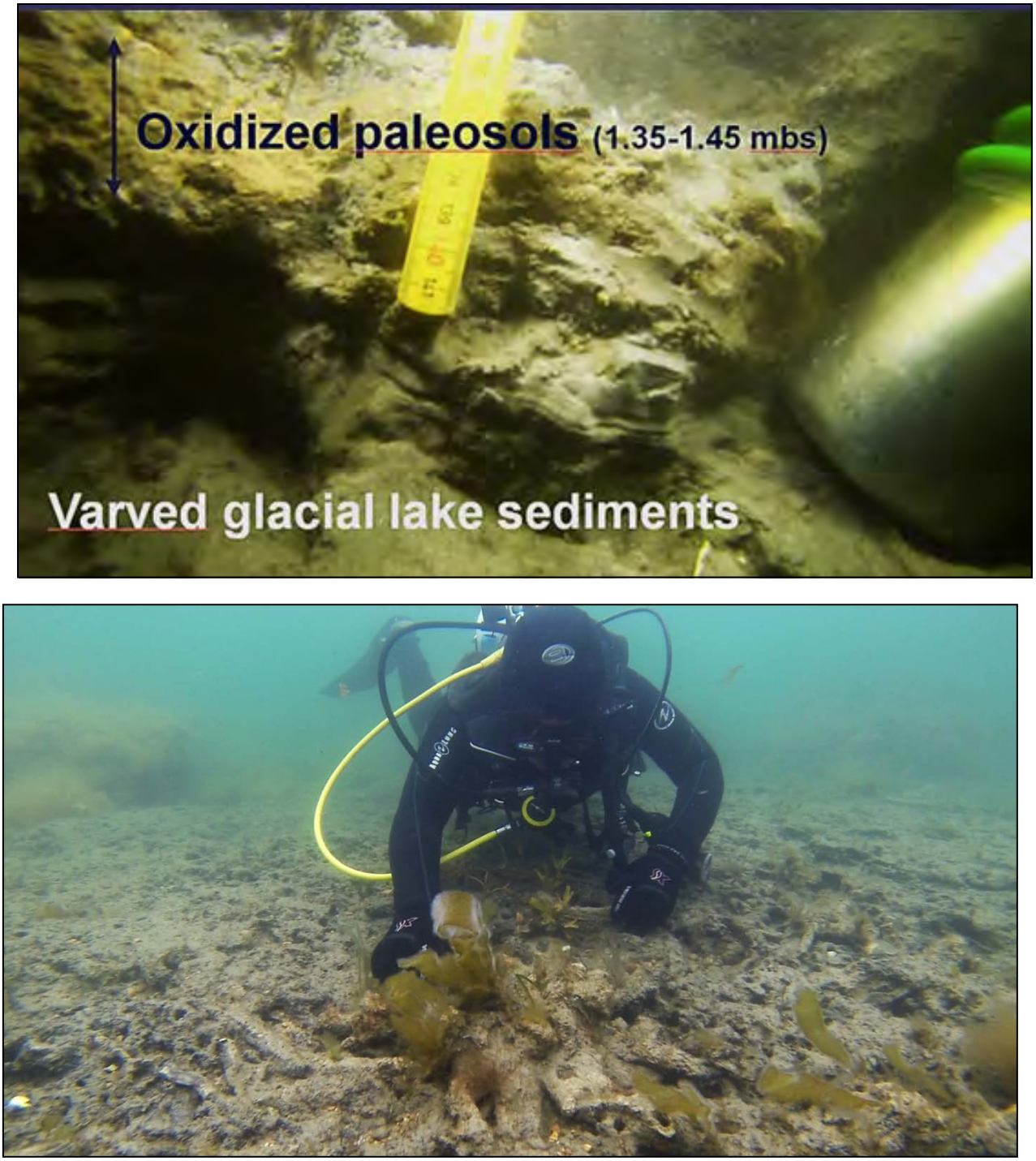


Figure 3-5. Submerged paleocultural landscapes where ancient Native American cultural deposits have been found preserved in the shallow waters off of the Rhode Island coast in Greenwich Bay (top image) and in Block Island Sound (bottom image) (source: photographs by David Robinson, CML).

Figure 3-6. Lithograph depicting extensive damages to shipping and buildings in Providence Harbor during the height of the Great September Gale of 1815. The storm, which struck on September 23, 1815, brought with it an 11 ft (3.4 m) storm surge into downtown Providence that left dozens of ships on the city's streets. At India Point, directly across the mouth of the Seekonk River from the study area, houses and wharves were destroyed. The Washington Bridge and the Central (Red) Bridge were also destroyed during the storm (source: David Robinson, CML [personal collection]).

Figure 3-7. Photograph showing some of the damage in Providence from the New England Hurricane of 1938 (September 21), which brought with it into the city a storm surge of 17.6-foot (5.4 m) (source: David Robinson, CML [personal collection]).

Figure 3-8. Excerpt from the 1865 U.S. Coast Survey Chart No. 8 – Port of Providence, Rhode Island – showing the location of the study area relative to the nearly unaltered natural channel and bathymetry within Providence Harbor and on what would later be known as "Green Jacket Shoal." According to King (1882), the shoal's name derives from its green color caused by an abundance of eel grass that once grew upon it, as noted on this chart. "Oyster Beds" are also noted near the bottom of the chart (source: after U.S. Coast Survey 1865).

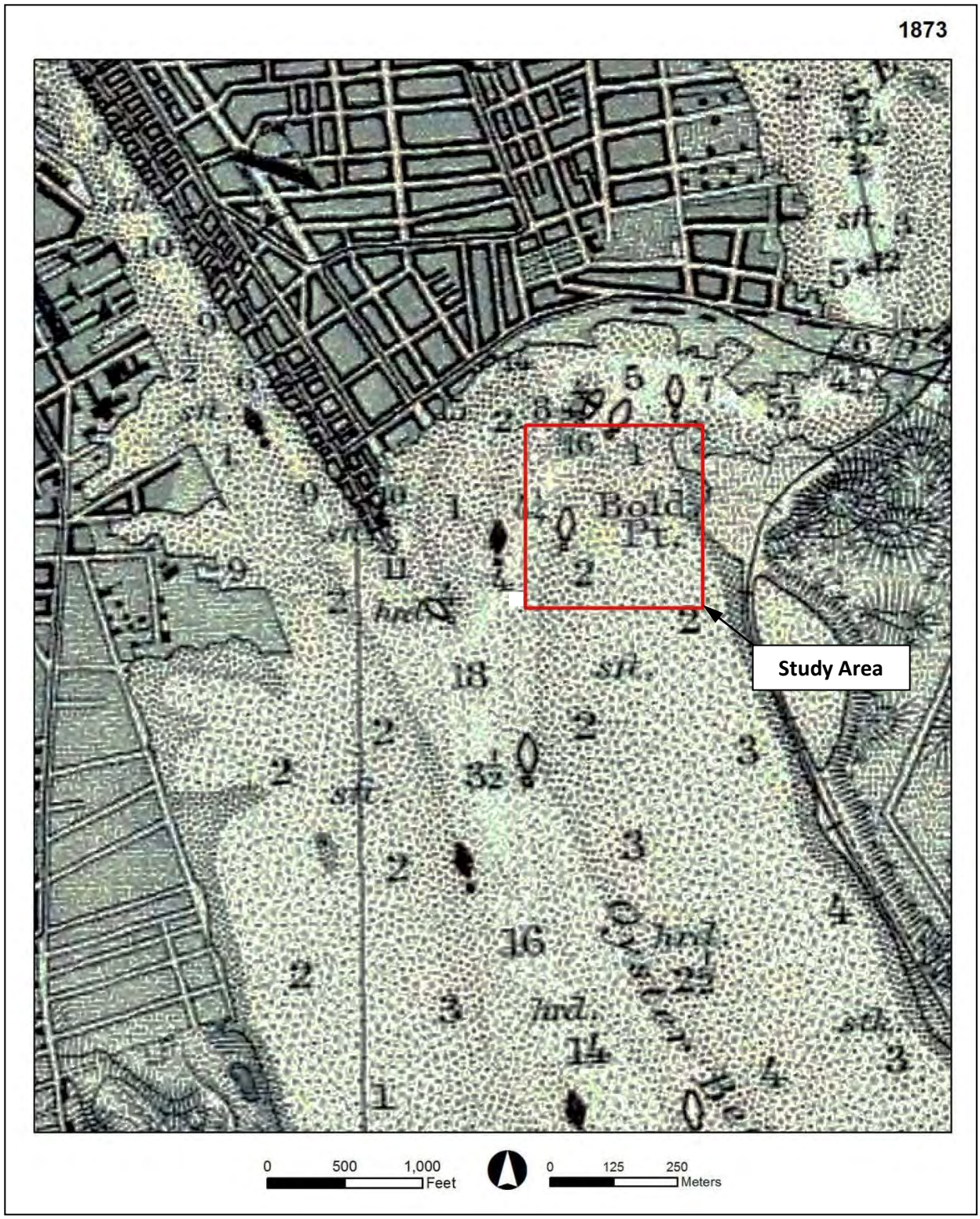


Figure 3-9. Excerpt from the 1873 U.S. Coast Survey Chart – Narragansett Bay – showing the location of the study area. Surveying for the chart was done between 1864 and 1871. "Oyster Beds" are still noted on the east side of the channel and Bold Point remains essentially undeveloped (source: after U.S. Coast Survey 1873).

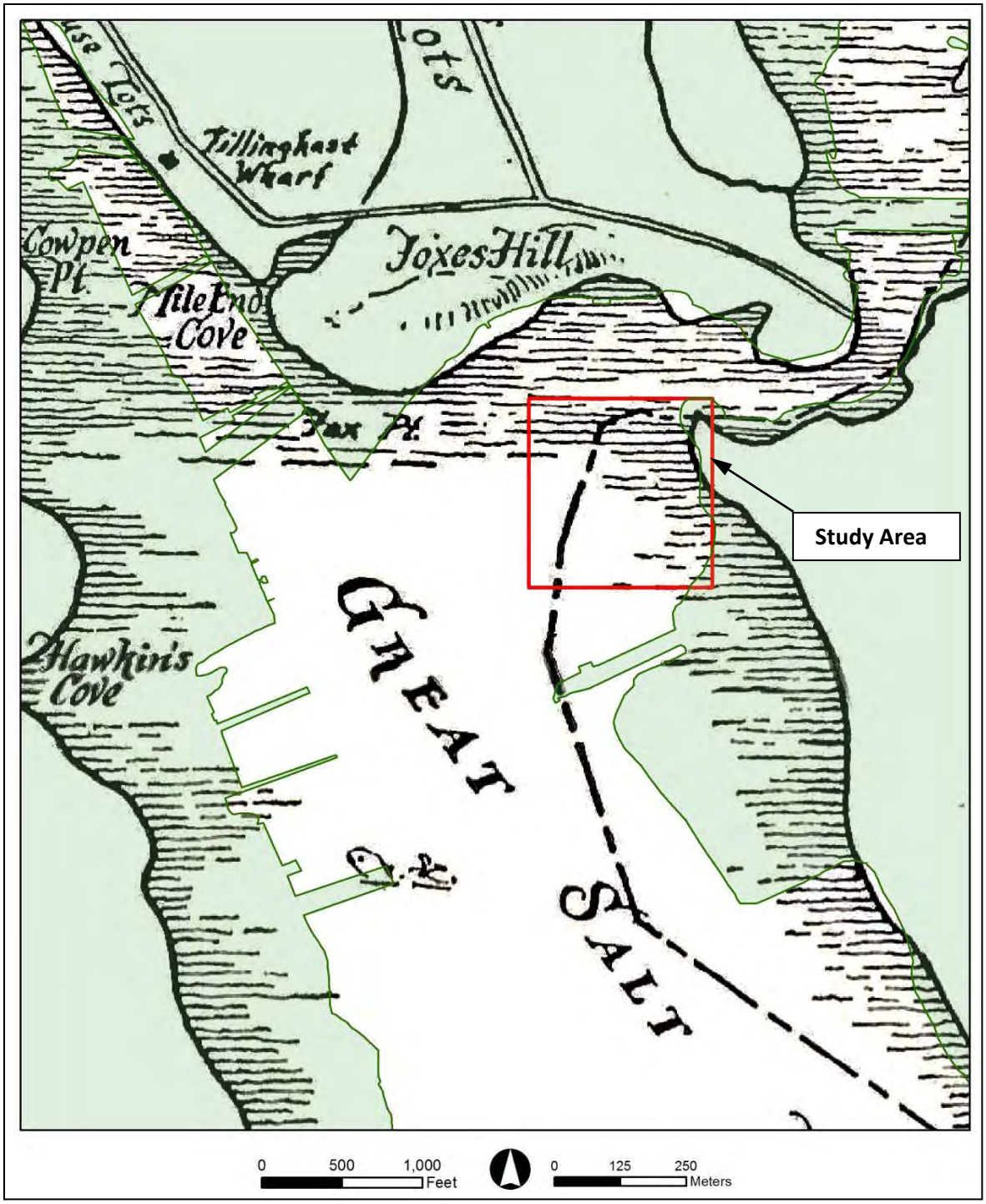


Figure 3-10. Excerpt from a 1936 Rhode Island State Planning Board map depicting a "Portion of the Town of Providence," including the "Great Salt River" (i.e., the Providence River) circa 1700. The modern (2014) shoreline (in green) projected onto the map shows that the shoreline in the study area (red line box) has remained essentially unchanged over the last 300 years, while the rest of the Providence Harbor shoreline has been altered and built-out significantly from its natural configuration (source: base-map depicting the circa 1700 shoreline is from Cady 1957:114).

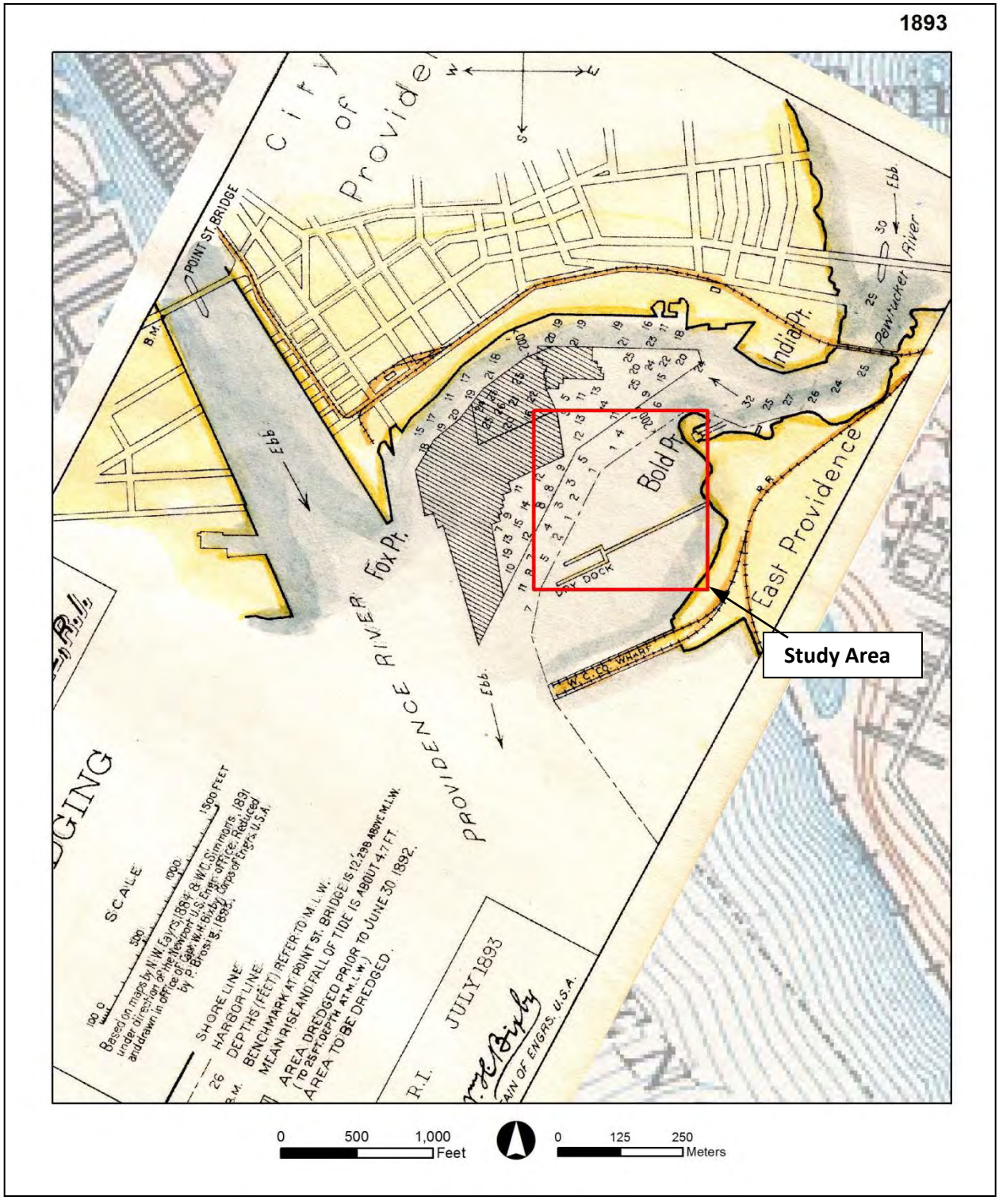


Figure 3-11. U.S. Army Corps of Engineers plan from 1893 entitled "Proposed Work at Green Jacket Shoal, R.I. – Dredging." Plan is based on maps by N. W. Eayrs (1884) and W. C. Simmons (1891) and is the earliest-known depiction of a dry dock pier and marine railways at Bold Point. Areas dredged prior to 1892 are shown as cross-hatched; areas to be dredged are outlined with a solid line (map is shown tilted to maintain the north-south orientation of the study area on the page) (source: David Robinson, CML (personal collection).

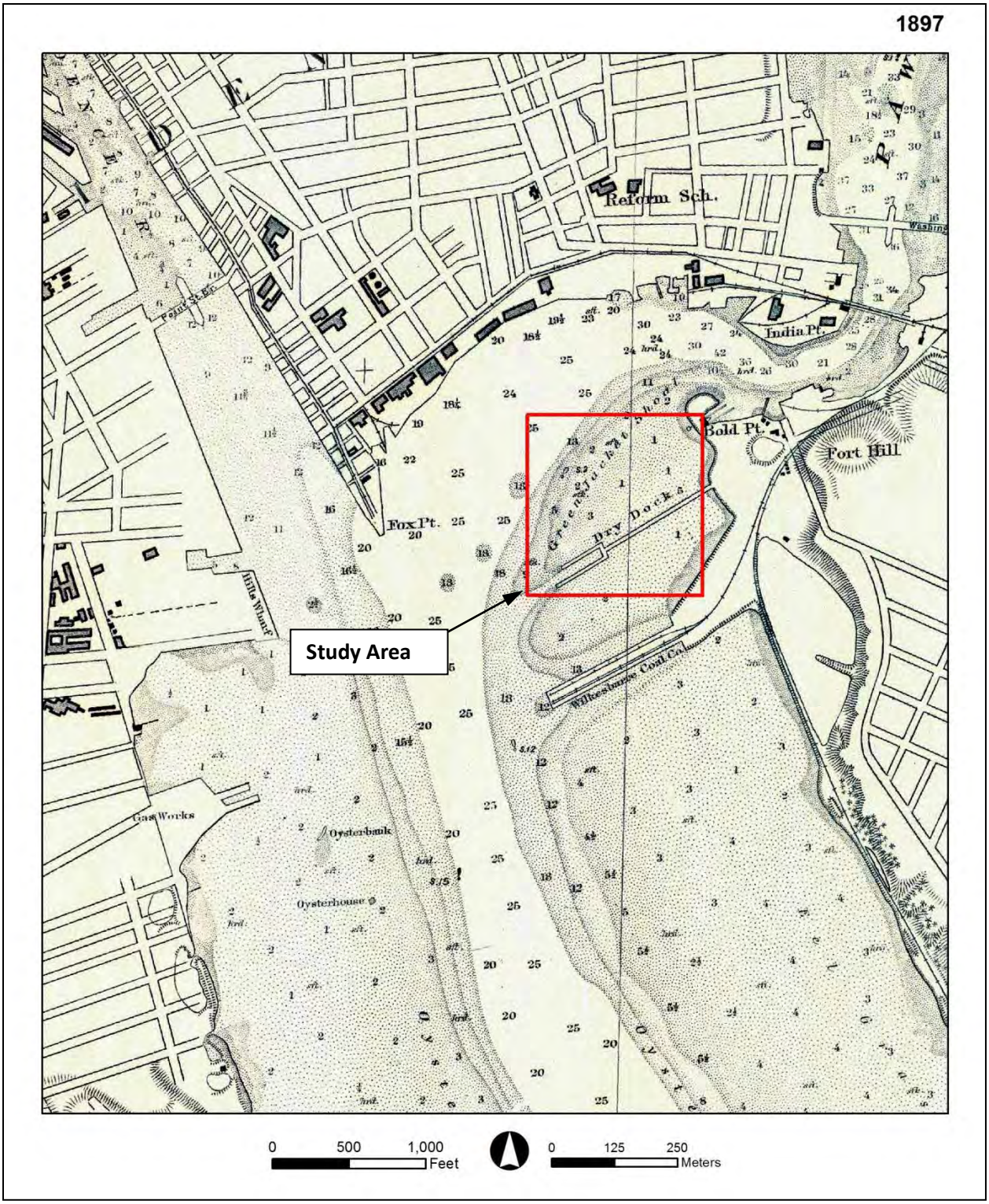


Figure 3-12. Excerpt from the 1897 U.S. Coast and Geodetic Survey Chart No. 352 – Providence Harbor, Rhode Island – showing the location of the study area and the now-dredged and widened navigation channel into the harbor and deepened approaches to the dry dock pier and the Wilkesbarre Coal Co. pier. The chart also is the earliest of which "Green Jacket Shoal" is labeled (source: after USCGS 1897).

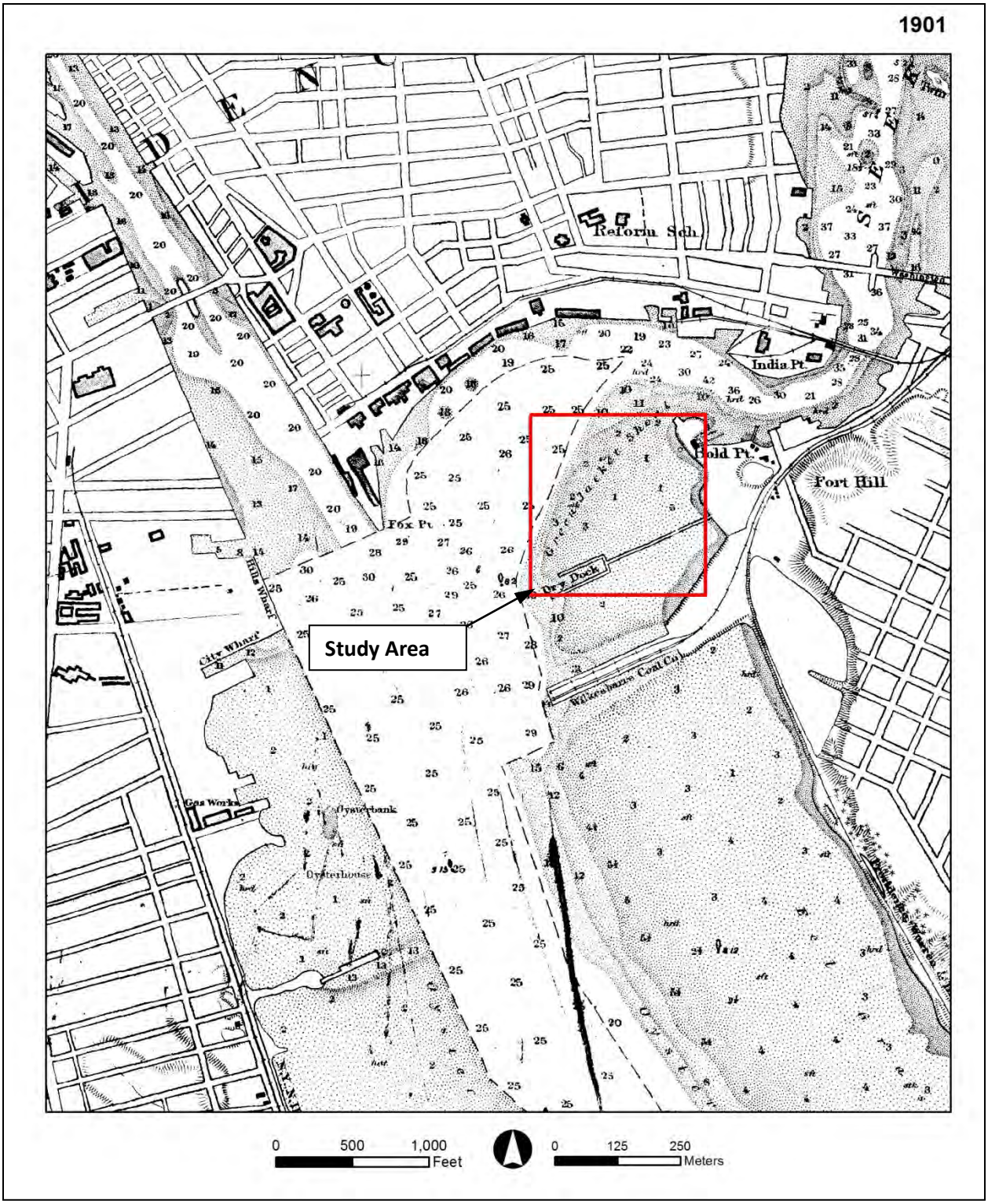


Figure 3-13. Excerpt from the 1901 U.S. Coast and Geodetic Survey Chart No. 352 – Providence Harbor, Rhode Island – showing the location of the study area and the expanded navigation channel and harbor turning basin created by the removal of significant material from the northern and western margins of Green Jacket Shoal (source: after USCGS 1901).

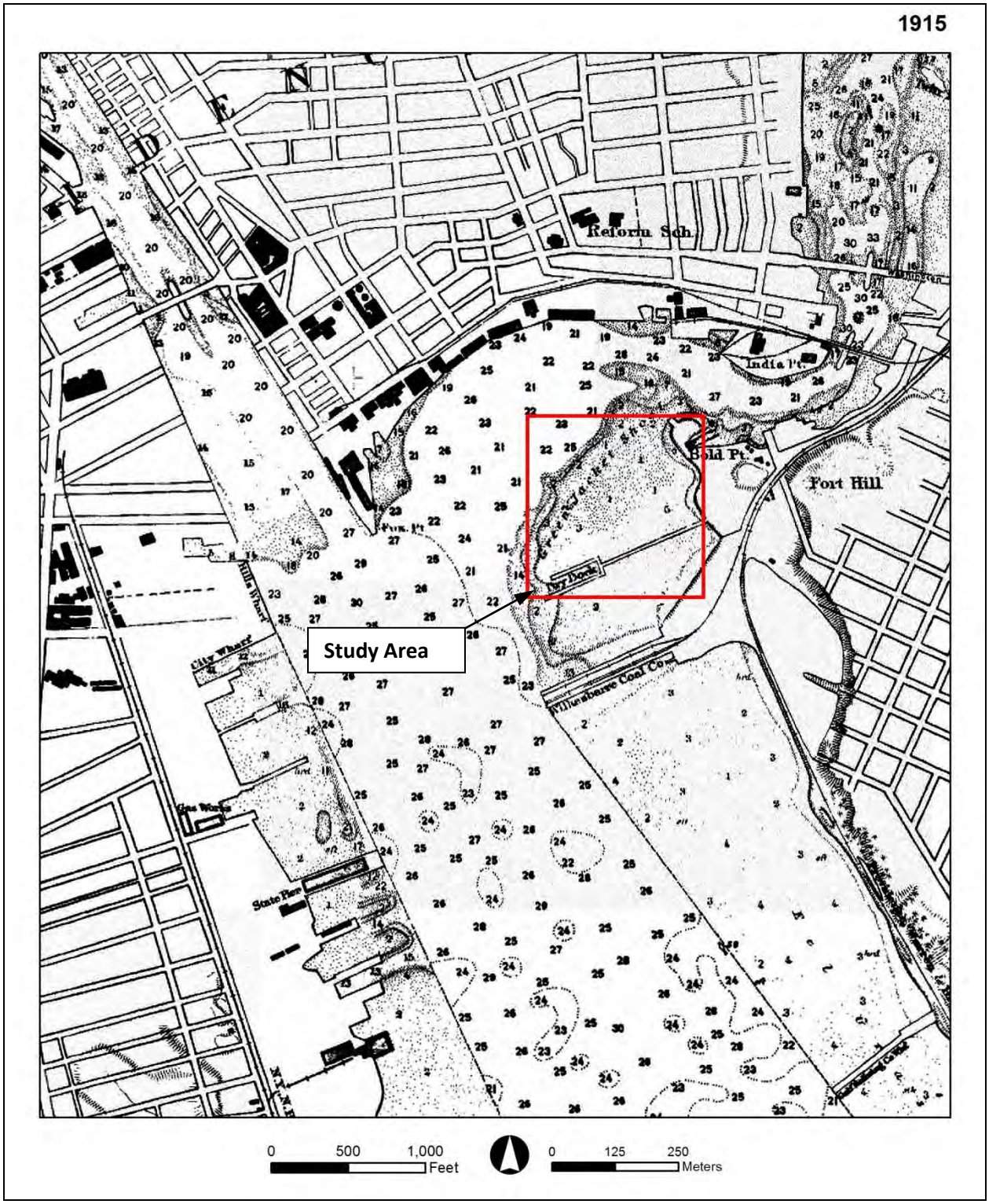


Figure 3-14. Excerpt from the 1915 U.S. Coast and Geodetic Survey Chart No. 352 – Providence Harbor, Rhode Island – showing the location of the study area and the now fully-expanded navigation channel limits out to its current "harbor lines" (source: after USCGS 1915).

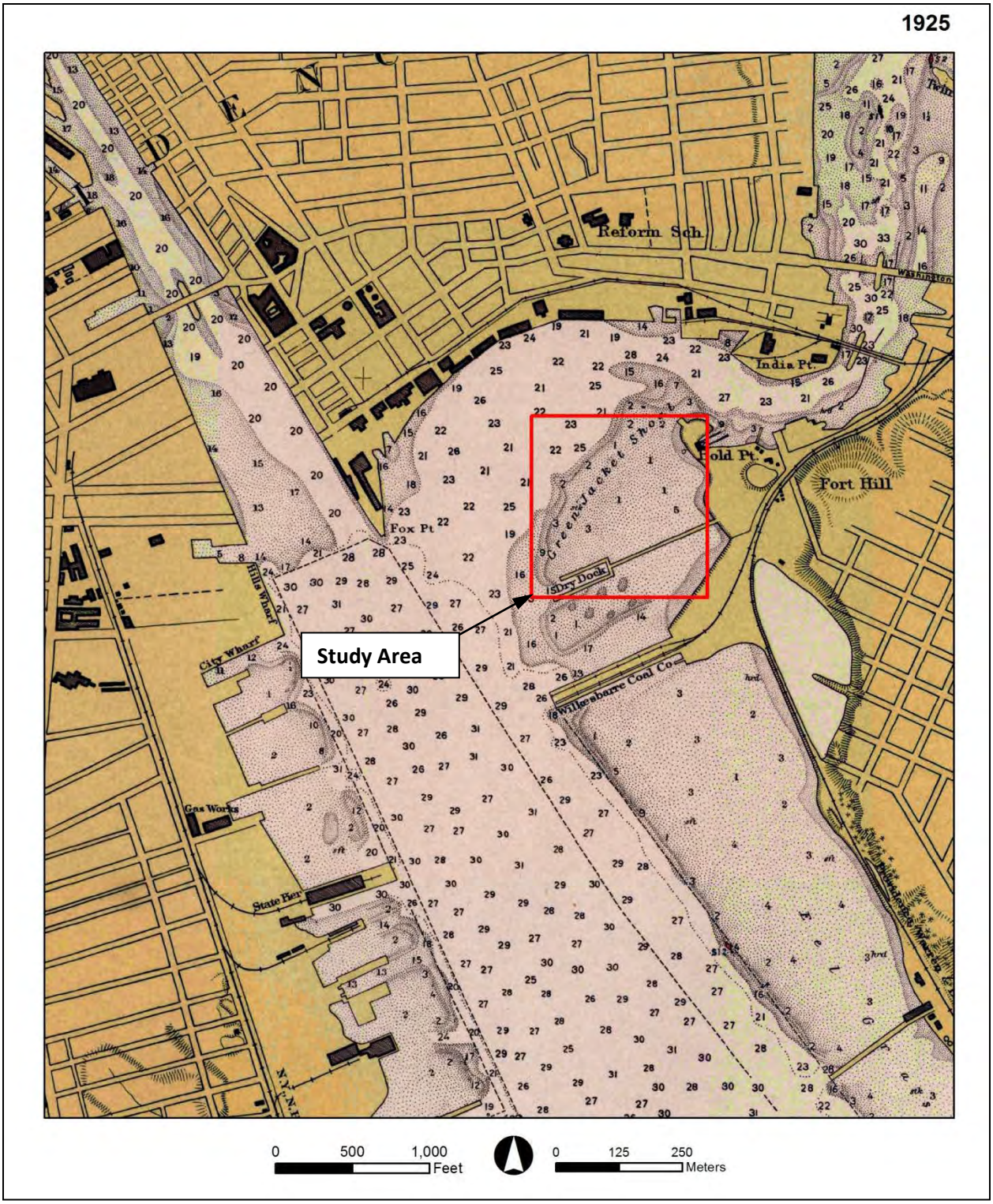


Figure 3-15. Excerpt from the 1925 U.S. Coast and Geodetic Survey Chart No. 352 – Providence Harbor, Rhode Island – showing the location of the study area and the deepened area north of the Wilkesbarre Coal Co. pier. Note the apparently resultant mounds of dredge spoil adjacent to and north of it, which remain present today (source: after USCGS 1925).

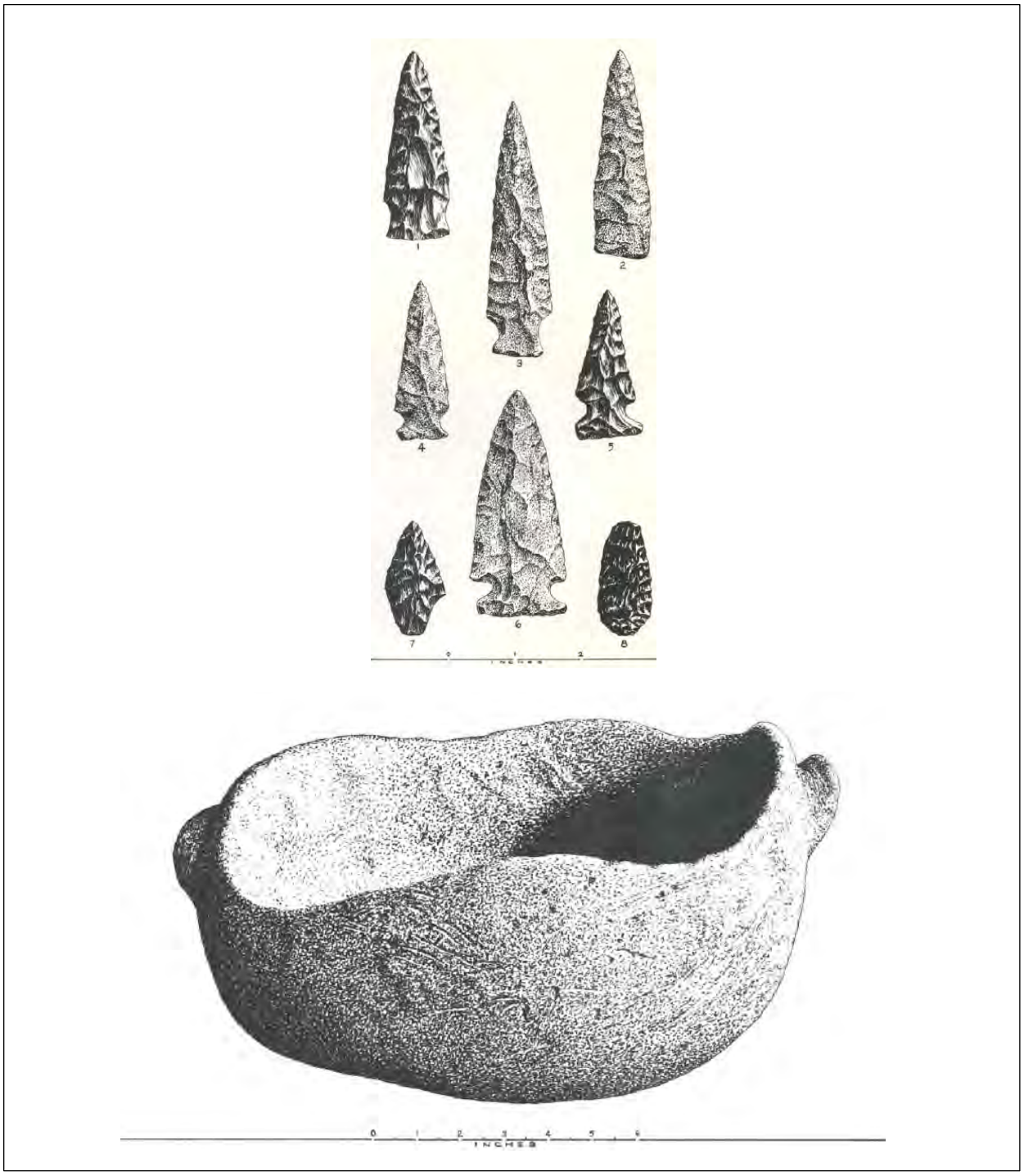


Figure 4-1. Transitional Archaic Period projectile point types (Orient Fishtail, Coburn, and Wayland Notched), and a steatite bowl recovered from Fort Hill in 1939 by Jess Welt. Fort Hill is located in East Providence at the southern end of Bold Point, just southeast of the Green Jacket Shoal study area. It is the closest of the previously-identified archaeological site in the area. A resident of East Providence, Welt and some of his family members had once been employed by the Providence Dry Dock and Marine Railway Company (source: after Fowler and Welt 1955).

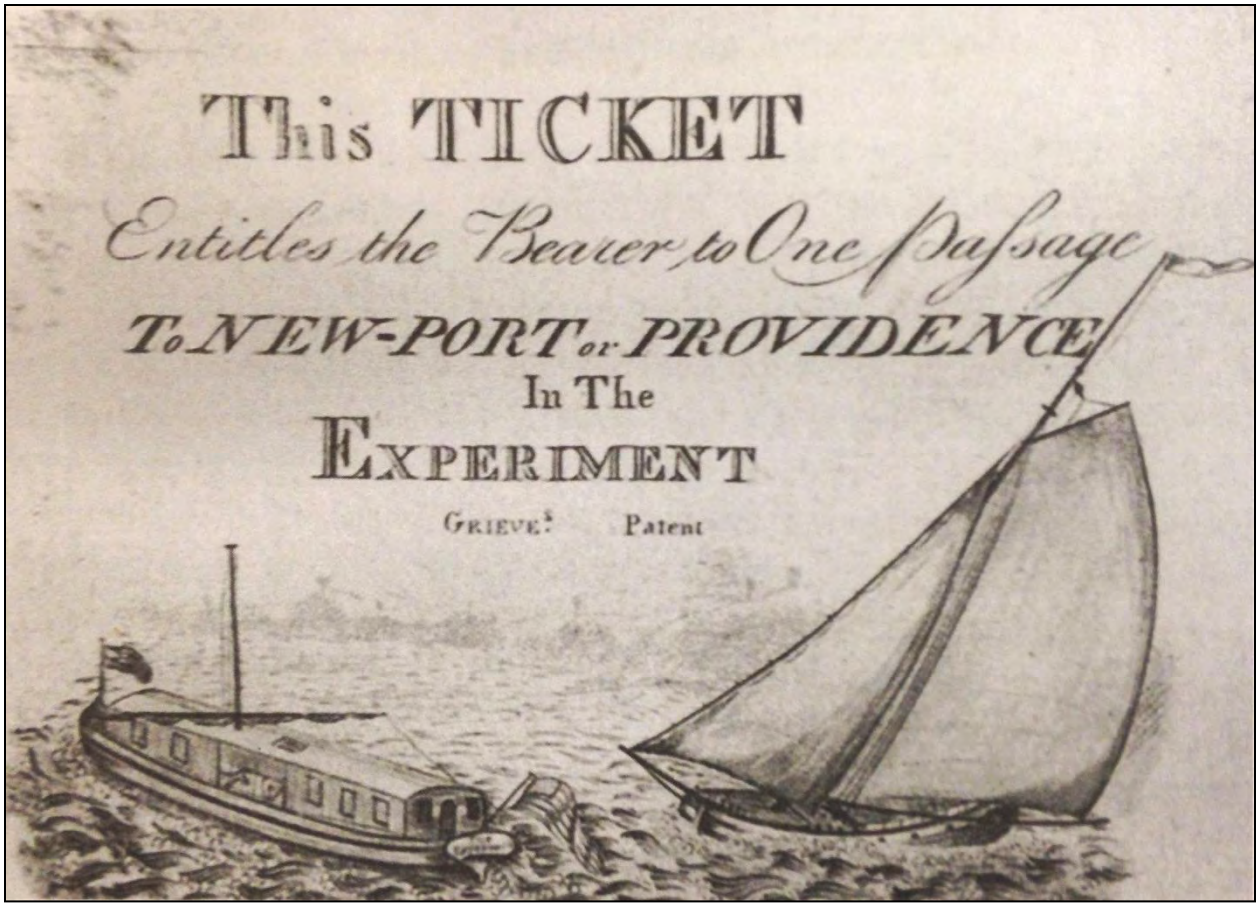


Figure 4-2. Ticket for passage on Elijah Ormsbee's vessel, *Experiment*, one of the earliest boats to be driven by steam-power in the world. Experiment operated on the Seekonk River, traveling between Providence and Pawtucket for several weeks in 1792. The early steamer was a harbinger of the future direction of Providence's transportation system (source: Geake 2013:94).

Figure 4-3. Portrait of Tristam Burges (1770-1853) by Charles B. King. Burges was one of the first land-owners and settlers of Bold Point (previously called "Burges Point" while he was alive), who went on to become an early developer of the Watchemoket area, Chief Justice of Rhode Island, and a two-term U.S. congressman (source: Brown University Portrait Collection, 1857, http://library.brown.edu/cds/portraits/display.php?idno=207).

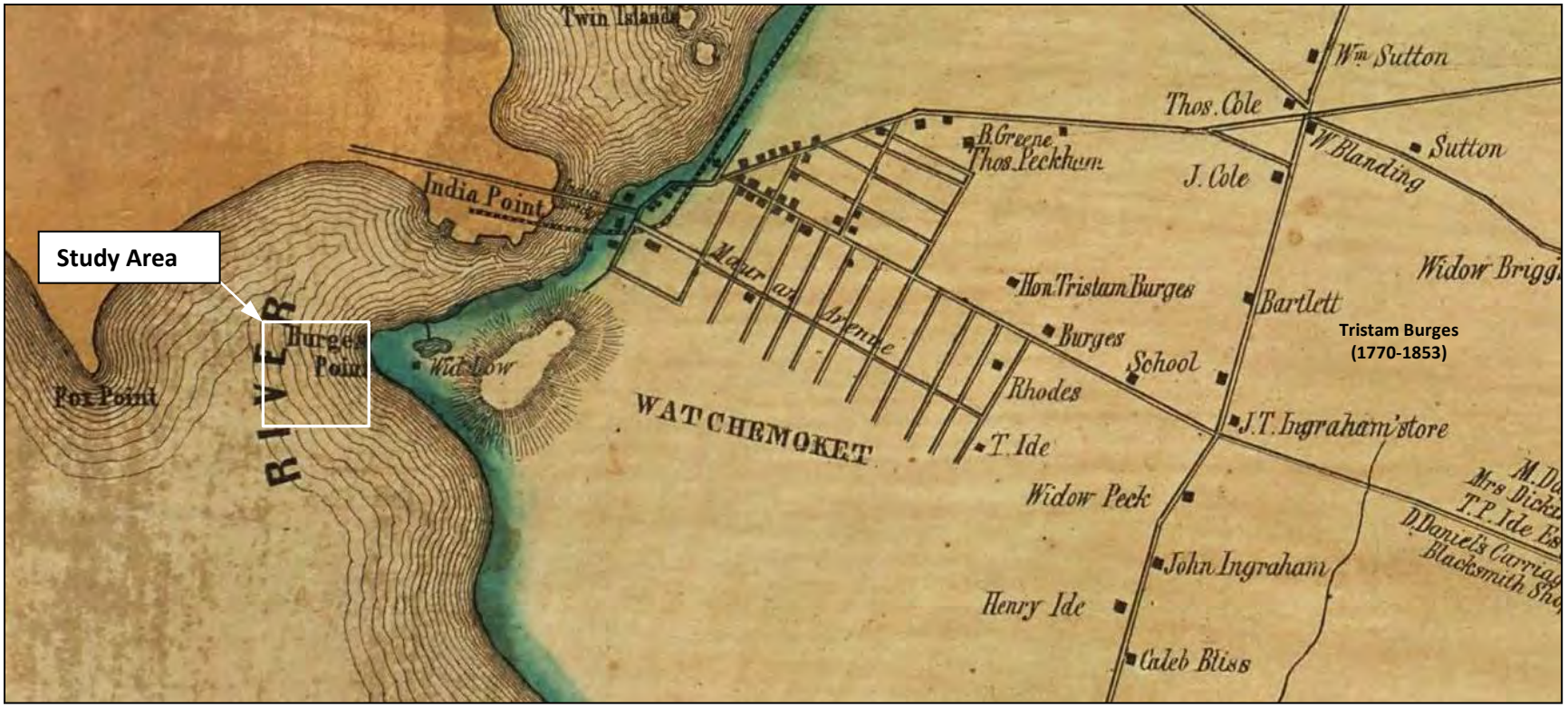


Figure 4-4. Excerpt from Henry F. Walling's (1850) Map of the Town of Seekonk showing early settlement of the Watchemoket area and "Burges Point" – the previous name of Bold Point. Tristam Burges was one of the earliest settlers and largest land-owners within the Watchemoket area (source: Boston Public Library, Norman B. Leventhal Map Center, http://ark.digitalcommonwealth.org/ark:/50959/79408311s).

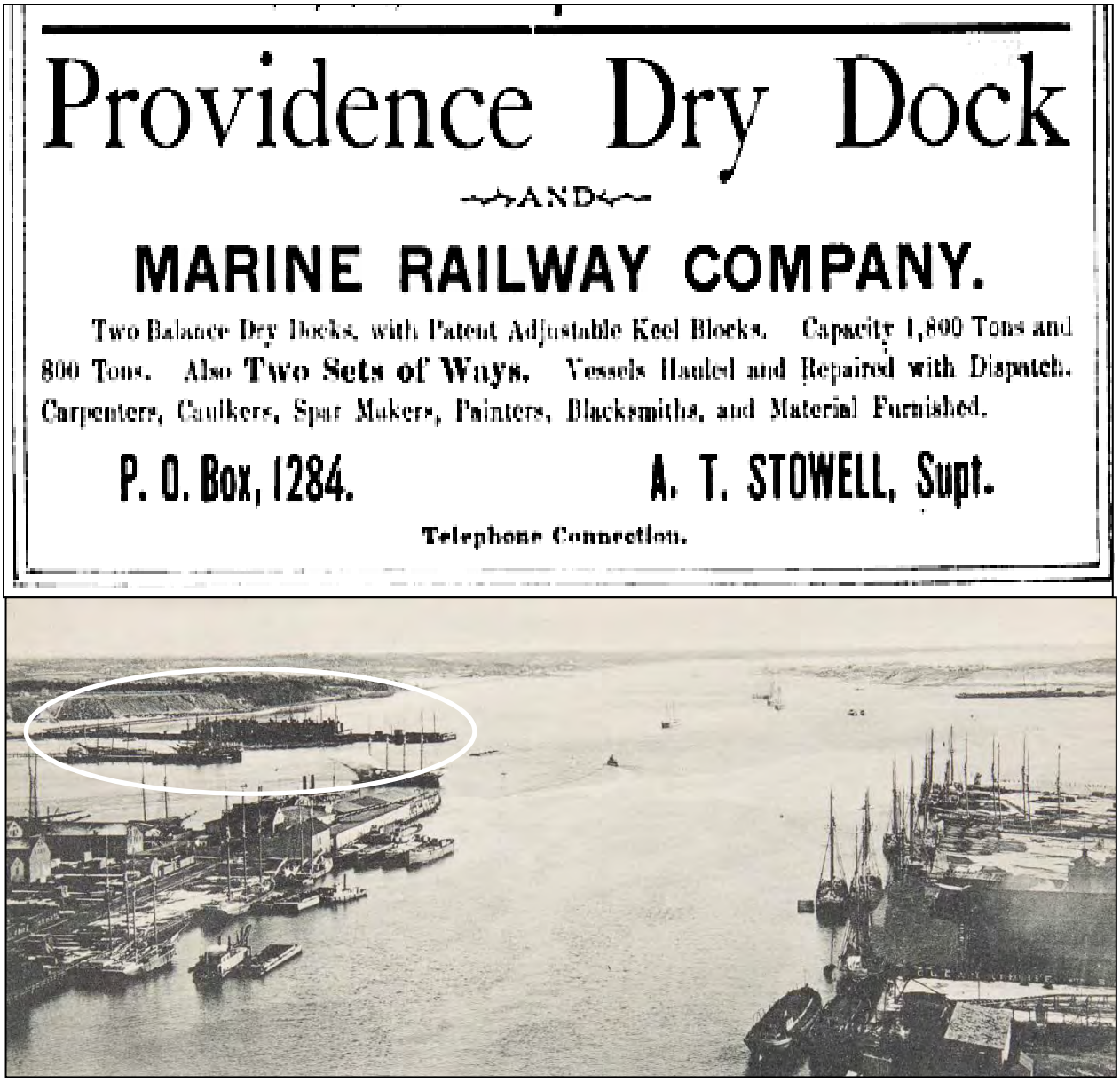


Figure 4-5. Advertisement for the Providence Dry Dock and Marine Railway Company from the 1888 *Providence Directory and Rhode Island Business Directory* (upper image); and an 1898 photograph of the Providence River waterfront (south-looking view). The Providence Dry Dock and Marine Railway Company's floating dry dock and dry dock pier and the Wilkesbarre Coal Company pier are visible (circled) as the only significant harbor infrastructure on the harbor's east side (lower image) (source: Sampson, Murdock & Company 1888 [upper image]; Providence Public Library Rhode Island Collection [lower image]).

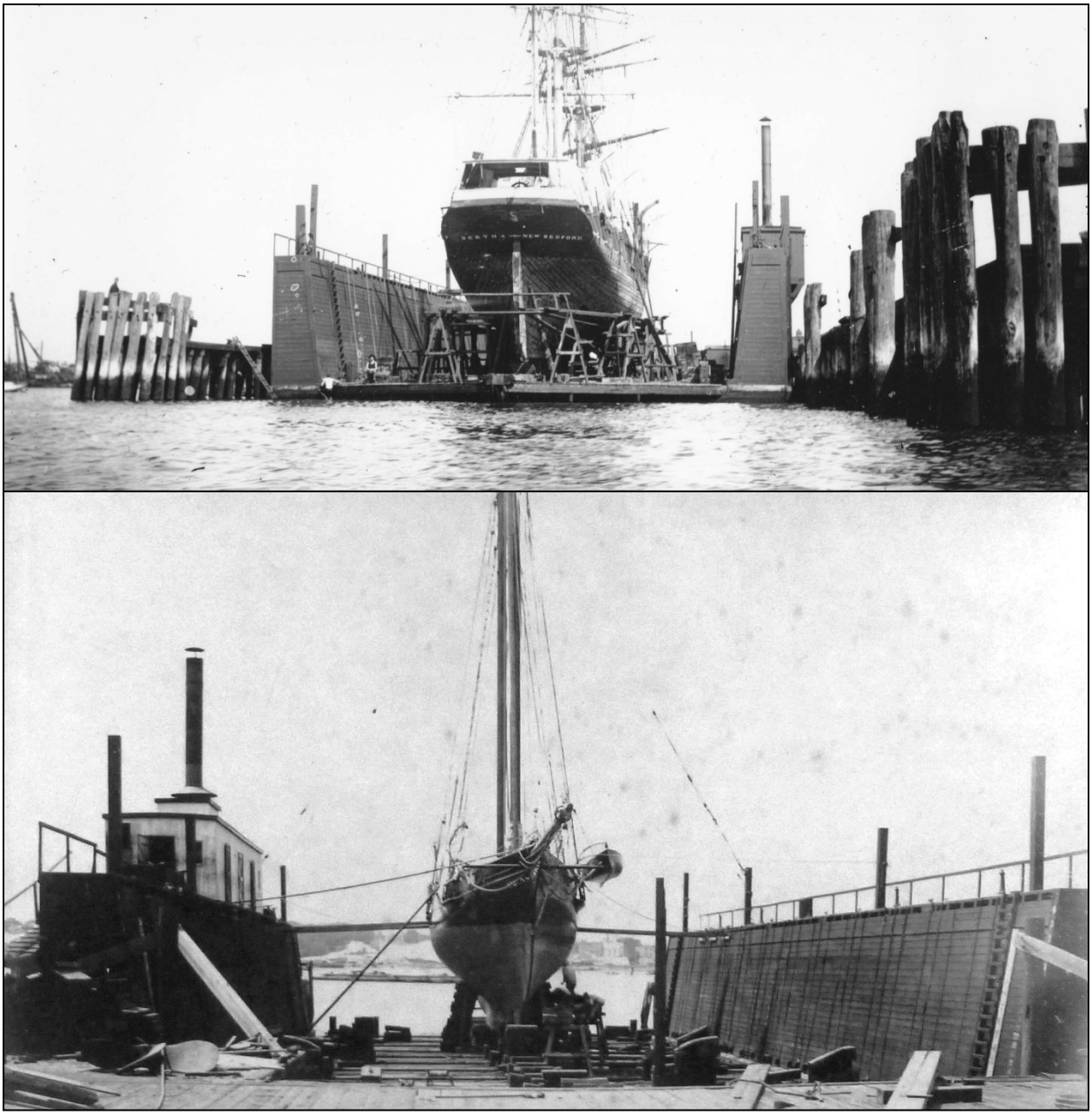


Figure 4-6. Rhode Island's first floating dry dock was established in East Providence at Bold Point in 1884 by the Providence Dry Dock and Marine Railway Company, and remained in operation until the business was dissolved in 1919 (35 years). The dry dock serviced vessels of all types, including the steamers *Bay Queen* and *Mount Hope*, the remains of which are in the Green Jacket Shoal study area. The upper image shows the dry dock slipped within the ends of the dry dock pier as viewed from the harbor, and the lower image shows it viewed from the dry dock pier (source: photograph by Jess Welt, William H. Ewen, Jr. Collection [upper image]; Providence Public Library Rhode Island Collection [lower image]).

Figure 4-7. Two views of the Providence Dry Dock and Marine Railway Company's shipyard at Bold Point near the beginning and end of the yard's 35-year operational history. The upper photograph is from 1890, just six years after the business was established. It provides a partial view of the marine railways, several buildings, and a "timber-pickling" pond in the foreground. The lower image was taken by Archibald F. Ellis in 1910 after the company was in business for 26 years. The yard's infrastructure has been expanded with additional buildings and a rail spur visible on the property. Noteworthy are the absence of derelict vessels in the water or along shore in the 1890 image, and the presence of several derelict vessels in the 1910 image. This accumulation of derelict ships over the course of a 20-year period in the waters adjacent to the shipyard suggests a causal relationship between the vessel remains in the water today and the shipyard (source: Providence Public Library Rhode Island Collection [upper image]; Providence City Archives [lower image]).

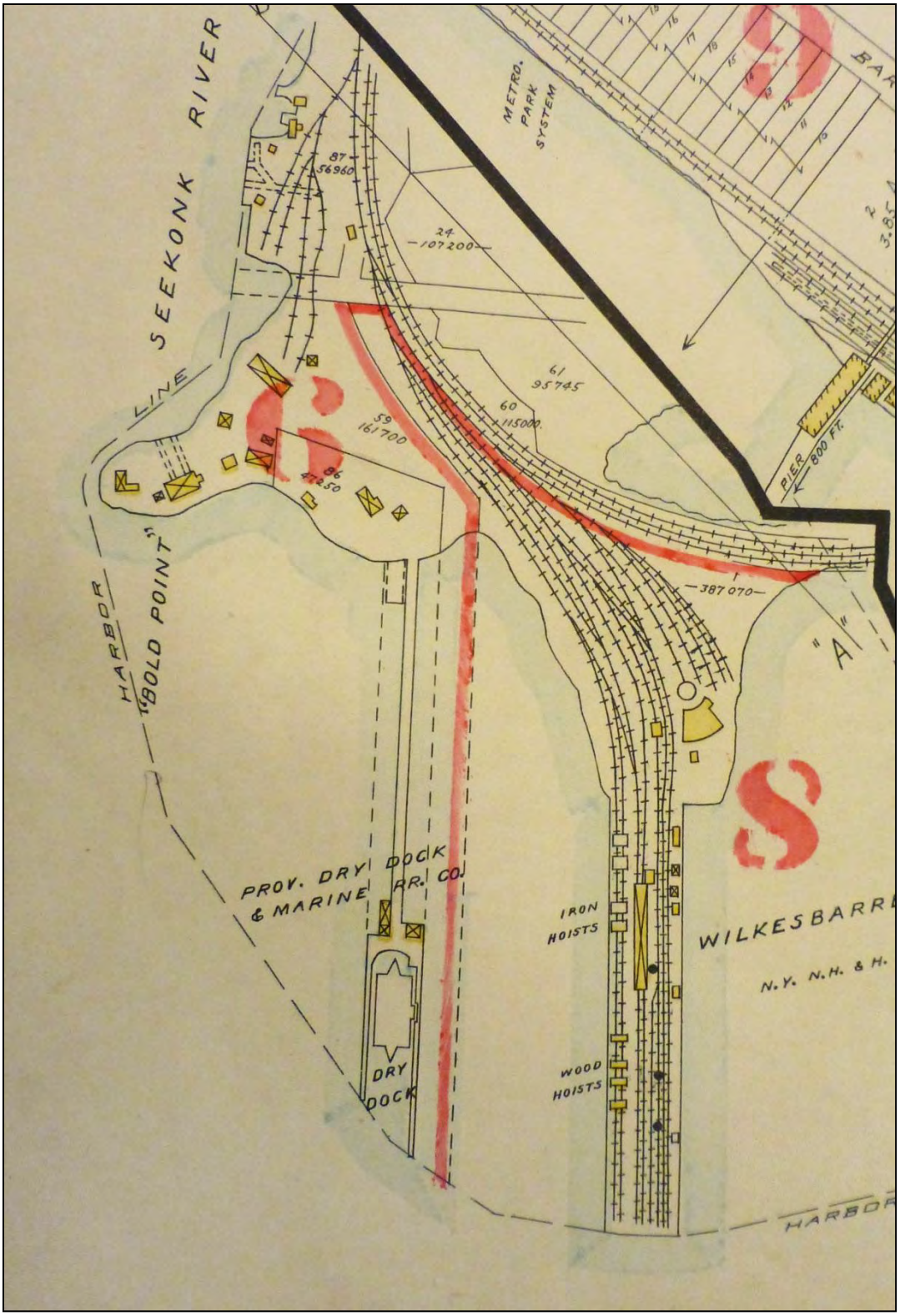


Figure 4-8. Detailed depiction of the Providence Dry Dock and Marine Railway Company property in 1917. Note the unique "tuning-fork" shape of the dry dock pier and the shape of the floating dry dock slipped within the pier (source: Richards Standard Atlas 1917).

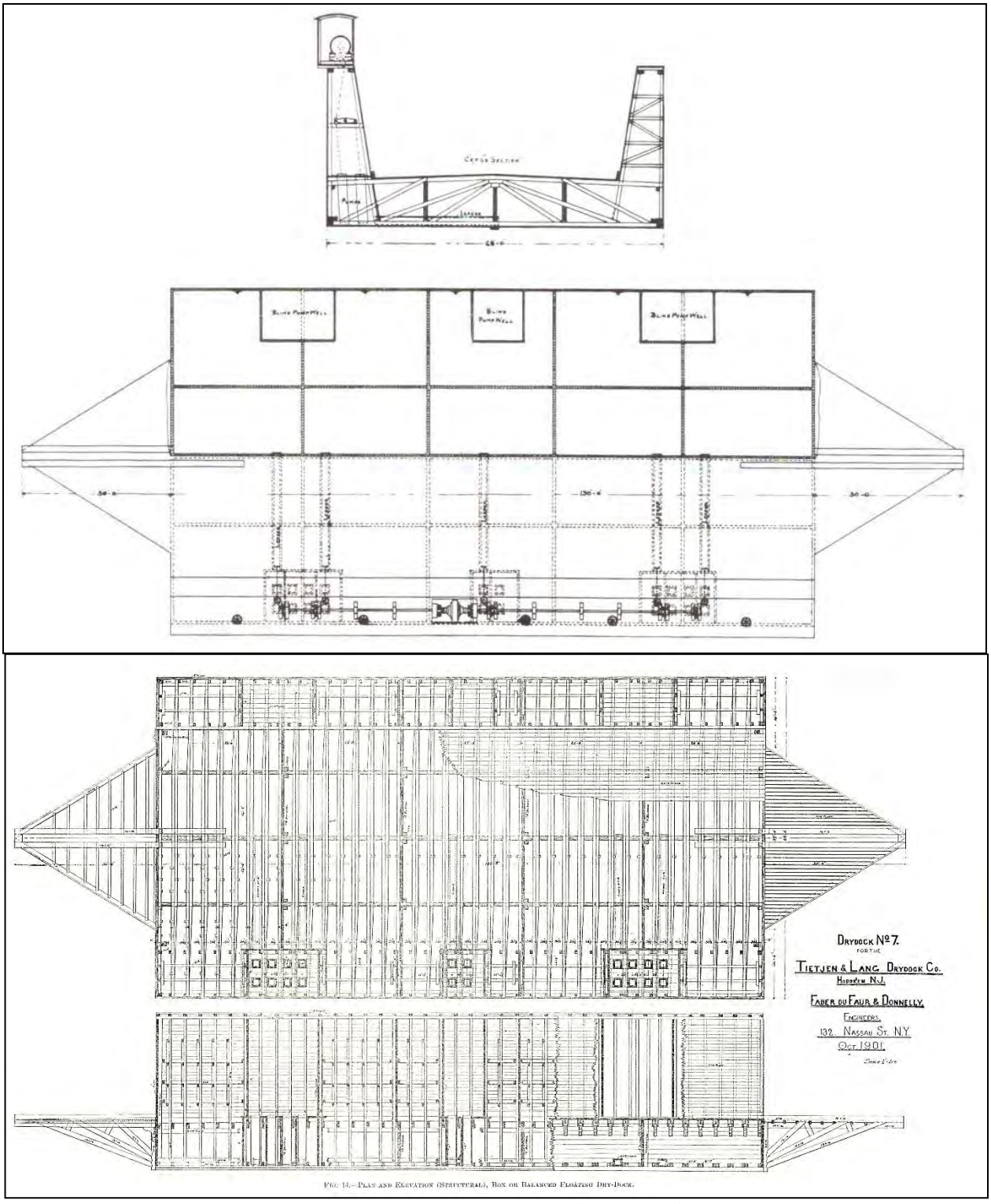


Figure 4-9. Construction plan and profile views of a "box" or "balanced" floating dry dock, similar to the Providence Dry Dock and Marine Railway Company's floating dry dock (source: Donnelly 1906).

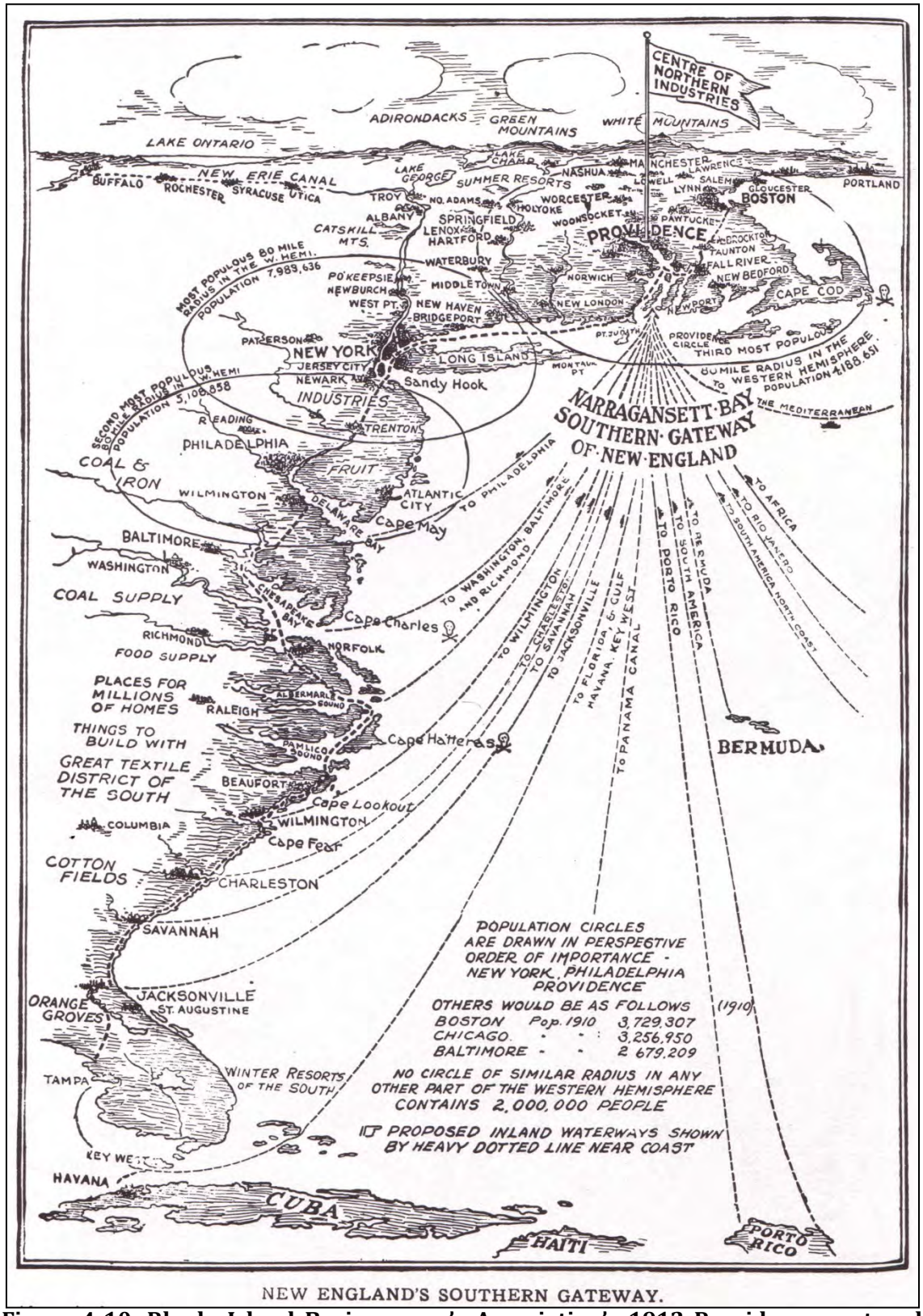


Figure 4-10. Rhode Island Businessmen's Association's 1912 Providence-centered map typified the optimism that infected the local business community (source: Conley and Campbell 1982).

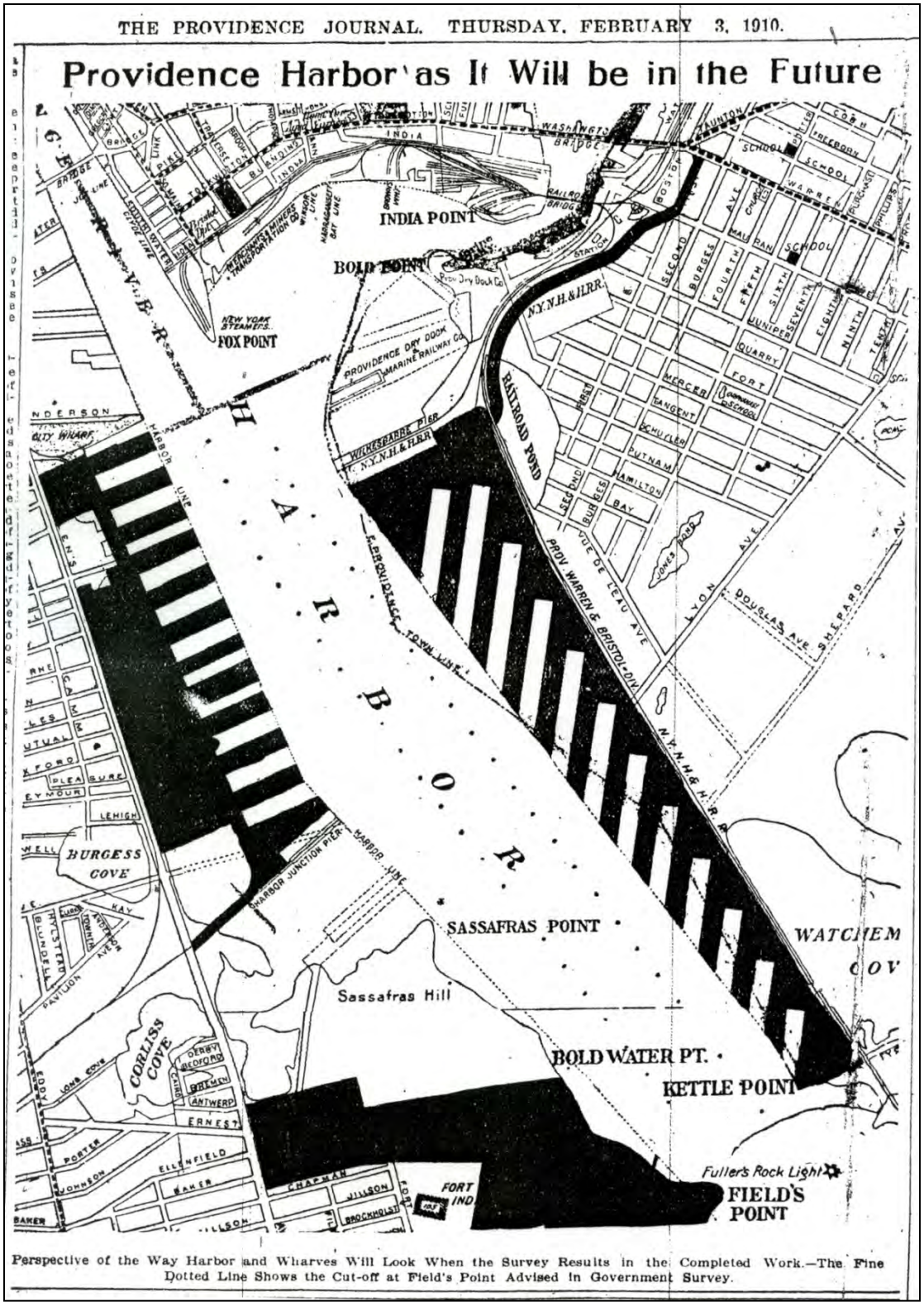


Figure 4-11. Map from 1910 showing the proposed removal of Bold Point and Green Jacket Shoal to create a basin at the mouth of the Seekonk River and the expansion of Providence Harbor's port facilities promoted by Grand Trunk Railroad president, Charles M. Hays (source: *Providence Journal* 1910).

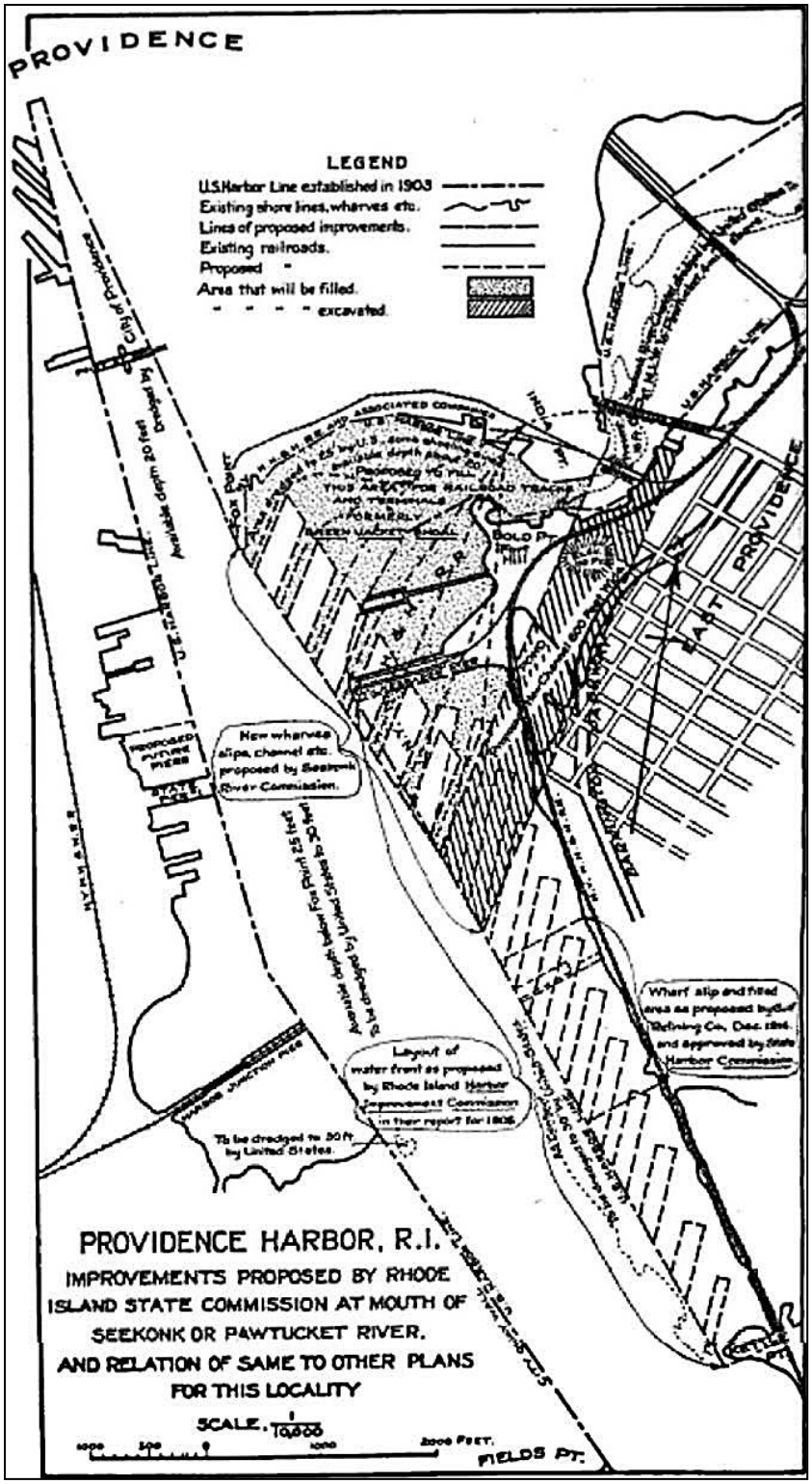
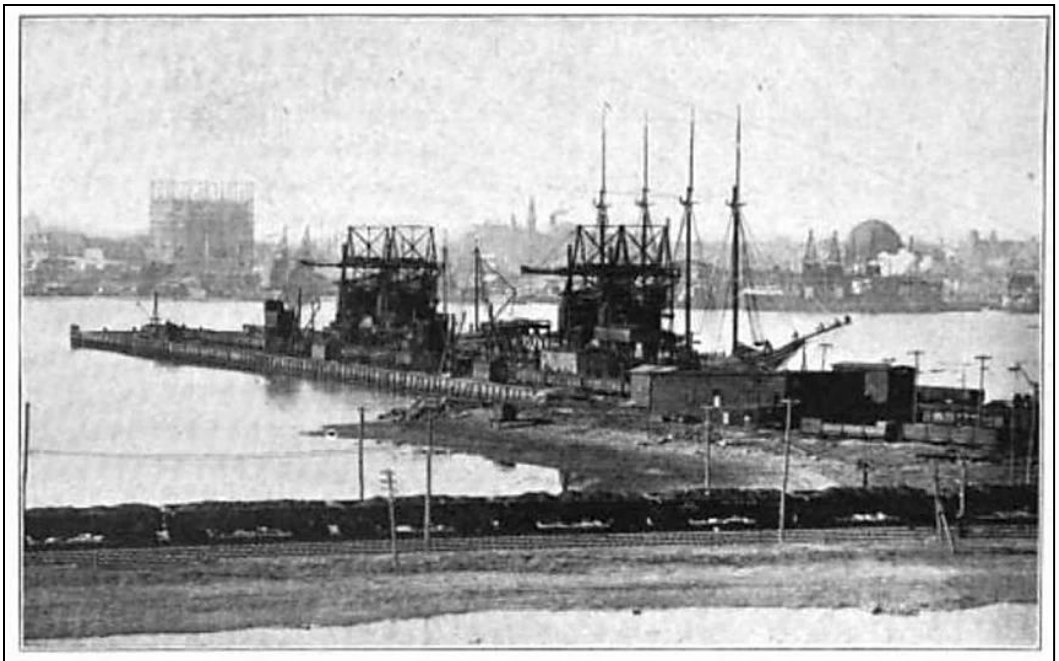


Figure 4-12. Map from 1918 showing the proposed filling-in of Green Jacket Shoal (gray stippled area), the shifted location of the mouth of the Seekonk River (dark cross-hatched area), and the expansion of port facilities (dashed line) out to the eastern harbor line along the East Providence and Providence shorelines (source: *Providence Magazine* 1918).



WILKESBARRE PIER—GREATEST COAL RECEIVING POINT IN PROVIDENCE HARBOR.

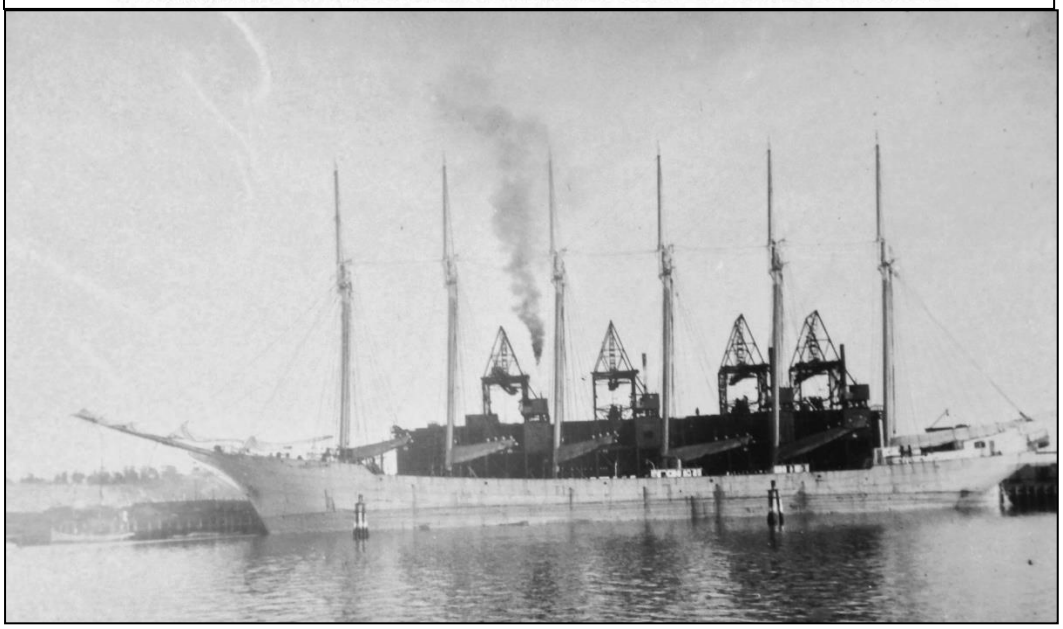


Figure 4-13. During the first quarter of the twentieth century, the Wilkesbarre Coal Company pier was one of the largest piers used exclusively for the discharge of coal in the country with some 530 ships unloading upwards of a million tons of coal there in 1913 (source: *Providence Magazine* 1918 [upper image]; East Providence Historical Society archives [lower image]).

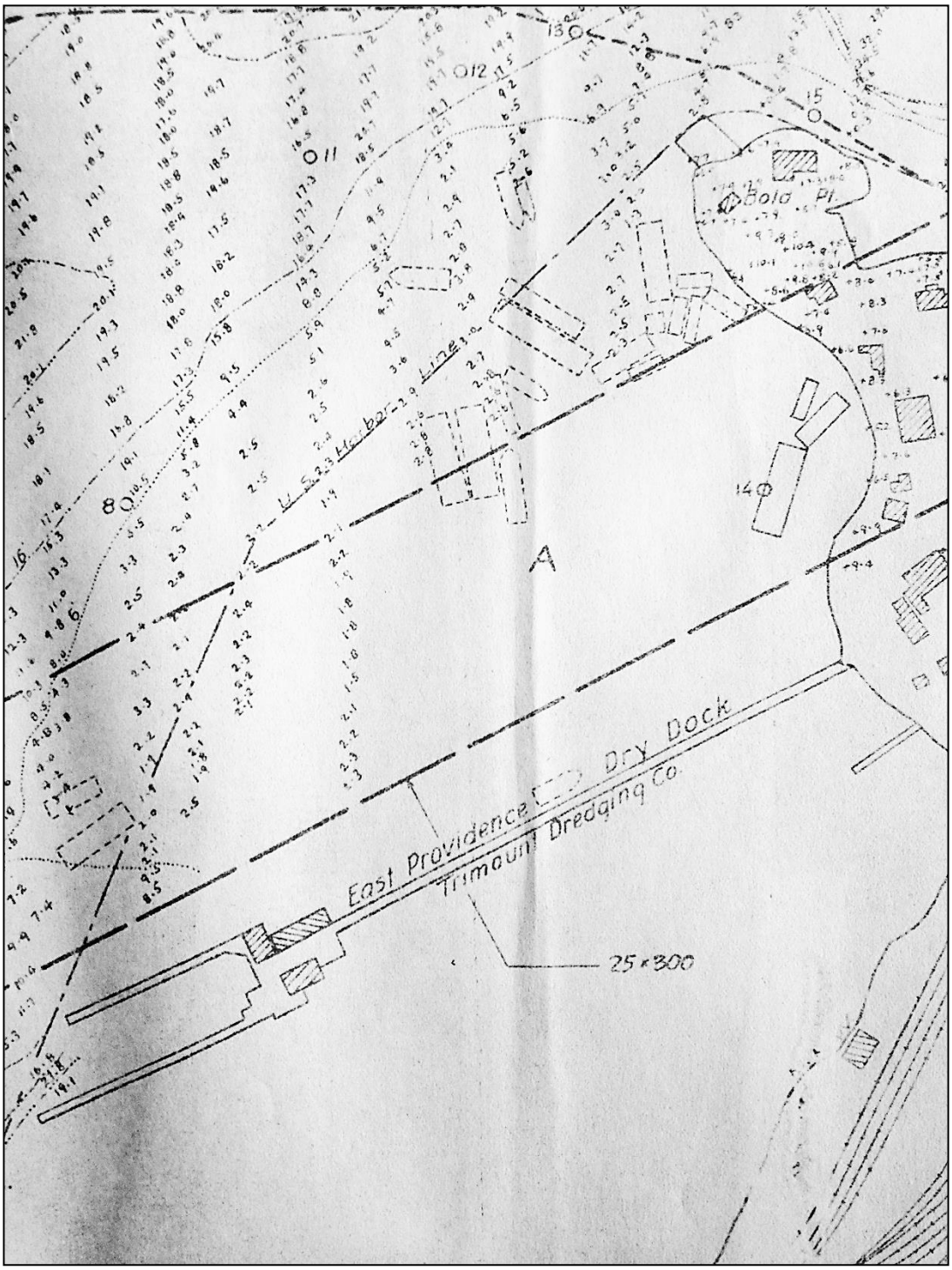


Figure 5-1. U.S. Army Corps of Engineers' 1932 plot of depth soundings, sediment types, and the locations of the remains of 24 derelict vessels and the Providence Dry Dock and Marine Railway Company's dry dock pier and wharf, as surveyed in 1931 and 1932 on Green Jacket Shoal. A comparison of this plot to vessel remains documented in the study area during this investigation indicates that 17 of them have been present since the 1931-32 survey, making these vessel remains a minimum of 84-85 years old (source: USACE 1932).

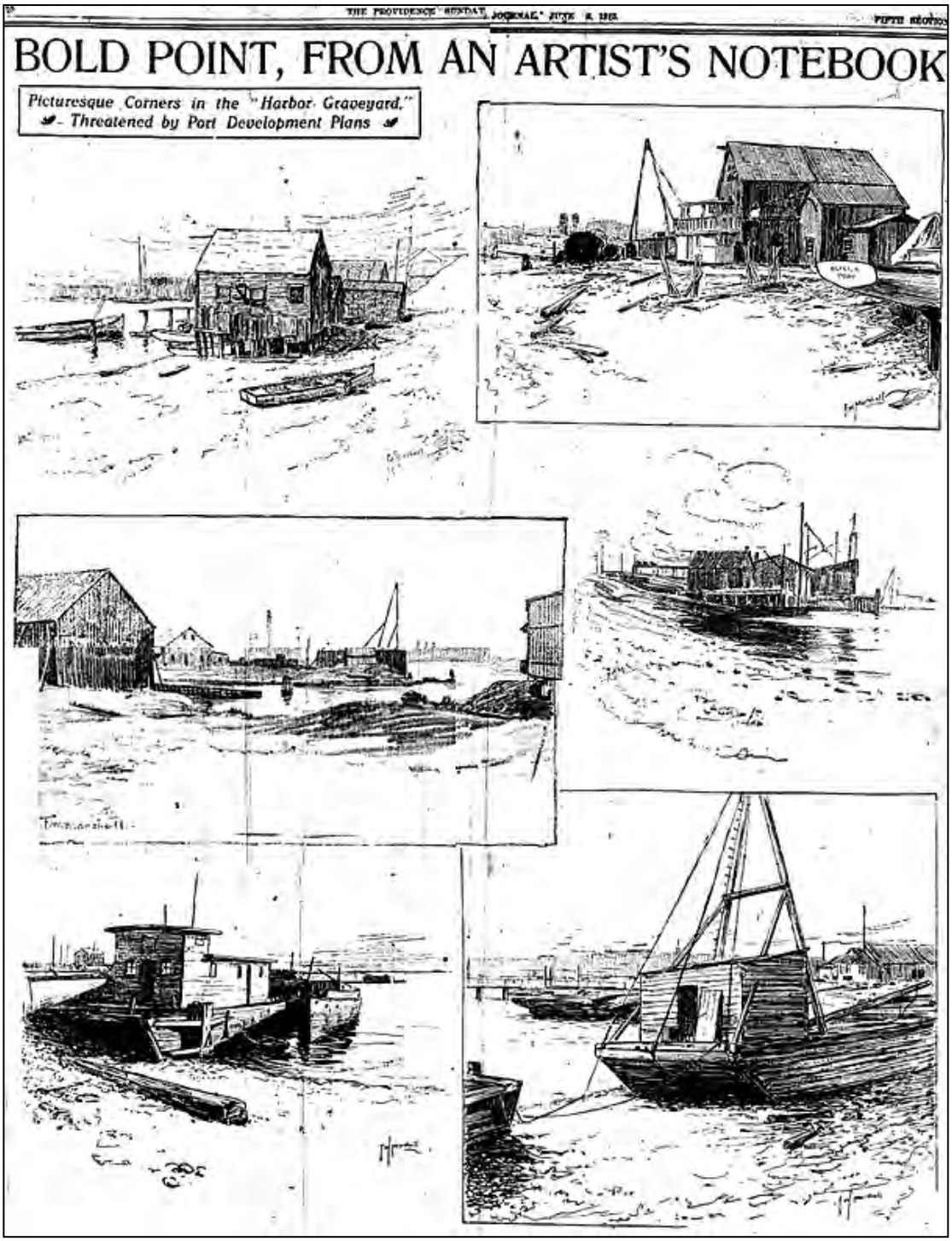


Figure 5-2. *Providence Journal* artist Frank W. Marshall's sketches of the "picturesque corners" of Bold Point and its "Harbor Graveyard" appeared in the newspaper in 1915. Marshall's description of the area as a 'harbor graveyard' and his detailed drawings of some of the vessels comprising it are the earliest published. Of particular interest are the different vessel types depicted, including three different kinds of scow-barges and a narrow-hulled sail- or steam-vessel, and Marshall's lament that the harbor graveyard is "threatened by port development plans" (source: Marshall 1915).

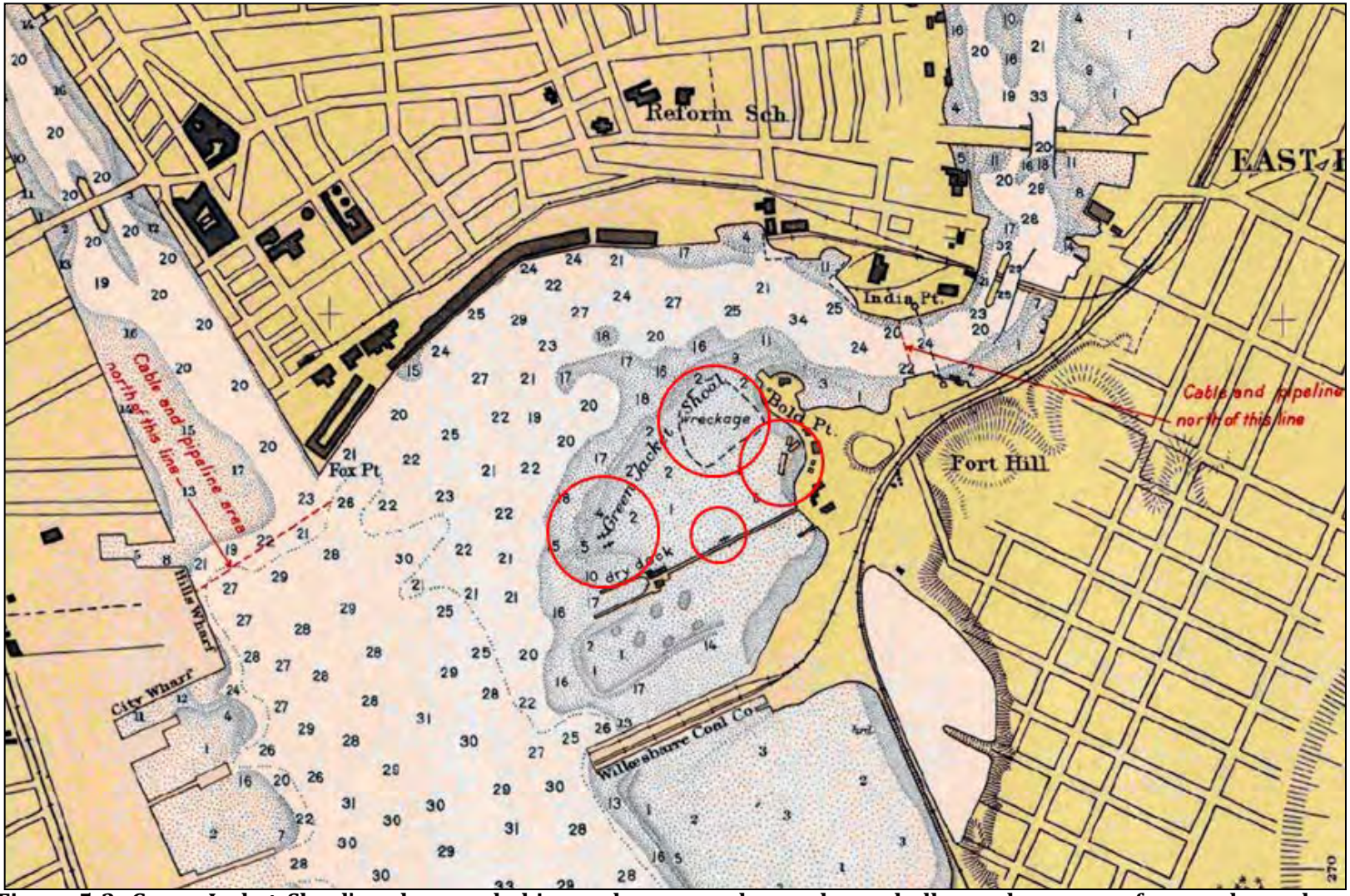


Figure 5-3. Green Jacket Shoal's submerged shipwrecks, exposed scow-barge hulks, and an area of general wreckage (circled here in red) were first depicted on navigational charts of Providence Harbor in 1932 (source: after USCGS 1932).

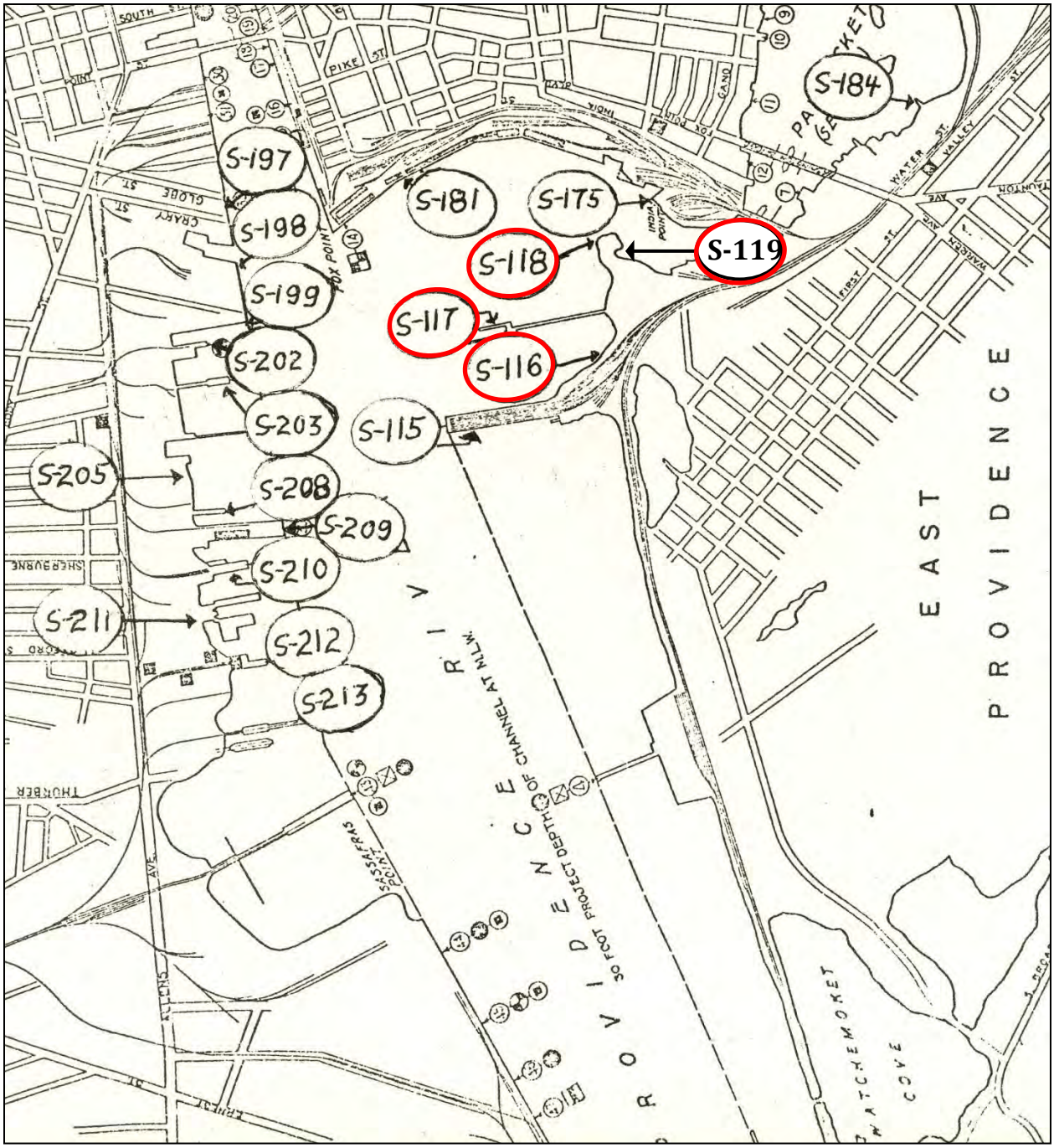


Figure 5-4. A 1982 Department of the Army cultural resources reconnaissance study assessed the Providence Dry Dock and Marine Railway Company site at Bold Point as having "special importance" as the sole survivor of Providence's wooden sailing ship-building industry with several structures identified on site (S-116, S-117, S-118 and S-119 highlighted in red) likely to have "particularly great historic and potential archaeological significance," making them worthy of archaeological investigation and National Register-eligibility evaluation. Derelict vessels were not included or considered as part of the overall research design of the 1982 reconnaissance investigation (source: after Department of the Army 1982:APPENDIX 7).

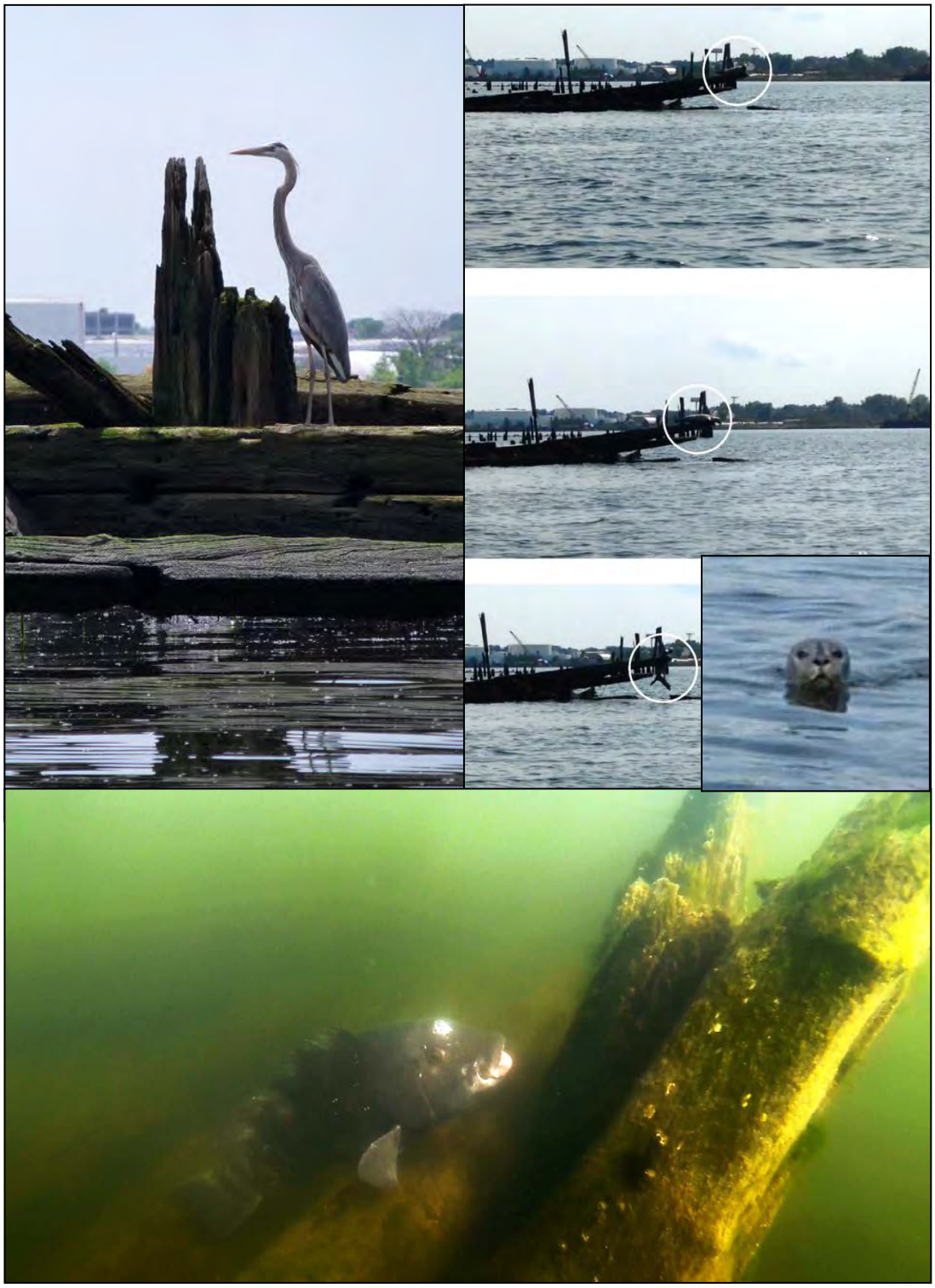


Figure 5-5. The shipwrecks in the Green Jacket Shoal study area provide important habitat for pioneer species of finfish, shellfish, birds and marine mammals returning to the Providence River as the water and habitat quality has improved (source: photographs by David Robinson, CML).

Figure 5-6. The presence of ship remains and shoreline infrastructure from the Providence Dry Dock and Marine Railway Company in the study area has not appeared to be a deterrent to the use and enjoyment of the Bold Point Park grounds and boat ramp by local and area residents (source: photographs by David Robinson, CML).

Figure 5-7. Different types of scow barges present in the study area – SW-2, a large modern (less than 50 years old) ocean-going barge (note curved end) (upper image) and an historical (more than 50 years old) inland waterway work-barge (SW-7) with centerline framing designed to help support weight on deck, rather than to carry bulk cargoes inside its hull (source: photographs by David Robinson, CML).

Figure 5-8. SW-12 is the remains of a large schooner-barge representing the last chapter in the history of America's merchant sailing vessel developmental chronology. The reduced sailing rig of a schooner-barge required a smaller crew and was less costly to operate. The rig was intended primarily for auxiliary purposes and could be used in the event of a break in the tow-line to the steam-tug that would have pulled a string of several schooner-barges joined together. Schooner-barges were employed in the bulk-cargo carrying trade and most-often carried stone, grain, lumber and coal. The after-half of SW-12's hull remains is full of rough-cut logs that may be unused pier piles that were discarded in the hulk (source: aerial photographs by Glenn Anderson; image of the schooner-barge underway from Morris 1984).

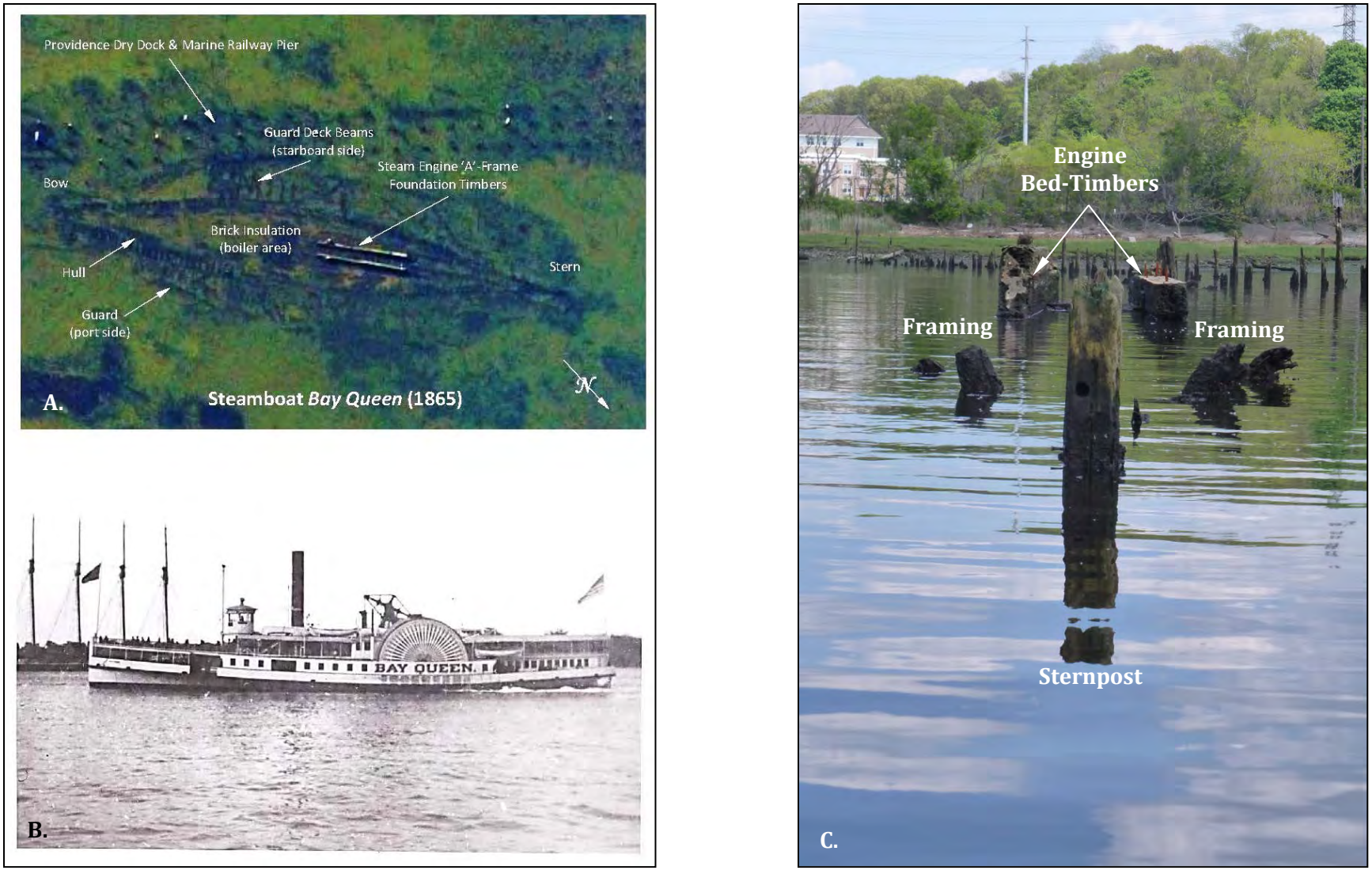


Figure 5-9. The well-preserved remains of the 1865 side-wheel steamer *Bay Queen* (SW-18) consist of the full-length of the entire bottom of its hull and a significant portion of the framing from its overhanging main deck (sources: A. base photograph by Glenn Anderson; B. William H. Ewen, Jr. Collection; C. photograph by David Robinson, CML).

Figure 5-10. The preserve remains of the 1888 side-wheel steamer *Mount Hope* (SW-16) are less extensive than those of *Bay Queen*. They consist of the nearly the full-length of the bottom of its hull with portions of the sides of the hull also preserved forward of amidships. However, except for the steamer's sides, most of the forward half of the hull is largely buried and was inaccessible for documentation. At lower-low tides, *Mount Hope*'s massive keelsons, iron-reinforced 'A'-frame timbers, engine bed-timbers, framing and planking are all usually visible extending above the water's surface (sources: uppermost aerial photograph by Glenn Anderson; lower photographs by David Robinson, CML).

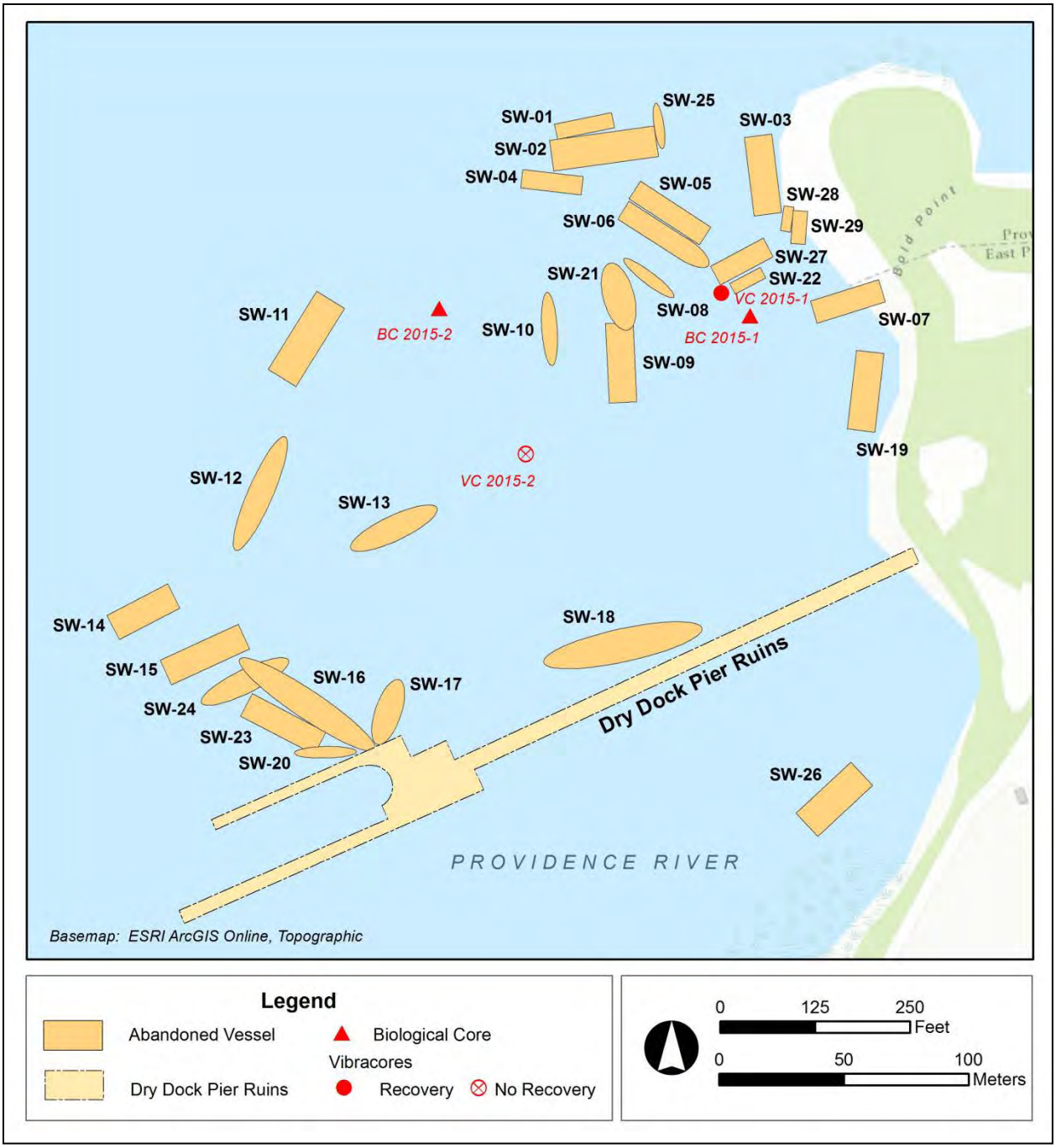


Figure 5-11. Plot of the locations of CML-identified and mapped submerged cultural resources, and the locations of CML's geological sampling completed in 2015. The identities and histories of just two of the 29 shipwrecks in the study area are presently known – those of the side-wheel steamers *Bay Queen* (SW-18) and *Mount Hope* (SW-16).

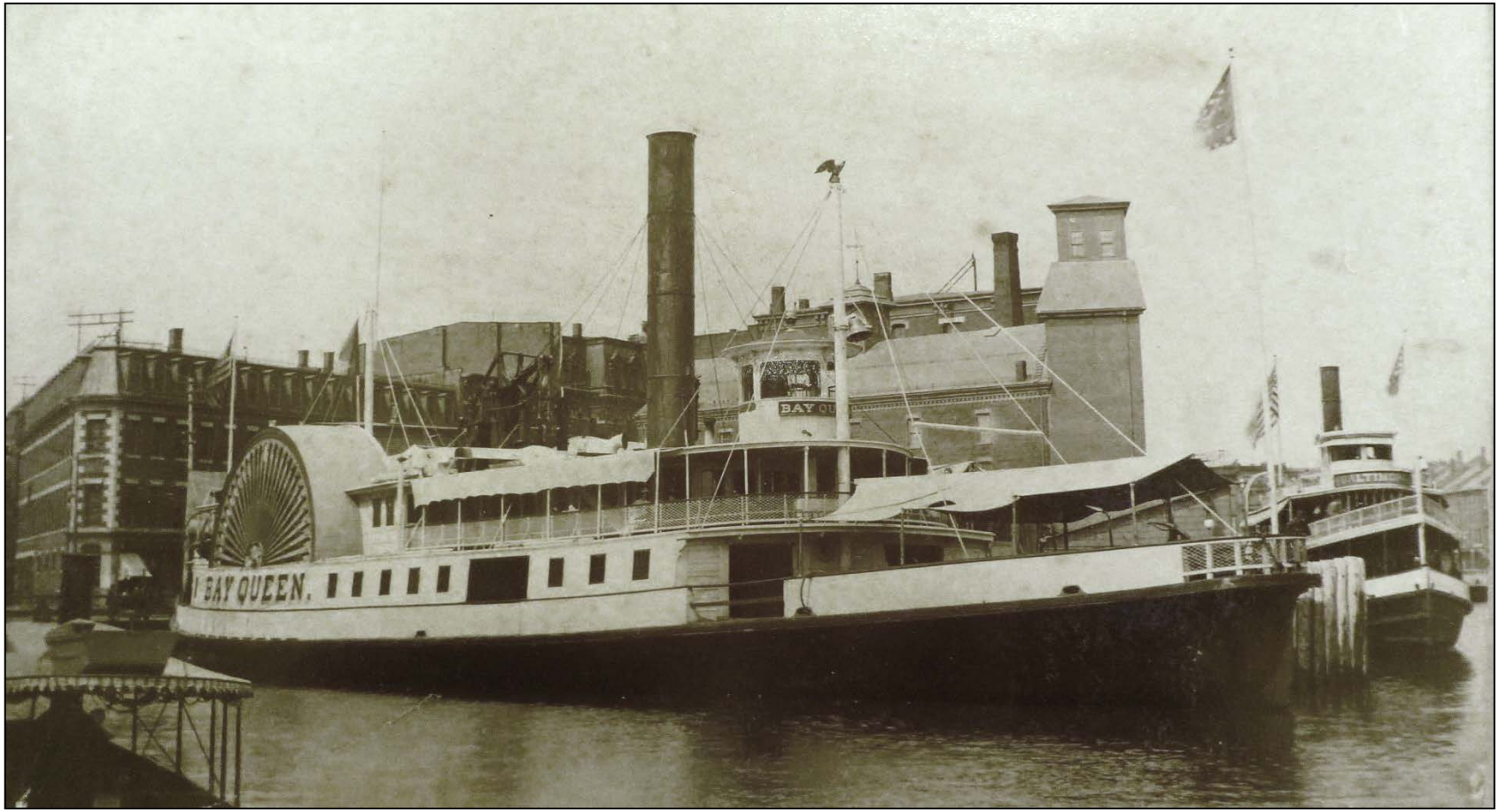


Figure 5-12. The Narragansett Bay excursion steamer, *Bay Queen* (1865-1902), had an operational lifespan of 37 years and was one of the most popular vessels on the bay during steam-boating's late 1800s heyday. *Bay Queen* was built in Brooklyn, New York in 1865 for the American Steamboat Company. It was sold at the end of its service life for conversion into a barge in 1901. In 1902, *Bay Queen* was stripped of its machinery and upper-works at the Providence Dry Dock and Marine Railway Company's dry dock pier at Bold Point. The planned conversion into a barge never proceeded, so *Bay Queen* was moved to the north side of the pier and abandoned (source: Providence Public Library Rhode Island Collection).

Figure 5-13. 1878 "Bird's Eye or Balloon View of Rock Point" with *Bay Queen* at the park's pier (source: Library of Congress Prints and Photographs Division, Washington, D.C., (http://loc.gov/pictures/resource/pga.08408/).

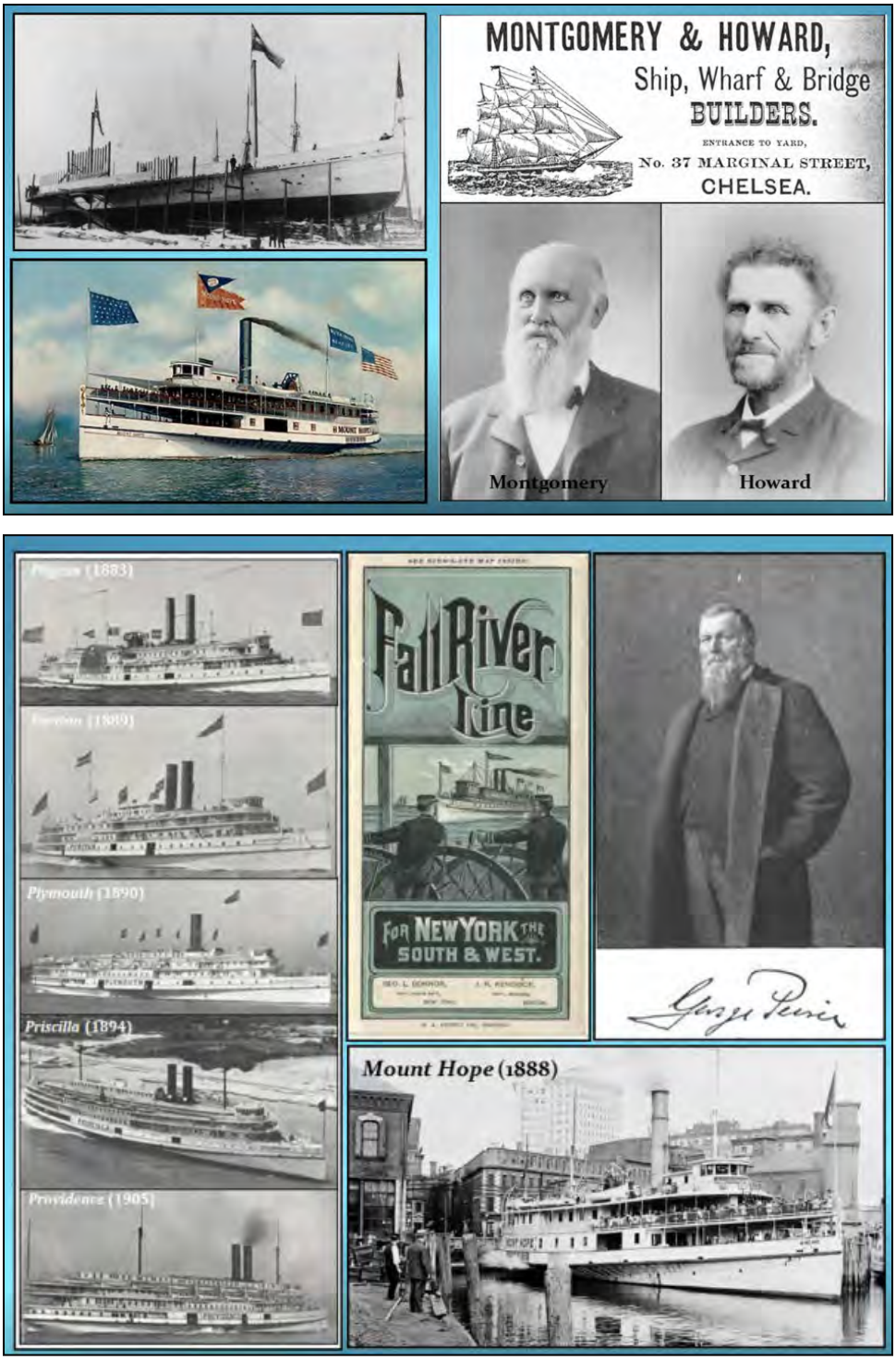


Figure 5-14. *Mount Hope* was built in the Chelsea, Massachusetts shipyard of Montgomery and Howard in 1888 and designed by master naval architect George Pierce. Pierce would go on to design a number of the Fall River Line's more famous Providence-to-New York "Night Boats" (sources: David Robinson, CML, personal collection; RI Historical Society - RHiX36992 (lower right image).

Figure 5-15. ***Mount Hope*** **was Rhode Island's best-known and most heavily-traveled steamboat. It served on the Providence-to-Block Island Route (with stops at Newport) for 47 years.** ***Mount Hope*****'s passenger capacity was 2,000 persons for transits within Narragansett Bay; 1,300-plus for transits out to Block Island.** ***Mount Hope*** **was taken out of service in 1934 and left to decay in Providence's upper harbor before it was eventually moved to the dry dock at Bold Point where it was stripped of its valuables and abandoned (sources: Cram 1984 [upper left image]; Providence Public Library, Rhode Island Collection; W. Warren Collection; and W. H. Ewen, Jr. Collection [all other images]).**

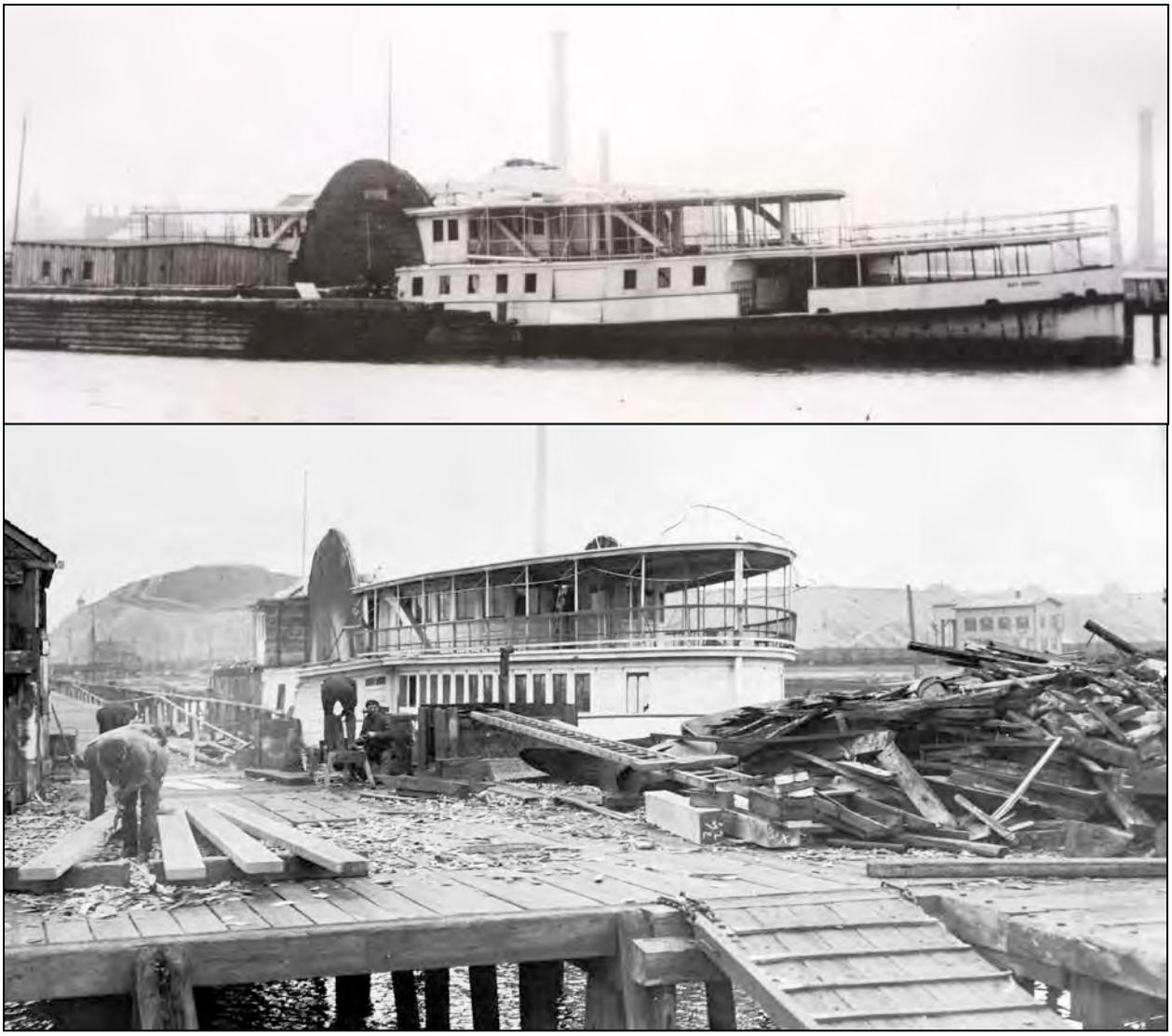


Figure 5-16. The Narragansett Bay excursion steamer *Bay Queen* (SW-18) at the Providence Dry Dock and Marine Railway Company dry dock pier in the process of being cut-down prior to its abandonment on the north side of the pier. These photos confirm the practice of the shipyard dismantling vessels for their valuable hardware or lumber prior to their disposal in the shallow waters of Green Jacket Shoal close to the dry dock pier and the marine railways (sources: William H. Ewen, Jr. Collection [upper image]; RIHS RHiX38351 [lower image]).

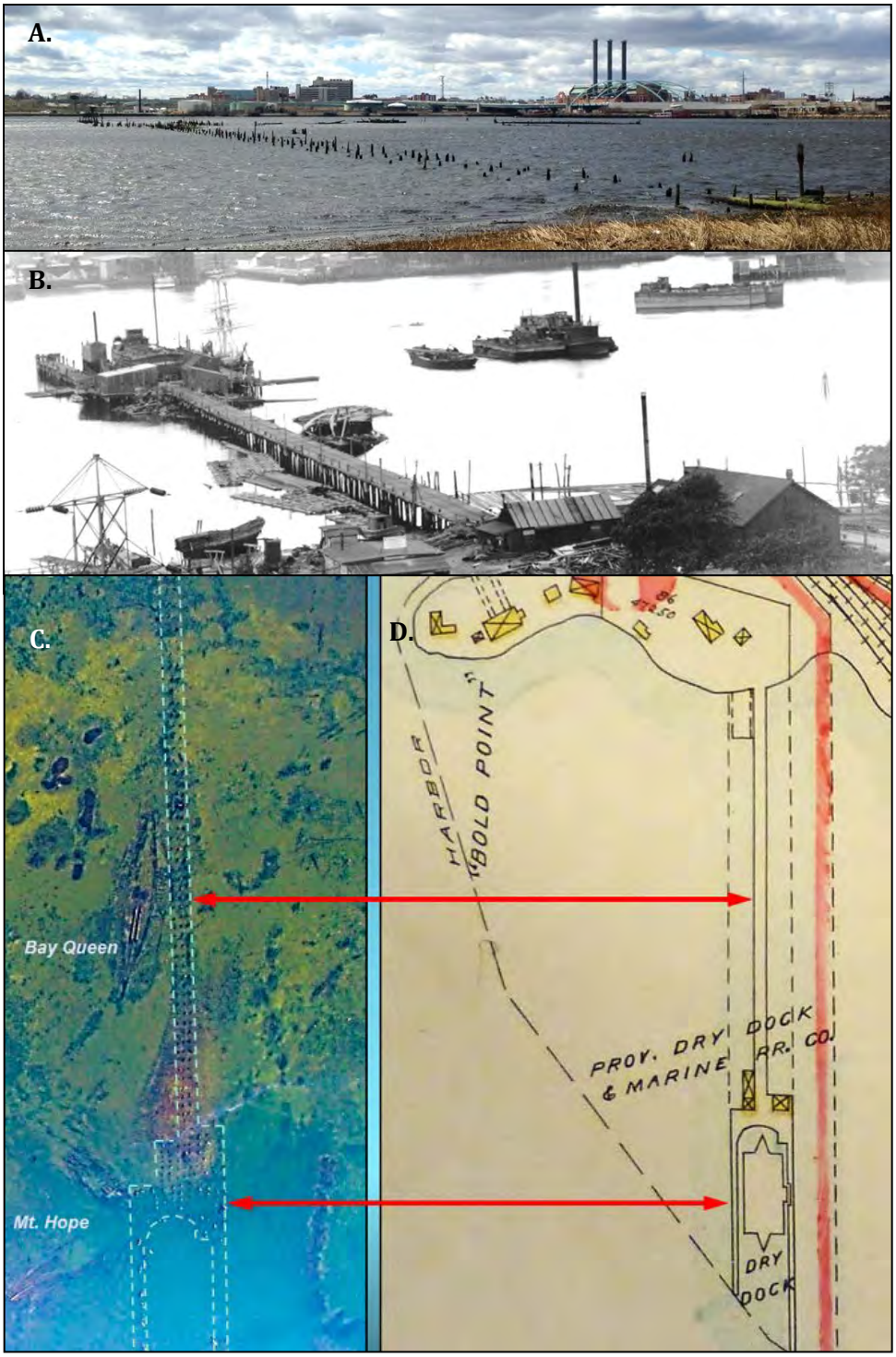


Figure 5-17. The remains of the Providence Dry Dock and Marine Railway Company's dry dock pier consist of fragmentary decking framing pieces and nearly all of the partially preserved piles and pile dolphins whose distribution maintains the unique "tuning-fork-like" footprint of the dry dock pier (sources: A. photograph by David Robinson, CML; B. William H. Ewen, Jr. Collection; C. base aerial photograph by Glenn Anderson; and D. Richards Map Company 1917).

APPENDICES

APPENDIX A

URI-GSO CML-MAPPED SHIPWRECKS IN THE GREEN JACKET SHOAL STUDY AREA

ID #	Vessel Class	Size (ft)	Estimated Age^	Latitude	Longitude	Notes
SW-01	Scow-Barge	85.5-x-29[1]	>28	41.8156886	-71.3930317	Modern; sheathed bottom; supports for deck machinery and donkey boiler
SW-02	Scow-Barge	134-x-40[1]	>44	41.8156067	-71.392966	Modern - heavy timbers used in construction and curved scow-ends below water-line indicate intended for use in open-ocean conditions; end-frames 11.5-x-11.5 in (moulded and sided); braced by timber knee and diagonal bracing planking 5-x-10-5/8 in; vertical side-frames 8-x-8 in (moulded and sided); room 2 ft; planking 5-x-10-5/8 in
SW-03	Scow-Barge	73-x-25[1]	>65	41.8155179	-71.3921796	only bottom preserved - easily accessible from shore
SW-04	Scow-Barge	72-x-26[1]	>84	41.8154839	-71.3932051	
SW-05	Scow-Barge	103-x-32[1]	>84	41.8153769	-71.3926341	
SW-06	Sailing Vessel	125.5-x-29.25[2]	>84	41.8153087	-71.3926884	planking 2.5 in thick; planking fasteners 1 in diam; treenails 1 in diam - round in cross-section; frames double-sawn, 5.5-x-13 in (moulded and sided as pair); room 15 in; ceiling 2 in thick; keelson 20-x-10.5 in (moulded and sided); rider-keelson 6-x-10.5 in (moulded and sided); deadwood 27-x-10.5 (moulded and sided); sternpost 8-x-10 in (moulded and sided); vertical transom planking 2.5-x-9.5 in
SW-07	Scow-Barge	100-x-30[2]	>84	41.815053	-71.3917702	easily accessible from shore
SW-08	Harbor Steamer (?)	81-x-17.5[2]	>84	41.8151396	-71.3927396	planking 2 in thick; frames double-sawn, 5-x-7.5 in (moulded and sided per pair); room 14.5 in
SW-09	Scow-Barge	100-x-28[3]	>84	41.8148424	-71.3928713	
SW-10	Steam or Diesel (?)	81-x-20[3]	>77	41.8149599	-71.3932153	
SW-11	Scow-Barge	115-x-32[3]	>77	41.8149299	-71.394383	completely submerged - only bottom of hull preserved
SW-12	Schooner-Barge	165.5-x-32.75[2]	>77	41.81436	-71.3946133	planking 3.5 in thick; double-sawn frames 8-x-12 in (as pair) (moulded and sided); room 20 in; stem 33.5 in full moulded width; tapers from 13 in on after face to 5 in on forward face; inner stem moulded 15 in; iron-fastened throughout 1-1/8 in diam; bilge ceiling 6-x-9.5 in (sided and moulded); inner and outer sternposts; inner post 12 in sided - outer post is 13 in sided; rudder post is 10 in in diameter; heavy chine-log below bilge-ceiling - 11.5-x-18.5 in (moulded and sided)
SW-13	Sailing Vessel	112-x-34[2/3]	>77	41.8142379	-71.3939723	entire bottom of the hull preserved included both stem and sternpost; planking and ceiling 2 in thick; double-sawn frames - 14 in sided as pair; room 9 in; stem is broken - section off of and in front of wreck; stem 10-x-14 in (sided and moulded) - preserved to height of 4 ft above sea floor; keelson white oak - 14 in sided and iron fastened; sister keelsons on each side of main keelson - 8-x-12 in (sided and moulded)
SW-14	Scow-Barge	80-x-31[4]	>84	41.8139309	-71.3951767	
SW-15	Scow-Barge	105-x-36[1]	>84	41.8137863	-71.3948615	
SW-16	*Mount Hope*	193-x-36[3]	*128	41.8135879	-71.3943703	planking 4-x-15 in and 2-x-11 in; ceiling 3.5-x-14 in; double-sawn frames - 10 in (5 in/5 in) sided-x-7.5 in moulded; room 16 in; bilge ceiling 3 in thick, copper-fastened with 1 in dumps; outer port stringer 9-x-11.5 in (sided and moulded); inner port stringer 10-x-11.5 in (moulded and sided) - 4 ft 19 in space between outer and inner stringers; main keelson 12-x-16.5 in (sided and moulded) iron-fastened with clenched-dumps; A-frame 10.25 in sided; A-frame-engine bed-timber connection reinforced with iron; keelson sided 12 in; 1 in diam peened fasteners; white oak timbers
SW-17	Steam or Diesel (?)	98-x-34[3]	>77	41.8135805	-71.3939944	double-sawn frames; timbers jumbled; port side more intact; iron or steel plate for machinery space
SW-18	*Bay Queen*	182.5-x-35 (61[+])[2]	*151	41.8138139	-71.3928592	entire hull-bottom, engine bed-timbers, engine A-frame stubs, guard framing, brick-insulation of boiler-room, rudder, framing, planking, ceiling, keelsons, sternpost, etc., all preserved; could not locate stem; A-frame timbers 9 in (sided); engine bed-timbers copper-fastened 1.75 in diam; numerous artifacts observed
SW-19	Scow-Barge	89-x-20[1/2]	>84	41.8147236	-71.3916917	may be 100 ft long originally - north end is broken-up
SW-20	Harbor Steamer (?)	74-x-16[3]	?	41.8134223	-71.394297	partially buried
SW-21	Sailing Vessel	82-x-28[3]	>84	41.8150809	-71.3928849	very little relief; wood fragile; may be oldest wreck on the site based on condition and length-to-breadth ratio
SW-22	Scow-Barge	113-x-30[3]	>84(?)	41.8151278	-71.3922473	
SW-23	Scow-Barge	100-x-30[3]	?	41.8135328	-71.394497	complete hull bottom and portions of scow-ends and sides preserved; planking 3 in; massive frames 10 in (sided and moulded); room 24 in
SW-24	Sailing Vessel (?)	114-x-30[3]	>82	41.8136778	-71.3946962	east end broken-up and partially buried; *Mount Hope* rests on top of SW24 - indicates deposition pre-dates 1934 abandonment of *Mount Hope* on Green Jacket Shoal; outline of SW-24 visible in undated aereial photograph in 1982 Depart of Army report suggests that it is the remains of a sailing vessel
SW-25	Harbor Steamer (?)	62-x-13[3]	>84	41.8156813	-71.3926802	planking 2-x-11- 5/8 in; ceiling 2-x-11-1/4 in; frames 7-x-7 in (moulded & sided); room 8 in
SW-26	Scow-Barge	100 x 41[3]	>65	41.8132575	-71.3918383	
SW-27	Scow-Barge	79 x 28[3]	>84	41.8151988	-71.3922842	
SW-28	Scow-Barge	33 x 14[3]	>84	41.8153477	-71.3920696	
SW-29	Scow-Barge	44 x 19[3]	>84	41.8153227	-71.3920091	

^ Estimated minimum age based first appearance on RIGIS aeriel orthophotographs or inclusion on 1932 USACE plan of Seekonk River.

*Known age (not estimated)

(61[+]) Maximum width (ft) on-deck measured to outside edges of preserved remains of guards.

[1]Dimensions calculated from orthophoto.

[2]Dimensions measured in the field.

[3]Dimensions calculated from georeferenced quad-coptor photo.

[4]Dimensions calculated from georeferenced sidescan sonar record.

APPENDIX B

APPENDIX B:

GEOLOGICAL SAMPLING PHOTOGRAPHS AND LOGS

BIOLOGICAL CORE
BC 2015-1

Core ID: Green Jacket Shoal BC 2015-1

Location: Green Jacket Shoal

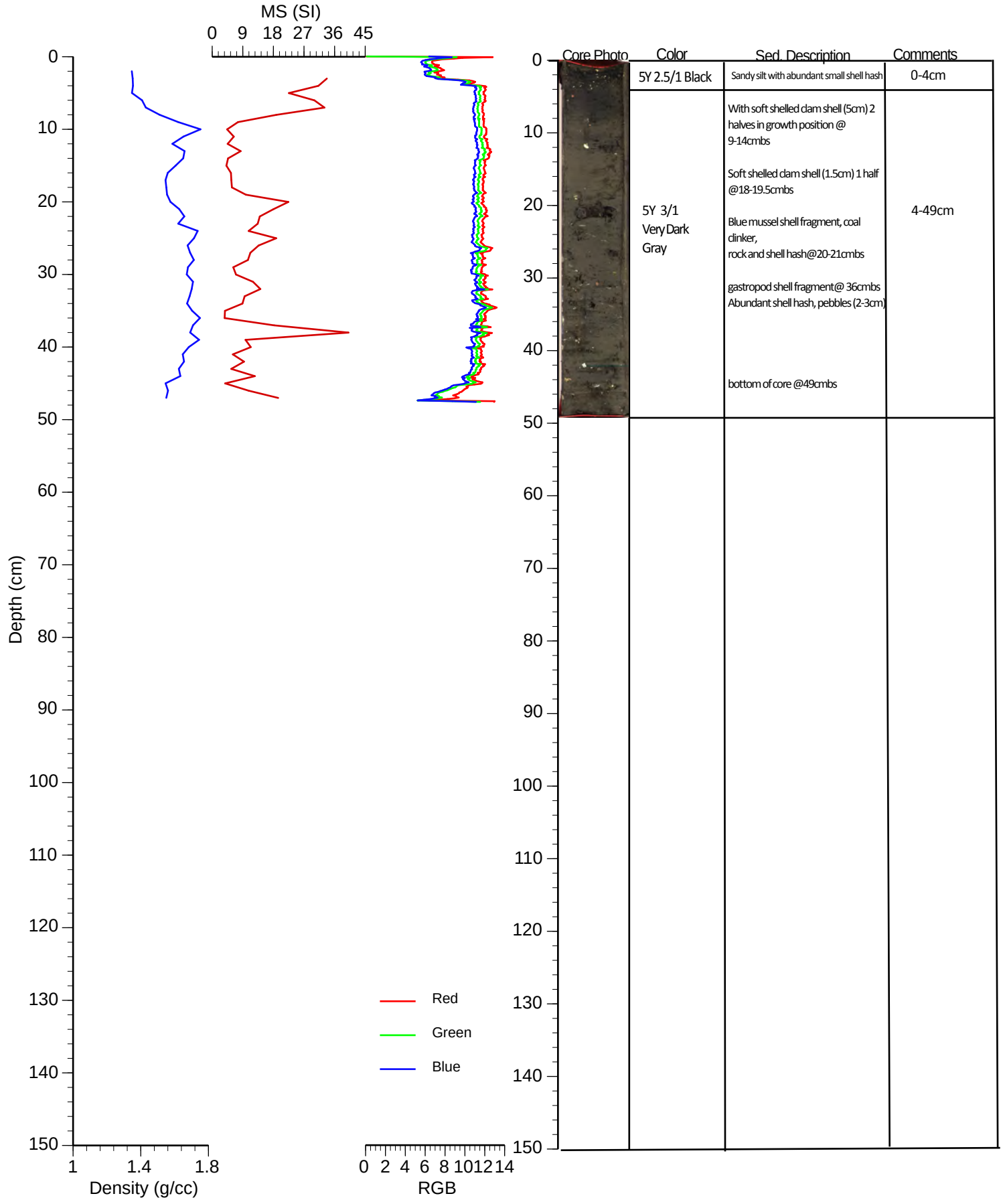
Coring Procedure: Biological Core

Logger: URI/GSO/DSRA Date: 5/7/15

Date Collected 4/28/15

Latitude: 41° 48' 54.1" Longitude: 71° 23' 32.0"

Water Depth: 16ft. Length: 49cm



Core Photo	Color	Sed. Description	Comments
	5Y 2.5/1 Black	Sandy silt with abundant small shell hash	0-4cm
	5Y 3/1 Very Dark Gray	With soft shelled clam shell (5cm) 2 halves in growth position @ 9-14cmbs Soft shelled clam shell (1.5cm) 1 half @18-19.5cmbs Blue mussel shell fragment, coal clinker, rock and shell hash@20-21cmbs gastropod shell fragment@ 36cmbs Abundant shell hash, pebbles (2-3cm) bottom of core @49cmbs	4-49cm

VIBRACORE
VC 2015-01

Core ID: Green Jacket Shoal VC 2015-1

Location: Green Jacket Shoal

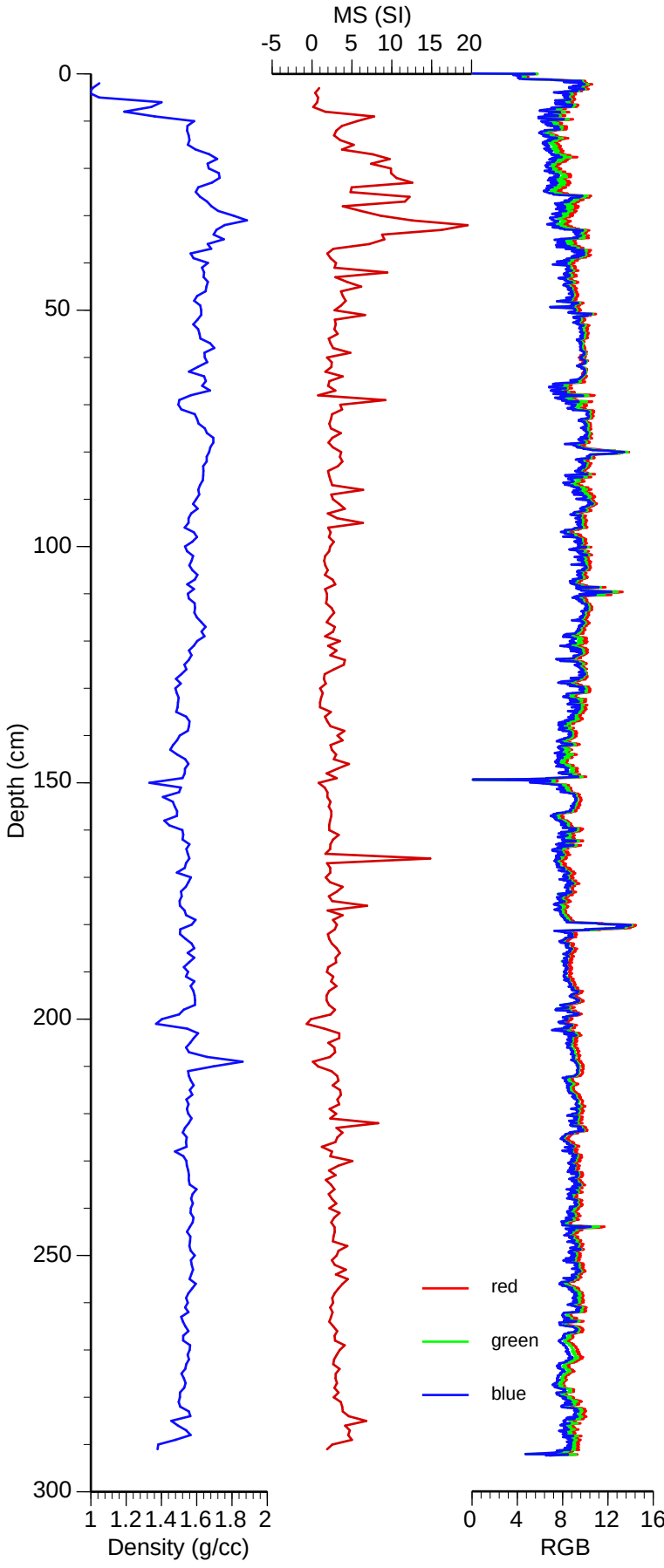
Coring Procedure: Biological Core

Logger: URI/GSO/DSRA Date: 5/12/15

Date Collected 4/29/15

Latitude: 41° 48' 54.3" Longitude: 71° 23' 32.6"

Water Depth: 4.5 ft. Length: 293cm



Color	Sed. Description	Comments
5Y 2.5/1 Black	Sandy silt with shell fragments, 3-8cm gravel mud snails at 2-3cm	0-8cm
5Y 3/1 very Dark Gray	Silt with shell fragments with gravel at transition; half oyster shell (4cm in size) at 22-25cmbs	8-30cm
5Y 3/1 Very Dark Gray	Sandy Silt	30-66cm
5Y 3/1 Very Dark Gray	Sandy silt grading top silt	66-70cm
5Y 3/1 Very Dark Gray	Silt with oyster shell (2 halves) @66-71cmbs (5cm-sized shell); oyster shell fragment @79-81cmbs; 5cm sized piece of wood @85.5-87.5cmbs; occasional small shell fragments throughout unit; granule-sized gravel @approx. 120cmbs; small linear piece of shale @147cmbs	70-149cm
	bottom of section 1	
5Y 3/1 Very Dark Gray	Silt with small amount of sand and occasional pebbles; oyster shell half @180-181cmbs	149-293cm
	bottom of core @ 293cmbs	

BIOLOGICAL CORE
BC 2015-2

Core ID: Green Jacket Shoal BC 2015-2

Location: Green Jacket Shoal

Coring Procedure: Biological Core

Logger: URI/GSO/DSRA Date: 5/7/15

Date Collected 4/28/15

Latitude: 41° 48' 54.1" Longitude: 71° 23' 37.5"

Water Depth: 5.1 ft. Length: 98cm