

**MARITIME ARCHAEOLOGY AT
KEITH'S WARF AND
BATTERY COVE (44AX119)
FORD'S LANDING
ALEXANDRIA, VIRGINIA**

Prepared for
Cook Inlet Region of Virginia

March 1993

ENGINEERING-SCIENCE, INC.
1133 Fifteenth Street N.W.
Washington, D.C. 20005



PARSONS ENGINEERING SCIENCE, INC.

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ABSTRACT

In the late summer and fall of 1989, Phase II and III archaeological investigations were conducted at the Ford's Landing development site, also known as the Old Ford Plant (44AX119), on the southern end of the waterfront in Alexandria, Virginia. The goal of the Phase II testing was to evaluate the significance of archaeological resources on the property, to assess their integrity and to consider the effect of proposed development plans on them. The Phase III study was conducted to mitigate adverse effects to significant archaeological resources at the site.

Archival research indicated that the property consisted entirely of made land, including a wharf constructed in 1785 by a consortium of local entrepreneurs, headed by James Keith. The wharf lay at the northern end of a long, shallow bay, later known as Battery Cove. Keith's Wharf saw little extensive commercial use through the middle of the nineteenth century, until the establishment of a marine railway in 1849. That enterprise disappeared before the onset of the Civil War, during which the wharf was appropriated by the Union Army's Military Construction Corps. A shipyard reappeared in the 1870s, with several marine railways and building slips on which a variety of vessels were repaired and constructed, including some of the largest built in Alexandria. Business was closely linked with the New England coal trade. The construction of large ships ended by the mid-1880s, but a marine railway operated on the wharf under various ownership through the early 1920s, continuing the repair of ships and boats. The yard shared the site with a number of light industrial concerns after the turn of the century. In 1910 and 1911, the U.S. Army Corps of Engineers dredged the main channel of the Potomac at Alexandria, depositing the resulting spoil behind a low stone wall erected to span the distance from Keith's Wharf to Jones Point, thereby filling in Battery Cove and creating the southern third of the study area. Due to the pace and character of later twentieth-century development in Alexandria, the Ford's Landing site represented the best and possibly last opportunity to investigate remains from periods ranging from the formation of the waterfront through early industrial development to the twentieth century.

Approximately 40 percent of the site was inaccessible to the current investigations due to development plans which called for the preservation of a large brick structure built by the Ford Motor Company on the north half of the site in the 1930s. Archaeological testing consisted of the excavation of a series of backhoe trenches oriented both perpendicularly and diagonally across the wharf, to test the area for structural remains. Additional, shorter trenches were scattered through the cove section of the property to test for the presence of derelict vessels beyond the edge of the wharf. Portions of a building slip, a marine railway and the bulkhead of the wharf were encountered. Data recovery investigations were undertaken, focusing on the wharf bulkhead, the building slip and several barge and boat fragments located at the edge of the cove.

The wharf consisted of a simple bulkhead of large yellow pine timbers, scarfed and pinned with iron drifts, and reinforced with tie-back braces which were anchored in fill behind the structure. Fill was comprised of clean earth, reportedly graded from the bluffs along Lee Street immediately west and northwest of the site. Few artifacts were contained within the fill. Those recovered generally consisted of incidental inclusions of late eighteenth-century domestic debris, late eighteenth- and nineteenth-century domestic debris assumed to represent an episode of maintenance at the turn of that century, and prehistoric artifacts, these latter derived from an apparently extensive base camp on the bluffs to the west. The wharf bulkhead had deteriorated, and nowhere rose to its original height. Analysis indicated that it originally stood approximately 3 feet above the contemporary high waterline, which was at least 18 inches below the current high water level. Shipyard features consisted of a building slip over 350 feet in length, composed of long pine timbers serving as spread footers laid directly on the earthen fill of the wharf. The slip was capable of accommodating a vessel of moderate beam (24 feet). There was evidence to suggest that the slip had not been used. The remains of the marine railway consisted of the brick and wood base of the capstan head within the engine room, and sections of the masonry foundation for the rails leading to the edge of the wharf. The ways were of sufficient size to handle some of the largest vessels on the river at the time. The railway extended 200 feet along the wharf surface, and harbor bottom contours shown on contemporary maps suggested that the rails extended an additional 250 feet beyond the waterline to reach a channel providing adequate draft.

The most appropriate means of preservation of the larger features at the site consisted of reburial. Some features will be disturbed by the excavation of a canal through the center of the property, but these resources have been mitigated through the documentation process represented by the present investigation. The northern portions of the site will remain undisturbed by current development beneath the Ford Plant building.

ACKNOWLEDGEMENTS

A project of this magnitude could not be accomplished without the aid and backing of a large number of people. It would be impossible to mention all who visited the site or offered advice or assistance. The following persons or institutions deserve special thanks: Paul Bennett and Sheldon Crosby, of Paul Bennett and Associates, Inc.; Frank Klett and the Cook Inlet Region of Virginia; Arthur Cotton Moore, Associates; Pamela Cressey, Steven Shephard, Barbara Magid and Joanna Moyer of Alexandria Archaeology; T. Michael Miller and the staff of Lloyd House, Alexandria Library; the Alexandria Archaeological Commission; Bruce Larson, John Broadwater, and Billy Ray Morris, of the Virginia Department of Historic Resources; Bruce Terrell, of the Hampton Roads Naval Museum; Harry Cusick and John Harper, of the Gloucester Marine Railway; Robert Hurry of the Calvert Marine Museum; the staff of the Geography and Maps Division, and the Prints and Photographs Division, Library of Congress; the staff of the National Archives. Their help and comment were greatly appreciated. Errors of fact or conclusion are our own.

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I. INTRODUCTION

Archaeological investigations conducted at the Ford's Landing site provide a rare opportunity for research into the history of Alexandria. Though Alexandria's maritime focus has decreased in the present century, the city's waterfront was from the start the center of the town, both physically and economically. Due to the character and pace of recent urban growth, most of the original portions of the central waterfront are beyond the reach of contemporary archaeological research, either covered by modern structures or altogether eliminated. Lying at the southern periphery of the waterfront, the Ford's Landing site has thus far been relatively unaffected by development, and thus preserves a unique record of riverfront growth, from the early beginnings of eighteenth-century land reclamation, through nineteenth-century industrialization, the decline of the waterfront in the twentieth century, and its eventual rebirth as a commercial, residential and tourist center.

Project Description

The following report is the result of an in-depth historical and archaeological survey and data recovery program conducted at the Ford's Landing site (the Old Ford Plant, 44AX119) in Alexandria, Virginia, by Engineering-Science, Inc., on behalf of Cook Inlet Region of Virginia [CIRV]. The property was acquired by CIRV from the General Services Administration, and thus was subject to cultural resource evaluation under Section 106 of the National Historic Preservation Act of 1966, as required by a transfer from the United States of America to Cook Inlet Region, Inc., dated May 6, 1985 and recorded on July 8, 1985 in Deed Book 1153, page 297, among the land records of the City of Alexandria; City of Alexandria Site Plan #88-026, Ford's Landing Residential Complex, Conditions 18-23; City of Alexandria Special Use Permit #2137, Conditions 22-27; and Department of the Army Permit #88-2035-12.

The action described herein follows a preliminary archival study conducted by John Milner Associates (Cheek and Glendening 1986), which predicted the presence of cultural resources on the property, and a Phase IIa archaeological survey conducted by Engineering-Science, Inc. (Artemel *et al.* 1988), which identified materials on site as potentially related to eighteenth- and nineteenth-century use of the property. The current research effort consisted of a multi-phased program designed 1) to complete the survey initiated in Phase IIa of areas

to be directly affected by planned development, and 2) to mitigate significant resources which might be encountered in the survey.

Phase II and Phase III archaeological investigations were carried out in compliance with Section 106 of the National Historic Preservation Act of 1966, as amended. The studies were conducted according to the standards of the Advisory Council on Historic Preservation and the National Park Service (36 CFR 800; 36 CFR 66), the "Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation" (48 FR 44716-44742), the *City of Alexandria Archaeological Standards* (1990), the guidelines of the Virginia Department of Historic Resources, and in coordination with archaeologists from Alexandria Archaeology and the VDHR.

Contractually the project consisted of two discrete phases:

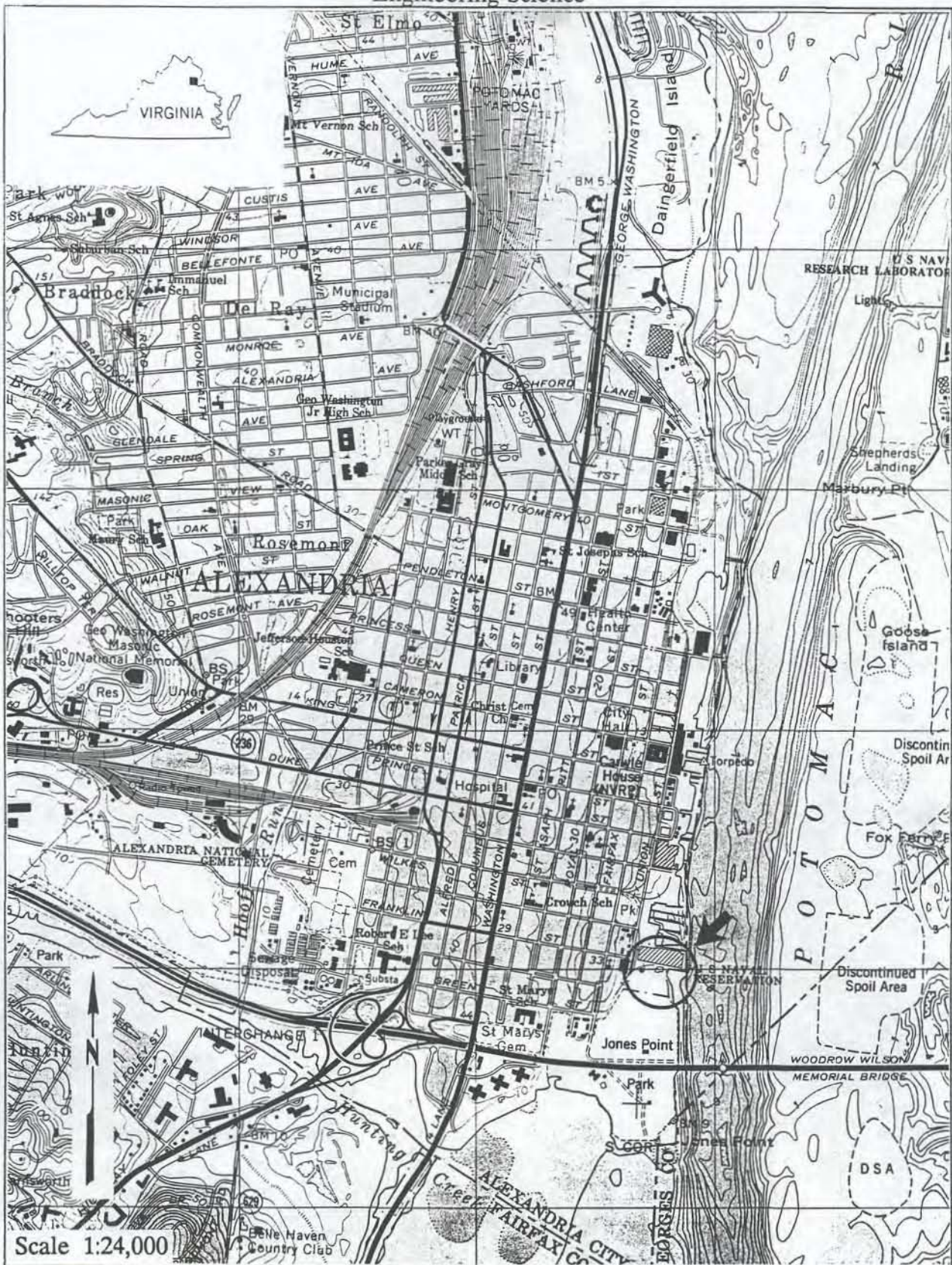
- survey - Phase IIb investigation of known wharf-related deposits; the survey investigation was eventually extended, as Phase IIc, to include those portions of Battery Cove lying within project area bounds

- mitigation - Phase III data recovery excavations.

In practice, the survey and mitigation phases overlapped due to the expansion of the portion of the property subjected to intensive survey, as will be explained in greater detail in the text which follows. Supporting documentary research was conducted concurrently in association with each phase of fieldwork.

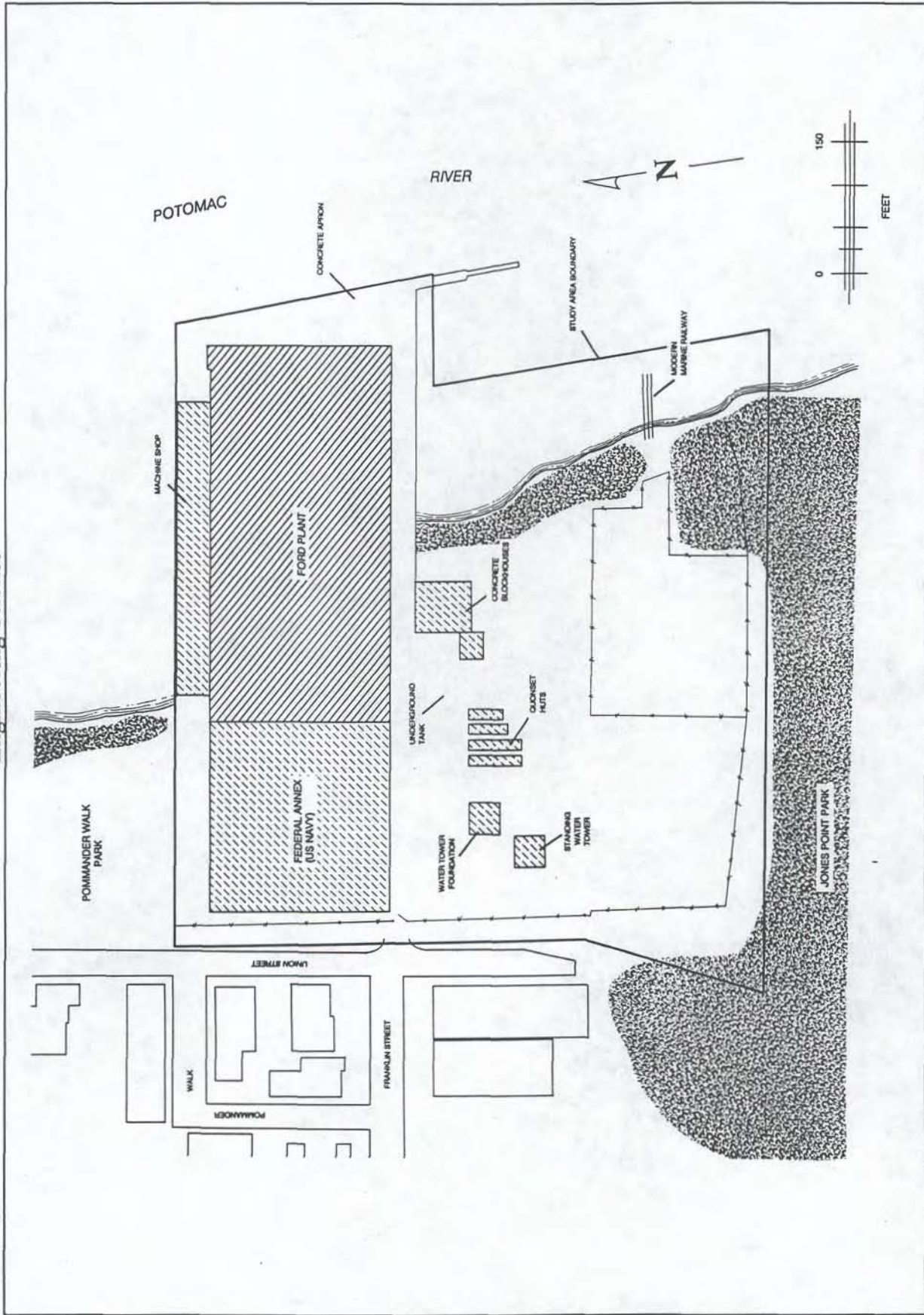
Project Location

The Ford's Landing property consists of a 10.1-acre parcel situated along the southern end of the waterfront in Alexandria, Virginia (*Figure 1*). The property lies on Union Street at the foot of Franklin Street, and at time of survey was bordered on the north by Pomander Walk Park, on the west by Union Street, on the south by Jones Point Park and on the east by the Potomac River. Two large buildings occupied the north half of the site (*Figure 2*): a two-story, yellow brick structure, the Ford Plant, built by the Ford Motor Company in 1932; and a two-story concrete structure erected by the United States Navy in 1943. A pair of



Source: USGS, Alexandria, VA.-D.C.-MD.
Ford's Landing

Figure 1
Project Area Location



Source: Holland Engineering/Engineering-Science
Ford's Landing

Figure 2
Site Plan at Time of Survey

concrete blockhouse structures, several cinder block and sheet metal Quonset huts, and the remains of two water towers, all dating from the 1930s to the 1950s, lay to the south of the larger structures.

Research Design

The Ford's Landing site, known historically as Keith's Wharf, consists of made-land, in the form of a solid-fill wharf constructed in the late eighteenth century on the west bank of the Potomac River. The site lies at the south end of the Alexandria waterfront, at one end of a shallow embayment known as Battery Cove, after Battery Rodgers, a Civil War gun emplacement overlooking the river on the bluffs above the shoreline at what is now the corner of Lee and Jefferson Streets. Throughout the eighteenth and nineteenth centuries, the configuration of the shoreline of the cove, including the edge of the wharf, varied as a result of the combined effects of erosion, silt accumulation and rising water levels. The portion of the cove south of the wharf to Jones Point was in-filled in the early twentieth century by the Corps of Engineers, using dredging spoil from the main river channel, producing the shoreline visible today.

At the outset of the current study, specific research objectives related to site chronology and function were considered -- whether evidence remained of the original wharf structure or structures on the surface of the wharf, for example, or whether it would be possible to delineate shoreline changes over time by distinguishing between various types of fill and natural sedimentation. As the project progressed, the objectives of the investigation became at once more particular, focusing on site-specific problems, and broader, focusing on issues of city-wide and more general historical concern.

Phase II Survey and Testing Objectives

In the Work Plan developed in consultation with Alexandria Archaeology, the initial, IIB survey phase of operations was concerned with the general evaluation of resources within project bounds. Certain portions of the site were not considered part of the present survey due to a variety of factors: inaccessibility -- for example, the areas directly under the Ford Plant building; previous disturbance -- as in an area around a series of underground storage tanks near the center of the site; or lack of direct impact -- as in the northwest corner of the

site, where subsurface disturbance from proposed development would be minimal. The unsurveyed portion of the property consisted of approximately 4 acres, 40 percent of the total site area.

From the findings of the Phase IIa survey, the site was known to be multi-component, with industrial remains from several historical periods existing with varying degrees of depositional integrity. It was thus predicted that materials would be encountered associated with the eighteenth-century wharf, in the form of bulkheading, cribbing or possibly structures on the wharf surface itself, all related to the mid-to-late eighteenth century Mercantile Capitalist and late-eighteenth to mid-nineteenth century Indigenous Commercial Capitalist periods of the city's development (Cressey *et al.* 1982; see Section III below). In addition, remains were expected of marine railway and shipyard industries and of several smaller industries, such as an electrical supply manufactory and a chemical company, these related to the late nineteenth- and early twentieth-century period of Industrial Capitalism. It was hoped that correlations could be made between material culture, as represented by the artifactual materials recovered from these deposits, and the various commercial and industrial activities known from documentary evidence to have been conducted on site. It was expected that the material remains from the site would reflect those activities, as well as the socioeconomic status of the occupants of the site.

An appropriate field methodology, described in detail in a separate section of the report, was devised to provide adequate sampling of the accessible portion of the wharf area. The survey findings in the main included most of the anticipated industrial features: evidence was uncovered of the eighteenth-century wharf, a nineteenth-century marine railway, and early twentieth-century workshops, along with a small number of prehistoric artifacts. In addition, a number of unexpected findings resulted from the survey: a second bulkhead, indicating a later configuration of the wharf; unrecorded shipyard features, including a large building slip; and derelict vessels in the filled-in cove area.

Phase III Data Recovery Objectives

Based on these findings, the site was considered eligible for nomination to the National Register of Historic Places. A plan to mitigate the adverse effects of development was designed in consultation with Alexandria Archaeology and the Virginia Department of

Historic Resources. The principal issues to be addressed through further investigation of the site concerned the following:

- *Technological analysis of the eighteenth-century wharf.* Relatively little is known about wharf construction in general, despite a seemingly large body of archaeological research, particularly from New England and New York City (e.g., Wilson and Moran 1980; Rockman *et al.* 1983; a more detailed survey of wharf-related research appears below in the text), while even less has been documented regarding wharf technology in the Mid-Atlantic and, in particular, Alexandria. Thus a detailed examination and comparative analysis of construction techniques observed at Keith's Wharf was proposed.
- *Landfilling.* Determination of the actual extent and configuration of the wharf, and an appraisal of the general processes involved in landfilling along this portion of the waterfront, along with a consideration of data relevant to the mapping of shoreline changes in the eighteenth and nineteenth centuries and to the question of natural sedimentation versus direct human activity.
- *City and regional contexts.* Investigation of the place of the wharf in a local and regional perspective, supplementing historical data on the place of Keith's Wharf in the history of Alexandria.
- *Technological analysis of the nineteenth century shipyard.* Consideration of the shipyard remains, including the marine railway, shipway and surrounding bulkhead -- comparing the latter with the earlier, eighteenth-century bulkhead -- and comparative analyses involving similar shipyard features documented at other locations on the eastern seaboard.
- *Socioeconomic analysis.* While the industrial character of the site suggested that little domestic artifactual debris should be expected, it was considered possible that a sufficient sample of artifactual materials from the various eighteenth and nineteenth century deposits might be recovered to supplement techno-industrial analyses and provide a database for socioeconomic studies of the occupants of the site.
- *Battery Cove.* Location of the early twentieth-century boundaries of the in-filled cove, along with data concerning the depth of filling spoil and the location of the World War I shipyard.
- *Derelict vessels.* Technological analysis of the vessels buried in the cove fill and an examination of their relationship to the historical development of the site.

- *Prehistoric Land Use.* Prehistoric materials were recovered from wharf fill deposits during Phase IIb excavations. A larger sample of prehistoric artifacts was sought from the site, along with an evaluation of the contexts from which the materials were recovered, in order to determine whether or not deeply buried, intact, prehistoric artifact-bearing strata exist within the original cove area.

To these ends, field methodology was tailored toward recovery of the maximum amount of pertinent data. Survey trenches containing significant features or materials had been left open after Phase II level documentation. Designated excavations were expanded, using excavation techniques similar to those employed in the survey phases.

Report Organization

The technical report which follows presents the results of both phases of the study. Background material includes a description of the local environment, emphasizing factors which have affected the development of the site during historic and prehistoric periods, along with summaries of prehistoric and historic use of the property, and a short survey of the current state of research into wharf and shipyard technologies. Excavation methodology is described, followed by an in-depth discussion of site stratigraphy and descriptions of the archaeological features documented. It is customary in the technical reporting of an archaeological field research project to include a detailed presentation of the data, both stratigraphic and artifactual, on which the various analyses and conclusions are based. Several methods were considered for the present report. In an effort to increase readability, the field data have been approached chronologically, as opposed to strict stratigraphic ordering. Raw data representing complete depositional sequences and a catalog of the artifactual materials recovered are included as appendices. Artifact and feature analyses are presented following the summary of archaeological findings. The report concludes with a final synthesis of historic, archaeological and artifactual data.

II. PHYSICAL ENVIRONMENT

A summary of the physiographic and ecological characteristics of the study area is presented here as background to a consideration of the formation of the Ford's Landing site as it exists today. The presentation highlights the geographical and biological characteristics which have attracted man to the area during both prehistoric and historic periods, and the geological and hydrological features which have contributed to the changes in shoreline configuration in the last 300 years.

Physiography and Geology

The project area is situated at the southern end of the Alexandria waterfront on a section of land reclaimed in the late eighteenth century from tidal flats along the Potomac River. Alexandria lies on the western edge of the Atlantic Coastal Plain physiographic province, a region of flat, rolling topography bordering the fall line of the Piedmont uplands to the west. Geologically the area is composed of a variety of unconsolidated deposits of fluvial and marine origin lying over bedrock of schist or gneiss which contains veins or outcrops of quartz (Porter *et al.* 1963). The overlying sand, silt and clay sediments occasionally contain interbedded small and large gravels, primarily of quartz and quartzite. This stone, occurring as pebbles or cobbles, constituted the main source of lithic raw material available to prehistoric populations. Chert and jasper pebbles were also available, though less frequently, washed down to the Coastal Plain from the Piedmont and collecting on gravel terraces along the Potomac and other major watercourses (Wentworth 1930; Schlee 1957).

The Coastal Plain sediments begin in a thin, feathered edge at the fall line, and thicken to the southeast at a rate of 100 to 125 feet per mile (Mack 1966). Surface deposits in the Coastal Plain portion of the current Potomac watershed consist of Cretaceous sediments and river terrace deposits dating to the Pleistocene and perhaps to the Pliocene periods, along with recent alluvium and artificial fill (Smith 1976). Bordered by these Pleistocene terrace deposits, the Ford's Landing study area lies on the modern floodplain of the river. This broad, level floodplain, along with the low terrace areas immediately adjacent to the shoreline, contain recent alluvium and in places, artificial fill. Prehistoric village sites were often situated in this type of setting, as the soils which form there were well suited to simple agricultural technologies.

Hydrology

The primary hydrological force in the area is the Potomac River. Alexandria is situated at the extreme northern end of the Potomac estuary basin, approximately eight to ten miles southwest of the fall line, where the river enters the plain from the Piedmont uplands. At this location, some 90 nautical miles from the mouth of the Potomac at the Chesapeake Bay, the river is influenced by tides of about three feet and is characterized year-round by salinity described as tidal fresh (0.5 parts per thousand) at surface and bottom. River sediments along the waterfront consist of firm mud and clay, well-compacted and mixed with sands and gravels (Lippson *et al.*, n.d.).

Land clearing for farming, on-going from the colonial period to the present, along with modern rapid urbanization in the Washington, D.C., metropolitan area has resulted in increased soil erosion within the upper Potomac watershed. As a consequence, run-off has contributed to high sediment yields within the Potomac basin, and has greatly augmented natural silt build-up and shoaling in the river. The problem of silting is not new. As early as the mid-eighteenth century, observations made on maps drawn by then assistant Fairfax County surveyor, George Washington, indicated that depths within the cove between West and Lumley Points, the center of the Alexandria waterfront, decreased by as much as three feet between 1748 and 1749. A further example of the problem of localized sediment accumulation is seen in the Anacostia River, a tributary of the Potomac entering some four miles north of Alexandria, and the site of the early tobacco port at Bladensburg. Dredging of the Anacostia was carried out early in the nineteenth century, though by the 1830s the port had lost much of its traffic, due largely to the reduced draft within the channel (Williams 1942; Wright 1977; Bandler 1988). Dredging of the Potomac channel along the Alexandria waterfront has also been carried out at periodic intervals, though only since the late nineteenth century (Shomette 1985).

At various points along the Potomac estuary, tidal freshwater marshes have formed at confluence points with tributary streams. These wetland areas are normally rich in natural resources, attracting plant species such as cattail, smartweed, bulrush and cordgrass, as well as various tubers (Peterson 1977; Lippson *et al.* n.d.). The marshes usually harbor a large number of both resident and migratory bird species, along with a variety of reptiles and mammals, and have been shown to have been heavily utilized by prehistoric groups during

certain periods (Gardner 1978; Custer 1986). Alexandria is bracketed by two such streams flowing eastward into the river: Four Mile Run to the north, and Great Hunting Creek to the south. While no streams are present within the city itself today, until the mid-nineteenth century a small, spring-fed creek known as Ralph's Gut drained into the so-called "Orinocco Marsh," just north of the early center of the town. Described by Washington in 1748 as "[a] fine Improvable Marsh," the area was situated along the waterfront at the present Oronoco and Pendleton Streets. Smaller streams, now masked by urban development, may also have flowed into the river along the waterfront, their function presently assumed by modern storm sewers. While early maps record the locations of several of the largest streams, few have in fact survived urbanization.

Climate

The regional climate along this portion of the Coastal Plain is referred to as continental, with well-defined seasons. Meteorological systems generally flow west to east, with summer and fall dominated by tropical air masses originating in the Gulf of Mexico and moving northward, and winter by cold, dry air streaming out of central Canada. Seasonal extremes are ameliorated to some degree by the presence of the nearby Chesapeake Bay and, off the Atlantic coast, the Gulf Stream, as well as by the Shenandoah Mountains to the west. Winter temperatures average 39 degrees Fahrenheit (Porter *et al.* 1963), and while the Potomac at Alexandria may freeze over completely during the coldest periods, only rarely does ice pose a hazard to navigation.

Wildlife

The upper end of the Potomac basin is defined as a mid-estuary habitat, characterized by tidal fresh waters throughout the year (Lippson, *et al.*, n.d.). A variety of freshwater fish species have been recorded in the area, including carp, largemouth bass, gar, blue gill, catfish and crappie. Anadromous and semi-anadromous species, those running upstream from saltwater environments to spawn in freshwater, are present in the form of striped bass, white perch, alewife and several varieties of herring and shad (*ibid.*). Silting and chemical pollutants have until lately rendered area watercourses virtually devoid of all but the hardiest aquatic plants and algae, but recent cleanup efforts have resulted in the return of a number of fish and mollusk species.

The Coastal Plain province, within which the project area lies, is part of the oak-hickory forest ecological zone, as defined by Shelford (1963). In its natural state, the project area would have consisted of a marsh along the Potomac, with higher, wooded ground lying to the west, habitat for numerous mammal species, including black bear, bobcat, white-tailed deer, and smaller mammals, such as raccoon, opossum, rabbit and squirrel, inhabiting the forest edge environment.

The present highly urbanized character of the project area has meant a decline, over the years, in the number of plant and animal species actually observed. Waterfront land reclamation and filling since the eighteenth century have resulted in the addition of as much as 9 feet in elevation above pre-existing contours, at the expense of the ecologically rich tidal marshes along the shoreline. The majority of the project area now consists of cleared ground, on which opportunistic weed species, adapted for rapid colonization in unstable or disturbed areas, compete with domesticated grasses in unpaved sections. Mammals are mostly small, seen in the form of rodents, or as scavenger species, such as raccoon or opossum, especially suited to an urban parkland setting and thus able to survive from the earlier, undisturbed woodland. Reptiles currently observed along the shoreline of the river included frogs, turtles and a large black snake, discovered by a VEPCO lineman disconnecting utility poles along the east edge of the site. Bird species until recently consisted mainly of pigeons which, though no longer present, had left ample evidence of their stay in the abandoned buildings. Mallard ducks were seen regularly at the river's edge, and a small group of herons nested in the trees along the shoreline, feeding mainly in the tidal flats south of Jones Point at the mouth of Hunting Creek.

III. LAND USE SUMMARIES

Prehistoric Background

Due to the potential for prehistoric use of the study area, borne out by the discovery of prehistoric materials in the deposits tested during the Phase IIb survey, it is necessary to briefly consider the record of prehistoric occupation in the area as a background to the interpretation of the present findings. In fact, a clear and detailed picture of the prehistory of Alexandria does not exist, since few sites are known within the city. It is assumed, though, that the general culture history of the city conforms with that of northern Virginia, the upper Potomac watershed and the Middle Atlantic region in general.

The prehistory of the region is traditionally divided into three major cultural periods: the Paleo-Indian (*ca.* 10,000 B.C.-7500 B.C.), the Archaic (*ca.* 7500 B.C.-1000 B.C.), and the Woodland (*ca.* 1000 B.C.-A.D. 1600). An alternative scheme, based upon broad economic and social patterns, and integrated with the changing environment, has been proposed for nearby Fairfax County (Johnson 1986). The sequence is divided into four periods: Paleo-Indian (*ca.* 10,000 B.C.- 8000 B.C.), Hunter-Gatherer (*ca.* 8000 B.C. - A.D. 800), Early Agriculturalist (*ca.* A.D. 800 - 1500), and Proto-Historic (*ca.* A.D. 1500 - 1675). The following examination attempts to combine aspects of the environment, as viewed from a diachronic perspective, the subsistence base which it provided, and the artifactual record which constitutes the direct remnants of human activity. Models for prehistoric site distribution which result from similar studies have enabled archaeologists to predict the most likely locations for sites related to the different cultural periods recognized in the archaeological record (*e.g.*, Gardner 1978; 1982; Bromberg 1987).

Paleo-Indian Period

The record of human habitation in the Middle Atlantic begins some 12,000 years ago, near the end of the cool and relatively wet Late Wisconsin Glacial period, at a time when the edge of the Laurentian Ice Sheet lay not far to the north, in southern Pennsylvania. The ice was preceded by a narrow, 60- to 100-kilometer band of open tundra, while most of the Coastal Plain to the south was dominated by a pine forest environment (Delcourt and Delcourt 1981). With large amounts of water trapped in the continental ice sheets, global sea levels were considerably lower than at present, and the Potomac basin was as yet a freshwater river valley.

By this period, environmental shifts were in progress which greatly enhanced subsistence resource potential for the prehistoric inhabitants of the region. As the northern glaciers retreated, the entire Middle Atlantic underwent a fairly rapid warming trend (Carbone 1976), which was directly reflected in the replacement of northern plant and animal species by southern types. The Middle Atlantic was thus characterized by a relatively complex set of overlapping microenvironmental zones, a mosaic which resulted in intra-regional variation in resource availability.

Archaeological sites dating to the Paleo-Indian period are usually identified by the presence of fluted stone projectile points, often made of high quality, cryptocrystalline lithic material such as chert or jasper. These points, used as spear tips, are relatively rare throughout the Middle Atlantic, usually found alone, without other artifacts nearby. Fluted points have been reported from locations to the west in neighboring Fairfax County, Virginia (Johnson 1986), to the east from nearby sections of the Maryland Coastal Plain (Steponaitis 1980; Brennan 1982; Wanser 1982) and in the District of Columbia (Flanagan *et al.* 1989). Even fewer Paleo-Indian occupation sites have been reported throughout the region. It is probable that many were located on the continental shelf and are now submerged by the rise in sea level which accompanied the melting of the ice sheets at the end of the Wisconsin glaciation, *ca.* 14,000 B.P. (Kraft and Chacko 1978). Others probably lie along the banks of now drowned rivers such as the Potomac and Anacostia.

The Archaic

The Archaic period extended from *ca.* 7500 B.C. to 1000 B.C. Major subperiods are recognized within the Archaic, referred to as Early, Middle and Late Archaic.

One of the most important environmental changes affecting prehistoric populations throughout the Middle Atlantic region during the Archaic period was the gradual rise in sea level accompanying the retreat of the continental ice sheets. Known as the Holocene marine transgression, the rise in sea level produced widespread lowland flooding, which extended up many Pleistocene river valleys, giving rise to the term "drowned" river valley. Among the effects of inundation were a marked rise in local water tables, an increase in shoreline complexity associated with estuary development, and the consequent increase in floral and faunal resources in newly formed marsh or wetland areas (Newman and Rusnak 1965).

Inundation of the Susquehanna River system, which resulted in the formation of the Chesapeake Bay, began with the initial rise in sea level between 14,500 and 14,000 B.C. By 9500-9000 B.C., marine transgression had reached the mouth of the Potomac, below what is today Point Lookout (Wanser 1982). The upper end of the modern day Potomac estuary basin, within which Alexandria lies, would have been among the last areas to have been affected. Though extensive studies have not been carried out, core samples from two locations along the Anacostia suggest that flooding began in the area between 7000 and 5000 B.C. (National Preservation Institute 1983). The Bay and upper estuaries appear to have reached something resembling their present configurations by around 3000 B.C., and to have largely stabilized at that point, as the rate of inland inundation decreased drastically, allowing the maturation of recently formed estuary areas (Gardner 1978; Delcourt and Delcourt 1981).

Early Archaic Period. Most archaeologists agree that there is some continuity in terms of cultural patterns between the Paleo-Indian and the Early Archaic periods (Gardner 1974; Custer 1989). The early proliferation of swampy conditions on the Coastal Plain produced an increasingly complex pastiche of boreal and open marshy areas. While there is evidence for an increase in the number of sites, the Early Archaic inhabitants of the area, like their predecessors, probably enjoyed high mobility and a varied subsistence base, exploiting environmental niches very similar to those in the earlier period, though in different and more numerous geographical locations (Custer 1990). The Early Archaic period (*ca.* 7500 B.C.-6500 B.C.) was marked by the introduction of a number of new projectile point styles: serrated Palmer and Kirk points and the later bifurcate base points (Broyles 1971).

Middle Archaic Period. By the Middle Archaic period (*ca.* 6500 B.C.-2500 B.C.), local populations were exploiting the new floral and faunal resources which became increasingly available with the transformation, begun around 6,000 B.C., of the mixed pine-oak forest to a temperate oak-hemlock deciduous forest (Ritchie 1979). Inland swamp formation appears to have become extensive, as a result of the ongoing inundation of coastal waterways. These large marshes became an important focus of occupation during the period, with seasonally specialized, transient procurement stations functioning as support facilities for estuarine base camps (Gardner 1978; Custer 1990). The Middle Archaic artifact assemblage included projectile point forms such as a transitional bifurcate type, the stemmed Stanly or Neville, early long or broad bladed forms, such as Guilford and Morrow Mountain, and later, the side notched Halifax point (Coe 1964; Johnson 1986). The tool kit was further distinguished by the appearance of ground stone tools.

Late Archaic Period. The succeeding Late Archaic period (*ca.* 2500 B.C.-1000 B.C.) was characterized by the prevalence of an oak-hickory forest environment. The rate of sea level rise slowed, allowing for the creation of riverine and estuarine environments stable enough to support significant populations of shellfish and anadromous fish (Custer 1978; Gardner 1978). Fish runs of American shad and white perch are recorded historically along the Potomac at the fall line (Lippson, *et al.* n.d.), for example, and sturgeon runs were described by the earliest European explorers (Fleet in Neill 1876). At least a dozen prehistoric fish weirs have been documented at points along the river at or above the falls, many of which were presumably placed to take advantage of the seasonal spawning runs (Strandberg and Tomlinson 1969). It is widely speculated that the focus of settlement shifted during the Late Archaic period to riverine and estuarine locales to take advantage of increasingly predictable fish and shellfish resources.

Cultural diagnostics of this period included steatite vessels and several types of broad-bladed points: Savannah River, Susquehanna -- mainly found in the Piedmont; and Holmes -- primarily confined to the Coastal Plain. Possibly serving as knives, these broader points may have been designed in part to exploit the newly available riverine resources. In many areas, particularly in the Piedmont to the west and north of the study area, rhyolite was the preferred lithic material for the manufacture of broad-bladed points, which are often found in association with vessels carved from steatite (Witthoft 1953; Ritchie 1965).

The Woodland

About 1000 B.C. techniques for the manufacture of pottery were introduced across the region. This innovation defines the beginning of the Woodland period, which, like the Archaic, is traditionally divided into Early, Middle, and Late sub-periods.

Early Woodland Period. Environmental stabilization in the Early Woodland period (*ca.* 1000 B.C.-500 B.C.) is evidenced by the lack of change in forest components in the region, as noted in pollen cores taken near St. Mary's City, in southern Maryland (Kraft and Brush 1981). These cores indicate the predominance of oak, hickory, and pine in the latter portion of the Archaic, around 3400 B.C. In general, environmental conditions remained the same to the present (Joyce 1988), except for relatively minor fluctuations such as the somewhat cooler and wetter sub-Atlantic period, *ca.* 2500 B.C. (Carbone 1976). A recent

increase in pine, along with grasses and other non-arboreal species, reflects the extent of historic land clearing.

Correlations between projectile point types and ceramic types are not well established for many portions of the Woodland in the Middle Atlantic: ceramics, which tend to have more discretely defined time ranges than contemporaneous projectile point types, have become the primary temporal indices for the period. For example, some broad-bladed, fishtail projectile point forms, characteristic of the end of the Late Archaic, have been associated with Early Woodland ceramics in the Chesapeake Bay area and the Upper Delaware Valley (Kinsey 1972; Wright 1973; Wesler 1983), and at a Woodland period fishing site in Washington, D.C. (McNett 1975). Similarly, there is evidence that smaller side-notched points and the slightly thinner Potts (Winfrey 1967; Johnson 1986) were associated with Early Woodland ceramics, as was the short stemmed Calvert point (Stephenson and Ferguson 1963; Waselkov 1982). Early Woodland ceramic types include the steatite tempered Marcey Creek and Selden Island wares, and the crushed quartz and sand tempered Accokeek wares (Manson 1948; Slattery 1946; Stephenson and Ferguson 1963).

Middle Woodland Period. Subsistence during the Middle Woodland (*ca.* 500 B.C.-A.D. 900) remained similar to that of the preceding Early Woodland, with a reliance on hunting, gathering, and fishing. There is some evidence for a shift in the locations of semi-sedentary base camps from small creek floodplains to large river floodplains, a shift which may have helped to set the stage for the local development or acceptance of horticulture (Snyder and Gardner 1979).

Technologically, the early portion of the Middle Woodland, to about A.D. 200, was characterized by a thick ceramic ware, known locally as Popes Creek, tempered with coarse sand or quartz and usually impressed with nets. By the later Middle Woodland, to A.D. 900, a shift to a shell-tempered, often cord-marked or net-impressed ceramic, known locally as Mockley, had occurred. Projectile points associated with the Middle Woodland period include the shouldered, contracting stemmed Rossville, the lanceolate or stemmed Fox Creek or Selby Bay, and the corner-notched Jack's Reef (Steponaitis 1980; Wanser 1982). As a final technological note, a marked increase in the use of rhyolite is noted during the Middle Woodland, especially as associated with the production of Selby Bay lithics (McNett and Gardner 1975; Custer 1986).

Late Woodland Period. By the Late Woodland period (*ca.* A.D. 900-1600), the development of horticulture probably began to achieve a significant role in the total subsistence system in most areas. Direct evidence is rare on the Coastal Plain: where found, early cultigens consist of small cobs of maize, with squash and beans later introductions (Turner 1990). The significance of an agriculturally based subsistence is great; no other single factor was as crucial in the establishment and maintenance of permanent, year-round settlements. Sedentary villages were established near the fertile soils of riverine floodplains (Barber 1979). Meanwhile, smaller, less permanent sites in a variety of settings attest to the fact that other resources were still being exploited.

Artifact sequences were more complex during the Late Woodland, due to a number of factors, including an increase in the number of ceramic types, the proliferation of variations of the triangular projectile point, and the paucity of absolute dates with which to associate assemblages of potentially diagnostic materials. The thin bodied, sand or quartz-tempered Potomac Creek (Stephenson and Ferguson 1963) and the shell-tempered Townsend series wares (Blaker 1950; Waselkov 1983) are among the most prominent ceramic types. Projectile points include the Jack's Reef pentagonal and the triangular Levanna and Madison (Stephenson and Ferguson 1963; Ritchie 1971; Hranicky and Painter 1988).

European Contact. With the founding of the permanent English colony at Jamestown, systematic European exploration of the Virginia Tidewater began, and trading contacts with native populations were established. Captain John Smith, in 1608, was the first European known to travel throughout the Chesapeake Bay and tributaries, including the Potomac River. Smith produced a map which, despite its lack of definition, is the best early record of Native American settlement in the area. Among the villages recorded was the trading center Nacochtanke, on the east bank of the Anacostia, near the confluence with the Potomac, a site tentatively identified archaeologically in a recent survey (Flanagan *et al.* 1989). Four other villages were depicted by Smith on the west side of the Potomac near the present site of Alexandria, inhabited by groups now referred to as Virginia Algonquians, including Nameranghquend, north of the city in the vicinity of National Airport, and Assaomeck, Namassingakent and Tauxenent south of the city (Feest 1978). By the end of the seventeenth century, pressure from expanding European settlement had forced most of the native populations to retreat south, below the Rappahannock to the region of the upper Mattaponi River.

Archaeological Findings of the Period

Few prehistoric archaeological sites have been recorded within the city. As reviewed in Section IV of this report, this situation is most likely a matter of sampling bias, and not a reflection of actual prehistoric settlement patterns, since so few surveys have been carried out within the city, and since there is relatively little ground remaining which has not been undisturbed after more than 250 years of historic urban development. Prehistoric occupation of the river shoreline was certainly extensive and repeated during the 10,000 years or more that man has inhabited the Middle Atlantic region. Regional survey data amassed in the past 20 years have indicated that prehistoric populations were drawn to the resource-rich areas at the confluences of fresh water and estuary streams. The potential for prehistoric occupation at the area around Ralph's Gut, at the foot of Oronoco Street, for example, is high, though historic land use has probably disturbed most direct evidence of its presence. Other, smaller streams would be expected at locations all along the river, particularly on the high, well-drained and relatively sheltered bluffs. It is, then, not unlikely to find indications of an extensive prehistoric site along the bluffs east of Lee Street.

In total, 262 prehistoric artifacts were recovered from various portions of the wharf fill at Ford's Landing. The ultimate proveniences of these materials are impossible to determine with precision, since all were recovered from fill deposits -- either primary wharf fill or a mixture of eroded wharf fill and nineteenth-century alluvium. No prehistoric artifacts were recovered from the intact alluvial deposits below the eighteenth-century wharf fill. Sources indicate that most, if not all, of the earth used to fill Keith's Wharf was derived from the cutting of the high bank along Lee Street. Thus it may be assumed that the artifacts present in the fill represent the remains of one or more prehistoric occupation sites along the former shoreline.

Diagnostic artifacts indicated occupations ranging from the Middle Archaic period, represented by a Halifax projectile point, the Late Archaic, by a small Savannah River variant projectile point type, the Early Woodland, by Calvert points, to the Late Woodland, by a fragment of Potomac Creek ceramic. An extensive study of the prehistoric artifacts in the collection was not undertaken, but examination of the material indicated that a variety of biface types, flakes and flake tools and fire cracked rock were present, suggesting that portions of several sites were represented. Alternatively a single, large site was present, probably in the form of a base camp which would have served as a long-term occupation site,

permanently inhabited for extended periods or seasonally revisited, and from which forays for particular resources would have been conducted. Excavation of the Lee Street bank in the late eighteenth century was presumably confined to a relatively small area, and thus the latter was probably the case.

Historical Background

Introduction

Archaeologists have divided the history of Alexandria into three periods:

1. mercantile capitalism (mid-eighteenth century), when Virginia was still governed by English colonial policy;
2. indigenous commercial capitalism (late eighteenth to mid-nineteenth century), when trade continued to be dominant, but was conducted largely by United States citizens; and
3. industrial capitalism (late nineteenth to early twentieth century), a period which mirrored world-wide trends spurred by the Industrial Revolution (Cressey and Stephens 1982; Cressey 1985).

The delineation of these periods is based on the study of broad historical trends as well as on archaeological research conducted largely in residential areas. Commercial and industrial activities carried out on the Alexandria waterfront formed the economic basis of the growth of the city. The developmental periods provide a convenient heuristic mechanism by which land use and technological change at sites such as Ford's Landing may be placed within city-wide and regional contexts. The Ford's Landing study is expected to contribute evidence that Alexandria, viewed as a single, evolving entity -- the city-site -- conforms with the general pattern and trends of historical city-sites in North America, while exhibiting local variations which reflect the city's particular role within the Mid-Atlantic region (Cressey and Stephens 1982).

For over a hundred and fifty years, Alexandria's waterfront was the center of the town. During the Colonial period, the wharves and warehouses of the English and Scottish tobacco merchants lined the central cove which then lay between what is now Oronoco and Duke Streets. Local merchants filled in the cove, constructing new wharves to accommodate numerous sailing vessels. These vessels transported wheat, flour and other commodities for

international and coastal trades during the boom times between the Revolution and the War of 1812. After the Depression of the early nineteenth century, the terminus of the Alexandria Canal was located on the waterfront. Both before and after the Civil War, waterfront wharves were important in providing coal, shipped down the canal from the western mines, to fuel burgeoning industries. Warehouses and industrial establishments continued to be found on what remained a working waterfront well into the twentieth century. With the exception of the Colonial period, each of these developments is clearly reflected in the history of the Ford's Landing site, and the archaeological remains found there.

Mercantile Capitalism (1659-1782)

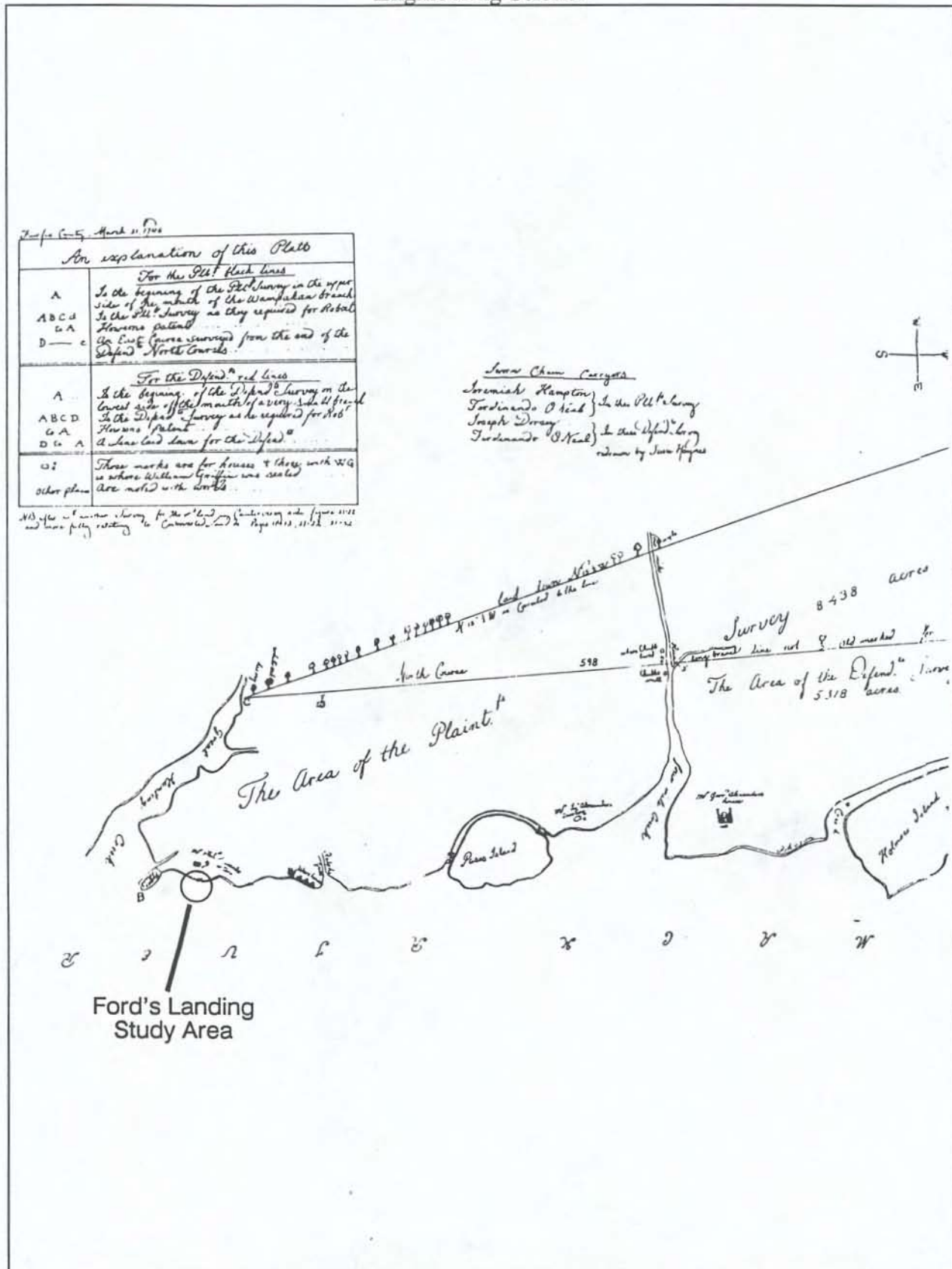
The Ford's Landing project area became part of the Northern Neck Proprietary granted to seven Englishmen in 1659 by the exiled King Charles II. This proprietary included all the land between the Rappahannock and Potomac Rivers in Virginia. In subsequent years, these seven shares of the original grant were consolidated through share purchasing and inheritance. In 1719, Thomas, Sixth Lord Fairfax, controlled the entire proprietary and had the right to issue patents. Serving as agent for Fairfax during the next thirteen years, Robert Carter collected quit-rents and greatly increased the number of grants within the proprietary (Kilmer and Sweig 1975).

Although northern Virginia was held as a proprietary colony after 1649, and some patents were held as early as the 1650s, the lands around what was later to become the town of Alexandria attracted little attention until after 1680 (Moxham 1974: 4). In 1654, Margaret Brent patented 700 acres on the Potomac in the Great Hunting Creek basin. This land encompassed much of what is now Alexandria and was probably occupied by tenants or slaves to "seat" the land. Like most early patents, Brent's holding was leased to tenant farmers and held against anticipated increases in value.

By the close of the seventeenth century, settlers began to establish small plantations clustered around landing places on the Potomac, where the relatively small, shallow draft ocean-going ships of the period could load tobacco and other goods for export to Great Britain. Warehouses for storing tobacco, then the primary profitable export, were soon constructed adjacent to the landings.

Part of what would become the town of Alexandria was located within the *Howson Patent*, which through oversight, also included the smaller tract previously granted to Brent (Mitchell 1977: 1). Ownership of a 500 acre tract of this patent was claimed by the Alexander family, who were later forced to make additional payments to settle disputes arising from conflicting claims resulting from the Brent grant. By the early eighteenth century, Philip Alexander (1704-1753) had established "quarters" on the bluffs above Battery Cove, immediately west of the Ford's Landing study area (Fairfax County Book of Surveys 1746) (*Figure 3*).

The town of Alexandria was settled on the banks of the Potomac above a cove located between two points extending outward to the main channel of the river. West Point, near a small stream known as Ralph's Gut, lay to the north, near what is now the intersection of Pendleton and Oronoco Streets. Point Lumley, at the foot of present-day Duke Street, formed the south end of the cove. The high bank to the west sheltered the cove from the prevailing northwest winds, which drove drifting ice across the river towards the Maryland shore (Shomette 1985: 22). Like many North American harbors, Alexandria was located on the right bank of the river, taking advantage of physical forces which tend to force moving objects to the right in the northern hemisphere. Thus the main channel of the Potomac lies closer to the right bank at Alexandria, offering relatively easy access for shipping, swift



Source: Fairfax County Book of Surveys
 Ford's Landing

Figure 3
 West Bank
 of the Potomac, 1746

currents which helped retard silting, and somewhat fresher water, seen as a protection against boring marine organisms.

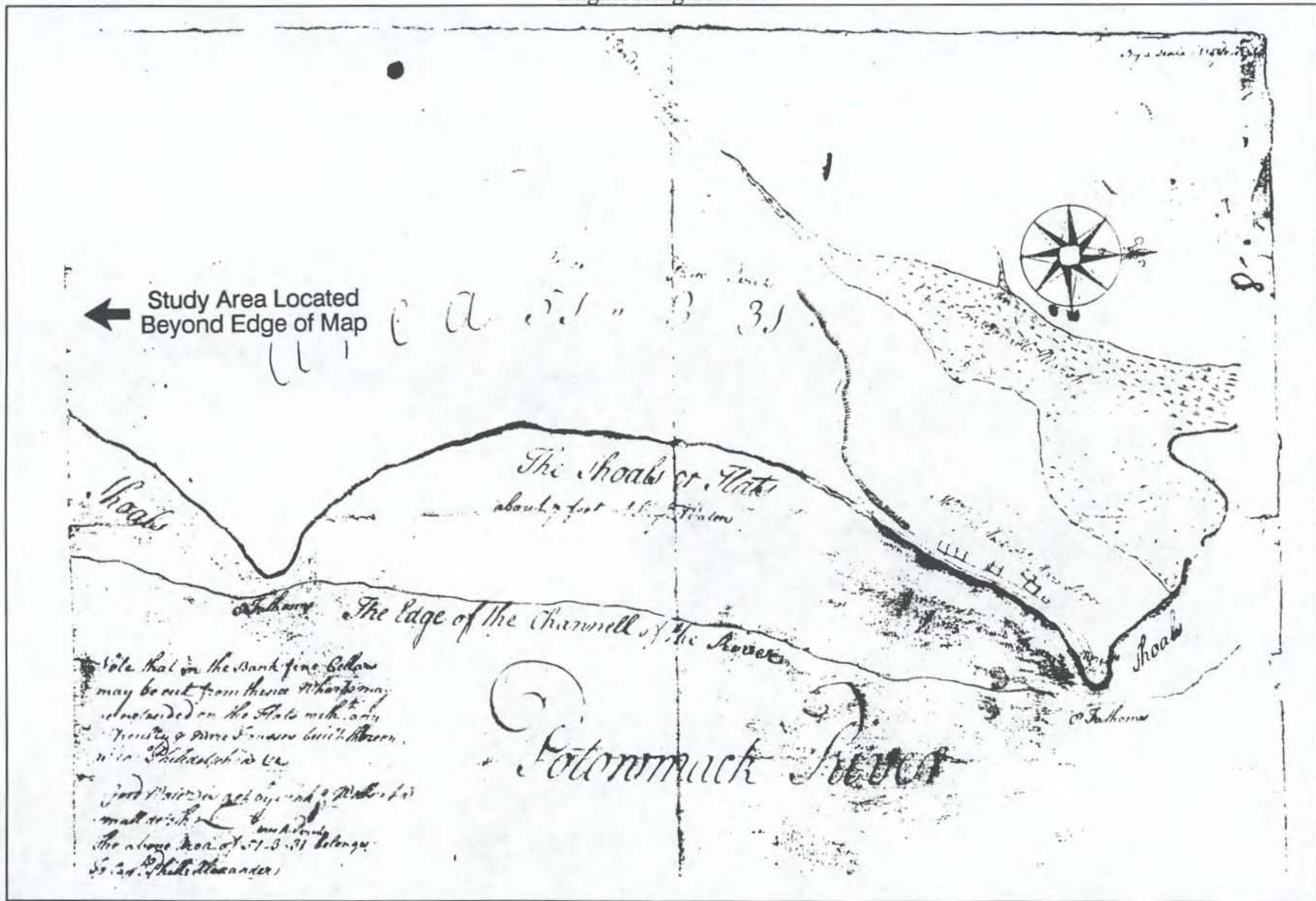
The cove lying between West Point and Point Lumley appears on early maps, identified as "shoals or flats." Seven feet deep at high tide, these flats were more than adequate to accommodate most eighteenth-century coastal and bay craft.¹ Lighters, or scows, were used to unload larger vessels, which anchored offshore in the main channel of the river. The depth of the Potomac immediately beyond Point West and Point Lumley increased sharply from a depth of 18 feet to the 40 foot depth of the main channel. The points were, therefore, the locations for the first roads, warehouses, and wharves. The warehouses on the bluffs at West Point formed the nucleus of the original town. Several dwellings were located there by the early eighteenth century, including those of John Summers, by 1703, and Gabriel Adams, by 1716 (Mitchell 1977: 36).

A survey of the site of Alexandria was conducted by George Washington in 1748, just before the town was platted (*Figure 4*). Washington noted the advantages of the location for a port:

... on the bank fine cellars may be cut. From thence wharves may be extended on the flats without any difficulty and warehouses built thereon as in Philadelphia (Washington 1748).

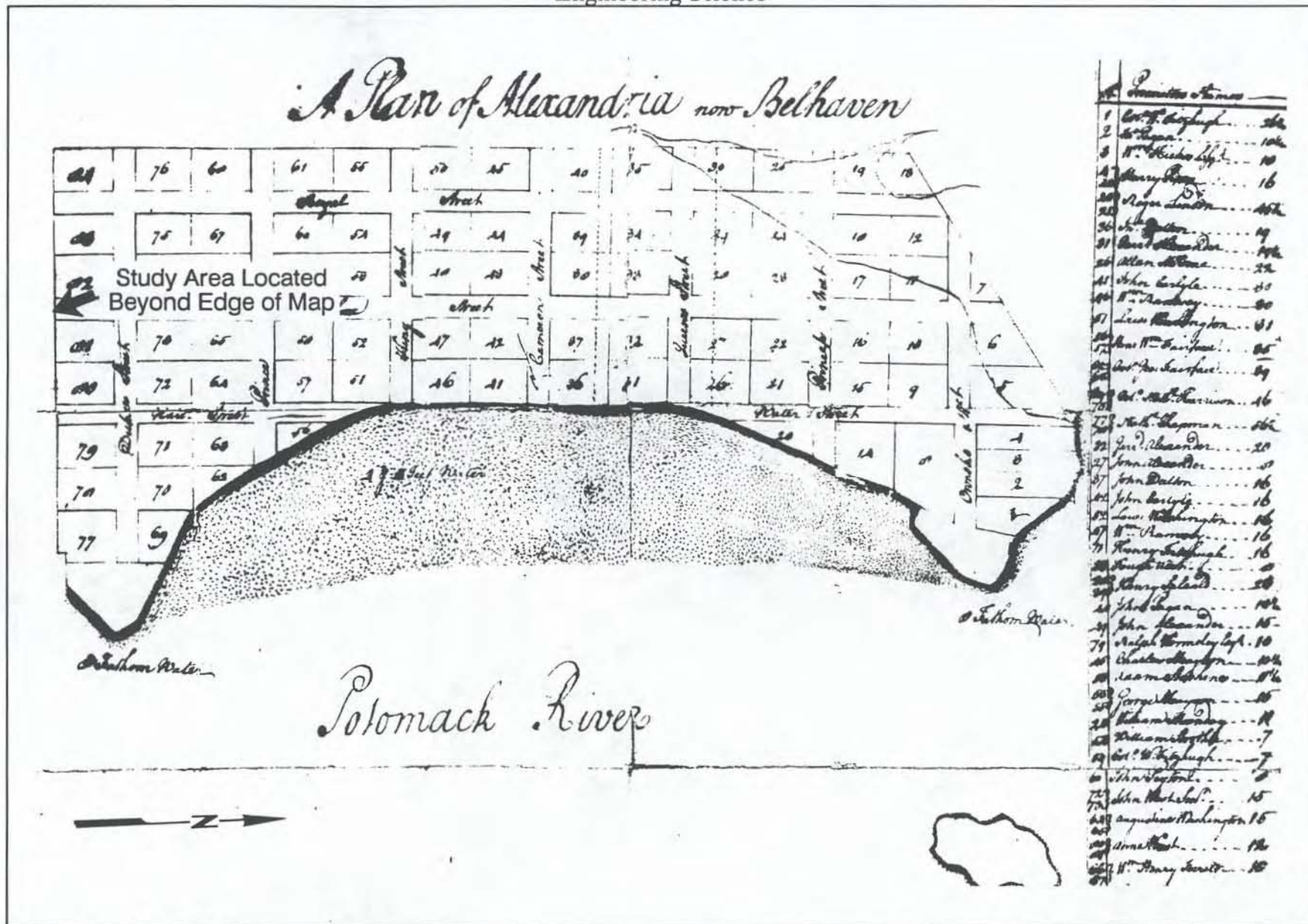
A petition to create the town of Alexandria was passed by the Virginia House of Burgesses on May 11, 1749. The plat of the new town, consisting of sixty acres divided into 84 one-half acre lots, was drawn, and on July 13 the first lots were sold (*Figure 5*). Shortly after the establishment of the town, a new road was created leading to a public warehouse built at Point Lumley (Shomette 1985: 28, 32). In 1762, increasing business encouraged the first expansion of the town. Fifty-eight additional lots were laid out and offered for sale on 9 May 1763 (Smith and Miller 1989: 21) (*Figure 6*).

¹As a comparison, at the end of the century, a three-foot depth was considered sufficient for the wharves at the busy Inner Harbor in Baltimore (Norman 1987: 53).



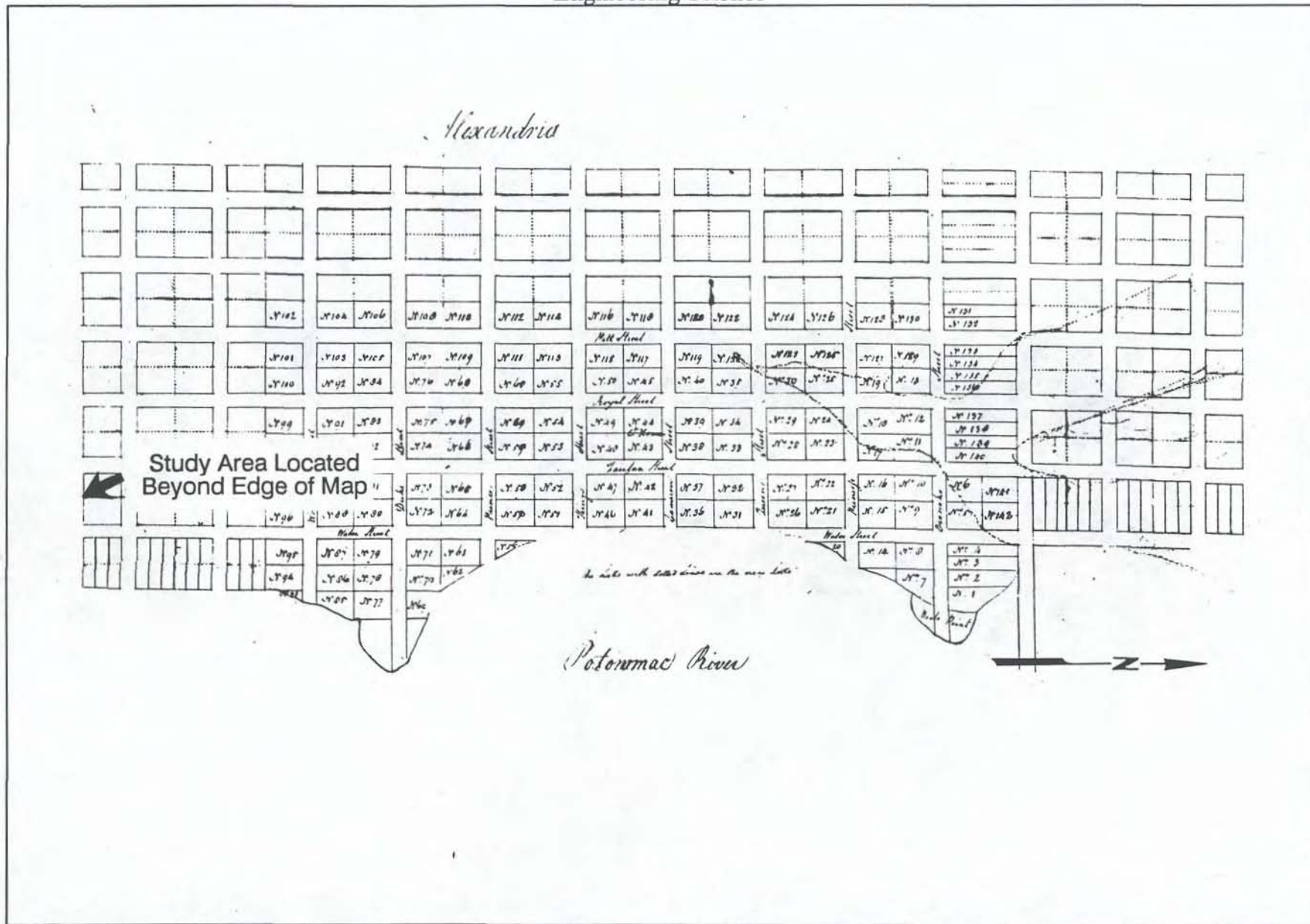
Source: George Washington, 1748
Ford's Landing

Figure 4
Map of the Site of
Alexandria, 1748



Source: George Washington, 1749
Ford's Landing

Figure 5
Plan of Alexandria, 1749



Source: George West, 1763
Ford's Landing

Figure 6
Map of Alexandria, 1763

Alexandria operated within the British mercantile system as a Colonial tobacco port, and became an important regional market prior to the Revolution. Ships were loaded with tobacco, grain, pork, fish, lumber and other commodities. In exchange, manufactured goods were imported from London, Glasgow, Caribbean outposts, and ports along the Atlantic seaboard (Preisser 1977: 59). Maritime craftsmen quickly joined other merchants and tradesmen already in Alexandria, and by the 1760s, bakers, shipwrights, and ship carpenters were well established along the waterfront (Sweig 1978: 71).

During Alexandria's early years as a port, the river provided the principal means of transportation for goods and people. Land connections consisted of roads providing access to the hinterland where tobacco or grain was grown. The roads westward led to the rich productive lands of the upland regions of the Piedmont. Along these and other roads were clusters of houses, taverns, mills and blacksmiths. The town itself centered on the waterfront with a core that extended for seven blocks north and south along Fairfax Street, and from the waterfront west to Royal Street. Several wharves were built by the major merchants of the town, in addition to the public wharves at West Point and Point Lumley (Preisser 1977: 213-220). At about the same time, John Carlyle and John Dalton built a wharf to the east of Carlyle's property in the town, extending Cameron Street out toward deep water (*Proceedings of Alexandria Trustees*, July 10, 1759). Disputes concerning the rights to newly constructed wharves were settled in 1760 by the Trustees:

we find an omission in not entering what was agreed on before the sale of any of the said Lotts, that is, that every purchaser of River side Lotts by the terms of the sale was to have the benefit of extending the said Lotts into the River as far as they shall think proper without any obstruction. . .
(*Proceedings of Alexandria Trustees*, Sept. 1, 1760).

The Ford's Landing project area, lying south of Point Lumley, was not included in the original town of Alexandria, nor in the expansion of the town in 1762. In 1753, the land had been inherited by John Alexander, who also owned lots in the town proper. William Thornton Alexander acquired the property in 1775, after John's death. The Alexander homestead and quarters were located on the higher elevation to the west. The shoreline formed a wide, shallow bay, which would eventually be known as Battery Cove, stretching from Point Lumley southward to Jones Point. A landing may have been located in the project area at which coastal vessels, which required little draft could be loaded and

unloaded. Such private landings, consisting of wharves or of simple planking which was sometimes used to provide dry loading areas, were common along Virginia's rivers and elsewhere (Artemel *et al.* 1987).

The project area is thus outside the city-site during the Mercantile Capitalist Era. Economic, political and social activities of the town did not directly affect land use at the Ford's Landing site during this period. Ownership remained with the Alexander family, and as far as can be determined, the land was also peripheral to plantation activities within Alexander's quarters on the bank above the waterfront.

Archaeological Findings of the Period

Archaeological investigations at the Ford's Landing site resulted in the excavation and documentation of portions of a variety of maritime features. None of these features can be attributed to use during the Mercantile Capitalism Period. As in the case of prehistoric artifacts, early historic artifacts were recovered from various portions of the wharf fill at Ford's Landing. The ultimate proveniences of these materials are impossible to determine with precision, since all were recovered from fill deposits -- either primary wharf fill or a mixture of eroded wharf fill and nineteenth-century alluvium. As stated earlier, most, if not all, of the earth used to fill Keith's Wharf was derived from the cutting of the high bank along Lee Street. Thus it may be assumed that the artifacts present in the fill represent the remains of early historic occupation along the former shoreline.

Artifacts were found within the eighteenth-century wharf deposit, both in place within the wharf and eroded over the deteriorating bulkhead. Artifact types included fragments of delft, white salt-glazed stoneware, Shaw stoneware, Chinese porcelain, creamware, gray stoneware and free-blown wine bottle glass. The artifacts represented materials deposited behind the bulkhead either in 1785, during the original construction of the wharf, or later. All of the artifacts occurred as very small fragments indicative of incidental inclusion in the fill and redeposition from areas of original discard.

Wharf fill was observed outside the bulkhead line, having eroded through gaps in the joinery as the timbers settled over time or over the top edge of the timbers as the bulkhead itself deteriorated. In Trench 12G, for example, diagnostic items included mid-to-late eighteenth-century ceramic and glass fragments, including white salt-glazed stoneware, creamware, Chinese porcelain and free blown wine bottle glass. Roseheaded, handwrought nails were recovered south of bulkhead in Trench 23.

Indigenous Commercial Capitalism (1782-1845)

Keith's Wharf

The years from the Revolution to the War of 1812 were the high point of Alexandria's commercial prosperity. In 1780, the town became a separate port of entry for goods destined for Virginia, and a naval office was established for the inspection and registry of incoming and outgoing ships. In 1791, Alexandria was the eleventh busiest port in the United States; by 1795 it was ranked fifth, with as many as 1,000 vessels entering the port annually (Rothgeb 1957: 15). By this time, Alexandria's trade was chiefly in wheat and flour, with markets in Atlantic coastal cities, European ports, and the Caribbean. This maritime activity, encouraged by international commerce potential, generated fierce competition for the first time among northern Virginia and Maryland residents. Local commerce and manufacturing was no longer curtailed by England, and the economy was no longer regulated by the tobacco trade.

By the last quarter of the eighteenth century, the plantation system had nearly disappeared in northern Virginia. A leading cause of this change was the decline in tobacco prices as a result of European wars, British taxation and decreased tobacco yields (Harrison 1987: 403). Although tobacco no longer was the basis of the economy in the area, improved farming methods in the western counties and new markets abroad continued to foster a need for a strong regional port. Alexandria succeeded in retaining its importance as a center for maritime trade by participating in the new flour trade with Europe and the Caribbean (Rothgeb 1957: 15). Landholders in western Fairfax, Loudoun, Prince William and Fauquier Counties, along with Alexandria merchants themselves, invested in the development of inland transportation, which was intended to bring wheat and other grains to the Alexandria port. Many of these same families also invested heavily in improvements to port facilities and businesses in Alexandria. A similar circumstance developed in Georgetown on

the Maryland shore, with descendents of former Scottish traders both administering inland farmlands and enhancing port facilities in Georgetown or Baltimore (Artemel *et al.* 1991).

Between 1782 and 1789 the cove between Point West and Point Lumley was filled in, reportedly using soil removed from the high bank formerly located to the west of the harbor (Friis 1963: 24, cited in Shomette 1985: 108). Water Street (now Lee Street) was extended and Union Street, with its adjacent wharves and warehouses, was laid out across the newly filled areas. By 1790, dry land had been extended as much as 400 feet beyond the original shoreline. The methods used for this major reclamation project are unknown, since city records for the period have not been located (Shomette 1985: 79-81). In 1795, a visitor reported that the town had established "superb wharves and vast warehouses" (Smith and Miller 1989: 32).

Commercial prosperity encouraged further expansion of the town. In 1782, the city limits were extended again, to the south and west as speculative investors gambled on the continued growth of the town. In 1785, the executors of John Alexander advertised the availability of lots in the new addition, including those immediately to the west of the project area:

To be let on Ground Rent in Fee Simple, to the highest Bidder, on Monday the 3rd day of October next, One Hundred Lots of Ground, contiguous to the town of Alexandria, each lot containing half an acre, fronting on two streets, one 176 feet 6 inches, and on the other 123 feet 5 inches, some of which are water lots, and many of them fronting on a street 100 feet in width [Franklin Street] leading from the extensive wharf now building by Captain Harper and others into the country, intersecting Washington street which is likewise 100 feet in width; at the intersection of the two streets a space is left for a Market-House and other public buildings; the residue of the lots are adjoining the last mentioned lots, and the lots on the west side of Washington street. William Alexander; William Gibbons Stuart; Executors of John Alexander, deceased (*Virginia Journal and Alexandria Advertiser*, July 28, 1785).

The major streets of the addition were Franklin Street and Washington Street, both to be 100 feet wide. The market house mentioned above was to be located at the intersection of the two streets (Harper *et al.* 1785).

The Ford's Landing study area, at the foot of Franklin Street, was a key component of this development venture, and is mentioned as "the extensive wharf" in the advertisement above. By 1785, James Keith, John Harper, Charles Simms, and Levin Powell had begun work on the wharf. The general date of construction is confirmed by a report in the *Alexandria Gazette* that "a laborer on Messrs. Harper and Keith's wharf lost his life by the falling of the bank" (*Alexandria Gazette*, September 15, 1785). The "bank" appears to refer to the bluffs to the west of Union Street, which were being cut down to provide fill for the wharf. In a petition filed in the same year, the owners announced their plan to build "commodious piers and docks in front of their wharf for the reception of shipping" (Harper *et al.* 1785).

Lots on the wharf and on the fast land immediately adjacent to the west were divided between the four petitioners. They were leased until 1791, when the executors of John Alexander's estate allowed their sale (Alexandria Deed Books, Hustings Court, D:4). The wharf was known as the Harper & Keith Wharf or, later, as Keith's Wharf, and was used as a landmark in notices of other properties for sale:

For sale one undivided fourth part of a WATER LOT . . . & a Lot
or two to the northward of Harper & Keith's wharf. Samuel Arell (*Virginia
Journal and Alexandria Advertiser*, November 16, 1786).

Keith, Harper, Simms and Powell were prominent local citizens. Like many ambitious men in Virginia, they were involved in a number of projects designed to stimulate trade and to encourage the development of the growing city of Alexandria (Powell 1928: 163). John Harper appears to be the same as the Captain John Harper already established at Harper's Wharf on the central waterfront. Harper was a member of the first City Council, a member of the Washington Lodge of Masons, loyal to the Federalist Party, and active as a landowner and developer (*ibid.*).

Charles Simms was a lawyer, beginning his career as a student in George Mercer's law office in Fredericksburg. Simms received the title of Colonel during the Revolution. He was a delegate to the Virginia Convention in 1788 and was chosen to vote on the adoption of a Federal constitution. In 1799 his loyalty to the Federalist party was rewarded with a political appointment as Collector of the Port of Alexandria. As Mayor of Alexandria in 1814, he had the responsibility of arranging the town's surrender to the British during the War of 1812 (Powell 1928: 274). In addition, he was a vestryman at Christ Church, and a founder of the Society of the Cincinnati.

James Keith studied law in Williamsburg (*Tyler's Quarterly* 8: 191) and later held a number of important positions in Alexandria, including membership in the Common Council. As the wharf was built, Keith was serving as Mayor, a post he would continue to hold until 1790. He was also President of the Patowmack Canal Company from 1790 to 1807, and President of the Little River Turnpike Company, both enterprises part of the effort to facilitate transport from the hinterlands to Alexandria and other ports (Calendar of Virginia State Papers, Volume 9: 314, 338).

Like Simms, Colonel Levin Powell was a veteran of the Revolutionary War. An important citizen of Loudoun County, Powell founded the towns of Centreville and Middleburg and served as a county Justice as early as 1770. In 1798, he represented the Loudoun District in the federal Congress (Powell 1928: 177). Like James Keith, Powell was involved in both the Little River Turnpike Company and the Patowmack Canal Company. The turnpike would have been particularly attractive to Powell as a means of carrying the agricultural products from his landholdings in western Fairfax County to shipping points in Alexandria, including the newly established wharf at the foot of Franklin Street. Powell was also a Trustee of Matildaville, the short-lived industrial town adjacent to the Patowmack Canal at Great Falls, Virginia (Artemel 1978: 206).

Each of these four men held office or to varying degrees had other close connections with the town of Alexandria. Yet their principal sources of income lay in landholdings in Prince William, Fauquier, Loudoun, and western Fairfax Counties, and in other commercial activities. Their investments included participation in canal and turnpike companies which were among the earliest privately funded transportation projects in the nation. Virginia was one of the first states to commit itself to a long-range program of internal improvements (Artemel 1978: 192). Canals and wide, well-maintained roads were intended to attract the

trade of the western part of the state, which at that time extended as far as the Ohio River (MacMaster 1966: 25). Thus, the investment by Keith and associates in construction of a new wharf in the area to the south and west of the original town appears to have been part of a larger, ongoing trend in the development of transportation facilities.

The builder responsible for the actual construction of the wharf is unknown. There were wharf builders in the town. Isaac Fleming, for example, was the earliest known shipwright on the waterfront, operating a shipyard on Point Lumley in the early 1750s, and was considered by many the most experienced of the local men in the craft of wharf construction (Shomette 1985: 84). A few years later, in 1791, Absalom Rowe was listed as a wharf builder, living near Wilkes Street, immediately to the north of the project area (Alexandria Directory 1791). Rowe was apparently a slave or indentured servant. Bound labor, either indentured or slave, was preferred in many shipyards both north and south along the eastern seaboard, for the work was irregular and seasonal, and thus it was difficult to maintain a reliable free labor force (Goldenberg 1976: 61).

Wharf-building services were also advertised by outsiders. David Sharon, of Baltimore, promoted his skill locally in 1785:

being here for the present season and desirous to be useful . . . can command any reasonable number of good workmen from Baltimore. . . . He professes also the capacity of building a complete pile driver . . . and recommends the driving of large piles on the outside walls of every wharf [which] is more peculiarly suitable here from the steepness with which the channel of the Potomack is formed (*Alexandria Gazette*, 20 July 1785).

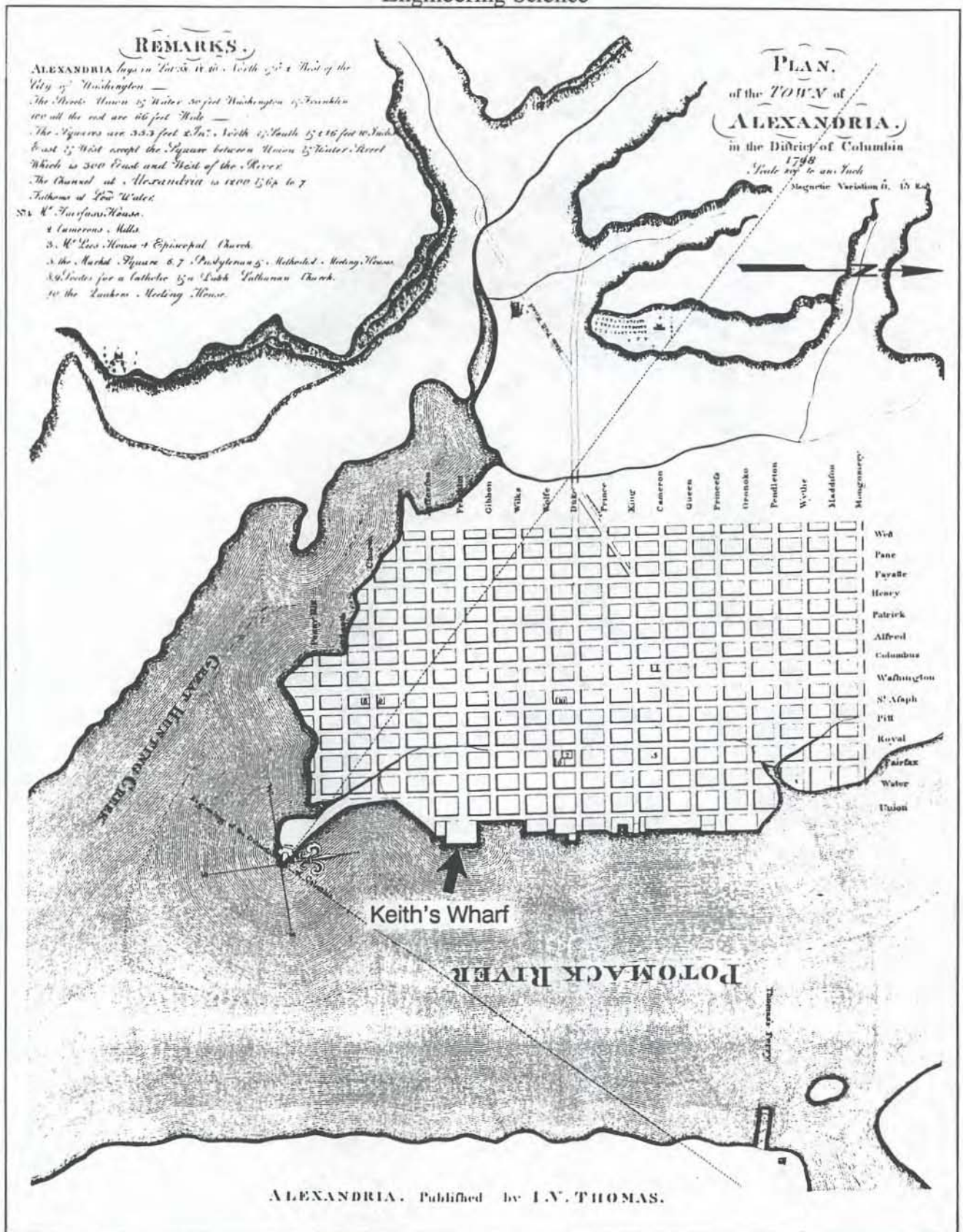
No precise description of the dimensions or method of construction of Keith's Wharf has been found, but certain facts are known from land deeds and advertisements. The completed wharf was described by its builders as measuring 400 feet in length from the high water mark (Harper *et al.* 1785), or extending 124 feet east of the short cross street laid out on the wharf (known variously as Strand or Madison Street), the latter measurement according to contemporary deed records (Alexandria Deed Books I:179). These two sources agree within approximately 25 feet. Unfortunately, the location of the original shoreline is not clear, although earlier research has suggested that it may have extended further west than

the present line of Union Street (Cheek and Glendening 1986: 23). Another description, this of a water lot on Keith's Wharf in 1803, notes its boundaries extending from the water "about 120 feet to a 50 foot street called Gibbon Street" (*Alexandria Advertiser*, May 18, 1803).

According to deed records, the wharf was constructed within a "frame" that was filled with earth (Alexandria Deed Books I:179). Many wharves of the period were little more than extensions of existing streets. The Carlyle and Dalton Wharf at the end of Cameron Street, for example, appeared to have been approximately 66 feet in width, the width of the street itself (Heintzelman 1985: 183, 188). Keith's Wharf was considerably wider, divided by streets and alleys, principally an extension of Franklin Street and a cross street, the Strand, each measuring 50 feet in width (Harper *et al.* 1785). The presence of the streets and alleys suggests that the construction of warehouses and stores was anticipated.

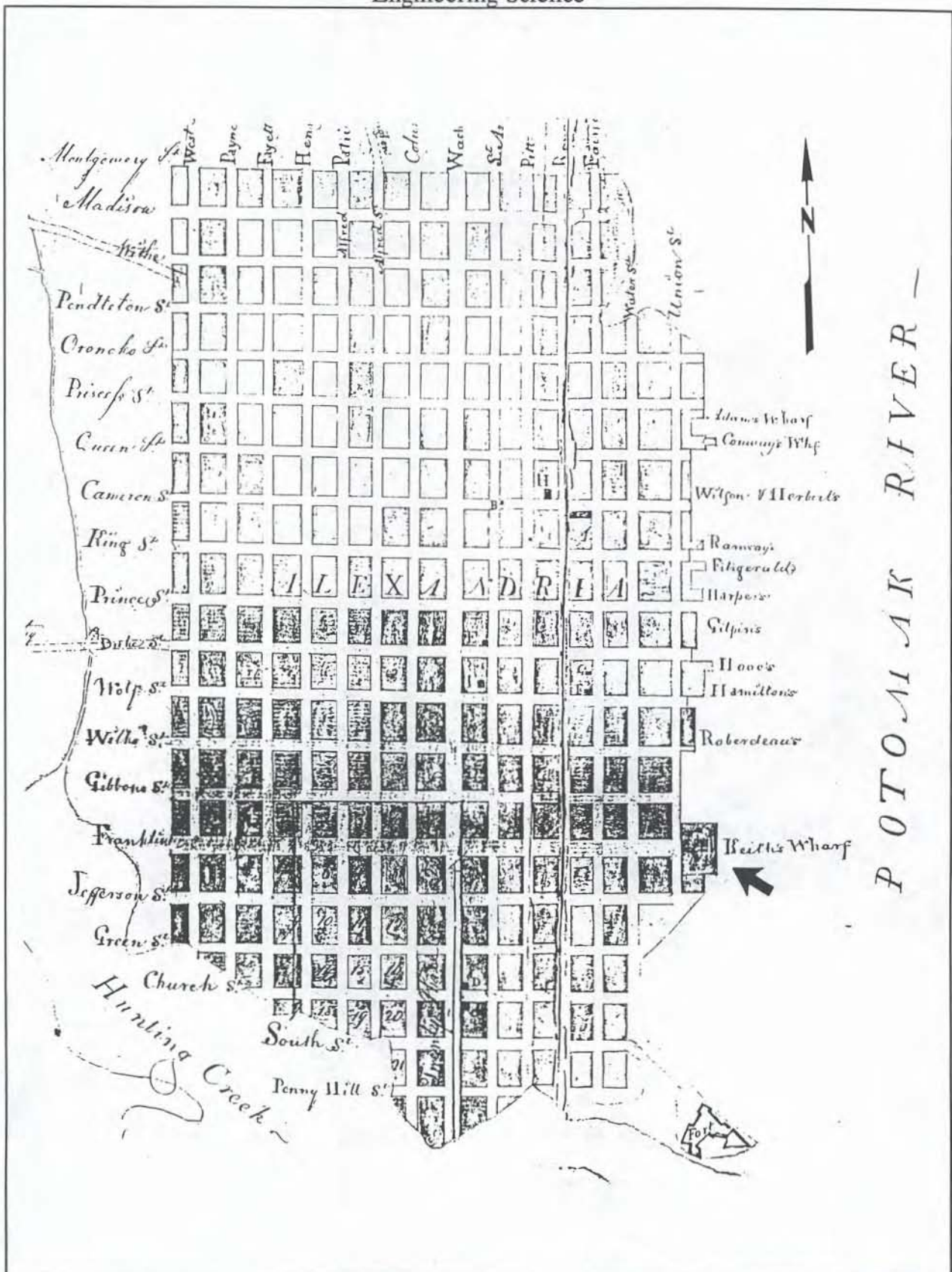
The wharf was clearly shown on a map published in 1798 by George Gilpin (*Figure 7*), although it did not conform well with the few written descriptions. A large rectangular area was drawn extending some 200 feet east of Union Street, toward the river, with a smaller rectangle shown immediately to the south. Beyond Jefferson Street the shoreline sloped sharply back to form Battery Cove. An anonymous map of 1803 (*Figure 8*), which identified the property as "Keith's Wharf," showed a virtually identical configuration to that portrayed on the Gilpin map, and may have been traced from the earlier drawing. Based on a study of the development of the waterfront through time, one researcher concluded that Gilpin's representation of the waterfront tended to be somewhat idealized (Moore n.d.). It is possible, then, that these maps showed general use or even intended development, rather than precise geography.

The land on the new wharf was divided among the men who had originally invested in its construction. A section of the wharf measuring thirty-foot in width was "covenanted by proprietors. . . to be left forever open as a passageway along the front of the wharf and a landing place" (Alexandria Deed Books K/2:575). Only a few lots were sold or leased during the first fifteen years after construction (*Figure 9*). One subdivision on the northeast corner of the wharf was transferred to Thomas and John Vowell in 1798, while the remainder



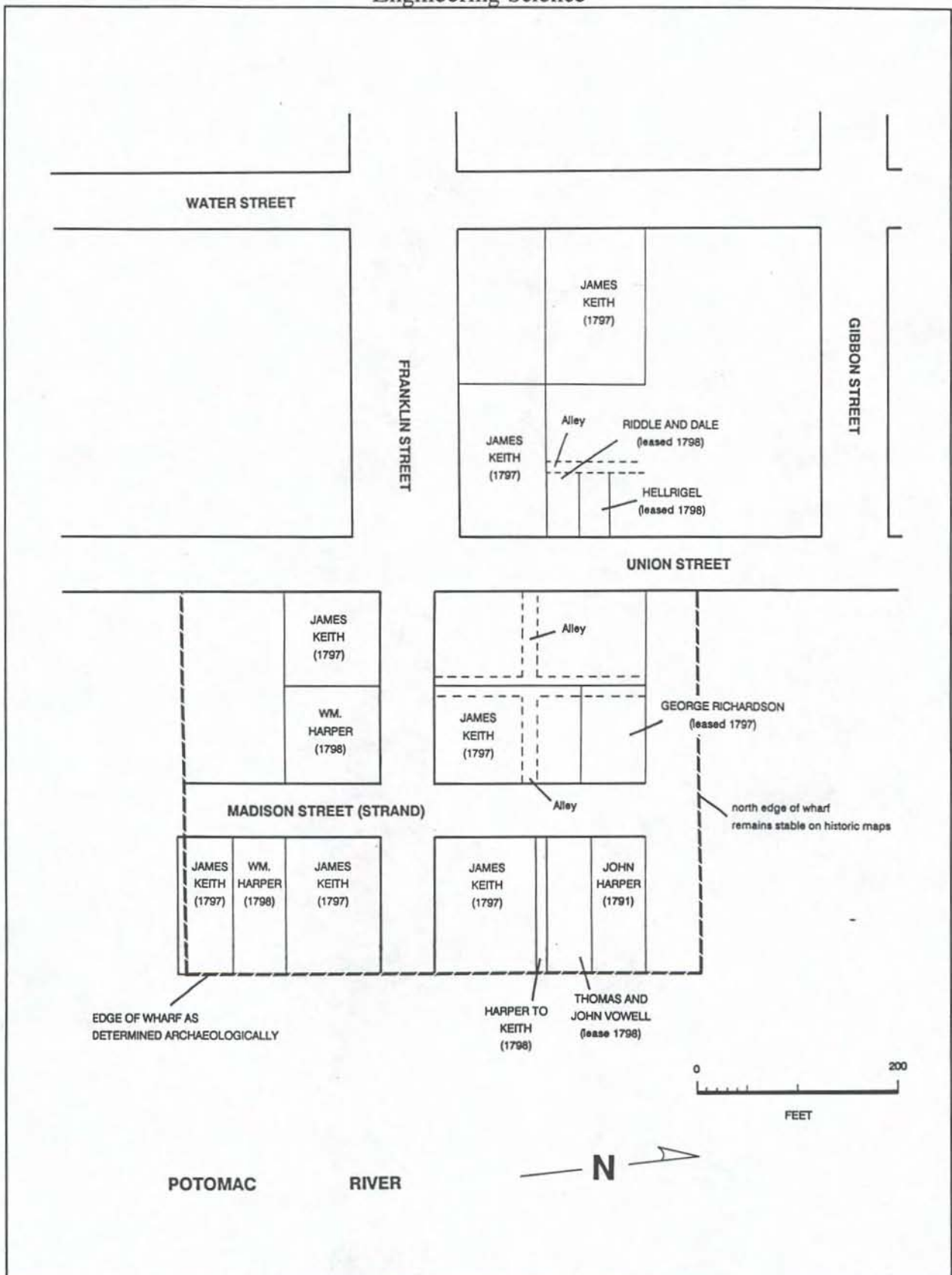
Source: George Gilpin, 1798
Ford's Landing

Figure 7
Keith's Wharf, 1798



Source: Anonymous, 1803
Ford's Landing

Figure 8
Keith's Wharf, 1803



Source: Engineering-Science
Ford's Landing

Figure 9
Lots on Keith's Wharf
ca. 1800

of that lot went from John Harper to William Harper in 1802, and then to Gardiner Ladd in 1803 (Alexandria Deed Books I:179). On the north side of the wharf, west of the Strand, George Richardson leased a lot in 1798 (Alexandria Deed Books I:329). Richardson's lot is distinguished by a reference to a line "of loggs laid for the said wharf forming the northern boundary." The transferral also stated that:

It was agreed that he and they may during said term land upon the said 15' in front of the premises hereby demised him and upon Madison Street any stone for the use of his shop free from wharfage he and they taking care to remove the same when required so that those places be not incumbered in such manner as to prevent other articles being landed thereupon (*ibid.*).

Richardson was probably a stone cutter, and the wharf used for loading and unloading, as well as temporary storage of the stone.

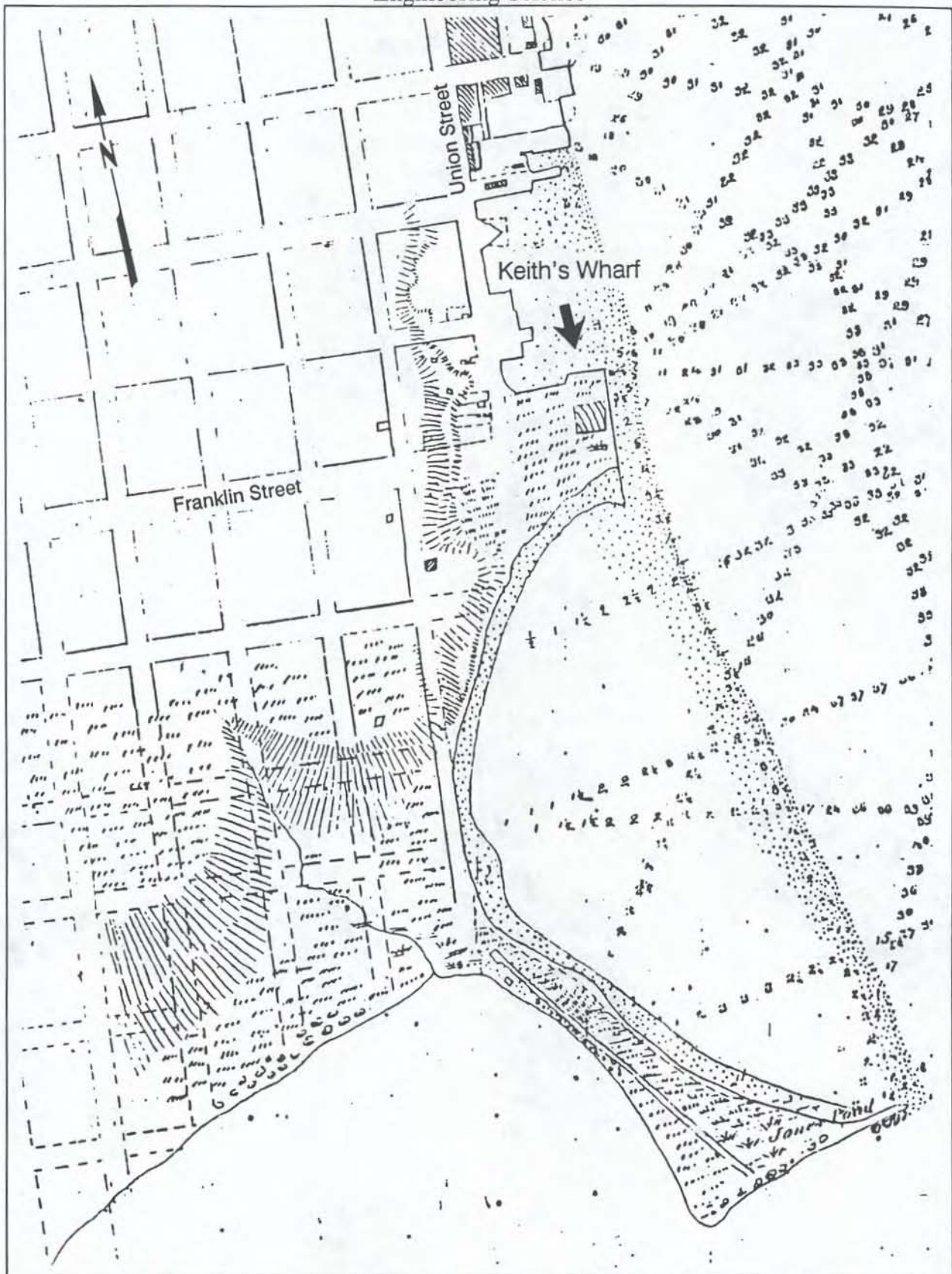
With so little evidence of specific use of Keith's Wharf, it is far from clear that the speculative venture was a success. The area at the foot of Wilkes Street, separating the new wharf from the main commercial center of the town, seems to have been marshy and undeveloped, with Union Street south of Wilkes elevated on a causeway which required frequent and extensive maintenance (Minutes of the Common Council, Volume 5, July 16, 1818). By 1804, Keith's wharf was still seen as peripheral to the central waterfront, being described as located "a little to the south of the present harbour of this town" (*Alexandria Gazette*, March 30, 1804). There are few references to shipping activities conducted on the wharf in local papers. One notice suggests that renovations were necessary by the turn of the century, describing the wharf as "lately logged and filled up and now. . .in complete repair" (*Alexandria Advertiser*, May 18, 1803). On March 30, 1804, the *Alexandria Gazette* reported that the superintendent of police would "assign as a place for the sale of fresh shad and herrings, from and after the first day of April next, the wharf of Mr. James Keith." Keith also applied for a license in 1804 "to keep a public ferry from the lower point of his wharf to the opposite shore" (Alexandria Deed Books G:399). Yet apart from the apparent activity of Keith himself, little other use of the wharf can be seen. For example, a survey of the *Alexandria Gazette*, conducted by Cheek and Glendening, covering three years beginning in 1804, revealed no advertisements for Keith's wharf. The researchers concluded that the

wharf was "not as prominent (geographically or economically) as the wharves located on the central waterfront" (Cheek and Glendening 1986: 26).

Depression of the 1820s and 1830s

During the agricultural depression of northern Virginia in the 1820s and 1830s, commerce in Alexandria began a long decline. Several reasons for this downturn have been suggested. Intense competition existed with Georgetown and the new City of Washington for the lucrative coastal trade. Completion of the C & O Canal through Georgetown to Rock Creek provided access from the west to the docks of Georgetown, as well as Lear's Wharf, near Foggy Bottom, and the 6th Street wharves of southeast Washington via the Washington Canal. The canal thus siphoned off much of the waterfront commerce hitherto enjoyed by Alexandria. The port continued to trade flour and grain from western Virginia, which was unaffected by the agricultural decline in the northern portion of the state: Portugal and Spain, as well as the West Indies, represented a steady market for these products (Artemel 1978: 184-5, 190-209). Nevertheless, in spite of the many turnpikes intended to improve access to Alexandria's wharves, overall trade in agricultural goods dropped. Early efforts at industrialization were limited by the unavailability in Alexandria of water power. By mid-century, railroads began replacing water transport for passengers and for all but high bulk commodities. Larger ports on the Chesapeake, such as Norfolk and, particularly, Baltimore, increasingly absorbed the trade which was earlier transshipped through smaller centers. The worst years for the port of Alexandria were 1836-1838, attributed to the general depression and poor crops of the late 1830s. A turnaround was not long in coming, though, as the peak of shipping came in 1840, when 64 foreign vessels cleared the port bringing 9,911 tons of cargo, and 106 domestic vessels carrying 16,725 tons of cargo (Rothgeb 1957: 24).

Although the study area was still known as Keith's Wharf in the 1820s and 1830s, it is not clear how active the wharf actually was. The goal of the original investors, to create a south-side Alexandria market center, had not succeeded. A commercial directory published in 1834 contained no listings for either residences or businesses on the wharf or in the surrounding area (Cheek and Glendening 1986: 36). The U.S. Army Topographical Engineering Department map of the Potomac riverfront published in 1836 (*Figure 10*) depicted the wharf as an irregular piece of land with marshy, overgrown borders. Depths off the wharf were two to four feet, while those off the wharves on the central harbor remained



Source: U.S. Army Topographical
Engineer Department, 1836
Ford's Landing

Figure 10
Detail of Waterfront
with Bathymetrics

20 feet or more. A fairly large, but unidentified structure was shown near the center of the site. Tax Assessor Records for the city from 1850 indicate the presence of a tobacco warehouse on the south side of the wharf at the intersection of Franklin and Madison (Strand), on property owned by the estate of James Keith. This is the earliest reference to the warehouse in the records, but the date of construction is not known. The structure depicted on the wharf in 1836 may have been the same warehouse.

The wharf was still identified as Keith's Wharf on a navigation chart from 1841, while the Maskell Ewing survey of 1845 (*Figure 11*) showed a slightly altered configuration, though with no structures indicated.

Archaeological Findings of the Period.

Archaeological investigations at the Ford's Landing site resulted in the excavation and documentation of portions of a variety of maritime features from the late eighteenth through mid-nineteenth centuries including sections of the original wharf structure (Feature 33) built by Keith and associates in 1785 on a portion of tidal flats along the northern waterfront, as well as a bateau hull (Feature 35) which probably dates from the late eighteenth or early nineteenth century, and was abandoned in the early decades of the nineteenth century. These investigations resulted in (1) a reconstruction of Keith's Wharf as it would have appeared in the late eighteenth century including its configuration, projection of sea level during the period; (2) analysis of its construction technology and comparison with other wharves investigated archaeologically along the eastern seaboard; (3) the use of wharf fill as part of wider programs in Alexandria and elsewhere to restructure the city landscape; (4) wharf construction as a craft in the eighteenth and early nineteenth centuries; and, (5) the economics of wharf construction and operation, as private and public investments.

Historical materials were encountered in several areas within the eighteenth-century wharf fill deposit, both in place within the wharf and eroded into the cove over the deteriorating bulkhead. In most cases, artifacts were recovered in small quantities and in relatively isolated areas. Artifact types diagnostic of the late eighteenth and early nineteenth century included fragments of delft, white salt-glazed stoneware, Shaw stoneware, Chinese porcelain, creamware, pearlware, gray stoneware and free-blown wine bottle glass. The artifacts represented materials deposited behind the bulkhead either in 1785, during the

Figure 11
Alexandria, 1845

original construction of the wharf, or somewhat later, around the turn of the nineteenth century when the upper courses of the bulkhead were retimbered and the fill replenished. All of the artifacts occurred as very small fragments indicative of incidental inclusion in the fill and redeposition from areas of original discard.

A relatively large amount of material was recovered from wharf fill deposits in Trench 12 Section F, near the south central edge of the wharf. A similar situation was recorded in Trench 13F, with numerous fragments of the same refined earthenwares recovered in combination with non-diagnostic artifacts such as kaolin pipe stem and bowl fragments, a doll's head, a bone toothbrush and an oarlock. In Test Unit 3, excavated in Trench 13G in the east central portion of the wharf, fragments of free blown wine bottle glass, creamware, shell edged and hand painted pearlware and gray salt-glazed stoneware were recorded. To the south along the bulkhead in Trench 22, creamware, pearlware and Chinese porcelain were recovered. Near the southeast corner of the wharf, in Trench 23, undecorated creamware, hand painted, transfer printed and annular decorated pearlware, and free blown wine bottle glass, were recorded along with assorted non-diagnostic construction materials and animal bone. Late eighteenth-century historic materials were also recovered from a similar provenience in Trench 23X, including the same refined earthenware types, and fragments of hand painted, overglaze Chinese porcelain, gray salt-glazed stoneware wasters and kaolin pipe stem.

As noted previously, wharf fill was observed outside the bulkhead line, having eroded through gaps in the joinery as the timbers settled over time or over the top edge of the timbers as the bulkhead itself deteriorated. In Trench 12G, for example, diagnostic items included mid-to-late eighteenth-century ceramic and glass fragments, including white salt-glazed stoneware, creamware, pearlware, Chinese porcelain and free blown wine bottle glass. Roseheaded, handwrought nails and fragments of hand painted pearlware were recovered south of bulkhead in Trench 23.

The material from Trench 15 included fragments of Chinese export porcelain, hand painted pearlware, lead glazed and unglazed redware, a smaller amount of whiteware and ironstone, wine bottle and mold blown container glass, lamp chimney glass, construction material and bird and mammal bone. Also recovered was a quartzite flake. All of this material may in fact have originally been derived from the wharf, which lay a short distance to the north. The artifacts may have been contained in fill which eroded from the main body

of the structure, or may have been material discarded or lost over the side of the wharf: eventually, all appeared to have washed out into the cove on the tide or during storms.

Several larger ceramic pieces, partially reconstructed from fragments, were recovered outside the bulkhead, suggesting loss over the side of the wharf into the waters of the cove as opposed to intentional deposition as wharf fill and later erosion over the bulkhead line. A number of pins, spikes and large nails, along with several smaller, roseheaded nails, were also recovered off the side of the wharf, either lost or resulting from the deterioration of the bulkhead itself.

Industrial Capitalism (1843 - 20th Century)

During the latter part of the 1830s, the business leaders of the town attempted to revive Alexandria's waning commercial life in a number of ways. Awareness that commerce depended on transportation connections with the Piedmont hinterland had already encouraged interest in turnpikes and canals in the eighteenth century (Artemel 1978). By the 1830s, canal fever had been joined by fascination with the new technology of the railroads. Some Alexandrians invested in the rail lines which were built to connect the city with agricultural areas to the south and west. The Orange and Alexandria, the Alexandria, Loudoun and Hampshire, and the Manassas Gap railroads, all leading to the grain shipping areas of the west, and the Alexandria and Washington Railroad, connecting the town with the Virginia end of the Long Bridge over the Potomac to Washington, were begun in the 1840s and 1850s. Tracks were laid along Union Street to connect with the western lines through the Wilkes Street tunnel, completed in 1851.

Most interest seemed to center on creating a link with the Chesapeake and Ohio Canal, which was planned to connect Georgetown, its eastern terminus, with the rich trade in wheat and coal of the Middle West through a planned western terminus at Pittsburgh. Work on the Alexandria Canal, which followed the west bank of the Potomac, crossing the river at Georgetown by means of an aqueduct bridge, began in the 1830s and was completed in 1843. The four locks connecting the basin at Montgomery and Washington streets with the Potomac wharves were completed in 1845. The new availability of cheap water transport for the grain of western Virginia immediately restored Alexandria's competitive advantage in the flour trade (Shomette 1985: 188-9). The completion of the C & O Canal to Cumberland in 1850, moreover, provided an apparently unlimited and relatively inexpensive source of coal, on

which industrial development in the city could be based (Shephard 1991). A number of substantial industrial enterprises were established in the 1840s and 1850s, including the Alexandria Foundry, Pioneer Mills and the Mount Vernon Cotton Factory. As an indication of the pace of industrial development, it has been determined that by June of 1860, there were 77 manufacturing establishments in the city, employing an average of ten men each (Shomette 1985: 196-7).

The Alexandria Marine Railroad Company

On January 13, 1849, the Alexandria Marine Railroad Company was founded for the purposes of refitting and repair of ships and other vessels on the river. The decision to establish a marine railway in the city was undoubtedly connected with the prosperity anticipated with the completion of the C & O Canal to Cumberland. Nathaniel Goodhand served as President of the company. Investors in the venture included D. Boyd Smith, Richard C. Smith, Stephen Shinn, Edward Daingerfield, John T. Johnson and Joseph P. Grimes (Alexandria Deed Books K3:441). Both Smiths, probably not coincidentally, were agents for the Frostburg Coal Company. Richard C. Smith was one of the founders of the Alexandria Foundry and the Smith and Perkins locomotive works. Like the original investors at Keith's Wharf, most of these men invested capital in the shipyard, but were not directly involved in its management. Though they hoped to profit from the city's continued expansion, their principal income was not derived from this particular venture. Nathaniel Goodhand, however, listed as president in the initial plans, seems to have been a practical shipbuilder, based on a listing in the 1850 Census of Manufactures.

Little documentation concerning the enterprise has survived. The main business of the yard was the repair and refitting of all types of vessels, although some craft were built on-site as well. The operation seems to have been fairly small, since the company held only the northwest corner of the water lot north of Franklin and east of the Strand, though additional lots to the south and west may have been leased.

The southern waterfront had been the center of the city's ship-building activities since the mid-eighteenth century, most of which had focused on Fleming's yard at Point Lumley, now the foot of Duke Street, and John Hunter's yard at Roberdeau's Wharf, at the end of Wilkes Street. This was a pattern typical of ports throughout the South during the Colonial period in which shipyards tended to be located outside active commercial waterfront areas (Shomette 1985: 35-6). A traveller to Alexandria in 1759 reported that there was a dock at one end of the town and a shipyard at the other, presumably at Point Lumley (Burnaby 1963: 36). As early as 1783, Hunter's yard had been established at Union and Wilkes Street, only two blocks north of the Keith's Wharf (Tilp 1978). A cluster of shipwrights and other marine artisans and suppliers were reportedly attracted by the yard. In 1791 there were four shipbuilders listed in the city directory; by 1810, there were eleven ship carpenters, as well as six rope makers and three sailmakers (Tallichet 1986; Veloz n.d.). By 1836, one of the longest rope walks in the Chesapeake region had been established on Jones Point, south of Keith's Wharf (LeeDecker and Friedlander 1985). A large proportion of the success and growth of the yards along the waterfront was the result of influential merchants and shippers of Georgetown, such as John Mason, who shifted much of their shipbuilding and repair work to Alexandria from the previously favored yards along the increasingly silted in Anacostia waterfront at Bladensburg (Mason Family Papers, Manuscripts Division, Library of Congress).

The 1850 Census of Manufactures reported that Goodhand's shipyard, the marine railway established on Keith's Wharf the year before, employed eight men, and had produced one schooner, valued at \$1,000, and had undertaken \$8,000 worth of repair work during the preceding year. By 1852, Goodhand was apparently no longer connected with the project: directory references list only the Smith brothers as President and Vice-President. A second, smaller marine railway was established a few blocks to the north, at Roberdeau's Wharf, also in the 1850s, and it appears that both were kept busy with repairs to the numerous canal, river, and coastal craft plying the harbors of Alexandria, Georgetown and Washington. A surviving log from the smaller railway records the consequences of the depression of 1857, which affected the entire east coast shipbuilding industry (Miller 1988d: 47). It is possible that the Alexandria Marine Railway was abandoned during this period, since it is not shown in directories after 1860, and later references indicate that there were no railways in the town in the early 1870s.

Civil War Railroad Wharf

When the majority of Virginians voted for secession on May 23, 1861, eleven regiments of Union soldiers crossed the Potomac and took control of Alexandria. For the next four years, Alexandria was under military occupation and served as the central distribution point for men and materiel for the Army of the Potomac. As a result, as many as 40 ships docked at the city's wharves each day (Shomette 1985: 236). The Union also appropriated Alexandria's railroads, using the Orange and Alexandria shop complex at Duke and Henry Streets as the headquarters of the United States Military Railroad (Williams 1977: 59). In addition, many private homes, churches, and public buildings were commandeered for military barracks, hospitals and prisons (Smith and Miller 1989: 84).

The Confederate victory at the First Battle of Manassas revealed the weakness of the Union armies and underscored the need to interpose defenses between General Robert E. Lee and the Capital. Major John G. Barnard of the Corps of Engineers was ordered to construct a ring of fortifications on the heights surrounding Washington, which included gun emplacements to protect the city against naval attacks from the river. It was for this purpose that Battery Rodgers was constructed on the high ground west of the project area, near what is today the corner of Jefferson and Lee Streets, complementing Fort Foote, on the opposite shore in Maryland (Barnard, Special Order 20, quoted in Dickman 1980: 15).

General Herman Haupt, commander of the Construction Corps of the U.S. Military Railroad, was assigned the Herculean task of maintaining rail supplies for the troops encamped around Fredericksburg. There was no direct rail connection between Alexandria and Fredericksburg in existence in 1860. The Richmond, Fredericksburg and Potomac line extended only as far north as Aquia Creek, and passengers and freight had to be transferred to steamboats to complete the final 25 miles to Alexandria or Washington. Haupt restored the RF&P tracks, which had earlier been destroyed, and also established a railroad wharf at Keith's Wharf at the Ford's Landing site. The wharf became a vital link in the Union supply effort. Haupt devised an ingenious method of speeding the transport of supplies to the Union armies in the south. A railroad spur connected the wharf with the Orange and Alexandria and the Alexandria and Western railroads, leading in from the south and west through the Wilkes Street Tunnel, and with the Washington and Alexandria, which connected Alexandria with the District of Columbia via the Long Bridge (*Plate I*). Freight cars coming in on these



Plate 1. Military Rail Spur from Union Street to Keith's Wharf, Late Civil War

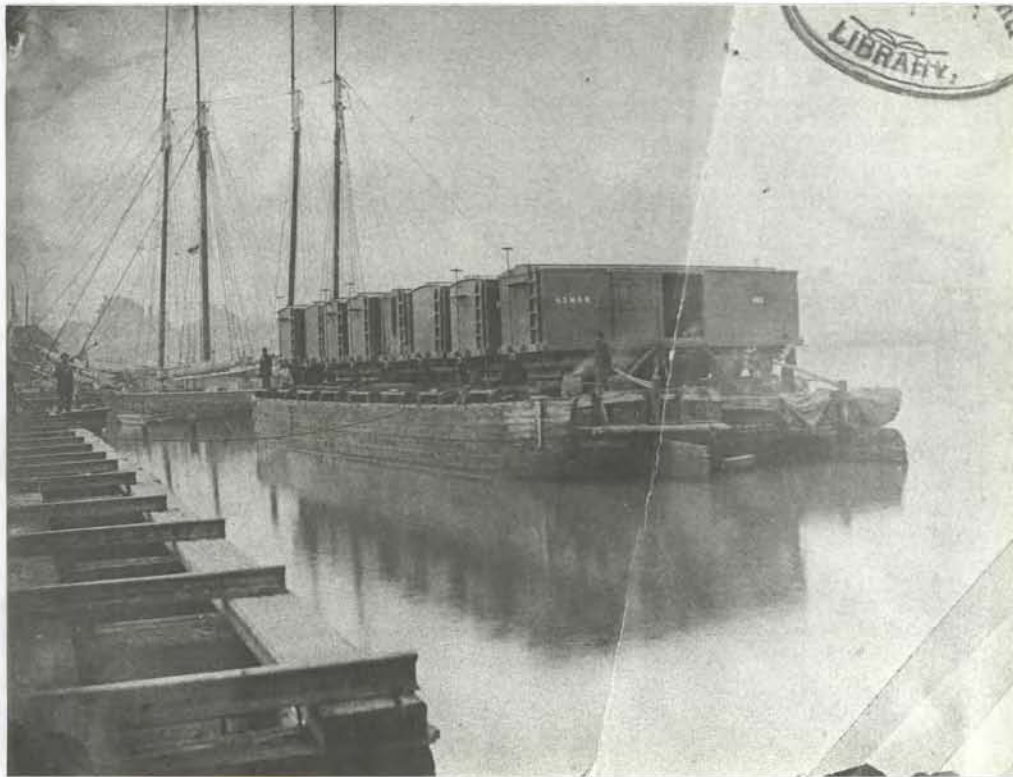
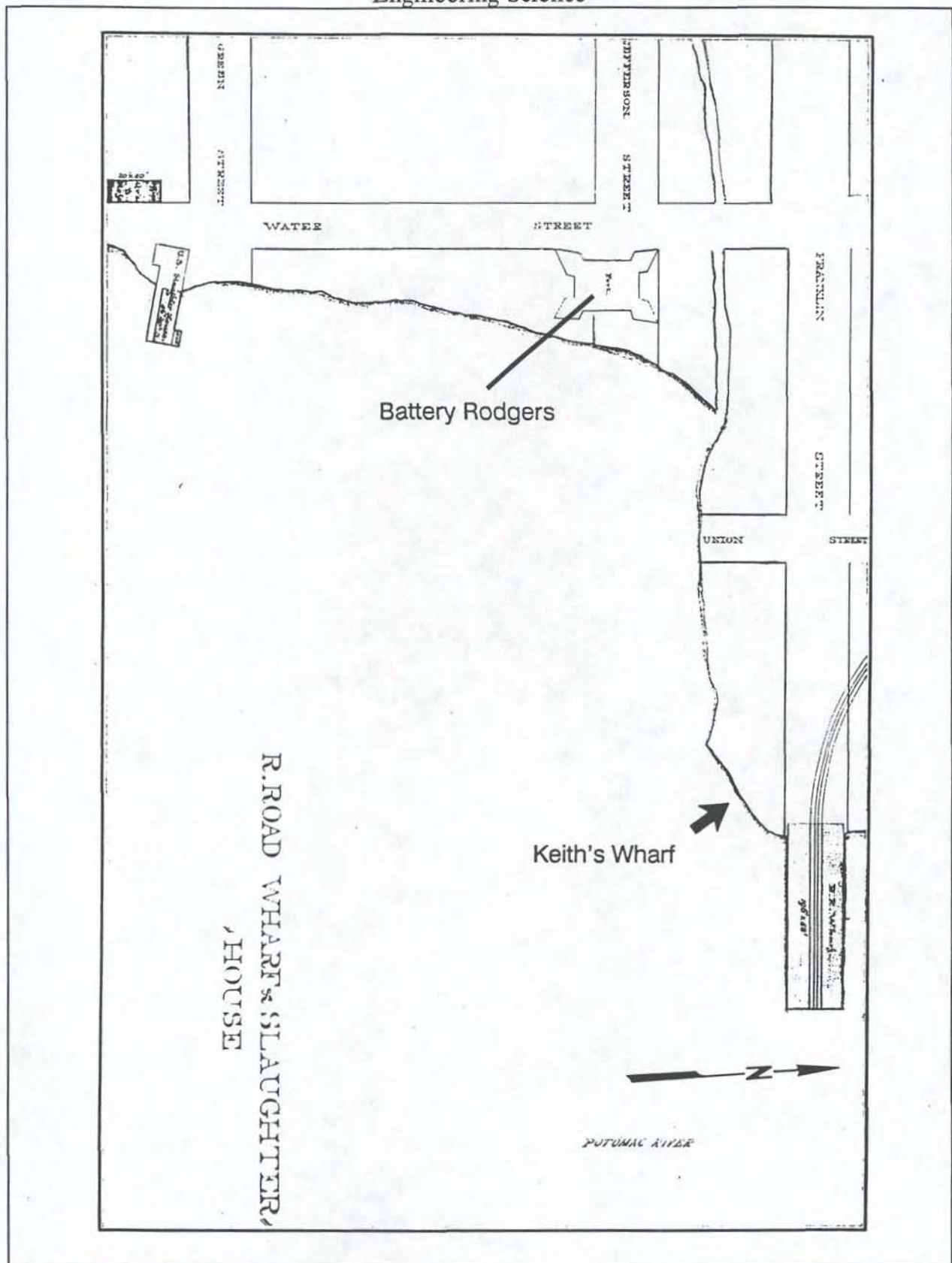


Plate 2. Canal Barges Carrying Rail Cars
(illustration shows marine railway similar to Features 18 and 19)

lines were transferred directly to floats made up of two Schuylkill canal barges lashed together, over which rails had been laid (*Plate 2*). The floats were pushed down river by steam tugboats to the railhead at Aquia, where the cars were transferred to tracks connecting to the south. The rail barges avoided the necessity of unloading the cars' contents for the river portion of the journey (Haupt 1862). Haupt's system, which prefigured modern containerized freight, was used for a time and then discontinued.

Civil War land use of the site was documented by photographs, taken by Captain A. J. Russell and others assigned to the Military Construction Corps, and by maps showing Army installations in Alexandria during the War. The photographs indicated that during the period there were at least two phases of land use in the project area. Early photographs showed the assembly of make-shift vessels called "blanket" barges, because of their improvised sheathing material, which Haupt developed to move men and equipment down river (*Plates 3-5*). Photographs of the barges in the water also showed the bulkhead marking the east end of the wharf, as well as two rows of what appeared to have been deteriorated pilings parallel to the bulkhead. A small marine railway was also shown, with two sailing vessels drawn up for repair, and a one story frame building with a chimney visible beyond the vessels to the west. If the structure on which the two vessels rested were a surviving portion of the 1849 marine railway, the building may have held an engine head, where the mechanical power to pull ships out of the river was generated. The method by which the early marine railway on the wharf was powered is not known, however, and it would have been somewhat unusual for steam power to have been used for a railway at that comparatively early date. A wooden fence separated the ship repair operation from the other activities on the wharf. A photograph taken from the water looking west showed the open, southern portion the wharf and the foot of Franklin Street to the west (*Plate 6*). There were no improvements or structures visible on the wharf at this time, although a number of houses still standing on South Lee Street are readily identifiable.

Photographs and maps of the military railroad wharf (*Plate 1; Figure 12*) appear to be from a later date. The late Civil War map (*Figure 12*) showed a pier, with measurements noted as 196 by 53 feet, extending east into the Potomac from the end of the wharf. A double set of railroad tracks ran from Union Street onto the pier. Many of the structures which appeared in the earlier photographs, including the marine railway and engine house, were not depicted. Judging from the schematic character of the plan -- the wharf was



Source: National Archives
Ford's Landing

Figure 12
 Military Railroad Wharf,
 1865

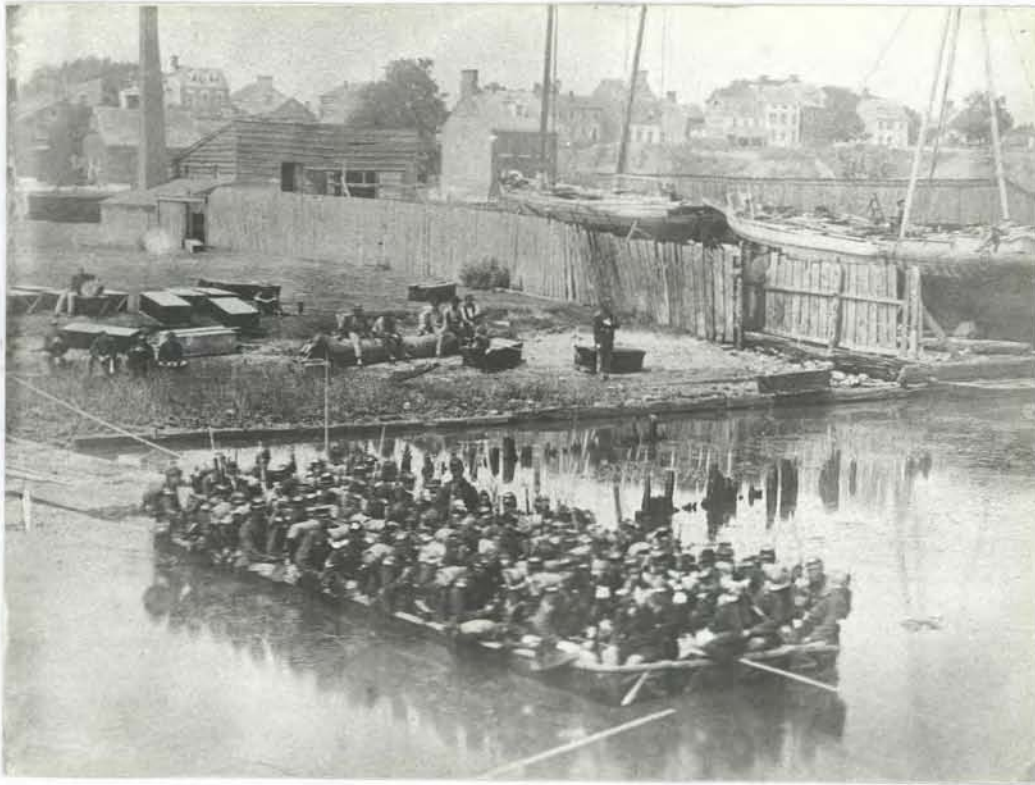


Plate 3. Keith's Wharf During Civil War--Troop and Materiel Lighters
(East Face of Bulkhead - Feature 33 -- and marine railway -- Features 18 and 19)

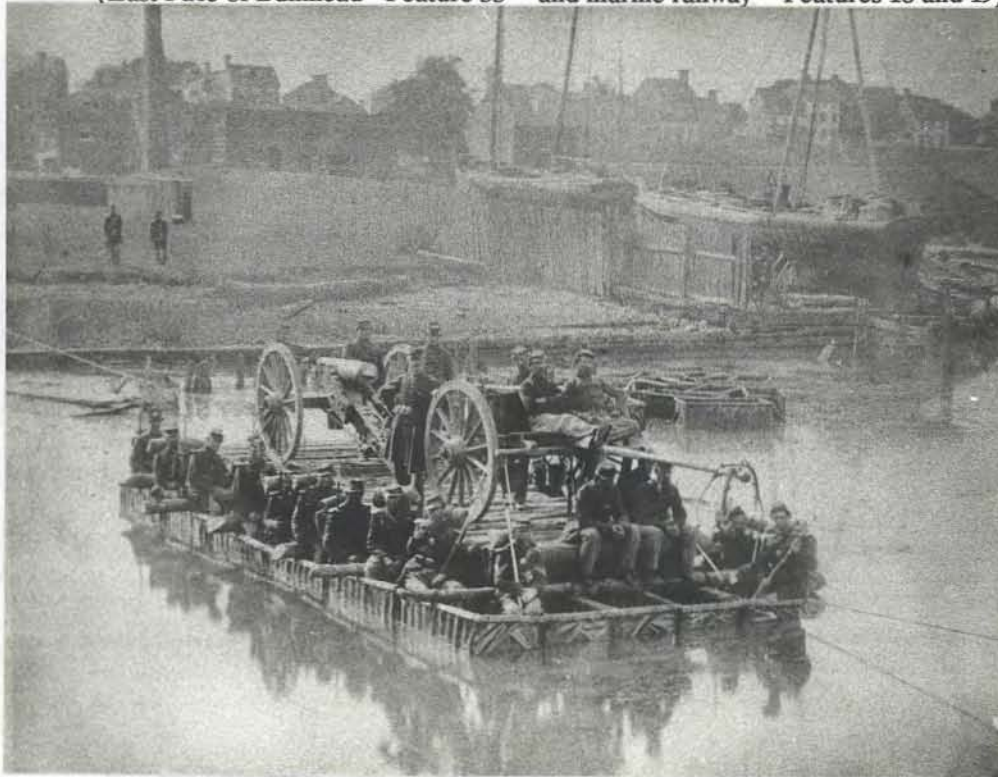


Plate 4. Keith's Wharf During Civil War--Troop and Materiel Lighters
(note bulkhead timbers, vessels on marine railway to right)
(East Face of Bulkhead - Feature 33 -- and marine railway -- Features 18 and 19)

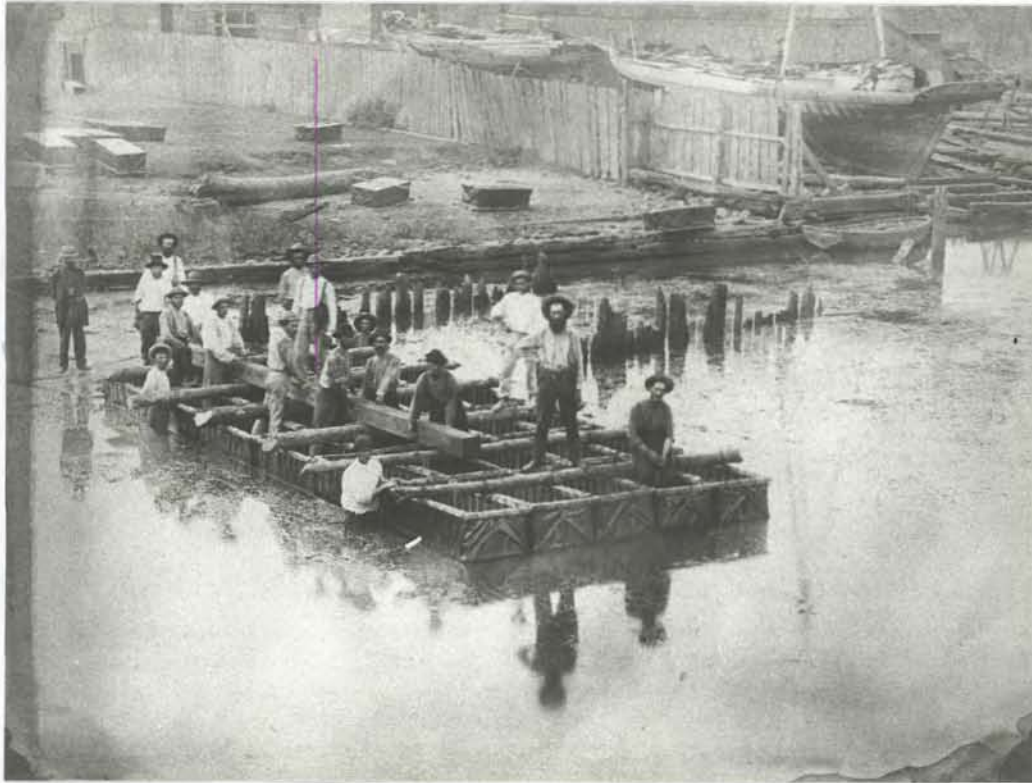


Plate 5. Keith's Wharf During Civil War
(East Face of Bulkhead - Feature 33 -- and marine railway -- Features 18 and 19)

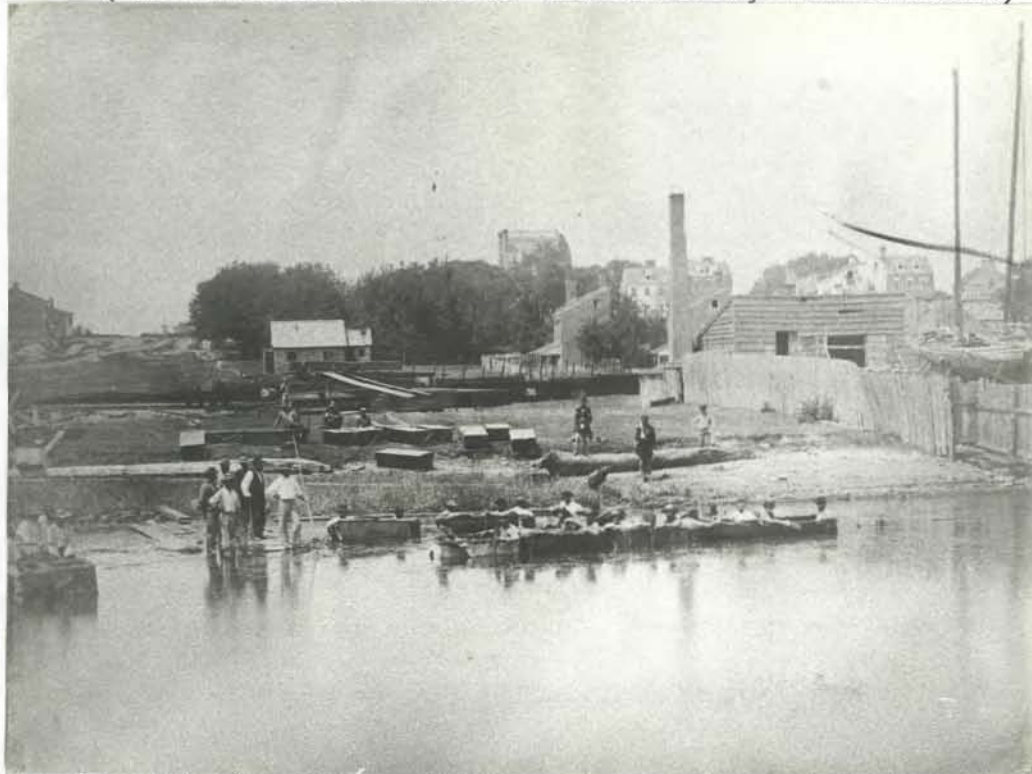


Plate 6. Keith's Wharf During Civil War--Troop and Materiel Lighters
(note position of Franklin Street to left)
(East Face of Bulkhead - Feature 33 -- and marine railway -- Features 18 and 19)

sectioned, for example, to allow inclusion of the "Fort" (Battery Rodgers) and a Slaughterhouse pier and Officer's Quarters and Mess to the west along the cove shoreline -- it is difficult to determine whether the earlier structures on the wharf had been removed when the military tracks were installed or merely were not included on the map.

Alexandria Marine Railway and Ship Building Company

Civilian commercial and industrial activity in Alexandria recovered slowly during the period of Reconstruction. Although the canal, now leased to private owners, was again in operation by 1866, many of the new industrial enterprises established during the 1850s took a period of years to re-establish themselves. As late as the summer of 1875, the *Gazette* described an almost deserted waterfront:

No vessels in the stream, no large coasters at the coal wharves, only
a few canal boats, and no steamers except the ferry boats at the piers
(*Alexandria Gazette*, July 2, 1875).

By this period, however, industrial activity in Alexandria and trade on the Potomac was beginning to revive (Macoll 1977: 33). Coal shipments on the C & O canal peaked in 1875, at a total of slightly more than 900,000 tons for the year (Shomette 1985: 267-8). At the same time, a new type of ocean-going vessel was being developed specifically to carry high-bulk, low value freight which did not require speedy delivery. Three- and four-masted schooners with huge centerboards rather than fixed keels, allowing them to be used in shallow water, riverine harbors, began to appear at the ports of Alexandria, Georgetown and Washington. Many of the craft were built in Maine shipyards. Although rivalry between the local cities was again intense, they seem to have formed a single market during the last quarter of the nineteenth century. Many suppliers had warehouses and distribution points in more than one location, with ships delivering cargo to one site and loading freight in another. Alexandria possessed the advantage of being one of the few ports on the Potomac where goods could be transferred directly between ships and railroad cars (Shomette 1985: 266-7).

Coal was the basis of the trade. Schooners with fertilizer, building materials or other bulk commodities would deliver their cargos to Alexandria or Washington and move to Georgetown to load Cumberland coal at the Canal basin near the mouth of Rock Creek. A profitable trade grew up between Maine ice houses on the Kennebec River, some of which

were owned by Washington distributors, and the butchers, dairies and ice cream manufacturers of Washington, though it was in fact the return trip to Maine laden with coal which made the round trip worthwhile financially. One source has estimated that over 2000 ships delivered ice to Georgetown alone between 1880 and 1910 (Mitchell 1986: 78-83).

During the early post-war period, the Ford's Landing site, still the property of the Alexandria Marine Railroad, apparently lay idle. In 1874, a group of Alexandria businessmen formed a company to re-establish a marine railway and shipyard at the southern end of the waterfront (*Alexandria Gazette*, March 27, 1874). As had been the case with the original construction of the wharf in 1785 and with the establishment of the first marine railway in 1849, most of these men seem to have invested capital in the venture, but not to have been directly involved in its administration. At least one, Stephen Shinn, had been one of the organizers of the original Alexandria Marine Railway in 1849. The chairman of the newly organized company was Robert Portner. Born in Prussia in 1837, Portner had emigrated to the United States and established himself briefly in New York before moving to Alexandria shortly before the Civil War. Initially, Portner worked as a grocer and later operated a restaurant. By 1870, he had established what came eventually to be the largest brewery in the South, marketing beer under the trademarks "Tivoli" and "Vienna Cabinet." Before his death in 1906, Portner had invested in a wide variety of enterprises in Alexandria and Washington, D.C., the latter becoming his residence in 1881. There is in fact no evidence that Portner had any practical shipbuilding experience, and so the new facility was almost certainly an additional investment, based on expectations of revived commerce and renewed shipping on the Potomac.

Initial acquisition plans had focused on the former Hunter shipyard at the foot of Wilkes Street (*Alexandria Gazette*, March 18, 1874), but ultimately the group purchased the Franklin Street site of the Alexandria Marine Railway, calling the new establishment the Alexandria Marine Railway and Ship Building Company. The new owners enlarged the yard through the purchase of additional lots within the project area, until they owned the entire wharf. The first railway established by the new company was located in the northern portion of the site, either built over or reusing material from the earlier railway or the military railway. Fixed shipways were constructed, and a second railway was added, south of the original. Eventually, additional shipways were built.

The Alexandria Marine Railway and Shipbuilding Company was primarily concerned with repairs for the substantial fleet of coal and ice schooners on the Potomac. Many of these vessels would have followed a pattern reported in the log of the three-masted schooner *Samuel P. Hitchcock*, which brought ice from Maine to warehouses in Washington and Alexandria and loaded coal in Georgetown, but was "towed to Alexandria and hauled out on marine railway to paint" in 1882 (diary of Captain Freeman K. Reed, reported in a letter from W. J. L. Parker to Frederick Tilp, dated 12 Nov. 1973, Tilp papers, Calvert Marine Museum).

The company also repaired other craft. During an unusually hard freeze in January of 1875, for example:

the steamer *Keyport* is on the new ways, and the steamer *Virginia* on old ones; a new steam tug is being built for Capt. Matt Kersey;² the tug *Susie Moleynaux* is being rebuilt, and the tug *Gov. Curtin* is being repaired and having a new pilot house put on her. Work upon these steamers is in active progress, large numbers of caulkers and carpenters finding employment there, and, in addition, numerous machinists, who are engaged in overhauling and repairing the old, and adjusting the new machinery of the tugs and steamers mentioned. As soon as the *Keyport* is launched, the coaster *S.S. Tyler* will take her place on the ways (*Alexandria Gazette*, January 27, 1875).

Business was good, but not without problems:

The difficulty that existed with some of the employees in regard to the number of working hours has been settled, they all, with probably two or three exceptions having agreed to the company's rules—ten hours a day (*ibid.*)

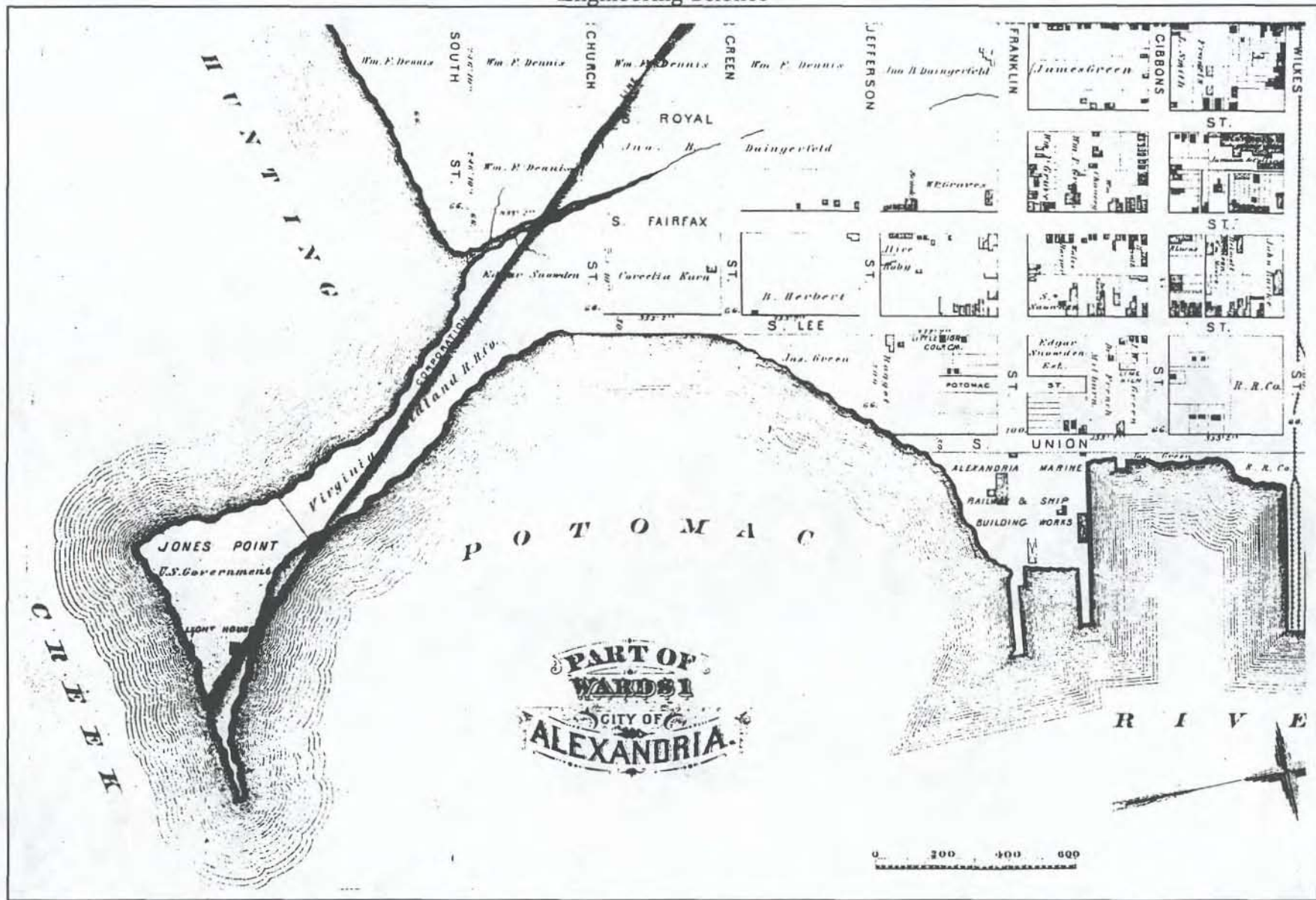
²The tug was the *William J. Boothe* (Shomette 1985: 253); Kersey was on the board of directors of the shipyard

Although repair work undoubtedly formed the bulk of the Marine Railway Company's work, ships construction was undertaken as well. In the mid 1870s, the new yard reportedly produced an average of ten vessels a year (Shomette 1985: 257). The first large vessel to be built was the 150 foot, 631 ton, three-master, the *Robert Portner*, launched in 1876. The next to be built was the 168 foot *James B. Ogden*, a three-masted schooner of 678 tons, completed in 1880. A notice in the *Alexandria Gazette* for September 21, 1880 reported the common belief that the firm had lost money on its first two large ships. The Democratic newspaper attributed the loss to the current Republican administration's tariff policy (Lyman 1952: 27).

As part of an assessment of American ship building completed for the U.S. Department of the Interior, Henry Hall, then business manager of the *New York Tribune*, visited Alexandria in 1881. He reported that the Alexandria Marine Railway and Ship Building Company had, in the four years since its foundation, built two large schooners and one tug and had repaired a large number of local river vessels (Hall 1884: 128).

In 1877, the G. M. Hopkins City Atlas of Alexandria documented the configuration of the site (*Figure 13*). The wharf was depicted with two piers reaching toward deep water. The larger of the piers, extending from the south corner of the wharf was somewhat irregular in outline. It followed the centerline of Franklin Street, and may have incorporated portions of the Civil War military railroad. The second pier, to the north, was shorter and extended the north line of the wharf, where a large building was located. Franklin Street no longer continued onto the wharf: two small structures faced Union Street on the west edge of the property. Another shed was located on the wharf, immediately to the north of the longer pier. Two substantial buildings, probably with chimneys, may have housed the engines providing power for the two marine railways located on the site. The railways themselves were not shown on the map, nor was the rail spur along Union from Wilkes Street. The map also did not record the shipways which are reported to have formed part of the yard; shipways seem to have rarely been shown on maps, perhaps because they were initially considered temporary structures used only for the construction and launch of a single vessel.

Engineering-Science



Source: Griffith M. Hopkins, 1877
Ford's Landing

Figure 13
Southern Waterfront, 1877

J.P. Agnew and the Alexandria Marine Railway, Ship Building and Coal Company

Shortly after Henry Hall's visit in 1881, the Alexandria Marine Railway and Ship Building Company came under the management of John Parke Custis Agnew. J.P. Agnew was born in Pennsylvania in 1837. Beginning in the iron business, he soon switched to coal, moving to Cumberland, Maryland in the 1840s or 50s. In 1857 he established himself as agent for the Frostburg Coal Company at the coal wharves at the foot of the Alexandria Canal (*Alexandria Gazette*, June 7, 1892).

The complex history of Agnew's enterprises in Alexandria is far from clear. Agnew purchased the site of the former Alexandria Foundry at Union and Wolfe Streets in 1877. In 1880, he reportedly set up an iron bloomery with six forges, a heating furnace and a twenty-one ton steam hammer. These facilities were probably located on the Wolfe Street site, and may have been connected with the plan to begin construction of iron ships in Alexandria, a project described by Henry Hall in that same year (Macoll 1977: 32). The Agnew and Company coal yards continued to occupy the foundry site into the early 1880s (Knepper and Prothro 1989: 18, 22).

Agnew took over the management of the Alexandria Marine Railway and Shipyard in 1881. Park Agnew, his eldest son (*Figure 14*), had been one of the original organizers of the marine railway in 1874, and was identified as president of that concern in 1876-77 (Chataigne 1877). The younger Agnew was born in Cumberland, Maryland and, like Portner, invested in a wide range of projects, not always successfully. The Agnews' shipyard, at Franklin and Union, was listed in directories of the period separately from the coal yards at Wolfe and Union (*Figure 15*). In September 1881, J.P. Agnew installed the first private telephone in Alexandria to connect the two (Macoll 1977: 34)).³



Figure 14. Park Agnew³

³*Alexandria Gazette*, July 14, 1910

A photograph taken in 1882 and identified as the "Alexandria Marine Railway and Ship Building Company" (*Plate 7*) showed the yard from a vantage point near Union Street, looking to the southeast. In the photo were two of the structures depicted on the Hopkins map, along with two large vessels. One ship was apparently under construction on the northern portion of the site. It rested on building ways on the ground, with its stern facing the river. The second vessel, a fully rigged, three-masted schooner, was hauled up on the southern marine railway for repairs; a portion of the railway was visible at the right of the photograph. A small structure with a chimney was located at the extreme left of the picture, probably the engine house for the northern marine railway. There was a covered shed between the two ships, and what appears to have been a pier on the south side of the site. Railroad tracks which were apparently unused were visible bending between the ways toward the water.

Not appearing in the photograph was the newly constructed, two story office building, which later maps showed to have been located along Union Street near the entrance to the yard. The structure was described as:

one of the best ship yard offices south of the Potomac. . .It is finished in hard wood, the doors are paneled in oak, and the wainscoating is of ten different kinds of native wood, so that builders can, at a glance, determine what wood they prefer the cabin of their vessel finished in (*Alexandria Gazette* July 3, 1882).

In 1883, J.P. Agnew purchased the Alexandria Marine Railway and Shipyard (Alexandria Deed Books 14:87,89). By this time, his principal coal operations had moved to Georgetown, and the Wolfe street yard was apparently no longer being used. Agnew and Company advertised in an 1883 Alexandria business directory as "retail and wholesale dealers of coal, with shipping yards at Georgetown, Alexandria and Baltimore" (Brockett and Rock 1883: 118) The address in Alexandria was then listed as the corner of Franklin and Union Streets (*Figure 15*). The Alexandria Marine Railway was now referred to in full as the Alexandria Marine Railway, Ship Building and Coal Company.



Plate 7. Vessels on Ways, 1882

In the early 1880s, William Crawford, an experienced shipbuilder from the Kennebunkport area of Maine, leased a portion of the Alexandria Marine Railway shipyard. Southern forests had by this point long been the principal source of supply for large timbers for Maine shipbuilders, whose own supplies had been exhausted by the mid-1830s. Crawford, and his son-in-law Charles Ward, were experimenting. By establishing themselves near the source of lumber, the Maine shipbuilders hoped to reduce shipping costs, as well as to have closer control over their timber supply. They also intended to continue to ship timbers to yards in the northeast. Moving the entire ship building operation closer to the source of supply may also have been in response to what many builders saw as excessive taxation in Maine (Lyman 1952: 28).

The yard was busy during this period. In July of 1882, Crawford launched the *Ellwood Harlow*, a three-masted center-board schooner built especially for the coal trade. The vessel measured 179 feet, had a capacity of 759 tons, and was constructed in five months at a cost of \$38,000, "which both Captain Edwards, the managing owner, and her builder, Mr. Crawford, say is as cheap as a vessel of her class could be built" (*Alexandria Gazette*, July 3, 1882). Several days after her launch, rigging began: "Mr. McFarland, of Baltimore, who is rigging the vessel, expects to have her ready for sea in less than two weeks" (*Alexandria Gazette*, July 10, 1882). Meanwhile, maintenance and repair work continued:

The yacht *Americus* and a small schooner, the *E.A. Johnson*, are on the ways at the same yard. The schooner *John P. Robinson* is receiving a coat of paint at the yard (*ibid.*).

In November of 1882, agreement was announced on construction of a 175 foot, four-masted schooner:

The work will be done under the management of Mr. W.H. Crawford, foreman of Messrs. Agnew's yard . . . Her frame is to be of the best white oak, with sheathing and planking of Georgia pine. She is to be a four master with engines for hoisting sails, anchors, &c., and her carrying capacity will be 14,000 tons . . . Her chief owners will be C.A. and J.F. Davis, of Somerset, Mass. (*Alexandria Gazette* November 15, 1882).

On the 21st of July of the following year, the launch of the four-masted *William T. Hart*, seen under construction in *Plate 8*, was reported with great excitement in the *Alexandria Gazette*. The *Hart* was the largest schooner to be built at any Alexandria yard:

LAUNCH OF THE SCHOONER WILLIAM T. HART. -- The four masted schooner *William T. Hart* which has for some time been in course of construction at the shipyard of Messrs. J.P. Agnew & Co., having, so far as her hull is concerned, been finished and painted, was committed to "its natural element" at twenty minutes to ten o'clock this morning (about the time previously announced) trimmed with flags on her decks crowded with people, in the presence of a goodly number of spectators -- much larger than at the first launch -- the temperature being lower, and the weather consequently more pleasant. In addition to the multitude in the yard and on vessels near by, Wind-Mill hill and all contiguous eminences were thronged with people, as were porches and windows wherever a view could be secured. The "wedging up" having been completed at an early hour, the remaining work -- that of cutting the blocks and props from under her -- was begun, and when two thirds of the same had been removed there was a snap and a gentle crash of some portion of the stocks, when cries of "here she goes!" rent the air, and the marine monster starting from its position, amid the hurrahs of thousands, the blowing of the whistles, ringing of bells, &c. glided into the water, sending swells in every direction, careening and shaking up the craft lying close by, and not stopping until nearly reaching the channel bank on the opposite side of the river where she was intercepted and towed back to the ship yard by the tug *Samuel Gedney*. As has always been the case with vessels built here, her symmetrical model caused her to float upon the water as gracefully as a swan . . . The spot over which the *Hart* was built is, we believe, the identical one on which formerly stood an old tobacco warehouse, the bowlshaped hole in the ground and a few bricks of the foundation of which had so long appeared as a sad reminder of an almost defunct Alexandria industry; but one and all rejoiced to think that trade had been superseded by one equally as important and that, too, at the same place (*Alexandria Gazette*, July 21, 1883).

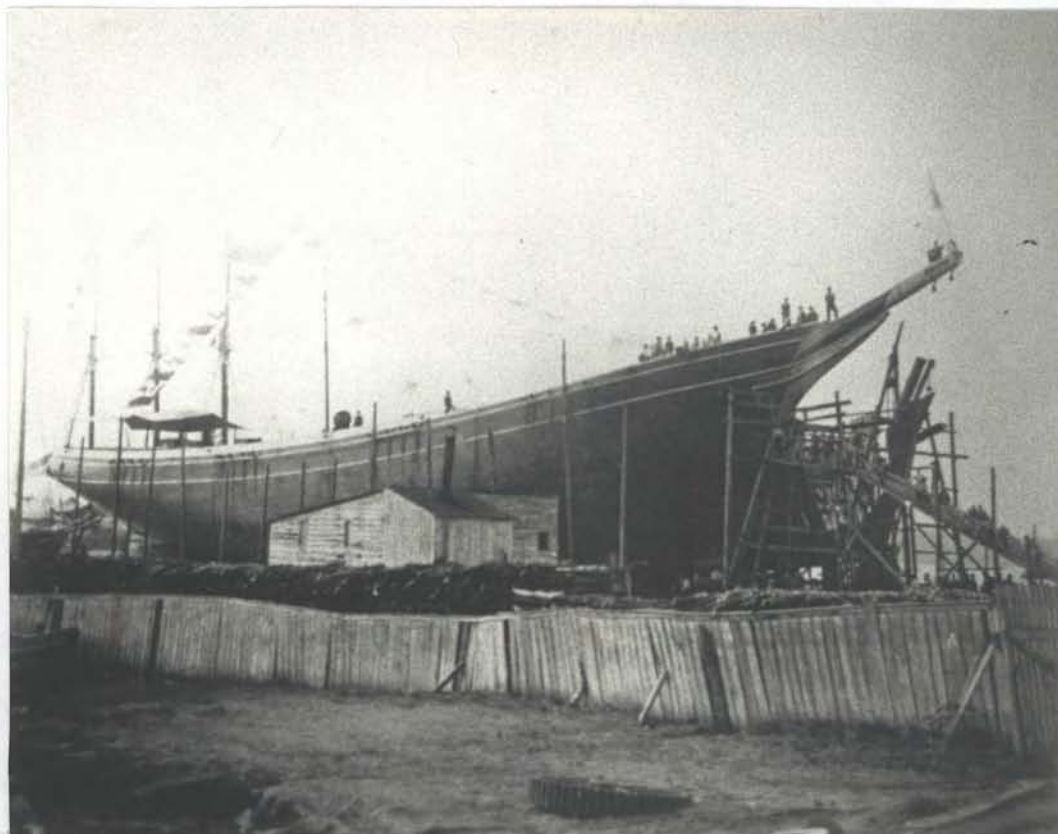


Plate 8. William T. Hart Under Construction

The warehouse mentioned in the report was probably that listed in the tax records for 1830 as belonging to James Keith.

One last large vessel was built at the Agnew ship yard: the *Henry S. Culver*, launched on about three months later, on October 27, 1883 (Morris 1973: 74). A note on the photograph of the *Hart* stated that the *Culver* was visible in the background. In fact, portions of vessels are visible on ways behind, or south of the *Hart*. The bow of one, in the initial stages of construction can be seen directly alongside the *Hart*. Farther back, a fully rigged 3 masted vessel can be seen drawn up for maintenance or repair work.

No further large schooners were built at the Agnew yards after 1883, and Crawford and Ward ultimately returned to Maine. The Alexandria Marine Railway, Ship Yard and Coal Company continued to prosper, however. The yard purchased two vessels from the Navy Department for salvage: the *Frolic*, "an iron side wheel steamer of 13,000 tons," bought for \$11,250; and the *Relief*, built in 1836, and bought for \$3,359 (*Alexandria Gazette* September 25, 1883).

Both vessels have been lying at the Navy Yard a long time and had become an eyesore. . . These two vessels will be brought to Messrs. Agnew & Co.'s ship yard in this city and broken up for the old material (*ibid.*).

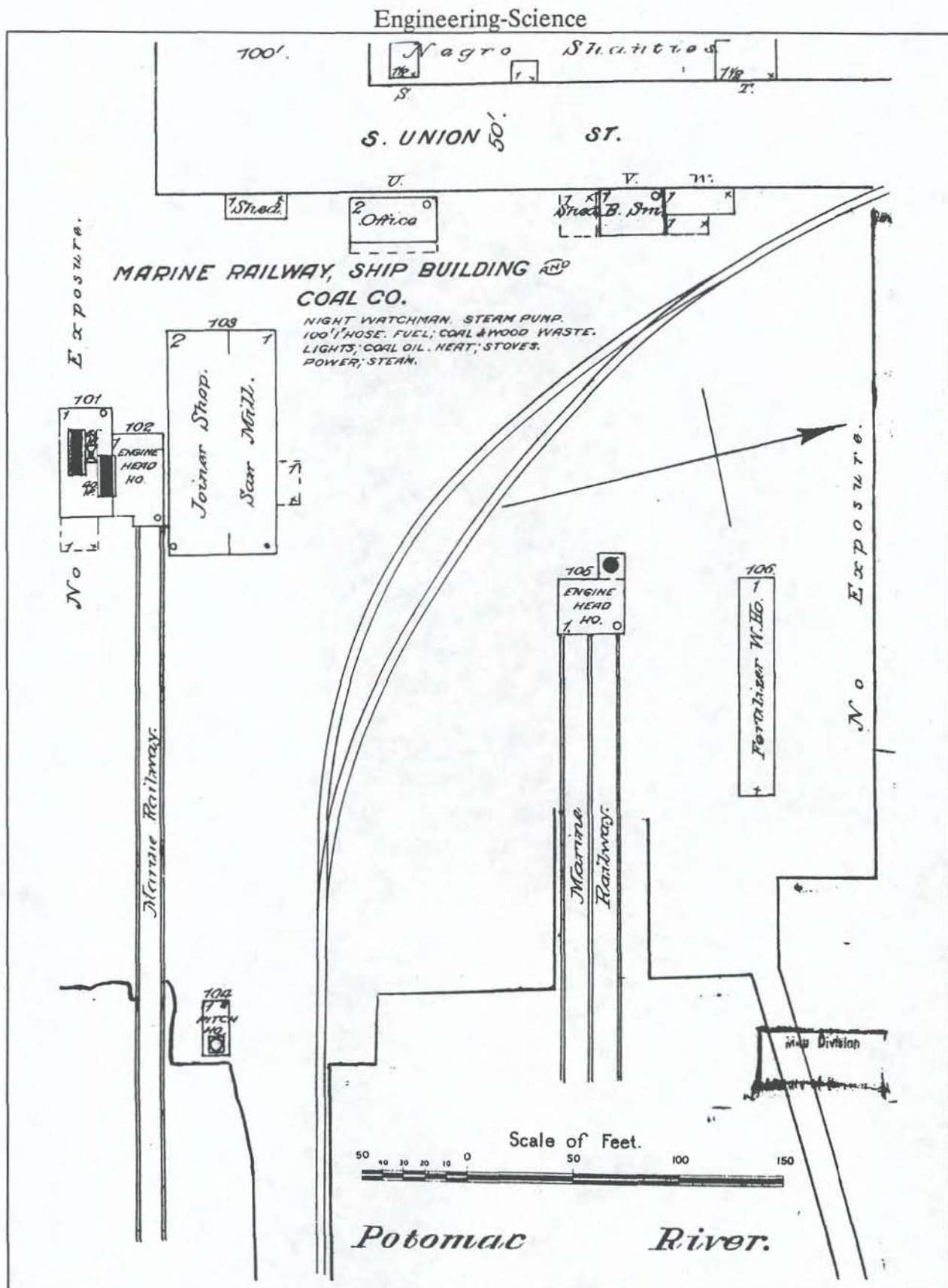
By 1887, Agnew was reportedly selling a half a million tons of coal annually, shipped to New York, New England and Southern ports (*Historical, Descriptive and Biographical Review* 1887: 56). The Alexandria offices and wholesale shipping yards for the concern were located at the Franklin Street site. The ship building facilities covered four acres and employed upward of 50 shipwrights and other hands. . . . These yards are equipped with the latest improved machinery and appliances, and the company is prepared not only to effect any repairs, but to rebuild hulls and make estimates for the construction of new vessels, of any tonnage. There are here two of the finest ways in the United States; captains who have tried them say that they are the easiest in the country and can take up to a 1000-ton ship as readily as an oyster pungy (*ibid.*).

Undoubtedly most of the firm's business during this period consisted of repair work to the dwindling fleet of ships and boats on the river. Smaller boats, including the local Potomac longboat, a slow but sturdy, shallow draft river transport vessel, which had

interested Henry Hall in the 1880s, continued to be built (Tilp 1983: 54). The *Alexandria Gazette* reported the laying of the keel for a new tug late in 1883 (November 27, 1883). In 1887 it was reported that the company was developing a "new type of steamship, whose speed it is the sanguine belief of the inventors will open a new era in ocean navigation" (*Historical, Descriptive and Biographical Review* 1887: 52). The Arrow Steamship Company was listed in the Alexandria Directory as being located at the same Franklin Street address as the Marine Railway in 1889, but there is no evidence that such vessels were ever actually constructed there.

Sanborn insurance maps provide a view of physical changes within the project area from 1885 into the twentieth century. The 1885 map (*Figure 16*) shows many of the same features as the Hopkins map of 1877 and gives more information on their uses. The small structure at the centerline of Franklin Street on the west edge of the property was identified as a shed. The other small structure on Union Street was gone, replaced by a complex of buildings including a blacksmith shop. A new brick office building had been constructed opposite the northwest corner of Franklin and Union Streets. The south pier was essentially unchanged, but the north pier now extended out from the corner of the wharf at a marked angle. The wharf itself had been drawn extending an additional 50 feet to the north, and the structure formerly on the north edge was now identified as a fertilizer warehouse. A small building near the water immediately south of the south pier was used to heat pitch for caulking the hulls of recently constructed or refitted ships. The building was probably located away from other structures to reduce the risk of fire.

The two marine railways were shown on the 1885 map. The shorter one to the north consisted of three tracks with a single engine-head house, a brick structure containing an upright boiler. The longer ways, to the south, were depicted with only two tracks. Two steam engines were located in a small structure to the south of the engine-head house for the south marine railway. The large building adjacent to the south engine-head house was shown as a two-story joiner's shop and saw mill. Although it was not identified as such, the second floor of this building may have been used as a mold loft for scaling construction plans for vessels. This building probably also housed the complete outfit of steam saws, used for cutting and squaring timbers, which Henry Hall described in his census report (Hall 1884: 128). The large building between the marine railways was not shown in 1885, but reappeared on later maps, identified as an open shed housing wood working. By 1885 a rail



Source: Sanborn Insurance Company, 1885
Ford's Landing

Figure 16
Alexandria Marine
Railway Wharf, 1885

spur was shown running along Union Street onto the south pier, in the location of the original military rails. Again, there were no indications of building ways.

The Sanborn maps of 1891 and 1896 (*Figure 17*) show few changes, except for the construction of a second railroad track onto the site, the addition of a small dwelling for a resident watchman, and the disappearance of the two story joiners' shop.

Later Enterprises

After 1900, the yard returned to the construction of ships for the river trade only, in addition to its repair work (*Plate 9*). The *George*, a 50 foot Potomac River longboat designed for hauling cordwood and stone, was built in 1917, when the yard was being managed by Charles Grover (Tilp 1978: 84). Photographs dating from about 1900 (*Plates 10-11*) showed a longboat being hauled out on the railway for repairs.

After 1900, portions of the property were leased to other concerns. The Sanborn map of 1902 (*Figure 18*), indicated that the Cheeseman Chemical Company used a portion of the site for the preparation of paint pigment. The northern railway was shown as not in use. The railway to the south was still active, and the engines had been upgraded from 45 and 65 horsepower to 50 and 75 respectively. The 1907 map (*Figure 19*) showed a portion of the yard leased to the National Electric Supply Co., a manufacturer of wooden insulator pins for telegraph and telephone lines. Fuel for the boilers was listed as wood shavings, a by-product of the National Electric Supply Company's operations transferred from sawmill to boilers by a drag conveyor. The 1912 map (*Figure 20*) showed only the Marine Railway, Ship Building and Coal Company on the site. The main buildings used by the National Electric Supply Company were gone or were labelled "no roof," and were clearly not in use.

Infilling of Battery Cove

Between 1911 and 1912, Battery Cove, the shallow bay stretching from the southern edge of Keith's Wharf southward to Jones Point, was used as a spoil dump for an extensive dredging project undertaken by the U.S. Army Corp of Engineers to improve navigation in the river and revive trade along the waterfront. Approximately one third of the current study area was created by the Corps of Engineers fill project.



Plate 9 Shipyard at Keith's Wharf, Early Twentieth Century
(view southeast from bluffs along Lee Street)

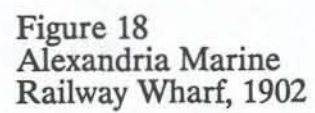


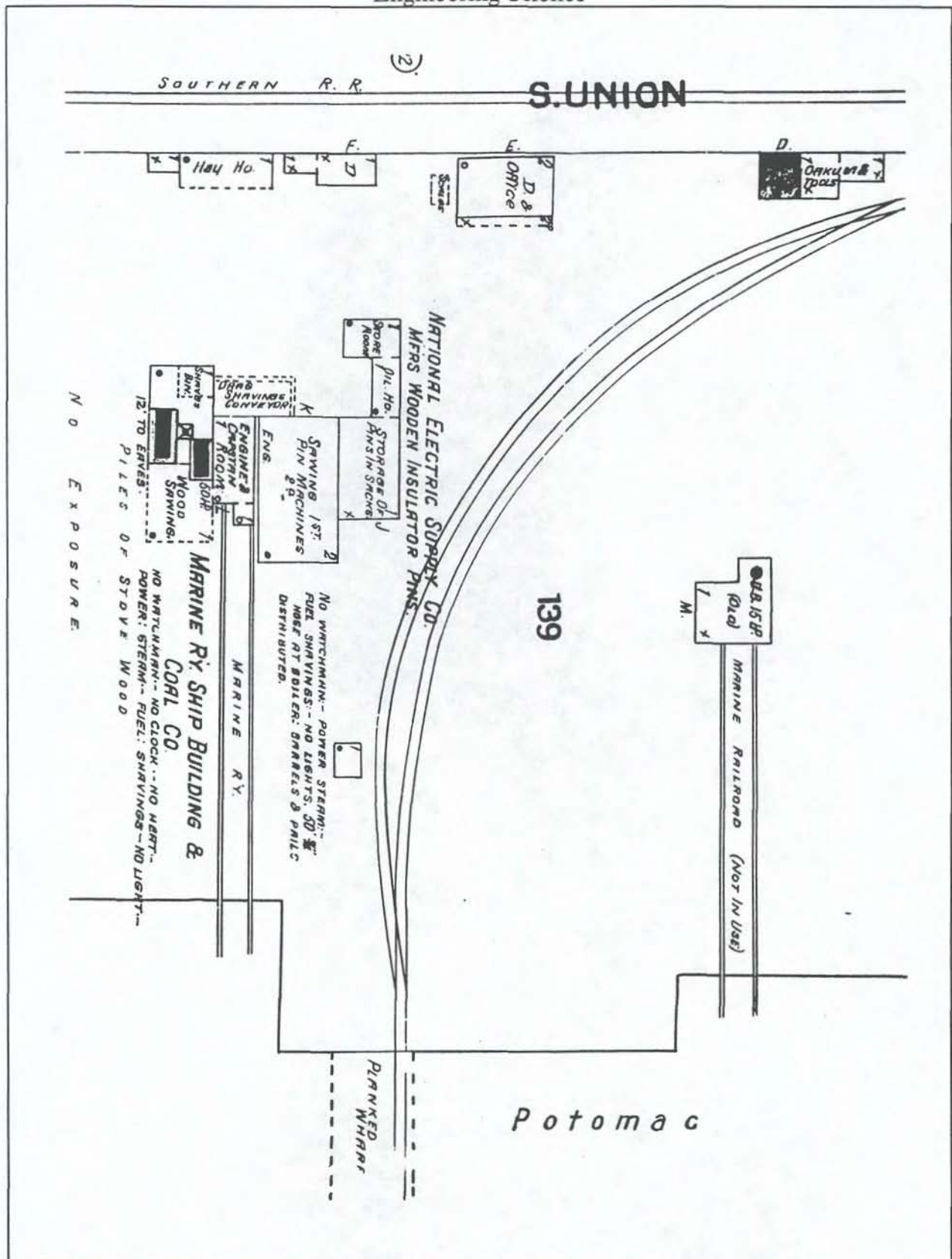
Plate 10. Potomac Longboat in Cradle of Marine Railway,
Early Twentieth Century



*Plate 11. Potomac Longboat in Cradle of Marine Railway,
Early Twentieth Century*

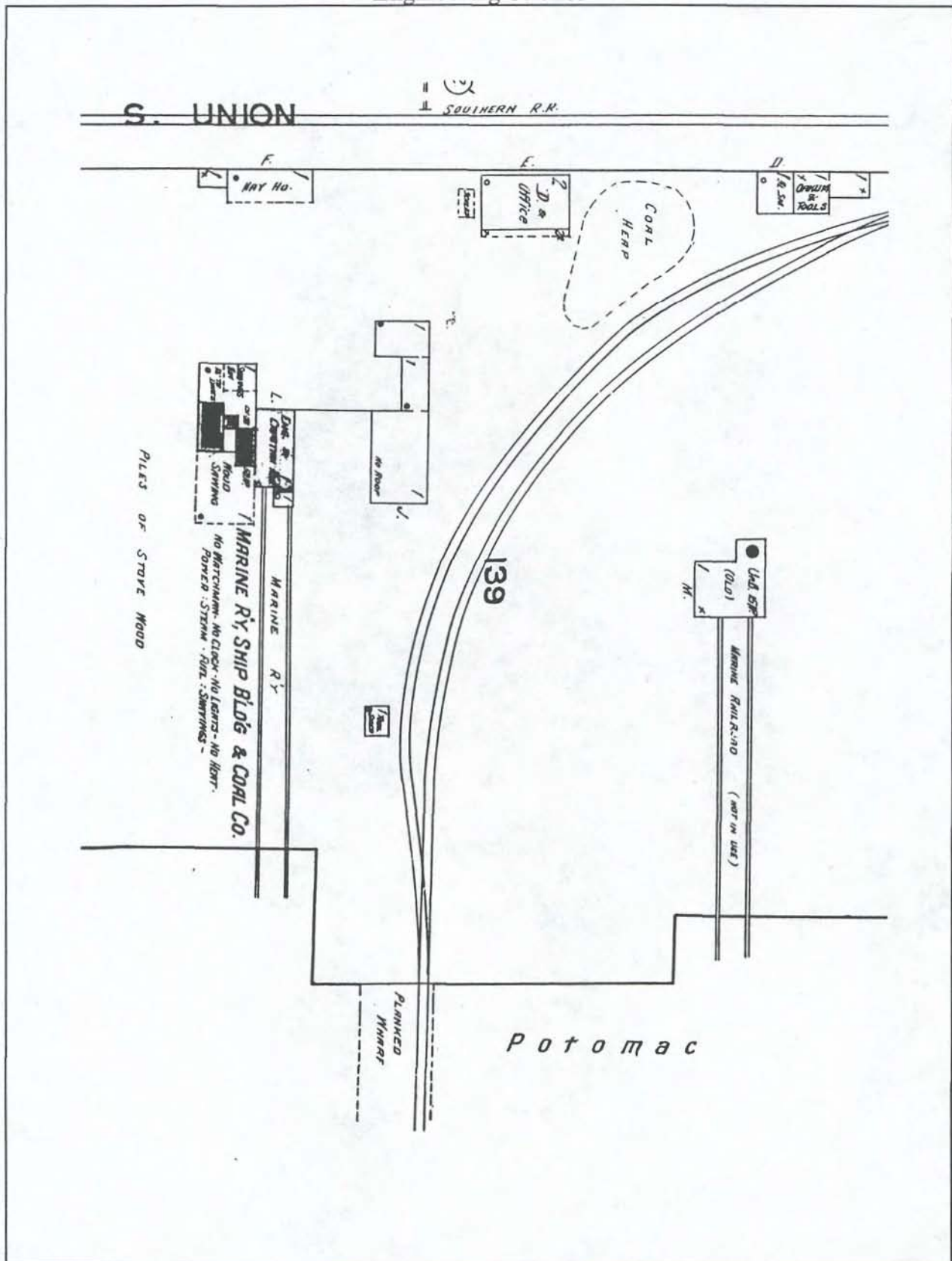
Figure 17
Alexandria Marine
Railway Wharf, 1896





Source: Sanborn Insurance Company, 1907
Ford's Landing

Figure 19
Alexandria Marine
Railway Wharf, 1907



Source: Sanborn Insurance Company, 1912
Ford's Landing

Figure 20
Alexandria Marine
Railway Wharf, 1912

Shoaling and sedimentation was a constant problem along the Alexandria waterfront. As early as 1875, private wharf owners had resorted to dredging to keep their wharves open. Silt build-up continued to hamper trade through the nineteenth century. Problems increased markedly late in the century with the sinking of a 300 foot barge (in reality a converted steamboat hull) at the northern end of the waterfront, off the Alexandria Canal Wharf, during the great Potomac flood of 1889. The massive barge diverted the main channel of the river towards the Maryland shore, increasing the rate of silt build-up along Alexandria's wharves, particularly at the north end of the town (Shomette 1985: 278-80, 282). In 1908, the city petitioned the U.S. Army Corps of Engineers to remove the steamship hulk and to dredge the area between the piers and the main channel. The project was eventually approved, and dredging was carried out during 1911-12. A total of 688,000 cubic yards of dredged material was deposited in Battery Cove between Agnew's Wharf and Jones Point, creating approximately 46.5 acres of new land lying an average of 3.5 feet above the current low water mark. The spoil was deposited behind a 2,730 foot long retaining wall of rip rap, or uncoursed stone, also constructed by the Corps of Engineers (U.S. Army Corps of Engineers 1911; 1912). The northern end of the retaining wall was designed to preserve a dock area to the south of the Alexandria Marine Railway, allowing operations to continue there. Photographs of the cove taken as the filling operations began (*Plates 12-13*) depicted several derelict vessels at the north end of the bay, portions of which were located in the course of the current archaeological excavations. No evidence has been found of any of the "fifteen small wrecks and five logs" which were removed during the course of dredging the main channel. According to the annual report of the Corps of Engineers for 1912, these materials were secured ashore, but the exact location was not identified (U.S. Army Corps of Engineers 1912: 1667).

A suit laying claim to part of the newly created land was brought by the Southern Railroad, Michael B. Harlow, the estate of Park Agnew and the estate of Cecelia L. Carne (*Figure 21*). The suit complicated the wartime formation of the Virginia Shipbuilding Corporation by the Groton Iron Works, whose yard was constructed in 1917 on the reclaimed land north of Jones Point. Until the suit was settled, land was rented, rather than sold, to Groton, and the rent money placed into a repository account (National Archives, RG 77, 83810, 14). The case, *U.S. vs. Marine Railway and Coal Company* (At law No. 54, 872), was eventually heard by the U.S. Supreme Court, which decided against the Railroad on October 21, 1921 (Court of Appeals, 24-25).



Plate 12. Infilling of Battery Cove, 1911
(View northeast; barges in foreground--Feature 31, left, Feature 2, right; marine railway -- Features 18 and 19--in background)

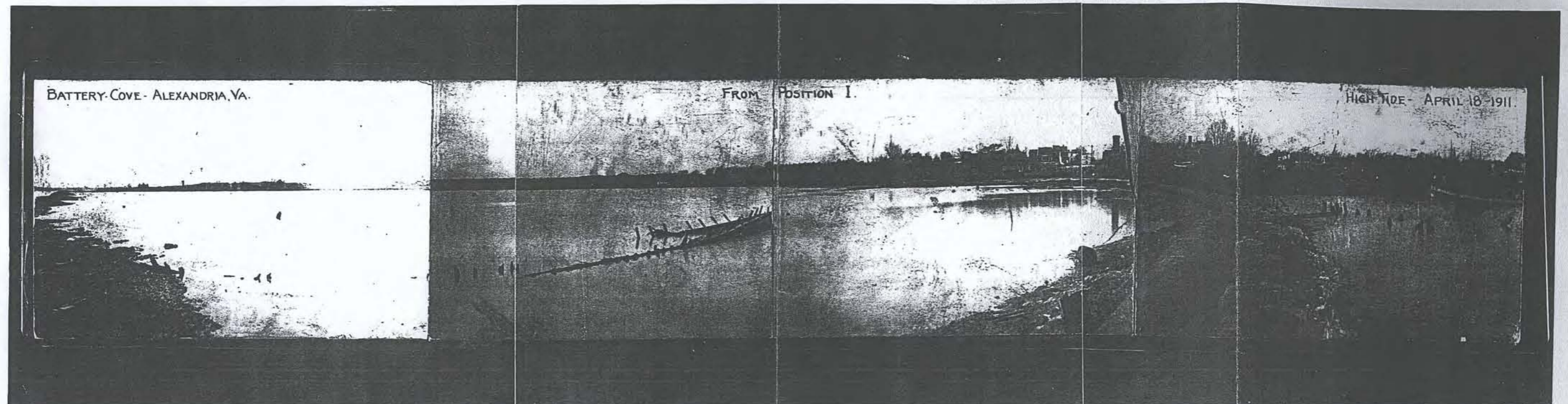


Plate 13. Battery Cove During Infilling, 1911

(Panoramic view toward the west; schooner, probably Feature 37, in foreground; marine railway, Features 18 and 19 in background; spoil pipeline to the right of the photograph)



Following the completion of the Corps dredging project, the Marine Railway Company continued its private dredging activities on both the north and south sides of the site, requesting permission to deposit the spoil on the Battery Cove site on four different occasions between 1918 and 1922. In 1926, the Corps' annual report noted that the fill of the Battery Cove area included 60,000 cubic yards of private dredging, probably consisting almost entirely of material removed from the adjacent site (U.S. Army Corps of Engineers 1926). In 1920, the yard was sold to E. A. Livingstone, who reorganized the venture as the Marine Railway and Terminal Corporation, with himself as president and R. E. Grover continuing as manager (Hill Directory, 1920). The railway was depicted on the Sanborn map of 1921 (*Figure 22*), and a photograph taken in the early 1920s (*Plate 14*) showed three two-masted sailing vessels moored at the wharf, suggesting that the facility was still busy at the time.

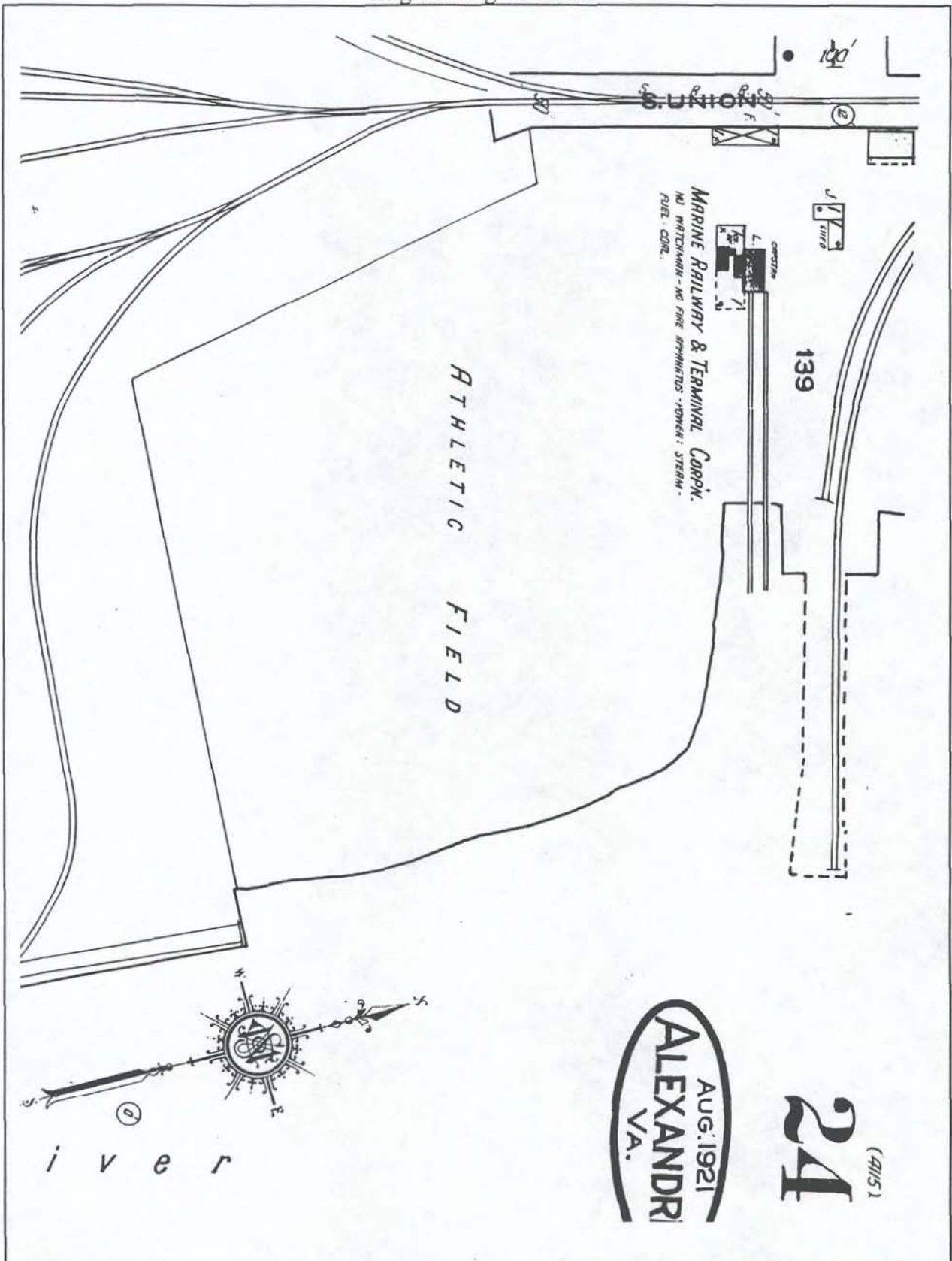
The marine railway survived until 1923. The Aquia Creek quarry, south of Alexandria, was re-opened in 1922 by the George Washington Stone Company. In June of 1923, the company purchased the Marine Railway property from Livingstone (Alexandria Deed Books, 77:123), and held it as part of the Aquia Creek Quarries Corporation. The wharf, listed on a Corps of Engineers map of the waterfront from 1923 as the "Aquia Creek Quarries Corporation Wharf," was used to house heavy stone milling equipment. A pier extended out 250 feet into the Potomac to a depth of 30 feet, making this the only stone mill in the country at that time which could accommodate ocean-going vessels at its docks (Tilp 1978: 248). In addition, the four acre site was served by trunk lines of six different railways. The sandstone from the tidewater quarries was shipped to Alexandria by barge, and there was cut and shaped.

According to promotional material released by the owners, the finishing plant was the most modern on the East Coast (Tilp papers, Calvert Marine Museum).

A survey conducted in 1926 by the Corp of Engineers of the port facilities Alexandria, made no reference to the stone milling operation, however. It documented the use of what it continued to refer to as "Agnew's Wharf" as "unloading pulp wood: public use," and went on to describe the wharf as having no transit sheds, no mechanical handling facilities, no lighting, and as being in generally poor condition (U.S. Army Corps of Engineers 1926).



Plate 14. Aerial View of Southern Alexandria Waterfront, Early 1920s
(Virginia Shipbuilding Corporation yard in foreground and three vessels
at end of Ford's Landing piers)



Source: Sanborn Insurance Company, 1921
Ford's Landing

Figure 22
Alexandria Marine
Railway Wharf, 1921

The Ford Plant and Later

In 1931 the wharf property was purchased by the Ford Motor Company, which immediately began the construction of a large, two story brick structure designed by the noted industrial architect, Albert Kahn (Alexandria Deed Books, 109:70) (*Plate 15*). Much of the factory building was constructed on piles, replacing the two piers of the old Agnew wharf and covering any remaining evidence of the northern part of the Agnew ship yard (*Plate 16*). A new concrete wharf and pier surrounded the factory, with sufficient depth of water to permit large ships to unload parts and supplies (*Plate 17*). Dock space to the north and south of the plant remained open (*Plate 18*), although maps of the area produced by the U. S. Coast and Geodetic Survey show the area of water on the south steadily diminishing. The Washington Branch of the Ford Motor Company officially moved from its previous location on Pennsylvania Avenue to the Alexandria waterfront site in October of 1931. By mid-March of 1932, the parts branch closed as a result of the deepening Depression. The Alexandria Branch remained open as a sales office until a parts service operation was restored in April of 1934 (Ford Motor Company 1941).

In 1942, the Ford Plant was purchased by the U. S. Government for use as an annex to the Navy Torpedo Factory located at Union and King Streets. In 1943, a two story concrete annex was constructed on the west end of the Kahn building, along with a smaller, rectangular structure south of the main building to house power generating equipment, and an adjacent underground storage tank. Additions in 1954 included a machine shop, north of the Kahn building, a small annex to the concrete power house, and four Quonset huts erected south of the main buildings for storage. During the years since its purchase by the government, the structures have been used as a Naval Reserve facility, and since 1960 as a storehouse for the General Services Administration, housing a variety of items ranging from blank forms to evidence in tax cases, and as a government motor pool. The property was declared surplus by the government in 1983 and put up for auction.

It was purchased in 1984 by Cook Inlet Region, Inc., one of 13 corporations established by the federal government under the 1971 Alaskan Native Claims Settlement Act, to administer compensation for lands seized during the purchase of Alaska in 1867. Present plans call for renovation of the property as a luxury residential development, Ford's Landing.





Plate 16. Construction of Ford Plant, June 1932



Plate 17. Construction of Ford Plant, August 1932



Plate 18. Ford Plant and North End of Battery Cove, 1933

Archaeological Findings of the Period.

The majority of the archaeological material remains found during excavation were from the latter half of the nineteenth century, which is not surprising since this is the period in which the Ford's Landing site was most intensively used. In addition to the nineteenth-century bulkhead (Feature 23), substantial remains were found of the Marine Railway, the shipway (Feature 1), and eight derelict vessels, including two round-ended scows (Features 27 and 34), two square-ended barges (Features 29 and 31), a longitudinally planked barge lying beneath a nineteenth-century bulkhead (Feature 30), barge sections used in construction of the nineteenth-century shipway (Features 32 and 38) and the bow and midships portion of a keeled vessel (Feature 37). Material remains were recovered from activities associated with the operation of the marine railway, shipway and the National Electric Supply Company (1910), as well as other activities on the property during the period.

The most extensive use of the wharf came after the mid-nineteenth century, when the site saw concentrated maritime industrial activity over a period which lasted into the early decades of the twentieth century. A series of shipyards, originally linked with the New England coal trade, operated on the wharf during the last quarter of the century. The yards were fairly advanced for the late nineteenth century, apparently relying on steam to power much of the mechanized equipment. Steam is generally considered a twentieth-century technology in maritime industry, but was in use at the yards on the wharf by at least the mid-1880s. A number of slips, both permanent building ways and marine railways, were in operation, and most were capable of accommodating the largest vessels plying the coastal and riverine routes.

Disappointingly little physical evidence of the yards remained on-site, other than the bases of several structural features associated with one of the marine railways and the remains of a building slip at the southern edge of the yard, the latter appearing to have been unused. On the basis of stratigraphic analysis, the lack of other shipyard materials, and especially of tools or construction debris, was credited to extensive grading during later twentieth-century development of the property. Thus, scant evidence was available of the particular equipment or construction methods employed during a given period of ownership, or of changes in technology at the site through time. Similarly, little evidence was encountered of domestic activity at the site, but for seemingly different reasons. Documentary evidence suggested that, in fact, few structures on the property were used as

residences. The types of artifact recovered from the area, consisting of either industrial materials of non-specific use, such as nails, spikes, wire or sheet metal, or of bottle glass -- mostly beer, liquor and milk bottles -- as well as a small amount of domestic ceramic material, suggested the presence of non-residential laborers around the turn of the twentieth century.

The cove was a ships graveyard, and the vessels found may have been hauled in from a variety of locations to be abandoned there. Yet all of these vessels documented in the excavations were typical of the types of vessel serving the wharf at various periods. Barges and scows hauled coal from the canal heads in Alexandria and Georgetown to load coastal vessels headed north to New England. Small boats, including the occasional dory or bateau, would have been common around the wharf, servicing large vessels anchored in the channel, for example. The scow hulls were used on this site as platforms for the repair of vessels careened or hauled down near the edge of the wharf, or as staging platforms or pontoons supporting machinery during the infilling of the cove. Some of the barges were eventually reused in the construction of new vessels at the site.

IV. PREVIOUS INVESTIGATIONS

Early Exploration

The maps and other records resulting from Captain John Smith's voyage up the Potomac in 1608 represent the earliest historic documentation related to the region encompassing Alexandria and the present study area. As previously noted, Smith marked on his map the locations of four Virginia Algonquian villages near the present site of the city. The exact locations of these settlements have not been confirmed, but all appear to have been situated outside the boundaries of the city itself.

Nineteenth-Century Investigations

The late nineteenth century saw a flurry of interest in North American antiquities. The local area was no exception, particularly with the proximity of the U.S. National Museum (later the Smithsonian Institution), which promulgated a considerable amount of research. S.V. Proudfit's late nineteenth-century study "Ancient Village Sites and Aboriginal Workshops in the District of Columbia" (1889), for example, recorded sites across the area, including one at Gravelly Point (now designated 44AR20), at the confluence of Roaches Run and the Potomac River north of National Airport, and another at the confluence of Four Mile Run and the Potomac (44AR12), beneath the southern end of the airport.

Working with the Bureau of American Ethnology of the National Museum, also in the late nineteenth century, William Dinwiddie, William Henry Holmes and Gerard Fowke surveyed portions of the Tidewater Potomac, collecting artifacts and locating sites of aboriginal occupation (Holmes, Dinwiddie and Fowke 1891). Though the provenience information recorded in the survey was not site-specific, the study did result in the plotting of the general locations of sites, including one near the mouth of Hunting Creek, where Cameron Run meets the Potomac estuary, in the vicinity of the present neighborhood of Belle Haven. Unfortunately, collections from many of these early surveys are missing, and thus even the poorly provenienced data are not available for analysis as to chronology or site function (Bromberg 1987).

Modern Prehistoric Investigations

After a long hiatus in systematic research, modern archaeological surveys have begun to extend knowledge of prehistoric land use in the area. With the foundation of Alexandria Archaeology in 1977, a recompilation of all known archaeological sites within the city was undertaken. This survey documented the locations of 22 prehistoric sites, most of which (44AX6, 44AX12, 44AX26 and others) consisted of undifferentiated lithic scatters without chronological diagnostics, located in upland settings along Holmes Run in the western portion of the city (Henry 1983). Three sites were located in upland areas along Four Mile Run, including two lithic scatters (44AX32 and 44AX36) and a short-term occupation site with Middle Archaic diagnostic material (44AX31). A stream terrace site (44AX17), located north of Cameron Run, contained evidence of Early Archaic use. The only site recorded on the Potomac shoreline (44AX53) was located on Jones Point, a mile below the Ford's Landing site at the south end of Battery Cove. The site was the subject of a recent study by LeeDecker and Friedlander (1985), in which lithic material and ceramics were recovered as a result of backhoe trenching, indicating occupation during the Late Archaic and Middle Woodland periods.

A somewhat larger number of sites has been recorded along the southern portion of the Hunting Creek/Cameron Run drainage, in Fairfax County. A Middle Archaic, Halifax Phase quarry related site was situated on a stream terrace along the east bank of Pike Branch, one-half mile below Cameron Run in Jefferson Manor Park (Bromberg 1987). A cluster of sites located in the Loftridge development on upland ridges above a southern tributary of Cameron Run was investigated by the Fairfax County Archaeological Survey (Johnson 1982). The sites in this area included lithic scatters and short-term occupation sites, several with diagnostic materials ranging from Middle Archaic Halifax to Late Woodland.

A survey of the Mt. Vernon Memorial Highway, completed in 1985 by the National Park Service, identified 13 prehistoric sites between Great Hunting Creek and Little Hunting Creek (Inashima 1985). They included shoreline sites, such as a base camp occupation site (44AX723) located north of the Belle Haven Marina, containing artifacts dating from the Middle Archaic through Late Woodland periods; a Middle Woodland base camp (44AX713) with a Popes Creek component situated some four miles south of the city; a similar Middle Woodland site (44AX618) several hundred feet to the south, this with a slightly later,

Mockley component; and a Late Woodland base camp (44AX211) at Sheridan Point, near Fort Hunt Park, where the river takes a westward bend towards the mouth of Dogue Creek.

Modern Historic Investigations

Research into Alexandria's historic past has been shaped by the work of Alexandria Archaeology, established in 1977. Emphasis has been placed on the concept of the "city-site," focusing on historical development within a city-wide context. The three major developmental periods, described earlier in the historic background summary, have been recognized in the city's history, and are used as a basis for many aspects of historical analysis. The periods include:

Mercantile Capitalism (mid-eighteenth century) Indigenous
Commercial Capitalism (late eighteenth to mid-nineteenth century) Industrial
Capitalism (late nineteenth to early twentieth century) (Cressey and Stephens
1982; Cressey 1985).

With the assistance of a knowledgeable and enthusiastic volunteer force, Alexandria Archaeology has conducted numerous archaeological investigations within the city, including extensive work at the Lee-Fendall House at Washington and Oronoco Streets, the Stabler-Leadbeater Apothecary Shop in the 100 block of South Fairfax Street, the McLean Sugar House, site of a nineteenth-century sugar refinery at Cameron and Alfred Streets, and at Fort Ward, on Braddock Road.

Recent work conducted by outside consultants has included two reconnaissance surveys of the Cameron Run Valley, one conducted in 1979 for the Alexandria Regional Preservation Office (Klein 1979), and a second by Louis Berger Associates for the Virginia Department of Transportation (1989). These surveys located fourteen historic sites, while concluding that the area in general was extensively disturbed. The Cameron Mills site, (44AX112), identified in the 1979 survey, was an early industrial site north of Cameron Run near the Eisenhower Avenue Metro station. The site of two late eighteenth-century grist mills, Cameron Mills was recently surveyed archaeologically as part of the city's newly adopted archaeological review ordinance (Knepper and Pappas 1990).

Salvage excavations were conducted in 1982 at the Carlyle-Dalton Wharf at the lower end of Cameron Street, which documented the remains of large, yellow pine timbers related to wharf underpinning. The results of these excavations were incorporated into a master's thesis surveying wharf technology on the eastern seaboard (Heintzelman 1985).

Survey and testing conducted at Daniel Roberdeau's Wharf, on South Union Street between Wolfe and Wilkes, two blocks north of Ford's Landing, yielded evidence of long-term, heavy industrial activity (Knepper and Prothro 1989). Earlier, in 1977, volunteers from Alexandria Archaeology uncovered a large wooden vat and a cache of wine bottle glass at the site of an eighteenth-century distillery run by Roberdeau on the property across Union Street from the wharf (Steven Shephard, personal communication 1989). Roberdeau's Wharf was constructed as a solid fill wharf in the 1790s. The site was later the location of Hunter's Shipyard, one of the earliest shipbuilding concerns on the waterfront, and a yard which operated almost continuously, under various owners, until the early twentieth century. The pine tar and sawdust surface of a shipwright's workshop and areas of sandy wharf fill were located during the excavation of exploratory backhoe trenches, along with the superimposed remains of several brick and stone buildings. Also encountered were the remains of an early nineteenth-century brewery, a mid-nineteenth-century foundry and locomotive works, and an early- to mid-twentieth-century electric power generating plant which incorporated portions of the earlier foundry structure into its design.

Finally, a Phase I archival study was conducted in 1986 for the Ford's Landing property, then referred to as the Old Ford Plant (Cheek and Glendening 1986). This study documented land use at the site from the late eighteenth through mid-twentieth centuries, and predicted the presence of significant archaeological remains dating to each period of activity. Somewhat later, a limited, Phase IIa archaeological survey was conducted by Engineering-Science, Inc. (Artemel et al. 1988). Backhoe testing included trenches in the northwest corner of the site, north of the two-story concrete annex west of the Ford Plant building; along the west edge of the property; and in the southwest corner, at the edge of the infilled Battery Cove. Testing was hampered by the presence of a thick wire-mesh-reinforced concrete slab extending across much of the area. Nonetheless, artifacts and features were documented which were tentatively identified as related to the eighteenth-century wharf and to nineteenth-century coal shipping and light industrial use of the site. Further survey and testing was recommended. An official site form was later submitted to the Virginia Division

of Historic Landmarks (Virginia Department of Historic Resources), and an official trinomial designation, 44AX119, was issued. Based on the findings of these two studies, further testing was recommended at the site, resulting in the present study.

V. MARITIME TECHNOLOGY

Due to the specialized nature of the resources documented at the Ford's Landing site, a summary of certain aspects of maritime and nautical construction technologies is presented as a background for discussions which follow. The distinction made between the terms "maritime" and "nautical" is one of compass or scope. Maritime is a general term describing things at or near the sea. In contrast, nautical is used specifically in relation to ships and boats. The general nature of the present investigation is, then, maritime, whereas certain components of the site are more particularly nautical in character. Definitions of other terms used in the exposition which follows are included in Appendix A.

Wharf Technology

A wharf, as defined throughout the eighteenth and nineteenth centuries in the United States, was a substantial structure built on the shore of a navigable body of water to permit the mooring of boats and ships for the transfer of cargo or passengers. Wharves were, in effect, land reclamation projects, extending the shoreline into the harbor, either to bridge areas of shallows or merely to provide new land surface along a crowded waterfront. Wharves typically consisted of two main components: 1) a retaining framework, and 2) fill. The structure produced was often quite large, and was sufficiently solid to support the weight of warehouses, retail, industrial and residential structures (Wilson and Moran 1980: 6).

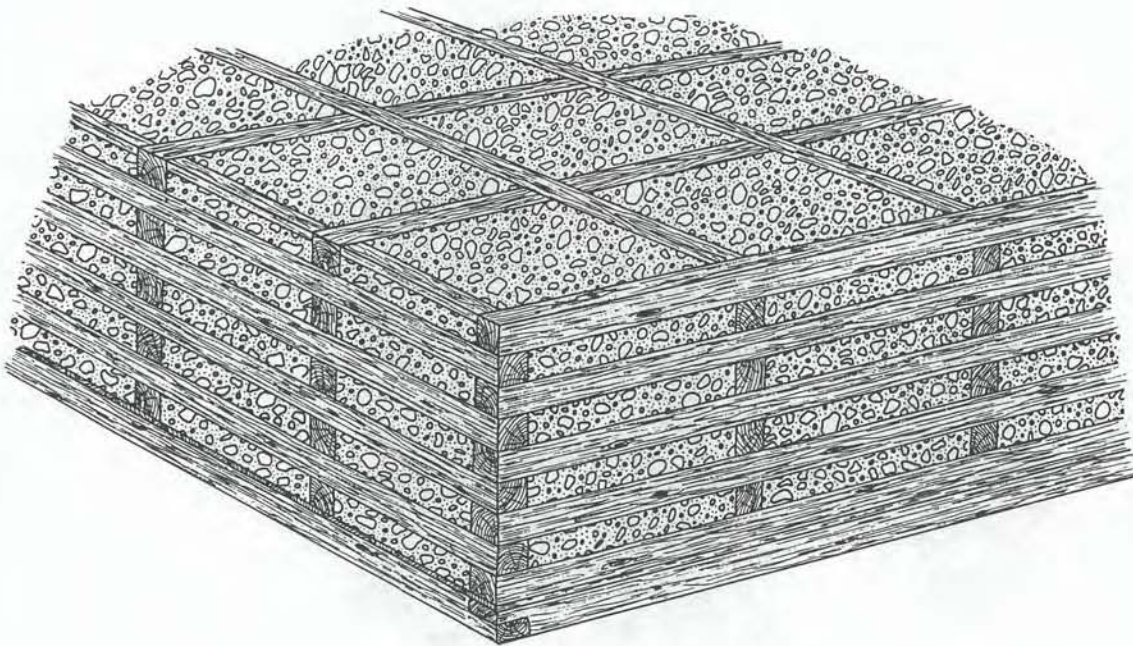
Depending on the orientation relative to the shoreline, a wharf was referred to as marginal (parallel to the shore) or projecting (extending into the water at right angles to the shore). Marginal wharves were traditionally known as quays in Europe, and that term, sometimes spelled "keys", was occasionally used in the United States. Projecting wharves eventually came to be called "piers", and by the early twentieth century, the term "wharf" was used only for marginal structures (Greene 1917: 1). During the eighteenth and early nineteenth centuries, however, a pier usually referred to a less substantial structure, usually a wooden floor supported on cribs or piles, extending out to deep water (Wilson and Moran 1980: 5; Norman 1987: 7). Vessels would moor at the sides or end of the pier, but the structure itself was not sufficiently strong to support large buildings. A dock or slip was differentiated from a wharf in that a dock represented the body of water defined by adjacent wharves or piers: the dock was the area in which vessels sat when moored (Greene 1917: 1-2). Wharves and piers were often used in combination (Hodgdon 1923: 440). The builders

of Keith's Wharf in Alexandria reported their intention of adding "commodious piers and docks for the reception of shipping" to the end of their wharf (Harper *et al.* 1785). It is not known whether their intention was ever implemented, though piers were eventually added, as depicted in a variety of maps of the wharf in the nineteenth and early twentieth centuries.

Wharf building technology in the eighteenth century provided a wide variety of choices, both for fill-retaining structures and for the fill itself. The retaining walls used to contain wharf fill could be constructed of wood or stone: wood was the typical material for wharf construction in the United States, while stone was a more traditional material in Europe (Wilson and Moran 1980: 6). Stone was used occasionally during the early Colonial period in New England, but was not common until the mid-nineteenth century (Hodgdon 1923: 440; Heintzelman 1986: 125).

The classification of wooden fill-retaining structures used in wharf construction is based largely on a growing body of archaeological data. Contemporary descriptions are often ambiguous in their terminology. In fact, very little was written concerning wharf construction technology until the twentieth century, at a time in which a number of eighteenth- and nineteenth-century techniques were no longer in use. Four general categories of wooden fill-retaining structures have been recognized: 1) cob/crib, 2) bulkhead, 3) grillage, and 4) pile.

Cob/Crib Wharves. The technology of cob wharves is quite old, extending to the medieval period, and possibly to classical antiquity (Geismar 1987: IV-2). Cob wharves consisted of open grids of rectangular cells, made up of logs or roughly squared timbers (*Figure 23*). The number and configuration of cells depended on the size of the wharf. A small wharf (probably no more than about 25 feet square) could consist of a single large cell (Norman 1987: 8-9). Long, narrow, projecting wharves might be formed by a row of individual cells. Larger, wider wharves would consist of many cells forming a block. In a slightly different configuration, cells were occasionally aligned in an open U-shape with the arms resting on the shore to form a frame, the interior of which would be filled with rocks or earth (Hodgdon 1923: 440).



Source: Engineering-Science

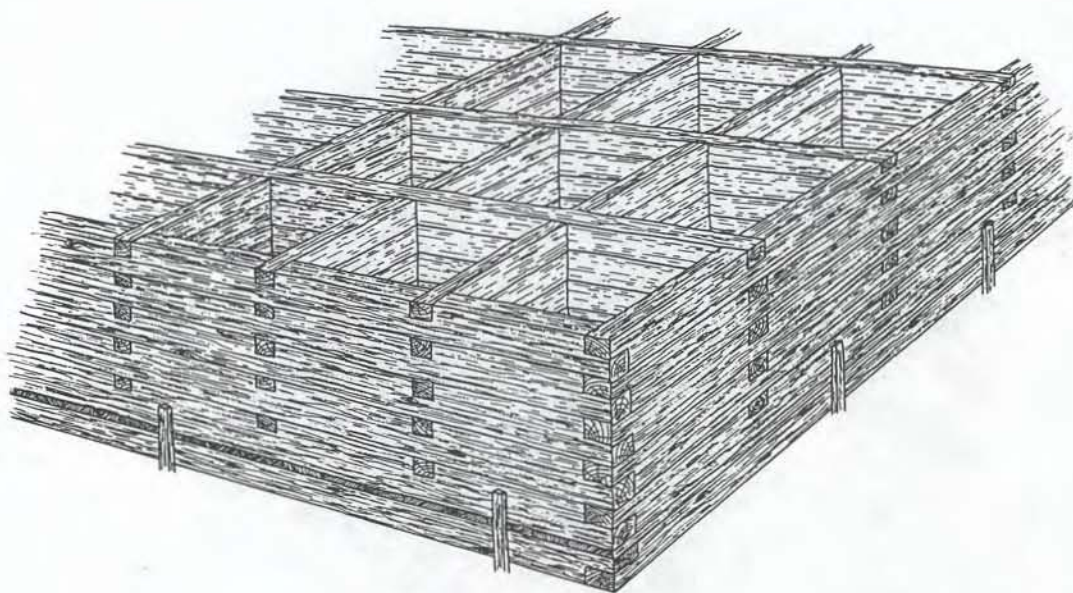
Figure 23. Cob Wharf Construction

The timbers used in construction were commonly 40 to 50 feet in length and 12 to 15 inches in diameter (Cunningham 1904: 105). Bark was often left on the timbers to retard decay. The ends of the logs were dovetailed or notched and interlocked to form a rigid structure. The gridwork was open, with large spaces remaining between parallel logs, and a floor of roughly finished logs or planks usually placed at, or near, the bottom. The wooden framework was constructed on the shore near the point at which the wharf was to be located and when finished, would be floated into position at high tide. The cells of the grid were filled with loose rocks and cobbles and allowed to sink to the bottom, which had usually been prepared beforehand. Additional layers of logs might then be added to raise the frame to the desired elevation above the high water mark. The logs above the waterline were usually somewhat more finished than those below (in part for aesthetic reasons) and were closely fitted to hold the finer fill which was used near the top of the wharf. A second floor of planking would occasionally be added near the top of the structure to hold the gravel, sand, or mud which constituted the uppermost layer of wharf fill (Wilson and Moran 1980: 16).

Like cob wharves, crib wharves consisted of a rectangular timber framework comprised of numerous compartments formed by transverse and longitudinal ties (*Figure 24*). Cribbing was also built on the shore, floated into place, and sunk to the bottom. There was usually a floor of logs or timbers near the bottom to hold the fill, but frequently no upper flooring. Crib wharves differed from cob wharves largely in the materials used as fill, which dictated a somewhat different mode of construction. The fill consisted of finer material, small stones, gravel, or mud, often mixed with driftwood or cord wood, the latter particularly in the South where stone was less common. In contrast to the open framing of cob wharves, the wooden components of a crib wharf were tightly fitted to retard the escape of the relatively fine-grained fill materials.

Bulkhead Wharves. A bulkhead wharf consisted of a large, three-sided frame built out from the shoreline and behind which fill was deposited. The bulkhead itself was comprised of horizontal rows of logs or planks, vertical planks or closely set timber piles (Wilson and Moran 1980: 28). Various types of fill were used, as in crib wharves, and the degree to which the timbers of the bulkhead were closely fitted was dependent on the nature of the fill. Without the stability provided by the transverse gridding of a cribbed wharf, bulkheads were less able to resist the outward pressure of relatively fluid, water-saturated fill materials. For this reason, the bulkhead would be braced with struts or long tie beams or, later, with pilings. Tie beams were often anchored to the opposite bulkheads on a long narrow wharf (Norman 1987: 35). In the case of wider structures, the ties extended into the fill, with the ends of the beams attached to bollards, or heavy piles driven into the bottom sediments, or to "deadmen," logs or large timbers buried in the fill at right angles to the ties to act as anchors. Corner bracing was often used for added stability (Wilson and Moran 1980: 15).

Grillage. A third technique used in the construction of wooden wharves has been referred to as grillage, a term adapted from architectural design to describe rafts of logs layered alternately at right angles and weighted with stones (Geismar 1983). The technique is thought to be relatively primitive, and has obvious disadvantages in terms of the amount of timber required and in problems associated with leveling during initial construction and with subsequent settling. Only two wharves have been discovered, both in New York, which exhibit this technology.



Source: Engineering-Science

Figure 24. Crib Wharf Construction

Pile Wharves. Pile wharves, a particular form of bulkhead wharf, were constructed with large timbers or logs sharpened at one end and driven into the harbor bottom. The pile wharf came to be the standard in most major ports by the mid-nineteenth century and ultimately replaced most other construction techniques. In general, the use of piles for construction in watery environments has been recorded as early as the first century A.D. In the United States, piles were used in the eighteenth and early nineteenth centuries to stabilize and anchor wharves of a variety of types (Norman 1987: 19-21, 28-30). Early pile drivers consisted of heavy blocks of iron, sliding on vertical guides mounted on a heavy frame. The blocks were raised by human or animal power and dropped on the pile. In 1785, Daniel Sharon recommended the use of piles for wharves in Alexandria, but indicated that a pile driver would have to be collectively financed, because its cost would be beyond the means of a single owner (*Alexandria Gazette*, July 21, 1785). Use of the technology did not in fact become common until the introduction of steam-driven pile drivers in the second quarter of the nineteenth century (Henn *et al.* 1986: n.p.; Norman 1987: 104). By 1840, the wharves of New York were described as consisting of rows of closely set piles secured with horizontal

stretcher beams along the front. The pile facework was further strengthened by the use of diagonal bracing and ties extending back into the fill (Hunt 1840: 313). An 1852 advertisement for bids to rebuild the Fish Wharf, located at the north end of the Alexandria waterfront, called for over 150 piles, from 25 to 45 feet in length, suggesting that at least some of Alexandria's wharves at that time followed the New York pattern (*Alexandria Gazette*, July 22, 1852).

It appears, then, that a variety of construction techniques were available to wharf builders in the eighteenth and nineteenth centuries. A more detailed comparative treatment of the technology will follow in the analysis section of this report. For the present, summary data for a sample of wharves documented at harbors in the Virginia and Chesapeake Bay area are included in *Table 1*.

Location	Date	Structural Type	Fill	Source
Norfolk	Early 18th c.	Crib (?)	--	Byrd 1929
Georgetown	Mid-18th c.	Bulkhead	Cobbles/ earth	Georgetown Commissioners 1762
Alexandria (Carlyle-Dalton)	1759	Crib	Cobbles/ gravel	Heintzelman 1985
Portsmouth/ Norfolk	1773	U-shaped cribbing	Earth/ wood	Jamieson 1773
Alexandria (Roberdeau)	1785	Pier and bulkhead (?)	Earth	Knepper and Prothro 1989

Table 1. Selection of Wharves from the Virginia and Chesapeake Bay Area

Shipyard Features

A shipyard in the nineteenth century would have been a busy locale, with a variety of tasks going on in various portions of the site. The yard would consist of an assortment of buildings and work areas, the types depending on the size and number of vessels being

handled, and depending on the major activity conducted on the grounds, whether repair and refitting alone or full-scale construction. Included in most yards would have been a main workshop and a covered storage area for stockpiling timbers and other materials from which vessels were constructed. Usually above the largest workshop would be an attic or loft where the plans for the keel and various frames would be "lofted" or drawn to actual size. Thin wooden patterns would be created from the drawings to be used in cutting and shaping the ship's timbers. Other structures in the yard might have included a saw pit or, if the yard were relatively modern, a milling house with a steam powered sawmill; a steam chest, where planks were rendered supple enough to be bent to the lines of the hull; a sail loft, where sail canvas was cut and sewn; a forge or blacksmith's shop, where the many metal fasteners and fittings would be produced; a tar shed, where pitch was prepared for caulking; and possibly even a ropewalk, a long, narrow building in which hemp was braided into rope. Much of the yard would, though, have been occupied by the shipway, the foundation on which the vessels were constructed.

Shipways

The central feature of the shipyard, around which all activity centered, was the shipway or building slip, the structure on which vessels were actually erected. The shipway consisted of an inclined foundation which provided support for the vessel, adequate working space around and beneath the hull, and a means of transferring the craft to the water when construction was complete. Building slips varied in complexity, but typically included several essential features: a supporting foundation; keel blocks to sustain the weight of the vessel during construction; and a number of features used in launching -- ground ways, launching ways, a launching cradle and various support paraphernalia such as poppets, packing and ribbands.

During the Colonial period, temporary foundations were built for the construction of a single ship (Goldenberg 1976: 69). Although the practice continued, according the needs of the individual yard, more permanent ways suitable for reuse eventually became the norm (Curtis 1919: 1). The foundation of the building slip was either laid directly on tamped earth, on earth combined with a compacting agent such as gravel or cobbles, or was set on rows of timber piles driven into the ground. These pilings were capped by shaped timbers or planks laid parallel to the shoreline, and the capping timbers were often decked over with flat

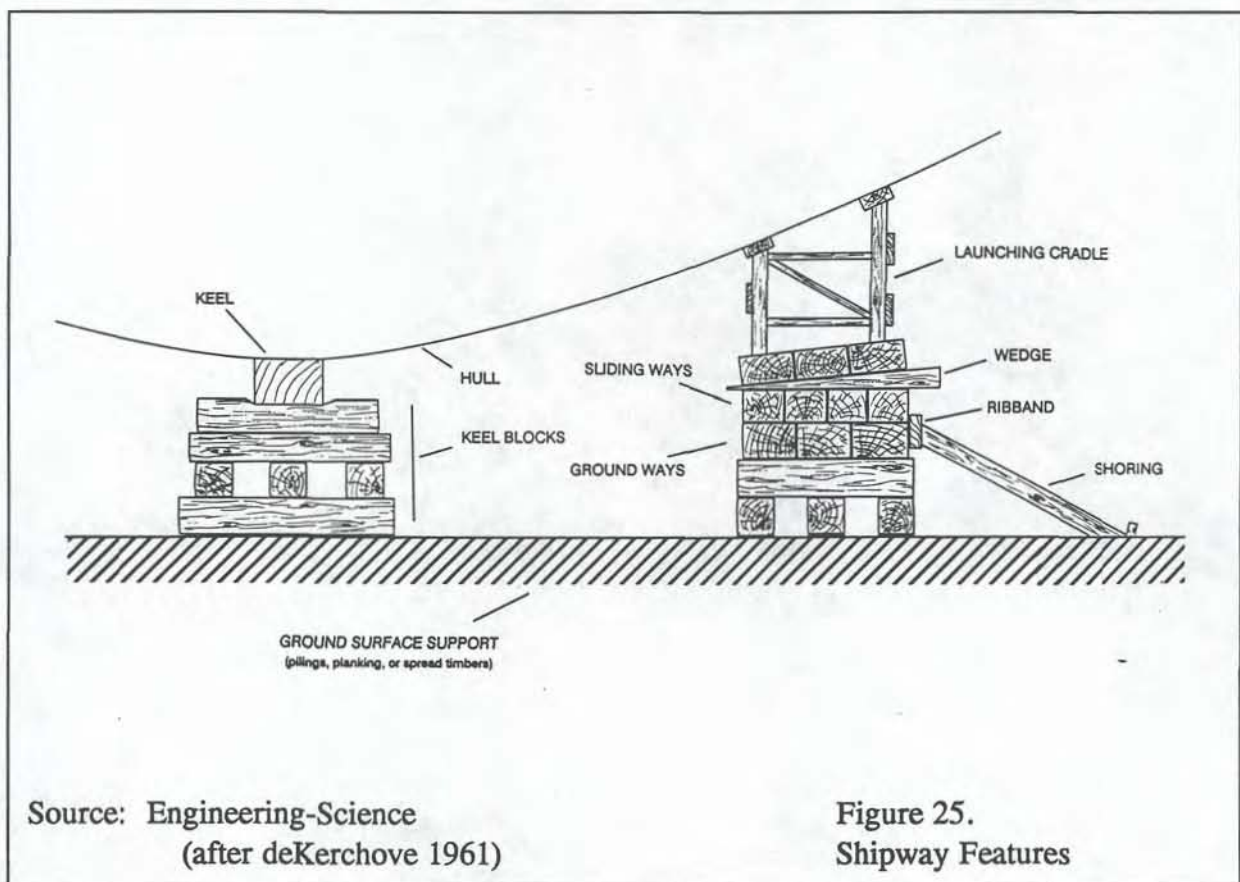
boards to provide a stable working surface, particularly at the aft end, running to the waterline (Desmond 1984: 66). The slip and its foundation extended into the water a sufficient distance to render an appropriate launching depth, with the ways often elevated some distance above the river bottom.

The dimensions of a shipway were based on a number of considerations. The length of the slip on dry land was a factor of vessel length, the amount of work space required and launching velocity. One early twentieth-century treatise states that the distance should be "at least one and one half times the length of the longest vessel that will be constructed on it" and that there must be "sufficient distance between the stern-post and water to allow the vessel to attain a safe launching velocity" (Desmond 1984: 69). The portion of the slip underwater must be long enough to support the launching ways until the vessel could float freely. The width of the slip needed to be sufficient to accommodate the widest vessel to be built, as well as to allow the necessary staging and work space.

The slope or inclination at which the slip was constructed was directly related to the length and launching velocity required for a particular vessel. An average inclination was four degrees to the horizon, approximately 6.7 percent (Desmond 1984: 67), though another set of figures ranges from $\frac{5}{8}$ to $\frac{3}{4}$ inches of fall per foot of length, a slope of 5.2 to 6.3 percent (Curtis 1919: 1). As will be seen, the more crucial inclination was that of the keel blocks and launching ways. Vessels were launched either diagonally, sideways (as was common at yards on the Great Lakes in the early twentieth century [Davis 1918: 57]), or end first. Although end first launches were sometimes conducted with the bow leading, vessels were most often launched stern first, the method described herein.

With the shipway in place, construction of the vessel would proceed. Vessels were built keel first, with the long keel timbers laid on keel blocks, also referred to collectively as stocks (Peake 1851), set down the center of the way (*Figure 25*). The keel blocks provided the main support for the hull during construction. The blocking consisted of stacked wood, often cribbed for extra stability during the early stages of construction when less weight was carried on the keel. The average spacing between blocks was reported to have ranged from four to as much as eight feet (Desmond 1984: 71; Curtis 1919: 3). Wedges were often used to align the keel down the centerline of the slip, or alternatively, the topmost block, the cap block, would be notched.

The height of the keel blocking was influenced by the amount of room needed to work below the vessel. Also of concern was the amount of room necessary for the vessel's forward end to clear the surface of the slip at the water's edge, when the bow rotated as the aft and midships became buoyant during launching (Andrews 1967: 753). The elevation was in fact quite variable, though a distance of between 5 and 6 feet from the surface of the slip to the top of the keel was one recommendation (Curtis 1919: 3). The inclination of the keel blocking was generally the same as that of the slip (5 to 6 percent), though it is noted that the keel need not necessarily be furnished with the same inclination as either the building slip or launching ways (Desmond 1984: 70).



Once the keel blocks were in place, erection of the framing began. Additional support for the structure was provided by a variety of shores and ropes or cables, known as horning guys, attached directly to the ground or to sole blocks located around the staging area. Uprights, with thwarts extending horizontally to the vessel, supported planks for scaffolding, used for work high on the sides of the hull.

After the hull had been planked, caulked, sealed and painted, the launching apparatus was erected. This consisted of a stationary segment, the fixed or ground ways, and a movable segment, the launching or sliding ways. The ground ways consisted of hardwood tracks planed smooth and firmly fastened to the floor or surface of the building slip on either side of the hull. The groundway timbers were shored at the sides and ends to prevent movement during launching: a thin line of planking, known as the launching ribband, was nailed to the outer edge of each track forming a lip to prevent the sliding ways from drifting outward. The launching cradle was the general term given to the wooden framing built up under the sides of the hull to support it on the launching ways. The launching ways, also called sliding or bilge ways, consisted of planed hardwood timbers attached to the base of the launching cradle, resting parallel to and against the fixed ground ways. Wedges and a second layer of timbers were usually placed over the sliding ways to allow the vessel to be raised enough to transfer its weight from the keel blocks for launching. Special wooden supports, referred to as poppets, were constructed beneath the bow and stern of the vessel as part of the cradle, and were also attached to the sliding ways. A layer of lubricating grease was placed between the two sets of ways to ensure free movement of the cradle and ways during the actual launch. The cradle and poppets were formed to contact the hull of the vessel, usually near the turn of the bilge. This support work lay on the sliding ways which contacted the lubricated ground ways attached to the building slip itself.

The distance between the launching ways was usually proportionate to the weight of the vessel: the maximum pressure exerted on the sliding ways typically did not exceed 2.5 tons per square foot (Desmond 1984: 73). The ways were normally separated by a distance equal to approximately one-third the maximum beam of the vessel, and were set two to three inches wider at the aft or shoreline end to compensate for the spreading of the launching cradle as the weight of the vessel was taken from the keel blocks. The sliding ways were also inclined slightly inward to reduce wallowing or side slippage and to compensate for slight imbalances in the horizontal positioning of the ways which would tend to accentuate sideward movement (Andrews 1967: 754; Desmond 1984: 74).

As mentioned previously, the inclination of the ground and launching ways was critical to the successful launching of the vessel. The optimum slope was a function of the weight of the vessel and the proper launching speed. Because the hull must move down the slip on its own when released, lighter vessels required more steeply inclined ways. Yet

steeper slopes resulted in more stress on the forward part of the ways as the stern entered the water, and thus overcompensation in the form of a steep incline to increase launching speed could lead to failure of the ways during the launch. The appropriate speed was determined by a variety of factors including the weight and height of the vessel and the characteristics of the body of water into which the vessel was to be launched. Higher speeds were required by very heavy vessels, since their weight tended to force the lubricating grease from between the fixed and sliding ways. Thus, balancing speed, weight and inclination became a problem of mathematics: calculations were made to determine, for example, the tendency of the vessel to tip, or the amount of pressure exerted on the fore poppets during the launch. The mathematics were eventually codified in a series of so-called launching curves, which expressed the moment of hull weight and buoyancy at different points along the ways (Wilson 1942).

When the cradle and poppets were in position and the launch ways prepared, the wedges above the sliding ways were driven in to raise the weight of the hull from the keel blocks. The blocks were quickly disassembled, and only temporary shores or dogs remained keeping the vessel in place. With these removed, the vessel would begin its run down the fixed ways into the water.

Marine Railways

A feature of many later nineteenth-century shipyards was the marine railway, also known as a patent marine railway or an inclined plane (Bradford 1972: 164). The marine railway consisted of rails leading into the water on which vessels were hauled clear for cleaning or repairs. A vessel would generally be attached to a fitted cradle which ran on stationary tracks and was winched above the waterline either by animal or mechanical power. After repairs had been carried out, the vessel could be smoothly returned to the water.

The simplest and earliest means of removing a vessel from the water for cleaning and repair was intentional beaching, allowing the vessel to careen, or lie on its side, at low tide (Cunningham 1904: 462). Also referred to as grounding out, the method was effective, but required particular shoreline configurations, cooperative tides and fast working carpenters. Careening was, obviously, rather hard on the internal structure of the vessel, but the technique has been used since the earliest known maritime merchant cultures, the Phoenicians

and the Egyptians, and continues in use, at least for smaller vessels, in all parts of the world through the twentieth century. A similar form of careening, and one which was somewhat less damaging to larger, heavy vessels, was known as heaving down, in which the vessel was hauled over on one side while still afloat, allowing repairs or maintenance to be effected from staging platforms on smaller craft on the opposite side. Yet another variation involved the use of the so-called gridiron, a timber framework placed beneath the hull at high tide onto which the vessel would ground out as the tide ebbed (Stevenson 1874: 167).

Two other methods have been developed for temporarily removing vessels from the water: dry docks and marine railways. Graving ways or dry docks involved enclosing the vessel in a basin which could be pumped dry. Dry docking required special equipment, and the work area created was often dark and cramped (Vernon-Harcourt 1885: 463).

The final method was the marine railway, also referred to as the slipway. The Carthaginians were the first known maritime cultures to use smoothed timbers as artificial slips to reduce the amount of friction produced in hauling a vessel out of the water and onto a beach (Cunningham 1904: 463). By the late eighteenth century, the Scot, Thomas Morton, had combined the concept of the inclined plane, which he had originally used for hauling out flat bottom vessels, the cradle (as seen in the gridiron) and metal rails to develop the modern marine railway (Stevenson 1874: 166).

Some of the earliest records of the use of marine railways in this country date from the early 1820s, in association with experimentation by Commodore John Rodgers at the Washington Navy Yard (Anon 1823). At roughly the same time, a horse-powered railway was established in Salem, Massachusetts (Baker 1973: 615). Iron rails and a cradle were used by a New England shipwright, John Thomas, for his "rail-way dock" constructed in New York in the later 1820s (*Franklin Journal and American Mechanic's Magazine* 1827, cited in Weber 1988). Other early railways included one established at the Bath, Maine, yards in the mid-1830s which was in service until 1876 (Baker 1973: 615). A patent marine railway was advertised in Baltimore in 1845 in terms suggesting that it was not unique in the local yards (Weeks 1987: 15). Marine railways have been in continuous operation at Gloucester, Massachusetts, since 1848 (John Cusick, Manager, Gloucester Marine Railway, personal communication 1989).

While little is known in detail of the configuration or operation of these early railways, the general characteristics were similar. Marine railways were typically situated perpendicular to the shoreline or embankment, with the vessel brought out sideways or end on. The vessel was positioned over a cradle, known as a traveling frame, which ran on parallel rails. The cradle normally incorporated a central line of keel blocks and two or more runs of parallel bilge blocks to support the sides of the hull. A system of pawls, or stops, was usually included to engage the cradle at regular points as it rode up the slip, preventing backsliding. In some cases, a sweep or plow ran ahead of the cradle to remove silt or other debris from the submerged rails (Cornick 1968: 243-6). The following is a contemporary report of the process as described by Lightfoot and Thompson, nineteenth-century maritime engineers:

The cradle is...run down into the water by its own weight, assisted if necessary by a down-hauling chain worked by an independent apparatus at the top, arranged also for quickly drawing up the empty cradle after launching a vessel...The vessel is then floated into position as accurately as possible, being guided by hawsers manipulated from a jetty or the shore, and also by the guides fixed at the front of the cradle, which are drawn up into a vertical position by ropes, afterwards secured to the vessel. The hauling up then commences, the ship all the time sitting on the keel-blocks placed on the centre rib, and being guided at the stern by the after-guides. At the proper time, the sliding bilge-blocks are drawn in by ropes previously taken up to the jetties, or on board the vessel; the operation thus proceeds until finally the ship is drawn out of the water, safely seated on the cradle, and supported uniformly over the length of the keel, as well as by the bilge-blocks on each side.

In launching, the reverse process takes place. The vessel is lowered by the machinery to within a convenient distance of the water; the cradle is then disconnected from the links, and...with its burden runs down the way until it reaches the water and the vessel floats off. The empty cradle is drawn up by the supplementary hauling chain, and...is ready to take on another ship (in Colson 1894: 320-1).

The following is a modern description of the operation of the railways at the Gloucester yards, which continue today as working ways with little or no technological modification since the nineteenth century. The account was provided by John Harper and Harry Cusick of the Gloucester Marine Railway. A cradle of heavy timber construction rides on cast-iron rollers, flanged both inside and out to fit wide, flat rails. The portions of the rails on shore are mounted on concrete, though originally granite foundations may have been used, while the portion running into the water is supported on piles. At high tide, the cradle is lowered into the water and the vessel floated into position over it. Lines are used to attach the vessel to the cradle, and a heavy chain hawser draws the cradle out of the water. Initially the vessel is hauled out only enough that it rests loosely within the cradle, allowing movable support blocks to be drawn in flush against the sides of the hull, following a blocking plan (usually provided by the captain) which aligns the blocks with the frames of the hull. When the blocks have been set, the vessel is hauled entirely out of the water, a process which may take up to two hours.

A capstan, a large, vertical winch, was the most common means of hauling the vessel from the water. Through much of the nineteenth century, capstans were powered by animals, or, occasionally, by humans: one capstan, it is noted, was geared so that a horse walked 17 miles to move a vessel 450 feet (Baker 1973: 615). In general, mechanically powered tools were not used in the construction of wooden ships until the early twentieth century (Greenhill and Manning 1988). Similarly, steam-powered capstans did not commonly drive marine railways until the turn of the century, though not necessarily due to a technological gap. Thomas Morton, for example, had developed a hydraulic hauling-gear in the late eighteenth century, and steam engines worked the hauling machinery in many nineteenth-century English railways (Cornick 1968: 246). In this country, a steam engine was suggested for the railway at Bath, but was reported to have been turned down by the directors in 1837 (Baker 1973: 616).

The length of the railway depended on the length of the vessels to be accommodated, and it was not uncommon for more than one vessel to be on the ways at once, a procedure known as relieving (Colson 1894: 321). The extent or length of the submerged portion of the railway was a function of the slope of the harbor bottom and the draft of the largest vessel to be hauled, since most cradles need be fitted beneath the hull while the vessel was still afloat. The width of the rails was also dependent on the size of the vessels: for vessels

with a beam of up to 25 feet, two tracks were considered sufficient, while three or four tracks were used for larger vessels. The inclination of the ways also depended on the length and the size of the vessel. Several sources note that slopes varied between 1 foot in 15 to 1 in 25 feet, with 1 in 19 being optimal for most large ways (Stevenson 1874: 166; Colson 1894: 313; de Kerchove 1961: 491).

VI. FIELD METHODOLOGY

The current study at Ford's Landing consisted of Phase II and Phase III investigations, including both survey and significance testing, as well as full-scale data recovery operations. Though the methods employed in each portion of the project were similar overall, the specific techniques varied somewhat depending on the type of information sought, the amount of open or area excavation carried out and the degree of detailed documentation undertaken.

General Concerns

Fill

A major concern in the investigation of this as well as of many urban sites is the problem of land modification accomplished through the introduction of fill. Filling along this portion of the Alexandria waterfront has consisted in the main of major land acquisition projects, involving the importation of large amounts of fill dirt to raise surface contours over low-lying wetland areas and, as in the case of Ford's Landing, to extend usable land outward toward the navigable channel of the river. Examination of the characteristics of this type of fill, referred to as primary landfill, was in fact one of the major emphases of the current archaeological study. Of further concern was the later addition of material to the surface of the site, secondary fill in the form of occupation debris or material accumulated as a consequence of the demolition of existing structures during later periods of development. Such material was regularly used to level a site prior to new construction. Extensive and occasionally thick surface deposits of early- to mid-twentieth-century debris were thus expected across much of the property.

As a result of Phase IIa investigations, it was predicted that relevant historic features or deposits would lie at depths ranging between 3 and 10 feet below modern grade. Intact or undisturbed soils, with potential significance to prehistoric activity in the area, were predicted to lie between 8 and 10 feet below grade. To achieve the stated survey ends of maximum resource identification with minimum disturbance to intact deposits, emphasis was placed on mechanical excavation using a backhoe -- a Case 580E, with extending arm and a 24-inch bucket -- with an experienced and practiced operator monitored by archaeological personnel. Survey and testing excavations consisted of a series of long, and where feasible,

continuous trenches as a means of most efficiently encountering and exposing structural or non-structural materials and of allowing examination of extended stratigraphic profile sections.

Modern Obstructions

A number of obstructions to survey work were apparent, both from a cursory, on-site examination of the property and from preliminary excavations undertaken during the Phase IIa study. Already mentioned were the Ford Plant building itself, the concrete annex to the west and a standing water tower in the southwest quadrant of the site. The concrete foundations of an earlier tower lay just to the northeast of the standing tower, and both structures suggested that a substantial amount of disturbance lay to the north and east from underground water mains. East of the towers were four large Quonset huts and a two story concrete building extending almost to the present shoreline. West of this structure and north of the Quonset huts lay several buried storage tanks containing an unknown quantity of fuel oil, which was leaking into the surrounding soils: hazardous waste engineers were attempting to delineate the proportions of the contamination as the present survey began. The final obstructions on the site consisted of several railroad sidings and a reinforced concrete slab, the latter capping most of the area north of the water towers.

After consultation with representatives of Alexandria Archaeology, it was concluded that the areas of greatest development impact lay in the southern portion of the site, south of the Ford Plant structure. Areas to the north and northwest did not appear likely to be adversely affected by development plans since much of the Ford Plant building was to be retained. Areas in the extreme south of the property, beyond the standing water tower and Quonset huts, exhibited comparatively low resource potential, lying at the north edge of Battery Cove, the shallow bay which was in-filled during the early twentieth century by the Corps of Engineers.

Before survey excavations could begin, it was necessary to remove portions of the concrete slab. A hoeram -- a backhoe equipped with a pneumatic hammer and a standard 3 1/2-inch bit -- was used for this purpose. Larger machinery was considered impractical due to the potential for disturbance to underlying deposits -- compaction, crushing or actual displacement. The reinforced concrete proved to be difficult to break apart, and thus, rather

than removing the complete slab as planned, only sections wide and long enough to accommodate the proposed archaeological trenches were cleared (*Plate 19*).

Water Control

Groundwater problems at the Ford's Landing site were not entirely unexpected, considering the waterfront location of the property and given the results of previous archaeological and geotechnical surveys. The surface of the lot lay at an elevation of from 6 to 8 feet above mean sea level, while archaeological materials were predicted to lie at depths of 10 feet or more below grade. In fact, much of the water influx which occurred in the trenches was less a factor of the current level of the water table than of surface water trapped within various unconsolidated fill deposits well above the waterline. Several types of fill deposit were encountered in the trench excavations: wharf fill, a sandy soil used to fill in the eighteenth-century wharf structure at the center of the site; Corps dredging spoil, a heavy, fine sandy silt removed from the main channel of the Potomac by the Corps of Engineers in the early twentieth century and dumped into Battery Cove in the south portion of the site and beyond; and a variety of late nineteenth- and twentieth-century fills, consisting mainly of demolition rubble and debris from later industrial use of the property. Many of the fill deposits acted as localized aquifers discharging their loads when tapped during excavation. Major examples included the heavy gravel beds on which the several rail sidings were laid, and the sandy fill of the wharf. In every trench, layers of water retaining fill were disturbed causing the rapid flooding of the excavation, though it was usually possible to manage the inundation by means of a combination of sump excavation and pumping.

Wharf fill was found to extend to depths of up to 11 feet below grade, and was usually topped with 2 to 4 feet of hard packed clay and rubble fill laid down in the nineteenth and twentieth centuries. The wharf fill deposits were increasingly waterlogged and unconsolidated with depth, sometimes attaining the consistency of freshly poured cement. Due to the loose nature of these deposits, as well as to their weight and that of the overlying fill layers, deep excavation proved difficult, and water control was not feasible with the means available. Nevertheless, excavation to depths of 10 to 12 feet was usually possible, thus allowing adequate assessment of deposition. Entry into these deeper trenches to clean and closely examine profiles was considered too hazardous to attempt. Caution proved to be warranted, since in every instance major cave-ins occurred as the unconsolidated deposits



Plate 19. Concrete Slab Removal



*Plate 20. Phase IIb Survey
Trenching--Trench 11E*

sloughed into the excavation, undercutting the more compact overlying fill, which would eventually fall to the bottom of the trench in large chunks.

Excavation within the area comprising Battery Cove was somewhat easier. The dredging spoil used as fill by the Corps of Engineers extended to virtually the same depths as the wharf fill to the north, but as it contained less sand, the material was heavier and more compact, serving as an unexpectedly effective water barrier, even in several trenches near the present river shoreline. The historic floodplain deposits were reached in every excavation in the cove area, at depths ranging from 9 to 11 feet below grade. These deposits were less consolidated than the overlying dredging spoil, and excavations within them could not be easily maintained. Nonetheless, trenches were excavated to final depths ranging from 13 to 17 feet below grade to test for archaeological materials below the early floodplain surface.

Horizontal and Vertical Controls

As noted, development plans called for the preservation of the outer, brick shell of the Ford Plant building. Using the structure as a reference, a horizontal control grid was established relative to the south wall of the building, with the southwest corner designated as the horizontal datum point for the site. The southeast corner was mapped in as well, as a secondary datum, in the event that demolition of the concrete annex and remodeling of the west end of the Ford Plant structure should remove or change the position of the primary datum. The line of the building, and thus of the site grid, deviated 8.5 degrees from a N-S/E-W axis (Virginia state grid). All mapping was carried out with transit and measuring tapes relative to the horizontal datum, and all measurements were recorded in English units -- feet and inches -- as is the convention in historic sites archaeology. Since the trench excavations were not systematically placed across the site, nor were they oriented with the site grid, trenches were numbered consecutively in order of excavation, without reference to grid location -- numbering began at 10, following the numbering of the earlier, Phase IIa trenches.

A vertical site datum was established at a bronze-capped USGS benchmark, 9.00 feet above mean sea level, also located at the southwest corner of the Ford Plant structure. The elevations of ground surfaces prior to excavation and of all relevant features and stratigraphic deposits were measured relative to the vertical datum with a transit. Several secondary points

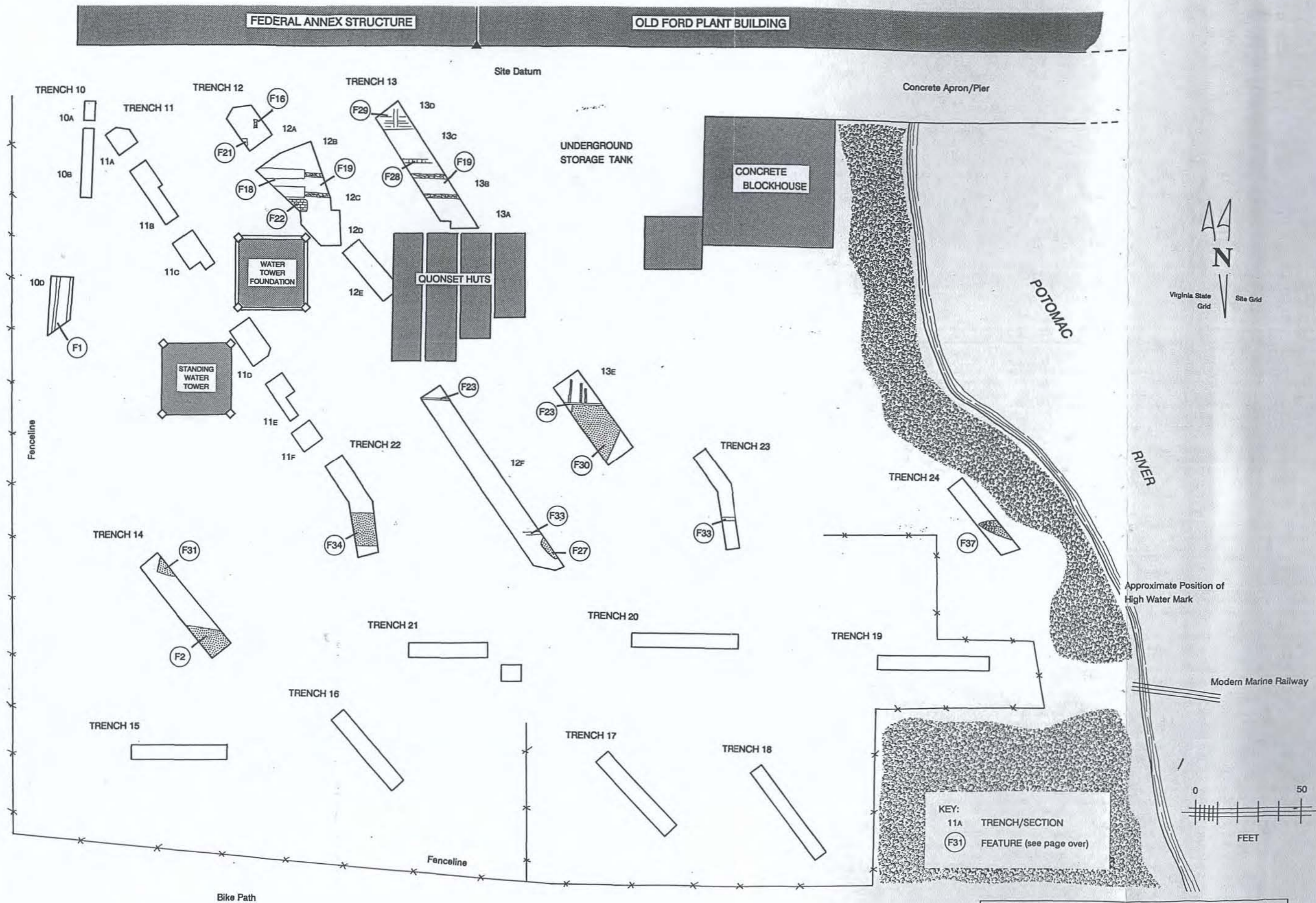
were established throughout the course of the project, at the southeast corner of the standing water tower, for example. But with the beginning of demolition, these points began to disappear, and thus, intermediate points were shot in for each transit run. An interesting observation was made during the transit surveys as to the nature of the fill across much of the area. Once demolition began, heavy machinery was in constant use on the site. Vibrations caused by the passage over the saturated sandy clay fill of the wharf of large front end loaders, a crane and a small fleet of dump trucks made transit readings possible only during lulls in activity, indicating the degree to which the wet fill conducted shock waves. Readings were less difficult over the more consolidated silty fill within the Battery Cove area.

Phase II Survey

The survey portion of the current study consisted of two separate operations: Phase IIb, the investigation of the wharf area south of the Ford Plant structure; and Phase IIc, an additional phase of testing designed specifically to sample the portion of the site lying within the filled-in area of Battery Cove, seeking wrecks or derelict vessels within the dredging spoil or cove bottom sediments.

Phase IIb

The sampling procedure employed during the Phase IIb operation was a combination of 1) non-systematic, directed excavation, with the locations of trenches based on a study of eighteenth- and nineteenth-century maps and written descriptions of the property, and 2) systematic excavation to ensure adequate coverage of the site. In total, five trenches were excavated to investigate the wharf (*Figure 26*): Trench 10, parallel with Union Street along the west property line, used to further investigate a feature encountered in Phase IIa excavations which could not then be adequately examined due to the presence of extensive concrete surfacing in that part of the site; Trenches 11 through 13, oriented northwest to southeast, at a 45 degree angle to the property line, and spaced systematically (*ca.* 60-foot centers) through in the central portion of the wharf; Trench 14, near the southwest corner of the property to further investigate a previously identified feature there. The trenches ranged from 5 to 12 feet in width, with lengths varying greatly -- the diagonal trenches were designed to be extended to the southeast a sufficient distance to intersect the south or east edges of the wharf. A total of 555 linear feet of trench was excavated in the four weeks of



Source: Engineering-Science

Figure 26. Site Plan: Phase II Trench Locations

Phase IIb testing -- at an average width of 8.5 feet, the trenches represented a 5.5% sample of the wharf area south of the standing structures (*Plate 20*).

Feature	Location	Description
Feature 1	Trench 10D-J	19th c. shipway
Feature 2	Trench 14B	barge hull
Feature 16	Trench 12A	timber machinery foundation
Feature 18	Trench 12B	brick footer, marine railway capstan head
Feature 19	Trench 12B, 13C	fieldstone track bed, marine railway
Feature 21	Trench 12A	coal box
Feature 22	Trench 12C	brick workshop floor
Feature 23	Trench 12F, 13E-G, J	19th c. bulkhead
Feature 27	Trench 12F-G	mid and stern section of scow
Feature 28	Trench 13C	wooden gutter north of marine railway
Feature 29	Trench 13A	wooden workshop floor
Feature 30	Trench 13E,I,L	barge hull beneath 19th c. bulkhead
Feature 31	Trench 14C,B	barge hull
Feature 33	Trench 12F-G, 14D, 22, 23	18th c. bulkhead
Feature 34	Trench 22	mid and stern section of scow
Feature 37	Trench 24	bow and mid sections of keeled vessel

Key to Figure 26: Archaeological Feature Location

The trenches were not continuous, due to the poorly structured soils encountered within the wharf. In order to contain slumping or to avoid obstacles, as for example the piers of the water towers, deep waterlines or railroad tracks, trenches were occasionally broken into sections. Each section was given a separate letter designation for ease of reference, *e.g.*, 10A, 12E. In several cases, trench excavations were greatly widened to expose larger areas of structural features as an aid in the assessment of function and date: for example, Trench 10D, over Feature 1, a portion of a nineteenth-century shipway; or Trench 12B, over Feature 18, the engine room of a marine railway. While most trenches were excavated to from 8 to 10 feet below grade, depending on the level of features encountered, at least one area in each excavation was taken to the maximum reach of the extended backhoe arm, 12 to 14 feet depending on the safe set-up distance for the machinery relative to the trench edge. The deepest test was in Section E of Trench 12, south of the Quonset huts,

where a small terrace was excavated for the backhoe and the deposits tested to a level 17 feet below grade. Stratum designations were generally unique to each trench, though in cases in which correspondences between excavations were recognized as significant, correlations were maintained in the field. Universal Stratum designations were later applied to certain deposits during analysis -- the correspondences are listed in the text and in Appendix D.

With a skilled equipment operator and careful monitoring by experienced archaeological personnel, it was possible to conduct all excavations according to observed stratigraphy. Backdirt from each stratum was scattered near the trench excavation by the backhoe, and the material randomly trowel sorted. The bias toward recovery of large artifacts inherent in this method of retrieval, particularly toward glass and ceramic items, was recognized and accepted in the interests of efficiency. Samples from several trench proveniences were waterscreened to assess the level of data recovery (*Plate 21*). While not quantified, the artifact sample recovered from non-waterscreened backdirt appeared representative, though recovery of very small materials was predictably lower. In view of the overall decision to concentrate resources on exposing the greatest number of features and largest amount of structural material possible, systematic screening of each deposit was not attempted. Deposits found to contain chronologically or functionally diagnostic cultural materials were intensively sorted and the recovered artifacts placed in appropriately labeled polyethylene bags. Column profiles were drawn to scale at two or more points along the walls of each trench, the number of columns depending on the complexity of the stratigraphy exhibited. When necessary, complete profiles of significant trench walls were drawn, as were plan views of relevant features. All plans and profiles were documented photographically and the trenches and features added to the site map.

When potentially significant archaeological features or deposits were encountered, trench walls were documented, and then made safe for entry as necessary, by sloping or stepping, so that the materials could be hand cleaned, using shovels and trowels. Hand excavations were carried out in selected locations. Several informal shovel tests were conducted to quickly assess the nature and integrity of certain deposits which had been exposed mechanically. Soils from these tests were either trowel sorted or a sample passed through 1/4-inch mesh screening to enhance artifact recovery. In addition, several formal Test Units were excavated (*Plate 22*) using standard archaeological techniques: excavation was carried out according to natural or observed stratigraphy and all soils passed through



Plate 21. Waterscreening

*Plate 22. (Below) Test Unit
Excavation--Trench 12 Section A*



1/4—inch mesh screening. The stratigraphic record of each unit was documented on standard excavation forms, and upon completion, representative profiles were photographed and drawn to scale.

Those portions of survey trenches containing significant features were left open for eventual mitigation. Since most of the deposits were damp or, more often, saturated, materials in open trenches were covered with heavy plastic sheeting for protection from the drying effects of the air. All other excavations were backfilled following documentation.

Phase IIc

Remote sensing was a considered option for the additional survey within the Battery Cove deposits, but after consultation with an acknowledged expert in the field, Bruce Bevin (Geosight, Pitman, New Jersey), it was determined that ground-penetrating radar, the most appropriate technology, would prove unsuccessful due to the depth and character of the fill layers in the area. Thus, the Phase IIc survey consisted of systematic backhoe sampling of the deposits at or near the edge of the cove. Ten trenches (Trench 15 through 24) were excavated. The IIc trenches were more standardized in dimensions, each measuring approximately 7 to 8 feet in width and averaging 50 feet in length. In total, 497.5 linear feet of trench were excavated over the course of three weeks, representing a 4.7% sample of the cove area lying within Ford's Landing property bounds. No archaeologically significant deposits were predicted below depths of 8 to 9 feet below grade, and except in the three trenches along the north edge of the cove, none were found. All trenches were excavated to the surface of the original cove bottom and beyond, with one area in each trench excavated several feet below that level, to the maximum reach of the backhoe arm. As in the Phase IIb excavations, archaeological features, if encountered were manually cleaned in order to allow identification and significance assessment. Random samples of all backdirt were trowel sorted. Concentrations of snail shell observed on the cove bottom were sampled for species identification and habitat analysis. Trenches and features were documented as in Phase IIb, and excavations containing significant features were left open.

Phase III Data Recovery

Mitigation focused on materials related to the eighteenth-century wharf, the nineteenth century shipyard and vessels encountered in the cove survey trenches (*Figure 27*). Trench sections containing features slated for mitigation were widened in appropriate directions to allow sufficient exposure for documentation. The backhoe was used to clear fill and other debris from the surfaces of the features, to secure trench walls and to excavate sump areas so that pumping could keep deposits relatively water free (*Plate 23*). As before, manual cleaning was accomplished with shovels and trowels. Ten features were investigated in this manner, contained within six of the original fifteen trenches from the Phase IIb and IIc surveys. Over a period of thirteen weeks, approximately 14,000 square feet were excavated to depths ranging from 4 to 9 feet below grade to expose additional portions of the features. The cumulative area excavated over the course of Phase II and Phase III excavations was just under 22,500 square feet, or 12.9% of the study area. Phase III documentation was conducted of portions of the eighteenth-century wharf bulkhead, portions of a late nineteenth-century building slip, and of seven barge hulls or hull fragments, a small bateau hull and the bow section of a keeled vessel -- all of the vessels were derelicts, either abandoned in the cove in the nineteenth and twentieth centuries, or used in shipyard construction.

All structural features and significant archaeological soil profiles were documented to the standards previously described. The level of documentation appropriate for the vessels in the cove deposits was agreed upon after lengthy consultation with representatives of Alexandria Archaeology and the Virginia Department of Historic Resources and the Historic American Engineering Record. Large format photography was used to record each vessel from a variety of angles, and scale drawings made to normal archaeological standards (referred to by architects as schematic drawings), in this case to an estimated accuracy of $\frac{1}{8}$ inch or better -- isometric or reconstruction views were not undertaken.

Few artifacts were encountered during Phase III operations. Those recovered were treated in a manner similar to those recovered during the Phase II surveys. Wood samples were taken from all eighteenth- and nineteenth-century structural features as well as from various elements of each vessel. The samples were sent to the Brooks Forest Products Center at Virginia Tech in Blacksburg, Virginia, for species identification. Dendrochronological analysts were consulted as to the possibility of analysis of the timbers from the eighteenth-

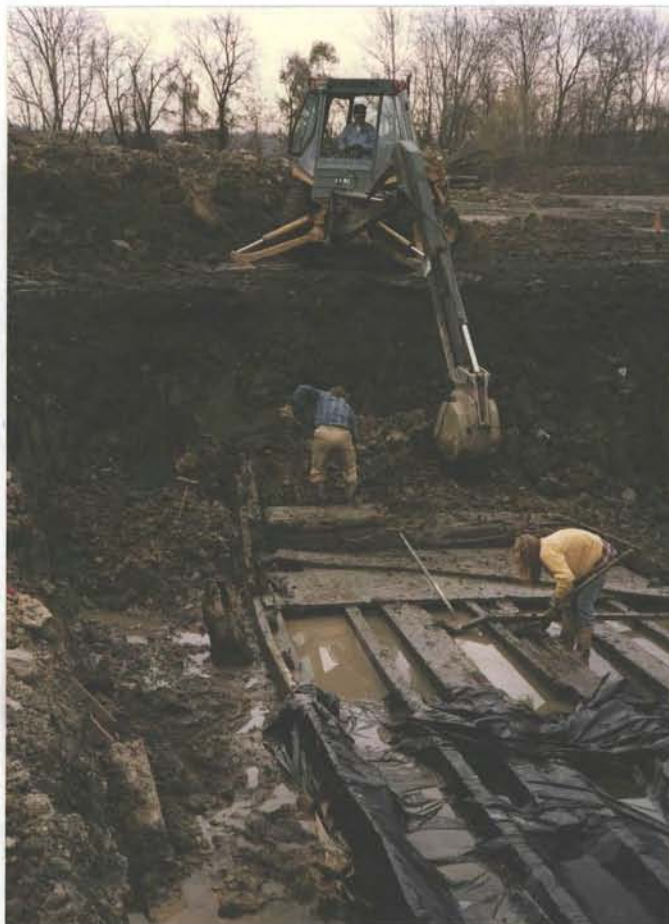
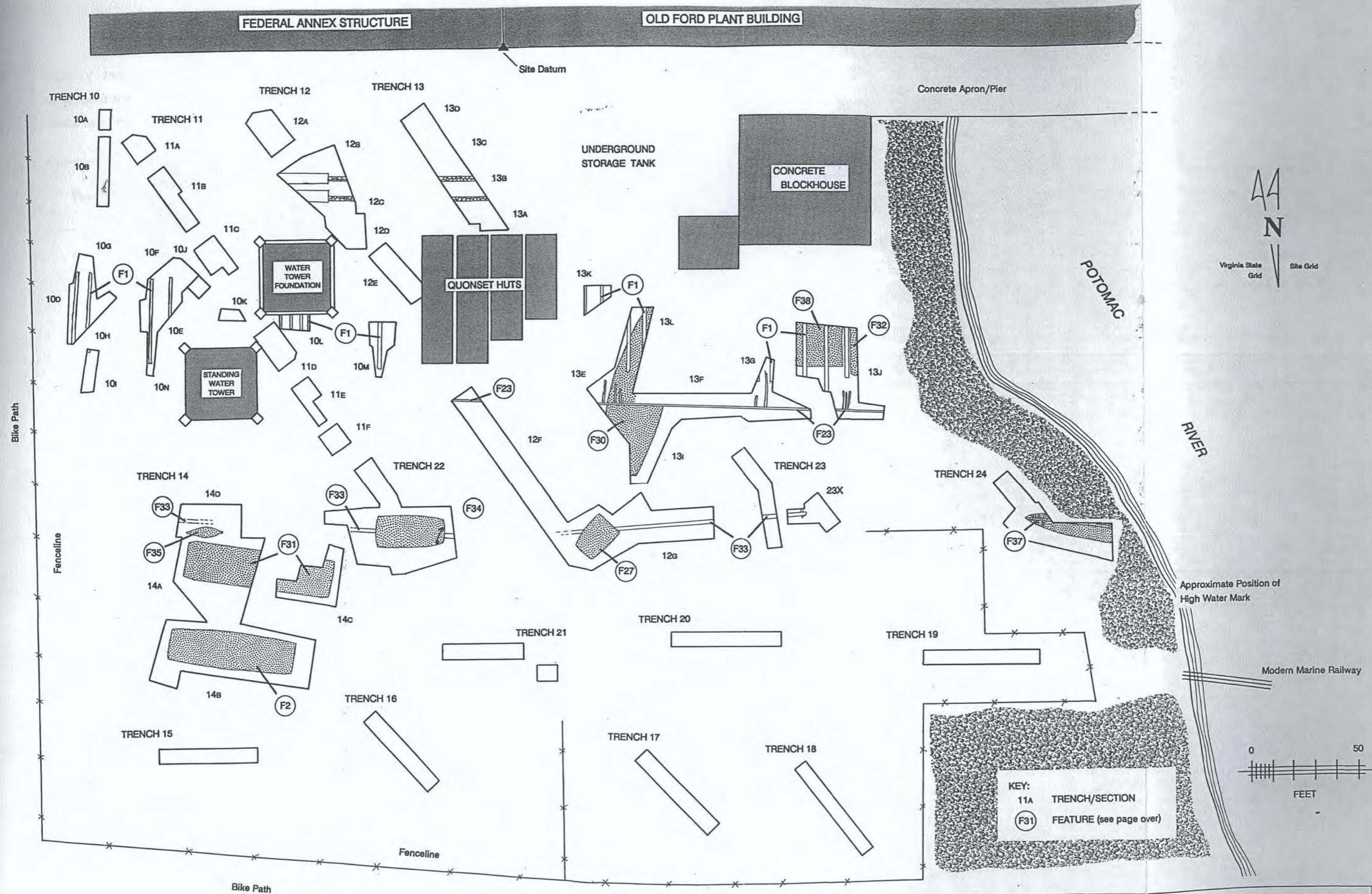


Plate 23. Phase Data Recovery Excavation--Scow Hull (Feature 34), Trench 22



Source: Engineering-Science

Figure 27. Site Plan: Phase III Trench Locations

century bulkhead. It was determined that, due to the limited range for which a dendrochronological baseline had been developed for the region, the cost of the procedure could not be justified.

Feature	Location	Description
Feature 1	Trench 10D-J	19th c. shipway
Feature 2	Trench 14B	barge hull
Feature 23	Trench 12F, 13E-G, J	19th c. bulkhead
Feature 27	Trench 12F-G	mid and stern section of scow
Feature 30	Trench 13E,I,L	barge hull beneath 19th c. bulkhead
Feature 31	Trench 14C,B	barge hull
Feature 32	Trench 13J	barge hull fragment supporting shipway
Feature 33	Trench 12F-G, 14D, 22, 23	18th c. bulkhead
Feature 34	Trench 22	mid and stern section of scow
Feature 35	Trench 14D	bateau hull fragment
Feature 37	Trench 24	bow and mid sections of keeled vessel
Feature 38	Trench 13J	barge hull fragment supporting shipway

Key to Figure 27: Archaeological Feature Location.

A number of experts in maritime history, archaeology and related fields were contacted during the planning stages of the project and throughout its implementation (see Appendix H for a listing of the most important contacts). Two specialists were officially engaged as consultants to provide analysis of 1) marine railway and shipyard materials -- Warren Reiss, of the Maritime Archaeological and Historical Institute, Bristol, Maine; and 2) barges and other riverine craft -- Bruce Terrell, then of the Hampton Roads Naval Museum, Norfolk, Virginia.

In terms of long-term treatment of the features at the site, it was decided that the least amount of disturbance would result from their being left in place, due to the sizes of the features, the logistical problems and expense involved in the necessarily long-term conservation of large, water-logged wooden objects, and the types of development impact expected.