HISTORICAL PERSPECTIVES

Phase IA Archaeological Documentary Study Battery Park City Ballfield and Community Center Resiliency Project New York, New York #20PR00260

Phase IA Archaeological Documentary Study
Battery Park City Ballfield and Community Center Resiliency Project
New York, New York
 # 20PR00260

Prepared For:

STV, Inc.
225 Park Avenue South
New York, NY 10003

and

Battery Park City Authority
200 Liberty Street, 24th floor
New York, NY 10281

Prepared By:

Historical Perspectives, Inc.
P.O. Box 529
Westport, CT 06881

Author:

Faline Schneiderman, MA RPA

October 2020

MANAGEMENT SUMMARY

SHPO Project Review Number (if available): **20PR00260**

Involved State and Federal Agencies: **Battery Park City Authority**

Phase of Survey: **Phase IA Archaeological Documentary Study**

Location Information
Location: **200 And 300 North End Avenue, Block 16 Adjacent to Lot 7520 and Lot 7519**
Minor Civil Division: **06101**
County: **New York**

Survey Area
Length: **ca. 410' on West Street, 165 feet along Warren Street, and 220 feet along Murray Street**
Width: **ca. 10'**
Number of Acres Surveyed: **2.2 acres**

USGS 7.5 Minute Quadrangle Map: **Jersey City, NJ-NY 2019**

Archaeological Survey Overview
Number & Interval of Shovel Tests: **N/A**
Number & Size of Units: **N/A**
Width of Plowed Strips: **N/A**
Surface Survey Transect Interval: **N/A**

Results of Archaeological Survey
Number & name of precontact sites identified: **None**
Number & name of historic sites identified: **None**
Number & name of sites recommended for Phase II/Avoidance: **None**

Results of Architectural Survey
Number of buildings/structures/cemeteries within Project Site: **None**
Number of buildings/structures/cemeteries adjacent to Project Site: **None**
Number of previously determined S/NRHP-listed or -eligible buildings/structures/cemeteries/districts**: 1**
S/NRHP-eligible within APE, Hudson River Bulkhead
Number of identified eligible buildings/structures/cemeteries/districts: **None**

Report Authors(s): Faline Schneiderman, M.A., R.P.A., Historical Perspectives, Inc.

Date of Report: October 2020

EXECUTIVE SUMMARY

The Battery Park City Authority (BPCA) is proposing the construction of interim independent flood protection measures that would protect the Battery Park Ballfield and Community Center located at West Street between Warren and Murray Streets, New York, New York (the Project Site). The flood protection measures would primarily consist of installing approximately 800 linear feet of an interim flood barrier system (flood barrier) along West, Murray, and Warren Streets. The flood barrier is intended to provide temporary protection to the Ballfields and Community Center on an interim basis, until permanent flood protection for the entirety of Battery Park City is completed. The BPCA is acting as lead state agency for the environmental review.

The Project Site is located on Block 16, Lot 3 immediately east of and adjacent to Lot 7520 (200 North End Avenue) and Lot 7519 (300 North End Avenue). Construction of the flood barrier would require excavations up to five feet deep along the Project Site's northern, southern, and eastern perimeter. The proposed flood barrier will be composed of steel plates embedded in a continuous concrete grade beam attached to existing or new fence posts using steel angles. In order to construct the flood barrier, the existing perimeter fence mesh may need to be removed and a new concrete grade beam will be added, running between existing fence post 2'-0" sonotubes. This grade beam would be installed to a depth of approximately 3.5 feet (to match the existing foundation that supports the existing perimeter fencing). The Area of Potential Effect (APE) is a linear trench that is about 410 feet in length along Route 9A/West Street, 165 feet along Warren Street, and 220 feet along Murray Street.

As part of the environmental review, an archaeological assessment is being prepared. Historical Perspectives, Inc. (HPI) was contracted by STV to complete this Phase IA Archaeological Documentary Study for the proposed flood barrier. This study was prepared to comply with the standards of both the New York State Office of Parks, Recreation, and Historic Preservation (OPRHP) and the New York City Landmarks Preservation Commission (LPC) (New York Archaeological Council 1994; OPRHP 2005; LPC 2018; CEQR 2014, revised 2016).

Documentary research found that sections of the Hudson River Bulkhead might lie beneath the Project Site. New York City's Hudson River Bulkhead from Battery Place to West 59th Street, Site No. 06101.019225, was first identified as part of the cultural resources assessment of the Route 9A corridor post-demolition of the West Side Highway (HAA and HPI 1990), and addressed again in several subsequent studies including the Hudson River Park cultural resources assessment (HPI 1997). Its significance has been documented in several development projects, and a Programmatic Agreement (PA) was developed for the bulkhead as part of the initial Route 9A Reconstruction Project (1997), with an amendment for the Route 9A Lower Manhattan Development Project Supplemental study initiated after 9/11 (NYSDOT et al 2005). Another PA was developed for the bulkhead for the Hudson River Park Project (Hudson River Park 2000).

The Hudson River Bulkhead may exist beneath the Project Site, buried by landfill introduced in the early 1970s for the creation of Battery Park City. Because the impact area for the proposed flood barrier is confined to the exterior perimeter of the extant ballfield, only two locations potentially intersect with this feature: one on the north boundary line and one on the south. The bulkhead at the southern location may date to between 1891 and 1894 (or possibly earlier), and the bulkhead at the northern location may date to between 1871 and 1879.

The existing ballfields currently have a fence along the perimeter, and there are extensive utility boxes and conduits at the southeastern corner of the ballfield. While it is possible that the installation of the fence and electrical conduits have disturbed the bulkhead in either of the two locations identified as potentially sensitive, the precise depth of prior excavations in relation to the potential depth of the bulkhead wall cannot be established through the documentary records. Therefore, if the bulkhead walls have remained undisturbed in the two identified locations highlighted on Figure 17, the installation of the proposed flood barrier, for which excavations are expected to extend five feet below existing grade, *may* disturb this S/NRHP-eligible resource.

Because the Project Site has the potential to contain intact sections of the Hudson River Bulkhead, and because excavations in two locations for the proposed flood barrier may impact this feature, Phase IB Archaeological Excavations immediately prior to construction are recommended. Prior to initiating Phase IB work, an Archaeological Work Plan (AWP) for subsurface testing will be prepared for review and acceptance by both OPRHP and LPC. The AWP will describe the methodology that will be used to determine whether resources are present and intact. It will also provide a strategy for the archaeological examination of the resource, and methods of documentation. Further, it will describe potential laboratory work and provide details of the personnel, estimated

hours for field work, laboratory work, and report writing, editing, and submission. Finally, it will include a research design - a systematic planning of archaeological research - consistent with the scope of the proposed work and should be developed in consultation with OPRHP and LPC. Ongoing agency coordination and meetings will be part of the future work.

TABLE OF CONTENTS

FIGURES

PHOTOGRAPHS

(see Figure 2 for Photograph locations)

Photograph 1: Eastern perimeter of Battery Park City Ballfields at right, facing south from Warren Street at Hudson River Park on West Street.

Photograph 2: Southern perimeter of Battery Park City Ballfields at right, facing west from Hudson River Park/West Street intersection with Murray Street.

Photograph 3: Western perimeter of Battery City Park Ballfields, facing north from Murray Street.

Photograph 4: Northern perimeter of Battery Park City Ballfields, facing west from Hudson River Park/West Street intersection with Warren Street.

Photograph 5: Southeastern section of the Battery Park City Ballfields, facing southeast from the western edge of the fields. Arrow points to utility boxes at the extreme southeastern corner for the field.

Photograph 6: Close up of utility boxes at the southeastern corner of the Battery Park City Ballfields, facing east from just north of Murray Street.

Photograph 7: Close up of utility boxes at southeastern corner of Battery Park City Ballfields, facing west from Hudson River Park/West Street just north of Murray Street.

Photograph 8: Trees planted inside the perimeter of the northeastern corner of the ballfields, facing northeast.

I. INTRODUCTION

The Battery Park City Authority (BPCA) is proposing the construction of interim independent flood protection measures that would protect the Battery Park Ballfield and Community Center located at West Street between Warren and Murray Streets, New York, New York (the Project Site). The flood protection measures would primarily consist of installing approximately 800 linear feet of an interim flood barrier system (flood barrier) along West, Murray, and Warren Streets. The flood barrier is intended to provide temporary protection to the Ballfields and Community Center on an interim basis, until permanent flood protection for the entirety of Battery Park City is completed. The BPCA is acting as lead state agency for the environmental review.

The Project Site is located on Block 16, Lot 3 immediately east and adjacent to Lot 7520 (200 North End Avenue) and Lot 7519 (300 North End Avenue). Construction of the flood barrier would require excavations up to five feet deep along the Project Site's northern, southern, and eastern perimeter. The proposed flood barrier will be composed of steel plates embedded in a continuous concrete grade beam attached to existing or new fence posts using steel angles. In order to construct the flood barrier, the existing perimeter fence mesh may need to be removed and a new concrete grade beam will be added, running between existing fence post 2'-0" sonotubes. This grade beam would be installed to a depth of approximately 3.5 feet (to match the existing foundation that supports the existing perimeter fencing). The Area of Potential Effect (APE) is a linear trench that is about 410 feet in length along Route 9A/West Street, 165 feet along Warren Street, and 220 feet along Murray Street.

As part of the environmental review, an archaeological assessment is being prepared. Historical Perspectives, Inc. (HPI) has been contracted by STV to complete this Phase IA Archaeological Documentary Study for the proposed flood barrier and addresses archaeological resources as required by the City Environmental Quality Review (CEQR) and the State Environmental Quality Review Act (SEQRA). This study was prepared to comply with the standards of the both the New York State Office of Parks, Recreation, and Historic Preservation (OPRHP) and the New York City Landmarks Preservation Commission (LPC) (New York Archaeological Council 1994; OPRHP 2005; LPC 2018; CEQR 2014, revised 2016).

II. METHODOLOGY

Area of Potential Effect

The 2014 (revised 2016) *CEQR Technical Manual* identifies archaeological sites as a location or place that possesses historic, cultural, or archaeological value, either because a significant event or sequence of events took place there, or because an important building or structure, whether now standing, ruined, or vanished, is or was, located there. A site can be important because of its association with significant historic (or prehistoric) events or activities, buildings, structures, objects, or people, or because of its potential to yield information important in prehistory or history. Examples of sites include a Native American habitation site or a battlefield. As such, the Area of Potential Effect (APE) for the proposed flood barrier is limited to the specific locations where project-related excavation would result in new in-ground disturbance. Therefore, the APE is a linear trench that is about 410 feet in length along Route 9A/West Street, 165 feet along Warren Street, and 220 feet along Murray Street.

Documentary Research Tasks

This study entailed a review of various resources to establish the history of the APE, and assess prior disturbances as well as impacts to potential archaeological and historic resources. Undertaken research is described below.

- Historic maps were reviewed using materials available at the Map Division of the New York Public Library, and various online websites. These maps provided an overview of the topography and a chronology of land usage for the Project Site.
- Previously recorded archaeological sites were reviewed using data from OPRHP and the LPC.
- Previously completed cultural resources surveys were reviewed using OPRHP's Cultural Resources Information System (CRIS).
- Data were reviewed from a Phase I Environmental Site Assessment (ESA) (STV 2019).
- STV provided project construction and modification plans and photographs, which confirmed locations and depths of prior subsurface disturbance to the Site.

- STV provided site photographs, which allowed assessment of any obvious or unrecorded subsurface disturbance (Photographs 1-8; Figure 2).
- Historic site photographs were garnered from various online repositories and publications.

These sources served to document existing conditions, prior disturbances, and potential archaeological resources in the APE.

III. ENVIRONMENTAL SETTING AND CURRENT CONDITIONS

Environmental Setting

The history of Manhattan was in part shaped by the topography, ecology, and economic conditions that prevailed at various times. Understanding the city's geologic history aids in understanding the land use history. During the Pleistocene period, ice advanced in North America several times. In the last 50,000 years, the Wisconsonian period, ice was 1,000 feet thick over Manhattan. Gravel and boulders deposited at the melting margins of ice sheets formed Long Island about 15,000 years ago (Kieran 1982). For a brief period, Manhattan was largely covered by a glacial lake. Glacial Lake Flushing occupied broad, low-lying areas when deglaciation of the region produced vast volumes of meltwater. Higher elevations of Manhattan may have been marginal to this lake (Rutsch et al 1983). By 12,000 years ago, the lake drained and sea levels have gradually risen as glaciers retreated.

Manhattan Island lies within the Hudson Valley region and is considered part of the New England Upland Physiographic Province (Schuberth 1968). The underlying geology is made up of gneiss and mica schist with heavy, intercalated beds of coarse grained, dolomitic marble and a thinner layer of serpentine. During the three known glacial periods, the land surface in the Northeast was carved, scraped, and eroded by advancing and retreating glaciers. With the final retreat during the Post-Pleistocene, glacial debris, a mix of sand, gravel, and clay, formed the many low hills or moraines that constitute the present topography of the New York City area (U.S.D.A. 2005).

The Project Site is within the embayed section of the Coastal Plain which extends along the Atlantic Coast and ranges from 100 to 200 miles wide. The Manhattan prong, which includes southwestern Connecticut, Westchester County, and New York City, is a small eastern projection of the New England uplands, characterized by 360 million year old highly metamorphosed bedrock (Schuberth 1968). The Manhattan ridge generally rises in elevation toward the north, and sinks toward the south.

The APE is on man-made land, outboard of the historic Manhattan shoreline. The majority of the Project Site was filled by 1975. The easternmost edge of the APE was filled during the historic period as the shoreline of Manhattan was gradually pushed outward into the Hudson River.

Current Conditions

The Project Site has approximately 410 feet of frontage on West Street (along the Hudson River Greenway), 165 feet of frontage on Warren Street, and 220 feet of frontage on Murray Street (Figure 2; Photographs 1-4). The irregularly shaped two-acre Project Site is developed with two synthetic turf ballfields enclosed by a welded wire fence. The Site also contains dugouts, an approximately 1,400 square foot maintenance storage area, and an electrical substation at its southeastern corner (Photographs 5-7). A concrete-paved walkway provides access to the ballfields from the western boundary. The northeast and southeast portions of the Project Site are landscaped, with mature trees planted inside the perimeter fence at the northeastern corner (Photograph 8). Miscellaneous athletic equipment is present throughout the Site. The northern, eastern, and southern Project Site boundaries are enclosed by temporary, tarp-covered flood barriers. Excess tarps and temporary flood barriers are currently stored along the northeastern perimeter of the Site.

- Soils

The U.S.D.A. soil survey for New York City indicates that the Project Site is located within mapping unit 101, "Pavement & buildings, wet substratum-Laguardia-Ebbets complex, 0 to 8 percent slopes." It is described as:

> Nearly level to gently sloping urbanized areas filled with a mixture of natural soil materials and construction debris over swamp, tidal marsh, or water; a mixture of anthropogenic soils which

> vary in coarse fragment content, with up to 80 percent impervious pavement and buildings covering the surface (U.S.D.A. 2005:12).

Documentary research found that the Project Site is on landfill predominantly deposited in the early 1970s. More specifically, excavated material from the creation of the World Trade Center, and dredged material from the floor of the Hudson River and lower New York Bay was deposited outboard of the Hudson River Bulkhead to create the terrain that comprises the Project Site.

- Topography and Hydrology

Battery Park City was historically submerged land within the Hudson River that was filled in the early 1970s to create the landform west of West Street that currently exists. The United States Geological Survey (U.S.G.S.) topographic map shows the Site as approximately 600 feet east of the current Hudson River shoreline, with topographic elevation at less than 10 feet above mean sea (amsl) (Figure 1). The topography within the immediate area of the Site is generally level as it was graded after filling (Figure 2). According to the 2019 ESA for the site, groundwater is expected at depths of eight to nine feet below ground surface.

IV. BACKGROUND RESEARCH/HISTORICAL OVERVIEW

Precontact Overview

For this report, the word precontact is used to describe the period prior to the use of formal written records. Based on data from these sources, a precontact cultural chronology has been devised for the New York City area. In the western hemisphere, the precontact period also refers to the time before European exploration and settlement of the New World. Archaeologists and historians gain their knowledge and understanding of precontact Native Americans in the metropolitan New York area from three sources: ethnographic reports; Native American artifact collections; and archaeological investigations. Scholars generally divide the precontact era into three main periods: the PaleoIndian (c. 14,000-9,500 years ago); the Archaic (c. 9,500-3,000 years ago); and the Woodland (c. 3,000-500 years ago). The Woodland period is further divided into Early, Middle, and Late substages, and is followed by the Contact Period (c. 500-300 years ago). Artifacts, settlement, subsistence, and cultural systems changed through time with each of these stages. Characteristics of these temporal periods have been well documented elsewhere, and in keeping with guidelines issued by the OPRHP (2005), will not be fully reiterated here.

The Site was historically land under the waters of the Hudson River. Until the 1970s, the shoreline of the Hudson River was east of its currently location, and at the time of European Contact, the shoreline was more than 1,000 feet to the east (see Historical Period Overview section below). Therefore, the Site is considered to have no potential for precontact resources.

Historical Period Overview

The margins of historical Manhattan were once further inland than they are today. The Hudson River shoreline has undergone dramatic change over the last 300 years as various steps were taken to push it outward to maximize land area in the growing city. Prior studies of the western Manhattan shoreline have been completed, in part by HPI (Route 9A, Hudson River Park). Relevant research and passages from these prior studies are presented herein, together with additional data relevant to the Project Site (HAA and HPI 1990, HPI 1997).

When Giovanni de Verrazano first sailed into New York harbor in 1524, the Project Site was land under water. In 1623 the Dutch West India Company was granted rights to all lands within Manhattan by the Dutch States General (Hoag 1905:32). Subsequently in 1626 Peter Minuit, the Director General, purchased Manhattan Island from the local Indians for what amounted to less than 25 dollars. By 1664, the English had obtained possession of the island, and King Charles II regranted the land to the Duke of York. In 1699, the British removed their Wall Street stockade and the city slowly expanded northward.

In 1686, the Dongon Charter was adopted and the City of New York was officially established. Correspondingly, land ownership out to the low water mark was transferred from the Crown to the City (Hoag 1905:32). At that time, the Project Site was submerged land and the shoreline along the Hudson River was situated several blocks east of its

current location. Early travelers found the East River a better and safer harbor compared to the high bluffs and jagged edges of the Hudson shoreline. The depth of the Hudson, the lack of protected coves, and the propensity for winter ice floes rendered the riverfront untenable for dockage (Buttenwieser 1987:27). Hence filling along its edges was not pursued as early as it was along the shoreline of Manhattan's East River (Ibid:32).

In 1730, the Montgomery Charter granted river lots for two blocks beyond the low water mark along the Hudson River. The charter provided for the creation of Greenwich, Washington, and West Streets parallel to the river's shoreline (Hoag 1905:32). Since filling the shoreline was egregiously slow and sporadic, in 1795 the Common Council passed another ordinance to create West Street with the hopes of compelling landowners to fill their water lots. By the early 19th century, many docks and piers had been built on the Hudson River shorefront in lower Manhattan including Dean's Dock at Murray Street built in 1804, and Rhinelander's Shipyard between Warren and Harrison Streets, built in 1803. The shoreline remained east of West Street, with docks jutting out into the river in the Project Site. In 1804, the Common Council increased the distance from Washington to West Street from 160 feet to 200 feet, lengthening the city blocks between them by 40 feet to encourage development (Rutsch et al. 1983:153).

By the early 19th century, chaotic street construction spurred a city plan that provided for the systematic laying out of streets and avenues throughout Manhattan. The resultant Commissioner's Plan of 1811 imposed a grid system over the city, disregarding natural topographic features that may have impeded road construction. Street regulations called for extensive grading and filling, removing massive rocks and boulders, and tearing down existing houses located in the paths of proposed roadways. Although the plan was laid down on paper, many of the roads were not actually created until decades later. West Street remained incomplete in many places at that time (Bridges 1811; Ewen 1827-30).

The frustrations experienced by the City in their attempts to create West Street caused the Common Council to pass yet another ordinance in 1825, demanding the creation of West Street and filling of water lots. Although the Common Council was relentless in their pursuit to assure the complete construction of West Street, filling and development was slow. In 1835, the landowners west of Bowling Green took the issue into their own hands and petitioned for the extension of West Street, from Cedar Street south to the Battery, using refuse from a recent downtown fire as fill (Buttenwieser 1987:41).

Land reclamation and filling along the Hudson River waterfront was pursued by allowing unstructured harbor silts and river accretion to build up, or by placing fill in engineered retaining devices (Geismar 1983:672). In lower Manhattan, ships were sometimes deliberately sunk as cribbing to help stabilize fill (Berger 1983:9; AKRF 2013:1-1). After wharves and piers were built, derelict ships were sometime sunk adjacent to them, and together these features contributed to and fill and served to retain additional dumped materials. In one such case, part of the burnt seventeenth century Dutch ship "Tiger" was sunk and subsequently encountered during subway excavation at the northwest corner of Dey and Greenwich Streets in 1916 (Solecki 1974:109). During the later excavation of the adjacent World Trade Center (WTC) in the 1970s, archaeologists unsuccessfully searched for the remainder of the ship (Ibid.). However, excavations, post-dating the 9/11/2001 attack on the WTC encountered yet another sunken ship in an area not previously excavated (AKRF 2013:1-1).

Wooden cofferdams, wharves, and bulkheads were built as fill retaining devices, framed with hewn logs, filled with loose stone, and covered with earth (McDonald 2011:43; Geismar 1983:30). Timber grillage was commonly used as cribbing, a practice first employed in Europe (McDonald 2011:44). Colonists continued to use this method, as both the Dutch and English had previously, aided by the ample supply of wood in the region. To retain fill, quays were first built by driving a row of wooden piles into the river with diagonal braces bolted to the inside, forming the face work. Earth and fill was then placed in the vacant area behind the piles, and was then planked over to form a roadway level with adjacent streets. Wooden jetties were similarly built. Once the economic value of clean fill generated from building excavations was realized, this was no longer used as fill. Instead, wharves and piers were frequently used as dumping boards, where garbage was collected and pushed overboard into scows or directly into the river, all east of the Project Site (Buttenwieser 1987:42).

By the mid-19th century, new technologies fostered interest in the relatively unused Hudson River waterfront. The invention of the steamboat in 1807, the production of larger vessels by local shipbuilders, the opening of the Erie Canal in 1825, and the demand for coal in New York City generated more shipping through the port of New York and a demand for deeper berths (Buttenwieser 1987:39). To accommodate these growing industries, new piers were built off of West Street into the Hudson River, and by 1839, narrow wooden finger piers projected from every street

end between Vesey and King Streets, including Murray and Warren (Ibid.). The shorefront was predominantly controlled by private individuals and businesses, contributing to deplorable waterfront conditions (Hoag 1905:36). Irregularly shaped, privately owned piers were in a continual state of disrepair and the solid base construction of piers prohibited the flow of sewage, draining from the shores out to sea, creating disease-ridden waters (New York Pier and Warehouse Co. 1869:58). The miserable waterfront conditions desperately called for corrective measures, and numerous public agencies were established to deal with these issues. After complaints about crowding the harbor, in 1857 the State of New York and the New York Harbor Commission established permanent pier and bulkhead lines along the Hudson River (Buttenwieser 1987:48).

One of the agencies created to address waterfront conditions was the Department of Docks, established in 1870. The department was granted rights and land for the construction of wharves, bulkheads, docks, piers, basins, and slips. They instituted the McClellan Plan, which resulted in the construction of a solid block and granite bulkhead wall, around the southern half of Manhattan between West 61st and East 51st Streets, over the course of the next sixty years. The wall was to be placed outside of the previously existing bulkhead to allow 250 feet for the width of West and Marginal Streets (Buttenwieser 1987:73). The plan enabled the available pier area to double on the Hudson River shorefront. Piers were built to accommodate many steam ship lines and ferry houses for the New Jersey Central and Pennsylvania Railroads (McCabe 1882:360).

Despite all the efforts put forth by the Department of Docks, by the 20th century conditions along the waterfront had barely improved. In the 1930s, West Street was edged with busy docks, and was the “main highway for the city's incoming and outgoing supplies” (Works Progress Administration 1938:58). South of West 23rd Street, the Hudson River was walled by an “almost unbroken line of bulkhead sheds and dock structures” (Ibid.:69), blocking any view of the river itself from pedestrians or nearby residents. Subsequently, more plans were enacted to help alleviate traffic congestion in the 1920s and 1930s, and thus the West Side Highway (Highway) was constructed. By 1947, the elevated structure continued as far south as Rector Street, supported on piles driven to bedrock (Vollmer Associates 1989:10). The Highway was abandoned in the 1970s, and has since been demolished. An at-grade roadway was built to replace it (Ibid.).

In the 1960s, the previously established laws governing development west of the bulkhead line were changed to allow for landfilling west out to the U.S. Pierhead line between Battery Place and Chambers Street. As a result, the Battery City Park landfilling project was initiated in 1966 and was finally completed in 1974, although the area remained unused for some time thereafter. The Project Site falls within the northern section of the 92 acres of this manmade land, west of the bulkhead line (Battery Park City Authority 1981:1).

Site Specific History

Historically, the majority of the Project Site was land under water through the early 20th century. Maps from the 1770s through at least 1817 show the Project Site in the Hudson River outboard of the shoreline that had not yet been filled as far west as current West Street (Ratzer 1766-7, Figure 3; Longworth 1808; Poppleton and Maverick 1817). By 1824, filling had extended westward so that West Street had been created east of the Project Site, and a pier had been built out into the Hudson River opposite what was then Robinson Street, roughly where Murray Street now intersects with West Street, so that its western end may have extended into the Project Site (Hooker 1824, Figure 4). Between 1824 and 1829, a pier also had been built off the foot of Murray Street through the Project Site, and by 1832, another had been built off the foot of Warren Street (Hooker 1829; Burr 1829, 1832). In 1835, the Commissioner of Wharves and Piers approved an excavation for a slip between Park Place (aka Robinson Street) and Warren Street, meaning this area had been dredged (Rutsch et al. 1983:132). The numbers of the two piers in the Project Site changed multiple times in the 1830s, and in 1846 were numbered 26 and 27 (Pendleton 1834; Colton 1836; Burr 1846). Revised again, by 1852 they had been numbered 28 and 29 (Dripps 1852, Figure 5). Other than the two piers, the remainder of the Project Site was open water at that time.

The adoption of a bulkhead line in 1857 did little to change the layout of the waterfront along the Hudson River in the vicinity of the Project Site (Buckhout 1860, Figure 6; Dripps 1867). In both 1871 and 1873, the majority of the Project Site remained unchanged, although maps showed that plans were underway for new piers to replace the old ones at the foot of Murray and Warren Streets, likely in response to the 1870 adoption of a new bulkhead line (Map of West Street 1871, Figure 7; Commissioner of Docks 1873, Figure 8). While the new 1870 bulkhead line had been established and piers proposed, both remained unrealized in the Project Site through at least 1891 (Bromley and Robinson 1879, Figure 9; Robinson 1885, Figure 10; Bromley 1891).

A small section of the northeastern corner of the Project Site historically extended north of Pier 19 at the foot of Warren Street into the footprint of the Pavonia Ferry terminal. Established at Chambers Street in the 1850s, conflicting maps showed the ferry complex extending out from the bulkhead between Chambers and Reade Streets in 1873 (see Figure 8), and between Warren and Chambers Street in 1871, 1879, 1885, and on through 1955 (see Figures 7 and 9-14), the latter location appearing to have been the correct one from at least 1879 onward. The ferry, run by the Erie Railroad (Erie), was sold to the Pavonia Ferry Company in 1854, but leased back to Erie in 1859.

In 1877, the Department of Docks reported it had surveyed and completed sections of the bulkhead wall between Warren and Morton Streets (Department of Docks 1878:45). In 1893, they reported that during the prior year, the Old Colony Steamboat Company had leased land under water for the extension of Old Pier 28 (Pier 18) off Murray Street (New York Department of Docks 1893:47). Also, Old Pier 29 (Pier 19) off Warren Street had platforms installed on its south side by the Providence and Fall River Steamship Company. Further, on the north side of Pier 19, ferry racks were installed by the Erie to service their Pavonia Ferry (Ibid.). Between 1891 and 1894, Pier 19 had been extended west, a bulkhead had been constructed between it and Pier 18 to the south, and West Street had been filled out to the 1870 bulkhead line (Sanborn 1894, Figure 11). The Project Site appeared unchanged in 1897, but by 1907 the land-side of the bulkhead between Pier 18 and Pier 19 was under lease to the New England Navigation Company, which was also granted a lease of land under water to extend Pier 18 westward (Department of Docks 1909:82). This extension was evident on maps by 1913, as was the new bulkhead and the filling of West Street (Bromley 1897; Sanborn 1913; Bromley 1916, Figure 12).

From approximately 1916 through the 1970s, the Project Site encompassed the two freight and passenger piers, 18 and 19, with associated storage sheds and head houses. These were sequentially occupied by various corporations including the "Old Colony Steamboat Co." in 1894, "Stern S.S. Corp'n" in 1928, and the "Eastern S.S. Corp'n." in 1955-56 (Sanborn 1894, Figure 11; Bromley 1916, Figure 12; Sanborn 1928, Figure 13; Bromley 1955-56, Figure 14). The Pavonia Ferry service continued through 1959, and the defunct terminal and piers were demolished in 1964 (*New York Times* 6/21/1964). After that, all remaining piers, piles, and associated structures were demolished by the early 1970s when the Project Site was filled in preparation for the creation of Battery Park City. All filling of the Project Site was completed by 1979 (Private Corporation 1979, Figure 14), with fill derived from multiple sources including dredged Hudson River bottom silts, and earth and rock excavated from the World Trade Center construction site.

The Project Site remained vacant, with indications of disturbance and construction activities from approximately 1979 to at least 1988. By 1991, it had been developed with miscellaneous athletic turf fields and associated equipment storage sheds and electrical facilities. On-site athletic fields were demolished and redeveloped at least three times in 2006, 2010, and 2013. The extant ballfields were created in 2013. Additional on-Site operations have included construction activities on the northwest corner, evidenced by land disturbance and unidentifiable builder's materials in 1991, which was complete by 1997, and the construction of an equipment storage shed on the southern perimeter of the Project Site, which stood from 1997 until at least 2010. An electrical equipment storage area was also established on the southeast corner of the Project Site by 2010 (STV 2019:6).

Previously Identified Archaeological Sites

Research conducted using data from the OPRHP, the LPC, and the library of HPI revealed one archaeological site within the Project Site, and numerous archaeological sites within a one-mile radius. Of note, only two vaguely mapped precontact sites have been recorded in Lower Manhattan, all north of the project site. The remaining archaeological sites are all historic period resources. These sites are listed below.

NYSM or OPRHP Site Number	Site Name/Description	Location	Site Type/Time Period
NYSM 4059	Shell Point	Near Canal St.	Unknown Precontact
NYSM 4060	N/A	Lower East side vicinity	Unknown Precontact
06101.000001	District and Extension	South Street Seaport Area	Unknown/form missing
06101.000014	Schermerhorn Row Block	South Street Seaport Area	Unknown/form missing
06101.000490	Unknown/form missing	Battery Park Area	Unknown/form missing
06101.000491	Unknown/form missing	Lower Manhattan	Unknown/form missing

NYSM or OPRHP Site Number	Site Name/Description	Location	Site Type/Time Period
06101.000503	*Tyjger*	Greenwich and Dey Streets	Ship, ca. 1613
06101.000604	209 Water St Site	South Street Seaport Area	c. 1775-1800
06101.000623	Block 74W Telco Site	South Street Seaport Area	c. 1740-1775
06101.001271	175 Water Street	Near South Street Seaport	c. 1740-1780
06101.001272	Historic Landfill Site, 64 Pearl Street	Financial District	Late 17th century
06101.001282	Ronson Project Site (Pearl, Bridge & Whitehall)	Financial District	17th century-modern
06101.001283	Barclay's Bank Site / 100 Water St	Financial District	1750s-1820s
06101.001284	Block 35 The Assay Site	Financial District	Revolutionary era
06101.001285	Site Washington St. Urban Renewal Project	West and Washington Streets	Early 19th century
06101.001304	City Hall Park	City Hall Park	18th-19th century
06101.006763	Schermerhorn Row Block	South Street Seaport Area	1780-1810
06101.006980	African Burial Ground	North of City Hall Park	18th-19th century
06101.006981	Five Points Area	Five Points	Late 18th-19th century
06101.007671	Broome St Historic Site	576 Broome Street	19th century
06101.012569	Worth St Historic Site	Worth Street and Lafayette Street	19th century
06101.013334	Whitehall Ferry - 18-19th Century landfill and cribbing site	Whitehall Ferry	18th-19th century
06101.013335	Tweed Courthouse Area Deposits - burials/structures/deposits	City Hall Park	Burials, structures, deposits, 19th century
06101.013876	Federal Hall Archaeological site	Wall and New Streets	19th century
06101.015598	Whitehall Slip site	Whitehall Street	18th and 19th century
06101.015768	18th Century Battery Wall	State and Water Streets	18th century
06101.015825	Block 100, Lot 1 site	New York Downtown Hospital	19th century
06101.016117	Columbus Park Pavilion cistern	Columbus Park, north of Worth Street	19th century
06101.016196	Log Cribbing & Fill at the South Ferry Terminal Project	Battery Park	17th-19th centuries
06101.017265	Spring Street Presbyterian Church Cemetery/Vaults	244-266 Spring St	Burials, 19th century
06101.017931	Historic well beneath Corbin Building	192 John Street	19th century
06101.015801	WTC - Vesey Street Site	Vesey Street	Unknown
06101.018000	WTC-VSC Ship	Vehicular Security Center/World Trade Center	18th or early 19th century ship
06101.018115	Burling Slip walls - Codwise and Remsen sections	John Street	18th-19th century
06101.018120	Pier 7 complex Site (NYSM 12322) -	West Street	Early 20th century
06101.018121	Liberty Street Pilings Site (NYSM 12321) -	Liberty Street	19th century
06101.019225	Hudson River Bulkhead	In Project Site	1870-1938

NYSM or OPRHP Site Number	Site Name/Description	Location	Site Type/Time Period
06101.019277	60 Wall Street	60 Wall Street	Multiple historic periods

Only the Hudson River Bulkhead was identified in the Project Site. New York City's Hudson River Bulkhead from Battery Place to West 59th Street, Site No. 06101.019225, was first identified as part of the cultural resources assessment of the Route 9A corridor post-demolition of the West Side Highway (HAA and HPI 1990), and addressed again in several subsequent studies including the Hudson River Park cultural resources assessment (HPI 1997). Its significance has been documented in several development projects, and a Programmatic Agreement (PA) was developed for the bulkhead as part of the initial Route 9A Reconstruction Project, with an amendment for the Route 9A Lower Manhattan Development Project Supplemental study initiated after 9/11 (NYSDOT et al 2005). Another PA was developed for the bulkhead for the Hudson River Park Project (Hudson River Park 2000). Further, the bulkhead has been the subject of at least one archaeological investigation to the south adjacent to Battery Park City at both the site of West Thames Park and Liberty Street Bridge (Lenardi 2011).

The Hudson River Bulkhead is considered significant under Criterion C in the area of engineering, under Criterion A in the areas of commerce or industry, and under Criterion D for its potential to yield information about historic engineering methods. New York City created a Department of Docks in 1870, and the department constructed the bulkhead and its associated structural systems between 1871 and 1936 (AKRF 2009). The majority of the bulkhead construction consisted of masonry walls on a variety of foundation systems, with quarry faced ashlar granite block forming the visible face along most of the armored frontage.

The Building/Structure Inventory Form on file with OPRHP, and included as an Appendix to this report, was completed by archaeologist Michael Raber. The form details the entirety of the bulkhead wall and its multiple iterations along the Hudson River that varied by date and subsurface conditions (see Appendix). The sections of the bulkhead wall identified by Raber in the Project Site date to two different periods, the early 1870s at the south, and the late 1870s through 1890s at the north. Specifically, Raber noted that in the Project Site were two wall types; Type IIA in the south section, and Type IIIB in the north section, both considered significant (Raber 1997; see Figure 16 of this report).

Bulkhead wall Type IIA is described as consisting of granite walls on mass concrete blocks, resting on two-inch thick concrete beds with piles beneath, and no timber relieving platforms, dating to ca. 1873-1875 in several sections between Murray and Horatio Streets (1.6 miles to the north of the Project Site) (see Appendix Figure 3). Cartographic research for this study, however, indicates that in the south section of the Project Site the bulkhead wall was erected between 1891 and 1894 (Bromley 1891; Sanborn 1894, Figure 11), far later than the narrow period of 1873-1875 described in the Inventory Form (Appendix). The discrepancy leaves an area of uncertainty as to the bulkhead's precise date and the type of construction employed.

In the north portion of the Project Site, Type IIIB bulkhead was identified. It is described as having granite walls on narrow concrete blocks, with inboard relieving platforms of inclined bracing piles that take lateral thrusts to below the base block, with timber binding frame around the piles (Raber 1997, see Appendix Figure 4). These were typically built between 1876 and 1898 between Warren and West 38th Streets. This is consistent with maps and atlases of the north end of the project site that show the Pavonia Ferry and Pier 19 built between 1871 and 1879 (Map of West Street 1871, Figure 7; Commissioner of Docks 1873, Figure 8; Bromley and Robinson 1879, Figure 9).

V. SUMMARY OF POTENTIAL RESOURCES AND POTENTIAL IMPACTS

The Hudson River Bulkhead has been identified as potentially beneath a small section of the northern perimeter and a small section of the southern perimeter of the Project Site, buried by landfill introduced in the early 1970s for the creation of Battery Park City. Prior research combined with documentary research completed for this study found that the south portion of the Project Site may contain remnants of the bulkhead dating between 1891 and 1894 (or possibly earlier if the Inventory Form is correct), and the north section may contain remnants of the wall dating between 1871 and 1879. Because the impact area for the Project Site is confined to the exterior perimeter of the extant ballfield, only two locations potentially intersect with this feature: one on the north boundary line and one on the south (Figure 17).

The existing ballfields currently have a fence along the perimeter, and there are extensive utility boxes and conduits at the southeastern corner of the ballfield. While it is possible that the installation of the fence and electrical conduits have disturbed the bulkhead in either of the two locations identified as potentially sensitive, the precise depth of prior excavations in relation to the potential depth of the bulkhead wall cannot be established through the documentary records. Therefore, if the bulkhead walls have remained undisturbed in the two identified locations highlighted on Figure 17, the installation of the proposed flood barrier, for which excavations are expected to extend five feet below existing grade, *may* disturb this S/NRHP-eligible resource.

VI. RECOMMENDATIONS

Because the Project Site has the potential to contain intact sections of the Hudson River Bulkhead, and because excavations in two locations for the proposed flood barrier may impact this feature, Phase IB Archaeological Excavations immediately prior to construction are recommended. Prior to initiating Phase IB work, an Archaeological Work Plan (AWP) for subsurface testing will be prepared for review and acceptance by both OPRHP and LPC. The AWP will describe the methodology that will be used to determine whether resources are present and intact. It will provide a strategy for the archaeological examination of the resource, and methods of documentation. Further, it will describe potential laboratory work and provide details of the personnel, estimated hours for field work, laboratory work, and report writing, editing, and submission. Finally, it will include a research design – a systematic planning of archaeological research - consistent with the scope of the proposed work and should be developed in consultation with OPRHP and LPC. Ongoing agency coordination and meetings will be part of the future work.

VII. REFERENCES

Battery Park City Authority
1981 *Battery Park City Final Environmental Impact Statement.* Battery Park City Authority, New York.

AKRF
2009 *Topic Intensive Archaeological Documentary Study, WTC Vehicular Security Center and Tour Bus Parking Facility Streetbeds. Liberty Street between Greenwich Street and Route 9A, Cedar Street between Washington Street and Route 9A, and Washington Street between Cedar and Liberty Streets. New York, New York.* Prepared for the Port Authority of New York and New Jersey. December 2008, revised February 2009.

2013 *Final Technical Report World Trade Center Memorial and Development Plan: Data Recovery and Analysis of the WTC Ship Blocks 54, Lot 1 and Block 56, Lots 15, 20, and 21 New York, New York.* Prepared for: The Lower Manhattan Development Corporation, New York, New York.

Berger, Louis and Associates
1983 *Barclays Bank Site, 100 Water Street, New York, New York.* The Cultural Resource Group of Louis Berger, Inc.

Bridges, William
1811 *Map of the city of New York and island of Manhattan, as laid out by the commissioners appointed by the legislature, April 3d, 1807.*

Bromley, George W.
1891 *Atlas of the city of New York, Manhattan Island. From actual surveys and official plans.* G. W. Bromley & Company, Philadelphia.

1897 *Atlas of the city of New York, borough of Manhattan from actual surveys and official plans.* G. W. Bromley & Company, Philadelphia.

1916 *Atlas of the city of New York, borough of Manhattan Volume One (Battery to 14th Street) - from actual surveys and official plans.* G. W. Bromley & Company, Philadelphia. 1899 corrected to 1916.

1955-56 *Manhattan Land Book of the City of New York.* G. W. Bromley and Company, New York.

Bromley, George W. and Edward Robinson
1879 *Atlas of the Entire City of New York, Complete in One Volume.* George W. Bromley and Edward Robinson Company, New York.

Buckhout, I.C.
1860 *Maps of the wharves & piers from the Battery to 61st Street on the Hudson River and from the Battery to 41st Street on the East River, New York.* Surveyed by I.C. Buckhout, city surveyor.

Burr, David H.
1829 *Map of the City and County of New York.* Simeon DeWitt, New York.

1832 *Map of the City and County of New York with the adjacent country.* Simeon DeWitt, New York.

1846 *Map of the City of New-York.* C. S. Frances & Co., New York.

Buttenwieser, Ann
1987 *Manhattan Water Bound.* New York University Press, New York.

City Environmental Quality Review (CEQR)
2014 *City Environmental Quality Review Technical Manual (Revised 2016).* City of New York, Mayor's Office of Environmental Coordination. Updated to 2016.

Colton, John H.
1836 *Topographical Map of the City and County Of New-York, and the adjacent Country*. J. H. Colton and Company, New York.

Commissioner of Docks
1873 *Map showing the high and low water mark and the original city grants of lands under water made to various parties from 1686 to 1873, extending from Battery to Fifty-first Street, Hudson and East Rivers, New York City, also the several pier and bulkhead lines established from 1750 to 1873.* New York City Department of Docks.

Dripps, Matthew
1852 *Map of the city of New-York extending northward to Fiftieth St. Surveyed and drawn by John F. Harrison, C.E.*. M. Dripps, New York.

1867 *Map of New York and vicinity.* M. Dripps, New York.

Ewen, Daniel
1827-1830 *Shore maps. Hudson River from the Battery to the North Fort.* Topographic Bureau, Manhattan Borough President's Office, Municipal Building, New York.

Geismar, Joan
1983 *The Archaeological Investigation of the 175 Water Street Block, New York City.* Soil Systems Division of Professional Services Industries, Inc.

Hartgen Archaeological Association and Historical Perspectives, Inc. (HAA and HPI)
1990 *Route 9A Reconstruction Project, Draft Archaeological Assessment, Battery Place to Harrison Street.* Prepared for NYSDOT and FHWA.

Historical Perspectives, Inc. (HPI)
1997 *Existing Conditions Report: Archaeological Resources, Hudson River Park Project West Houston Street to Little West 12th Street, Manhattan, New York.* Prepared 1994, revised 1997. Prepared for: Allee King Rosen and Fleming, Inc., New York.

Hoag, S.W., Jr.
1905 *Dock Department and New York Docks.* The Municipal Engineers of the City of New York, New York.

Hooker, William
1824 *Hooker's New Pocket Plan Of The City Of New York.* William Hooker, New York.

1829 *Hooker's New Pocket Plan Of The City Of New York.* William Hooker, New York.

Hudson River Park
2000 *Hudson River Park Programmatic Agreement among the United States Army Corps of Engineers, the New York State Historic Preservation Officer, the Advisory Council on Historic Preservation, and the Hudson River Park Trust Regarding the Development of the Hudson River Park Along Manhattan's West Side,* March 31, 2000.

Kieran, John
1982 *Natural History of New York City*. Fordham University Press, New York. Reprint.

Landmarks Preservation Commission (LPC)
2018 *Landmarks Preservation Commission Guidelines for Archaeological Work in New York City.*

Lenardi, Michael
2011 *A Cultural Resource Survey Report, Archaeological Monitoring, Treatment, and Data Recovery for New York City Hudson River Bulkhead and World Trade Center Site, at Two Locations: Utility Trench at Southern End of West Thames Park and BIN 2-24549-0 Liberty Street Bridge Median at the Intersection of Liberty Street and NY Route 9A. OPRHP Project Review 04PR00903.* Prepared by the New York State Museum for the New York State Department of Transportation and the Federal Highway Administration.

Longworth, David
1808 *Plan of the city of New York.* Shakespeare Gallery, New York.

Map of West Street…
1871 *Map of West Street from Battery Park to Barrow Street, Manhattan, New York.* Retrieved from http://digitalcollections.nypl.org/items/4d243210-f3a2-0130-4183-58d385a7b928. Site accessed 9/18/20.

McCabe, James D.
1882 *New York By Sunlight and Gaslight.* Douglass Brothers Publishers, Philadelphia.

McDonald, Molly
2011 Wharves and Waterfront Retaining Structures as Vernacular Architecture. *Historical Archaeology* 45(2):42-67.

New York Archaeological Council (NYAC)
1994 *Standards for Cultural Resource Investigations and the Curation of Archaeological Collections.* New York Archaeological Council.

New York City Department of City Planning
2020 *Tax Map*, MapPluto. Retrieved from https://www1.nyc.gov/site/planning/data-maps/open-data/dwn-pluto-mappluto.page#mappluto. Site accessed 9/17/20.

New York City Soil Survey Staff
2005 *New York City Reconnaissance Soil Survey.* United States Department of Agriculture, Natural Resources Conservation Service, Staten Island, NY.

New York Department of Docks
1878 *Seventh Annual report of the Department of Docks for the Year Ending April 30, 1877.* New York Department of Docks and Ferries.

1893 *Twenty-Third Annual Report of the Department of Docks of the City of New York for the Year Ending April 30, 1893, Volume 23.* New York Department of Docks.

1909 *Thirty-Eighth Annual Report of the Department of Docks of the City of New York for the Year Ending December 31, 1908.* New York Department of Docks.

New York State Department of Transportation, Federal Highway Administration, and United States Department of Transportation (NYSDOT, FHWA, USDOT)
2005 *Final Supplemental Environmental Impact Statement (FSEIS) Route 9A Lower Manhattan Redevelopment Project, West Thames Street to Chambers Street in New York County, NYC PIN NYCD.Ol.322.* NYSDOT, FHWA, and USDOT.

New York State Office of Parks, Recreation, and Historic Preservation (OPRHP)
2005 *Phase I Archaeological Report Format Requirements.*

New York Pier and Warehouse Company
1869 *Piers and Wharves of New York.* Evening Post Steam Press, New York.

New York Times
1964 Chambers Ferry Terminal To Be Torn Down by City. *New York Times* June 21, 1964.

Pendleton, John
1834 *The city of New York drawn from actual surveys as furnished by the several city surveyors.* Pendleton Lithographer, New York.

Poppleton, Thomas and Peter Maverick
1817 *Plan of the city of New-York ; the greater part from actual survey made expressly for the purpose (the rest from authentic documents).* Prior and Dunning, New York.

Private Corporation
1979 *Aerial Photograph.* Private Corporation. Recovered from historicaerials.com 9/16/20.

Raber, Michael
1997 *Building Structure Inventory Form: New York City's Hudson River Bulkhead from Battery Place to West 59th St., New York, New York.*

Ratzer, Bernard
1766-7 *Plan of the City of New York, In North America, Surveyed in the Years 1766 and 1767.* Faden and Jeffries, London.

Robinson, E. and R. H. Pidgeon.
1885 *Atlas of the city of New York: embracing all territory within its corporate limits from official records, private plans & actual surveys*. E. Robinson & R.H. Pidgeon.

Rutsch, Edward, Nan Rothschild, et al.
1983 *Westside Highway Cultural Resource Survey, Archaeological Work Program: Cultural Resources Research.* Prepared for New York State Department of Transportation.

Sanborn Map Company
1894 *Insurance Maps of Manhattan.* New York.

1913 *Insurance Maps of Manhattan.* New York.

1928 *Insurance Maps of Manhattan.* New York.

1934 *Insurance Maps of Manhattan.* New York.

1951 *Insurance Maps of Manhattan.* New York.

1981-2006 *Insurance Maps of Manhattan.* New York. Various years.

Schuberth, Christopher J.
1968 *The Geology of New York City and Environs.* Natural History Press, Garden City, New York.

Solecki, Ralph S.
1974 The Tiger, An Early Dutch Seventeenth Century Ship, And An Abortive Salvage Attempt. *Journal of Field Archaeology.* Vol. 1:109-116.

State Environmental Quality Review Act (SEQRA)
2018 *Official compilation of codes, rules and regulations of the State of New York, Title 6. Department of Environmental Conservation Chapter VI. General regulations Part 617.* State Environmental Quality Review. Updated through June 27, 2018.

STV Incorporated.
2019 *Phase I Environmental Site Assessment of Battery Park City Ball Fields West Street Between Murray and Warren Streets, New York, NY 10282.* STV, New York. December 10, 2019.

United States Department of Agriculture (U.S.D.A.)
2005 *New York City Reconnaissance Soil Survey*. United States Department of Agriculture, Natural Resources Conservation Service, Staten Island, NY.

U.S. Department of the Interior
2017 *Secretary of the Interior's Standards for the Treatment of Historic Properties, with Guidelines For Preserving, Rehabilitating, Restoring & Reconstructing Historic Buildings.* Revised by Anne E. Grimmer. U.S. Department of the Interior, National Park Service Technical Preservation Services, Washington, D.C.

U.S.G.S.
2019 *Brooklyn, New York* 7.5 Minute Quadrangle.

2019 *Jersey City, New Jersey-New York* 7.5 Minute Quadrangle.

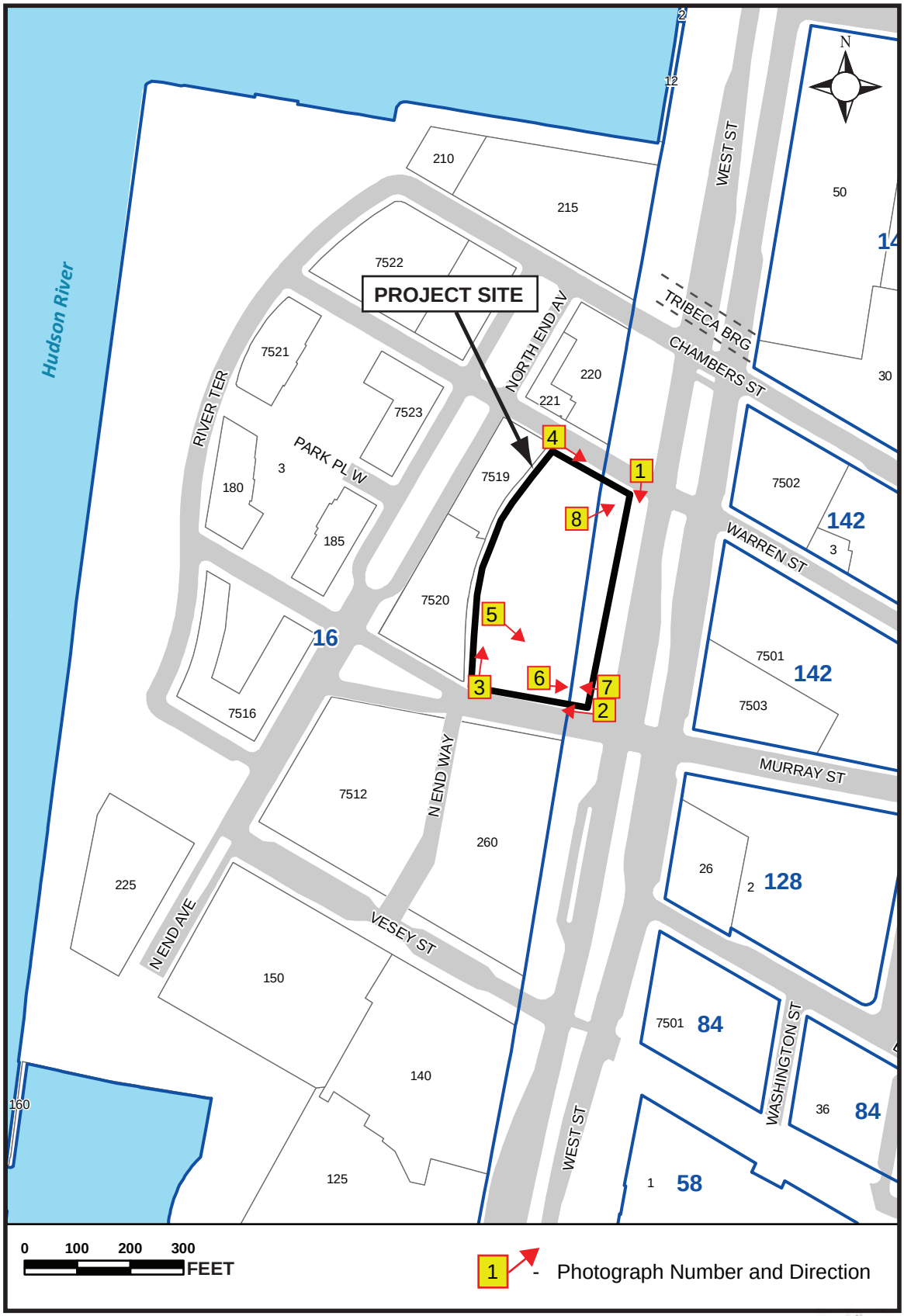
Viele, Edger L
1865 *Sanitary and Topographical Map of the City and Island of New York.* Ferd. Mayer & Co., New York.

Vollmer Associates
1989 *Route 9A Reconstruction, Preliminary Review of Existing Data and Proposed Subsurface Investigation.* Prepared for NYS Department of Transportation, Albany, New York.

Works Progress Administration (WPA)
1938 *Pier 18, North River, foot of West and Murray Streets, Manhattan.* Retrieved from https://digitalcollections.nypl.org/items/510d47d9-4ee1-a3d9-e040-e00a18064a99. Retrieved 9/16/20.

Phase IA Archaeological Documentary Study
Battery Park City Ballfield and Community Center Resiliency Project
New York, New York # 20PR00260

Figure 1: Project Site on *Jersey City, NJ-NY* and *Brooklyn, NY* topographic quadrangles (U.S.G.S. 2019).



Phase IA Archaeological Documentary Study
Battery Park City Ballfield and Community Center Resiliency Project
New York, New York # 20PR00260

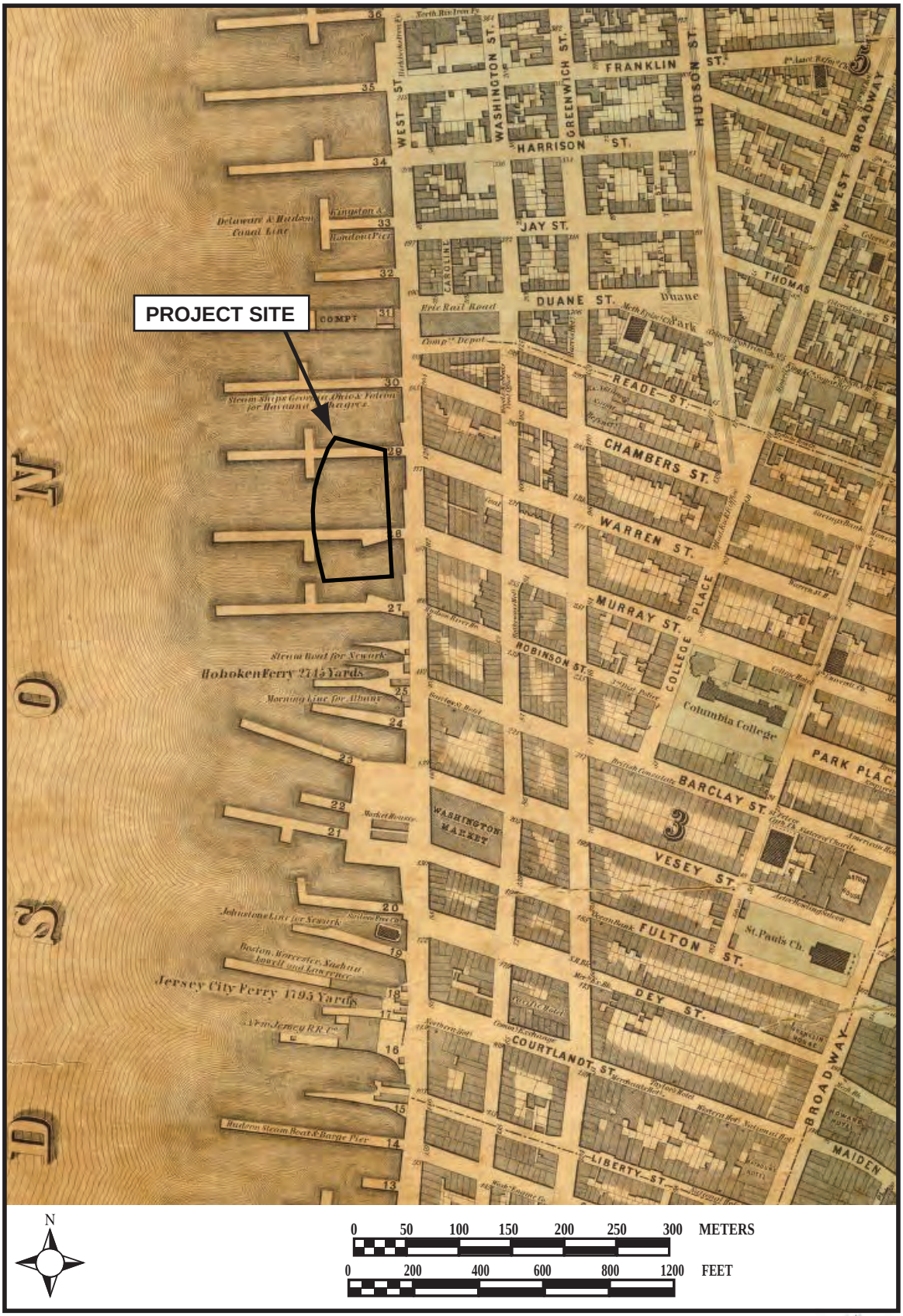
Figure 2: Project Site and Photograph Key on Tax Map (New York City Department of City Planning and HPI 2020).

Phase IA Archaeological Documentary Study
Battery Park City Ballfield and Community Center Resiliency Project
New York, New York # 20PR00260

Figure 3: Project Site on *Plan of the City of New York, in North America, Surveyed in the Years 1766 and 1767* (Ratzer 1766-7).

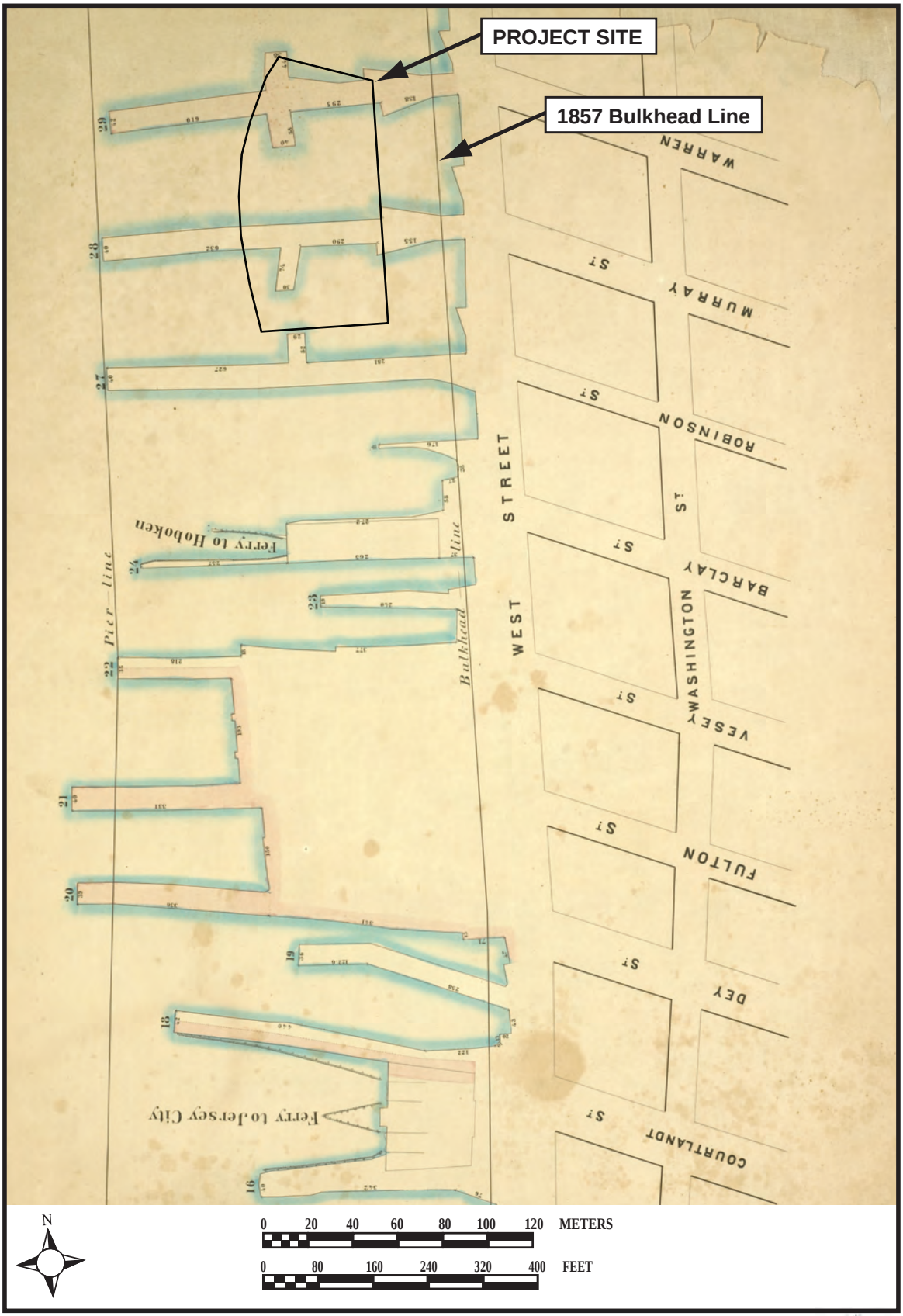
Phase IA Archaeological Documentary Study
Battery Park City Ballfield and Community Center Resiliency Project
New York, New York # 20PR00260

Figure 4: Project Site on *Hooker's New Pocket Plan of the City of New York* (Hooker 1824).



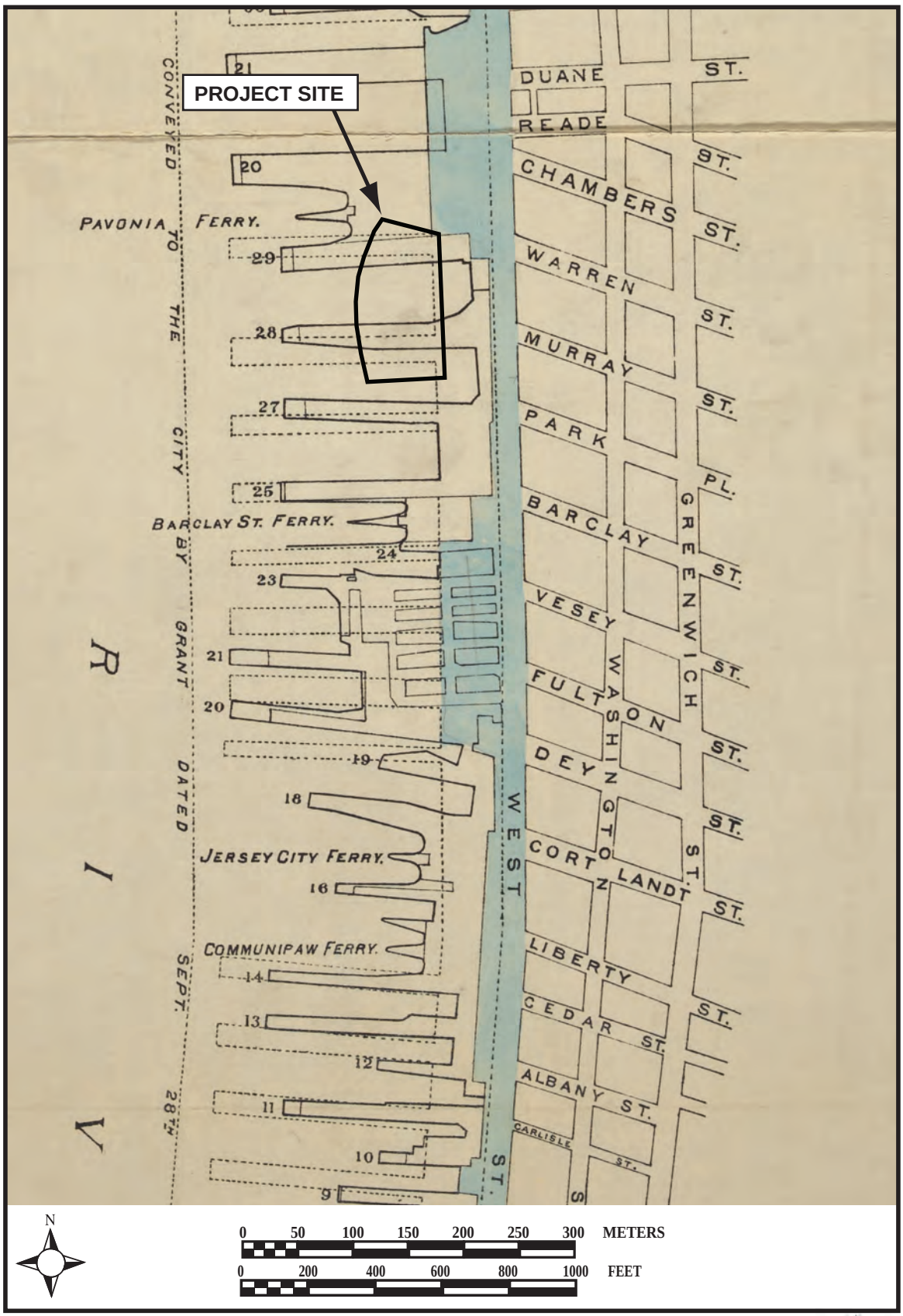
Phase IA Archaeological Documentary Study
Battery Park City Ballfield and Community Center Resiliency Project
New York, New York # 20PR00260

Figure 5: Project Site on *Map of the City of New York Extending Northward to Fiftieth St. Surveyed and drawn by John F. Harrison C.E.* (Dripps 1852).



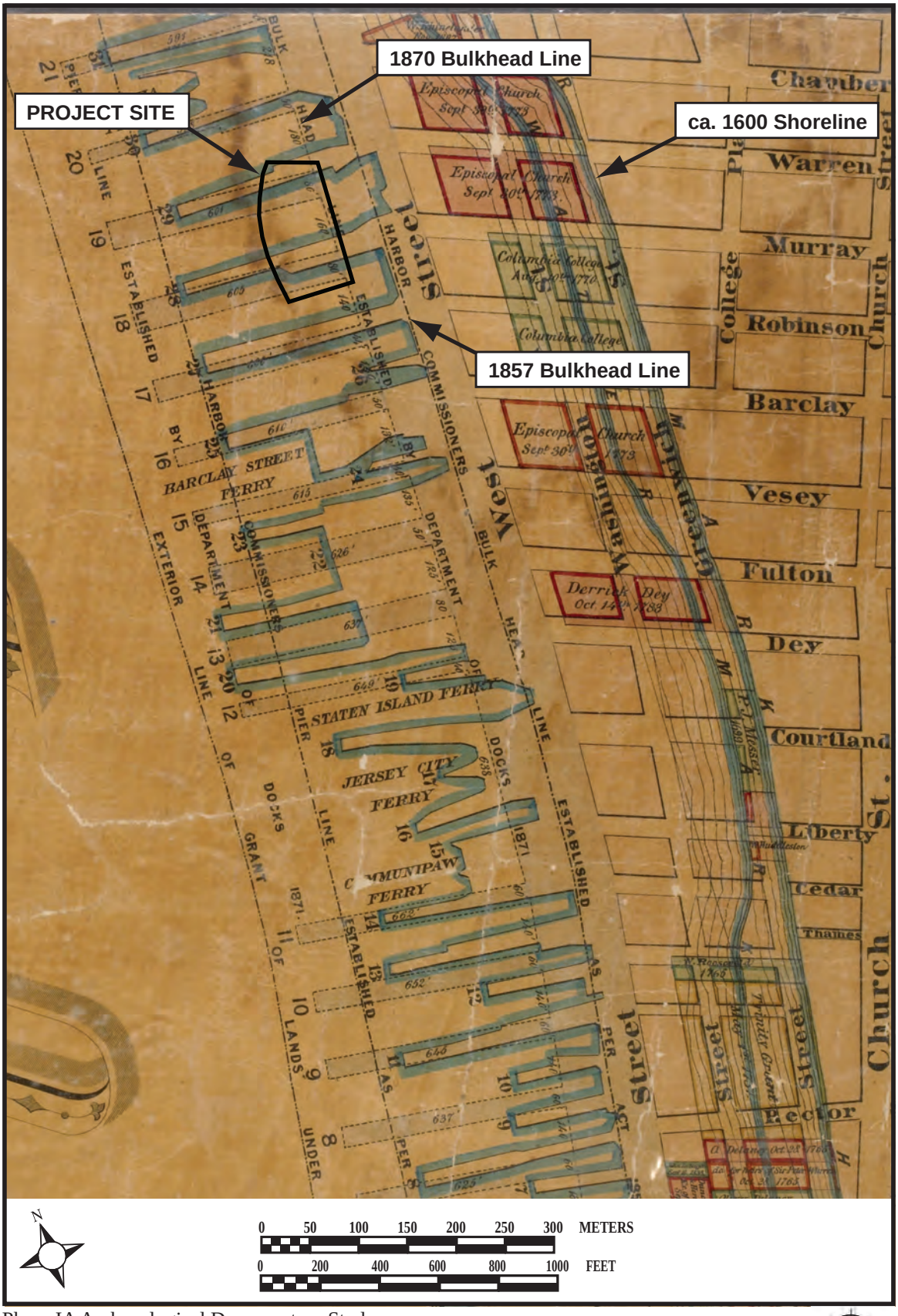
Phase IA Archaeological Documentary Study
Battery Park City Ballfield and Community Center Resiliency Project
New York, New York # 20PR00260

Figure 6: Project Site on *Maps of the wharves & piers from the Battery to 61st Street on the Hudson River and from the Battery to 41st Street on the East River, New York* (Buckhout 1860).



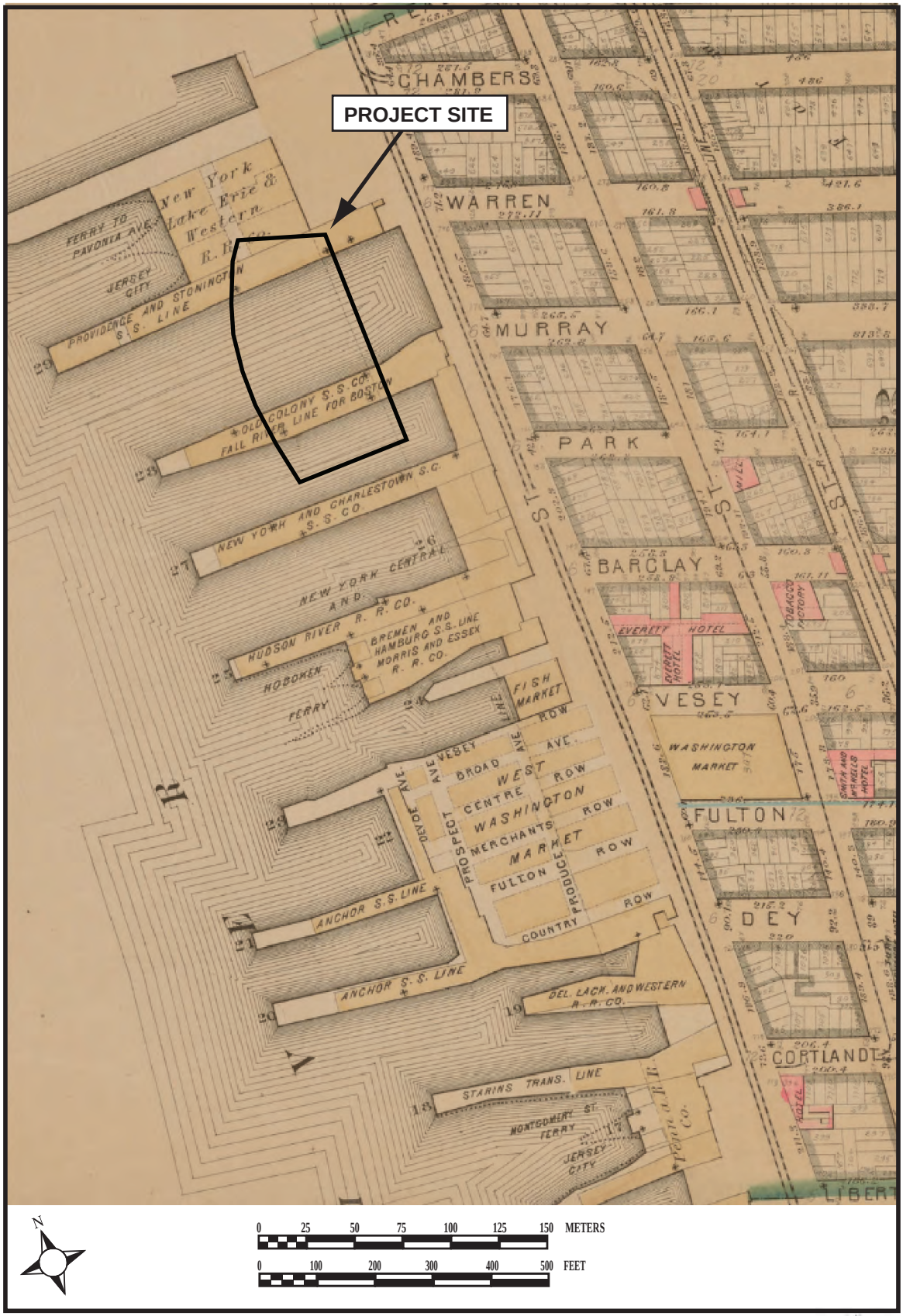
Phase IA Archaeological Documentary Study
Battery Park City Ballfield and Community Center Resiliency Project
New York, New York # 20PR00260

Figure 7: Project Site on *Map of West Street from Battery Park to Barrow Street, Manhattan, New York* (Map of West Street 1871).



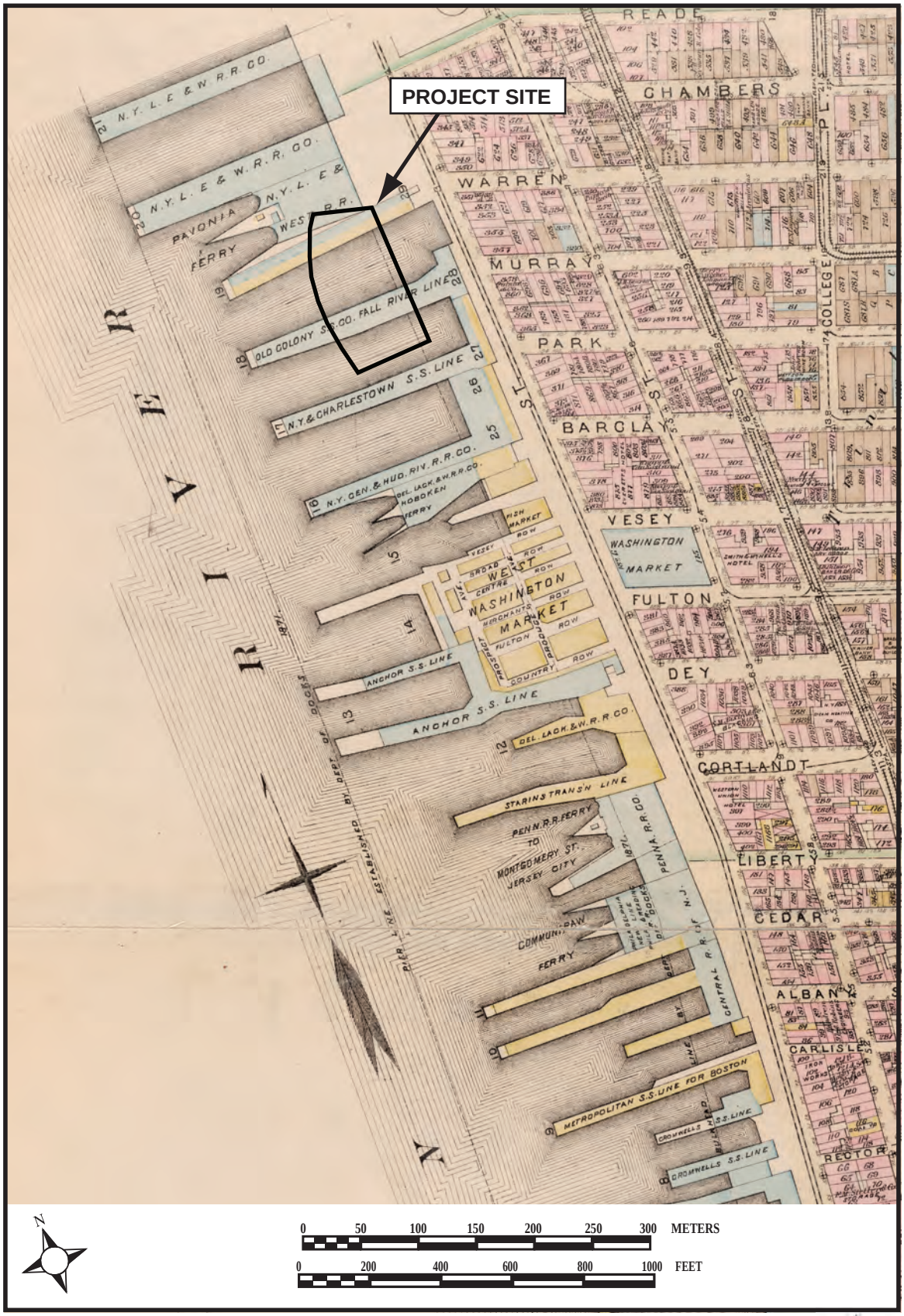
Phase IA Archaeological Documentary Study
Battery Park City Ballfield and Community Center Resiliency Project
New York, New York # 20PR00260

Figure 8: Project Site on *Map showing the high and low water mark and the original city grants of lands under water made to various parties from 1686 to 1873* (Commissioner of Docks 1873).



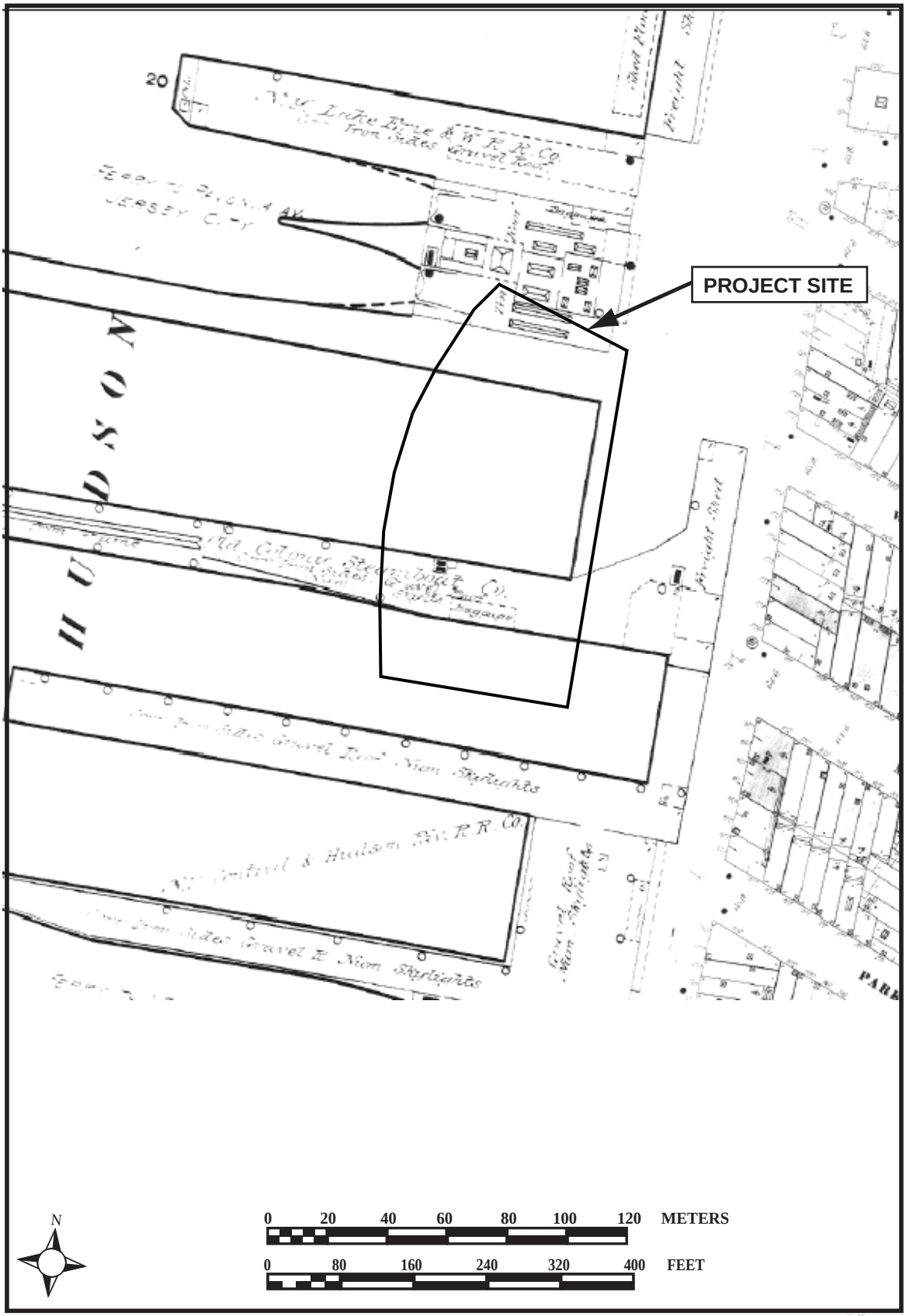
Phase IA Archaeological Documentary Study
Battery Park City Ballfield and Community Center Resiliency Project
New York, New York # 20PR00260

Figure 9: Project Site on *Atlas of the Entire City of New York, Complete in One Volume* (Bromley and Robinson 1879).



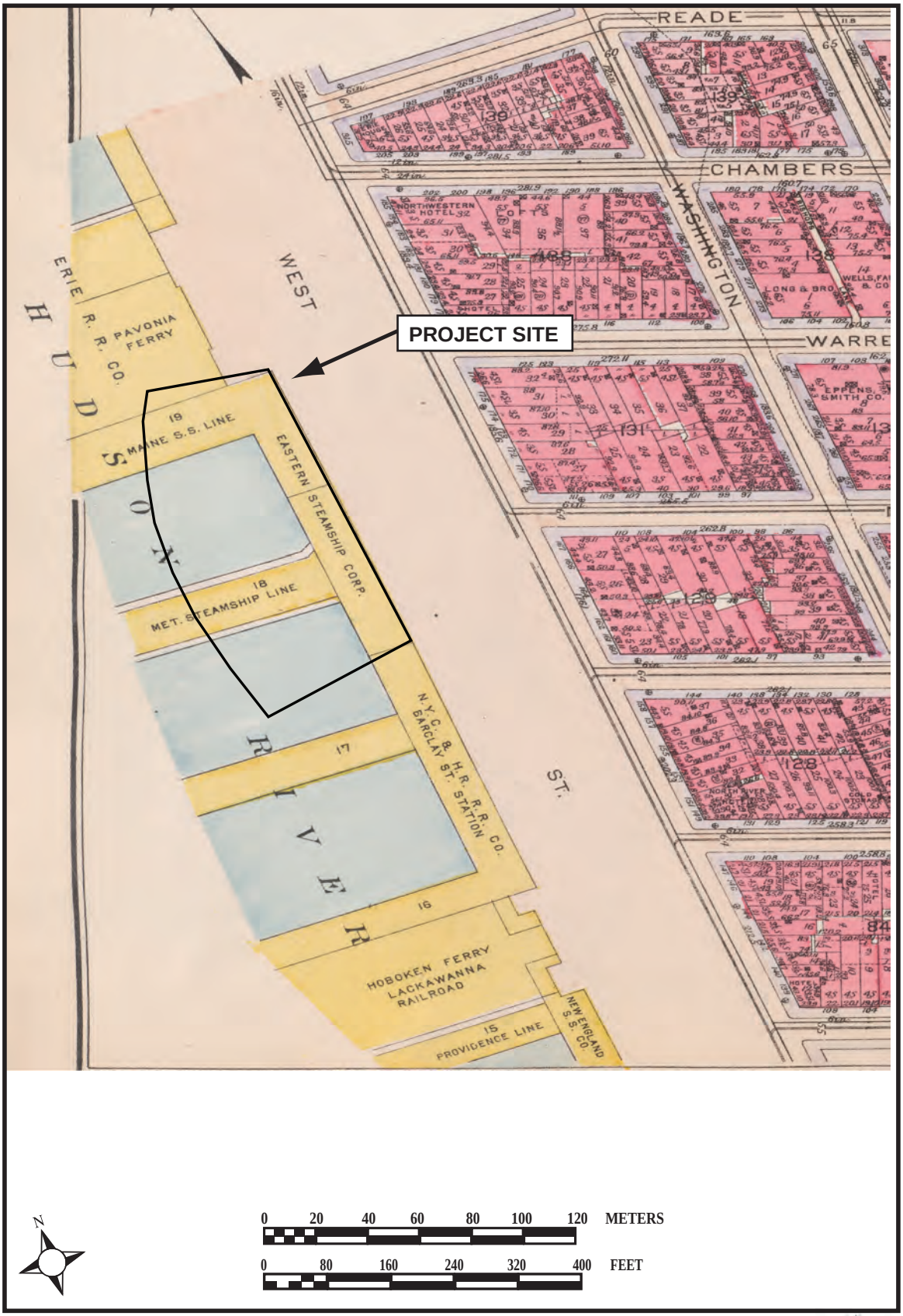
Phase IA Archaeological Documentary Study
Battery Park City Ballfield and Community Center Resiliency Project
New York, New York # 20PR00260

Figure 10: Project Site on *Atlas of the city of New York: embracing all territory within its corporate limits from official records, private plans & actual surveys* (Robinson 1885).



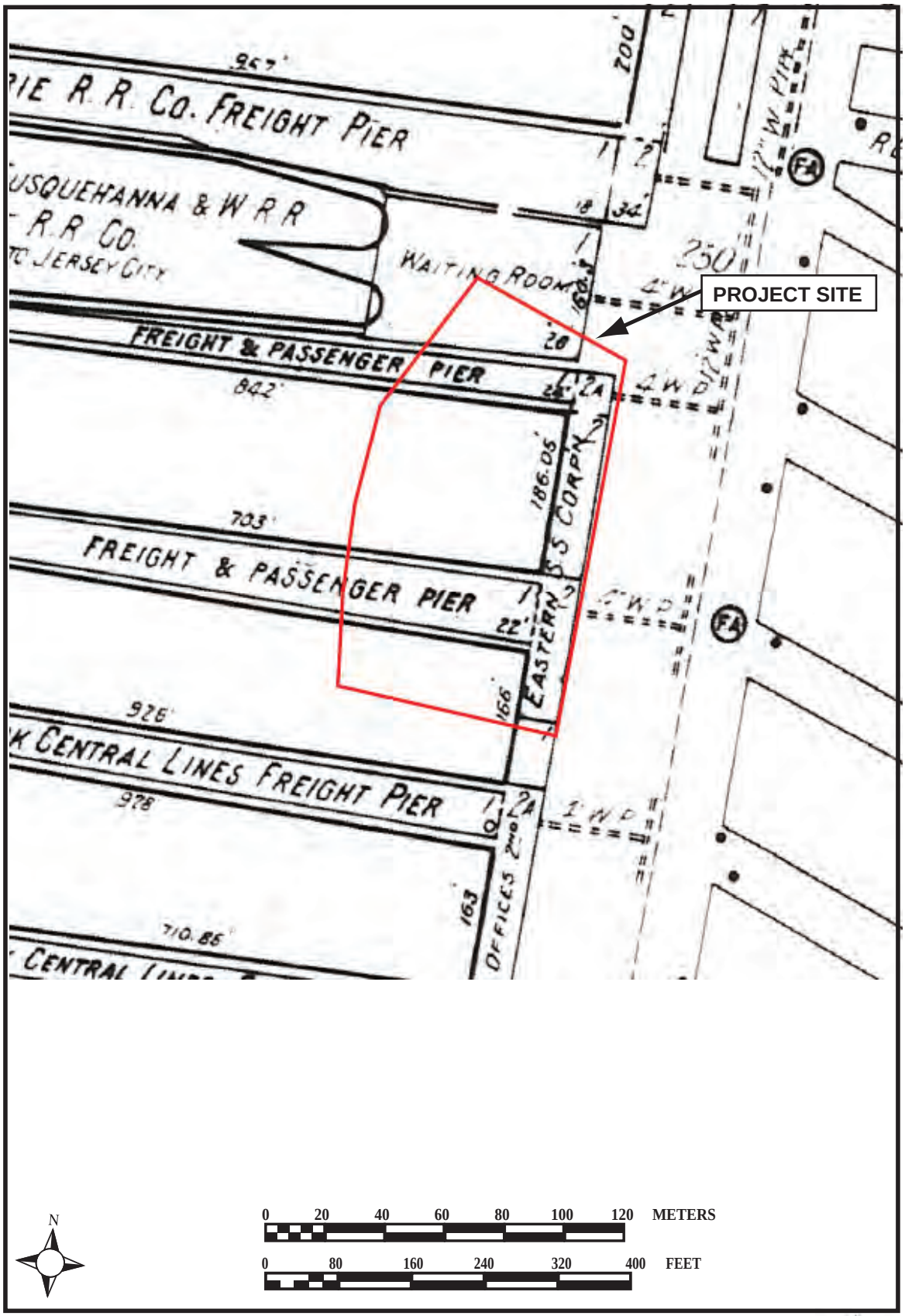
Phase IA Archaeological Documentary Study
Battery Park City Ballfield and Community Center Resiliency Project
New York, New York # 20PR00260

Figure 11: Project Site on *Insurance Maps of Manhattan* (Sanborn 1894).



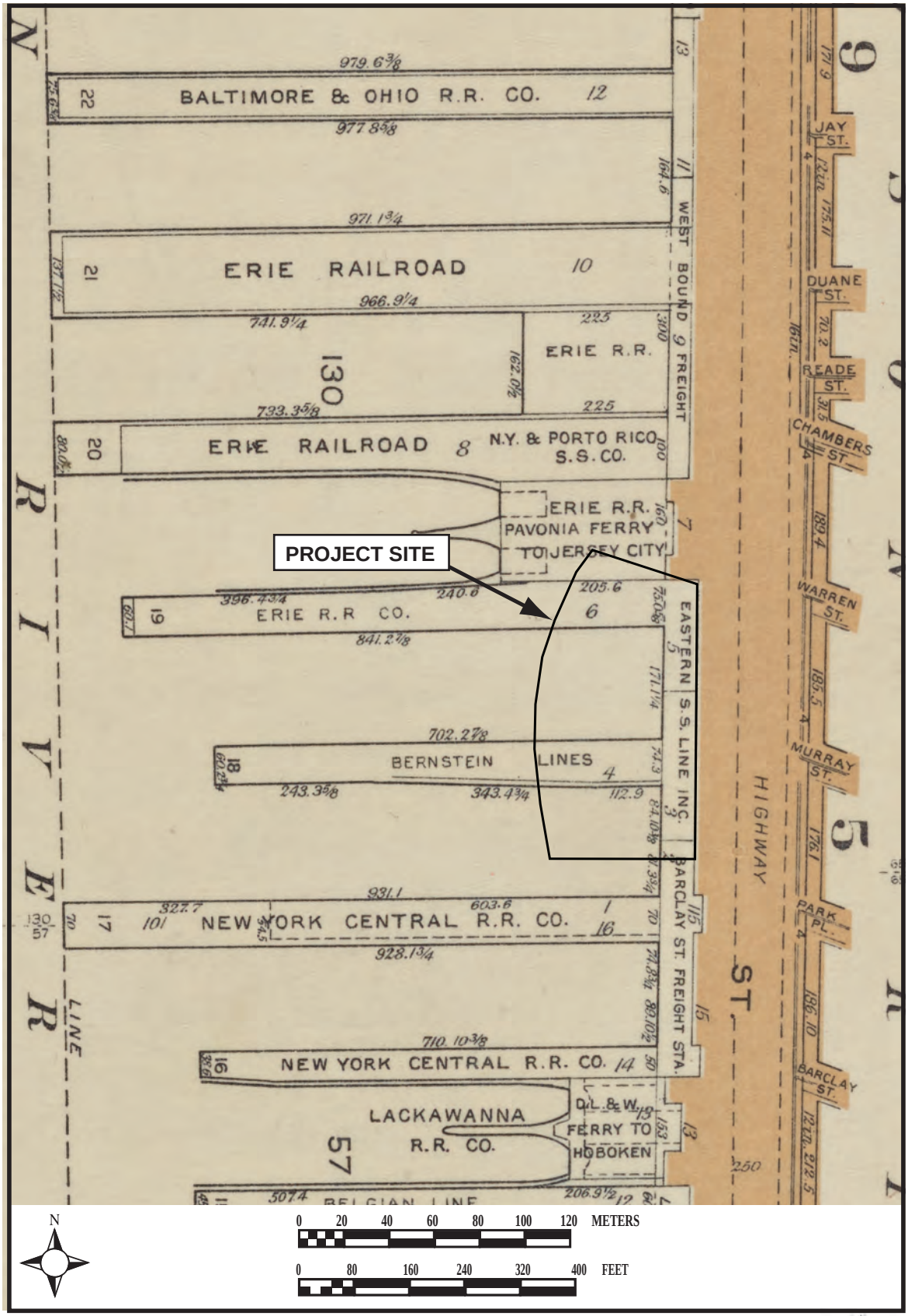
Phase IA Archaeological Documentary Study
Battery Park City Ballfield and Community Center Resiliency Project
New York, New York # 20PR00260

Figure 12: Project Site on *Atlas of the city of New York, borough of Manhattan Volume One (Battery to 14th Street) from actual surveys and official plans* (Bromley 1916).



Phase IA Archaeological Documentary Study
Battery Park City Ballfield and Community Center Resiliency Project
New York, New York # 20PR00260

Figure 13: Project Site on *Insurance Maps of Manhattan* (Sanborn 1928).

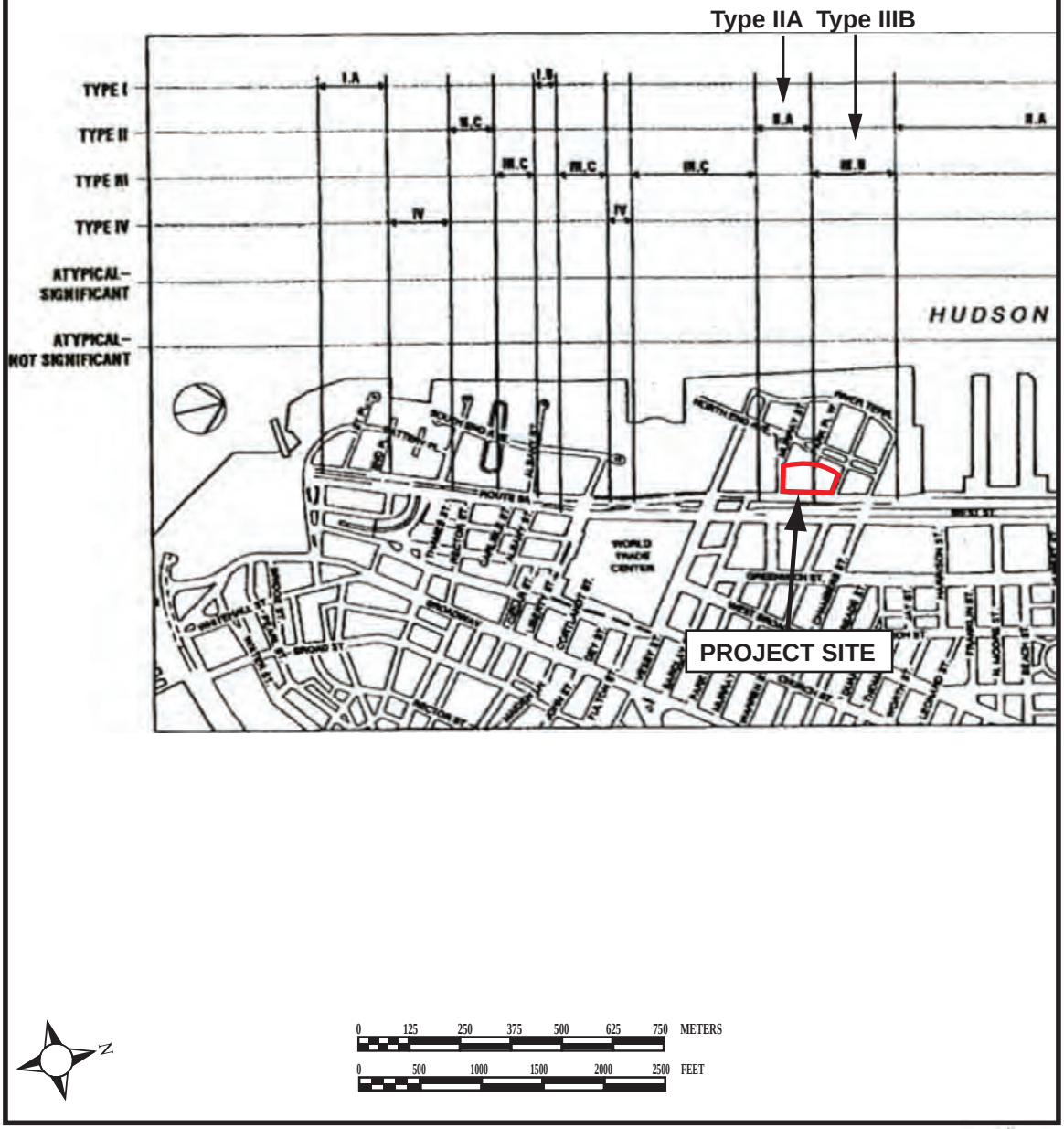


Phase IA Archaeological Documentary Study
Battery Park City Ballfield and Community Center Resiliency Project
New York, New York # 20PR00260

Figure 14: Project Site on *Manhattan Land Book of the City of New York* (Bromley 1955-56).

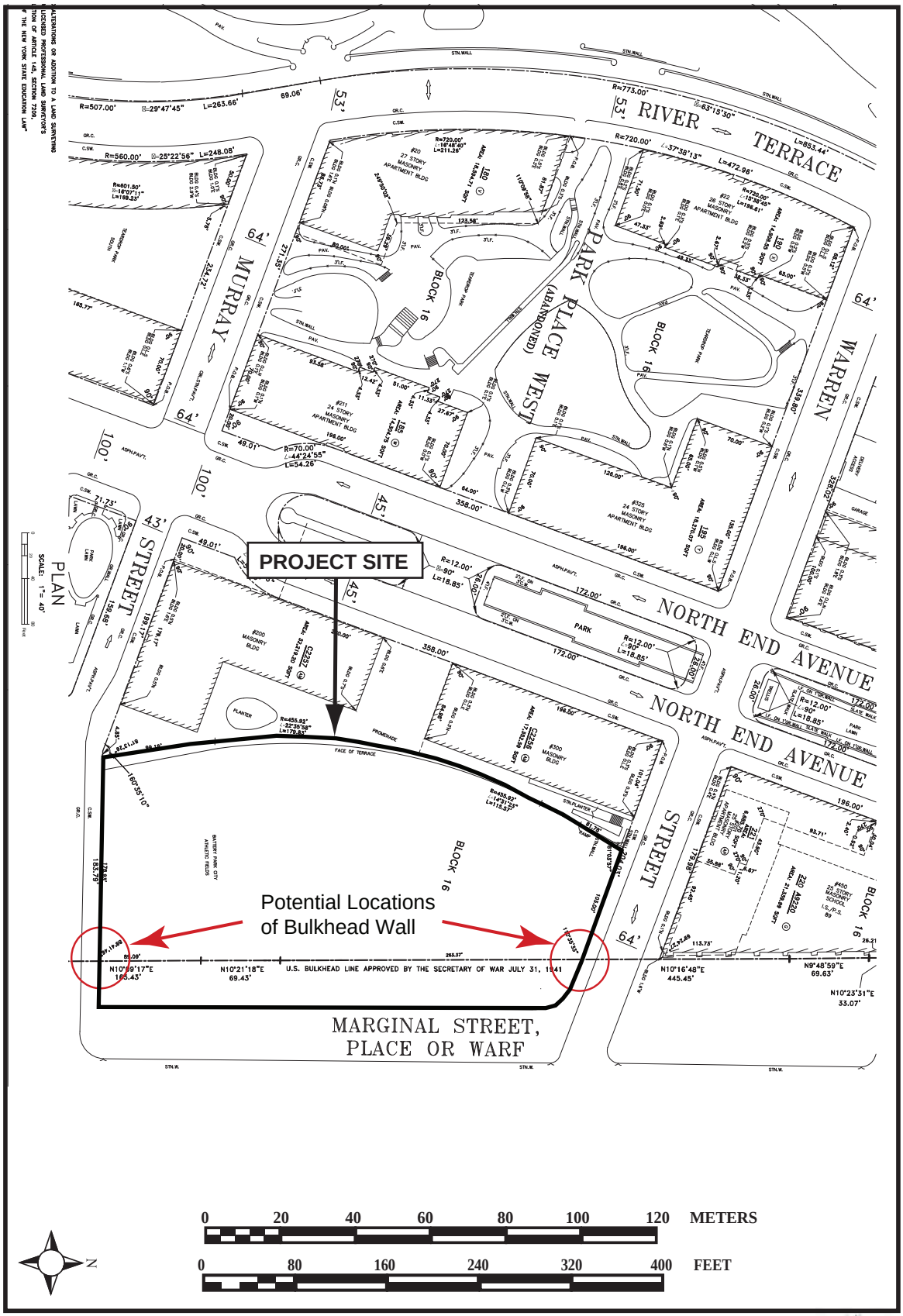
Phase IA Archaeological Documentary Study
Battery Park City Ballfield and Community Center Resiliency Project
New York, New York # 20PR00260

Figure 15: Project Site on *Aerial Photograph* (Private Contractor 1979).



Phase IA Archaeological Documentary Study
Battery Park City Ballfield and Community Center Resiliency Project
New York, New York # 20PR00260

Figure 16: Project Site on *Hudson River Bulkhead Building/Structure Inventory Form, Figure 1* (Raber 1997).



Phase IA Archaeological Documentary Study
Battery Park City Ballfield and Community Center Resiliency Project
New York, New York # 20PR00260

Figure 17: Locations of potential sensitivity for Hudson River Bulkhead.

Photograph 1: Eastern perimeter of Battery Park City Ballfields at right, facing south from Warren Street at Hudson River Park on West Street.

Photograph 2: Southern perimeter of Battery Park City Ballfields at right, facing west from Hudson River Park/West Street intersection with Murray Street.

Photograph 3: Western perimeter of Battery City Park Ballfields, facing north from Murray Street.

Photograph 4: Northern perimeter of Battery Park City Ballfields, facing west from Hudson River Park/West Street intersection with Warren Street.

Photograph 5: Southeastern section of the Battery Park City Ballfields, facing southeast from the western edge of the fields. Arrow points to utility boxes at the extreme southeastern corner for the field.

Photograph 6: Close up of utility boxes at the southeastern corner of the Battery Park City Ballfields, facing east from just north of Murray Street.

Photograph 7: Close up of utility boxes at southeastern corner of Battery Park City Ballfields, facing west from Hudson River Park/West Street just north of Murray Street.

Photograph 8: Trees planted inside the perimeter of the northeastern corner of the ballfields, facing northeast.

APPENDIX

Image Not Available

BUILDING-STRUCTURE INVENTORY FORM

NYS OFFICE OF PARKS, RECREATION
& HISTORIC PRESERVATION
DIVISION FOR HISTORIC PRESERVATION
(518) 474-0479

FOR OFFICE USE ONLY
UNIQUE SITE NO. _____
QUAD _____
SERIES _____
NEG. NO. _____

YOUR NAME: Michael S. Raber DATE: February 20, 1997

YOUR ADDRESS: 81 Dayton Road
So. Glastonbury, CT 06073
TELEPHONE: (860) 633-9026

ORGANIZATION (if any): Raber Associates and Allee King Rosen & Fleming, Inc. for the Hudson River Park Conservancy (HRPC)

* *

IDENTIFICATION

1. BUILDING NAME(S): New York City's Hudson River Bulkhead from Battery Place to West 59th St.*
2. COUNTY: New York TOWN/CITY: New York VILLAGE: _____
3. STREET LOCATION: Battery Place to 59th Street
4. OWNERSHIP: a. public ☒ b. private ☐
5. PRESENT OWNER: New York City/New York State Department of Transportation ADDRESS: _____
6. USE: Original Commercial Waterfront Wharfage Present: Commercial, Municipal Services, Recreation
7. ACCESSIBILITY TO PUBLIC: Exterior visible from public road: Yes ☒ No ☐
   Interior accessible: Explain No; Structurally Inaccessible.

DESCRIPTION

8. BUILDING MATERIAL: a. clapboard ☐ b. stone ☐ c. brick ☐ d. board and batten ☐ e. cobblestone ☐ f. shingles ☐ g. stucco ☐ other: Varied, including wood, granite, pre-cast concrete, mass concrete, cobbles, riprap, demolition debris, and ashes.
9. STRUCTURAL SYSTEM: (if known)
   a. wood frame with interlocking joints ☐
   b. wood frame with light members ☐
   c. masonry load bearing walls ☐
   d. metal (explain) ☐
   e. other ☒ *See attached page.*
10. CONDITION: a. excellent ☐ b. good ☒ c. fair ☒ d. deteriorated ☐
    See attached page.
11. INTEGRITY: a. original site ☒ b. moved ☐ if so, when? _____
    c. list major alterations and dates if known:
    See attached page.

12. PHOTO:
See attached Photos 1-11.

13. MAP: *See attached figure.*

* Two areas along this stretch of the waterfront are outside the planning jurisdiction of the Hudson River Park Conservancy (HRPC). These are between West 35th and 38th Streets and West 48th and 54th Streets.

14. THREATS TO BUILDING: a. none known ☐ b. zoning ☐ c. roads ☐
d. developers ☐ e. deterioration ☒
f. other:

15. RELATED OUTBUILDINGS AND PROPERTY:
a. barn ☐ b. carriage house ☐ c. garage ☐
d. privy ☐ e. shed ☐ f. greenhouse ☐
g. shop ☐ h. gardens ☐
i. landscape features: ☐
j. other: ☒ These include piers in various states of preservation and use; one railroad transfer bridge; and wooden platforms supporting public access, heliport, ferry, sports, and restaurant facilities.
Of these structures, Pier 57, the piersheds at Piers 60 and 61, and the Baltimore & Ohio Railroad Transfer Bridge at 26th Street have been determined eligible for the State and National Registers of Historic Places.

16. SURROUNDINGS OF THE BUILDING (check more than one if necessary):
a. open land ☐ b. woodland ☐
c. scattered buildings ☐
d. densely built-up ☐ e. commercial ☒
f. industrial ☒ g. residential ☐
h. other:

17. INTERRELATIONSHIP OF BUILDING AND SURROUNDINGS:
(Indicate if building or structure is in an historic district)
Most bulkheads were originally visible from the water only between piers, whose decks rested on lowered bulkhead faces. Piersheds, bulkhead sheds, and headhouses covered bulkhead tops in these areas. Except for areas around Gansevoort Street and between West 35th and 37th Streets (the latter outside HRPC's planning jurisdiction), masonry bulkheads were continuous along most of the location in question.

18. OTHER NOTABLE FEATURES OF BUILDING AND SITE (including interior features if known):
At the three sites built to accommodate passenger ship terminals, bulkhead construction involved extensive upland excavation behind long coffer dam systems. These terminals were built between West 11th and Gansevoort Streets (Gansevoort Piers), Little West 12th and West 23rd Streets (Chelsea Piers), and West 44th and 52nd Streets. See Item 20 below.

SIGNIFICANCE.

19. DATE OF INITIAL CONSTRUCTION: 1871 - ca. 1960

ARCHITECT:

BUILDER: New York City Department of Docks and successor agencies

20. HISTORICAL AND ARCHITECTURAL IMPORTANCE:
See attached page.

21. SOURCES
See attached page.

22. THEME:

9. STRUCTURAL SYSTEM

Viewed from the water, there are three major kinds of Hudson River bulkheads retaining the landfilled waterfront south of West 59th Street: quarry-faced ashlar granite walls, pre-cast or cast-in-place concrete walls, and timber cribwork. The masonry bulkheads are much more varied in their foundation systems, and reflect all the evolutionary stages of about 50 years of Department of Docks design work. Masonry wall foundations reflect bottom conditions, the need for pile footings, and the use of pile-supported relieving platforms behind the walls to reduce live load pressure and lateral thrusts.

Masonry Bulkhead

There is no standard typology for the masonry bulkheads. Figures 1-6 show the distribution and typical design of different bulkhead types, based on a classification scheme that attempts to show the full range of design variations. Other classifications have also been used (e.g., Hoag 1906; Mueser Rutledge Consulting Engineers 1997). The classifications used here, and the respective percentages of all the masonry bulkheads built from Battery Place to West 59th Street*, are:

Type I. GRANITE OR CONCRETE BULKHEAD ON FIRM OR ROCK BOTTOMS (See Figure 2)

Type I was typically built on firm bottoms less than 40 feet below mean high water. Type I totals about 18.6 percent of the masonry bulkheads.

IA Granite blocks on riprap, built at the Battery in 1871 as the first Department of Docks bulkhead—comprises about 2 percent of the masonry bulkheads.

IB Granite wall supported by one to three pre-cast concrete blocks and bagged concrete, built ca. 1872-1920 at Cedar Street and between 52nd and 59th Streets—comprises about 7 percent of the masonry bulkheads.

IC Concrete wall built ca. 1915-1936 between 44th and 52nd Streets—comprises about 9.5 percent of the masonry bulkheads.

Type II. PILE-SUPPORTED GRANITE BULKHEAD WITHOUT TIMBER RELIEVING PLATFORMS

(See Figure 3)

Type II was usually built on soft or deep mud bottoms 40-170 feet below mean high water. Type II totals about 23.1 percent of the masonry bulkheads

IIA Granite wall on mass concrete block, resting on a 2-inch-thick concrete bed, built ca. 1873-1875 in several sections between Murray and Horatio Streets—comprises about 19.8 percent of the masonry bulkheads. Some sections of this type were replaced by Types IIIB and IV.

IIB Granite wall on concrete block resting on a 2-timber-thick grillage, with inclined bracing piles, built ca. 1875 at Morton Street to Christopher Street—comprises about 2 percent of the masonry bulkheads.

IIC Granite wall on pre-cast concrete block, with mass concrete backing and inclined bracing piles—comprises about 1.3 percent of the masonry bulkheads. In this case, built ca. 1900 at Rector Street, the mass concrete backing served as an alternative to a Type IIIC timber-relieving platform.

Type III. PILE-SUPPORTED GRANITE BULKHEAD WITH TIMBER RELIEVING PLATFORMS

(See Figure 4)

Type III was built on soft or deep mud bottoms 40-170 feet below mean high water. The relieving platforms were encased in fill or cut off from open water. Type III totaled about 49.1 percent of the masonry bulkheads.

IIIA A modified form of Type IIA, built ca. 1874 at Canal Street—comprises about 1.9 percent of masonry bulkheads.

IIIB Granite wall on narrow concrete block, with inclined bracing piles taking lateral thrusts to below base block, and timber binding frame around piles; built 1876-1898 in many areas between Warren and 38th Streets—comprises about 21.5 percent of the masonry bulkheads.

* Percentages given in this form are based on the entire bulkhead from Battery Place to West 59th Street, including sections of the wall—between West 35and 38th Streets, and West 48th and 54th Streets—that are outside HRPC's planning jurisdiction.

9. STRUCTURAL SYSTEM (CONTINUED)

IIIC Granite wall on wider concrete blocks, similar to Type IIIB without binding frame, built ca. 1899-1915 in many areas between Carlisle and 44th Streets—comprises about 25.6 percent of masonry bulkheads.

Type IV. CONCRETE BULKHEAD WITH TIMBER RELIEVING PLATFORM
(See Figure 5)
Type IV generally replaced Type IIIC, with relieving platforms exposed to open water. This type was built in many areas ca. 1920-1960 for replacement of some older types, and as new construction. Type IV totaled about 8.8 percent of the masonry bulkheads.

From Battery Place to West 59th Street, the granite walls comprise approximately 81.3 percent of all the masonry bulkheads built in this area, and 77.9 percent of all masonry and timber bulkheads. In most cases, the granite walls rest on large pre-cast concrete blocks weighing 25-70 tons. The derrick-installed base blocks typically extend from about 2.5 feet below mean low water to 16-40 feet. Regardless of foundation, all the granite walls, except the very earliest (see Figure 2, Type IA), were backed by mass concrete and originally included four courses of granite blocks laid as alternating headers and stretchers to an elevation of about 9.4 feet above mean low water. These blocks were typically 4 feet long and 2 feet wide, with the lowest course 4 feet high and the others about 1.75 feet high. Additional courses were sometimes added as bulkheads settled.

Above the facing blocks, a coping of 8-foot-long, 3-foot-thick granite blocks rose about 2.5 feet to street level. Twelve-inch-square timber backing logs, bolted to the coping, rose above street level in most areas not covered by piersheds, bulkhead sheds, or other structures. The backing logs helped prevent wheeled vehicles from rolling over the top of the bulkhead into the river (see Photo 8 and Figures 2, Type IB; 3, Types IIB and IIC; and 4, Types IIIB and IIIC). Original or later variations in granite-face construction included round and rectangular openings for stream, sewer, or drainage outfalls (see Photos 3 and 5).

The concrete-face bulkheads total about 18.3 percent of the masonry walls (18.1 percent of the total masonry and timber bulkhead), and consist of sections resting on rock (see Figure 2, Type IC) and sections resting on relieving platforms (see Figure 5, Type IV).

Timber Bulkhead

Timber cribwork totals about 4 percent of all the current bulkheads south of West 59th Street, and is found at Little West 12th Street (built ca. 1870-1905) and outside HRPC's planning jurisdiction between West 35th and 37th Streets (built ca. 1885-1890) (see Figure 6: Type V and Atypical Significant Type 2). Typically, timber bulkheads from this era consist primarily of vertically layered timber cells, floated into place and sunk with rock and earth fill, which often reached 20-25 feet below mean low water and extended about 10 feet above this elevation. In section, cribs below mean low water typically extended to widths of 20 to 25 feet, sometimes tapering on the exterior or both faces as they rose. Above mean low water, crib widths in section narrowed to about 15 feet. Square timbers—spiked or bolted together in a smooth, continuous face and fitted onto notched cribwork logs—formed the outer face of the bulkhead above mean low water in most cases.

10. CONDITION

A thorough investigation of the condition of the bulkhead has been conducted for the Hudson River Park Conservancy (HRPC) by the firm of Mueser Rutledge Consulting Engineers in the fall-winter of 1996-1997. As part of this study, Mueser Rutledge reviewed previous inspection reports, including a study the firm prepared in 1989 for the New York State Department of Transportation as part of the Route 9A Reconstruction project; conducted inspections of the bulkhead from both land and water (during mid- and low-tide conditions); conducted limited diver inspections; took core samples of timber piles at relieving platforms to investigate the existence and extent of marine borer damage; and identified areas requiring repair, remediation, or new construction and developed concepts for basic repair types. The following excerpt is from Mueser Rutledge's Final *Hudson River Park Project Bulkhead Condition Review* report:

> In general, the visible portions of the bulkhead are in fair to good condition. At some locations, the granite capstone has been replaced with cast-in-place concrete. Timber backing logs (curbs) along the top of the bulkhead and fendering piles, where installed, are typically in a deteriorated condition. Facing stones and capstones are missing in various sections along the bulkhead specifically at junctions with former piers. Mortar between stone facing blocks in the splash zone is typically weathered and often has been eroded away. Over much of the alignment, the stone facing blocks are chipped, eroded at the edges and portions of block are missing. This 'worn' condition is generally not considered to be a structural defect, but unless replaced, missing blocks could lead to structural degradation and loss of fill inboard. Although a number of blocks contain spalls that vary in degree, this condition, while not aesthetically pleasing, should not be viewed as a structural insufficiency. Other visible masonry and concrete elements are generally in good condition.
>
> In the northern vicinity of the site, the bulkhead contains approximately one thousand feet of low-water relieving platforms over water where the timber piles that support the concrete bulkhead wall are visible above the mudline. Typically, the concrete bulkhead wall in this area contains spalls and cracks. Many of the outfalls which penetrate the bulkhead in this area are in poor condition. The timber piles, pile caps and decking in this area exhibit signs of marine borer infestation. At several locations, gaps between the piles and pile caps exist (non-bearing). Gaps of approximately one inch width between the timber deck plans exist at several locations. No fill loss through these gaps was observed at the time of the inspection.
>
> At isolated locations throughout the park alignment, the surface inboard of the bulkhead generally contains small sinkholes and depressions. Although a fair amount of the surface immediately adjacent to the bulkhead has recently been repaved, the surface elevation generally varies. A significant amount of grade variation is due to the installation of multiple asphalt pavement overlays over time in adjacent areas.

11. INTEGRITY

As described above in response to Item 9, "Structural System," and Item 10, "Condition," when viewed from the water, there are three main types of Hudson River bulkhead: 1) quarry-faced ashlar granite walls constructed between ca. 1871 and 1920, which comprise nearly 78 percent of all the bulkhead between Battery Park City and West 59th Street; 2) concrete face bulkhead constructed between ca. 1920 and 1970, which comprises approximately 18 percent of the bulkhead between Battery Place and West 59th Street; and 3) timber cribwork built ca. 1870 to 1905, which comprises roughly 4 percent of all current bulkhead between Battery Place and West 59th Street. Thus, the appearance of the bulkhead is not consistent for its entire length, but rather contains a mix of materials.

In addition to the type of replacement of bulkheads of earlier design with later designs at the same locations, there have been two other major changes to the bulkhead that have affected its integrity. First, intact sections south of Harrison Street were buried ca. 1970 behind fill used to create Battery Park City. Second, since World War II, the uppermost elements of bulkhead wall and coping have frequently been altered. Modifications include vertical additions of granite block facing to address bulkhead settlement, and use of several kinds of concrete infill to replace granite coping blocks or areas formerly occupied by pier decks. These modifications were made by various agencies and tenants, often without any attempt to create a uniform appearance. The dates of these modifications are incompletely documented. In several locations, new railings or other edge treatments, have been mounted in the bulkhead. These include the new steel railings installed ca. 1994-96 along the western edge of the interim public safety zone (bikeway/walkway) on New York State Department of Transportation property between Battery Park City and 29th Street.

Other alterations reflecting lack of maintenance include loss of timber backing logs and coping blocks, weathering or wear damage to wall facing blocks, and recent marine borer damage to exposed timber-relieving platforms and piles. Changes made to bulkhead tops, and weathering or wear damage have generally not threatened the structural integrity of visible bulkhead components. Aside from the marine borer damage, foundations of the granite- or concrete-faced walls are evidently in good condition. Cribwork foundation conditions are not known.

20. HISTORICAL AND ARCHITECTURAL IMPORTANCE

Summary

Between 1871 and 1936, the City of New York built more than 5 miles of bulkhead along the Hudson River, extending in an almost unbroken line from the Battery to the south end of the New York Central Railroad's terminal at West 59th Street. The vast majority of this construction consisted of masonry walls on a variety of foundation systems, with quarry-faced ashlar granite block forming the visible face along nearly 80 percent of the armored frontage (see Photo 1). Masonry bulkhead construction was the "... most expensive and most important class of... permanent [waterfront] improvement" undertaken by the City (Hoag 1906: 107), during a long campaign to maintain New York's status as the premier American port. The carefully built granite walls created a consistent surface to waterfront sections seen by many thousands of transatlantic passengers, reinforcing an aura of commercial prominence. The City rarely made such investment in waterfront sections not used for shipping. North of 59th Street on the Hudson River, the only comparable construction was about 1,100 feet of masonry bulkhead built ca. 1902-1908 in an area used for the 130th Street ferry.

The City's waterfront redevelopment program was significant as the first and largest of its kind in the United States, and included construction of individual piers and four complete Hudson River terminals for transatlantic passenger traffic. With the disappearance of virtually all the original superstructures, the well-preserved bulkheads remain the principal artifacts of an unprecedented public effort that helped sustain Manhattan's maritime prominence until the era of airplane travel, containerized shipping, and interstate trucking after ca. 1960. The bulkhead line reflects large upland excavations at three of the passenger terminals, built between 1897 and 1936 in a race to accommodate ever-longer steamship liners within federally controlled pierhead limits. In addition to their importance in the history of urban planning and international commerce, the varied masonry bulkhead sections reflect evolving marine substructure design, including significant and influential innovations made by municipal engineers. The last general bulkhead form, including concrete facing on a low-water relieving platform (see Figure 5), became a standard for new or replaced pile-supported bulkheads after ca. 1920. Since World War II, a variety of repairs have been made by different agencies and tenants to the uppermost components of the granite walls, often without any attempt to create a uniform appearance.

Older timber bulkhead designs, built by the City or several railroads in areas not used for transatlantic shipping, may include significant but deeply buried, undocumented historic engineering information at cribwork bottoms. This information is probably at least 20-25 feet below mean low water.

Urban and Commercial Redevelopment Context

The City's waterfront redevelopment began in response to decades of deterioration, congestion, and siltation. Although privately owned, antebellum wharves and piers were too encumbered by municipal controls and often-corrupt bureaucracy to warrant investment. Accumulating sewage amidst rotting solid-fill wooden piers threatened public health as well as commerce. New York State's reorganization of the City's charter in 1870, a reaction to widespread public concerns, included creation of a Department of Docks to redevelop Manhattan's waterfront on the Hudson and East Rivers. The State deeded all previously ungranted underwater shoreline property to the City, and the Department was authorized to acquire, rebuild, and regulate existing commercial waterfront. Under the Department's first Engineer-in-Chief, Gen. George B. McClellan, a plan emerged in 1871 that in general form was followed until the last major Hudson River terminal was finished in 1936. Noting that the port's narrow tidal range did not require the enclosed tidal basins seen in Great Britain, McClellan proposed new bulkheads sufficiently outshore of existing waterfronts to create a 250-foot-wide marginal street, from which 60- to 100-foot-wide piers with cargo sheds would project 400-500 feet around 150- to 200-foot-wide slips. As property was acquired and as commerce warranted, the City built the bulkheads, built or rebuilt pier substructures, and leased redeveloped areas to private companies who were usually responsible for piershed and headhouse construction.

When McClellan's plan appeared, regional water pollution had already decimated the marine borers that destroyed wooden structures, allowing for open-pile wooden-pier construction. Open-pile piers had better tidal flow, less siltation, and greater flexibility in ship-versus-pier encounters than the more solid structures built earlier. In contrast to the piers, the bulkhead proposed by McClellan was all masonry above footings or piles. McClellan remains best known for his over-cautious command of Civil War armies, but he was by training and experience an excellent engineer. Before the war, he made surveys for various railroad and military installations, and served as chief engineer or president of several railroads. The need for very substantial footings in railroad construction may account in part for McClellan's emphasis

on bulkheads intended for unusual permanence. Origins of the Department's earliest bulkhead designs remain undocumented. McClellan was in Europe from late 1864 until 1868, and he may have seen designs for British bulkheads that resemble those built by New York City (cf. Bray and Tatham 1992). The choice of a quarry-faced bulkhead with concrete foundations likely reflects a widespread desire among New York's commercial leaders for a waterfront with the imposing character of European ports, commensurate with the City's growing international stature. McClellan ignored most recommendations for waterfront plans offered during public hearings, but it is probably no coincidence that many of these ideas included masonry bulkheads, piers, piersheds, and warehouses. Concrete above low water was not then regarded as sufficiently durable "...for a work of such monumental character" (Greene 1917: 62).

Surviving bulkheads from the 1870's include a number of sections south of Gansevoort Street, including the earliest Department project, built at the Battery in 1871 (see Figure 2: Type IA). Until ca. 1880, the pace of municipal waterfront redevelopment was slowed by depressed economic conditions following the Panic of 1873, limits on allowable annual bonding for property acquisition, and initial problems with soft-bottom bulkhead designs. As these economic conditions and engineering solutions improved, construction accelerated. By ca. 1905, the Department had built about 3.7 miles of Hudson River masonry bulkhead, most of it after 1880 (Hoag 1906: 120; Buttenweiser 1987: 83). The largest projects in this period were the liner terminals built in the Gansevoort (1897-98) and Chelsea (1902-08) sections, both of which involved upland excavation.

The section between these terminals was one of only two south of West 59th Street in which masonry bulkheads were not built. At Gansevoort Street, solid fill originally retained by timber-crib bulkheads served as a Department of Docks work yard, and was later redeveloped by the City as the second West Washington or Gansevoort Market in 1889. During part of the 20th century, the market site served as a garbage-processing facility, a use that continues today. Surviving cribwork along the north face of this site is partially visible, and has been classified as Type V in Figures 1 and 6 (Mueser Rutledge Consulting Engineers, 1997). Within HRPC's planning jurisdiction, an atypical waterfront section remains between West 34th and 35th Streets, where the shore consists of a low-rubble slope. It appears that no bulkhead of any kind was built along the current bulkhead line (see Photo 7).*

The remainder of the waterfront discussed here was used by cargo and passenger shipping firms, with the largest City projects after 1910 at the terminals between West 44th and 52nd Streets (1915-1936)** and West 55th and 57th Streets (1915-1917). Despite the effort to keep up with docking requirements of larger ships, some terminals proved not quite long enough as new vessels were built. Two curved indentations—9 and 40 feet deep, respectively—were made in the bulkheads at West 10th and 57th Streets to accommodate the bows of such ships.

Historic Engineering Context

The granite-faced masonry bulkheads built by the City until ca. 1920 were unique within the Port of New York. No commercial bulkheads in the region were ever finished in such a deliberately monumental manner. The City bulkheads were also perhaps the earliest American examples of granite seawalls placed on concrete bases, breaking a long tradition of bulkhead foundations made of various timber cribwork designs. Earlier stone-faced walls found in some New England ports appear to be on variants of crib foundations, or rest directly on shallow surfaces with timber reinforcing around the faces (Greene, 1917; Heintzelman, 1986). The Department of Docks made especially notable progress in the problem of supporting the bulkhead on soft-bottom or deep-mud conditions. After about 6 years of trial and error, including removal of some early bulkhead sections, the Department under Engineer-in-Chief George S. Greene, Jr. developed a remarkably successful design involving perhaps the earliest use of a relieving platform in the Port of New York (see Figure 4, Type IIIB). Although some sections of this type sank as much as 4 feet, no vertical deflection exceeding 6 inches was ever noted. Described as "[o]ne of the most remarkable...bulkhead walls" as late as World War I (Greene 1917: 88), the early relieving platform type used from 1876 to 1898 was praised in more detail by an 1895 Board of Consulting Engineers:

---

* Outside of HRPC's planning jurisdiction, there is an atypical cribwork section between West 35th and 37th Street. In this location, cribwork conditions and extent have been obscured by pile-supported platforms built outshore on deposits of riprap (Mueser Rutledge Consulting Engineers, 1997).

** The section of this terminal between West 48th and 52nd Streets is outside HRPC's planning jurisdiction.

> To float a wall in mud when that wall must also take a horizontal thrust is a problem which can only be solved by care and experience, no formulas or mathematical rules being available. The wall, as now built, is a satisfactory solution of the problem. Your Board believes it to be a unique construction, one which is worthy of the most careful study, and deserves the strongest commendations...this wall...is remarkable for its originality and the excellence of its results (quoted in Hoag 1906: 117).

This design was modified slightly in 1899 with a wider concrete base block, which reduced timber and labor costs by eliminating the diver-installed timber binding frame used around the piles of the 1876 design. The surviving Hudson River bulkheads include examples of virtually all the granite-faced designs ever used by the Department, including those which led to the adoption of the most successful relieving-platform models (see Figure 3, Types IIA and IIB; Figure 4, Type IIIA).

The Department's designs probably influenced the early-20th-century adoption of relieving-platform construction for solid-fill structures by a number of railroads using the port. In these private designs, reinforced-concrete walls were supported on concrete and timber platforms set on timber piles cut off below mean low water. By ca. 1920, the Department eliminated its use of granite facing and began to use a similar design, with platforms set just above low water. This was the only type of municipal masonry bulkhead that left timber elements exposed to open water. Although not a problem when first built prior to ca. 1960, this design is now the most vulnerable to attacks by marine borers, which have reappeared in the port with the improvement of water quality since ca. 1980.

From ca. 1920 to 1960, concrete facing on a low-water relieving platform became a standard for new or replaced pile-supported bulkheads. Unlike the granite walls, which were dressed in an ashlar finish and divided into blocks, the concrete walls have a plain smooth finish and are monolithic. Approximately 18 percent of the bulkhead, scattered throughout the length of the waterfront, is of this design (see Figures 1 and 5). Since World War II, numerous other repairs have also been made, largely in an uncoordinated manner, to the bulkhead. The most common repair has been replacement of missing or damaged granite capstones with concrete that is cast in place (see Photos 2 and 5).

In addition to the masonry bulkheads, the Hudson River waterfront south of West 59th Street includes two sections of timber-crib bulkheads, noted above. The most exposed timber bulkhead is at Little West 12th Street (on the north side of the Gansevoort peninsula), and a buried section apparently survives outside of HRPC's planning jurisdiction from West 35th Street to 37th Street. Both timber bulkheads appear to be late-19th-century examples of what was, by then, a well-established and relatively standardized means of construction. When timber was relatively inexpensive, cribwork was a cheap form of bulkhead requiring only hand tools after any dredging phases. Disappearance of marine borers from the harbor beginning about 1850 made most bulkhead components permanent. Periodic replacement of all components subject to decay above mean low water complicates any identification of extant cribwork bulkheads with particular decades, and minimizes the significance of these upper elements. Cribwork bottoms are the least documented and probably most varied elements in timber bulkheads throughout the port, however, and tend to remain well-preserved under water. The bottoms of the Hudson River examples, buried at least 20 feet underwater, could include important information on once-widespread vernacular engineering practice.

National Register Criteria of Significance

As discussed under "Condition" (Item 10) and "Integrity" (Item 11), the masonry bulkheads are in fair to good condition. Beyond integrity, National Register eligibility is based on meeting at least one of four criteria of significance, summarized as follows:

A. Association with important historic events or activities;
B. Association with important persons;
C. Distinctive design or physical characteristics, including representation of a significant entity whose individual components may lack distinction; and
D. Potential to provide important information about prehistory or history.

The masonry bulkheads appear to meet at least Criteria A-C, and possibly Criterion D. The central place of the bulkheads in more than 60 years of City waterfront development, the considerable engineering and architectural investment made in bulkhead construction, and the influential role played by some bulkhead types in regional waterfront engineering, all appear to satisfy Criterion A. The central role of George B. McClellan (1829-1885) in initial bulkhead planning

and design appears to satisfy Criterion B. McClellan was one of President Lincoln's most important generals early in the Civil War, and was also an unsuccessful candidate for the American presidency in 1864. Criterion C is met by the presence not only of distinctive, influential engineering designs, but of the full range of bulkhead types built by the Department throughout the period of New York City's direct involvement in Hudson River waterfront development.

Even the latest type (see Figure 5: Type IV), similar to relieving-platform designs used elsewhere in the ports of New York and other cities, remains significant as part of the Department's long sequence of bulkhead designs. The masonry bulkhead appear well-documented in surviving drawings, descriptions of construction methods (e.g., Greene 1917: 88-94), and possibly in surviving original specifications. It is possible, however, that the surviving structures include undocumented details reflecting minor adaptations to bottom or other site conditions. Such undocumented details in the masonry or timber bulkheads could meet Criterion D.

21. SOURCES

Bray, R.N., and P.F.B. Tatham
1992 *Old Waterfront Walls: Management, maintenance and rehabilitation.* London: E & FN Spon.

Buttenweiser, Ann
1987 *Manhattan Water-Bound.* New York: New York University Press.

Engineering News
1893 New York Bulkhead Construction. Vol. 29: 104.

Greene, Carleton
1917 *Wharves and Piers: Their Design, Construction, and Equipment.* New York: McGraw-Hill Book Co., Inc.

Heintzelman, Andrea J.
1986 Colonial Wharf Construction: Uncovering the Untold Past. *The Log of Mystic Seaport* 37,4: 124-35.

Historic Conservation and Interpretation, Inc.
1983 Westside Highway Cultural Resource Survey Archaeological Work Program: Cultural Resources Research. Report prepared for New York State Department of Transportation.

Hoag, Sidney W.
1906 The Dock Department and the New York Docks. Municipal Engineers of the City of New York *Proceedings for 1905*: 31-155.

Mueser Rutledge Consulting Engineers
1997 Hudson River Park Project/Bulkhead Condition Review/Hudson River, New York. Final report prepared for Quennell Rothschild Associates/Signe Nielsen, P.C.

Raber, Michael S., Thomas R. Flagg, Ernest A. Wiegand, and John Antici
1984 The Evolution of Port Structures in New York Harbor, in Cultural Resources Reconnaissance, Edgewater, New Jersey Reach: New York Harbor Collection and Removal of Drift Project, pp. 40-90. Report prepared for New York District, U.S. Army Corps of Engineers.

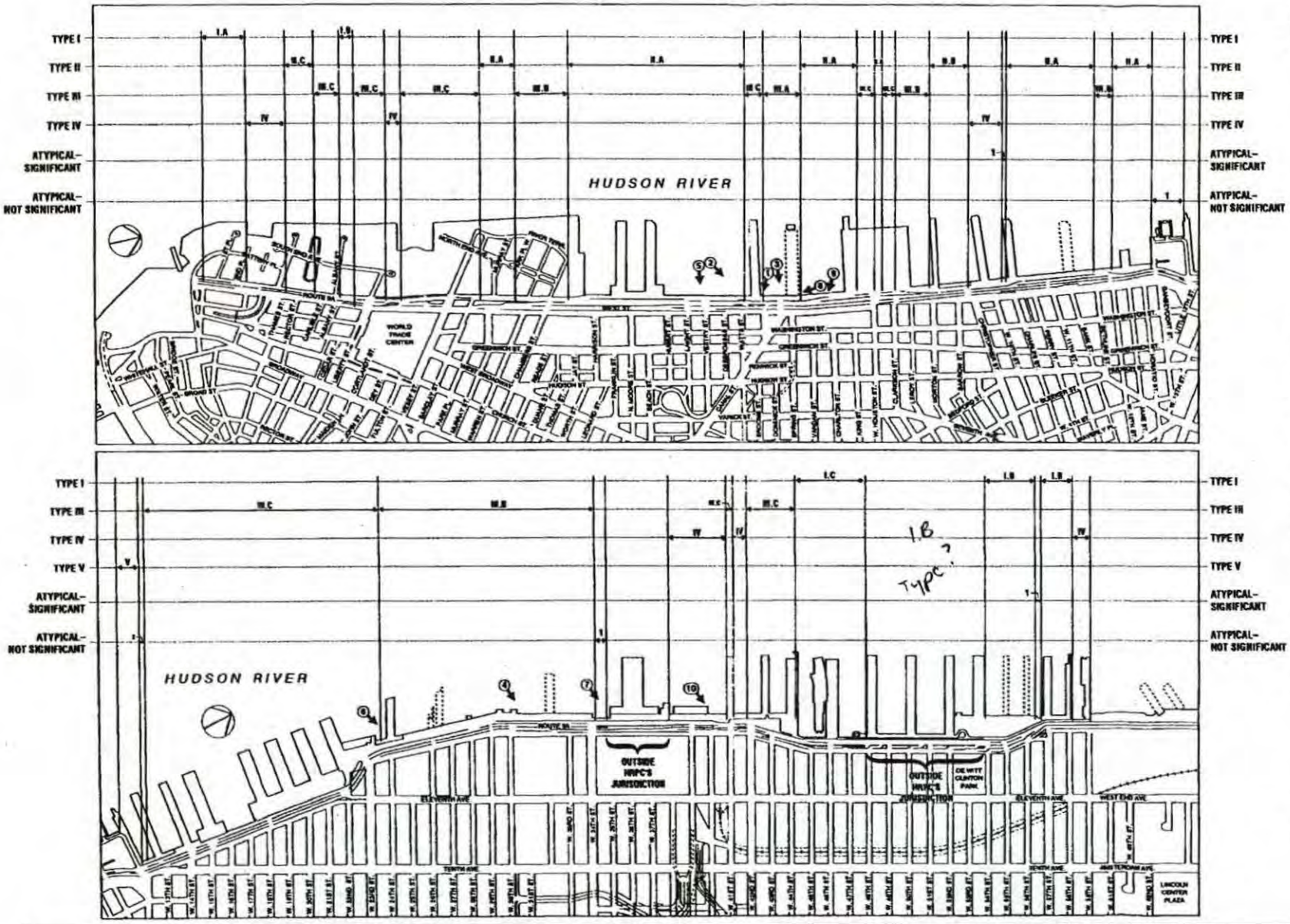
Raber, Michael S., Thomas R. Flagg, Gerald Weinstein, John Antici, and Ernest A. Wiegand
1986 Cultural Resources Reconnaissance of the Manhattan Upper West Side Reach: New York Harbor Collection and Removal of Drift Project. Draft report prepared for New York District, U.S. Army Corps of Engineers.

Raber, Michael S.
1986 West 55th Street and West 56th Street Piers. HAER No. NY-147. Historic American Engineering Record.

van Buren, John D.
1874 The Waterfront of the City of New York. *Transactions of the American Society of Civil Engineers* 3: 172-89.

Bulkhead Types and Key to Photographs

Figure 1



LEGEND

Significant Types

- I Granite or concrete walls without piles, on rock or firm bottoms (see Figure 2)
- II Granite walls with piles, no timber relieving platforms, usually on soft or deep mud bottoms (see Figure 3)
- III Granite walls with piles and buried timber relieving platforms, on soft or deep mud bottoms (see Figure 4)
- IV Concrete walls on piles with exposed timber or concrete relieving platforms (see Figure 5)
- V Timber cribwork (see Figure 6)
- Atypical 1 Curved-plan indentations for ships' bows

Atypical Non-significant Types

1. Collapsed pile-supported platforms and/or rip-rap
2. Narrow pile-supported building foundation
3. Riprap shoreline
4. Pile-supported platform in rip-rap, fronting cribwork

Key to Photographs

① Photo Number and Location from which Photograph was Taken

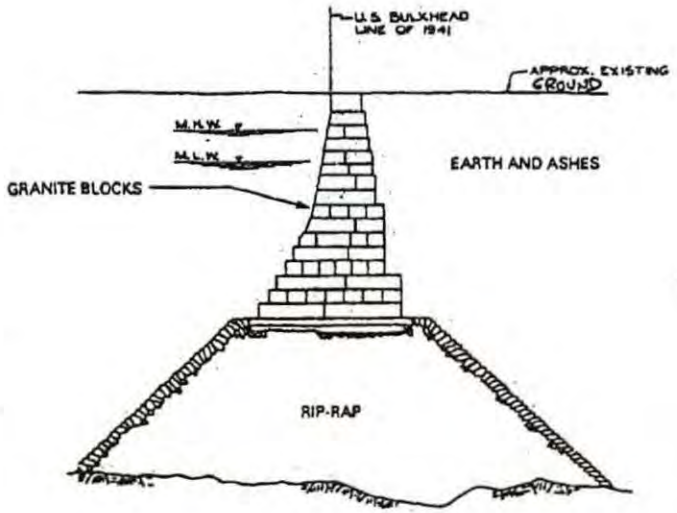
Source: Mueser Rutledge Consulting Engineers

SCALE 0 500 1000 FEET

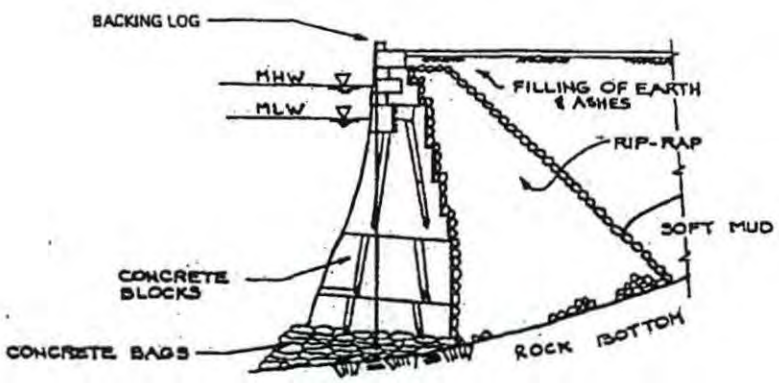
Figure 2

Bulkhead Type I Sections

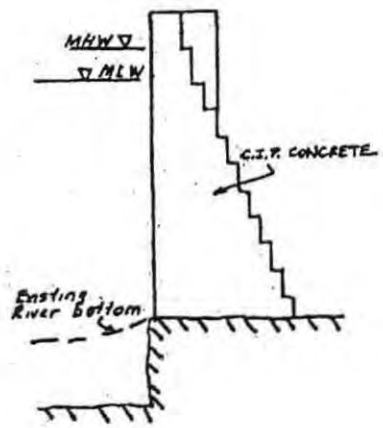
Type I: Granite or Concrete Bulkhead on Firm or Rock Bottom



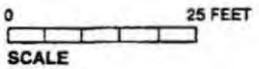
TYPE I-A
Granite blocks on rip-rap. Built in 1871 at Battery as first Department of Docks bulkhead.



TYPE I-B
Granite wall supported by 1-3 pre-cast concrete blocks and concrete base. Built c. 1872-1920 at Cedar Street and between 52nd-59th Streets. (Portion between 48th-54th Streets outside HRPC's planning jurisdiction.)



TYPE I-C
Concrete wall. Built c. 1915-1936 between 44th-52nd Streets.

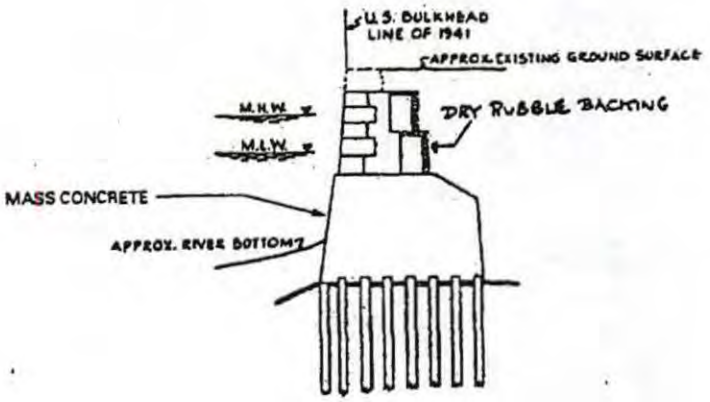


Note: Type I was typically built on firm bottoms less than 40 feet below mean high water.
Source: Mueser Rutledge Consulting Engineers.

Figure 3

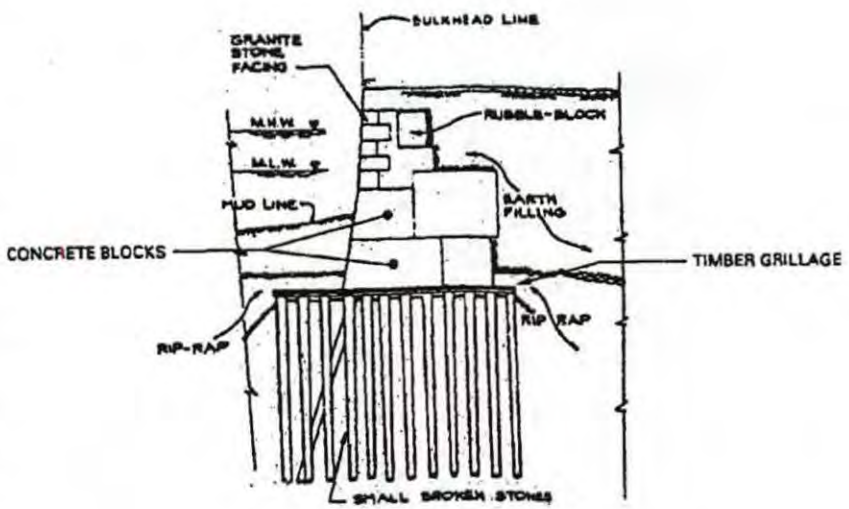
Bulkhead Type II Sections

Type II: Pile-Supported Granite Bulkhead Without Timber Relieving Platforms



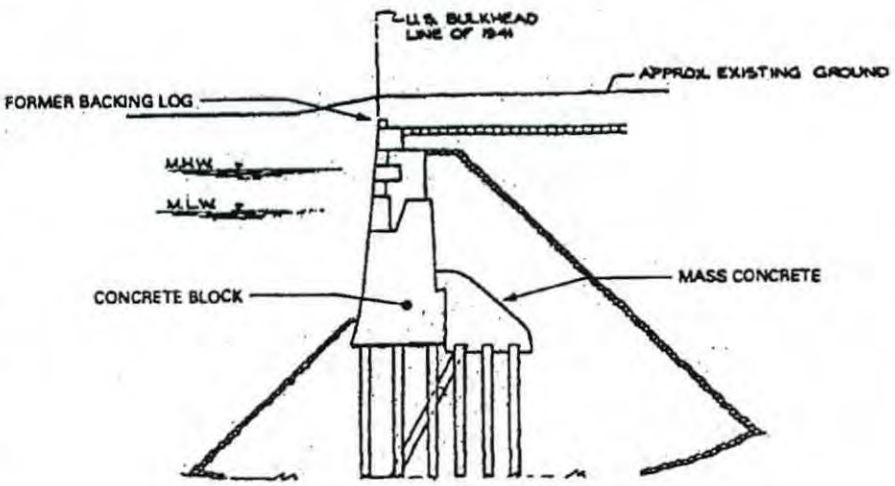
TYPE II-A

Granite wall on mass concrete block, resting on 2-inch thick concrete bed. Built c. 1873-1875 in several sections between Murray and Horatio Streets; some sections replaced by Types III-B and IV.



TYPE II-B

Granite wall on concrete block on 2-timber-thick grillage, with inclined bracing piles. Built c. 1875 at Morton and Christopher Streets.



TYPE II-C

Granite wall on pre-cast concrete block, with mass concrete backing and inclined bracing. An alternative to Type III-C timber-relieving platform. Built c. 1900 at Rector Street.

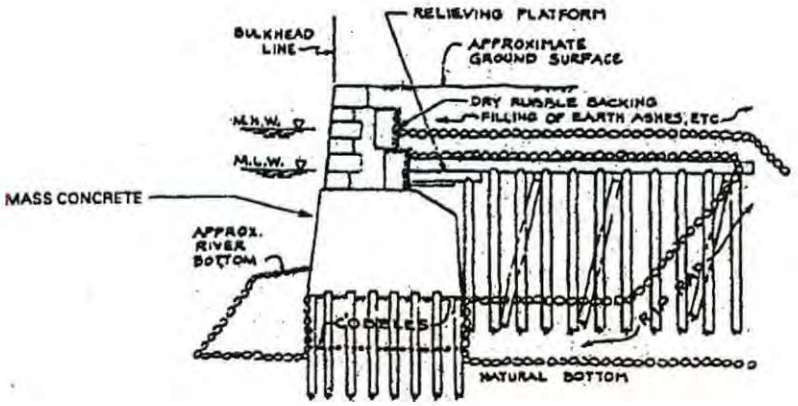
0 25 FEET
SCALE

Note: Type I I was usually built on soft or deep mud bottoms 40-170 feet below mean high water.
Source: Mueser Rutledge Consulting Engineers.

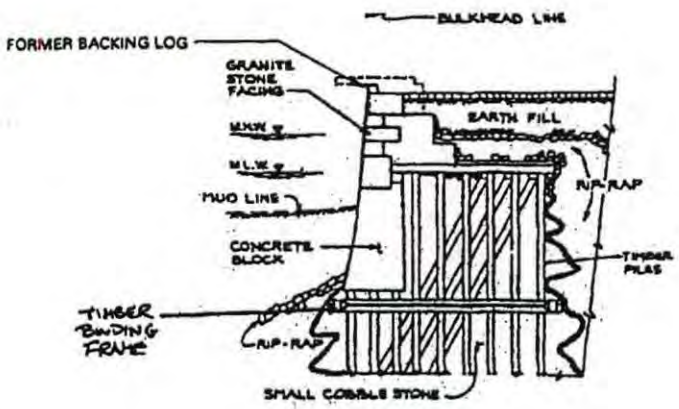
Figure 4

Bulkhead Type III Sections

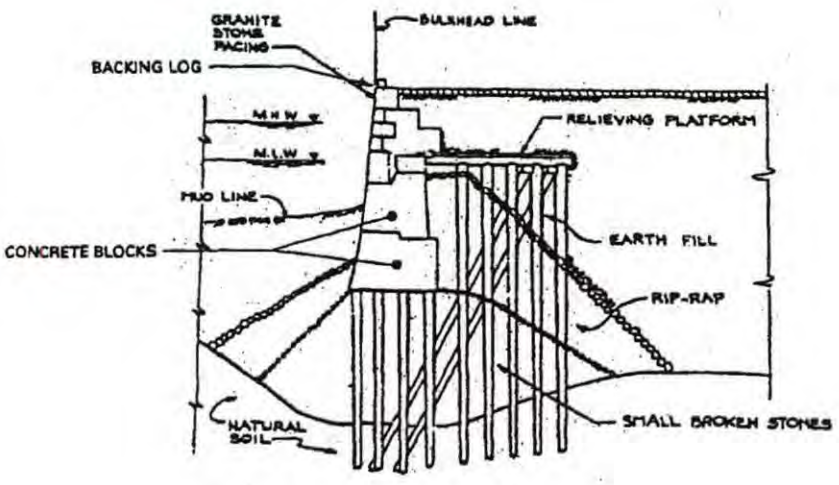
Type III: Pile-Supported Granite Bulkhead With Timber Relieving Platforms



TYPE III-A
Modified form of Type II-A. Built c. 1874 at Canal Street.



TYPE III-B
Granite wall on narrow concrete block, with inclined bracing piles taking lateral thrusts to below base block, and timber binding frame around piles. Built 1876-1898 in many areas between Warren and 38th Streets.



TYPE III-C
Granite wall on wider concrete blocks, similar to Type III-B without binding frame. Built c. 1899-1915 in many areas between Carlisle and 44th Streets.

0 25 FEET
SCALE

Note: Type III was built on soft or deep mud 40-170 feet below mean high water. The relieving platforms were encased in fill or cut off from open water.

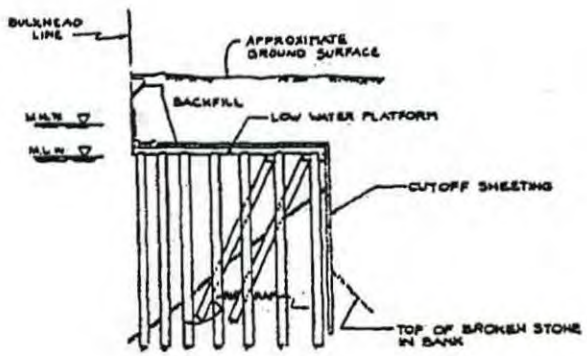
Source: Mueser Rutledge Consulting Engineers.

2•97

Figure 5

Bulkhead Type IV Section

Type IV: Concrete Bulkhead With Timber or Concrete Relieving Platforms



TYPE IV

Concrete bulkhead with timber or concrete relieving platforms on piles. Built c. 1920-1960 in many areas, as replacement of some older bulkhead types and as new construction.

0 25 FEET

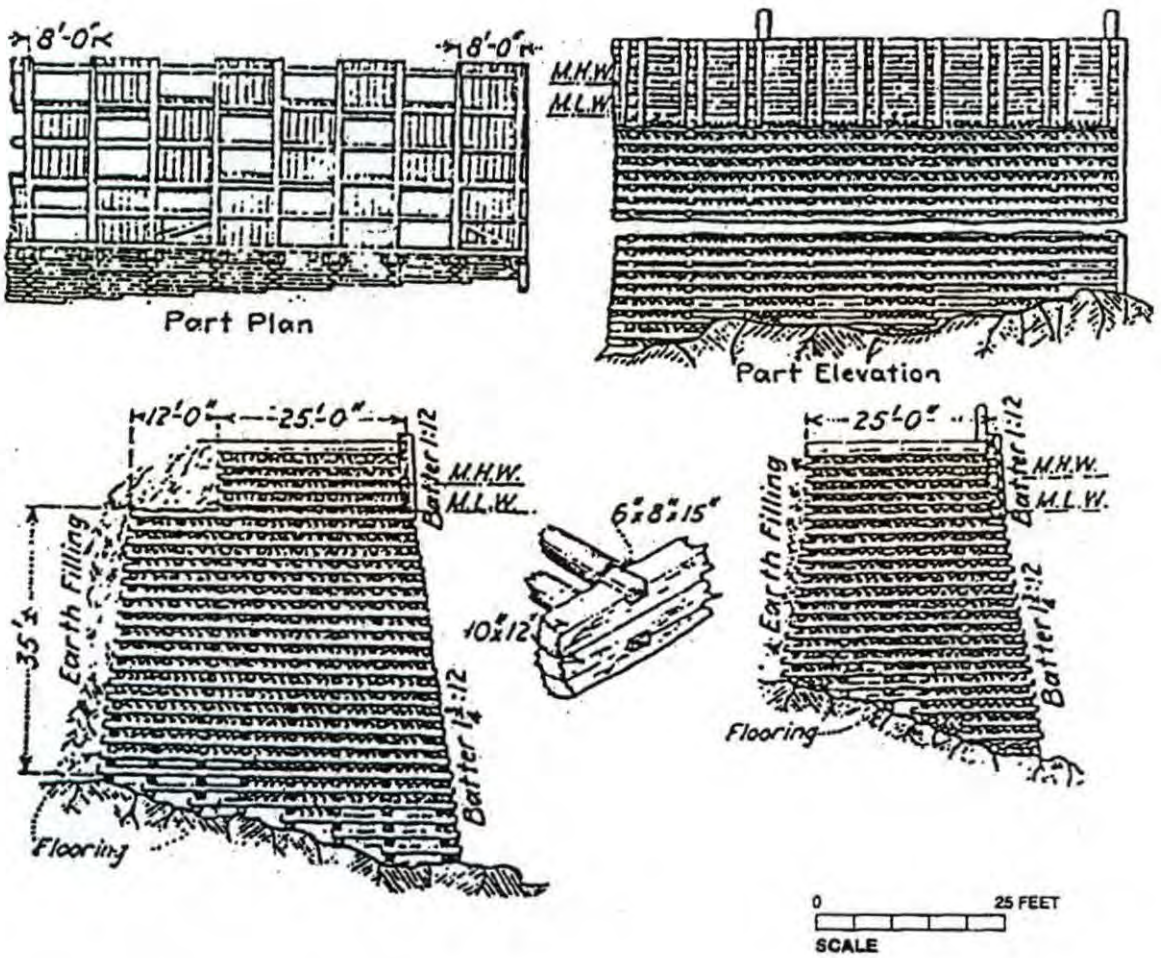
SCALE

Note: Type IV generally replaced Type III-C, with relieving platforms exposed to open water.
Source: Mueser Rutledge Consulting Engineers.

Figure 6

Bulkhead Type V Sections and Other Views

Type V: Timber Crib Bulkhead



TYPE V
Layered, rock- and earth-filled timber cells, with outer face of squared timbers above mean low water.

Note: This is a typical design and does not reflect possible crib-bottom variations adopted to specific bottom conditions. On the Manhattan waterfront south of West 59th Street, the only remaining cribwork bulkhead along the water is a late 19th century example at Little West 12th Street. There is also a cribwork bulkhead, built c. 1885-1890, buried near the water between West 35th and West 37th Streets, in an area outside HRPC's planning jurisdiction.

Source: Carleton Green, *Wharves and Piers*, 1917, pg. 53.