



Contract No. W912DS-07-D-0005

**U.S. Army Corps of Engineers
New York District**

**PHASE IB ARCHAEOLOGICAL
CULTURAL RESOURCES INVESTIGATION
FOR THE ADMIRAL'S ROW SECTION OF THE
FORMER BROOKLYN NAVY YARD, BROOKLYN,
KINGS COUNTY, NEW YORK**

OPRHP # 03PR05477

FINAL

July 2009

**PANAMERICAN CONSULTANTS, INC.
Buffalo Branch Office
2390 Clinton Street
Buffalo, New York 14227-1735**

Prepared for:

**TETRA TECH, INC.
451 Presumpscot Street
Portland, Maine 04103**

Under contract to:

**U.S. ARMY CORPS OF ENGINEERS
New York District
26 Federal Plaza
New York, New York 10278-0090**

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Prepared by:

**Donald Smith, Ph.D., Principal Investigator
Mark A. Steinback, M.A., Senior Historian
John Wah, Ph.D, Geologist
Sharon Jenkins, M.A., Project Archaeologist
Michael A. Cinquino, Ph.D., RPA, Project Director/Senior Technical Advisor**

**PANAMERICAN CONSULTANTS, INC.
Buffalo Branch Office
2390 Clinton Street
Buffalo, NY 14227
(716) 821-1650**

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Management Summary

SHPO Project Review Number (if available): 03PR05477

Involved State and Federal Agencies: U.S. Army Corps of Engineers, U.S. Army National Guard Bureau

Phase of Survey: Phase IB Archaeological Cultural Resources Investigation

Location Information:

Location: Admiral's Row, northeast corner of Flushing Avenue and Navy Street, Brooklyn Navy Yard

Minor Civil Division: Borough of Brooklyn

County: Kings County, New York

Survey Area (Metric & English): The survey area comprises approximately 6.07 acres on the north side of Flushing Avenue.

USGS 7.5 Minute Quadrangle Map: Brooklyn

Archaeological Survey Overview

Number & Interval of Shovel Tests: 212 total (45 at 15-m interval; 116 at 7.5-m interval; 51 radials)

Results of Archaeological Survey

Number & name of historic sites identified: 1 historical site (the PCI/Admiral's Row site, A04701.016569)

Number and name of sites recommended for Phase II/Avoidance: Phase II investigation recommended for PCI/Admiral's Row site

Results of Architectural Survey

Number of structures within project area: 17 with 22 official building designations

Number of buildings/structures/cemeteries adjacent to project area: in a densely urban environment (New York City)

Number of identified eligible buildings/structures/cemeteries/districts: 16 buildings in Admiral's Row plus a timber shed (see Phase IA report, Hanley et al. 2008)

Report Author(s): D. Smith, M. Steinback, J. Wah, S. Jenkins, M. Cinquino

Date of Report: July 2009

Abstract

Project Name: Phase IB Cultural Resources Investigation for the Admiral's Row Section of the Former Brooklyn Navy Yard, Brooklyn, Kings County, New York

Location, Size, and Boundaries of Project Area: 6.07 acres northeast of the intersection of Navy Street and Flushing Avenue, Brooklyn, New York

Purpose and Goals: Panamerican Consultants, Inc. (Panamerican) was contracted by Tetra Tech, Inc., Portland, Maine, and the U.S. Army Corps of Engineers, New York District (USACE) to conduct a Phase IB cultural resources investigation for the Admiral's Row section of the former Brooklyn Navy Yard in the Borough of Brooklyn (Kings County), New York. The U.S. Army National Guard Bureau (NGB) is responsible for transferring the Admiral's Row property from the federal government's ownership and disposing of the property as per Public Law 100-202. The USACE is currently serving as the real estate agent assisting the NGB in complying with all federal regulations as they pertain to the undertaking. The City of New York, through an agreement with the Brooklyn Navy Yard Development Corporation, a not-for-profit organization that has a long-term lease with the City as the management and development administrators for the rest of the former navy yard, has expressed interest in acquiring the 6.07-acre parcel (USACE 2008). The completion of the Phase IA cultural resources investigation is part of the environmental review for disposal of the property.

The purpose of the Phase IB investigation is to identify all archaeological cultural resources present within the Admiral's Row project area. Panamerican previously completed a Phase IA cultural resources investigation for the study area that included an assessment of the archaeological sensitivity / potential of the project area developed from background research, a review of historical maps, and a field reconnaissance / site visit (Hanley et al. 2008)

Regulatory Basis: The NGB, as a federal agency, has management responsibilities concerning the protection and preservation of cultural resources on land it controls or uses. As an agency of the federal government, the Army has certain responsibilities regarding the identification and protection of the cultural resources that may be eligible for inclusion on the National Register of Historic Places (NRHP). As part of project planning, federal statutes and regulations require the identification of significant cultural resources that are eligible for the NRHP and mitigation of adverse impacts to such resources, if identified. The federal statutes and regulations authorizing the Army to undertake these responsibilities include Section 106 of the National Historic Preservation Act, as amended through 2004, the Abandoned Shipwreck Act of 1987, and the Advisory Council on Historic Preservation Guidelines for the Protection of Cultural and Historic Properties (36 CFR Part 800); as well as Army Regulation (AR) 2001, "Environmental Protection and Enhancement" (December 2007).

NYSHPO correspondence: Letter dated December 17, 2007 (Cumming 2007). New York State Historic Preservation Office Project Review number is 03PR05477.

Summary of Phase IA Investigation: The study area contains eight domestic structures (ten quarters) that were erected between ca. 1850 and ca. 1900, related outbuildings, and a timber shed that was likely built around 1853. Prior to Panamerican's Phase IA, the domestic buildings were recommended as eligible for inclusion as an historic district on the National Register of Historic Places in a report by Beardsley/Crawford & Stearns (2008). Panamerican's Phase IA report concurred with the Beardsley/Crawford & Stearns assessment of eligibility for

the domestic structures and also recommended that related outbuildings, the timber shed, and other ancillary structures (including a tennis court and a shower room building) be re-evaluated and included as contributing elements to the district. Additionally, the investigation recommended the timber shed is individually eligible for inclusion on the Register. The study also concluded that the entire project area has potential to yield archaeological cultural remains from the prehistoric through historic periods and a Phase IB archaeological investigation with a geomorphological component was recommended.

Phase IB Geomorphological Investigation Results. The geomorphological component of the study included the extraction of 32 cores using a Geoprobe machine and the excavation of 7 backhoe trenches totaling 31.4 linear meters (103 feet). Unfortunately, no sampling was possible in the narrow area between the Admiral's Row quarters and Flushing Avenue, where access was extremely limited due to the presence of an historical yard wall and fence that extends along the north side of Flushing Avenue, large amounts of vegetation including mature deciduous trees, aboveground utilities such as hydrants, and concrete entry-stairways for the quarters buildings. In addition, historical fencing surrounding the Admiral's Row lawns was an impediment to machine access. Finally, safety was a primary concern in the narrow space between the structures and Flushing Avenue, since sampling there would necessitate the use of heavy machinery in proximity to the structurally questionable Admiral's Row quarters, the possible collapse of which would have posed severe hazards for the investigators (one of the buildings, Quarters C, suffered a nearly complete collapse following heavy rain subsequent to the archaeological fieldwork).

The geomorphological investigation concluded that a deeply-buried (3 m or more) intact natural soil surface extends under the entirety of the study area and comprises an organic marsh surface that formed on top of sandy fluvial/estuarine sediments. Its presence indicates the project area was covered with a tidal marsh before it was filled in the nineteenth century. Evidence of an eighteenth / early nineteenth-century mill pond identified in the Phase IA investigation was also found. Such conditions imply that the project area would not have been used for settlement by Native Americans in pre-Contact times and that resource procurement visits would have been brief, if conducted at all. Therefore, it is highly unlikely that prehistoric cultural resources are present. No prehistoric remains of any kind were found during either the geomorphological or archaeological investigation.

The results are also largely consistent with information derived from the Phase IA documentary research regarding large-scale historical alterations to the terrain in the study area. The entirety of the investigated area was filled relatively rapidly during the 1850s. Due to the rapidity with which it was deposited, it is highly unlikely that any deeply buried archaeological (i.e., cultural materials with known context) deposits are present in the fill. One of the fill layers is composed of a trash deposit of coal, coal ash, mortar, and iron slag that also included historical items, of which a sample of 85 was collected. Items in the trash layer, which include fragments of porcelain, whiteware, and ironstone, have *termini post quem* in the mid-nineteenth century, a date consistent with the hypothesis that the layer was deposited during the 1850s filling of Wallabout Pond. The deposit lacks cultural context (i.e., integrity) and is thus not eligible for inclusion in the National Register. No further archaeological work related to the trash deposit is recommended.

Phase IB Archaeological Investigation Results. A total of 212 shovel test pits were dug during the field investigation, of which 45 were in the parade ground / park covering the northern half of the project area. A total of four domestic artifacts were found in four of these shovel tests

and non-diagnostic historical artifacts, such as coal, coal ash, and brick fragments, were found in 17. This assemblage is consistent with the light volume of cultural material observed in the upper strata of trenches dug during the geomorphological investigation. No historical features or concentrations of artifacts were identified in the parade ground shovel tests.

The remaining 167 shovel tests were dug across the lawns of the Admiral's Row quarters – now referred to as the PCI/Admiral's Row site (A04701.016569; the site form is included in Appendix C). Of these, 21 yielded a total of 28 domestic historical artifacts with a *terminus post quem* in the nineteenth century, including: 17 ceramic fragments; 9 pieces of container glass (one of which is from a drinking glass and some of which may be modern); a fragment of medium-gauge sheet brass punched in a crescent shape; and a plastic faux mother-of-pearl button (*terminus post quem* ca. 1868). An additional two artifacts (fragments of pearlware) were found in a trench dug on the lawn of one of the Admiral's Row quarters during the geomorphological investigation. The assemblage from the site is temporally consistent with deposition in the second half of the nineteenth century. This, together with the fact that the items are related to prosaic household activities, indicates they are possibly attributable to some of the individuals who inhabited the quarters. No historical archaeological features were around the Admiral's Row buildings.

Phase IB Archaeological Recommendations. Panamerican concludes that the PCI/Admiral's Row site is potentially eligible for inclusion on the NRHP. Although the density of domestic artifacts from the site is best characterized as light to moderate, the context of the assemblage needs to be considered in assessing whether the site is potentially eligible for inclusion on the State/National Registers. First, it lies within an NR-eligible historic district, the eligibility determination of which was based on its architectural resources. The site is likely associated with the individuals who inhabited structures that are contributing elements to the district. While the quarters were attached to buried utilities by 1894, no documentation is available to address exactly when they were connected to the lines. Before buried utilities were available, Admiral's Row inhabitants would possibly have employed privies, the filled remnants of which (along with other pit features) may be present in the yards around the buildings, but were not detected by the shovel tests. The earliest three quarters (Quarters B, C and D, built in the 1850s) have the highest potential for associated privies. Thus, based on the presence of the domestic artifacts, the potential for intact features, and the historical sensitivity of the site's context, it is potentially eligible for inclusion on the NRHP.

Panamerican recommends a Phase II investigation of the site to determine whether it is eligible for inclusion on the NRHP, either individually and/or as a contributing element to the proposed Admiral's Row Historic District. This will address whether it contains any intact historical features related to the domestic lives of the quarters' inhabitants that are likely to contribute additional information concerning (but not limited to) nineteenth century life for officers at the Navy Yard and how they interacted with communities and groups of individuals of differing socio-economic standing. In so doing, the Phase II will assess whether the PCI/Admiral's Row site is individually eligible for inclusion on the NRHP and whether it is a contributing element to the proposed Admiral's Row Historic District.

Consultation among the USACE, NGB, NYSHPO, and Panamerican yielded several alternative potential methods of investigation and levels of effort for the Phase II, each of which has benefits that need to be considered against their limitations (which are related primarily to site conditions – see below) prior to implementation. All are focused on determining whether

filled pit features – the most likely type of historical archaeological feature that might be found at the site – are present. They include:

- The use of a geophysical remote-sensing device, preferably a ground penetrating radar (GPR) unit, supplemented by shovel testing, to ascertain whether potential pit features are present in the ca. 1.5 acres of yards surrounding the Admiral's Row quarters, as well as the small yard south of the timber shed. Although GPR can be calibrated to image through obstructions such as sidewalks and walkways, it may be somewhat limited by the quarters' foundation walls, which might cause reflective interference in areas near the Admiral's Row buildings. It would be most useful for locating filled pit features (i.e. privies) that extend into subsoil. Although many buried utilities extend across parts of the site, they would be easily discernable in GPR imagery, particularly given the availability of utility maps. Perhaps the greatest impediment to the use of the instrument is the occasional presence of dense vegetation. However, the impacts of the vegetation can be moderated through the use of a GPR unit that does not need to be wheeled across the ground surface or else by scheduling the investigation for a time when vegetation is minimal, such as early spring. The number and locations of shovel tests used in tandem with the GPR survey would be contingent upon the frequency and configuration of features identified by the device.
- Alternatively, NYSHPO has recommended a topsoil stripping operation, supplemented with shovel testing. Topsoil removal is highly effective for identifying features that extend below the base of the upper soil layer. However, the method can be highly destructive to underlying soils and deposits in areas with dense woody roots and utility lines, since the soil removing equipment can drag impediments through the subsoil resulting in considerable disturbance. Both roots and numerous buried utilities, some of which are encased in concrete and not all of which may be mapped, extend across parts of the PCI/Admiral's Row site. Beyond the possibility of disturbing potentially feature-bearing subsoil, the use of heavy equipment poses additional dangers that are unique to the site. The Admiral's Row quarters are all in severe disrepair and at least portions of them have collapsed (in one case, nearly all of one of the buildings, Quarters C, collapsed in a single event subsequent to the archaeological field investigation). In such conditions, the accidental movement of a buried, concrete-encased utility line connected to the foundation of a building, or a minor inadvertent collision between earth-moving equipment and the superstructure of a building, could pose extreme hazards for the field crew. As with the GPR survey, the number and locations of shovel tests used in tandem with the stripping would be contingent upon the frequency and configuration of features identified by the device.
- The third alternative is close-interval (3-m) shovel testing across the entirety of the site, supplemented with the excavation of 1-x-1-m units. If used independently of GPR or topsoil removal, the shovel testing option is the least effective, and most labor-intensive, for finding pit features. However, if neither of the other methods is feasible the STPs are a viable, albeit least-productive, alternative. At the recommended interval, approximately 250 to 300 STPs would be needed to cover the site. Unfortunately, even at this high density of coverage, shovel testing still only samples a small percentage of the site and may miss even relatively large features. The units would be needed to ascertain whether deposits of artifacts are from features. Their number and locations would be dependent upon the frequency of shovel tests that yield significant volumes of cultural material.

If it is determined that field conditions at the time of the Phase II investigation do not favor the use of either GPR or topsoil removal across the entirety of the site, the best alternative is a combination of the three methodologies, where each would be employed in areas of the site where it is most effective and practicable.

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1.0 Introduction

1.1 PROJECT DESCRIPTION

Panamerican Consultants, Inc. (Panamerican) was contracted by Tetra Tech, Inc., Portland, Maine, and the U.S. Army Corps of Engineers, New York District (USACE) to conduct a Phase IB Archaeological Investigation of the Admiral's Row section of the former Brooklyn Navy Yard in the Borough of Brooklyn (Kings County), New York (Figures 1 and 2). Admiral's Row is located in the southwestern portion of the former navy yard along the north side of Flushing Avenue, east of Navy Street. It covers 6.07 acres and contains six domestic structures comprising ten officers' quarters that were reportedly erected between ca. 1850s and ca. 1900, related outbuildings and other structures, and a timber shed that was likely built around 1853 (Figure 2). These structures have all been recommended as eligible for inclusion on the National Register of Historic Places both individually and as elements of an historic district on the Register (Beardsley/Crawford & Sterns 2008; Hanley et al. 2008). The New York State Historic Preservation Office (NYSHPO) has concurred with these recommendations (see Appendix D).

The Brooklyn Navy Yard closed in 1966 and most of it was sold to the City of New York. The Admiral's Row project area, however, remained the property of the U.S. Department of the Navy. It was later transferred to the Department of the Army and, at the time of the transfer, it was anticipated that it would be licensed to the New York Army National Guard. The U.S. Congress subsequently authorized the Army to dispose of the property. "The City [of New York], through an agreement with the BNYDC [Brooklyn Navy Yard Development Corporation], a not-for-profit organization that has a long term lease with the City as the management and development administrators for the rest of the former Navy Yard, has expressed interest in obtaining the property. Their current proposal is to redevelop the property for use as a supermarket, with a parking lot, and to construct a new light industrial building for manufacturing purposes" (USACE 2008:2). USACE is serving as real estate agent for the U.S. Army on behalf of the National Guard Bureau (NGB) assisting in the compliance with all federal regulations pertinent to the disposition of the property from federal ownership per Public Law 100-202 (USACE 2008; Beardsley/Crawford & Stearns 2008; Hanley et al. 2008).

The U.S. Army, as a federal agency, has management responsibilities concerning the identification, protection and preservation of cultural resources on land it controls or uses. Federal statutes and regulations require the Army to identify and evaluate significant cultural resources on these properties, and include: the National Historic Preservation Act of 1966, as amended (16 U.S.C. 470 *et. seq.*) through 2000 (which includes Section 106 compliance); the National Environmental Policy Act of 1969 (42 U.S.C. 4321 *et. seq.*); the Archeological and Historic Preservation Act of 1974 (16 U.S.C. 469-469c); Curation of Federally-Owned and Administered Collections, September 12, 1990 (36 CFR 79); the Advisory Council on Historic Preservation Guidelines for the Protection of Cultural and Historic Properties (36 CFR Part 800); as well as Army Regulation (AR) 2001, "Environmental Protection and Enhancement" (December 2007). The current investigation was also conducted according to the New York Archaeological Council's Standards for Archaeological Investigations and New York State Historic Preservation Office (NYSHPO) Guidelines.

The purpose of the Phase IB investigation is to identify all archaeological cultural resources present within the Admiral's Row project area. Panamerican previously completed a Phase IA cultural resources investigation for the study area that included an assessment of the

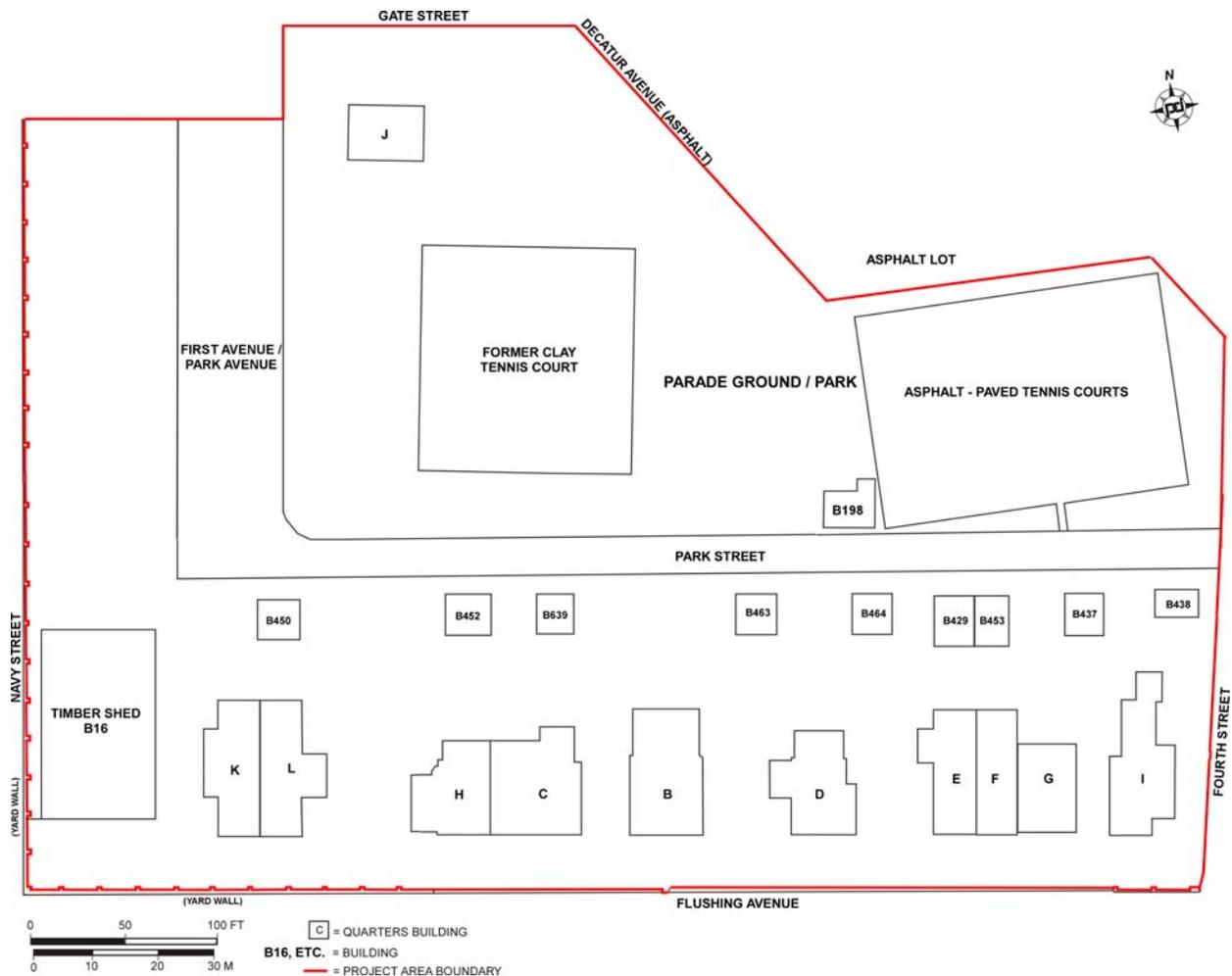


Figure 2. Layout of the project area showing buildings, roads, and other features. Brooklyn Navy Yard, Kings County, New York (PCI 2009).

archaeological sensitivity / potential of the project area developed from background research, a review of historical maps, and a field reconnaissance / site visit (Hanley et al. 2008). Among the findings of the study – and among the most relevant for assessing archaeological sensitivity – was the fact that significant degrees of landscape alteration had occurred within the project area during historical times. Most prominent of these was a series of filling episodes in the nineteenth century during which the study area was gradually transformed from an estuarine environment adjacent to the Wallabout Bay section of the East River to stable dry land several hundred meters from the river (see below, Section 1.2). Because of the magnitude and complexity of these alterations to the landscape, the Phase IB archaeological investigation was conducted in conjunction with a geomorphological study, the results of which are included in Section 2 of the current report.

In addition to the geomorphological study, the Phase IB investigation included limited additional documentary research, photographic and cartographic documentation of site conditions, and the excavation of shovel test pits (STPs). The tests were dug at a close interval of 7.5 m (25 ft) in the portion of the study area with the highest archaeological sensitivity (i.e., in the yards surrounding the Admiral’s Row quarters) and at the standard 15-m (50-ft) interval in

areas of lower sensitivity (i.e., across the parade ground north of the quarters – see discussion below, Section 1.2). The geomorphological field investigation was conducted from January 19 to January 30, 2009 and the archaeological fieldwork was conducted from April 6 to April 8, 2009. Dr. Donald Smith served as Principal Investigator and Field Director; Dr. John Wah conducted the geomorphological investigation and wrote Section 2.0; Ms. Sharon Jenkins, M.A., assisted with the artifact analysis; and Dr. Michael A. Cinquino, RPA, served as project director. Dr. Smith was assisted by four technicians during the field investigation.

1.2 SUMMARY OF PHASE IA FINDINGS AND RECOMMENDATIONS

1.2.1 Brooklyn Navy Yard / Admiral’s Row Project Area Historical Chronology. The archaeological sensitivity assessment, recommendations, and conclusions presented in the Phase IA report, as well as the methods employed during the Phase IB field investigation, were largely determined by the sequence of historical events, transactions, and episodes of construction and development in the study area. A brief chronology of these events is presented as Table 1 below; for a more complete discussion, see the Phase IA report (Hanley et al. 2008).

Table 1. Chronological summary for the Admiral’s Row project area

Year(s)	Event	Page(s) in IA report
c. 1637-1664	Dutch Period	
1640s	Governor Kieft granted tracts of land along the west bank of Wallabout Bay to several investors.	3-13
1664-1783	British Period	
1710	Aart Aertsen (Middagh) constructed a mill on the west side of Wallabout Bay “where a natural pond in the marsh [along the edge of the bay], requiring a short dam, afforded the necessary facilities” (Stiles 1867:80-81). The pond is sometimes referred to as Wallabout Pond.	3-13
ca. 1767	Rem Remsen built a wooden toll bridge that was about 500 ft in length and extended across the study area along a southeast-northwest axis.	3-15
1767	The mill, mill dam, and pond complex, then owned by Remsen, is shown on Ratzler’s map “Plan of the Town of Brooklyn and Part of Long Island.” Although georeferencing of details in the map are somewhat speculative, it shows roughly 80 percent of the project area in the mill pond and the remainder – the northwest corner of the study area – in a marshy zone. Remsen’s bridge is not shown in the map. A feature labeled “Mill Dam” is shown extending north to south east of the project area, separating the mill pond from Wallabout Bay.	3-14 to 3-16
1776-1783	The British occupied New York City through much of the American Revolution, during which British prison ships were moored in Wallabout Bay. Between 11,000 and 12,000 American prisoners perished aboard the vessels and many were buried northeast of the study area, in the narrow sandy peninsula that formerly formed much of Aertsen (Middagh) and Ramsen’s dam. Ramsen apparently continued to use the pond that covered much of the study area for seasoning timbers.	3-17 to 3-19

Table 1 continued.

Year(s)	Event	Page(s) in IA report
1781-1801	John Jackson, who bought Ramsen's land, established and ran a small shipyard. Although Jackson made significant changes to his land as he constructed the shipyard (sometimes resulting in the inadvertent exhumation of Revolutionary War American POW burials), maps produced before and after his ownership show no major differences within the study area. Jackson continued to use the former mill pond for seasoning timbers.	3-19, 3-20, and 3-21
1801-1966	Brooklyn Navy Yard	
1835	The study area is shown on Herbert and Tolford's Map of the City of Brooklyn in largely the same condition as it was earlier illustrated on Ratzer's 1767 map. As before, roughly 80 percent is covered with water and the remaining portion, now shown as dry land rather than marsh, is in the northwest corner of the study area. One difference relative to the earlier map concerns the boundary between the water and land/marsh, which is illustrated as a straight line rather than the previous more 'naturalistic' shoreline configuration, perhaps indicating the presence of piles or some other form of stabilization. Remsen's toll bridge is also shown. Water is illustrated as extending up to the edge of Flushing Avenue along the southern edge of the study area (i.e. the future site of Admiral's Row).	3-20, 5-3
1853	The Navy constructed three officers' residences on the site of the current Admiral's Row structures: Quarters B, C and D. Quarters B was occupied by the Captain of the Yard Military, Quarters C by the Captain of Industrial Activity, and Quarters D by the Sailing Master of the Yard. The three structures were known as Officer's Row or Captains' Row. An 1857 woodcut from <i>Frank Leslie's Illustrated Newspaper</i> shows the structures and suggests they were accompanied by several small outbuildings (Figure 3). All the buildings fronted on Flushing Avenue. Building 16, the Timber Shed, was also likely built about 1853. It extended parallel to Navy Street and, at the time of its construction, measured about 400 ft by 60 ft.	3-21, 5-3 and 5-4 (see Corey and Ortoleva 1987), 6-5, and 11-6
1850s	The mill pond was filled in. The filling likely occurred in the latter part of the decade; an 1857 woodcut from <i>Leslie's Illustrated Newspaper</i> shows the pond filled with water, while another, entitled "United States Navy Yard, Brooklyn, New York," also dating to the 1850s, illustrates the pond area as dry land, possibly covered with piles of timbers (Berner 1999:23).	3-24; see Corey and Ortoleva 1987
ca. early 1860s	Several sources suggest the Navy demolished the Officers' Row quarters before replacing them with the current Admiral's Row buildings. This seems unlikely (see Beardsley/Crawford & Stearns 2008:79, 99).	(see Corey and Ortoleva 1987)
1864-1901	Build dates for the remaining Admiral's Row Quarters. Quarters E/F/G (which share a single structure) were constructed in 1864; Quarters H dates to ca. 1880; Quarters I to roughly 1899; and Quarters K/L (which also share a single structure) to 1900 or 1901. As with Quarters B, C and D, all the structures fronted on Flushing Avenue.	3-22, 5-3

Table 1 continued.

1889	The study area is shown on a map of proposed improvements to the Navy Yard. Among the notable features that appear on the map are the two primary roads in the project area: Park Street, which parallels Flushing Avenue north of the quarters; and Park Avenue (sometimes First Avenue), which parallels Navy Street. The remainder of the study area – north of Park Street and east of Park Avenue – is labeled as a park and has a small decorative ‘pond’ near its center. Several small structures are also shown fronting the south side of Park Street, north of the quarters.	(see Beardsley/ Crawford & Stearns 2008:12)
1894	The study area is illustrated on a map of the navy yard that shows utilities and other details. The Admiral’s Row quarters are shown connected to a ‘water pipe’ and a ‘small sewer’ line, both of which run beneath Park Street. ‘Small sewer’ lines also extend south from the quarters and out of the navy yard to Flushing Avenue. This is the earliest consulted map that shows buried utility lines connected to the Admiral’s Row quarters. Besides the utilities, the map also shows the entire zone between the timber shed and the future location of Quarters K/L as covered in pavement. The small structures along the south side of Park Street illustrated in the 1889 map are also still present, but the small decorative pond in the park north of the street is not shown.	(see “Plan of the U.S. Navy Yard, N.Y.” 1894)
1904	The study area is depicted on Belcher Hyde’s “Plan of the United States Navy Yard and Wallabout Basin.” Differences between the map and that from 1894 include the presence of a ‘band stand’ just north of Park Street. Also, Quarters K/L – which date to roughly the turn of the century – are shown, along with a small ancillary building to the north, fronting on the south side of Park Street.	3-32
1907	The Navy constructed a building in the northwest corner of the study area on the site of the current Quarters J. The structure housed the radio station.	9-1 (see West 1941:25-26)
1918	Build date for the paved tennis courts (Building 710) north of Park Street in the eastern portion of the study area. Another tennis court, paved with clay, appears on later maps (see below) and possibly dates to roughly the same time.	10-10
1919	Build date for most of the extant garages and greenhouses fronting on the south side of Park Street and that service the Admiral’s Row quarters, including Buildings 429, 437, 438, 450, 452, 463 and 464.	7-1, 7-8, 7-17, 7-27, 7-46, and 10-8
1934	The Navy converted the radio station in the northwest corner of the study area into Quarters M.	9-1 (see West 1941:25-26)
1943	Build date for Building 639, a garage that services Quarters C, as well as a flagpole (Building 135) that stands in the northern portion of the study area.	7-8
1952	Build date for Building 198, a shower room north of Park Street at the southwest corner of Building 710, the tennis court	10-5
mid-1950s	Build date for Quarters J, constructed in the northwest corner of the study area. Quarters J occupied the same location as the previous Quarters M, which presumably had been demolished at some point since 1934.	9-1
1958	The study area is shown on a base map of the navy yard that shows numerous details, including utility lines, walkways/sidewalks, and fences. Most of the buried utilities are encased in concrete ducting, likely installed to ‘harden’ the utilities either during the second world war or the early part of the cold war. A notably dense axis for buried utilities runs east-west just north of the Admiral’s Row quarters (see Figure 4).	(see Figure 1.3, current report)

Table 1 continued.

1966	Closing of the Brooklyn Navy Yard; Admiral's Row remained the property of the Navy.	1-1
early 1960s	The Navy demolished the northern three-quarters of Building 16. The area where this part of the structure formerly stood is visible in use as a parking lot in a 1966 aerial photograph (not reproduced in the Phase IA report; see NETR 2009)	11-2
ca. 1970s	Occupation at Admiral's Row ended and the buildings and surrounding terrain – including the streets, utilities, park/parade ground, and tennis courts – fell into disrepair	1-1

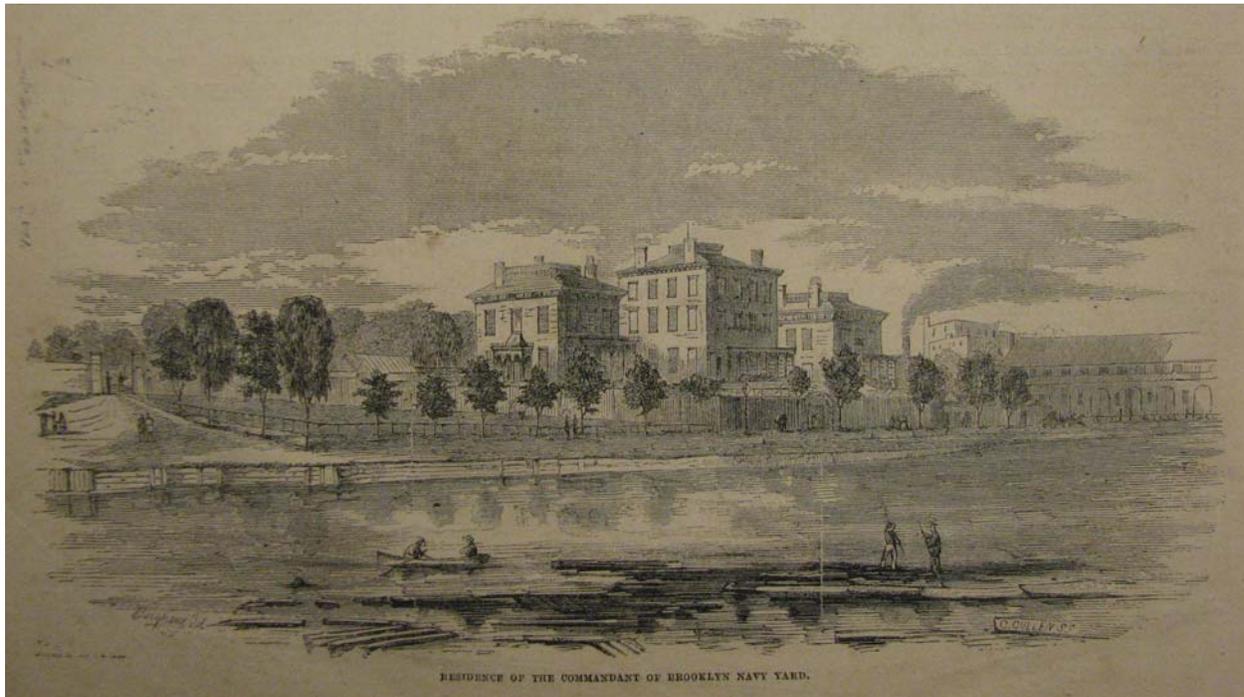


Figure 3. 1857 woodcut from *Frank Leslie's Illustrated Newspaper* (p. 168) showing (from left to right) Admiral's Row Quarters D, B and C, facing southwest. Several other features are visible, including Fourth Street, at left, the timber shed (Building 16) at right, and the yet-unfilled mill pond in the foreground. Brooklyn Navy Yard, Kings County, New York.

1.2.2. Phase IA Archaeological Investigation Findings and Conclusions.

Prehistoric and Early Historic Sensitivity. The site file check conducted during the Phase IA investigation revealed no prehistoric sites listed within one mile of the project area in the archaeological site files at NYSHPO and the New York State Museum. This region and the Wallabout Bay waterfront were inhabited by Native Americans including the Canarsee in the early historic period. Land-use or settlement by prehistoric Native Americans spans thousands of years. The likelihood for the presence of buried prehistoric cultural resources within the APE is generally low due to the former presence of tidal salt marshes and open water of Wallabout Bay that originally covered the entire project area. Although not likely, potential prehistoric sites would include shell middens, small camps, or early Holocene remains deposited prior to a post-glacial rise in sea level.



Figure 4. The southeast portion of the study area on a 1958 map of the navy yard showing utilities, fences, and other details. Brooklyn Navy Yard, Kings County, New York (PCI 2009). (map courtesy of Brooklyn Navy Yard).

There is also a low likelihood for the presence of early historic cultural resources due to the APE's former state as a tidal marsh/salt meadow. With the exception of Remsen's wooden bridge, which crossed the millpond in the late eighteenth century, no historic map-documented structures (MDS) are documented in the study area during this era. If the fringes (i.e., shore) of the tidal marsh lie within the APE, possible historic remains could include those associated with Dutch and English settlement as well as African slaves. Evidence (e.g., lost timbers or dock remains [if ever constructed]) also could remain from the time when the former millpond was used for seasoning timbers (ca. 1776-1801).

Revolutionary War Period Sensitivity. The study area has moderate sensitivity for remains associated with the Revolutionary War. The British and their allies reportedly foraged and encamped around Wallabout Bay during the seven-year occupation of New York City and there is a slight possibility of remains related to these activities. The sensitivity of the project area relative to Revolutionary War burials is somewhat higher, although moderate. Map and documentary evidence indicates that captured American soldiers who died on prison ships anchored in Wallabout Bay were buried near a shoreline just outside the study area. The precise location of the shoreline for any given period, however, has not been established, due to the shifting nature of the tidal flats and salt marshes surrounding the bay, as well as the potential inaccuracies of historic maps, such as problems with consistent scale, proportion or location. Finally, most of the ship building and maintenance facilities for Jackson's post-revolutionary-war shipyard (with the exception of the mill pond, which he used for seasoning timbers) were located outside the study area, so there is a low probability for finding any remains related to them.

Nineteenth and Twentieth Century Archaeological Sensitivity. The use of the project area by the U.S. Navy spanned the years 1801 to 1966 and residences along Admiral's Row were occupied into the 1970s. The setting of the study area appears to have changed little during the first half of the nineteenth century. Prior to the 1850s, the northwest corner may have been dry land during at least some of the time and Herbert and Tolford's 1835 map suggests the shoreline had been stabilized, perhaps through the use of pilings. Earlier maps, however, such as Ratzler's 1767 plan, indicate that it was previously wetter. The precise limits of the mill pond are in question, since they are depicted in different locations on a series of historic maps from between 1838 and 1854, which could reflect reality, but also might be a result of cartographic error. If a dry area along the edge of the mill pond did exist in the northwest corner of the study area, it would have been under the portion of the timber shed that was demolished in the 1960s. Thus, this area is sensitive for archaeological remains from activities along the former shoreline, as well as more recent materials left during the operation of the structure.

There is low to moderate potential for nineteenth-century and twentieth-century cultural resources in the area of the parade ground / park north of Park Street and east of Park Avenue. This area was extremely wet, if not completely inundated, until it was filled in the latter part of the 1850s. Historic use of the space would not have likely resulted in significant artifact deposition with identifiable patterns or stratification. No indication of former outbuildings associated with the residences of Admiral's Row was found for this area during background research. Foundation remains of the former bandstand could be present but its historic use would not likely result in significant artifact deposition. The presence of subsurface features (e.g., midden) is unlikely. Similarly, the zone adjacent to the tennis courts and flagpole has a low sensitivity for associated cultural resources even though both structures are greater than 50 years old. The areas surrounding Building J and the tennis court shower room have low sensitivity for significant cultural resources because the structures were built in the second half of the twentieth century.

The likelihood of historic archaeological resources associated with the Admiral's Row residences is high. With the exception of impacts associated with the installation of utilities, the yards surrounding the buildings are generally undisturbed. Artifact deposits and other cultural features could be present and have the potential to provide insight regarding the everyday lives of Naval officers and their families (e.g., economy, material culture, etc.) from the middle nineteenth to the late twentieth century. As Simeon Bankoff (Executive Director, Historic Districts Council) expressed in a communication to Kristin Leahy (National Guard Bureau Cultural Resources Manager): "This is during the time when America grew into a defining world power. During this time, the U.S. military and military life grew and changed, and the stories of the people in these houses might open an interesting and important window to that evolution" (April 18, 2008). The yards behind (i.e. north of) each residence are particularly sensitive for the presence of middens and filled or covered privies, wells and cisterns. Although the 1894 map of the navy yard shows that the Admiral's Row buildings were connected to buried utilities by that time, it is unclear exactly when this was completed. In general, Brooklyn and the navy yard installed utility lines in the second half of the nineteenth century – after 1857. Thus, at least Quarters B, C and D were probably not connected to utilities at the time of their construction, and it is at least feasible that Quarters E/F/G and H (which date to 1864 and 1881, respectively) were not either. Their inhabitants may have employed older methods for disposing of domestic waste and procuring water. If present, the material correlates of these practices, including filled wells and privy features, could be sensitive for cultural materials deposited toward the end of the nineteenth century as they became obsolete.

1.2.3. Phase IA Archaeological Recommendations. As a result of the Phase IA sensitivity assessment and conclusions (Hanley et al. 2008), Panamerican recommended a Phase IB field investigation that included closely integrated archaeological and geomorphological components. Subsurface testing was recommended to determine the presence or absence of potentially buried prehistoric and historic cultural resources and included standard archaeological shovel testing as well as geomorphological sampling. The geomorphological investigation was to be completed prior to the archaeological field work, since it would shed light on several of the issues noted in the sensitivity assessment in Section 1.2.2, as well as facilitate the archaeological components of the survey. For example, its results would determine the practicality of shovel testing in areas sensitive for deep deposits, as well as assess the impacts of ground disturbances, such as those from the buried utilities shown in Figure 4. The geomorphological field investigation also focused on the northwest portion of the project area to determine whether the shoreline shown on late-eighteenth and early nineteenth-century maps is present and if any of the original landscape is intact. Testing was recommended between the Admiral's Row quarters and Flushing Avenue to identify any former mill pond shoreline(s) that might be extant in that part of the study area.

Two methods of investigation were recommended for the geomorphological field work: machine boring with an auger followed by the excavation of exploratory backhoe trenches. The lengths of the trenches were to vary depending on the results of borings, initial trench results, and logistical limitations. It was anticipated that evidence of the former shoreline might appear as natural soils below dateable fill (i.e., fill containing diagnostic materials) or remains of former walls/bulkheads (e.g, timber, stone, brick). Trenching would be conducted with prudence, since it is a highly destructive exploratory method. A manual bucket auger would cause the least amount of disturbance to any potentially sensitive soils; however, the thickness (potentially 12+ feet) and nature (10 to 75 percent coarse fragments) of the historic fill necessitated the recommendation of heavier machinery.

Shovel testing at regular intervals was recommended as the primary method for the archaeological field investigation. The study area was divided into two zones based on the results of the archaeological sensitivity assessment, each of which was to be investigated with a degree of intensity proportional to its sensitivity and that reflected the results of the geomorphological investigation. The yards surrounding the Admiral's Row residences south of Park Street are highly sensitive for remains that might provide insight regarding the everyday lives of naval officers and their families as part of the Brooklyn Navy Yard and the neighboring community. Close-interval shovel testing (e.g., 7.5-m [25-ft]) was recommended for this area, so long as the geomorphological investigation did not definitively indicate it was profoundly disturbed. Closer interval radial shovel testing (i.e., one- or three-meter intervals in cardinal directions) was to be conducted where initial testing results indicated greater research potential and to delineate artifact concentrations or other cultural features.

The results of the geomorphological investigation were to be used to determine the intensity of shovel testing across the remainder of the study area, including the zone west of Park Avenue, where the mill pond shoreline or remains related to the timber shed could possibly be found, and the parade ground. A standard interval (15 m [50 ft]) between shovel tests was recommended if shallow and undisturbed sensitive strata were present. Closer intervals (7.5 m [25 ft]) would be used if locations were found with higher research potential. The necessity for backhoe trenching within Park Street or Park Avenue was to be determined using the results of investigation adjacent to each paved area.

In the event that human burials were uncovered, the NYSHPO-required protocol for inadvertent discovery of human remains would be implemented (see Appendix E).

The development of a Health and Safety Plan prior to the Phase IB fieldwork was also recommended in the Phase IA. Potential hazards in the study area include, but are not limited to: collapsing structures; buried utilities; PCBs, which were identified around Building 198 (see Figure 2); poison ivy; discarded hypodermic needles (left by transient trespassers); and other unknown, potentially hazardous materials in rubble-filled areas. Additional dangers include those associated with the recommended investigation methods, including mechanical testing and hand excavation. The Health and Safety Plan is presented in Appendix G.

1.3 PHASE IB IMPLEMENTATION OF PHASE IA RECOMMENDATIONS

The borings for the geomorphological investigation were extracted using a Geoprobe 6620DT machine. A total of 32 core samples were taken from across most of the study area; the results are presented in detail in Section 2 and summarized below in Section 1.4. No sampling was possible in the narrow area between the Admiral's Row quarters and Flushing Avenue, where access was extremely limited due to the presence of an historical brick yard wall and wrought iron fence that extends along the north side of Flushing Avenue, large amounts of vegetation including mature deciduous trees, aboveground utilities such as hydrants, and concrete entry-stairways for the quarters buildings (see Figure 23). In addition, historical fencing surrounding the Admiral's Row lawns was an impediment to machine access. Finally, safety was a primary concern in this area, since sampling there would necessitate the use of heavy machinery in proximity to the structurally questionable Admiral's Row quarters, the possible collapse of which would have posed severe hazards for the investigators (one of the buildings, Quarters C, suffered a nearly complete collapse following heavy rain subsequent to the archaeological fieldwork). Elsewhere, there were no significant access issues for the Geoprobe machine and a fairly complete sample of stratigraphic cores was obtained for the remainder of

the study area. Cores extracted in the portion of the project area west of Park Avenue consistently encountered a large concrete pad (likely formerly associated with the timber shed) that had several implications for the later stages of the investigation, namely that it unfortunately precluded both backhoe trenching and shovel testing in this zone.

A John Deere 50C excavator was used to dig seven trenches totaling 31.4 linear meters. The access issues noted above prevented trenching west of Park Avenue and between the Admiral's Row quarters and Flushing Avenue. Six of the trenches were excavated in the parade ground / park north of Park Street. Because of the sensitivity of the yards north of the Admiral's Row quarters, only one trench was dug there. Besides limited disturbances adjacent to buried utilities, no significant disturbances were observed in any of the trenches.

With the exception of the zone west of Park Avenue, where the concrete pad prevented the excavation of shovel tests, the archaeological component of the Phase IB investigation was completed as recommended in the Phase IA. The area south of Park Street – i.e., the yards surrounding the Admiral's Row quarters and their outbuildings – was surveyed with close-interval shovel tests dug at a 7.5-m (25-ft) interval. Shovel test pits were dug at the standard 15-m (50-ft) interval in the parade ground / park north of Park Street. The archaeological investigation is discussed in more detail in Section 4.0 and is summarized below in Section 1.4.

1.4 SUMMARY OF PHASE IB FIELD INVESTIGATION AND RESULTS

The field investigation included the recovery of 32 Geoprobe cores and the excavation of seven trenches totaling 31.4 linear meters, as well as 212 shovel tests. The geomorphological component of the study concluded that a deeply-buried (ca. 3 m or more) intact natural soil surface extends under the entirety of the study area, and comprises an organic marsh surface that formed on top of sandy fluvial/estuarine sediments. Its presence indicates the project area was covered with a tidal marsh before it was filled in the nineteenth century. Evidence of Remsen's mill pond was also found, but there were no indications of the earthen dam that separated it from Wallabout Bay. The wet conditions imply that the project area would not have been used for settlement by Native Americans in pre-Contact times and that resource procurement visits would have been brief, if conducted at all. Therefore, it is highly unlikely that prehistoric cultural resources are present. No prehistoric remains of any kind were found during either the geomorphological or archaeological investigation.

The results of the geomorphological investigation are also largely consistent with information derived from the Phase 1A documentary research regarding large-scale historical alterations to the terrain in the study area. The entirety of the investigated area was filled relatively rapidly during the 1850s, during at least two episodes, one before the construction of Quarters B, C, and D, and one later, soon after 1857. Due to the rapidity with which it was deposited, it is highly unlikely that any deeply buried archaeological (i.e. cultural materials with known context) deposits are present in the fill. One of the fill layers is composed of a trash deposit of coal, coal ash, mortar, and iron slag that also included historical items, of which a sample of 85 was collected. Items in the trash layer, which include fragments of porcelain, whiteware, and ironstone, have *termini post quem* in the mid-nineteenth century, a date consistent with the hypothesis that the layer was deposited during the 1850s filling of Wallabout Pond. Panamerican recommends no further work be conducted related to the layer, since it lacks cultural context – i.e. integrity – and thus is unlikely to yield additional information.

The geomorphological investigation also provided some information concerning the area west of Park Avenue. The Geoprobe cores, coupled with the documentary evidence indicate that, while the northwest corner of the study area may have been filled as early as the 1830s, the entire ground surface west of Park Avenue is now covered with a concrete pad. The installation of the pad, along with the construction of the underground support structure for the portion of the timber shed that formerly stood upon it, would have significantly impacted the upper strata of the underlying fill. Therefore development in this part of the project area will have no impacts on archaeological cultural resources and Panamerican recommends no further archaeological investigation there.

Of the 212 STPs dug in the study area, 45 were in the parade ground / park north of Park Street, where a total of four domestic artifacts were found in four shovel tests. Non-diagnostic historical artifacts, such as coal, coal ash, and brick fragments, were found in 17 of the tests. This assemblage is consistent with the light volume of cultural material observed in upper strata of the trenches dug during the geomorphological investigation. No historical features or concentrations of artifacts were identified in the shovel tests north of Park Street. Therefore development in this part of the project area will have no impacts on archaeological cultural resources and Panamerican recommends no further archaeological investigation there.

Of the 167 shovel tests dug across the lawns of the Admiral's Row quarters – now referred to as the PCI/Admiral's Row site (A04701.016569; a map showing the limits of the site is in Section 5, Conclusions and Recommendations [Figure 40]; the site form is included in Appendix C) – 21 yielded a total of 28 domestic historical artifacts with a *terminus post quem* in the nineteenth century, including: 17 ceramic fragments; 9 pieces of container glass (one of which is from a drinking glass and some of which may be modern); a fragment of medium-gauge sheet brass punched in a crescent shape; and a plastic faux mother-of-pearl button (*terminus post quem* ca. 1868). Also, two artifacts (fragments of blue transfer-printed pearlware) were collected from a trench dug on the lawn of one of the Admiral's Row quarters during the geomorphological investigation. The assemblage is temporally consistent with deposition in the second half of the nineteenth century. This, together with the fact that the items are related to prosaic household activities, indicates the artifacts are possibly attributable to some of the individuals who inhabited the quarters. Although there is little perceivable patterning in the configuration of tests that yielded domestic artifacts, there does seem to be some clustering in the yard between Quarters D and E, and the area between Quarters H and L. No historical archaeological features were found in the shovel tests dug around the Admiral's Row buildings.

No materials dating to the Revolutionary War era, including human remains or other items associated with the American POW burials, were found anywhere in the project area. This is consistent with the maps and documentary evidence reviewed in the Phase IA report (Hanley et al. 2009:3-16 to 3-19), as well as the results of the geomorphological investigation. Primary accounts of witnesses to the POW burials report they were on “a sand beach” or “the edge of the bank,” which historical maps show corresponds to a stretch of Remsen's mill dam northeast of the study area. Other historical maps consistently show the dam east of the project area, and it was not identified during the geomorphological investigation.

Panamerican concludes that the PCI/Admiral's Row site is potentially eligible for inclusion on the NRHP. Although the density of domestic artifacts from the site is best characterized as light to moderate, the context of the assemblage needs to be considered in assessing whether the site is potentially eligible for inclusion on the State/National Registers. First, it lies within an NR-eligible historic district, the eligibility determination of which was based on its architectural resources. The site is likely associated with the individuals who inhabited structures that are

contributing elements to the district. In addition, while the quarters were attached to buried utilities by 1894, no documentation is available to address exactly when they were connected to the lines. Before buried utilities were available, Admiral's Row inhabitants would possibly have employed privies, the filled remnants of which (along with other pit features) may be present in the yards around the buildings, but were not detected by the shovel tests. The earliest three quarters (Quarters B, C, and D, built in the 1850s) have the highest potential for associated privies. Thus, based on the presence of the domestic artifacts, the potential for intact features, and the historical sensitivity of the site's context, it is potentially eligible for inclusion on the NRHP.

Panamerican also recommends a Phase II investigation of the site to determine whether it is eligible for inclusion on the NRHP, either individually and/or as a contributing element to the proposed Admiral's Row Historic District. This will address whether it contains any intact historical features related to the domestic lives of the quarters' inhabitants that are likely to contribute additional information concerning (but not limited to) nineteenth century life for officers at the Navy Yard and how they interacted with communities and groups of individuals of differing socio-economic standing. In so doing, the Phase II will assess whether the PCI/Admiral's Row site is individually eligible for inclusion on the NRHP and whether it is a contributing element to the proposed Admiral's Row Historic District.

Consultation among the USACE, NGB, NYSHPO, and Panamerican yielded several alternative potential methods of investigation and levels of effort for the Phase II, each of which has benefits that need to be considered against their limitations (which are related primarily to site conditions – see below) prior to implementation (see Appendix D). All are focused on determining whether filled pit features – the most likely type of historical archaeological feature that might be found at the site – are present. They include:

- The use of a geophysical remote-sensing device, preferably a ground penetrating radar (GPR) unit, supplemented by shovel testing, to ascertain whether potential pit features are present in the ca. 1.5 acres of yards surrounding the Admiral's Row quarters, as well as the small yard south of the timber shed. Although GPR can be calibrated to image through obstructions such as sidewalks and walkways, it may be somewhat limited by the quarters' foundation walls, which might cause reflective interference in areas near the Admiral's Row buildings. It would be most useful for locating filled pit features (i.e. privies) that extend into subsoil. Although many buried utilities extend across parts of the site, they would be easily discernable in GPR imagery, particularly given the availability of utility maps. Perhaps the greatest impediment to the use of the instrument is the occasional presence of dense vegetation. However, the impacts of the vegetation can be moderated through the use of a GPR unit that does not need to be wheeled across the ground surface or else by scheduling the investigation for a time when vegetation is minimal, such as early spring. The number and locations of shovel tests used in tandem with the GPR survey would be contingent upon the frequency and configuration of features identified by the device.
- Alternatively, NYSHPO has recommended a topsoil stripping operation, supplemented with shovel testing. Topsoil removal is highly effective for identifying features that extend below the base of the upper soil layer. However, the method can be highly destructive to underlying soils and deposits in areas with dense woody roots and utility lines, since the soil removing equipment can drag impediments through the subsoil resulting in considerable disturbance. Both roots and numerous buried utilities, some of which are encased in concrete and not all of which may be mapped, extend across parts of the

PCI/Admiral's Row site. Beyond the possibility of disturbing potentially feature-bearing subsoil, the use of heavy equipment poses additional dangers that are unique to the site. The Admiral's Row quarters are all in severe disrepair and at least portions of them have collapsed (in one case, nearly all of one of the buildings, Quarters C, collapsed in a single event subsequent to the archaeological field investigation). In such conditions, the accidental movement of a buried, concrete-encased utility line connected to the foundation of a building, or a minor inadvertent collision between earth-moving equipment and the superstructure of a building, could pose extreme hazards for the field crew. As with the GPR survey, the number and locations of shovel tests used in tandem with the stripping would be contingent upon the frequency and configuration of features identified by the device.

- The third alternative is close-interval (3-m) shovel testing across the entirety of the site, supplemented with the excavation of 1-x-1-m units. If used independently of GPR or topsoil removal, the shovel testing option is the least effective, and most labor-intensive, for finding pit features. However, if neither of the other methods is feasible the STPs are a viable, albeit least-productive, alternative. At the recommended interval, approximately 250 to 300 STPs would be needed to cover the site. Unfortunately, even at this high density of coverage, shovel testing still only samples a small percentage of the site and may miss even relatively large features. The units would be needed to ascertain whether deposits of artifacts are from features. Their number and locations would be dependent upon the frequency of shovel tests that yield significant volumes of cultural material.

If it is determined that field conditions at the time of the Phase II investigation do not favor the use of either GPR or topsoil removal across the entirety of the site, the best alternative is a combination of the three methodologies, where each would be employed in areas of the site where it is most effective and practicable.

2.0 Geomorphological Investigation

2.1 GEOMORPHOLOGICAL FIELD INVESTIGATION AND RESULTS¹

Soil and geomorphological deep testing was undertaken in conjunction with the cultural resource survey at the Brooklyn Navy Yard. Such examinations are critical both in the early and latter stages of archaeological investigations. Soils, sediments, and landscape are indicative of depositional environments, while soil morphology, as a reflection of pedogenesis, can be used to identify periods of landscape stability and estimate the age of landforms. In initial archaeological survey, soils and geomorphological testing can be used to determine where cultural materials may or may not be located, where they may be deeply buried or restricted to the surface, and to evaluate the integrity of landscapes and archaeological deposits. In the latter stages of archaeological studies, soils can be used to examine post depositional process – processes affecting and altering the archaeological record, and to reconstruct the past landscapes and environments. The objectives of this study were to determine the thickness of historic fill and depth to intact soils across the project area, to identify the presence and preservation of the tidal marsh depicted on historical maps of the project area, and to examine the extent of the constructed and subsequently filled Wallabout Pond.

The project area is located in the Embayed section of the Atlantic Coastal Plain province which is characterized by a generally flat and low-elevation land surface that slopes to the sea (Rogers 2000). Mean annual temperature (La Guardia Airport) is 12.8° Celsius (55.1 °F) with 112.7 cm (44.4 in) of precipitation spread evenly throughout the year (NOAA 2002).

The underlying geology of the area consists of poorly consolidated sediments deposited during periods of marine transgression. The Raritan Formation underlies the Mogathy Formation. Both are Late Cretaceous in age and made up of sand, clay, and gravels deposited in coastal and nearshore marine environments. Gardeners Clay was likely deposited during a period of high sea stand during the Pleistocene and unconformably overlies the Mogathy Formation. Gardners Clay is present across Kings County with the exception of an area along the East River from which it may have been eroded prior to deposition of glacial sediments (deLaguna 1948; Suter et al. 1949; USGS 2003).

Surficial geology consists of unconsolidated glacial sediments. Multiple episodes of glacial advance and retreat marked the Pleistocene. These glacial movements scoured the landscape, transported, and redeposited sediments. During the last glacial maximum, approximately 20,000 years before present, the Hudson-Champlain Lobe of the Laurentide Ice Sheet reached its southernmost extent and upon subsequent retreat left the Harbor Hill terminal moraine. The Harbor Hill Moraine forms an east-west ridge with its highest elevation south of the Brooklyn Navy Yard project area (Cadwell 2000; USGS 2003). Well boring logs from Kings County reveal that glacial sediments, including Late Wisconsin deposits and those from earlier advances, reach as much as 200 feet in thickness and consist of unstratified sands, gravels, boulders and fines (deLaguna 1948; Suter et al. 1949).

Mapped soils in the project area reflect the natural and cultural processes that have formed the site. The New York City Reconnaissance Soil Survey (New York City Soil Survey Staff, 2005) identifies soils in the project area as:

¹ This section was written by John Wah, Ph.D., who also conducted the geomorphological field investigation.

Pavement & buildings, wet substratum-Laguardia-Ebbets complex, 0 to 8 percent slopes: 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 50 to 80 percent of the surface covered by impervious pavement and buildings.

Both the Ebbets Series and Laguardia Series are described as greater than 40 inches of fill with construction debris. A typical Ebbets Series soil has from 10 to 34 percent coarse fragments while Laguardia has from 35 to 75 percent coarse fragments. Both series are described as having a cambic (Bw) horizon formed in the fill. Recent test borings performed within the Brooklyn Navy Yard found nineteenth and twentieth century fill to extend to a depth of no less than 2.3 m (7.5 ft) in one area and to greater than 3.65 m (12 ft) in another. Neither buried organic soils, nor thick, dark surface horizons typical of tidal marshes and soils formed in saturated, anaerobic settings were described in any of the borings (Geismar and Oberon, 1995, 1996).

Soils and landforms of the project area at the Brooklyn Navy Yard were a function of Pleistocene glacial activity, sea level, and human alteration beginning in the mid-eighteenth century. The terminal moraine of the Late Wisconsin glacial advance made up the landform on which the project area was located. After the glacial retreat soils developed in glacial sediments and tidal marshes formed on the margins of Wallabout Bay. Development of the U.S. Navy Yard resulted in the filling of tidal marshes and the creation and later filling of Wallabout Pond at the site of the current project.

Historical maps of Brooklyn, Kings County, are abundant and document the alterations to the landscape in the shift from an early undeveloped environment to the modern setting. A 1767 map shows Wallabout Bay prior to its adoption as the U.S. Navy Yard (Ratzer 1767; see Hanley et al. 2008: Figure 3.2). The project area is located within tidal marshes with a winding drainageway at the southwestern corner of the bay. Most of the project area, however, was already at least minimally altered by the construction of Remsen's mill dam and flooding by the mill pond. By 1816, the west side of Wallabout Bay had become the U.S. Navy Yard with manmade Wallabout Pond covering most of the project area with the exception of the northwestern corner (see Hanley et al. 2008: Figure 3.4). Wallabout Pond was filled by the 1850s and the timber shed was built along the western edge of the project area in ca. 1853 (see Hanley et al. 2008: Figure 3.9). This structure or a later replacement appears in aerial imagery as late as 1954.

Deep borings and backhoe trenching comprised the soils/geomorphological testing (Figure 5; the boring and trench logs are included in Appendix F). In consideration of the anticipated thickness and make up of the fill across the project area, a Geoprobe 6620DT recovering samples in 2-inch diameter cores and 5-foot sections was used for deep borings. Geoprobe boring was generally successful, however, there were some issues with the recovery of saturated sands and with saturated sediments flowing into the borings. The result of these problems was that in some cases the given depths from which samples were recovered may be incorrect. Backhoe trenching was similarly hampered by the relatively high water table in the project area with saturated sediments slumping and preventing trenches from being excavated deeply. Soil morphological properties including horizonation, color, texture, moist consistence, and redoximorphic features were described (Soil Survey Staff 1992; Schoeneberger et al. 1998).



Figure 5. Location of Geoprobe borings and backhoe trenches across the project area. Brooklyn Navy Yard, Kings County, New York (PCI 2009).

Thirty-two deep Geoprobe observations were made across the project area (Figure 6). Maximum depth of the borings ranged from 250 cm to 571 cm. Historic fill was present in all borings. An organic soil was recovered in 26 of the 32 borings and fine lacustrine sediments were recovered in 28 of the 32 borings.

Historic fill was present in all observations. The thickness of the fill ranged from 147 cm in Geoprobe (GP) 27 to 372 cm in GP 4. In most observations fill was between 200 and 300 cm thick. Texture was predominantly sandy loam but varied widely. Coarse fragment (> 2 mm) contents ranged from zero to 55 percent. Concrete, brick, coal, ash, wood, slag, and historic ceramics were common. Color, like texture, was mixed and variable.



Figure 6. Acquiring a core sample with the Geoprobe machine during the geomorphological investigation. Brooklyn Navy Yard, Kings County, New York (PCI 2009).

Underlying the fill was a deposit of fine lacustrine sediments which was present in all borings with the exception of GP1, GP2, GP3 and GP9 in the northwest corner of the project area. Sediments were very dark gray (N3) and predominantly silt-sized (2-50 μm) (Figure 7). The deposit was structureless massive with an average thickness of 114 cm. No coarse fragments were noted in the lacustrine silts, although blades of marsh grasses and snail shells were present. There were no coarse fragments. The fine sediments were deposited in a low-energy water environment such as that which would have been present in Ramsen's mill pond and later Wallabout Pond. There was no evidence of pedogenesis in the lacustrine silts indicating that these sediments were either underwater until buried by fill in the mid-nineteenth century or exposed at the surface only briefly. The lack of lacustrine sediments in the northwest corner corresponded with historical maps showing Wallabout Pond covering the project area with the exception of that corner.



Figure 7. GP27 showing the sequence of very dark gray (N3) silty lacustrine sediments, very dark brown (7.5YR 3/3) organic tidal marsh surface, and gray (2.5Y 6/1) sandy fluvial/estuarine sediments. Note: tape shows scale not depth. Brooklyn Navy Yard, Kings County, New York (PCI 2009).

Directly below the lacustrine silts was an organic soil horizon. The organic horizon was identified across the project area and was recovered in all borings except GP2, GP3, GP20, GP22, GP23 and GP 25. It averaged 25 cm thick and was a dark brown (7.5YR 3/3 and 7.5YR 3/2) horizon made up of partially decomposed marsh grasses, possibly smooth cordgrass (*Spartina alterniflora*) and hay grass (*Spartina patens*). Organic soils and organic soil horizons form in saturated anaerobic settings such as tidal and nontidal wetlands. The rate of growth and death of vegetation exceeds the rate of decomposition of organic matter by soil microorganisms resulting in the accumulation and build-up of organic soils. The organic soil horizon across the project area was consistent with tidal marshes on the margins of Wallabout Bay depicted in Rutzer's 1767 map (Hanley et al. 2008: Figure 3.2). The lack of organic soil horizon in GP20, GP22, GP23 and GP25 was the result of difficulty with recovery caused by saturated sediments and the depth to the organic surface rather than an absence of the organic marsh surface at these locations. In GP21 and GP28, adjacent to GP20, GP22 and GP23, the depth to the organic surface was 415 cm and 485 cm, respectively. In GP26, adjacent to GP25, the organic marsh surface was encountered but problems with recovery of samples prevented reasonable estimates of the depths to soil horizons. In GP2 and GP3 the organic surfaces seem to have been absent. Fill extended to 415 cm in GP2 while in adjacent GP1 the marsh surface was at 320 cm. The boring at GP3 was refused on wood, possibly positioned vertically, at 274 cm.

The organic marsh surface was formed on top of sandy fluvial/estuarine sediments. Colors in the sandy sediments varied somewhat but were generally low chroma (< 2) with gray (2.5Y 6/1) and grayish brown (2.5Y 5/2) being common. Sandy sediments were stratified and there were no coarse fragments (> 2 mm) in the sands.

In addition to Geoprobe borings, seven backhoe trenches were excavated across the project area (see Figure 5). Trenches were excavated to the water table with depths ranging from 115 cm in T4 to 150 cm in T3. No trenches reached either the silty lacustrine sediments or the organic marsh surface. They did, however, allow a more thorough examination of the historic fill. Fill was stratified and represented several episodes of deposition. Cultural materials in the fill included concrete, brick, glass, coal, ash, slag, wood, iron, and ceramics (Figure 8). Additionally, concrete structures were encountered in T1, T2, T4 and T5, while attempts to trench at GP1 and GP3 were refused on concrete pads at the soil surface (Figure 9). After describing the fill, T1 was excavated to a depth of 300 cm but did not intersect the lacustrine sediments underlying the fill. Slumping of saturated sediments in the trench prevented deeper testing.

The entire project area had been altered from its natural state. The development of the Brooklyn Navy Yard has resulted in the filling of tidal marshes, construction and subsequent filling of Wallabout Pond, and building and demolition of structures. Deep testing by Geoprobe was useful in identifying the depositional sequence and spatial distribution of sediments across the project area that reflect the natural and cultural history of the site. Fluvial/estuarine sands were present across the project area. An organic tidal marsh surface formed at the margins of Wallabout Bay was present across the project area and was not destroyed in the construction of Wallabout Pond. Fine lacustrine sediments, which buried the marsh surface across the entirety of the project area with the exception of the northwest corner, were deposited in a low energy environment, such as Wallabout Pond. Historic fill as thick as 372 cm covered the lacustrine sediments and marsh surface and formed the modern ground surface.



Figure 8. Profile from T7 showing stratified historic fill. Soil knife at 50 cm is in a layer of ash and slag. A second layer of ash and slag from 70 to 96 cm has brick and iron. Brooklyn Navy Yard, Kings County, New York (PCI 2009).



Figure 9. Profile from T2 showing stratified historic fill. A concrete pillar extending beyond the bottom of the trench is in the right side of the profile. Brooklyn Navy Yard, Kings County, New York (PCI 2009).

2.2. ARCHAEOLOGICAL INTERPRETATION OF THE GEOMORPHOLOGICAL TRENCHES

2.2.1. Trench Descriptions. Although the shallowness of the water table in the project area coupled with the depth of the fill prevented any of the trenches dug during the geomorphological fieldwork from reaching natural sediments, they yielded information concerning the deposition of the upper levels of fill across the study area. Together with the results of the Geoprobe tests, the data was useful for developing the field methodology employed during the archaeological component of the investigation. The trenches also provided information concerning the qualities of the utilities illustrated on the 1958 map shown in Figure 4 and the disturbances that accompanied their installation.

Trench 1. Trench 1 was dug in the northwest quadrant of the study area, south of Quarters J (and the former location of Quarters M). It was 5.6 m in length, was excavated to a maximum depth of 165 cm and was oriented along an east-west axis (Figure 10). Six strata of historical fill were identified. Stratum 1 was a layer of black gravelly sandy loam that typically reached a depth of about 15 to 20 cm. Stratum 2 was a mix of black, dark brown, and yellowish brown gravelly sandy loam that had a mean thickness of roughly 30 to 35 cm. Stratum 3 was a deposit of light olive brown silt loam with pockets of sand that extended about halfway into the trench from its east end; at its greatest vertical extent this stratum was about 20 cm thick. Stratum 4 was a mix of dark yellowish brown, strong brown, and black sandy loam that underlaid both Strata 2 and 3 and ranged from 25 to 45 cm in vertical extent. Stratum 5 was a 15-cm thick deposit of asphalt. Finally, Stratum 6, which extended below the base of the trench, was a layer of strong brown, black, and dark brown sand that contained abundant non-diagnostic historical artifacts, including fragments of mortar, brick, and coal ash. Its excavated portion had a maximum thickness of roughly 50 cm. Three disturbances from utilities were also noted. Two of these were related to concrete-encased utilities running roughly north to south, unearthed in the east and west ends of the trench, respectively (Figure 11). The concrete at the east end extended between 55 and 80 cm in depth and the other extended below 45 cm and through the base of the trench. A redware pipe, also oriented approximately north/south, was in the base of the trench about 90 cm from its west end. The pipe had been installed in a builders' trench that was roughly a meter wide and was filled with a mix of Strata 2, 3, 4, 5 and 6. The upper surface of the trench was obscure, but likely was at the interface of Strata 1 and 2.

A total of six artifacts were collected from the back dirt during the excavation of Trench 1, including: a piece of ironstone, 4 fragments of pearlware, and a piece of porcelain (see Appendix B). Numerous non-diagnostic items, such as fragments of bricks, coal, mortar, coal ash, and flat glass, were also present. Most of the items are likely attributable to Stratum 6.

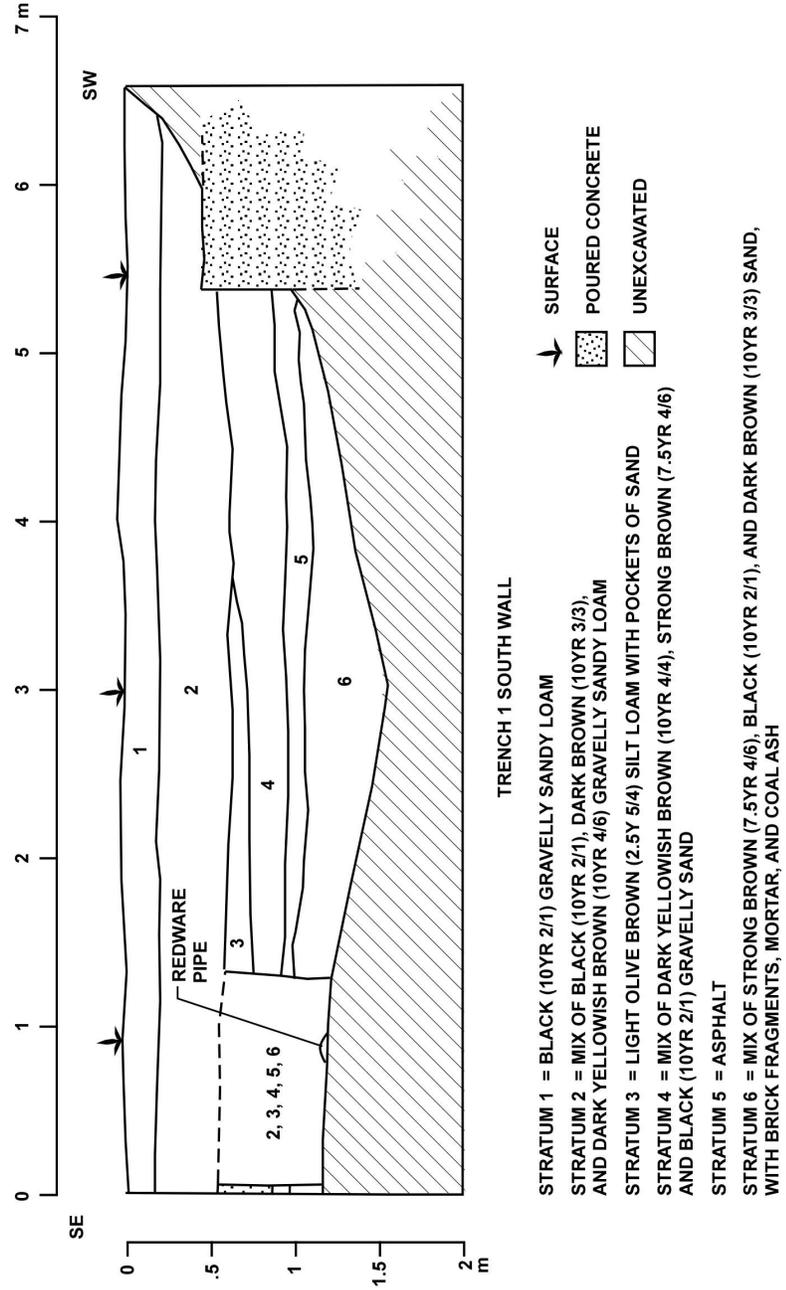


Figure 10. Trench 1 south wall profile. Brooklyn Navy Yard, Kings County, New York (PCI 2009).



Figure 11. Poured-concrete utility casing exposed in the west end of Trench 1. Brooklyn Navy Yard, Kings County, New York (PCI 2009).

Trench 2. Trench 2 was south of Trench 1, just northeast of the intersection of Park Street and Park Avenue (see Figure 5). It was about 6.3 m in length, reached a total depth of 140 cm, and was oriented along an east-west axis (Figure 12). Eight strata of fill were identified in the trench: Stratum 1, a layer of dark brown sandy loam that extended to a depth of 35 cm below the surface; Stratum 2, a 5-to-10-cm-thick deposit of black gravelly sandy loam; Stratum 3, a layer of dark brown sandy loam that was typically 10 cm in vertical extent; Stratum 4, strong brown sandy loam that averaged 15 cm in thickness; Stratum 5, a layer of black loamy sand about 10 cm thick; Stratum 6, composed of strong brown sandy loam that averaged around 20 cm in vertical extent; Stratum 7, a thin (ca. 3 to 5 cm) horizon of olive brown sandy loam; and Stratum 8, a layer of strong brown sandy loam, the excavated portion of which was roughly 30 cm thick. Three disturbances from utilities were noted in the trench. The corner of a concrete casing for utilities (or possibly a manhole) was in the east end of the trench and was surrounded by a builders' trench filled with a mix of all eight strata. The upper surface of the concrete was about 40 cm deep. Its base was below the bottom of the trench. The second utility, a bundle of telephone cables, was 2 m west of the concrete encasement. It ran in a trench that extended below the base of Stratum 2, to a maximum depth of 70 cm and was roughly 1 meter wide at its upper terminus, below which it gradually narrowed. Its fill consisted of a mix of Strata 3, 4 and 5. Finally, another bundle of telephone cables – this one encased in a metal sleeve – was noted about 70 cm west of the concrete casing at a depth of 35 cm. Its installation trench extended below the base of Stratum 1, through Stratum 2, and several centimeters into the upper surface of Stratum 3. It was filled with Stratum 1 material.

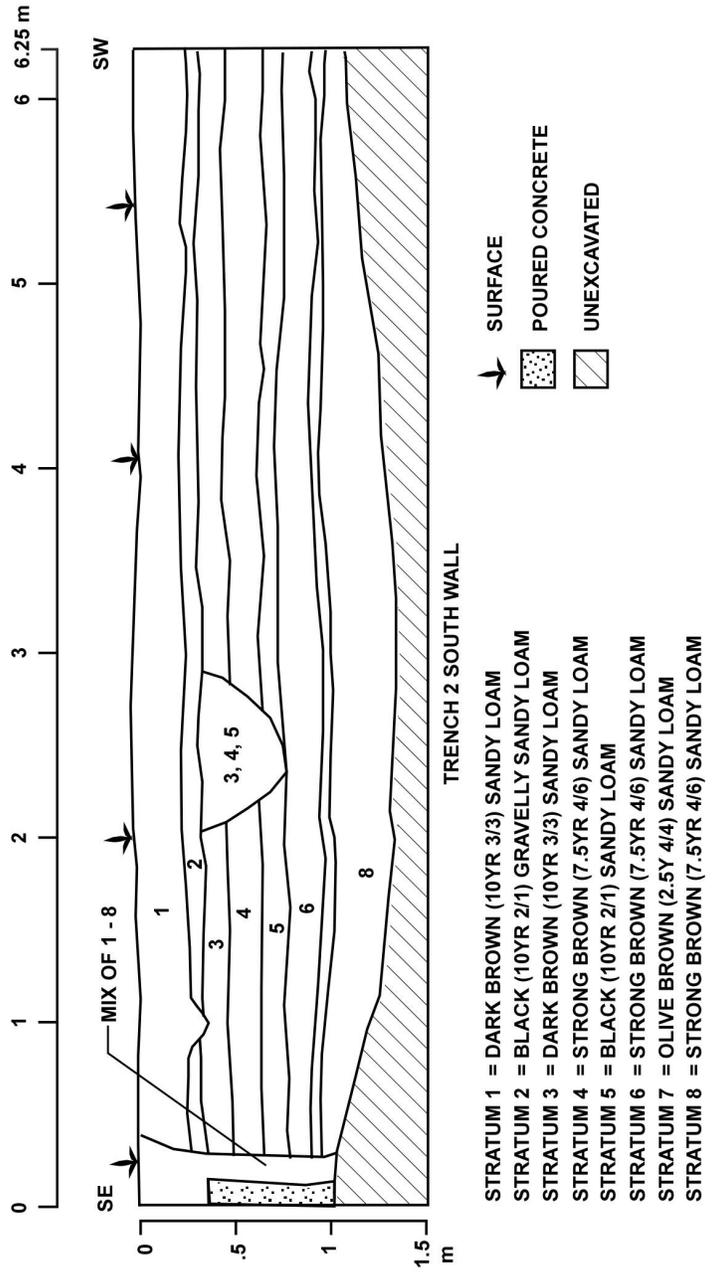


Figure 12. Trench 2 south wall profile. Brooklyn Navy Yard, Kings County, New York (PCI 2009).

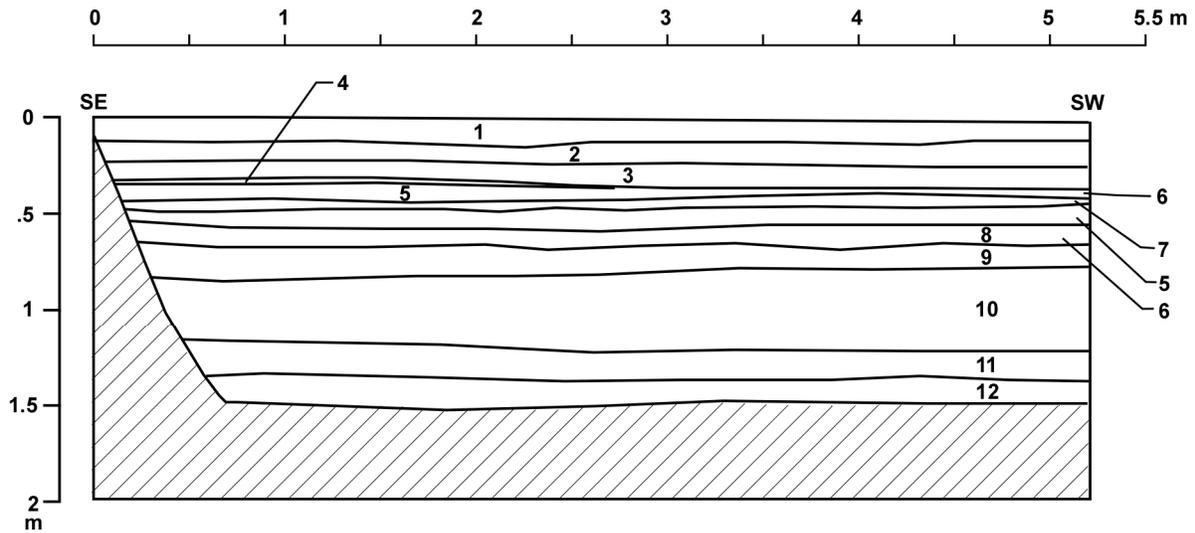
Ten artifacts were collected from Trench 2 back dirt, including: a fragment of creamware; 5 pieces of ironstone; a fragment of porcelain; 2 pieces of container glass (1 aqua and the other olive); and an aqua glass insulator. Moderate amounts of bricks, coal, mortar, and coal ash also were noted throughout the strata of the trench.

Trench 3. Trench 3 was near the center of the asphalt-paved tennis courts in the eastern portion of the study area north of Park Street (see Figure 5). It was roughly 5.2 m in length, reached a total depth of 152 cm, and, like Trenches 1 and 2, was oriented east-west (Figure 13). Twelve strata were identified in the trench, of which the upper levels were undoubtedly deposited during the construction of the tennis courts. Stratum 1 was asphalt that extended to a depth of about 10 cm. Stratum 2 was a 10-cm-thick layer of light olive brown concrete. Stratum 3 was yellowish brown gravelly sand that averaged about 10 cm in thickness. Stratum 4 was a thin (2-3 cm) horizon of reddish brown sand that extended laterally about 2.5 m from the east end of the trench. Stratum 5 was a layer of black sandy loam that underlaid Strata 3 and 4 and ranged from 3 to 8 cm in vertical extent. Stratum 6 consisted of reddish brown sand and was about 5 to 8 cm thick. Stratum 7 was a 10-cm thick deposit of dark grayish brown gravelly sandy loam that contained moderate amounts of brick fragments. Stratum 8 was a layer of light olive brown gravelly sandy loam that was between 7 and 10 cm thick. Stratum 9 was a 15-to-20-cm-thick deposit of dark brown and black gravelly sandy loam with pockets of sand and sandy loam and that contained brick and mortar fragments. No disturbances from utilities were noted in the trench.

No historical artifacts were collected from the Trench 3 back dirt, and relatively lower numbers of non-diagnostic historical items (which included bricks and coal) were noted during excavation (with the exception of Stratum 9, where moderate amounts of mortar and brick were present).

Trench 4. Trench 4, the only trench dug in the archaeologically sensitive area around the Admiral's Row quarters, was north of Quarters D, in the southeast quadrant of the study area (see Figure 5). It totaled 5.3 m in length and 120 cm in depth and was oriented along a north-south axis (Figures 14 and 15). Four strata were identified in the trench, fewer than in any of the others dug in the project area. Stratum 1 was a layer of black and dark brown sandy loam that reached 40 to 50 cm below the surface; Stratum 2 was a 30-to-40-cm thick deposit of dark yellowish brown sandy loam; and Stratum 3 was dark yellowish brown and strong brown gravelly sandy loam that extended below an average level of about 80 cm. It contained a large, obliquely-oriented lens of black gravelly sand that had a maximum thickness of roughly 10 cm. Two concrete-encased utilities were identified; one was oriented east-west and was in the south end of the trench. The other was nearly parallel to the west side of the trench, and a 1.5-m-long portion of its lateral surface was exposed near the north end of the excavation (Figure 16).

Very little historical material was identified during the excavation of Trench 4. Two fragments of pearlware, both with blue transfer-print decoration were collected. Small numbers of other non-diagnostic items were also noted in the back dirt, including brick fragments and coal.



TRENCH 3 SOUTH WALL

- STRATUM 1 = ASPHALT
 - STRATUM 2 = LIGHT OLIVE BROWN (2.5Y 5/4) CONCRETE
 - STRATUM 3 = YELLOWISH BROWN (10YR 5/6) GRAVELLY SAND
 - STRATUM 4 = REDDISH BROWN (2.5YR 5/4) SAND
 - STRATUM 5 = BLACK (10YR 2/1) SANDY LOAM
 - STRATUM 6 = REDDISH BROWN (2.5YR 4/2) SAND
 - STRATUM 7 = DARK GRAYISH BROWN (2.5Y 4/2) GRAVELLY SANDY LOAM WITH BRICK FRAGMENTS
 - STRATUM 8 = LIGHT OLIVE BROWN (2.5Y 5/4) GRAVELLY LOAMY SAND
 - STRATUM 9 = DARK BROWN (10YR 3/3) AND BLACK (10YR 2/1) GRAVELLY SANDY LOAM WITH POCKETS OF SAND AND SANDY LOAM; ALSO CONTAINS BRICK AND MORTAR FRAGMENTS
 - STRATUM 10 = OLIVE BROWN (2.5Y 4/4) GRAVELLY SANDY LOAM WITH POCKETS OF SAND
 - STRATUM 11 = DARK BROWN (10YR 3/3) SAND
 - STRATUM 12 = DARK YELLOWISH BROWN GRAVELLY LOAM SAND
- SURFACE
 UNEXCAVATED

Figure 13. Trench 3 south wall profile. Brooklyn Navy Yard, Kings County, New York (PCI 2009).

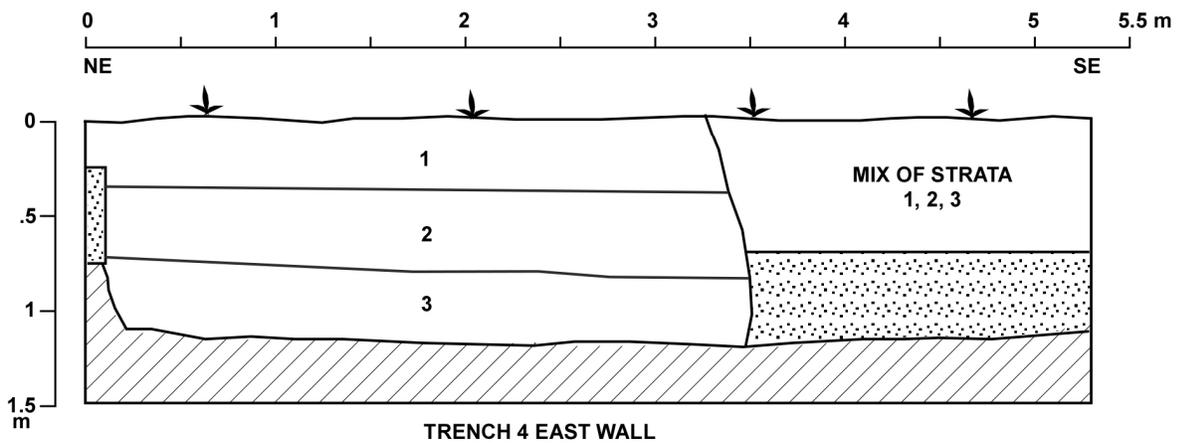
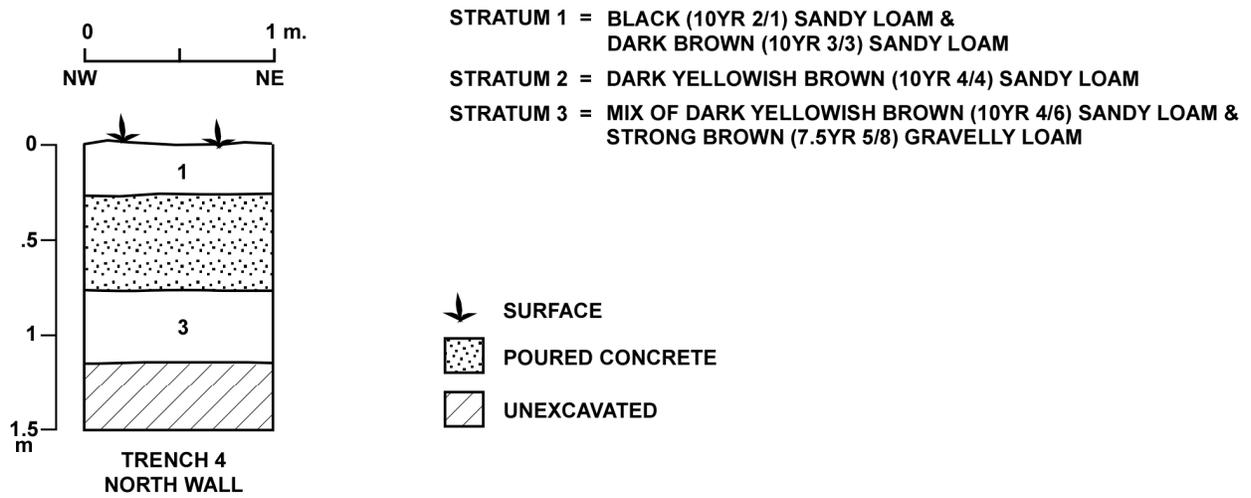
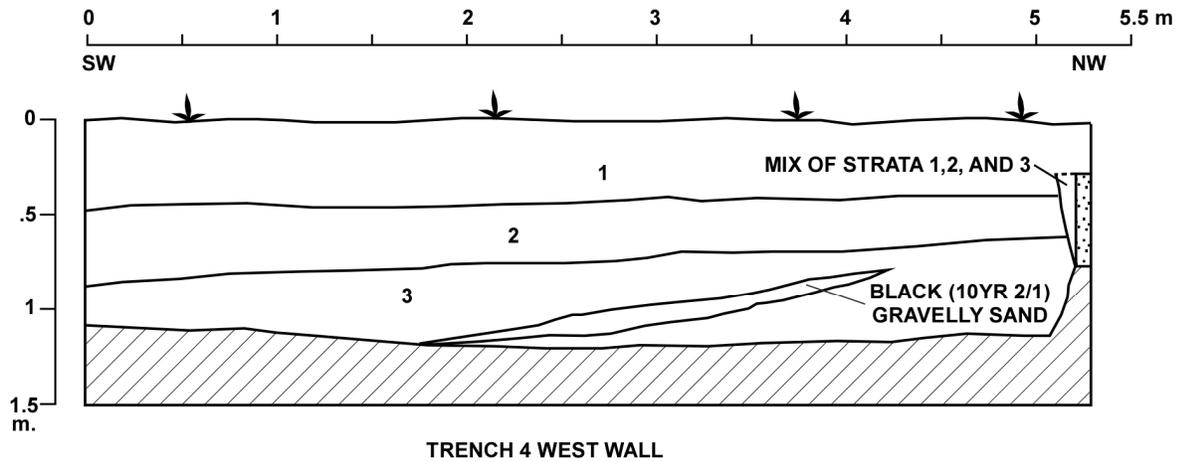


Figure 14. Trench 4 wall profiles. Brooklyn Navy Yard, Kings County, New York (PCI 2009).



Figure 15. Trench 4 west wall. Brooklyn Navy Yard, Kings County, New York (PCI 2009).



Figure 16. The southern part of the east wall of Trench 4, showing the concrete utility casing exposed along the edge of the trench. Brooklyn Navy Yard, Kings County, New York (PCI 2009).

Trench 5. Trench 5 was in the northern portion of the study area, just southwest of Decatur Avenue (see Figure 5). It was oriented east-west, totaled 3 m in length and extended to a depth of 60 cm (Figure 17). It was inadvertently positioned directly atop a concrete utility encasement, so further vertical excavation was terminated at the shallow depth. In order to determine the dimensions of the encasement, the trench was expanded laterally to the south to a width of about 2.5 m. Two soil strata were identified. Stratum 1, which reached a depth of about 20 cm, was a mix of very dark gray and dark brown sandy loam. Stratum 2 was dark yellowish brown and strong brown gravelly sandy loam that extended below the level of excavation. The upper surface of the concrete encasement was buried at a depth of 47 cm and measured 45 cm thick by 1.2 m wide (Figure 18). There were no indications of a builders' trench for the concrete encasement, although it is possible the boundaries for such an excavation were outside the edges of the investigation trench.

Two artifacts were collected from the Trench 5 back dirt: a complete brick with a maker's mark reading "SHAMROCK" and a piece of salt-glazed stoneware.



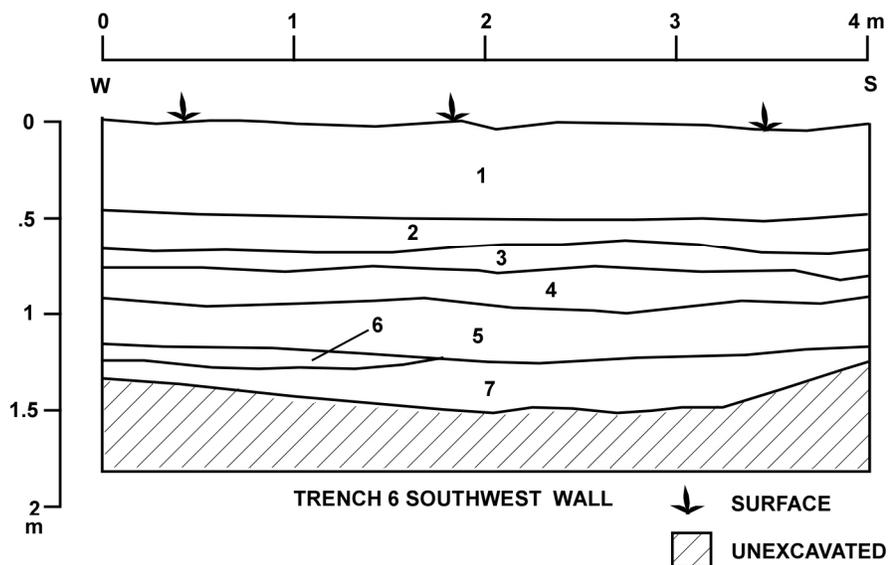
Figure 17. South wall profile of Trench 5; the trowel sits atop the concrete utility encasement inadvertently uncovered in the trench. Brooklyn Navy Yard, Kings County, New York (PCI 2009).



Figure 18. Concrete utility casing in Trench 5 after the trench was widened to the north. Brooklyn Navy Yard, Kings County, New York (PCI 2009).

Trench 6. Trench 6 was in the northern portion of the study area, about 2.5 m southeast of Trench 5 (see Figure 5). It was 4 m in length, reached a maximum depth of 148 cm, and was oriented along a northwest-southeast axis (Figure 19). Seven strata of fill were identified in the trench: Stratum 1, a mix of dark brown and black sandy loam that reached to about 48 to 50 cm below the surface; Stratum 2, strong brown to dark brown gravelly sandy loam that was 15 to 20 cm in thickness; Stratum 3, a 10-to-15-cm-thick layer of dark brown sandy loam; Stratum 4, a mix of dark yellowish brown and black sandy loam that averaged around 20 cm in vertical extent; Stratum 5, a 25-to-30-cm-thick layer composed entirely of coal ash, mortar, brick fragments, iron slag, and coal; Stratum 6, a deposit of mortar fragments that extended laterally about 1.75 m into the trench from its southeast end and had a maximum thickness of about 8 cm; and Stratum 7, a layer of yellowish brown very gravelly sand that underlaid Strata 5 and 6, the excavated portion of which was 10 to 25 cm in vertical extent. No disturbances from utilities were observed in the trench.

A sample of 10 historical artifacts was collected from the Trench 6 back dirt, including a piece of creamware; 2 fragments of ironstone; a thick (14 mm) piece of green plate glass; a piece of heavy-gauge copper-sheathed wire; an unidentified fragment of iron (possibly a fastener); and 4 leather shoe sole fragments. All the items were likely from Stratum 5, the deposit of coal ash, mortar, brick fragments, iron slag, and coal.



- STRATUM 1 = MIX OF DARK BROWN (10YR 3/3) AND BLACK (10YR 2/1) SANDY LOAM
- STRATUM 2 = MIX OF STRONG BROWN (7.5YR 4/6), AND DARK BROWN (10YR 3/3) GRAVELLY SANDY LOAM
- STRATUM 3 = DARK BROWN (10YR 3/3) SANDY LOAM
- STRATUM 4 = MIX OF DARK YELLOWISH BROWN (10YR 4/6) AND BLACK (10YR 2/1) SANDY LOAM
- STRATUM 5 = ASH, MORTAR, BRICK FRAGMENTS, IRON SLAG, AND COAL
- STRATUM 6 = MORTAR FRAGMENTS
- STRATUM 7 = YELLOWISH BROWN (10YR 5/6) VERY GRAVELLY SAND

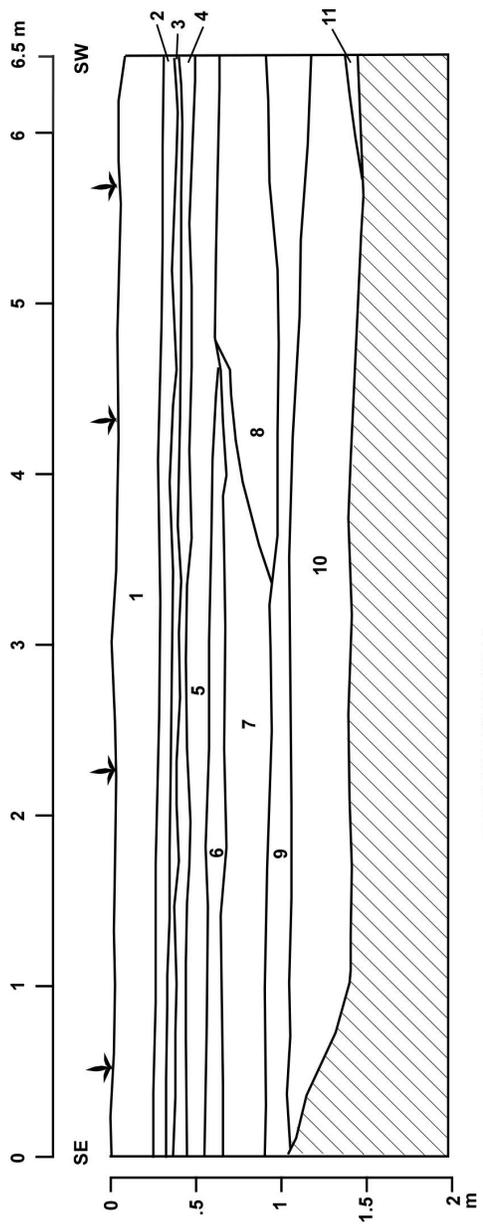
Figure 19. Trench 6 southwest wall profile. Brooklyn Navy Yard, Kings County, New York (PCI 2009).

Trench 7. Trench 7 was about 30 m south of Quarters J, roughly in the center of the former parade ground / park north of Park Street (see Figure 5). It was oriented along a north-south axis, was 6.5 m long, and reached a total depth of around 145 cm (Figure 20). Eleven strata were identified, the upper several of which were likely impacted by the tennis courts that formerly occupied this part of the study area (see Figure 2). Stratum 1 was a layer of dark brown gravelly sandy loam that reached a depth of about 20 cm. Stratum 2 was a horizon of dark grayish brown very gravelly sand that ranged from 5 to 8 cm in thickness. Stratum 3 was a relatively thin (ca. 5 cm) deposit of red loamy sand. Stratum 4 was a layer of dark yellowish brown gravelly loamy sand that was 4 to 8 cm in vertical extent. Stratum 5 was a 10-cm-thick deposit of coal ash and iron slag. Stratum 6 was a layer of dark yellowish brown and brown gravelly sand that extended laterally about 4.7 m into the trench from its south end and had a maximum thickness of roughly 8 cm. Stratum 7 was a deposit of coal ash and iron slag that extended laterally about 4.8 m into the trench from its south end. It underlaid Strata 5 and 6 and had a maximum thickness of around 25 to 30 cm. Stratum 8 was a deposit of dark yellowish brown and brown gravelly sand that was confined to the northernmost 3 m of the trench. It underlaid Strata 5 and 7 and had a maximum vertical extent of 35 cm. Stratum 9 was a layer of very dark grayish brown sand that ranged from 8 to 20 cm thick. Stratum 10 was a mix of strong brown, dark grayish brown, and very dark brown gravelly sand that, with the exception of the northernmost meter of the trench, extended below the level of excavation. Its excavated portion was typically about 30 to 40 cm in thickness. Finally, Stratum 11 was confined to the northernmost meter of the trench and consisted of strong brown sand, where it underlaid Stratum 10. Its excavated portion had a maximum thickness of about 5 cm.

A sample of 59 historical artifacts was collected from the Trench 7 back dirt, all of which came from the lower levels of the trench (i.e., most likely Stratum 10). The assemblage includes: 3 mammal bone fragments (of which one is possibly from a handle; one is burned and partially calcined, and one is cut); 5 pieces of creamware; 12 pieces of ironstone; 8 fragments of pearlware; 3 pieces of porcelain; a fragment of slipware; 8 pieces of stoneware; 12 fragments of whiteware; 2 pieces of yellowware; 2 fragments of flat glass; a piece of milk glass; a small piece of unidentified iron (perhaps a fastener); and an industrial gauge iron fastener approximately 11 in long.

2.2.2. Trench Archaeological Summary and Interpretations. Excluding Trench 5, from which little stratigraphic data was recovered, a total of 31.4 linear meters of trenches was dug during the geomorphological component of the investigation, from which a sample of 87 historical artifacts was collected. No historical features (with the exception of a large trash deposit – discussed below) were identified, nor were any prehistoric remains of any kind found. The conditions observed in the trenches are generally consistent with the results of the documentary research and the geomorphological investigation. Nearly all the strata encountered during the operation contained artifacts with a *terminus post quem* in the mid-nineteenth century. The presence of these items in numerous relatively thin strata with widely varying characteristics, well defined vertical boundaries, and frequent lenses are all consistent with the hypothesis that the soils were deposited over a relatively short span of time around the 1850s.

Beyond this, the evidence from the trenches sheds some additional light on the mechanisms with which the study area was filled. First, a large portion of the fill material was composed of a mix of industrial, architectural, and domestic trash. Stratum 6 in Trench 1, Stratum 10 in Trench 3, Strata 5 and 6 in Trench 6, and Stratum 10 in Trench 7 all were composed almost entirely of a mix of coal, coal ash, brick fragments, and iron slag, within



TRENCH 7 WEST WALL

- STRATUM 1 = DARK BROWN (10YR 3/2) GRAVELLY SANDY LOAM
- STRATUM 2 = DARK GRAYISH BROWN (10YR 4/2) VERY GRAVELLY SAND
- STRATUM 3 = RED (2.5YR 4/6) LOAMY SAND
- STRATUM 4 = DARK YELLOWISH BROWN (10YR 4/6) GRAVELLY LOAMY SAND
- STRATUM 5 = BLACK (10YR 2/1) COAL ASH AND IRON SLAG
- STRATUM 6 = MIX OF DARK YELLOWISH BROWN (10YR 4/6) AND BROWN (10YR 4/3) GRAVELLY SAND
- STRATUM 7 = VERY DARK BROWN (10YR 2/2) AND BLACK (10YR 2/1) COAL ASH AND IRON SLAG
- STRATUM 8 = MIX OF DARK YELLOWISH BROWN (10YR 4/6) AND BROWN (10YR 4/3) GRAVELLY SAND
- STRATUM 9 = VERY DARK GRAYISH BROWN (10YR 3/2) SAND
- STRATUM 10 = MIX OF STRONG BROWN (7.5YR 4/6) DARK GRAYISH BROWN (10YR 4/2) AND VERY DARK BROWN (10YR 2/2) GRAVELLY SAND
- STRATUM 11 = STRONG BROWN (7.5YR 4/6) SAND

Figure 20. Trench 7 west wall profile. Brooklyn Navy Yard, Kings County, New York (PCI 2009).

which was mixed abundant historical artifacts. Also, the upper surfaces of these strata were encountered at roughly the same depth (120 to 130 cm), suggesting they all belong to a single large trash deposit that extends under much of the park / parade ground north of Park Street.

Second, characteristics of the soil stratigraphy in Trench 4, relative to those of the strata in the other trenches, corresponds with the conditions shown in the 1857 woodcut from *Leslie's Illustrated Newspaper*, in which the area south of Park Street is depicted as land, while the site of the parade ground / park is shown as still filled with water. The stratigraphy in the trench is composed of only three soil strata, which were oriented obliquely downward towards the north. Trenches dug across the parade ground, however, cut through at least six soil strata, all of which were roughly horizontal. Also, the layer of nineteenth-century industrial, architectural, and domestic trash found in trenches across the parade ground was not noted in Trench 4. Thus the evidence implies that the Trench 4 soils were laid down with different depositional mechanisms than was the material in the parade ground. This is consistent with the hypothesis that the project area was filled during at least two episodes – one before 1853, when Quarters B, C, and D were constructed and another soon after 1857. Also, although it is problematic to interpret artistic woodcuts too literally, the 1857 image apparently shows the terrain around the quarters sloping gently towards the north, which may be reflected in the oblique orientation of the soil strata in Trench 4.

3.0 Archaeological Investigation Methodology

3.1. FIELD METHODOLOGY

The archaeological component of the field investigation included pedestrian reconnaissance, photographic documentation, and shovel testing. The pedestrian survey was used to identify cultural features visible at the ground surface, as well as disturbances from building collapse, the installation of utilities, or other processes that may have resulted in subsurface disruptions. Digital photographs were taken to document environmental conditions and pertinent views (e.g., cultural features and disturbances).

The results of both the Phase IA investigation and the geomorphological component of the Phase IB study were used to develop the design for the archaeological fieldwork portion of the IB investigation. For example, shovel testing would not reach natural soil levels, which are buried under three or more meters of historical fill deposited in the 1850s. Also, the project area was filled in a relatively short period of time and there was no evidence of buried living surfaces (i.e., A-horizon soils) within historically-deposited strata during the geomorphological fieldwork. No earlier (i.e., map-documented) structures are known to have stood in the study area. Therefore, if any historical archaeological features are present, they were deposited after the project area was filled and would be relatively close to the current surface. Thus, a depth of 60 cm was adopted as a benchmark at which shovel test excavation would be terminated, rather than employing the standard practice of stopping excavation 10 cm into 'culturally sterile' natural soils. The results of the trenching component of the geomorphological investigation indicate the 60-cm depth was great enough to reach 10 cm below the base of the upper soil stratum anywhere in the project area.

Shovel tests were excavated at a close interval (i.e., 7.5 m [25 ft]) in the archaeologically-sensitive yards surrounding the Admiral's Row structures and at the standard 15-m (50-ft) interval across the parade ground / park north of Park Street. The intervals were increased to bypass locations that could not be tested, such as on sidewalks or walkways, or within structures. No shovel testing was conducted west of Park Avenue and north of the timber shed (Building 16), where the geomorphological investigation revealed a concrete pad covering the entirety of the ground surface beneath a thin mantle of humus and leaf matter. Also, no shovel testing was conducted within 15 m of Building 198, a small ancillary structure where PCBs were detected during a 2006 Environmental Site Investigation by Quay Consulting, LLC (see Figure 22 and Appendix G).

Shovel test pits averaged 40 cm (16 inches) in diameter and, as discussed above, were excavated to 60 cm, unless reaching this depth was prevented by an impasse (e.g., roots or utilities). Soil colors were recorded using Munsell® color chart designations. All excavated soils were sieved through quarter-inch hardware screens and backfilled to original landscape contour upon completion. All field information for shovel tests—provenience, pertinent stratigraphic data, natural or manmade disturbances, and the presence or absence of cultural materials—was recorded on shovel test forms. A Garmin® GPS unit was used to record the UTM (North American Datum [NAD] 83) coordinates of surface finds and other pertinent features. Recovered artifacts were stored in plastic bags, on which all provenience information was recorded with waterproof marker. General archaeological procedures for artifact cleaning and storage were followed, with provenience information retained with the materials at all times. The complete shovel test log is included as Appendix A.

3.2 ANALYTICAL / LABORATORY METHODS

Cultural materials found during the investigation are stored at Panamerican's Buffalo Office for processing and analysis. Processing of recovered artifacts followed guidelines elaborated in 36 CFR Part 79 (Curation of Federally-Owned and Administered Archaeological Collections) and in the New York Archaeological Council's Standards and Curation of Archaeological Collections document (NYAC 1994). Standard archaeological procedures of cleaning and storage were also followed, with provenience information kept with artifacts at all times. Final disposition of artifacts will be coordinated with the NGB. The artifact catalog for items found during both the geomorphological and archaeological components of the investigation is included as Appendix B.

Analysis of Prehistoric Artifacts. No prehistoric artifacts were found during the investigation.

Analysis of Historical Artifacts. Historic artifact analysis typically entails the categorization of artifacts by broad material class (e.g., ceramic, glass, metal), with further subdivision into artifact types based on manufacturing characteristics, form, and function. These identifications are based on the New York State Museum artifact catalog (NYSM 2004), published guides such as Miller (2000), Munsey (1970), Noël Hume (1969), and South (1977), and well established web sites (e.g., Stelle 2001). The data was recorded in an artifact catalog, which includes provenience, material class, artifact type, count, secondary type (e.g., color of decoration on ceramics), description (e.g., portion of vessel if a fragment, description of maker's mark), and the beginning and ending dates of manufacture. The initial purpose of the classification is to identify the general time period to which the assemblage dates. With larger assemblages, artifacts are also classified by functional category, which typically include household/kitchen, structural/architectural, industrial, and personal. Functional categories enable archaeologists to characterize site use and the human activities which formed the archaeological assemblage at the site.

4.0 Archaeological Investigation

At the time of the field investigation (Figures 21 and 22), large amounts of modern trash and historical building debris were scattered across the surface of much of the project area (Figures 23 and 24). The largest density of modern litter occurred just inside the yard wall along Flushing Avenue and Navy Street. The amount of modern items was just slightly lower along the fences adjacent to the navy yard. Typically, the volume of trash decreased with distance from the edges of the study area, although at least moderate amounts of litter were nearly ubiquitous.

The density of architectural and building debris was very high around the Admirals' Row structures, where collapsing portions of the buildings were dropping onto the surrounding yards. While moderate amounts of material had built up in the front and side yards of the quarters, there were extremely large amounts of debris in the backyards (i.e., areas to the north), where wood-stick extensions to the buildings constructed in the early twentieth century had nearly all completely collapsed. Two of the quarters (B and C) had wood-stick roofed walkways connecting them with greenhouses and garages on the south side of Park Street; portions of each walkway superstructure have collapsed, further contributing to the volume of architectural debris in the backyards of the two quarters buildings (Figures 25 to 29). There were no indications at the surface of several small structures that appear on the 1958 Navy Yard map and that were subsequently demolished, including Buildings 309 (southeast of Quarters B), 449 (north of Quarters K at the south terminus of Park Avenue), and 404 (a small support structure at the east end of the asphalt tennis court) (see Figure 4). A concrete pad was observed just south of Park Street extending between the Quarters C garage (Building 639) and the Quarters B roofed walkway. The pad was formerly the floor of a greenhouse (Building 433) that was demolished soon after 1958 to clear space for the semi-circular drive north of Quarters B (see Figure 21). The only other surface disturbance evident around the quarters was a series of push piles southeast of Quarters I (Figure 30).

A total of 212 shovel tests were dug in the study area, of which 167 were south of Park Street around the Admirals' Row quarters and the remainder were in the parade ground / park to the north. Of the STPs dug around the quarters, 116 were distributed at a 7.5-m (25-ft) interval along 27 transects (Transects 1-27) and 51 were radial tests dug around STPs that yielded historical domestic artifacts (see Figure 21). The shovel tests north of Park Street were distributed at a 15-m (50-ft) interval along 9 transects (Transects 28-37) (see Figure 22). Transects 1-33 were oriented perpendicularly to Flushing Avenue and Park Street, along a bearing of roughly 10 degrees. Transects 34 to 37 surrounded the asphalt-paved tennis courts in the northeastern portion of the project area and were oriented parallel to its boundaries. As noted in Section 3, no tests were dug within 15 m (50 ft) of Building 198, in order to avoid the possibility of contact with soils contaminated with PCBs.

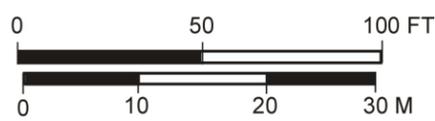
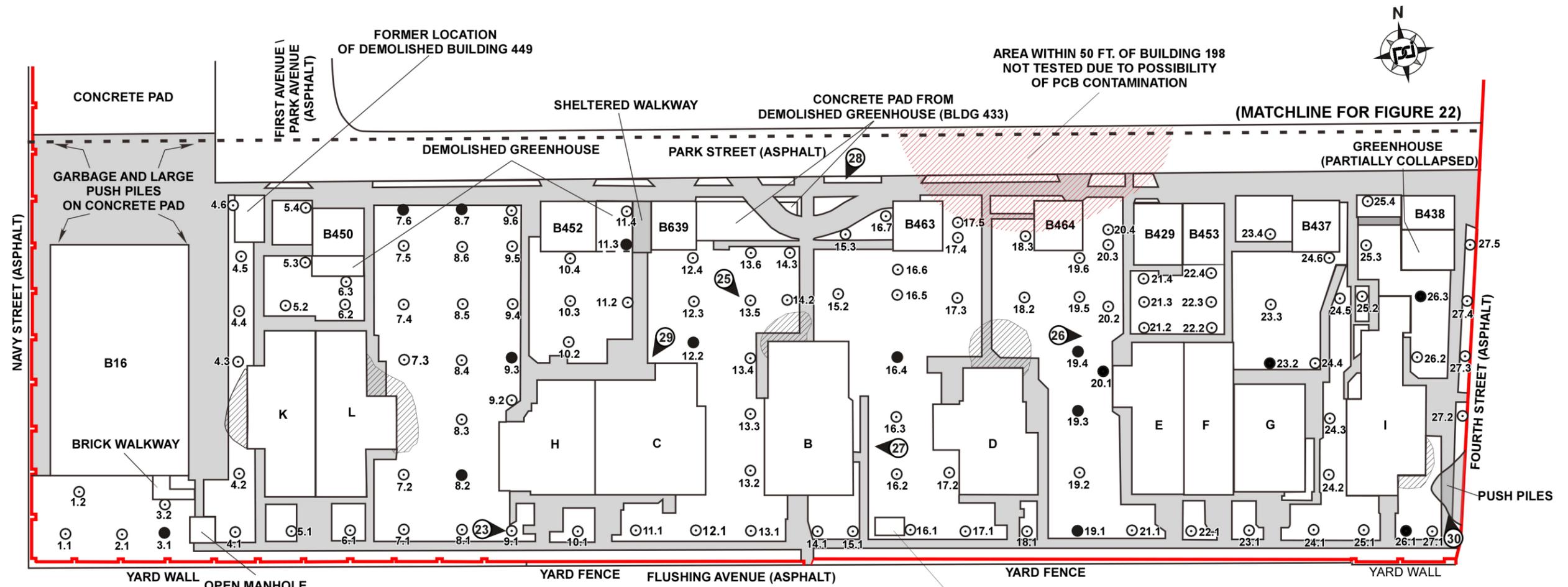
Qualities of the soils identified in the shovel tests around the Admirals' Row quarters south of Park Street varied moderately. A single stratum was observed in 34 tests, of which 30 were terminated due to the presence of impasses before a second stratum was noted and four reached 60 cm before a soil transition was encountered. A total of two strata were identified in 119 tests and three strata were found in the remaining 14 STPs. Stratum 1 was very dark grayish brown sandy loam. In the tests where more than one stratum was identified it extended between 12 and 50 cm below the surface, reaching an average depth of 32.5 cm. Tests that terminated before a soil transition was encountered ranged between 6 and 48 cm in depth and had an average vertical extent of 28.7 cm. Stratum 2 was typically yellowish brown to dark yellowish brown sand, that occasionally also included a loamy component. In the tests where

only two strata were identified, the excavated portion was between 5 and 48 cm thick and had an average vertical extent of 21.6 cm. In tests with three strata, thickness varied from 7 to 31 cm and had a mean value of 18.4 cm. The qualities of Stratum 3 varied moderately in the tests where it was encountered, ranging in color from yellowish brown to dark gray, strong brown, and light brownish yellow, and its texture varied between sandy loam and loamy sand. Its excavated portion was between 13 and 34 cm thick and had a mean vertical extent of 22.4 cm. The shovel tests around the Admirals' Row quarters were dug to average total depth of 51.3 cm.

Soil characteristics in the 45 shovel tests dug across the former parade ground north of Park Street varied significantly more than did those of tests around the Admirals' Row quarters. A single soil stratum was identified in seven STPs, of which six were terminated due to impasses before reaching a soil transition and one was dug to 60 cm before a change in soil was noted. A total of two strata were observed in 30 tests, three strata were identified in seven tests, and a fourth was noted in a single STP. As was the case south of Park Street, qualities of the upper soil stratum were fairly consistent. It was composed of dark grayish brown to very dark grayish brown sandy loam. In tests where more than a single soil was identified, it varied between 18 and 40 cm in thickness and extended to a mean depth of 29.1 cm. Tests that were terminated because of impasses before a second soil was noted ranged from 21 cm to 34 cm in total depth and extended to an average of 28.5 cm below the surface. In STPs where at least two strata were identified, the qualities of Stratum 2 were highly variable. Its texture ranged from loamy sand to sandy loam and its color was even more inconsistent, varying from yellowish brown to very dark grayish brown, reddish yellow, red, brown, and strong brown. In those tests where a total of two strata were observed, its excavated portion was between 7 and 36 cm in thickness and had an average vertical extent of 20.7 cm. In tests where more than two strata were identified, Stratum 2 was between 7 and 12 cm thick and had a mean vertical extent of 9.8 cm. Stratum 3 was also inconsistent, ranging from yellowish brown to reddish yellow and even black, and its texture varied from loamy sand to sandy loam. In the tests in which it was the lowest stratum identified, its excavated portion was between 14 and 22 cm thick and had a mean vertical extent of 18.9 cm. In the test with a fourth stratum (STP 29.2), Stratum 3 was 10 cm thick and Stratum 4 was yellowish brown sandy loam that extended below a depth of 36 cm. The tests north of Park Street were dug to a mean total depth of 50 cm.

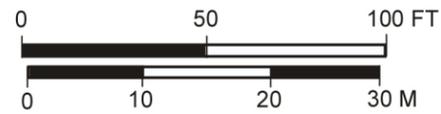
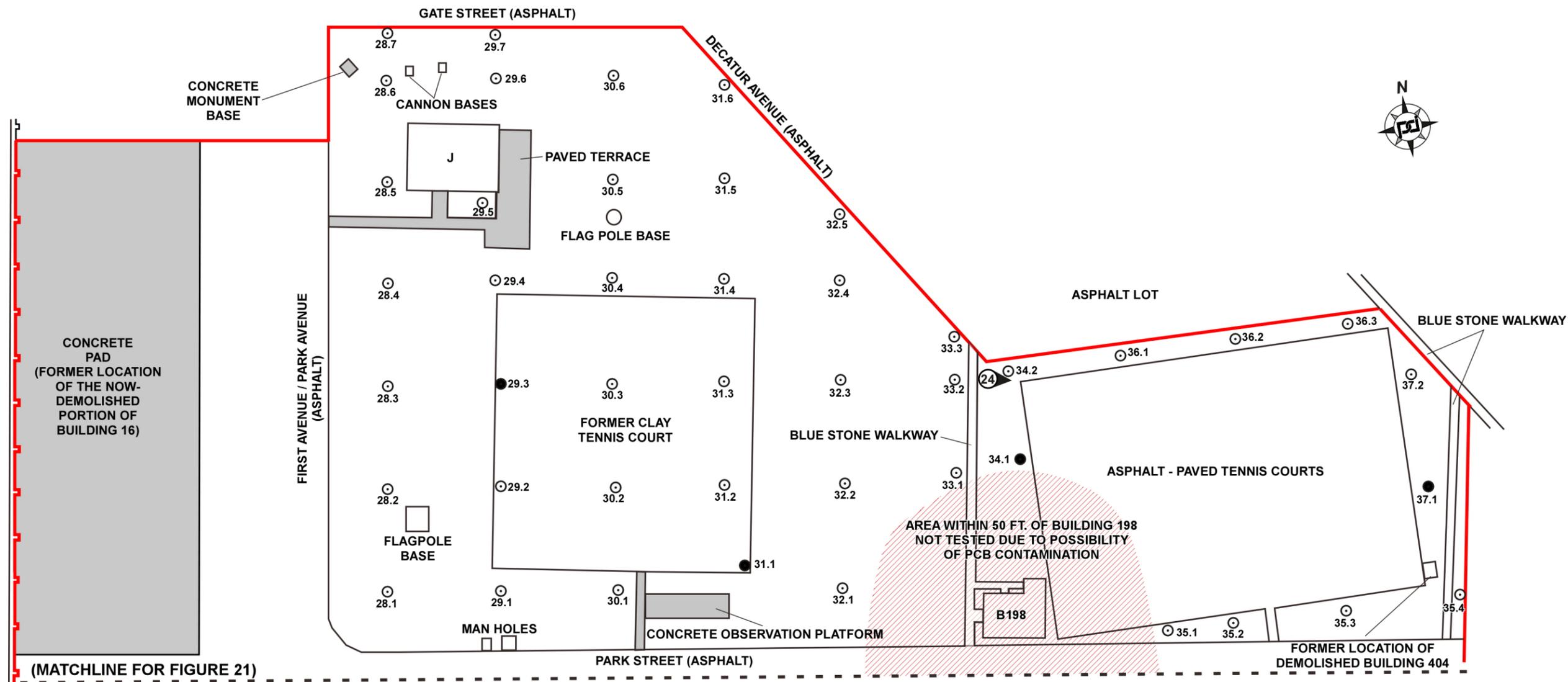
Non-diagnostic historical artifacts, construction/architectural debris, and modern items were found in 104 of the 167 close-interval shovel tests dug around the Admirals' Row structures (i.e., south of Park Street). Of those tests, 40 yielded coal and/or coal ash; 12 had pieces of iron slag; 77 contained architectural remains including wire nails and fragments of glazed redware tiles, brick, flat glass, mortar, asphalt shingles, concrete, and drain tiles; and 21 STPs contained modern items such as pieces of plastic, aluminum, and foil wrappers.

A total of 20 domestic historical (i.e., non-modern) artifacts were found in 15 of the regular-interval tests dug around the quarters (STPs 3.1, 7.6, 8.2, 8.7, 9.3, 11.3, 12.2, 16.4, 19.1, 19.3, 19.4, 20.1, 23.2, 26.1 and 26.3). The items include: a piece of stoneware; a fragment of creamware with blue transfer-printed decoration on both sides; 3 pieces of pearlware (of which one has a flow blue design with leaves and berries; one has a blue hand-painted design and possibly comes from a tea pot or a serving vessel; and one has molded floral decoration); a small fragment of molded porcelain with a single glazed surface possibly from a doll; 3 pieces of whiteware (of which one is hand-painted, one has blue transfer print decoration, and one is undecorated); 3 fragments of undecorated semi-vitreous china; a crescent-shaped piece of medium-gauge sheet brass (possibly decorative); 6 fragments of container glass (one of which is possibly from a drinking glass or tumbler and another is from a bottle with a hexagonal cross section); and a faux-mother-of-pearl plastic button.



- = POSITIVE SHOVEL TEST WITH HISTORICAL DOMESTIC ARTIFACTS
- = NEGATIVE SHOVEL TEST
- ▨ = DEBRIS FROM PARTIALLY COLLAPSED STRUCTURES
- = CONCRETE (WALKWAYS, SIDEWALKS, STAIRWAYS, ETC.)
- = QUARTERS BUILDING
- = BUILDING
- 📷 = PHOTO ANGLE
- = PROJECT AREA BOUNDARY

Figure 21. Project Area layout and shovel test arrangement for the area around the Admiral's Row quarters, south of Park Street, also showing photo angles. Brooklyn Navy Yard, Kings County, New York (PCI 2009).



- = POSITIVE SHOVEL TEST WITH HISTORICAL DOMESTIC ARTIFACTS
- = NEGATIVE SHOVEL TEST
- = CONCRETE (WALKWAYS, SIDEWALKS, STAIRWAYS, ETC.)
- = QUARTERS BUILDING
- B16, ETC. = BUILDING
- ②④ = PHOTO ANGLE
- = PROJECT AREA BOUNDARY

Figure 22. Project Area layout and shovel test arrangement for the zone north of Park Street, including the former parade ground / park, also showing photo angles. Brooklyn Navy Yard, Kings County, New York (PCI 2009).



Figure 23. The front (south) yards of Quarters C and H, facing east. The yard wall is at right. An aboveground steam utility line is visible just to the left of the wall. Note the large amounts of modern refuse. Also note the density of obstructions that precluded the use of heavy machinery in this part of the study area during the geomorphological investigation. Brooklyn Navy Yard, Kings County, New York (PCI 2009).



Figure 24. Site surface conditions along the north side of the asphalt-paved tennis courts in the northeastern portion of the study area, facing east. Brooklyn Navy Yard, Kings County, New York (PCI 2009).



Figure 25. Partially collapsed twentieth-century extension on the north (back) side of Quarters B, facing southeast. The pink flags mark the locations of shovel tests in Transects 13 and 14. Brooklyn Navy Yard, Kings County, New York (PCI 2009).



Figure 26. Debris along the north side of Quarters E/F from the partially collapsed twentieth-century extension on the north (back) side of the building, facing east. The pink flag marks the location of STP 21.2. Brooklyn Navy Yard, Kings County, New York (PCI 2009).



Figure 27. Architectural debris on the east side of Quarters B. This density of material is typical of that along the lateral sides and fronts (i.e., south sides) of the quarters buildings. Brooklyn Navy Yard, Kings County, New York (PCI 2009).



Figure 28. Collapsed portion of the superstructure for the roofed walkway that extends north from Quarters B, facing south from Park Street. Brooklyn Navy Yard, Kings County, New York (PCI 2009).



Figure 29. Collapsed portion of the superstructure for the roofed walkway that extends north from Quarters C, facing southwest. Brooklyn Navy Yard, Kings County, New York (PCI 2009).



Figure 30. Push piles along the boundary of the study area southeast of Quarters I, facing north. Fourth Street is at right. Brooklyn Navy Yard, Kings County, New York (PCI 2009).

A total of 49 radial shovel tests were dug around eight tests that yielded historical domestic material (STPs 7.6, 11.3, 12.2, 16.4, 18.1, 19.1, 19.4, 26.1 and 26.3; two radial tests were also dug around STP 18.1 which was determined not to have yielded domestic items during analysis after the fieldwork) (Figures 31 to 39). Six of the radial tests yielded an additional 8 non-modern domestic items, including 2 pieces of creamware (one of which was undecorated and the other was annular ware with a brown stripe); 2 fragments of whiteware (both of which are undecorated); 3 pieces of container glass (1 olive and 2 clear); and a burned fragment of porcelain.

Non-diagnostic historical artifacts, construction/architectural debris, and modern items were found in 17 of the 45 shovel tests in the parade ground/park north of Park Street. Of those tests, 11 contained coal and/or coal ash, 9 had architectural artifacts (including brick fragments, flat glass, pieces of mortar, and a possible fragment of slate roofing tile), 9 had iron slag, and just 1 yielded modern trash. A total of four historical domestic artifacts were found in four of the tests (STPs 29.3, 31.1, 34.1 and 37.1), and included a piece of undecorated pearlware, a piece of porcelain with a blue hand-painted design, a fragment of olive container glass, and a piece of white salt-glazed stoneware.

No previously unrecorded historical features were identified during the field investigation, nor were prehistoric remains of any kind found in the study area.

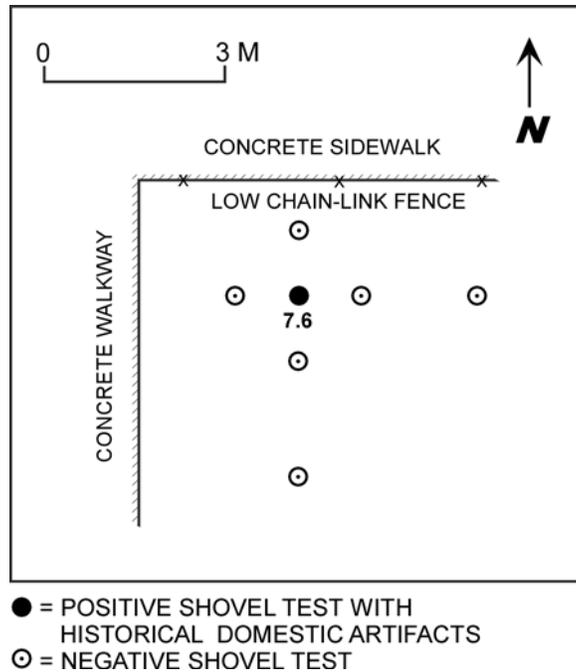


Figure 31. Radial shovel tests dug around positive STP 7.6. Brooklyn Navy Yard, Kings County, New York (PCI 2009).

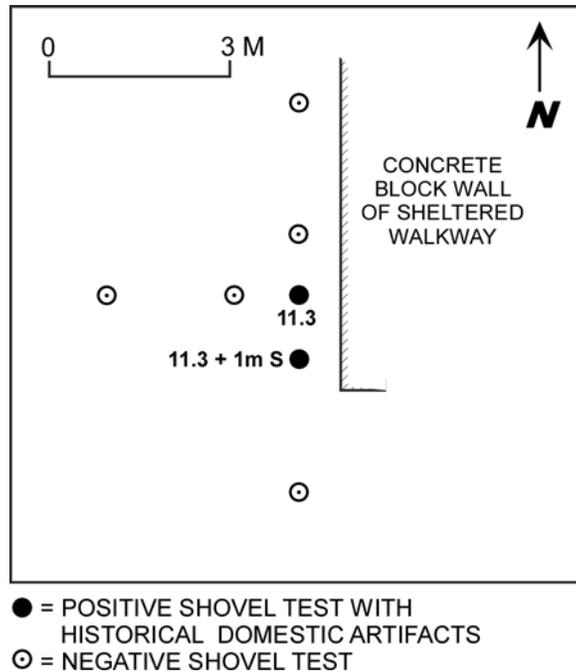


Figure 32. Radial shovel tests dug around positive STP 11.3. Brooklyn Navy Yard, Kings County, New York (PCI 2009).

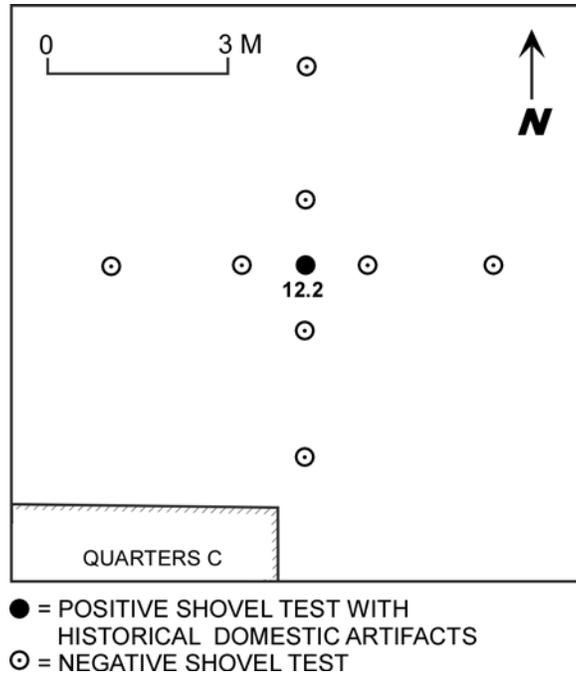


Figure 33. Radial shovel tests dug around positive STP 12.2. Brooklyn Navy Yard, Kings County, New York (PCI 2009).

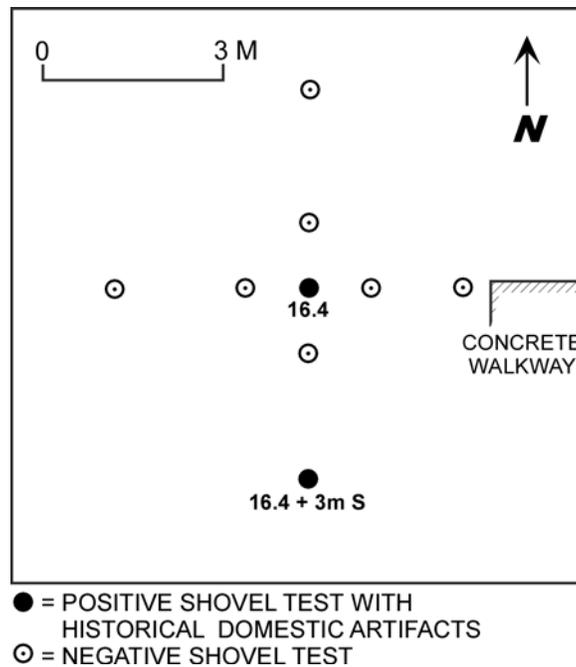


Figure 34. Radial shovel tests dug around positive STP 16.4. Brooklyn Navy Yard, Kings County, New York (PCI 2009).

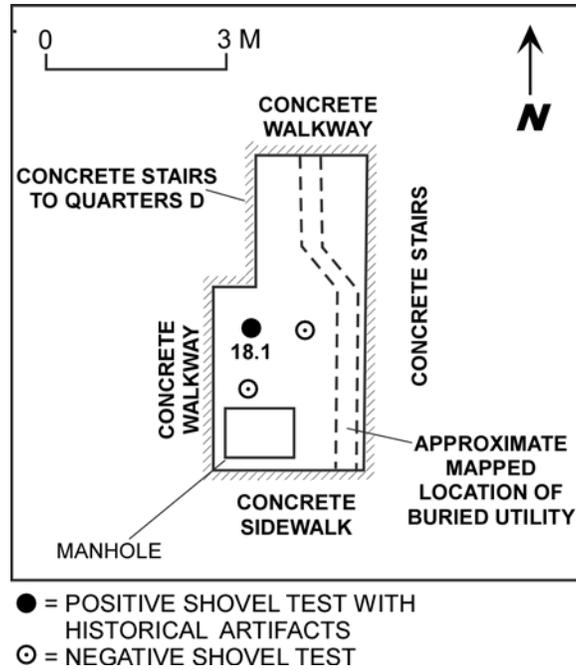


Figure 35. Radial shovel tests dug around positive STP 18.1. Brooklyn Navy Yard, Kings County, New York (PCI 2009).

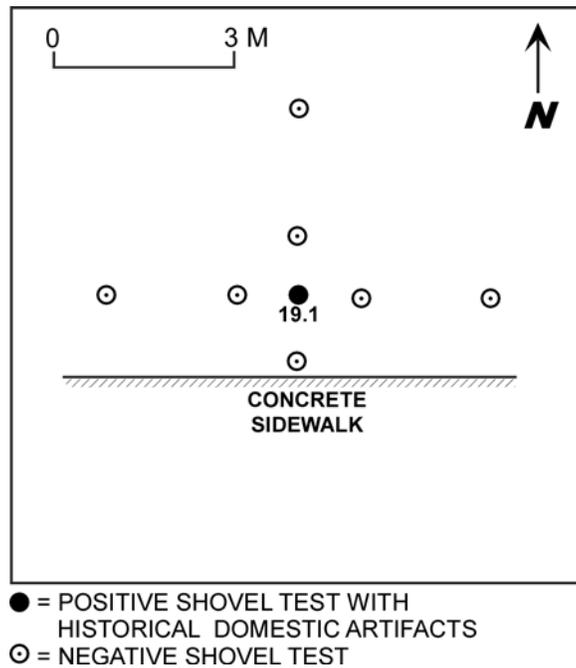


Figure 36. Radial shovel tests dug around positive STP 19.1. Brooklyn Navy Yard, Kings County, New York (PCI 2009).

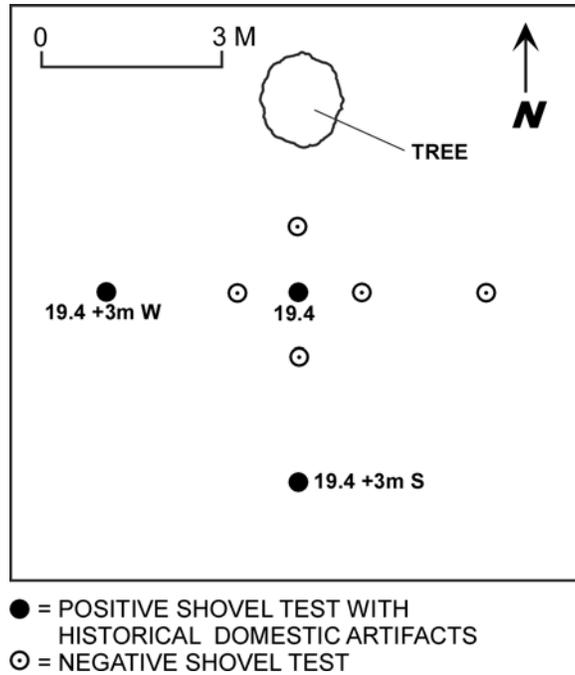


Figure 37. Radial shovel tests dug around positive STP 19.4. Brooklyn Navy Yard, Kings County, New York (PCI 2009).

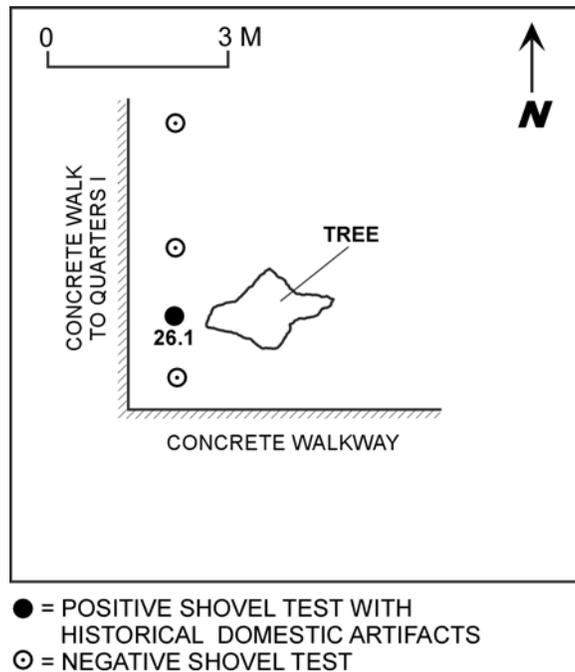


Figure 38. Radial shovel tests around positive STP 26.1. Brooklyn Navy Yard, Kings County, New York (PCI 2009).

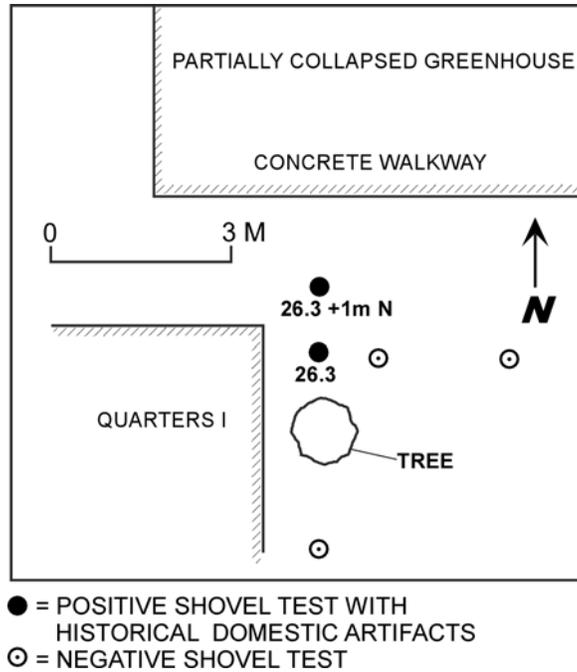


Figure 39. Radial shovel tests around positive STP 26.3. Brooklyn Navy Yard, Kings County, New York (PCI 2009).

5.0 Conclusions and Recommendations

The Phase IB geomorphological and archaeological field investigation included the recovery of 32 Geoprobe cores and the excavation of seven trenches totaling 31.4 linear meters, as well as 212 shovel tests. The geomorphological study revealed a deeply-buried (i.e., 3 m or more) intact natural soil surface under the entirety of the study area. This soil horizon comprises an organic marsh surface that formed on top of sandy fluvial/estuarine sediments. Its presence indicates the project area was covered with a tidal marsh before it was filled in the nineteenth century. Such conditions imply that the project area would not have been used for settlement by Native Americans in pre-Contact times. If people visited it for activities associated with resource procurement, they would have done so only for very brief periods. Therefore, it is highly unlikely that prehistoric cultural resources are present. No prehistoric remains of any kind were found during either the geomorphological or archaeological investigation. Evidence from some of the Geoprobe cores also reflects Remsen's (Wallabout) mill pond, which was present between the mid-eighteenth century and the 1850s.

The results of the geomorphological investigation are also largely consistent with information derived from the Phase IA documentary research regarding large-scale historical alterations to the terrain in the study area. The entirety of the investigated area was filled relatively rapidly during the 1850s, during at least two episodes, one before the construction of Quarters B, C and D, and one later, soon after 1857. Due to the rapidity with which it was deposited, it is highly unlikely that any deeply buried archaeological (i.e., cultural materials with known context) deposits are present in the fill. Panamerican recommends no further work be conducted related to the artifact-bearing trash layer found in Trenches 1, 3, 6 and 7. Items in the layer, which include fragments of porcelain, whiteware, and ironstone, have *termini post quem* in the mid-nineteenth century, a date consistent with the hypothesis that the layer was deposited during the 1850s filling of Wallabout Pond. The deposit lacks cultural context (i.e., integrity) and is thus not eligible for inclusion in the National Register. No further archaeological work related to the trash deposit is recommended.

The geomorphological investigation also provided some information concerning the area west of Park Avenue. Evidence from historical maps from the 1830s and 1840s is inconsistent as to the configuration of the shoreline in the northwest corner of the study area. Two maps, one from 1835 and another from 1838, illustrate the shore as a straight line extending north-northeast from the intersection of Navy Street and Flushing Avenue, suggesting it had already been stabilized (perhaps with wood pilings) and filled (see Hanley et al. 2008:3-20 and 3-26). The Burr 1845 map (see Hanley et al. 2008:3-27), however, shows the shoreline outside the study area to the west and also illustrates part of it as being more 'naturalistic' in form (i.e., not linear). While the Geoprobe cores did not provide definitive evidence favoring either of these scenarios, they are consistent with the qualities of the northwestern corner of the study area shown on Ratzler's 1767 map (see Hanley et al. 2008:3-16), where it is illustrated as covered with a marsh, but not within the boundaries of the mill pond. This in turn suggests the configuration depicted on the 1835 and 1838 maps is more accurate than that on the 1845 map. The cores also indicated the entire area west of Park Avenue and north of the timber shed – which includes the northwest corner of the study area – is currently covered with a concrete pad, consistent with the one shown on early twentieth-century historical photographs (see Hanley et al. 2008:6-3). Plans of the timber shed, the demolished portion of which formerly stood atop the pad, show that it was supported by numerous (hundreds) of support columns, which were constructed of cut-stone blocks atop wood pilings that extended several meters below the ground surface (see Hanley et al. 2008:6-8 to 6-10). The construction of these

columns would have disturbed large portions of the area beneath the timber shed. Thus, the upper strata of any layers of fill beneath the building (including material possibly associated with the altered shoreline configuration shown in the 1835 and 1838 maps) would have been considerably disrupted by its construction. Therefore, development west of Park Avenue and north of the timber shed will have no impacts on archaeological cultural resources and Panamerican recommends no further archaeological investigation in this part of the project area.

Of the 212 shovel tests dug in the study area, 45 were in the parade ground / park north of Park Street, where a total of four domestic artifacts were found in four shovel tests. Non-diagnostic historical artifacts, such as coal, coal ash, and brick fragments, were found in 17 tests. This assemblage is consistent with the light volume of cultural material observed in upper strata of the trenches dug during the geomorphological investigation. No historical features or concentrations of artifacts were identified in the shovel tests north of Park Street. Therefore, development in this part of the project area will have no impacts on archaeological cultural resources and Panamerican recommends no further archaeological investigation there.

Of the 167 shovel tests dug across the lawns of the Admiral's Row quarters – now referred to as the PCI/Admiral's Row site (A04701.016569; Figure 40; see Appendix C) – 21 yielded a total of 28 domestic historical artifacts with a *terminus post quem* in the nineteenth century, including: 17 ceramic fragments (see Table 2); 4 pieces of clear container glass (one of which is from a drinking glass and some of which may be modern); 3 fragments of olive container glass; 2 pieces of aqua container glass (one from a vessel with a hexagonal section); a fragment of medium-gauge sheet brass punched in a crescent shape; and a plastic faux mother-of-pearl button (*terminus post quem* ca. 1868). An additional two artifacts (fragments of pearlware with blue transfer-print decoration) were found in a trench dug on the lawn of one of the Admiral's Row quarters during the geomorphological investigation. Numerous other items were found in the shovel tests that reflect cultural and natural processes similar to those embodied in the material assemblage found at the surface (i.e., modern trash deposition and architectural artifacts possibly related to the collapse of portions of the nearby Admiral's Row quarters or to earlier maintenance of the structures). Much of this material is likely not related to the activities of individuals who inhabited the quarters historically. However, the assemblage of domestic items (N=30) is temporally consistent with deposition in the second half of the nineteenth century. This, together with the fact that the artifacts are related to prosaic household activities, indicates they are possibly attributable to some of the individuals who inhabited the quarters. Although there is little perceivable patterning in the configuration of shovel tests that yielded domestic artifacts, there does seem to be some clustering in the yard between Quarters D and E and the area between Quarters H and L. No historical archaeological features were found around the Admiral's Row buildings.

Table 2. Frequencies of ceramic types from shovel tests dug south of Park Street.

Ceramic Type	Frequency	Beginning Date	End Date
Creamware	3	1762	1820
Pearlware	3	1779	1840
Porcelain	2		
Semi-vitreous china	3	1880	
Stoneware	1	1705	1930
Whiteware	5	1805	

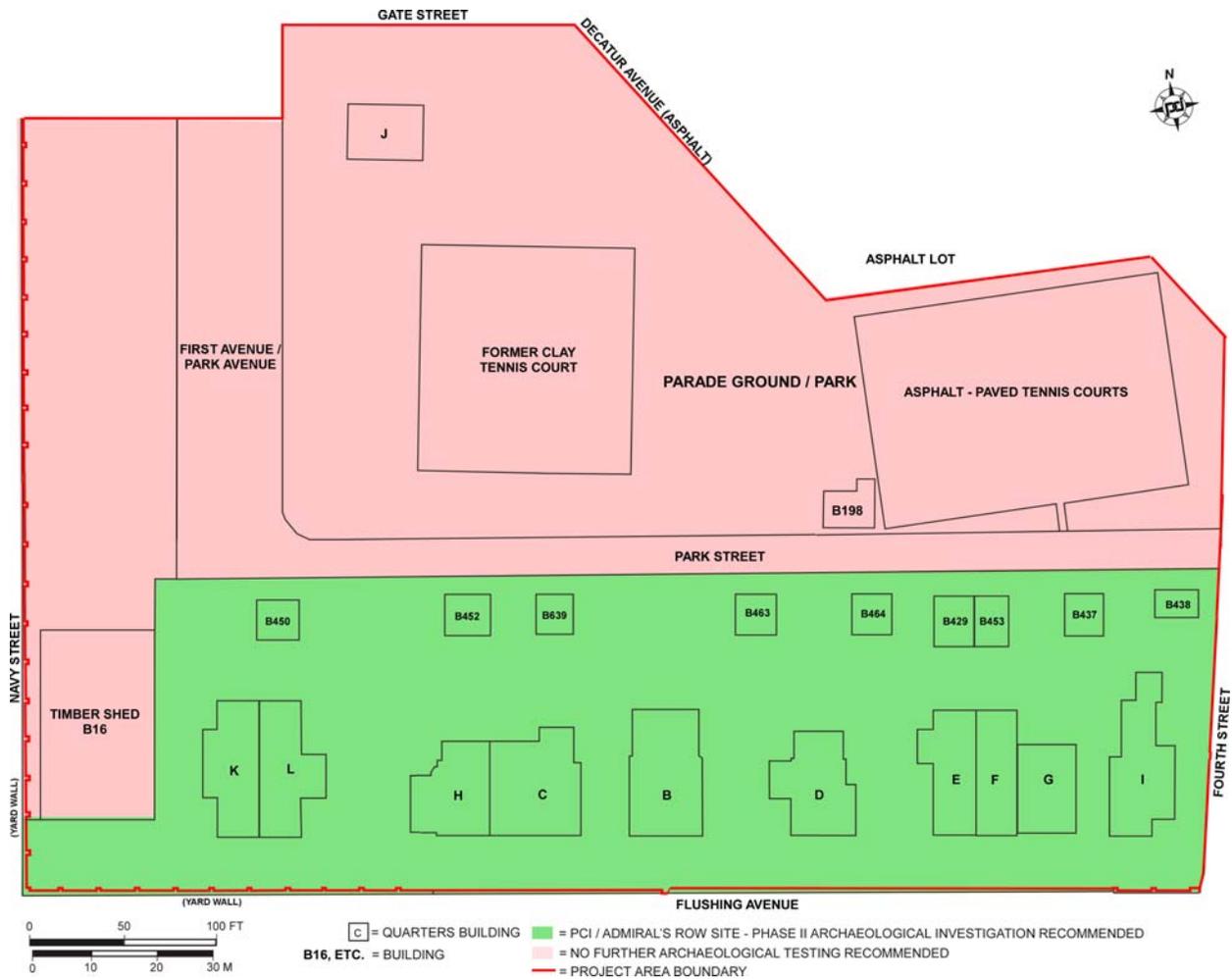


Figure 40. Summary of Phase IB recommendations.

No materials dating to the Revolutionary War era, including human remains or other items associated with the American POW burials, were found anywhere in the project area. This is consistent with the maps and documentary evidence reviewed in the Phase IA report (Hanley et al. 2009:3-16 to 3-19), as well as the results of the geomorphological investigation. Primary accounts of witnesses to the POW burials report they were on “a sand beach” or “the edge of the bank,” which historical maps show corresponds to a stretch of Remsen’s mill dam northeast of the study area. Other historical maps consistently show the dam east of the project area, and it was not identified during the geomorphological investigation.

Panamerican concludes that the PCI/Admiral’s Row site is potentially eligible for inclusion on the NRHP. Although the density of domestic artifacts from the site is best characterized as light to moderate, the context of the assemblage needs to be considered in assessing whether the site is potentially eligible for inclusion on the State/National Registers. First, it lies within an NR-eligible historic district, the eligibility determination of which was based on its architectural resources. The site is likely associated with the individuals who inhabited structures that are contributing elements to the district. In addition, while the quarters were attached to buried utilities by 1894, no documentation is available to address exactly when they were connected to the lines. Before buried utilities were available, Admiral’s Row inhabitants would possibly have

employed privies, the filled remnants of which (along with other pit features) may be present in the yards around the buildings, but were not detected by the shovel tests. The earliest three quarters (Quarters B, C and D, built in the 1850s) have the highest potential for associated privies. Thus, based on the presence of the domestic artifacts, the potential for intact features, and the historical sensitivity of the site's context, it is potentially eligible for inclusion on the NRHP.

Panamerican also recommends a Phase II investigation of the site to determine whether it is eligible for inclusion on the NRHP, either individually and/or as a contributing element to the proposed Admiral's Row Historic District. This will address whether it contains any intact historical features related to the domestic lives of the quarters' inhabitants that are likely to contribute additional information concerning (but not limited to) nineteenth century life for officers at the Navy Yard and how they interacted with communities and groups of individuals of differing socio-economic standing. In so doing, the Phase II will assess whether the PCI/Admiral's Row site is individually eligible for inclusion on the NRHP and whether it is a contributing element to the proposed Admiral's Row Historic District.

Consultation among USACE, NGB, NYSHPO, and Panamerican yielded several alternative potential methods of investigation and levels of effort for the Phase II, each of which has benefits that need to be considered against their limitations (which are related primarily to site conditions – see below) prior to implementation (see Appendix D). All are focused on determining whether filled pit features – the most likely type of historical archaeological feature that might be found at the site – are present. They include:

- The use of a geophysical remote-sensing device, preferably a ground penetrating radar (GPR) unit, supplemented by shovel testing, to ascertain whether potential pit features are present in the ca. 1.5 acres of yards surrounding the Admiral's Row quarters, as well as the small yard south of the timber shed. Although GPR can be calibrated to image through obstructions such as sidewalks and walkways, it may be somewhat limited by the quarters' foundation walls, which might cause reflective interference in areas near the Admiral's Row buildings. It would be most useful for locating filled pit features (i.e., privies) that extend into subsoil. Although many buried utilities extend across parts of the site, they would be easily discernable in GPR imagery, particularly given the availability of utility maps. Perhaps the greatest impediment to the use of the instrument is the occasional presence of dense vegetation. The impacts of the vegetation, however, can be moderated through the use of a GPR unit that does not need to be wheeled across the ground surface or else by scheduling the investigation for a time when vegetation is minimal, such as early spring. The number and locations of shovel tests used in tandem with the GPR survey would be contingent upon the frequency and configuration of features identified by the device.
- Alternatively, NYSHPO has recommended a topsoil stripping operation, supplemented with shovel testing. Topsoil removal is highly effective for identifying features that extend below the base of the upper soil layer. The method, however, can be highly destructive to underlying soils and deposits in areas with dense woody roots and utility lines, since the soil-removing equipment can drag impediments through the subsoil resulting in considerable disturbance. Both roots and numerous buried utilities, some of which are encased in concrete and not all of which may be mapped, extend across parts of the PCI/Admiral's Row site. Beyond the possibility of disturbing potentially feature-bearing subsoil, the use of heavy equipment poses additional dangers that are

unique to the site. The Admiral's Row quarters are all in severe disrepair and at least portions of them have collapsed (in one case, nearly all of one of the buildings, Quarters C, collapsed in a single event subsequent to the archaeological field investigation). In such conditions, the accidental movement of a buried, concrete-encased utility line connected to the foundation of a building, or a minor inadvertent collision between earth-moving equipment and the superstructure of a building, could pose extreme hazards for the field crew. As with the GPR survey, the number and locations of shovel tests used in tandem with the stripping would be contingent upon the frequency and configuration of features identified by the device.

- The third alternative is close-interval (3-m) shovel testing across the entirety of the site, supplemented with the excavation of 1-x-1-m units. If used independently of GPR or topsoil removal, the shovel testing option is the least effective, and most labor-intensive, for finding pit features. If neither of the other methods is feasible, however, shovel testing is a viable, albeit least-productive, alternative. At the recommended interval, approximately 250 to 300 STPs would be needed to cover the site. Unfortunately, even at this high density of coverage, shovel testing still only samples a small percentage of the site and may miss even relatively large features. The 1-x-1-m units would be needed to ascertain whether deposits of artifacts are from features. Their number and locations would be dependent upon the frequency of shovel tests that yield significant volumes of cultural material.

If it is determined that field conditions at the time of the Phase II investigation do not favor the use of either GPR or topsoil removal across the entirety of the site, the best alternative is a combination of the three methodologies, where each would be employed in areas of the site where it is most effective and practicable.

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