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L Berger 2003

PROPOSED NEW SOUTH FERRY TERMINAL

LOWER MANHATTAN
NEW YORK, NEW YORK

PHASE IA ARCHAEOLOGICAL ASSESSMENT

Ø New South Ferry Terminal MTA / SEQRA-M

Prepared For:

New York City Transit
New York, New York

MTA New York City Transit

Prepared By:

The Louis Berger Group, Inc.
New York, New York

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I. INTRODUCTION

EXECUTIVE SUMMARY

At the request of New York City Transit, The Louis Berger Group, Inc., has prepared a Phase IA Archaeological Assessment for the proposed South Ferry Terminal Project, a federal undertaking. This archaeological assessment covers proposed areas of excavation starting at a point north of the intersection of Battery Place and Greenwich Street, through Battery Park and Peter Minuit Plaza, located in Lower Manhattan. The proposed project will construct a Subway Terminal with new approach tunnels constructed through Battery Park and the erminal Station located underneath Peter Minuit Plaza and in front of the Whitehall Ferry Terminal. Excavation for the new subway tunnels and station will proceed through a combination of cut and cover and tunneling techniques. As currently designed, the South Ferry Terminal Project will require a total of 3 acres (100,000 ft^2) to be disturbed by the excavation. 2.3

The goal of this assessment is to determine whether prehistoric and/or historic archaeological resources are or might be present in the areas where subsurface excavation is anticipated and to determine whether the proposed undertaking may have an effect on any such resources. The assessment involved collection of information of predictive value in determining whether archaeological sites are or might be present in the project area and analysis of the collected information to identify areas that are known to or may contain archaeological resources.

A thorough search of primary and secondary sources focused on gathering 1.) general background information concerning prehistoric and historic use of the area and; 2.) narrative and cartographic evidence for specific prehistoric and historic archaeological deposits in or in the immediate vicinity of Battery Park and Peter Minuit Plaza. These cartographic data were then georeferenced to the project area and potential historic archaeological resources were digitized from the historic maps. Lastly, research was conducted to identify evidence for late historic and recent ground disturbance that may have compromised the integrity of any archaeological deposits in the project area. The collected information was analyzed in a number of ways to determine whether uncompromised prehistoric and/or historic archaeological deposits are present or likely present in the project area.

The archaeological sensitivity of the South Ferry Terminal Project area was determined to be low for prehistoric archaeological resources and very high for pre-Revolutionary War, Colonial and historic era archaeological resources. The project area is centered over an area of Lower Manhattan that figured prominently in America's nascent beginnings. The original fort constructed by the Dutch in the early 1600s was located in close proximity to the proposed subway tracks in Battery Park. Additionally, the proposed area of the South Ferry Terminal is situated in an area originally located off Manhattan Island and was filled in during the eighteenth century, after which this area was part of the British fortifications at the Battery. This portion of the project area also holds the potential to encounter historic wharves and bulkheads from the nineteenth century and footings for the nineteenth and twentieth century elevated trains lines that terminated at South Ferry Station.

As the project area has a high potential to encounter historic period archaeological resources, it is possible that the construction of the South Ferry Terminal has the potential to effect significant archaeological resources. Therefore, a Phase IB Archaeological Survey of the project area will be required to determine the presence or absence of potential significant archaeological resources within the project area. The Phase IB investigation may include a combination of hand-excavated test pits, heavy-machine excavated trenches and archaeological screening in advance of excavation work.

I. INTRODUCTION

New York City Transit (NYCT) is planning to replace the South Ferry Subway Station with a new and improved terminal that would eliminate the current station's physical and operational deficiencies. The project objectives are to:

- maintain close Terminal access to the Whitehall Ferry Terminal;
- improve, if feasible, the Line's "on time" performance by providing "scheduled recovery time" at the Terminal;
- meet current subway design standards;
- minimize construction duration and impacts;
- meet all Americans with Disabilities Act requirements for station features and access, and
- maintain the track connection between outer and inner track "loops" "A" and "B" respectively at South Ferry for operating flexibility between the East and West Side IRT Lines.

The proposed project is approximately 1,800 feet in length, measured along a line beginning at the intersection of Greenwich Street and Battery Place, through the eastern portion of Battery Park to Peter Minuit Plaza, and terminating immediately north of the Whitehall Ferry Terminal (Figures 1 and 2). At the northern end of the project area, the existing IRT 1/9 tracks will be lowered north of Greenwich Street to accommodate the new track grade. At Battery Place a bellmouth (wide opening) will be constructed several hundred feet east of the Brooklyn Battery Tunnel to transition the new 1/9 tracks west of the existing ones. The tracks will be enclosed in two concrete tunnels, each approximately 18 feet wide, with inverts ranging from 30 feet below grade (fbg) at the bellmouth to 50 fbg at the terminus of the track overrun. East of Greenwich Street at Battery Place, a new fan plant will be constructed within the limits of the Battery Place roadbed.

The proposed commuter station will be a subway (underground) structure located along the south side of State Street and aligned southeast into Peter Minuit Plaza towards the rehabilitated Whitehall Ferry Terminal. The proposed station will be configured in two levels: 1) a platform level with two tracks and a single island platform located at a depth of approximately 50 feet below the surface; and 2) a mezzanine level located primarily within Peter Minuit Plaza and above the platform level, containing various transit-related service rooms (e.g., mechanical and electrical rooms) along with a connection to the BMT N/R Whitehall Street Station.

The construction of the tunnels and station will involve mostly cut and cover techniques through Battery Park and Peter Minuit Plaza. The tunnels will pass under the existing IRT 1/9 loop track and the IRT 4/5 Brooklyn-bound tunnel at the eastern portion of Battery Park north of State Street (Figure 3). In this area a combination of tunneling and mining may be used depending on the depth of bedrock as the work at this intersection is at the soil/rock interface. Construction may still include an open cut from the surface to minimize difficulty and risk during the underpinning process. The proposed area to be excavated for the construction of the new Terminal Station, tracks, and fan plant totals 2.25 acres.

The new terminal's features will include:

- two tracks to accommodate incoming and departing trains;

- tangent alignment to eliminate the need for high-maintenance platform extenders and reduce the potential for service disruptions. Noise resulting from wheel grinding will also be greatly reduced;
- full-length platforms, approximately 600 feet in length that can accommodate a full-length train;
- a 25-foot wide platform that will reduce platform crowding and congestion as passengers board and alight trains;
- elevator access to the terminal to comply with the Americans with Disabilities Act;
- improved access to Whitehall Ferry Terminal as the new terminal's location is proposed within Peter Minuit Plaza;
- a new connection between the new IRT 1/9 South Ferry Station and the BMT N/R Whitehall Station creating a connection between the BMT and IRT subway lines; and
- three points of access/egress to the subway terminal.

Because the proposed subway station project is proposed to be a federally funded project, under Section 106 of the National Historic Preservation Act (NHPA) and the regulations established by the Protection of Historic Properties (36 CFR 800), the local agency, NYCT, must take into account the effects of their undertaking on historic properties that are either listed in or eligible for the National Register of Historic Places. To comply with the Section 106 process, NYCT has contracted with The Louis Berger Group, Inc. (Berger), to complete an environmental evaluation of the proposed subway project.

As part of this environmental evaluation, Berger has conducted this Phase IA Archaeological Assessment to evaluate the archaeological potential of the site, in compliance with the National Historic Preservation Act of 1966 (36 CFR 800). Work conformed to the *Cultural Resource Standards Handbook* prepared by the New York Archaeological Council Standards Committee and the *Guidelines for Archaeological Work in New York City* prepared by the New York City Landmarks Preservation Commission. The investigation consisted of background research on the natural environment, prehistory, and historical development of the project site, as well as a field reconnaissance. Background research was conducted between March 19, 2002, and April 15, 2002, and included examination of historical maps and texts, secondary histories, and relevant cultural resource studies. Historical resources were consulted at the following institutions: New York Public Library, New-York Historical Society, Elmer Holmes Bobst Library at New York University, the Special Collections at Metropolitan Transportation Authority (MTA) Bridges and Tunnels, New York City Transit Museum Archives, and the City of New York Department of Design and Construction. Archaeological site files were reviewed at the New York State Museum and the New York State Office of Parks Recreation and Historic Preservation (NYSOPRHP), both in Albany. The field reconnaissance was conducted on March 6, 2002. Mr. Zachary Davis, a RPA certified archaeologist, performed background research for the report and also authored the report. Berger and Mr. Davis would like to acknowledge the assistance given by the following people during the background research section of this report: Laura Rosen (Administrator of Special Archives, MTA Bridges and Tunnels), Jaye Furlonger (Assistant Archivist, MTA New York Transit Museum), Jorge Alvear (Assistant Geologist, City of New York Department of Design and Construction), Dr. William Griswold (Archaeologist, National Park Service, Boott Cotton Mills Museum, Lowell, Massachusetts) and Judith Mueller (Museum Curator, National Park Service, Manhattan Sites, New York, New York). Mr. Davis prepared the graphics, and the report was edited by C. Carol Halitsky.

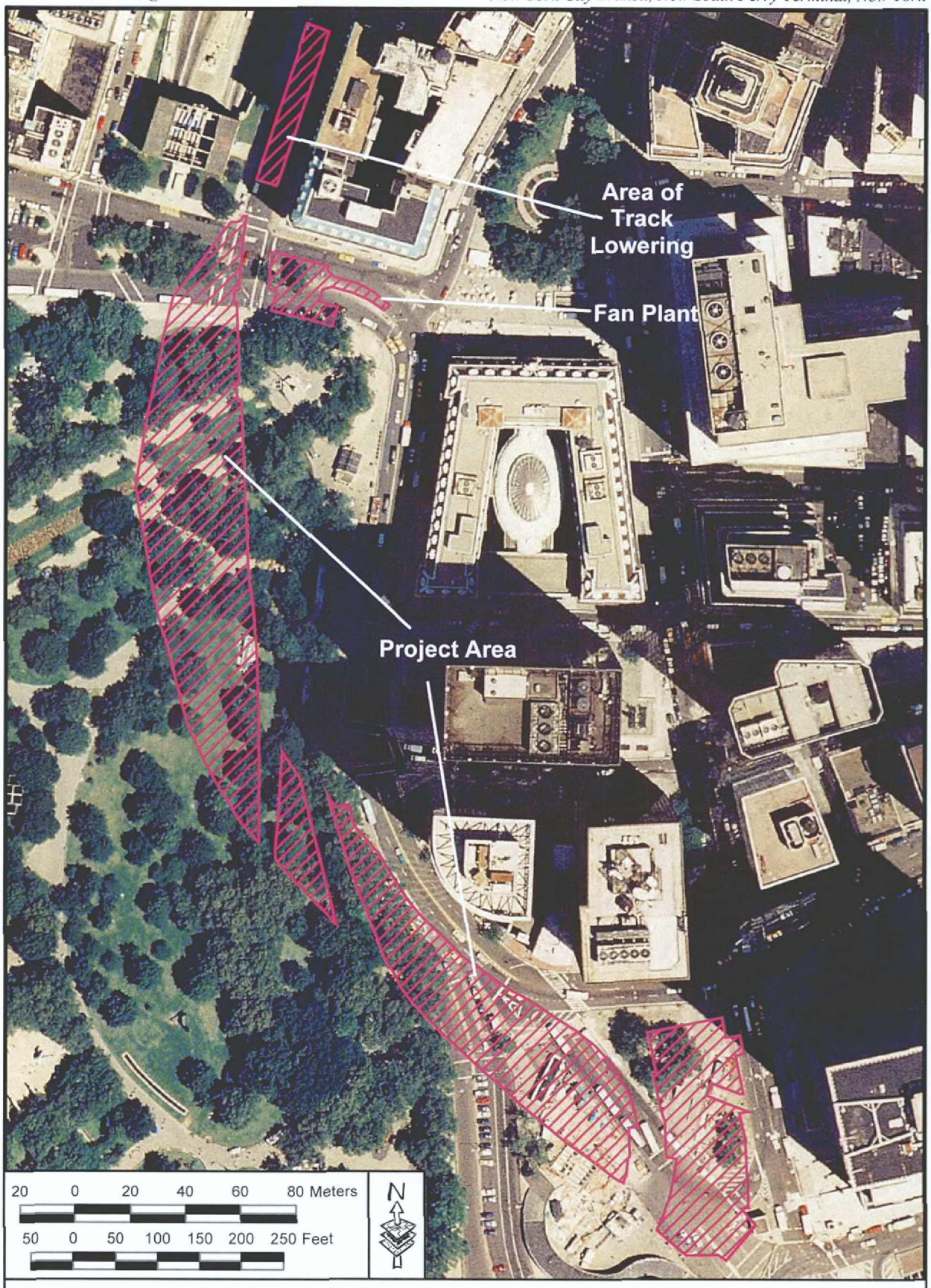

FIGURE 1: Aerial View of the New South Ferry Terminal Project Area *Source: NYCEMap GIS*

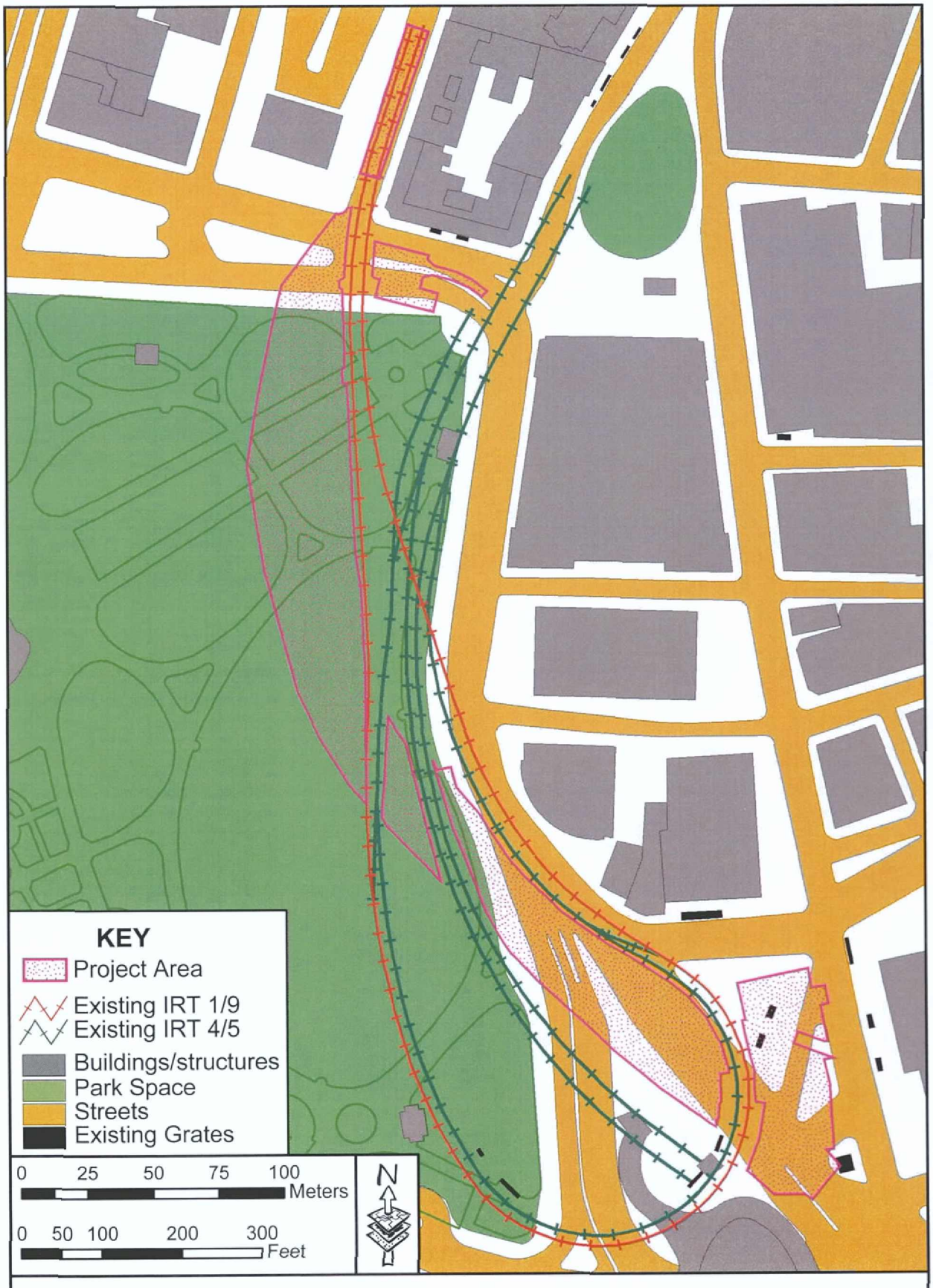

FIGURE 2: Overview of the New South Ferry Terminal Project Area *Source: NYCEMap GIS*

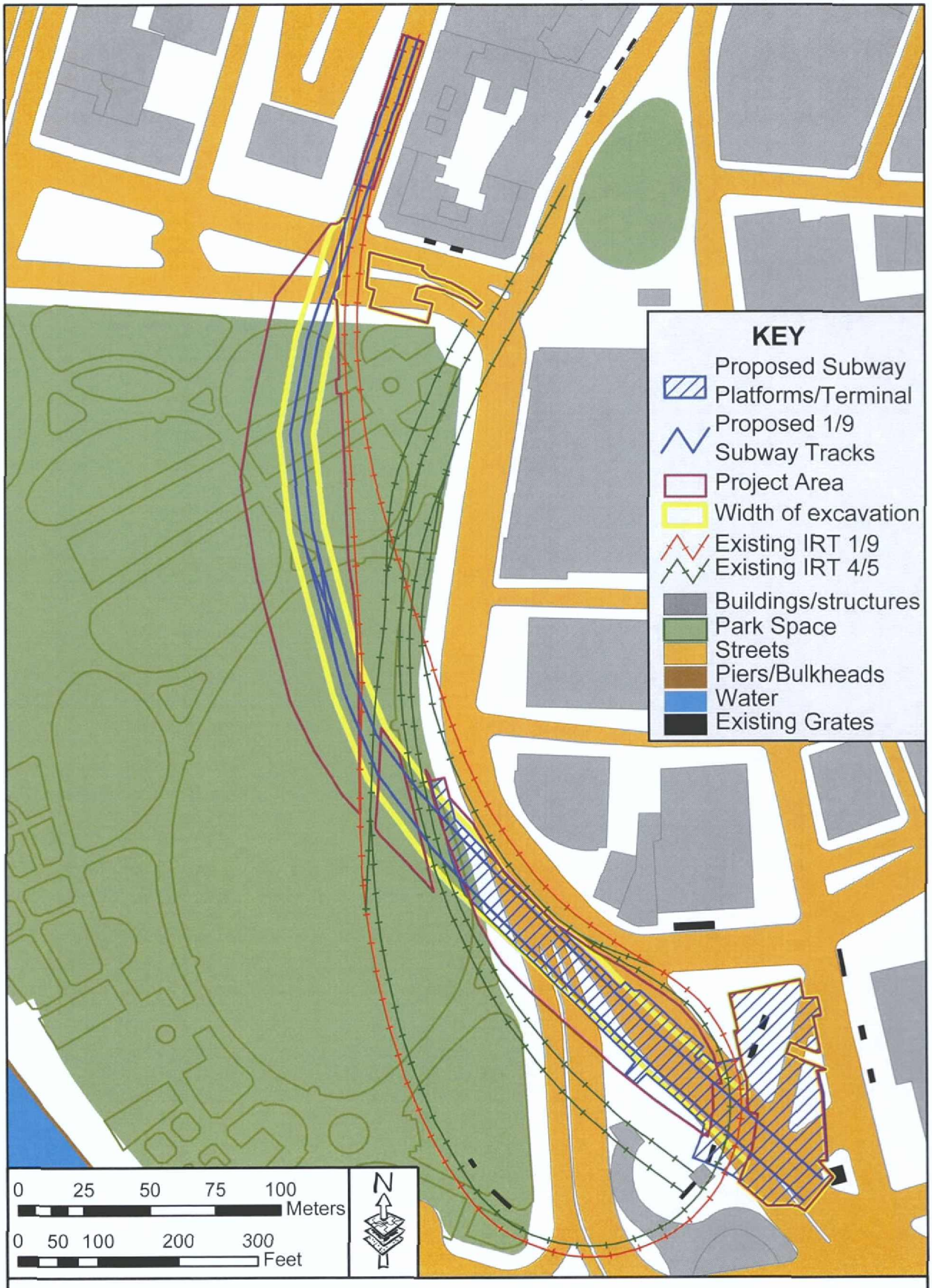

FIGURE 3: Proposed Design Plan for the New South Ferry Terminal *Source: NYCE Map GIS*

II. PROJECT SETTING

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A. PROJECT LOCATION

The proposed subway terminal will be located at Peter Minuit Plaza, with the northern portion of the new tracks located in Battery Park, which is part of the New York City Parks system and is overseen by the Conservancy for Historic Battery Park. Battery Park represents an area with a long history dating back to the beginning of European occupation of Manhattan in the early seventeenth century. The park is situated in close proximity to the location of a seventeenth-century Dutch and English fort, a military installation that included several batteries along its western and southern margins. It is from these batteries that the park derives its name. Battery Park today is a vibrant public space, containing several tourist attractions including Castle Clinton, a National Monument; Pier A, which is listed in the National Register of Historic Places; ferries to the Statue of Liberty and Ellis Island; and, as of March 11, 2002, Fritz Koenig's brass sculpture "Sphere," relocated to Battery Park after terrorist attacks on the World Trade Center. Additionally, Battery Park serves as a major transportation hub, with three subway lines in the area (IRT 1/9, IRT 4/5, and the BMT N/R), the Whitehall Ferry Terminal (the terminus for the Staten Island Ferry), and the newly constructed commuter ferry, located south of Pier A. The project area encompasses portions of the park's paths, trees, and grassy lawns and portions of Peter Minuit Plaza. The World Trade Center "Sphere" is located slightly southwest and outside of the northern portion of the project area. The park is frequented by residents of Battery Park City, local office workers from the downtown area, and tourists.

The proposed location for the subway tunnel/terminal covers a line 1,800 feet long running from the southern end of Greenwich Street, across Battery Place, through the eastern side of Battery Park down to Peter Minuit Plaza, and terminating immediately north of the Whitehall Ferry Terminal (see Figure 3). For the purposes of this archaeological assessment, the project area was defined as an area slightly larger than the proposed area of excavation. While the excavation area for the proposed terminal is 2.25 acres, the project area employed for the archaeological assessment is 3.3 acres. Using a project area that is slightly larger than the excavation area anticipates that potential project design changes might stray from the current excavation area. With a larger archaeological assessment area, small changes in design will be immediately assessed for their archaeological potential if they are outside the area of proposed excavation. The larger project area provides NYCT with a greater degree of flexibility for adjusting the design of the proposed terminal if non-archaeological issues necessitate a shift in the project alignment.

B. GEOGRAPHY AND GEOLOGY

The physiogeography of Lower Manhattan has changed significantly since European occupation in the seventeenth century. For example, the Dutch extended inlets of the East River along Broad Street, and fill was added to the shore along the East River, creating piers and wharfs (Cantwell and diZerega Wall 2001). Fortunately, the original geography of Manhattan Island was reconstructed by Viele in the mid-nineteenth century, and this provides an approximation of the pre-European configuration of the island (Viele 1865).

Figure 4 illustrates the original configuration of lower Manhattan as depicted on Viele's 1865 map. Based on this figure, the majority of Battery Park and the area south of State Street were originally located within the Hudson River. Greenwich Street, the northern portion of the project area, and State Street represent the original southwestern shore of Manhattan. The original southern shore of Manhattan Island was known to contain large glacially deposited boulders, known by the Native Americans as the Kapsee rocks, derived from the Delaware *kua ompsk ic* and *kau-p-si* (Bolton 1934:52; Grumet 1981:220). The Dutch referred to this area as *kaaphaokje*, meaning "a little cape or promontory" (Ruttenber 1906:17). When the English took over the city from the Dutch, State Street was known as Copsey Street (Stokes 1915:997).

Underlying the glacially deposited rocks is the uppermost portion of the bedrock Manhattan schist (Merguerian 1994), in some areas only 15 to 20 feet below the surface (Murphy 1937; see Appendix A). The shallow depth of the soils overlying the bedrock has facilitated the construction of skyscrapers as it is relatively easy for building footings to be placed on the sturdy bedrock.

Soil borings from 1937 (Murphy 1937) and 1941 (Singstad 1941a) indicate that the project area is covered by relatively thick deposits of modern fill (Figure 5; Appendix A). Soil borings excavated in the area of the

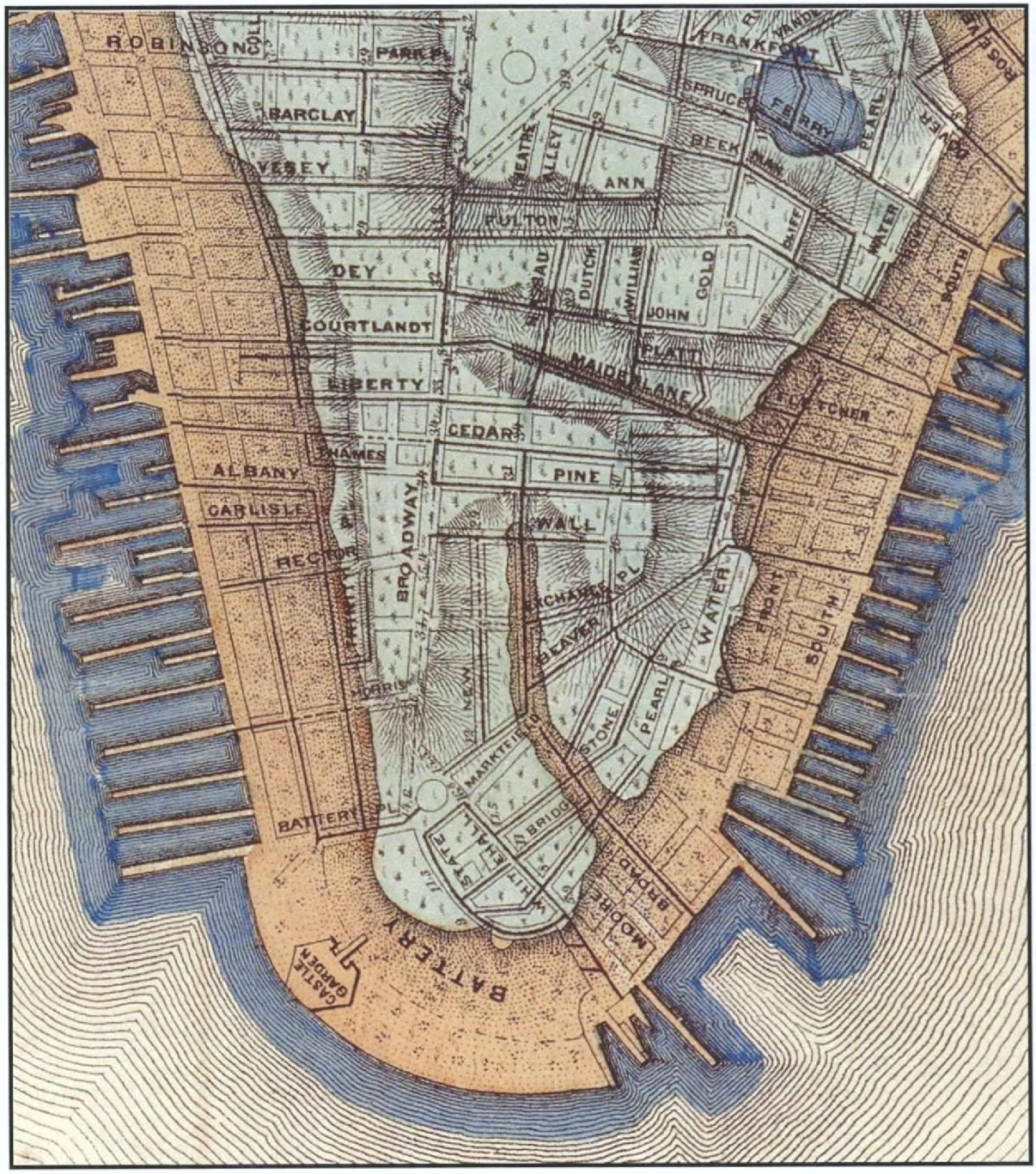

Figure 4: Reconstruction of the Lower Manhattan Shoreline (Viele 1865)

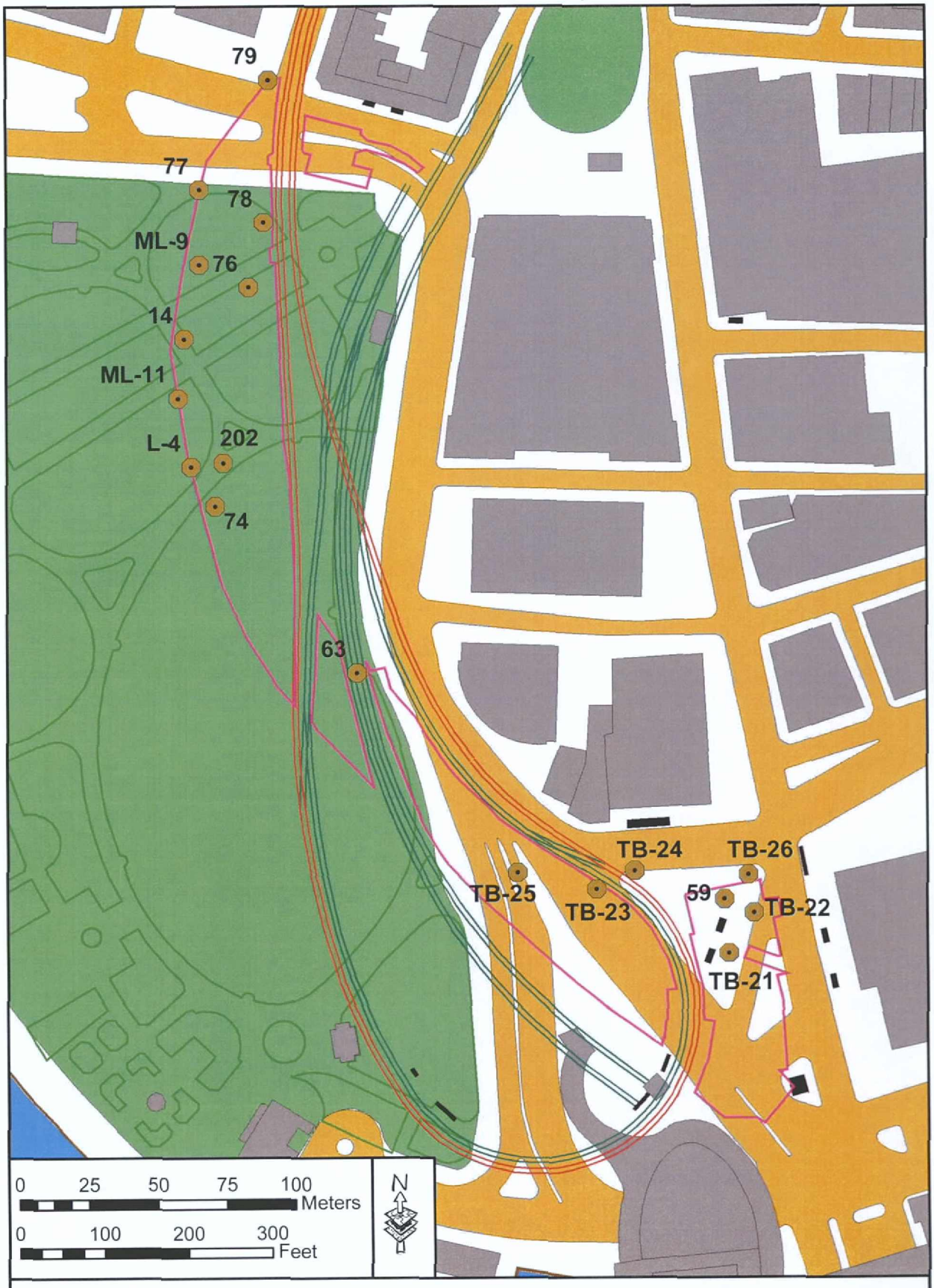

FIGURE 5: Previously Excavated Soil Borings in the New South Ferry Terminal Project Area

Source: NYCEMap GIS, Murphy 1937, Singstad 1941a

original Manhattan island indicate a relatively shallow bedrock overlain by 10 to 15 feet of fill. This fill is not described in great detail, though some boring logs (TB-21, TB-22, TB-23, TB-24, TB-25, and TB-26) indicate the presence of cultural material (brick, mortar, cinder, and/or timber). Of note is the timber discovered in boring TB-21 (at a depth of 12.5 feet below the surface), located near the existing entrance to the Whitehall Street N/R station and within the proposed location for the New South Ferry Terminal station. Depth to bedrock appears to increase to the west and south, as this portion of the park was originally part of the Hudson River and contained the Kapsee rocks. The depth of fill also increases to the west and south of the original island.

C. PLANT AND ANIMAL RESOURCES

Prior to European contact, the Native Americans in the area of the project site subsisted by hunting small game, fishing, collecting shellfish, and gathering local plants (Gilder 1936:3). In fact, oysters were such a common resource that the shore of southern Manhattan was littered with large oyster shells, some up to a foot in length (Gerard 1874:28). It was this abundance of oyster shells along the shore of southern Manhattan that led to the name of Pearl Street for one of the earliest streets in Manhattan established by the Dutch (Bolton 1934:63; Stokes 1915:1007). Cultivation of corn, local wild grasses, and tubers may have occurred prior to European contact, but this point is currently under debate. The first European explorers, Henry Hudson and Giovanni Verrazzano, among others, noted in some detail the surrounding environment; they remarked on the great quantities of fish, small game, oysters (larger than they had ever seen), and waterfowl (Kieran 1971). The early European settlers of the seventeenth century imported many of the initial foodstuffs they needed, including domestic animals (sheep, cattle, horses, swine, and fowl), seeds, grains, and root plants. The new agricultural species adapted easily to local soils; however, along with these importations came an unwanted invasion of foreign insects and fungi that later proved detrimental to native species (Barlow 1971; Kieran 1971).

D. PALEOENVIRONMENT

Reconstructing environmental and landscape changes through time is essential to identifying an area's archaeological sensitivity as certain environmental conditions produced preferred locations for prehistoric settlement. The climatic, hydrologic, and vegetational conditions in the project area have changed over the course of human occupation. For example, the earliest evidence of human activity in what is now New York occurred during the Late Pleistocene, when the climate was considerably colder (Imbrie and Imbrie 1979). Changes in the climatic system in the area of the project area since the end of the Pleistocene have affected the evolution of waterways in the area and the types of plant and animal resources upon which human populations depended. Paleoenvironmental reconstructions of the area provide a model for predicting settlement history and potential archaeological site locations.

Based on data from fossil pollen remains and associated radiocarbon dates, the local environment during the earliest human habitation of the area can be generally characterized as periglacial. The remnants of the Wisconsin glacial advance stretched in an irregular belt almost 1-mile wide from Perth Amboy at the mouth of Raritan Bay in New Jersey across New York State in a northwesterly direction. Between 12,000 and 13,000 years before present (BP), sea level may have been 300 feet lower than at present, and the shoreline extended out approximately 120 miles from its present position (Cantwell and diZerega Wall 2001). Consequently, river and stream systems and their plant and animal communities exhibited different configurations (Edwards and Merrill 1977). Peat borings from the continental shelf indicate that the fairly level plain supported an open spruce parkland or spruce woodland environment, including pine, fir, and other vegetation (Sirkin 1976, 1977). The geomorphology of the area in combination with the effects of glaciation and subsequent sea level rise indicates that marine environments were probably not stable at this early date

and could not have served as a primary focus of human subsistence activities (Edwards and Merrill 1977; Newman 1977).

The glaciers began to retreat between 17,000 and 15,000 BP. Glacial scarring created a variety of developing habitats, including estuaries, salt and freshwater marshes, bogs, and upland and midslope communities. Glacial soils contained a wide diversity in particle size, which allowed good drainage and adequate water supplies for the developing plant and animal communities.

After the retreat of the glaciers, the coastal region of New York was favored by a set of ecological factors that probably contributed to its attractiveness to early human populations. These factors included a relatively long frost-free period, a greater annual reception of sunlight, and the tempering effects of a coastal environment. Brennan (1977) suggests that during postglacial recovery, deciduous forests penetrated the coastal regions of New York and New England more rapidly than in the cooler and higher inland regions. Many of the cold-adapted animals probably followed the retreating glaciers northward and, in the case of mammoth and mastodon, became extinct. These creatures were replaced by deer, elk, moose, bear, and smaller mammals.

By circa 15,000 BP, the Wisconsin Ice Margin had receded north of New Jersey (Schuberth 1968). At that time, it is estimated that the sea level was approximately 300 feet lower than the current level. This would have exposed a large area of the continental shelf, possibly as far as 90 miles east of the present coastline. As a result, many of the islands in New York Harbor would have been connected to the mainland.

During the period of the glacial retreat, the regional vegetation changed from open spruce forest to mixed hardwood vegetation in the uplands, and grasses and wetland forest in the lowlands (Sirkin 1976, 1977). Changes in faunal communities accompanied the shifts in climate and vegetation. Large cold-adapted species, such as mammoths, mastodons, and caribou, were replaced by more temperate species, such as white-tailed deer. With the rise in sea levels, the area of the project site changed from an inland setting to a coastal one. These changes would have had an enormous effect on potential for population movements and resource exploitation. Upland terrain would have supported mixed hardwood forests, and lowlands would have supported a variety of wetland and lowland forest vegetation. Expanding wetlands and waterways in the project site would have provided environments for numerous migratory birds, waterfowl, fish, and mollusks.

Pollen data show that the regional environment continued to change after glaciation. By 2000 BP, environmental and meteorological conditions had approached those of the present, but southern tree species continued to migrate into the area (Barlow 1971).

III. PREHISTORIC CONTEXT

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The following prehistoric overview is based on data derived from sites in the New York City metropolitan area and, to a lesser degree, general patterns of prehistoric settlement in the Northeast Region. Traces of prehistoric occupation have been largely eradicated from highly developed urban areas as a result of intensive development since early European occupation of the New York City area. However, early in the twentieth century, avocational archaeologists, such as Reginald Bolton (1934) and Alanson Skinner (1909, 1915, 1919, 1920), recorded and excavated archaeological sites throughout the metropolitan region and documented the location of previously encountered prehistoric sites. Through the work of these and other avocational archaeologists, a rough outline of the prehistoric occupation of New York City has been constructed. Recent cultural resource management projects have augmented the earlier work to both verify and expand our understanding of prehistoric lifeways in the metropolitan area (Cantwell and diZerega Wall 2001).

Three major periods are commonly used to describe the prehistoric cultures of New York: Paleoindian, Archaic, and Woodland. The Paleoindian period dates from approximately 11,000 to 10,000 BP (Curran 1996; Fiedel 1999). The earliest known occupation of New York City comes from the southwestern shore of Staten Island, where stone tools dating to about 10,000 BP were found in disturbed soils associated with the Port Mobil oil tanks. Along Charleston Beach, located just south of Port Mobil, local avocational archaeologists collected stone tools that were similar to those found at Port Mobil (Boesch 1994). The common stone tool recovered from these two sites is a lanceolate-shaped spear point with a long, thin channel removed longitudinally from both faces of the point. This technique is known as "fluting" and is a hallmark of the Paleoindian period (Callahan 1979). In addition to these fluted points, other stone tools included unfluted points, scrapers, knives, borers, and gravers (Eisenberg 1978; Kraft 1977). This small collection of stone tools has been interpreted as prehistoric refuse from a small resource-procurement encampment (Funk 1977). Although the Port Mobil Site presently overlooks the Arthur Kill, sea levels were lower during the Paleoindian period, and the waterway did not exist when the site was occupied (Edwards and Merrill 1977). The occupation represented at the Port Mobil Site was likely a reconnaissance or hunting camp, rather than a marine-oriented gathering station.

Paleoindian economy may have centered on the hunting of game. Although other economic activities, such as the gathering of plant foods or maritime resources, may have been equally important (Jones et al. 2002; Roosevelt et al. 1996; Sandweiss et al. 1998), they have left little or no trace in the archaeological record. Lithic technological considerations may also have contributed to Paleoindian landscape settlement patterns. Goodyear (1989) suggests that high-quality cryptocrystalline materials (i.e., chert, jasper, and chalcedony) were the materials most commonly used to manufacture fluted lanceolate projectile points. He suggests that Paleoindians used high-quality lithic materials when producing fluted points because of the predictable manner in which these materials fractured, thereby decreasing the possibility of catastrophic fractures occurring as a result of internal (and hidden) flaws that are typically present in low-quality lithic materials. This predominance of high-quality lithic materials suggests that Paleoindians sought out high-quality materials, a hypothesis that is supported by the presence of high-quality lithic materials derived from great distances (up to 300 kilometers) at Paleoindian sites. However, recent geoarchaeological surveys have challenged this assumption by identifying local sources for Paleoindian lithic material (LaPorta 1994; Moeller 1999). These recent studies suggest that Paleoindians were occasionally manufacturing fluted projectile points on local and poorer quality lithic materials (Bamforth 2002).

The southwestern shore of Staten Island remains the only location in New York City where Paleoindian artifacts have been uncovered. There are several explanations for the limited evidence of Paleoindian occupation in coastal New York. One is the distance from high-quality lithic sources that were apparently critical to Paleoindian procurement and settlement strategies (Custer, et al. 1983; Goodyear 1989). Another is that many habitation sites from the Paleoindian era may have been destroyed by coastal geomorphologic

changes that occurred after the sites were abandoned (Marshall 1982). Given the scarcity of known Paleoindian remains in the area, the potential for recovering Paleoindian remains or cultural resources from the project area is rather low.

The Archaic period (10,000 to 3000 BP, or 8000 to 1000 BC) is divided into Early, Middle, and Late subperiods, distinguished by differences in tool assemblages, projectile point types, and preferred lithic materials. Of the several Early Archaic sites (8000 to 6000 BC) identified in New York City, most are located in Staten Island, including the Old Place Site, the Ward's Point Site, the H.F. Hollowell Site, and the Richmond Hill Site. All of these sites produced Kirk components, which produced radiocarbon dates from 5310 BC to 6300 BC. A radiocarbon date of 7410 BC from the Richmond Hill Site has also been identified, in relation to a Palmer (an Early Archaic variant) occupation (Ritchie and Funk 1971, 1973:38-39).

Middle Archaic (6000 to 4000 BC) remains are extremely rare in New York City, although extensive Middle Archaic shell midden sites are known from further up the Hudson River (Brennan 1974; Claassen 1995). Middle Archaic artifacts, such as Kanawha or LeCroy projectile points, have been uncovered in southern Staten Island in the Wards Point area (Jacobsen 1980) and from Rossville (Historical Perspectives, Inc. 1996). Unfortunately, so little is known about the Middle Archaic occupation of the metropolitan region that it is often linked with either the Early or Late Archaic in discussions of prehistory (Kraft and Mounier 1982).

Late Archaic sites (4000 to 1000 BC), on the other hand, are better documented for New York City owing to the high quantity of diagnostically dateable projectile points from this period that have been recovered. Two sites in northern Manhattan provide traces of information on Late Archaic settlement in the metropolitan region. These two sites, Tubby Hook and Inwood (Skinner 1920), are multi-component sites, indicating these locations were preferred habitation sites for several millennia. Late Archaic sites in the metropolitan area characteristically are situated on tidal inlets, coves, and bays. Site location and contents suggest that Late Archaic hunter-gatherer groups exploited various marine resources, including shellfish and fish. The sites are typically small and multicomponent because of reoccupation as preferred locations for resource procurement. Changes that occur in the Late Archaic aboriginal/indigenous toolkits reflect an expansion in the variety of utilized resources. Some of these changes include the manufacturing of fishing gear, such as netsinkers (weights), fishhooks, and an increase in the use of groundstone (Ritchie 1994:143). The increased utilization of marine and estuarine resources in this period may be associated with the eventual stabilization of coastal environments (Edwards and Merrill 1977) although sea levels were rising throughout the Archaic period (Bradley 1999; Salwen 1962).

Late Archaic remains found in New York City are mainly represented by narrow projectile points, including Poplar Island and Bare Island types (Silver 1984), other stone tools (endscrapers, bifacial knives, side scrapers), and special items such as bannerstones, steatite bowls, grooved axes, cylindrical pestles, and hammerstones (Ritchie 1980:149). Groundstone implements are also known from the Late Archaic (Historical Perspectives, Inc. 1996), though these most likely would have been used to grind acorns into meal (Ritchie 1980). Many points that are characteristic of the Late Archaic occupations of Staten Island and the rest of Late Archaic sites in New York City are made of argillite, which is not found locally. The nearest source of this material is within the Lockatong Formation of central New Jersey (Didier 1975; Venuto 1967). The increased variety of stone implements implies an increasingly complex development in the economic subsistence base exploited by the prehistoric population of New York City. The population would have been able to subsist on maritime, terrestrial, and even arboreal resources with their increasingly sophisticated technological repertoire, possibly moving from coastal to inland sites on a seasonal basis, as is suggested by ethnographic accounts worldwide (Mazel and Parkington 1981; Thompson, 1939).

The Transitional or Terminal Archaic period (circa 1000 to 700 BC) is represented by the introduction of soapstone vessels and distinctive fishtail types of diagnostic points. A complex mortuary tradition associated

with Terminal Archaic sites has been found on Long Island (Latham 1953; Ritchie 1965); however, such traditions have not been identified to date in New York City. Terminal Archaic sites in New York City have been identified in the Bronx (Skinner 1919), on Staten Island (Silver 1984), and Manhattan (Skinner 1919). The appearance of shell middens, which is characteristic of subsistence practices in the coastal areas of New York, continues through the Woodland period.

The Woodland period (circa 700 BC to AD 1500) in New York City is characterized by the introduction of ceramic technology. The earliest ceramics recognized in coastal New York are grit-tempered wares similar to a Vinette I-style series that is U-shaped with a rounded conical point when seen from top edge to bottom. Changes in pottery temper, vessel form, and surface treatments are useful chronological indicators. Middle Woodland ceramics include shell-tempered wares with cord and net impressions; Late Woodland ceramics include various collared vessels with incised as well as dentate and cordmarked decoration (Ritchie 1994).

While Early Woodland occupants appear to have followed hunting and gathering lifeways, plant cultivation became increasingly important during the Late Woodland period. Changes in subsistence practices and population growth led to increased settlement that resulted in the appearance of villages. Previous research has addressed the effects of an increasingly sedentary lifestyle on settlement patterns in coastal New York during the late Prehistoric and Contact periods (Ceci 1979; Silver 1984; Smith 1950).

Several Woodland sites have been identified in the City of New York, but only a few sites on Manhattan have yielded Woodland-period material. The largest sample of Woodland sites come from Staten Island, although sites in the Bronx have yielded spectacular information regarding exchange networks in the metropolitan region (Kaeser 1963). The largest prehistoric burial site in the New York metropolitan area was found at the southwestern corner of Staten Island at Wards Point. First noticed by Skinner, this site, known as Burial Ridge, provides a good example of the range of occupations that can occur within a single archaeological site. Collections from Burial Ridge include a large variety of projectile point types dating from the Early Archaic through the Late Woodland. The assortment of ceramic wares that has been recovered is diagnostic of all phases of Woodland occupation. At least 127 pits, burials, hearths, and some 4,000 artifacts have been associated with the Burial Ridge/Wards Point complex. Such findings suggest intensive Native American occupation from the Archaic through the Woodland periods (Jacobson 1980). Frequencies of types indicate that the most intensive prehistoric occupations of this area of Staten Island occurred during the Late Archaic and Middle through Late Woodland.

The end of the Woodland period is marked by the encounter between the indigenous Native American population occupying the metropolitan region and European explorers looking for the elusive route to the spice-laden lands of southeast Asia. Around 1524, Giovanni Verrazzano sailed into New York Harbor and commented on the general pleasantness of the Native Americans riding along in canoes as they came close to his ship (Burrows and Wallace 1999). During this period, no longer the Late Woodland and not yet the time when permanent European settlements were established, the indigenous population began trading and interacting with the Dutch and English travelers exploring New York Harbor and eventually settling on Manhattan. Evidence of this interaction between the native population and the European explorers has been documented archaeologically on Staten Island (Skinner 1909), in the Bronx (Skinner 1919), and on Manhattan (Skinner 1920).

The people inhabiting Lower Manhattan at the time of the European explorers were probably the Marechkawieck group of the Canarsee, who controlled all of the nearby islands in the East River and Brooklyn (Bolton 1975:14-15; Grumet 1981:26-28; Jaffe 1979). The Canarsee were related to Delaware or Munsee-speaking groups who occupied the west side of the Hudson and the area around New York Bay (Goddard 1978:214-215). Manhattan itself is derived from the Delaware *mannahata*, meaning"hilly island"

(Ruttenber 1906:14) or *Manahachtanienk*, meaning "the island where we all became intoxicated" (Heckewelder 1876:262).

The Marechkawieck were dispersed throughout lower Manhattan and lower Brooklyn, including Governor's Island, then called *Pagganck* (meaning nut or walnut) by the Canarsee (Grumet 1981:41). The Marechkawieck are most likely the individuals responsible for selling Manhattan Island to the Dutch in 1626 as they are listed on a 1637 document for the sale of Hell Gate to the Dutch (Grumet 1981:27). The Marechkawieck had a settlement in lower Manhattan just north of New Amsterdam, in proximity to the Collect and Little Collect, spring-fed freshwater ponds located in what is now Foley Square (Geismar 1993; Harris, et al. 1993). The area of City Hall Park would have been a desirable location for Native American settlement as it was comparatively level and close to the freshwater ponds, as well as to swampland and the East River. Valentine (1856:426) noted that the location of City Hall marked the former site of "a large Indian village." Bolton's map and index of Indian sites in New York City and its environs lists one site in the general project vicinity, Warpoes or Werpoes, described as shellheaps in an area above the Collect Pond (Bolton 1934:133, 1975:78-79). The location of this village is variously given as west or south of the Collect Pond (Geismar 1993:56). A Native American foot path was located in this section of Lower Manhattan, running north from the Battery to the northern end of Manhattan Island. This path, called the *Wickquasgeck* Road, was the main pathway for north-south movements along the length of Manhattan Island at the time of European occupation. This path followed the route of Broadway in Lower Manhattan (Grumet 1981:59). At the Battery, the *Wickquasgeck* Road terminated upon reaching the *Kapsee* rocks. The Battery was not an area where Native Americans were known to have established permanent settlements. However, the historically documented deposits of large oyster shells that gave Pearl Street its name suggest that the area would have been an attractive site for shellfish harvesting (Bolton 1934:63).

By the time of permanent Dutch settlement at lower Manhattan in 1623, the Canarsee way of life was forever changed through the introduction of European items, including guns, metal, alcohol, and glass. The most significant European contribution to the demise of the indigenous population was the spread of diseases such as smallpox. Snow (1980) calculated mortality rates from imported diseases on New England's indigenous population at 55-98 percent. The young and old were disproportionally affected. The loss of young people had a devastating effect on the size of subsequent generations. Maintaining traditional cultural integrity was likely substantially affected by the loss of elders. The remaining Canarsee eventually sold their land to the Dutch and moved to Massachusetts, or were killed by the Dutch or Mohawk during the mid-seventeenth century (Jaffe 1979:55). By the 1800s, the population that had once occupied Lower Manhattan and Brooklyn had been completely removed from the metropolitan landscape.

IV. HISTORIC CONTEXT

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Europeans probably first set foot on Manhattan during Henry Hudson's 1609 voyage up the river that now bears his name (Burrows and Wallace 1999:15). Following Hudson's travels in the New York City area, Adriaen Block, sailing for the New Netherland Company, made four trips to Manhattan. On the fourth trip in 1613-14, his ship, the *Tyjger*, burned where it rested on the western shore of Manhattan. A resourceful man, Block constructed a new ship, the *Onrust*, and sailed back to Holland in the spring of 1614. In 1916, during construction of the IRT subway at the intersection of Dey and Greenwich streets, the charred keelson of the *Tyjger* was uncovered. Although the remainder of the ship's hull was left in place, no further remains of the *Tyjger* were uncovered in the 1960s during construction of the World Trade Center (Solecki 1974). Block's forced winter stay represents the first European settlement on Manhattan; during their stay, the Dutch sailors relied on the local Canarsee for food. The remains of the *Tyjger* represent the earliest archaeologically documented European activity on Manhattan.

In May of 1623, the *New Netherland* sailed into New York Harbor with thirty Dutch families, mostly French-speaking Walloons, representing around 120 people (Gilder 1936:4). These settlers were sent by the Dutch West India Company to create a permanent settlement to be called New Amsterdam. The *New Netherland* landed at the southern shore of Manhattan, about where Greenwich Street and Battery Place now intersect (Gilder 1936:4); Greenwich Street runs along what was then the western shore of Manhattan. These colonists immediately began constructing a fort for their protection from the elements and the local Canarsee population. Governor Peter Minuit appointed Kryn Fredericksen, a Dutch surveyor, to draw up plans for the fort, which was to be called Fort Amsterdam (Goodwin 1897:4). The first fort, constructed by 1625, was not an imposing structure but a simple blockhouse surrounded by palisades and earthworks (Goodwin 1897:5). A 1626 view of New Amsterdam (Figure 6), reversed in its original printing, depicts the fort at the southern end of Manhattan. This drawing is most likely a proposed plan for the fort rather than an illustration of the actual fort (Kouwenhoven 1953:31).

Figure 6: 1626 View of New Amsterdam, Most Likely a Plan for the Fort and Not an Actual Depiction (Hartgers 1651)

Between 1628 and 1635, the blockhouse had been replaced by a four-bastion structure, the second Fort Amsterdam. While this four-bastion fort was being constructed, Minuit purchased Manhattan from the local

Canarsee in 1626. Following Minuit's purchase of Manhattan, he was replaced by Wouter van Twiller, who oversaw New Amsterdam during the second fort's construction. The four-bastioned fort was quadrangular with a bastion at each corner, the northwest bastion faced with "good quarry stone (Goodwin 1897:6)." The fort was around 300 feet long (north to south) and 250 feet wide (east to west) (Goodwin 1897:6). Barracks were constructed inside the fort, near the western embankment, and ammunition was stored in a ground cellar (Gilder 1936:6).

During the 1630s, the Dutch settlers begin to spread out into the metropolitan area, building their homes on Staten Island, in Brooklyn, and in parts of Jersey City. The settlement at the southern end of Manhattan had a corn or grist mill constructed west of the fort and a saw mill to the south (Kouwenhoven 1953:35), as seen on a 1639 view of New Amsterdam (Figure 7).

Figure 7: Lower Manhattan, Governor's Island, and Brooklyn in 1639 by an Unknown Compiler (Cohen and Augustyn 1997:29)

In 1638, van Twiller was replaced by Willem Kieft, who found the fort already in a neglected state; only one windmill was operating, the cannons were not functioning, and the walls were falling apart (Goodwin 1897). Kieft almost immediately began a long and costly war campaign against the Native American population in Manhattan and on the New Jersey shore, creating several years of panic and fear for the Dutch colonists. During the same period, Kieft constructed a church in the fort in 1640 and established a weekly market at the northern edge of the fort, which would today be located at the south edge of Bowling Green. The presence of this and subsequent markets led to the street being called Marckvelt Steegh, later Marketfield Street, and today, since 1857, Battery Place (Gilder 1936:7).

Kieft was replaced by Petrus Stuyvesant in 1647, who instituted several changes that turned the fledgling colony into a well-regulated town. Stuyvesant had the streets surveyed; established a fire brigade, police force and post office; constructed a pier on the East River; expanded the natural canal running along Broad Street into a small canal called the *Heere Gracht;* and repaired the walls of the fort (Burrows and Wallace 1999:43-46). Stuyvesant's improvements to New Amsterdam are clearly illustrated in the mid-seventeenth view of the town, commonly called the Prototype view (Figure 8).

Fort Amsterdam is clearly indicated in this figure as a large structure (letter A), with the flagpole (letter D) and the windmill (letter C) located above it. Several buildings are shown along the East River, including

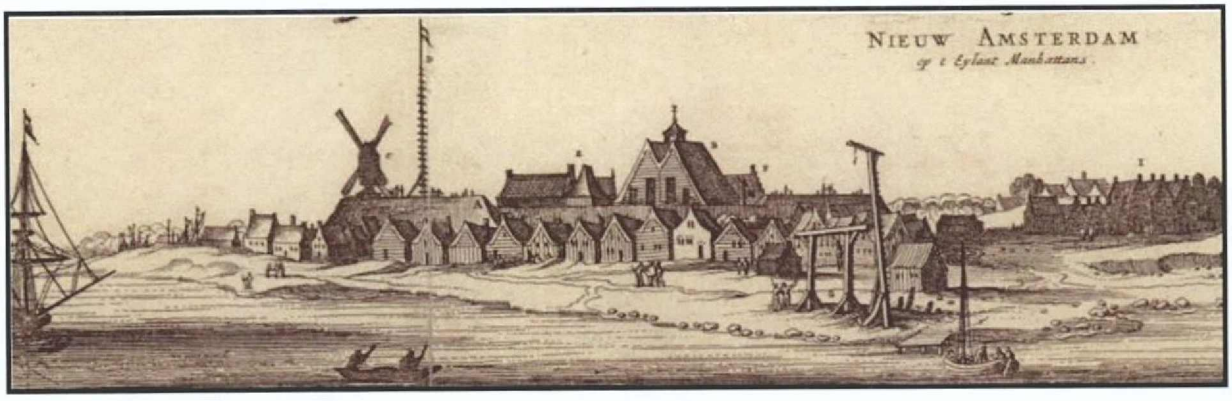

Figure 8: 1650 View of New Amsterdam (Hermann 1651-1653)

a shipping pier. Several residences south of the fort are also shown; these are likely located to the southeast of present day Battery Park.

New Amsterdam developed further throughout the 1650s, and in February 1653, Stuyvesant incorporated the town as the City of New Amsterdam. A view of the city was produced through Stuyvesant's street mapping projects by 1660 (Figure 9). Commonly called the Castello plan for the Italian villa in Florence where the map was discovered in the early twentieth century, this map was drawn by Cortelyou sometime between 1665 and 1675 (Cohen and Augustyn 1997:38-41).

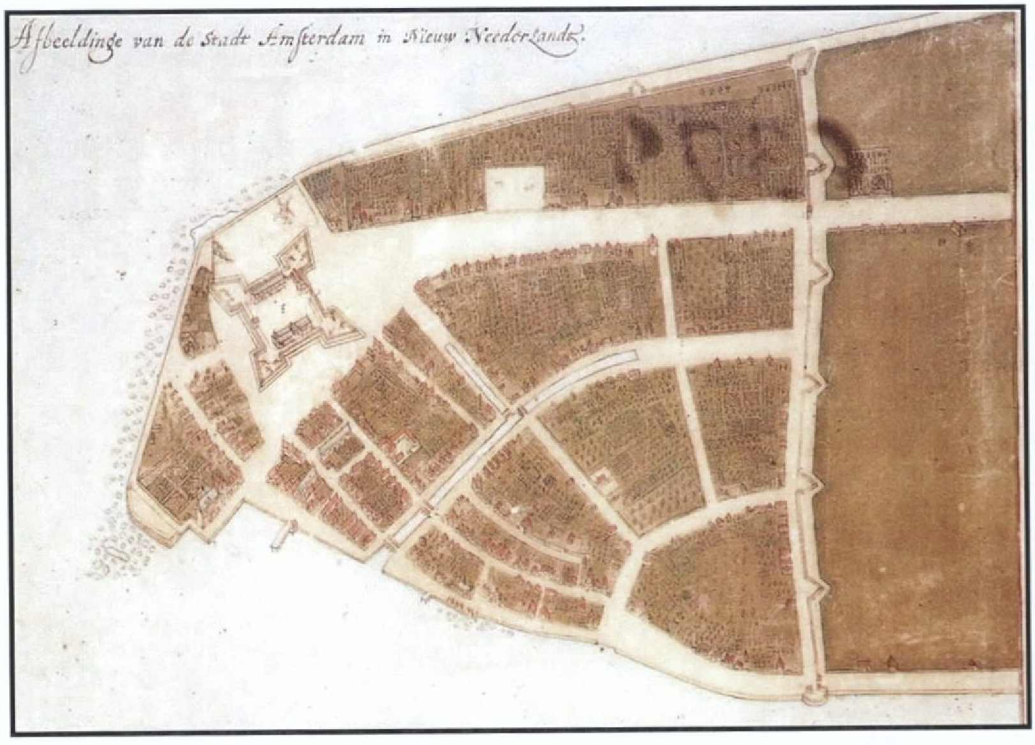

Figure 9: The City of New Amsterdam in 1660 (Cohen and Augustyn 1997:39)

The population of New Amsterdam in 1660 was almost entirely settled below Wall Street, represented by the wall constructed in 1653 for fear of attack by the neighboring British colony in New England. Many of the streets that became the modern downtown streets can be identified on this map. According to Gerard (1874), leading north from Fort Amsterdam is Broadway, known as *Wagen Wegh* and later *Brede Wegh*, running along the Native American *Wickquasgeck* footpath. Broad Street is represented by Stuyvesant's *Heere Gracht*, with a canal leading to the west along modern Beaver Street. The fort is situated west of Whitehall Street, then called *Marckvelt* for the markets that took place along the eastern side of the fort. The southern edge of the fort is located along present day Bridge Street, so named as it led to a small bridge crossing the *Heere Gracht* (Gerard 1874:45). State Street would have been the southwestern edge of the island, located along Manhattan's rocky shore; in fact, this street was called Copsey Street in the eighteenth century, after the rocks along its western edge (Stokes 1915:997). The modern western shore of Manhattan was not formed until the early nineteenth century; in the seventeenth century, the western shore was located where Greenwich Street now lies (Geismar 1987). The 1660 view of New Amsterdam is dominated by Fort Amsterdam and shows a small windmill at the western shore of the island. Note also the presence of a small ledge of land to the west of Fort Amsterdam. This land would form the foundation for future military additions in the late seventeenth century.

In the summer of 1664, the British were rumored to be planning an invasion of New Amsterdam, as Charles II had conveyed to his brother, the Duke of York, the land along the east coast of America between the Delaware and Connecticut rivers, including the Dutch claim to New Amsterdam (Goodwin 1897:29). In August of 1664, four British ships sailed into the New York Harbor and demanded that Stuyvesant turn the colony over to the British (Burrows and Wallace 1999:72). The town was not prepared to fight four British ships carrying 500 soldiers and 100 guns; Fort Amsterdam's guns had been neglected, and just 250 soldiers were stationed in the fort. Recognizing that any resistance would have resulted in the town being considerably damaged by the militarily superior British, Stuyvesant was compelled to surrender the town to the British on September 8, 1664 (Gerard 1874:33; Gilder 1936:17). In a letter sent to the West India Company following the surrender, Stuyvesant describes the poor state of the fort as one of the factors leading to the surrender of New Amsterdam: "The fort was and is encompassed only by a slight wall, two or three feet thick backed by a coarse gravel, not above eight, nine or ten feet high in some places" (Goodwin 1897:23). Defeated and dejected, the Dutch soldiers took down the Dutch flag and marched out of Fort Amsterdam. The British hoisted the British colors, changed the fort's name to Fort James (after the Duke of York), and rechristened the town New York[1].

Under British rule, New York was governed by Richard Nicolls, who had led the British fleet into New York Harbor in 1664. By 1672, the Dutch and British were at war again. In July 1673, the Dutch entered New York Harbor with around 20 ships commanded by Anthony Colve (Gilder 1936:21). Nine Dutch men-of-war positioned themselves within range of Fort James and opened fire. For an hour, cannons from Fort James and the Dutch ships exchanged shots, killing one man on each side. Colve, with 600 soldiers, landed on the western shore of Manhattan, near Trinity Church, and marched down Broadway to the fort (Burrows and Wallace 1999:82). Upon reaching Fort James, Colve demanded the British surrender, which they did on August 9, 1673. The Dutch again raised the their flag over the fort, now renamed Fort Willem Henrik. New York became New Orange, and the colony was once again called New Netherlands (Goodwin 1897:35). Colve, as the governor of New Orange, set about improving the defenses of Fort Willem Henrik by adding 180 cannons and removing all buildings close to the fort (Gilder 1936:21).

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[1] In June 1667, the Dutch and British negotiated a settlement to their latest war, fought since February 1665. Although the Dutch had dealt the British several crushing defeats, the Dutch agreed to let the English keep New Amsterdam in return for Surinam, a Dutch colony prized for its slaves and sugar plantations (Burrows and Wallace 1999:74).

No sooner than the residents of New Orange had become accustomed to the Dutch running the colony, the British and Dutch signed a treaty in February 1674. By October 1674, Colve was ordered to leave Fort Willem Henrik, and a new governor, Edmund Andros, would arrive to take over the fort, now called Fort James again (Gerard 1874:35). New Orange was once again called New York, and the Dutch flag would no longer fly above lower Manhattan.

Colve left the British with a well-defended fortification. During Andros's governorship, a Labadist missionary named Jasper Danckaerts described Fort James as:

> not large; it has four points or batters; it has no moat outside but is enclosed with a double row of palisades. It is built from the foundations of quarry stone. The parapet is of earth. It is well provided with [forty-six] cannon for the most part of iron, though there were some small brass pieces all bearing the mark or arms of the Netherlands [Gilder 1936:23].

Andros was succeed by Colonel Thomas Dongan, who can be credited with constructing the first battery along the waterfront of Manhattan (Gilder 1936:25; Wilson 1903:16). Along the west side of the fort, several cannons, including five demiculverins, were placed on the rocks. Demiculverins were small, long cannons with serpent-shaped handles, firing between eight- and twelve-pound cannonballs. These cannons were used for precision shooting and had a range of up to 5,000 yards (Manucy 1949:35). These cannons were placed along the waterfront between 1683 and 1689, forming a "half-moon mounting seven great guns (Wilson 1903:16)."

In 1688, the English monarchy was in turmoil. King James II had abdicated the throne, and there were tense struggles between the Catholic army, loyal to James, and the Protestant army, loyal to his son-in-law, William of Orange. In New York, a fervent Protestant supporter, Jacob Leisler, seized the fort and changed its name from the Fort in New York to Fort William, in honor of the newly installed King William. Leisler improved the fort's defenses, informing the king that "for the better defence I have caused one battery to be made at the river side at the west of the fort, where I have planted seven great guns" (Gilder 1936:23). According to Gilder, writing in the early twentieth century, the fort was a "semi-circular redoubt, a hundred feet over all" and "built on a flat rock, where Greenwich and Stone Streets would intersect today if they extended into Battery Park. For many years, this was called Leisler's Half Moon" (Gilder 1936:23).

Leisler's governorship of New York was cut short in 1691 when Colonel Henry Sloughter was sent from England to govern New York and demanded that Leisler rescind possession of the fort. Leisler and Sloughter's troops fought on March 17, 1691, and Leisler surrendered two days later. The fort was renamed Fort William Henry to differentiate it from the name Leisler had given it. Benjamin Fletcher assumed control of New York in 1692, and he too added to the fort's defenses. Fletcher states how "on the rocks at the water side of the fort, I have designed a platform on which I propose to mount a battery" (Gilder 1936:30). He also repaired the barracks in the fort and added 92 cannons along the waterfront from the foot of Greenwich Street to the intersection of Whitehall and State streets.

The British defensive improvements to the fort are understood in the context of their conflict with the French over land ownership in the New World from 1689 through 1697. These British fears were justified as the French had secretly acquired a plan of Fort William Henry in 1693 (Figure 10). This map provides significant information regarding the fort's structure and associated military fortifications lying to its west in the area of today's Battery Park. The battery first constructed by Dongan in the 1680s and improved upon by Leisler in 1689 is clearly indicated on this map as located west of the fort, between the northwest and southwest bastions. South of the fort are two barracks lying just west of Whitehall Street. A large wharf has been constructed south of the fort, and a large sand bar (*Banc de Sable*) is depicted on the southern edge of Manhattan Island. This sand bar would provide the footing for the expansion of Manhattan Island in the

Figure 10: Plan of Fort William Henry in 1693 (Franquelin 1693)

eighteenth century. The western shore of Manhattan Island is depicted in a rather natural and unmodified state.

Around the same time of the Franquelin (1693) map, John Miller, the Episcopal chaplain for Fort William Henry, drafted a very accurate plan of the city of New York (Miller 1695). Miller's plan (Figure 11) is the first to depict the curvature of the lower Manhattan streets, rather than depicting them in an idealized grid-like pattern. The shoreline is indicated by the slight hatching, again showing the western shore had not been modified as of the end of the seventeenth century. The western battery is shown situated further to the west from the fort, and a fortification wall has been constructed to enclose the battery along with the barracks located to the south. The fort is described as possessing 36 cannons in addition to the cannons located along the western battery (Cohen and Augustyn 1997:53).

In 1702, the fort was renamed Fort Anne, after the newly installed British monarch (Burrows and Wallace 1999; New York City Department of Parks 1952). Upon Queen Anne's death in 1714, George the Elector of Hanover came to the throne, naming himself King George I. When George I ascended to the British throne, the fort in lower Manhattan was renamed in his honor, becoming Fort George (Goodwin 1897:37).

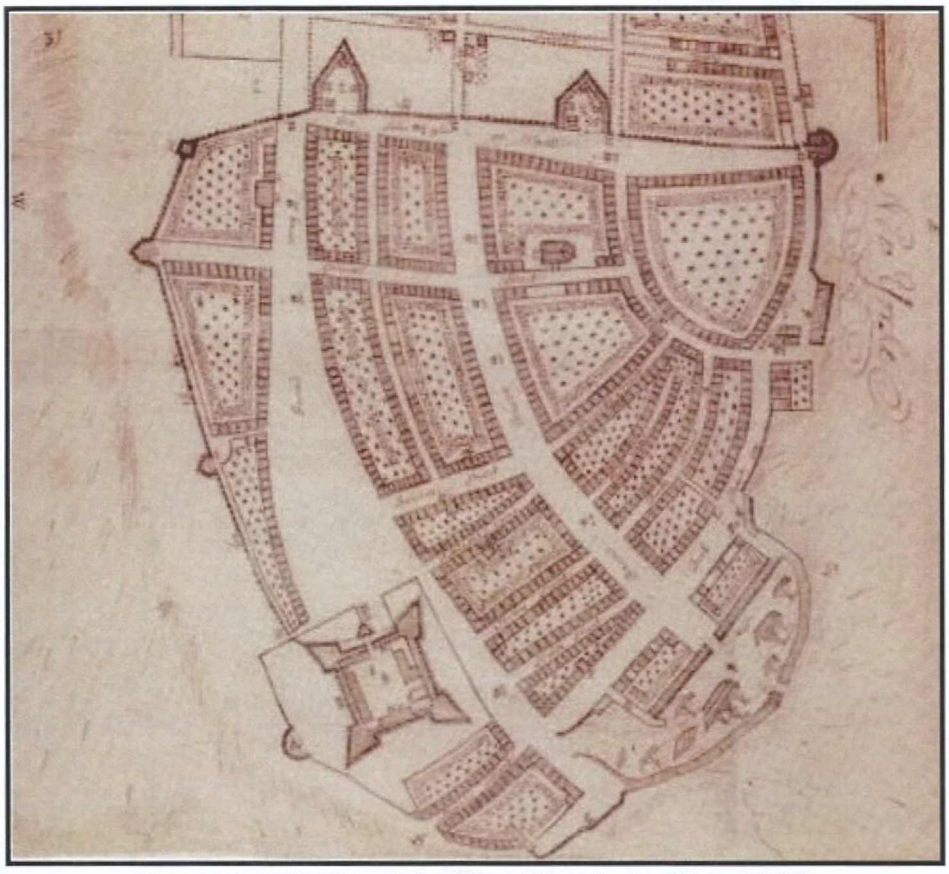

Figure 11: 1695 Map of the City of New York (Miller 1695)

Table 1: History of the Changes in Name for Fort George

Date	Fort Name	Name of New York City
1625-1635	No name given, simple block house structure	New Amsterdam
1635-1664	Fort Amsterdam	New Amsterdam
1664-1673	Fort James	New York
1673-1674	Fort Willem Henrik	New Orange
1674-1688	Fort James	New York
1688-1689	The Fort in New York	New York
1689-1691	Fort William	New York
1691-1702	Fort William Henry	New York
1702-1714	Fort Anne	New York
1714-1780	Fort George	New York

Table 1 (above) summarizes the name changes for Fort George from its construction in the 1620s through its last name change in 1714.

In the early eighteenth century (Figure 12), the area around Fort George continued expanding in size as fill was added to the western shore, south of Pearl Street, and just to the west of the pond that lay south of the barracks. The southern shore was still dotted with the Copsey rocks, as seen on the Carwitham map. The two small blocks located west of the shore, just above the word "Fort" in Fort George, are interpreted as the planned locations for Greenwich and Washington streets, which had been proposed in 1723 and surveyed in 1724 (Cohen and Augustyn 1997:56). The Lynn-Bradford Map, upon which the Carwitham map was based, indicates similar locations for these streets (Lyne 1730).

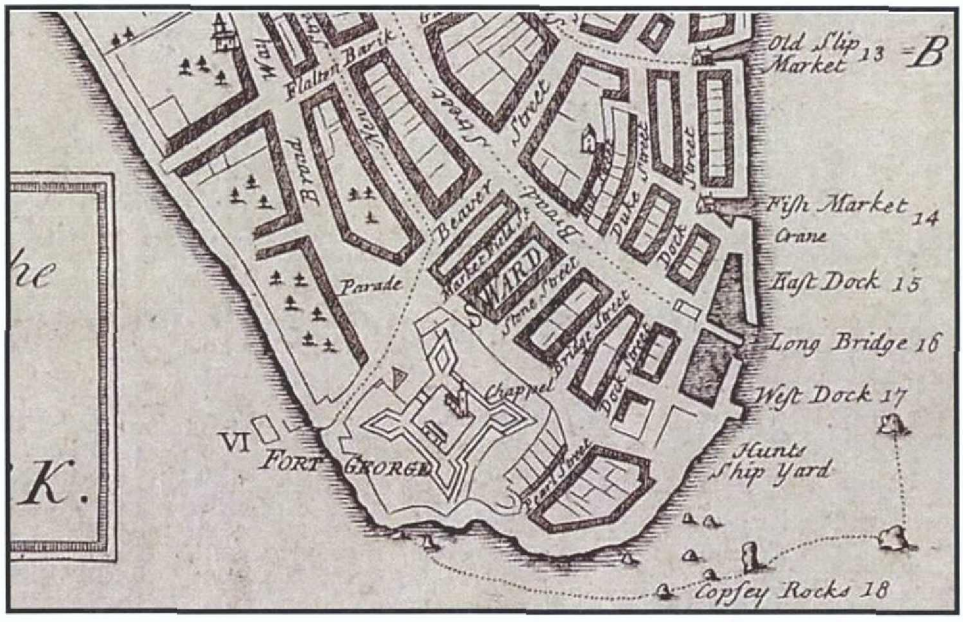

Figure 12: 1730 Map of the City of New York (Carwitham 1730)

A print from this period gives an indication of the grandeur of Fort George (Figure 13). This is only one of three images depicted from the west of lower Manhattan during the eighteenth century. The walls of the fort are strongly constructed, the church in the fort (built in 1731) dominates the southern end of the fort, and south of the fort is a battery, which may correspond to the battery depicted on the fort's southern end in Figure 12. This battery was constructed sometime in 1735, when the city legislature approved £6,000 for its construction (Gilder 1936:47). The fortification surrounding the fort encompasses a structure along the western shore, and a landing place is depicted here also. The western shore at this point represents where Greenwich Street is located today.

Further military fortifications were added to the western shore during the 1750s. The battery was located further west and extended further south, with a small slip to the east (Figure 14). This slip was located where Whitehall Street is located today. Also, a small pond was located within the fortification walls of the fort area. The Ratzer map (published under the name Ratzen) also indicates Greenwich Street had been constructed at this time, but Washington Street did not yet exist in 1767 (Ratzen 1776). A string of defensive works ran along the shore from the terminus of Greenwich Street to Whitehall Slip (Wilson 1903:17).

In 1773, the pond within the fortification walls was filled in (Stokes 1915:517). During the Revolutionary War, when the British were threatening to take Manhattan, the Continental soldiers razed the northern side

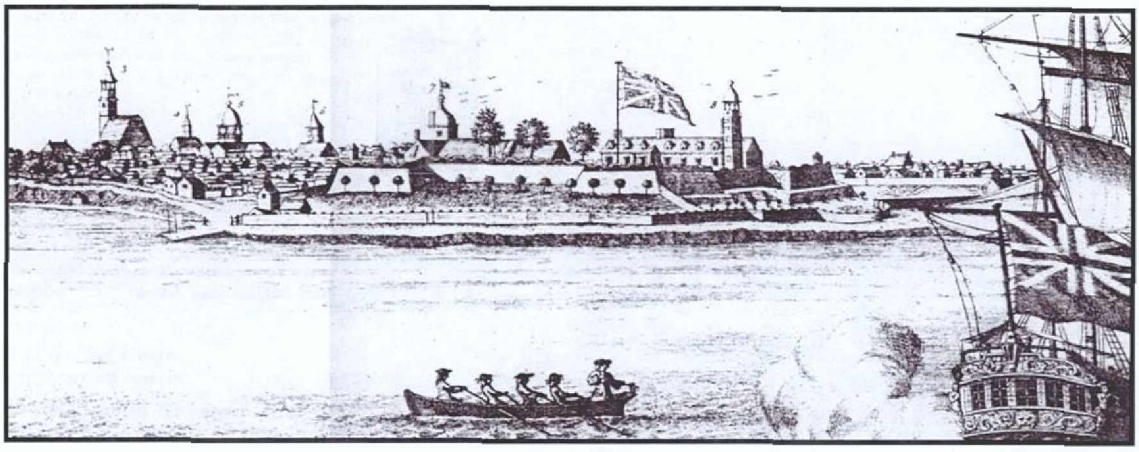

Figure 13: View of Fort George from the West, Between 1731 and 1736 by an Unknown Compiler (Stokes 1915:Plate 31)

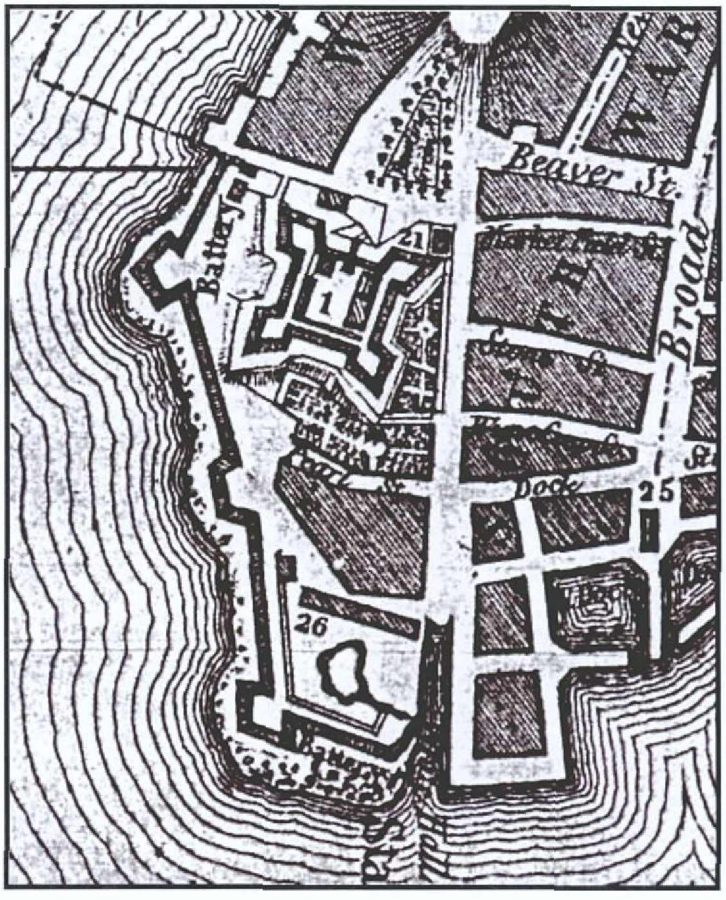

Figure 14: 1767 View of Fort George and the Surrounding Area (Ratzen 1776)

of Fort George and removed as much ammunition and weapons as they could carry away (New York City Department of Parks 1952). Following the Revolutionary War, Fort George stood for a few years longer until between 1788 and 1790, when the fort was torn down (Gilder 1936:113; Wilson 1903:17). Wood from the

the fort was given to the poor for firewood, and the debris from the fort was used to fill in the western shore, forming additional land for the park over the Battery (Gold 1988). A government house was constructed upon the fort's location, followed by row houses, and in the early twentieth century, the U.S. Customs House (Dolkart 1998).

Battery Park had been established as a place for walks and recreation since the mid-eighteenth century. Land had been gradually added to the area outside the fortification wall throughout the latter part of the 1700s. In 1789, the Common Council ordered the construction of a bulkhead for Battery Park (Stokes 1915:517). In November of 1807, the land along the western shore that once held the Battery was ceded to the federal government, and Colonel Jonathan Williams began designing a new fortification to be located at this shore (Gilder 1936:129). This was the beginning of the second fort to grace the Battery, today known as Castle Clinton. By 1811, Castle Clinton was completed, just in time to defend New York from the threatening British. However, the War of 1812 never endangered Manhattan, and Castle Clinton never fired a shot from its 28 thirty-two pounder cannons. Castle Clinton was built such that it extended out into the water, as seen in Figure 15. The fort was active as a military installation until March of 1822, when the federal government conveyed the fort to the City of New York (Gilder 1936:146). The Castle was renamed Castle Garden in 1824 and opened as an entertainment center where concerts and operas were performed. Castle Garden was where Swedish opera sensation Jenny Lind made her American debut in a concert promoted by P.T. Barnum in 1850 (Wilson 1903:20).

In 1819, a tax had been levied on the city's population to raise funds for expanding Battery Park. A faint line in Figure 15 indicates the original (1790) bulkhead of the park. Once the park was expanded in 1824, the size of the park remained constant until the Common Council recommended expanding the park in 1851. The proposed expansion of the park would almost double its size. Castle Garden would no longer be positioned out in New York Harbor, but would be part of the park. Work began on the enlargement of the park in 1854 and was not completed until 1872 (Gilder 1936:187). It was during this expansion of the park that Castle Garden's role as the music center for downtown was usurped by the construction of the Academy of Music at Fourteenth Street (Wilson 1903:22). No longer useful as a concert hall, Castle Garden was turned into an immigration center to handle the thousands of new comers to America. Castle Clinton functioned as an immigration center until 1896, when it was converted for use as the New York Aquarium.

Once Battery Park was expanded to its current size, with Castle Garden located on the mainland, the park was a popular place for evening strolls along the shore and enjoying the cool breezes coming off the harbor in the summertime. The park also functioned as a major transportation center, as the ferries from New Jersey, Staten Island, and Coney Island all converged at the park in the nineteenth century. Ferry slips were located along the southern end of Battery Park, covering several hundred feet from Whitehall Street (Figure 16).

The presence of several ferry lines in Battery Park created a demand for quick and efficient transportation alternatives in lower Manhattan. However, in the 1860s, the state of transportation in New York City was appalling. New Yorkers had two options: the omnibus, a small horse-drawn car that was usually crammed with passengers, or horsecars, which were larger than the omnibus and ran on tracks (Reed 1978). The roads were extremely bumpy and dirty, and each omnibus was so overcrowded that it appeared to be some form of sport to pack in as many people as possible. New York was ready for an alternative form of transportation, and in 1867, an experimental elevated cable-driven railway was constructed on Greenwich Street (Gilder 1936:212). In 1874, elevated railways were being constructed throughout the city; elevated railways were built on Ninth, Sixth, Third, and Second avenues (Reed 1978). The Ninth Avenue Elevated (Ninth Avenue El) originally began its run at Greenwich Street and Battery Place, but in February of 1876, the line was extended southward through Battery Park to South Ferry (Gilder 1936:212; Stokes 1915:517) (Figure 17). At South Ferry, the Ninth Avenue El line connected with the Second Avenue and the Third Avenue lines,

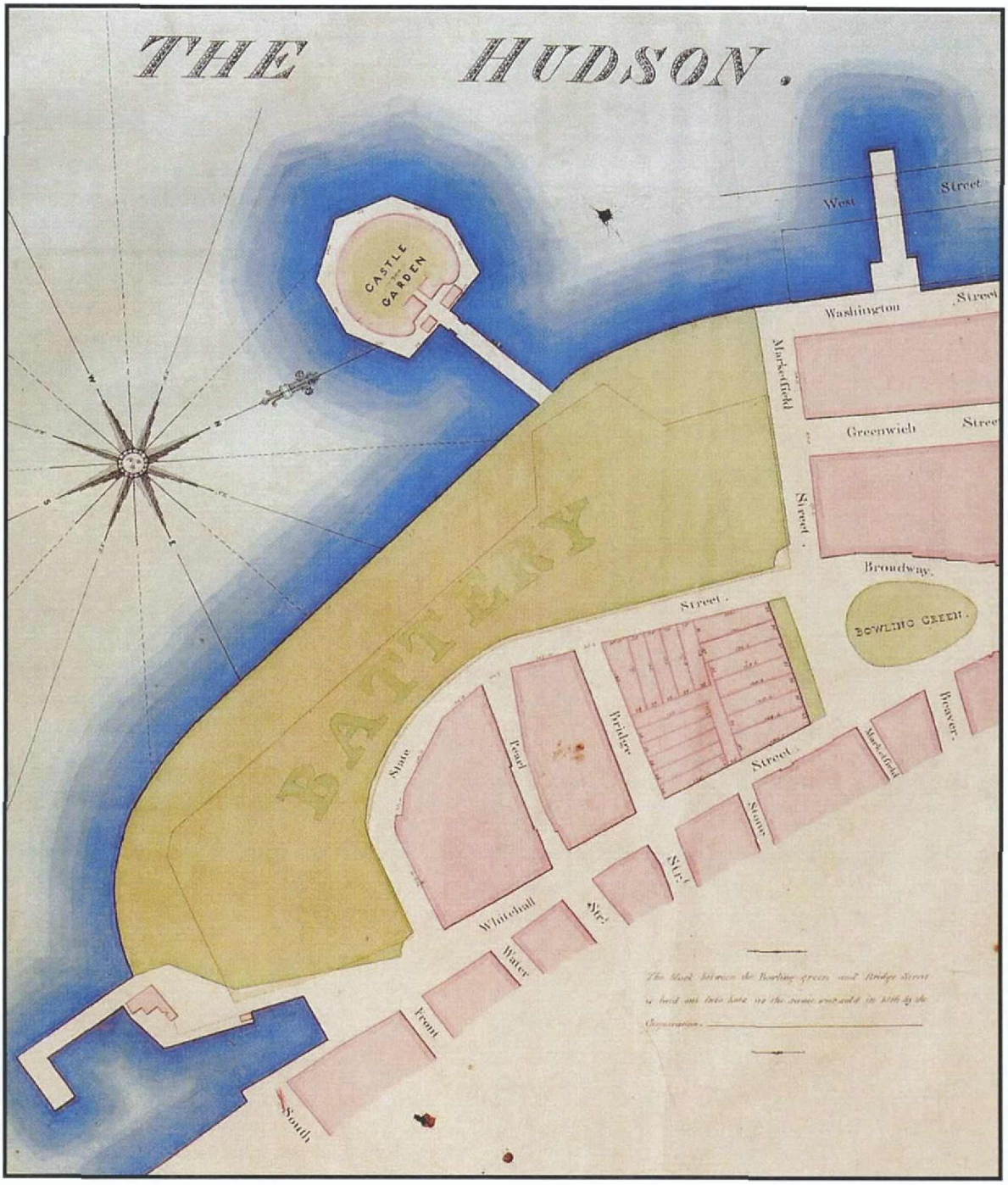

Figure 15: 1827 View of Battery Park and Castle Garden (Clinton) (Ewen 1827)

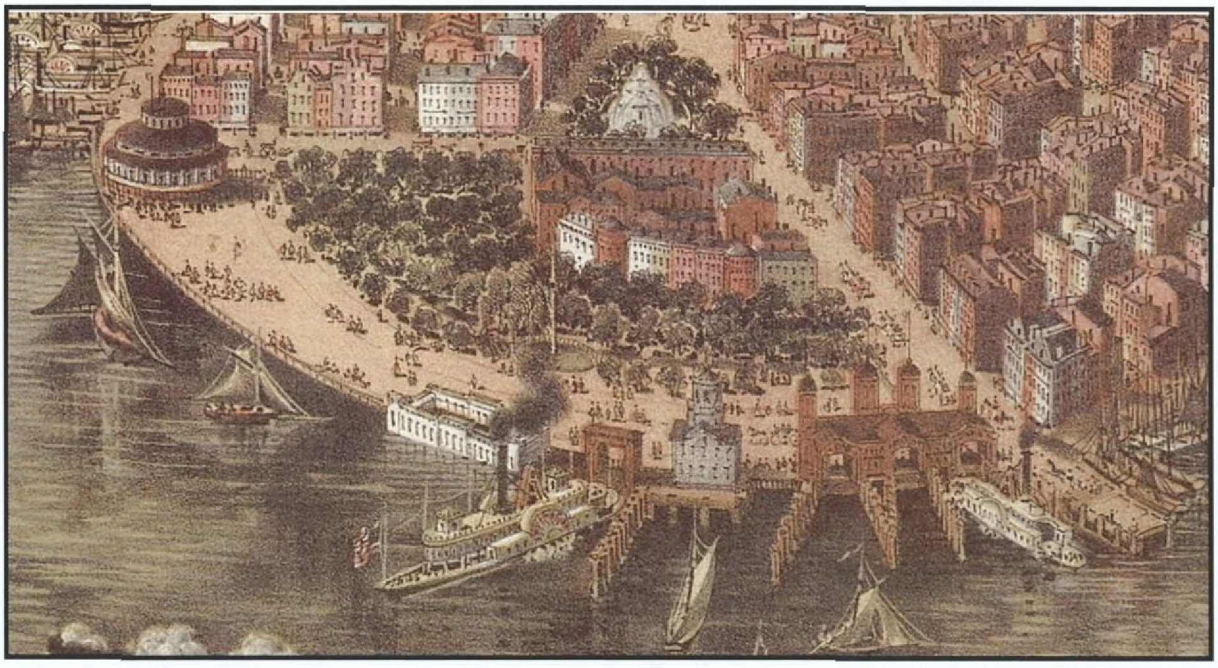

Figure 16: Bird's-eye View of Battery Park with Ferry Slips at the Southern End (Bachmann 1865)

Figure 17: 1870s View of the Ninth Avenue Elevated Railway in Battery Park (Reed 1978)

forming a "T" junction around the location of Peter Minuit Plaza (Cudahy 1995:10). Although the trains were fast and reliable, the populace of New York derided the El's as being quite noisy. Running along the eastern border of Battery Park at State Street, stops were constructed at Battery Place (at the foot of Greenwich Street), at Battery Park (opposite Bridge Street) and at South Ferry. The Ninth Avenue El transported passengers across New York City until its eventual closing in 1940, followed by the dismantling of the tracks in 1941 (Pirmann and Freeman 1995-2002).

At the end of the nineteenth century, Castle Garden's use as the immigration center was discontinued when immigration services were transferred to the federal government's control at Ellis Island. On December 10, 1890, Castle Garden was reopened as the New York Aquarium (Gilder 1936:233). It would function as the city's aquarium until 1941. In 1946, the fort was renamed Castle Clinton, and ownership was returned to the federal government when the property was listed as a National Monument. Castle Clinton now functions as the ticket booth for tourist ferries to Ellis Island and the Statue of Liberty and is operated by the National Park Service.

In the early twentieth century, further transportation changes came to New York City when the IRT opened their subway line on October 24, 1904 (Interborough Rapid Transit Company 1904; Jones 1978:149). The original line ran from City Hall northward to One Hundred Forty-Fifth Street on the Upper West Side. This line was expanded southward from City Hall to South Ferry (under Contract Two) on July 10, 1905 (Cudahy 1995:30). This extension is represented by the modern IRT 4/5 line running through the project area along State Street to Brooklyn, and the turn around loop for IRT 5 trains terminating at Bowling Green Station. Along State Street, the IRT line was constructed underneath the Ninth Avenue El supports. This technique for constructing the subway under the existing elevated structures was a common approach applied in other places in the city (Hood 1993). In some places, the foundations for the elevated railway were completely exposed as the sediments around them were removed to create room for the subway line. Figures 18 and 19 provide an example of the 1904 IRT subway construction in Battery Park and along State Street. Between 1906 and 1917, the BMT N/R line was constructed through the project area, creating the Whitehall Station stop as the first stop in Manhattan (Berger 2000). In 1918, the IRT 1/9 line was constructed through the project area. The IRT 1/9 line ran on the existing (outer) loop constructed in 1904 for the IRT 4/5 line, and an inner loop was built for the IRT 5 trains as the turn around track (Brennan 2002). The IRT 1/9 line ran down Greenwich Street and into the South Ferry Station, following the path of the Ninth Avenue El. The IRT 1/9 line excavations uncovered numerous buried utilities at Battery Place and Greenwich Street (Figure 20), the Kapsee rocks (Figure 21), and cannonballs in the park (Brennan 2002).

In the 1940s, the Triborough Bridge and Tunnel Authority (TBTA) began construction of the Brooklyn-Battery Tunnel, which sliced through the middle of Battery Park. When construction began in 1940, the Ninth Avenue El still ran along State Street (Figure 22), but by 1941, the elevated railway had been dismantled. Construction of the Brooklyn-Battery Tunnel obliterated the center of the park, but the area east of the tunnel was left relatively untouched, except for some temporary construction shelters (Figure 23).

The last transportation project conducted in Battery Park was the construction of the Battery Park Underpass linking West Street, now the West Side Highway, with South Street, now the FDR drive. This tunnel cuts directly south of the project area. Following the construction of the subway lines, the Brooklyn-Battery Tunnel, and the Battery Park Underpass, the paths and green spaces within Battery Park were revamped by Robert Moses and the New York City Department of Parks. Paths were shifted, several monuments were moved, and in 1952, Peter Minuit Plaza was created where the South Ferry elevated railway station had previously been located (New York City Department of Parks 1952). Since the construction of Peter Minuit Plaza, there have not been any significant modifications to the park's design.

Figure 18: 1904 Excavations for the IRT 4/5 Line Through State Street at Battery Park (Note the Presence of the Footings for the Ninth Avenue Elevated Railway) (NYCT Museum Archives)

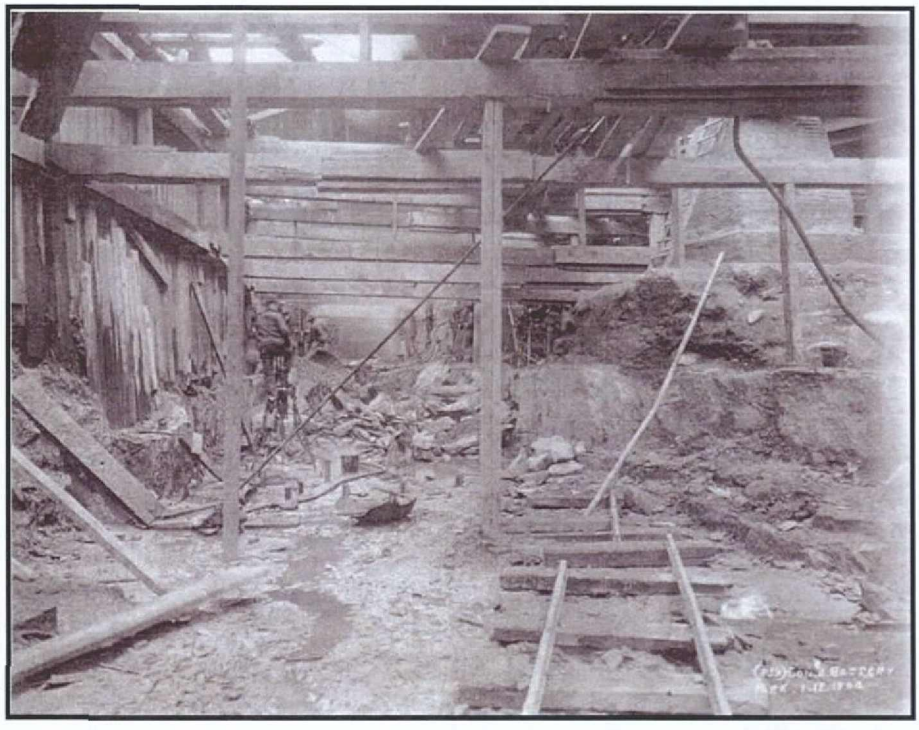

Figure 19: 1904 Excavations for the IRT 4/5 Line Through Battery Park (Note the Presence of the Footing for the Ninth Avenue Elevated Railway) (NYCT Museum Archives)

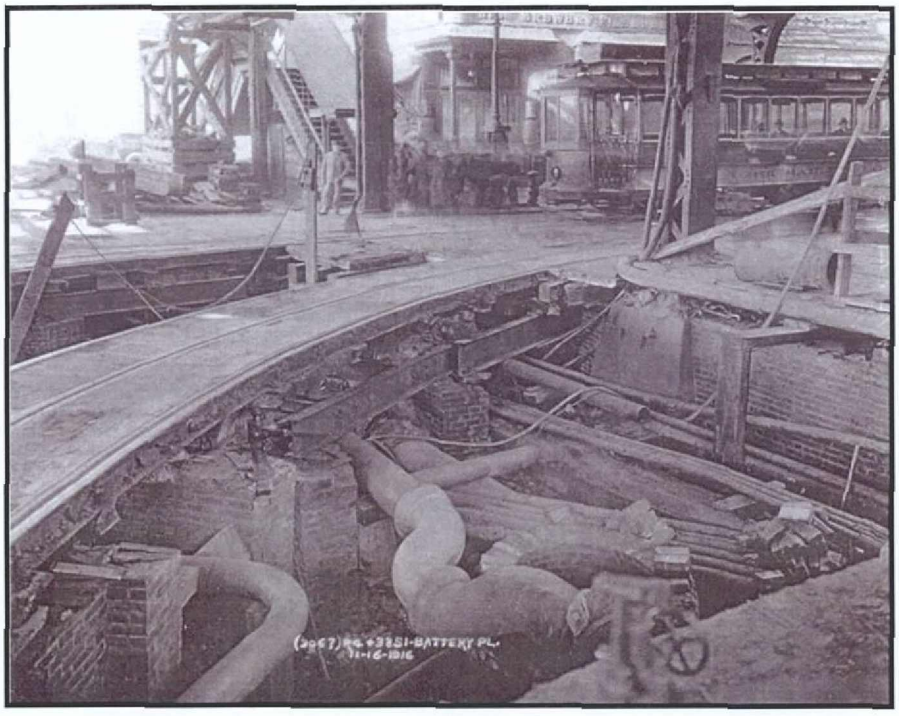

Figure 20: 1916 Excavations for the IRT 1/9 Line at Greenwich Street and Battery Place Revealing Several Utilities and Brick Foundations (NYCT Museum Archives)

Figure 21: Excavations for the IRT 1/9 Line along Battery Park (Note the Large Glacial Boulders on the Right, Most Likely the Kapsee Rocks) (NYCT Museum Archives)

Figure 22: 1940 Aerial View of Battery Park (NYCT Special Archives)

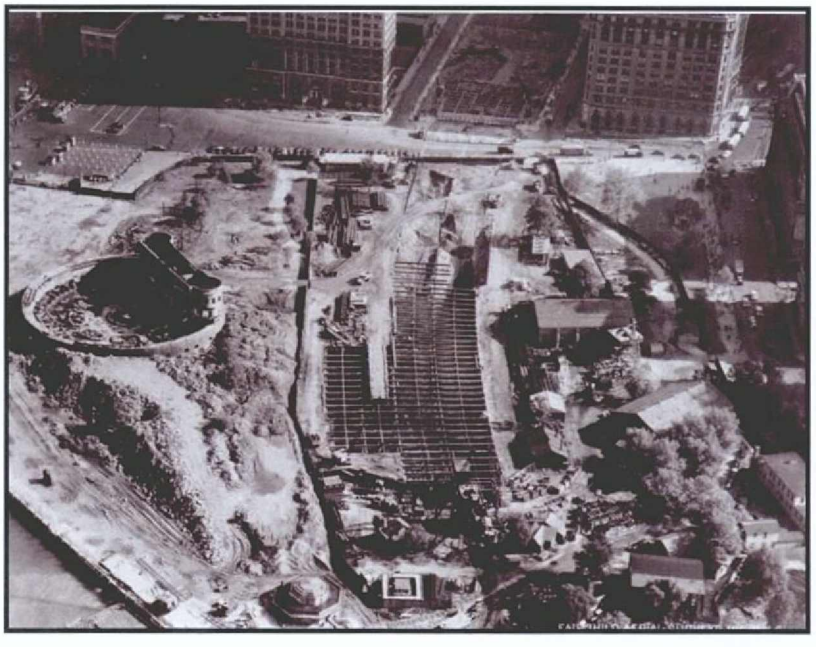

Figure 23: 1949 Aerial View of Battery Park During the Construction of the Brooklyn-Battery Tunnel (NYCT Special Archives)

V. ARCHAEOLOGICAL RESOURCE POTENTIAL

V. ARCHAEOLOGICAL RESOURCE POTENTIAL

Research was conducted at several repositories to collect information on recorded archaeological resources in the project area and vicinity and the possible presence of unrecorded archaeological resources. Field reconnaissance was also performed at the project site. The purpose of the research was to determine on a preliminary basis whether proposed construction activities would disturb any significant or potentially significant archaeological resources. Sources for background research included the New York State Museum and NYSOPRHP files for information on previously recorded archaeological sites in the project area and vicinity; the New York City Landmarks Preservation Commission (LPC) for information on recorded historic properties in the project area and vicinity; and recent cultural resource studies, for map data and historical documentation on historical use of the project area and vicinity.

A. PREVIOUSLY CONDUCTED ARCHAEOLOGICAL STUDIES IN THE PROJECT AREA AND VICINITY

A review of previously conducted archaeological studies of the project area indicated that there have not been any studies conducted in the Battery Park portion of the project area, and one archaeological project has been conducted in Peter Minuit Plaza. Griswold (2001) summarizes the previous archaeology conducted at Castle Clinton, which looked at differences between the design of Castle Clinton and archaeological features identified in the mid-twentieth century. Outside the park, archaeological work conducted in advance of the renovations to Whitehall Ferry Terminal (Berger 2000; Historical Perspectives, Inc. 1993) discussed the potential for archaeological resources in Peter Minuit Plaza. Based on the Historical Perspectives, Inc., report (1993), Berger (2000) excavated six small back-hoe trenches and identified traces of an early colonial cobb-style wharf (Heintzelman-Muego 1983). The remnants of this wharf are located on the south side of State Street and west of Whitehall Street. This location is just north of the proposed location for the New South Ferry Terminal station where it will connect to the BMT N/R Whitehall Station. As this cobb-style wharf is located close to the project area, there is potential to encounter additional remnants of this early eighteenth-century archaeological resource within this portion of the project area.

Two additional projects have been conducted outside the project area (Geismar 1986, 1987). These reports also indicated the potential for early colonial-period artifacts within undisturbed sections of their respective project areas (17 State Street and 10 Battery Place).

B. PREVIOUSLY DOCUMENTED ARCHAEOLOGICAL SITES WITHIN THE PROJECT AREA AND VICINITY

A search of the New York State Museum and NYSOPRHP site files revealed no previously identified archaeological sites within the project area. However, during the excavation of the Brooklyn-Battery Tunnel, volunteers from the New-York Historical Society identified nineteenth-century historic archaeological artifacts in the fill excavated for the tunnel. A catalog of the recovered material is published on the New-York Historical Society's Luce Center web page (http://luceweb.nyhistory.org/luce/luceweb/), and a search of their museum records provided a summary of the artifacts from Battery Park. During the Brooklyn-Battery Tunnel construction in 1948 through 1950, New-York Historical Society members recovered several intact bottles, 31 ceramic fragments, several bottle-glass, metal, and clay-pipe fragments, and a complete jackknife. Additional artifacts found in Battery Park include: the tip to a piling for a pier/wharf between Greenwich and Washington streets, uncovered in 1947; a copper coin, dating to 1734, found in Battery Park in 1911; and a cannonball imbedded in cinders, found during subway excavations. There is a complete list of the artifacts from Battery Park that are housed at the New-York Historical Society in Appendix B.

C. PROJECT AREA ARCHAEOLOGICAL POTENTIAL

1. Cartographic Resources

To assess the project area's potential for archaeological resources, a Geographic Information Systems (GIS) database was created to track the development and use of the project area through time. The software program ArcView 3.2a was used to create and analyze the GIS database for the New South Ferry Terminal. The base data for the project's GIS is the New York City Landbase (NYCMap), which was made available through the efforts of NYCT. The NYCMap uses the New York State Plane Coordinate System, Long Island Zone, with the NAD 83 Horizontal Coordinate Datum. All GIS data created for this project were plotted on the NYCMap directly or were georeferenced in ArcView using the ImageWarp 2.0 extension (McVay 1999). Historic maps were digitally scanned, georeferenced, and their shorelines and relevant features were digitized. Plans drawn by the TBTA for the Brooklyn-Battery Tunnel were also consulted and digitized as they indicated the presence of utilities in 1941(Singstad 1941b, 1941c, 1941d, 1941e, 1941f, 1941g, 1941h, 1941i, 1941j, 1946).

The following pages present a cartographic evolution of the project area, beginning with the Dutch land grants from the seventeenth century and finishing with the utility summary from the TBTA plans. For clarity's sake, only the project area, the proposed terminal, and subway lines were plotted over the historic maps. Within Battery Park the project area is defined as the area constrained by the existing IRT 1/9 line to the east (along State Street) and the Brooklyn-Battery Tunnel to the west until the proposed lines cross the existing IRT 1/9 lines west of Pearl Street. At this point the project area turns east and continues under the existing IRT 1/9 and 4/5 lines, until passing under the existing IRT 4/5 express lines. The project area is constrained by the eastern portion of the IRT 1/9 and 4/5 loop, and the express IRT 4/5 lines to the south. The project area, at this point located within Peter Minuit Plaza, crosses under the IRT 1/9 and 4/5 loop, and the remainder of the proposed terminal will be located between the IRT 1/9 and 4/5 loop, and the existing BMT N/R Whitehall Station.

Stokes's 1915 summary of the Dutch land grants (Figure 24) indicates the project area was for the most part located in the offshore (and submerged) portion of Manhattan Island. The northern portion of the project area is, however, located on original exposed landmass. The northern section of the project area would have crossed over a small portion of Lot 5 of Block H in the original land grants. Lot 5 had originally been deeded to a Francis Doughty (also spelled *Francoys Douthey*) in 1649; it was sold to Charles Morgan in 1652, and then to Jan Dircksen in 1657. When the British took Fort Amsterdam in 1664, the land was transferred to Governor Nicolls, who sold the land back to Jan Dircksen and Samuel Edsall (Stokes 1915:388). North of Lot 5 was the mill adjacent to Fort Amsterdam. The area of the proposed fan plant is located just north of where this mill stood and within the former Wagon Road to the Strand (the beach), also known as Beaver's Path.

Miller's 1695 map of New York (Figure 25) offers the first look at where the project area would have been located in the colonial period. The southern portion of the project area remains offshore while the northern portion is situated along the shore and at the location of Leisler's Half-Moon Battery. The Battery is located along the proposed subway tracks, about 250 feet south of present day Battery Place and 225 feet north of the cross-over for the proposed tracks. This area of the seventeenth century battery will be directly affected by the proposed subway tracks. The area of the proposed fan plant appears to coincide with a portion of the northwestern corner of the fort, known as Fort William Henry at the time of Miller's map. It is likely that the proposed fan plant will impact the remnants of the fort or land that was located within the confines of the fortified walls of the fort.

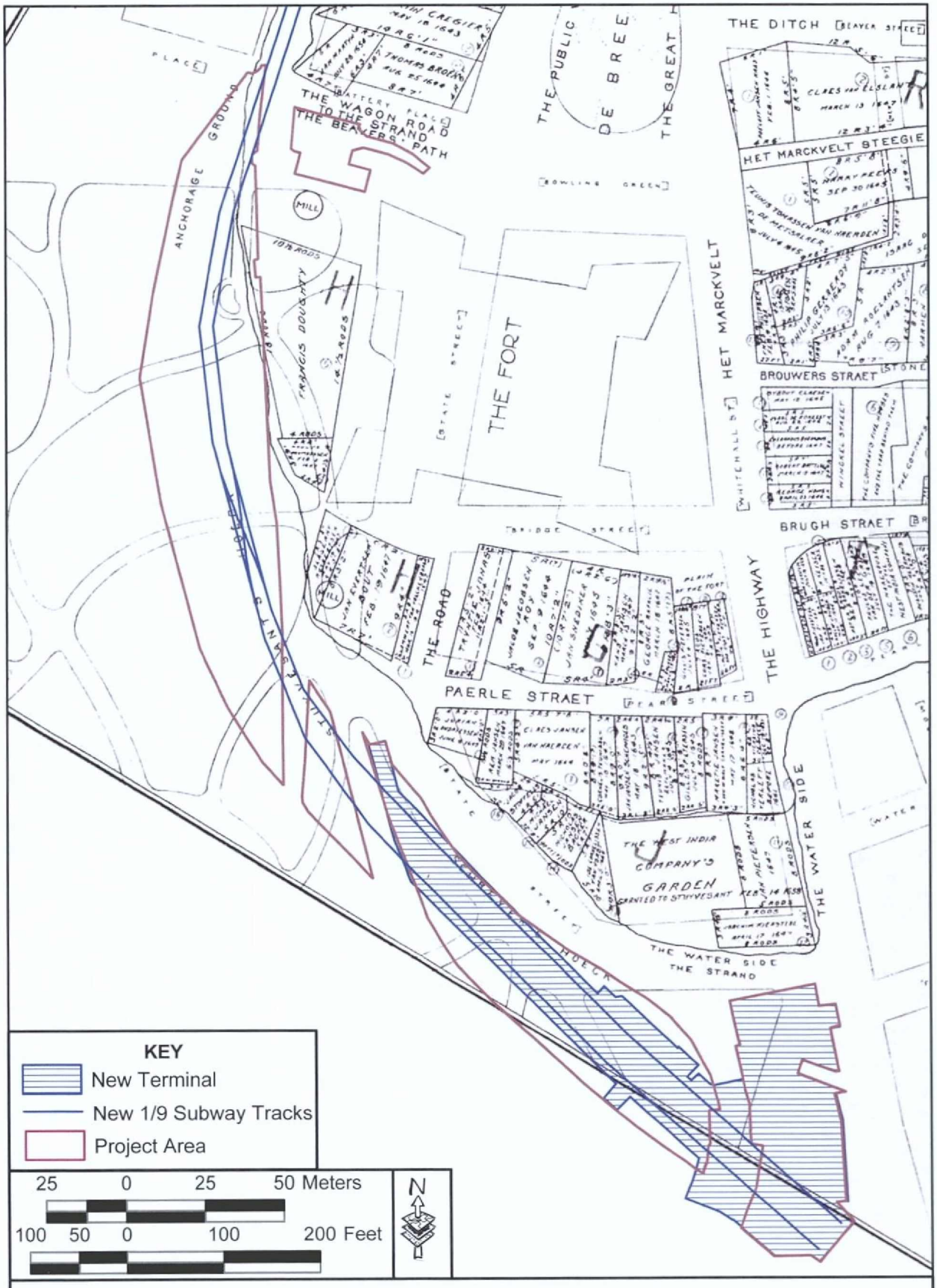

FIGURE 24: Original Dutch Land Grants in the Early Seventeenth Century *Source: Stokes 1915*

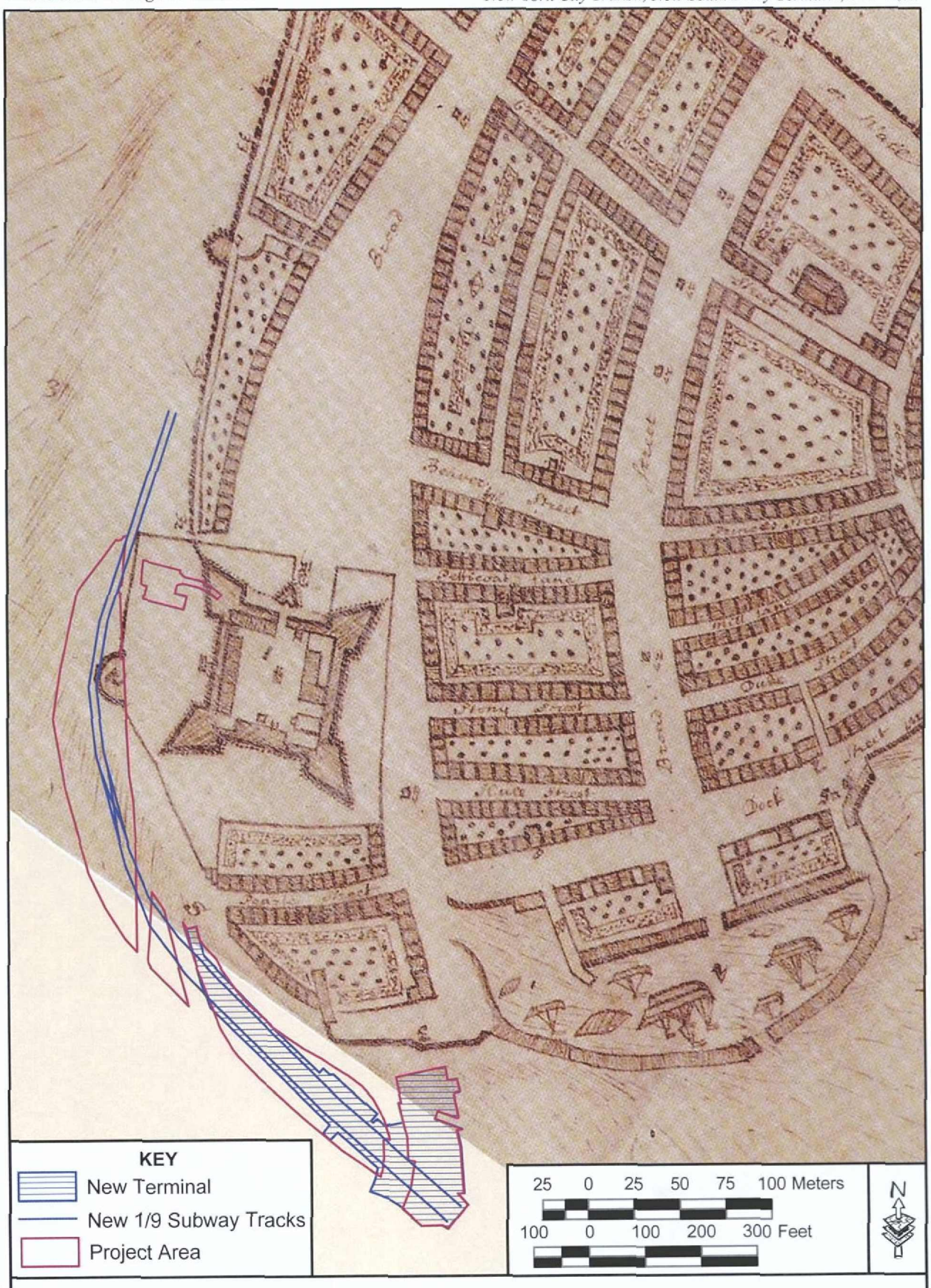

FIGURE 25: New South Ferry Terminal Project Area in 1695 *Source: Miller 1695*

There are two maps from 1730, one by Carwitham (Figure 26), and the second by Lyne (Figure 27) (Carwitham 1730; Lyne 1730). Both indicate similar structures present within the project area. By 1730, the fort is now known as Fort George, as shown on Figure 26. The southern portion of the project area remains for the most part off the island of Manhattan or barely on the southern shore. The proposed New South Ferry Terminal station is depicted as lying on the Kapsee rocks, but realistically, the entire shore at this end of Manhattan was covered with these large glacial boulders. The northern section of the project area is situated on seventeenth-century landfill and covers the western battery positioned on the shore of Manhattan. Greenwich and Washington streets have not yet been constructed, although they are indicated by the blocks to the west of the shore. The proposed area of the fan plant is partially located within the northwestern section of Fort George, overlapping both the corner of the fort and two structures located just inside the fortified walls.

Over the next thirty years, the area around Fort George saw a great deal of landfill added south of modern State Street. By 1767 (Figure 28), this extended area of Manhattan had created Whitehall Slip, and a battery had been added west of this slip. A defensive fortification was constructed at Whitehall Slip that encompassed the previous defensive wall that ran along the west of Fort George. This fortification wall cuts through the proposed location for the New South Ferry Terminal station in the south and along Leisler's Battery in the north. Military barracks constructed at the fort are located along modern-day State Street and would appear to be at the northern edge of the proposed Terminal station. A pond is also depicted within the area of modern day Peter Minuit Plaza and would be located within the proposed Terminal station. This pond was filled in by the next decade (Berger 2000). The proposed fan plant location remains positioned over the northwestern portion of Fort George.

Following the Revolutionary War, the majority of the project area is located along the edge of Manhattan Island, along the military fortifications associated with the fort; the southern portion of the project area remains located over the military barracks and the southern batteries (Figure 29). Greenwich Street is now a fully operational street and represents the western shore of the city. Bowling Green has been constructed just to the north of Fort George. It is around 1789 that Fort George was torn down and used as fill to create Battery Park. It is possible that the fort had already been torn down when this map was finalized as the fort appears smaller than depicted on previous maps. The western section of the proposed fan plant location is located over two structures within the confines of the fortified walls along the western shore of Manhattan Island. The pond that existed south of State Street and the barracks has now been filled in.

At the beginning of the nineteenth century, it is known that the fort had been torn down and the batteries along the west and south had also been removed to create Battery Park. Maps from 1803 (Figure 30) and 1808 (Figure 31) are not accurate representations of the area as they portray the planned configuration for the city at the beginning of the nineteenth century (Cohen and Augustyn 1997:96-99). The Mangin-Goerck Plan (Figure 30) depicts the batteries still on the shore, but these had already been torn down. Mangin decided to present the city not as it existed, but "such as it is to be (Cohen and Augustyn 1997:96)." Therefore, the configuration of the battery in Figure 30 is not a direct representation of the area. The location of the battery on the 1803 map can be considered as an approximate location of the now destroyed battery. Bridges' 1808 plan of the city correctly indicates that Battery Park no longer contained any batteries (Figure 31). The proposed fan plant location is shown to be within Battery Place.

In 1827, the most accurate map of the project area was produced by Daniel Ewen (1827) with his hand-drawn maps of the waterfront along the Hudson and the East rivers (Figure 32) Ewen's map provides an accurate representation of three aspects of the park: the location of Castle Garden (Clinton), the location of the recently expanded park bulkhead (built in 1824), and the location of the original 1790 park bulkhead, represented by the gray line running slightly inland of the 1824 bulkhead line. This map also indicates that Washington Street had been established. The project area is almost entirely located within the park as only

FIGURE 26: New South Ferry Terminal Project Area in 1730 *Source: Carwitham 1730*

FIGURE 27: New South Ferry Terminal Project Area in 1730 *Source: Lyne 1730*

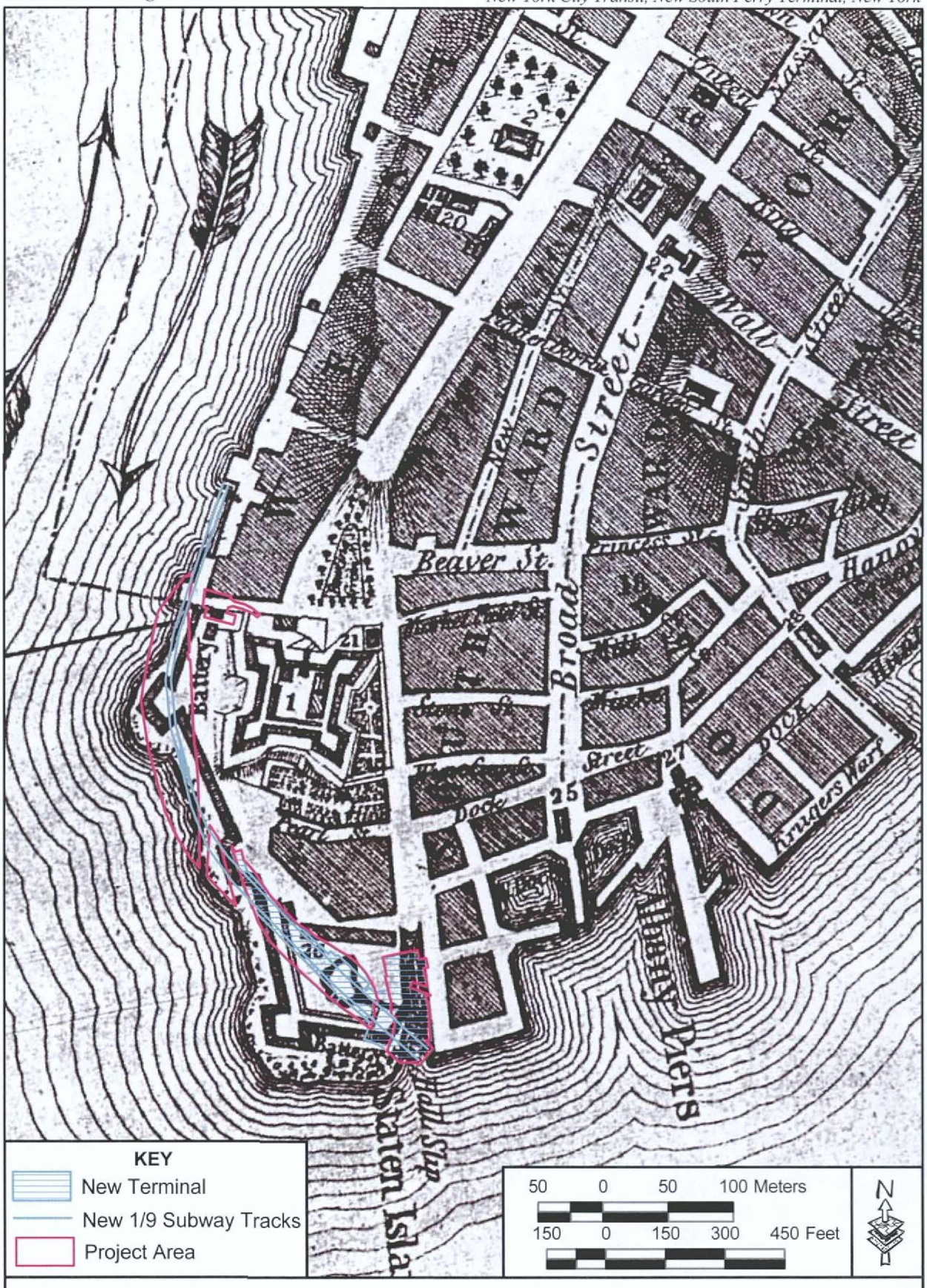

FIGURE 28: New South Ferry Terminal Project Area in 1767 *Source: Ratzen 1776*

FIGURE 29: New South Ferry Terminal Project Area in 1789 *Source: McComb 1789*

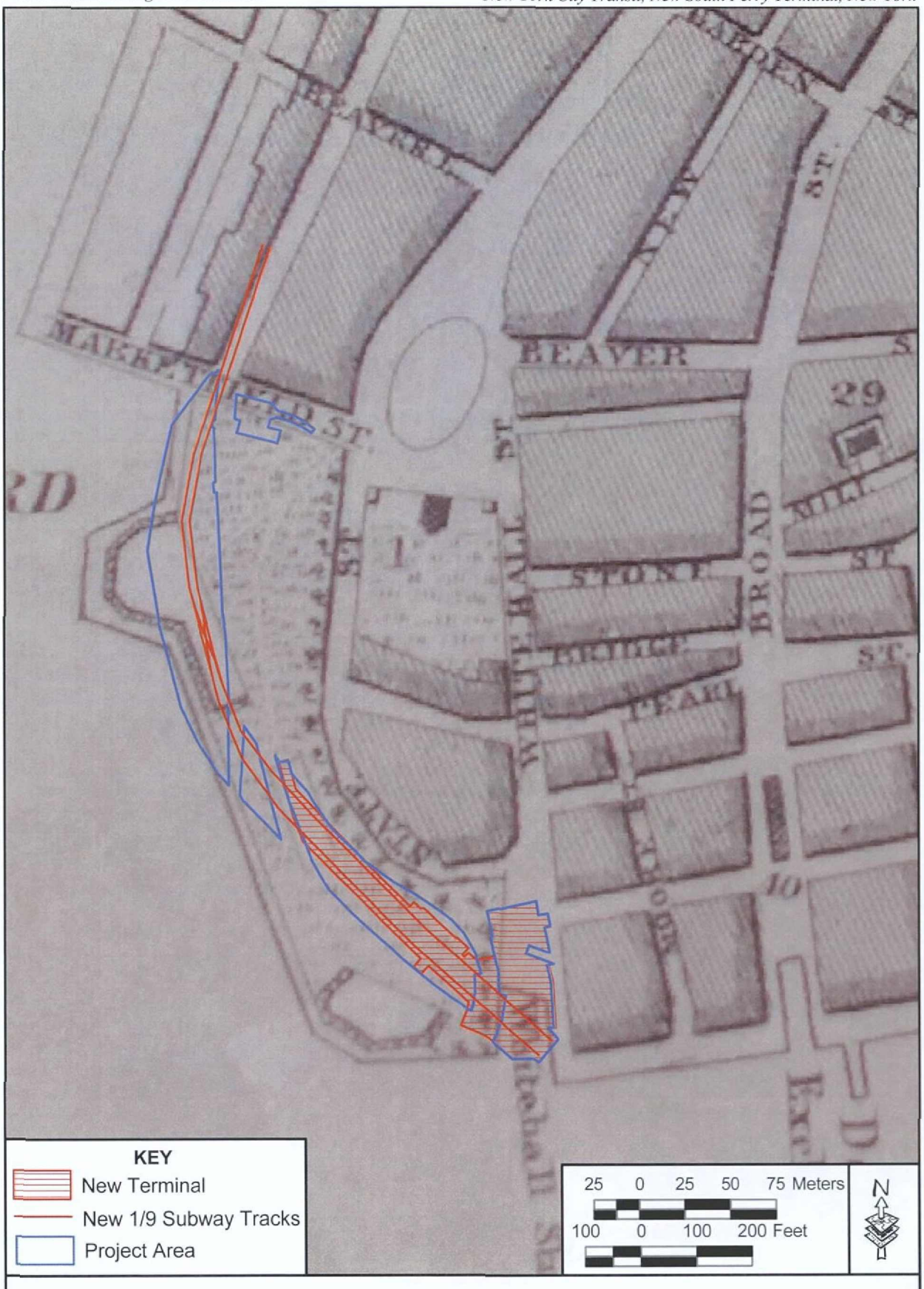

FIGURE 30: New South Ferry Terminal Project Area in 1803 *Source: Mangin & Goerck 1803*

FIGURE 31: New South Ferry Terminal Project Area in 1808 *Source: Bridges 1808*

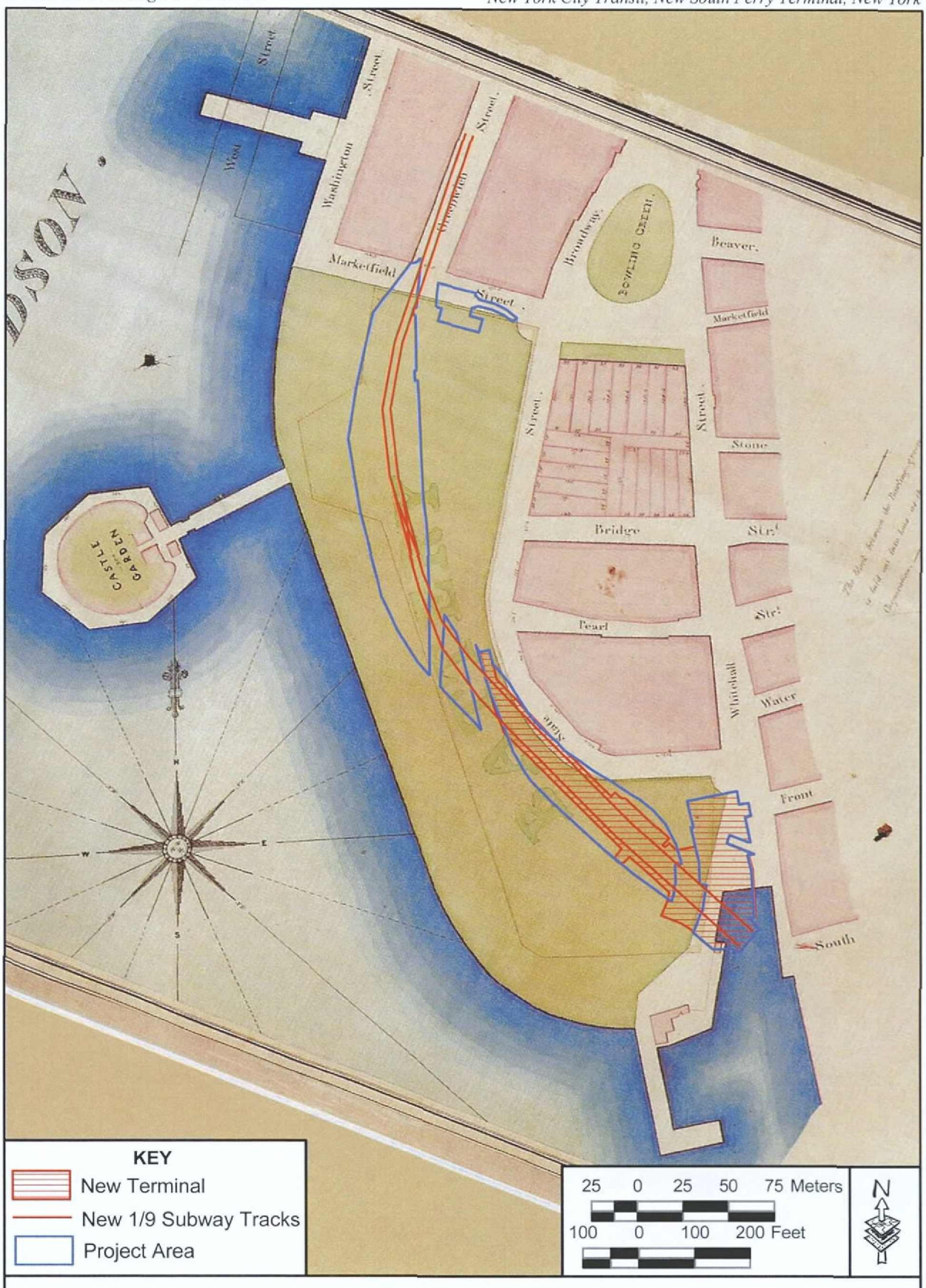

FIGURE 32: New South Ferry Terminal Project Area in 1827 *Source: Ewen 1827*

a small portion of the proposed Terminal station is located within Whitehall Slip. The northern portion of the project area is located within the boundaries of the 1790 bulkhead for the park, while the tracks begin along Greenwich Street. The proposed fan plant is within Battery Place and the northern limits of Battery Park. The proposed Terminal station is located just south of State Street and largely within the confines of the portion of Battery Park that was extended out into Peter Minuit Plaza during the nineteenth century. The southern end of the project area crosses the early nineteenth-century bulkhead forming the edge of Whitehall Slip.

The 1852 map of the city produced by Matthew Dripps (1852) is a remarkable documentation of Manhattan real estate and property boundaries (Figure 33). Within the project area, the paths through Battery Park are mapped, and when compared to the Ewen (1827) map (Figure 32), the position of the 1824 bulkhead is nearly identical. The entire project area is shown now entirely located on Manhattan Island as the southern end of Whitehall Street has been filled in, thereby removing Whitehall Slip. The northern section of the project area, where the fan plant is to be located, is within the limits of Battery Place and the northernmost path of Battery Park.

In 1865, the project area is shown to be entirely located on Manhattan Island when mapped on Viele's sanitary map of Manhattan (Figure 34). This map also indicates the original boundaries of Manhattan Island. Once the project area is mapped over the original island, it is clear that the northern portion of the project area, including the entire fan plant, is located on the original island. It appears that the seventeenth-century battery was constructed on the original island without a great deal of modification to the shoreline.

At the beginning of the twentieth century, Battery Park has seen significant changes to its landscape, most of which are related to transportation improvements. The Hyde 1906 map indicates three transportation facilities in the park: the Ninth Avenue El; the street-level trolley lines; the IRT 4/5 line, which ran in a loop under State Street and the park; and the express line to Brooklyn (Figure 35). At the northern edge of the park, at Battery Place and Greenwich Street, was the Battery Place station. The elevated railway then turned east toward State Street and ran along State Street until reaching South Ferry station. The northern section of the project area is located under the Battery Place station, and the proposed fan plant intersects with some of the street-level trolley lines. The proposed Terminal station is located underneath the T-junction of the South Ferry elevated station, and the Ninth Avenue, the Third Avenue, and the Second Avenue elevated lines. Locations of the footings for the elevated railway supports were plotted on the plans drawn by the TBTA during the construction of the Brooklyn-Battery Tunnel. Based on these plans, some footings for the elevated railway supports are located in the project area.

A 1908 map (Bromley 1908) of the project area provides similar information regarding the subway, elevated, and trolley lines running through and around Battery Park though the locations of the subway lines within Battery Park are not entirely accurate compared to the modern mapping of these lines (Figure 36).

2. Shoreline and Structures in the Project Area

Digitizing the shorelines from the historic maps, it is possible to trace the evolution of the waterfront within the project area from the original Manhattan shoreline through the construction of Battery Park and Peter Minuit Plaza. Figure 37 presents changes in the shoreline in the project area through time. Although several historic maps were consulted and georeferenced, for clarity's sake, this figure presents only changes in the shoreline. If two maps depicted the same shoreline, only the earlier shoreline is presented in Figure 37. The original shoreline (in light blue) of Manhattan Island is shown crossing through the northern section of the project area and then traveling down State Street, where it turns east toward Water Street at Whitehall Street. A portion of the new track section of the project area and the entire fan plant section are located on original

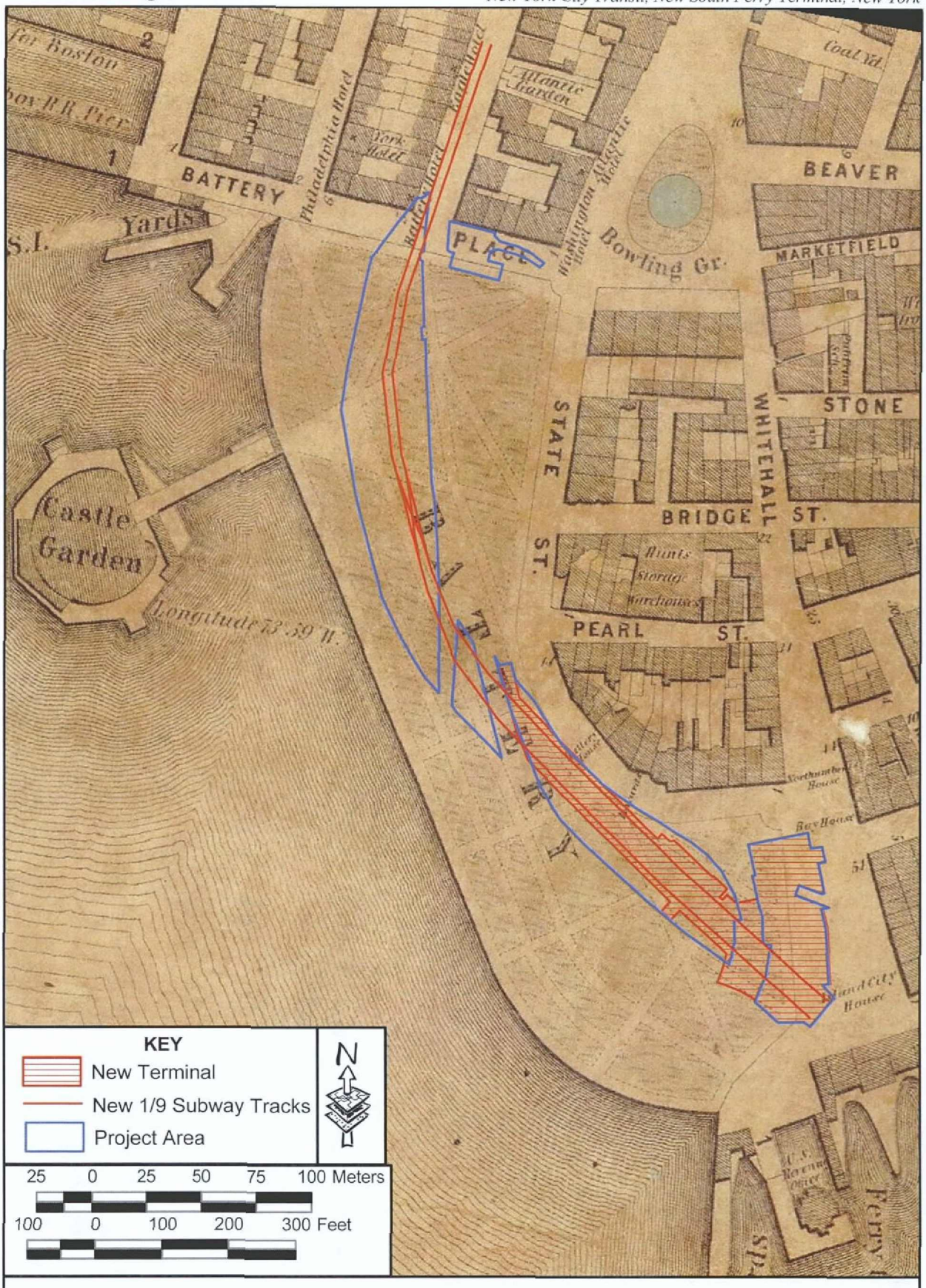

FIGURE 33: New South Ferry Terminal Project Area in 1852 *Source: Dripps 1852*

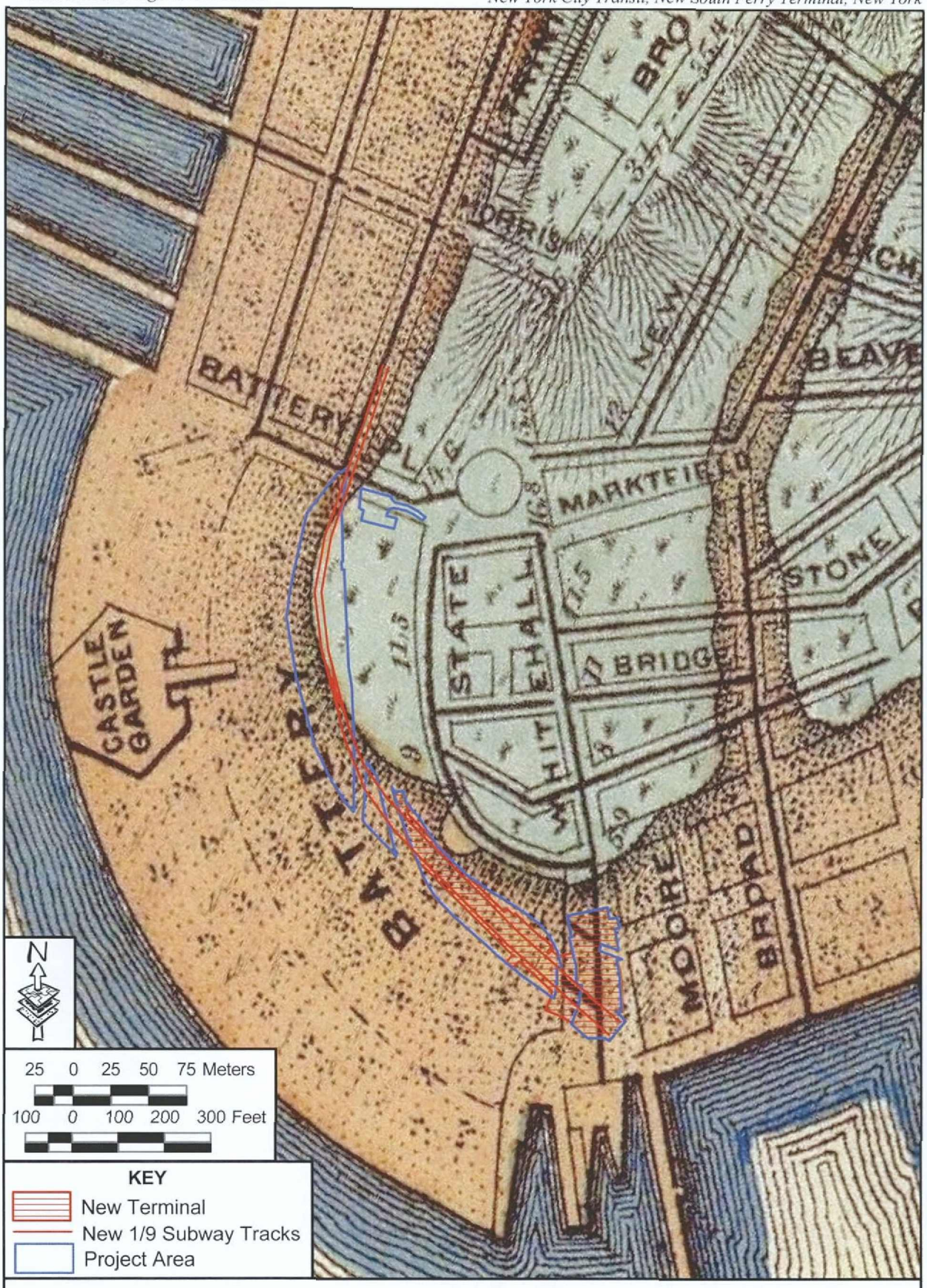

FIGURE 34: New South Ferry Terminal Project Area in 1865 with the Original Manhattan Shoreline

Source: Viele 1865

FIGURE 35: New South Ferry Terminal Project Area in 1906 *Source: Hyde 1906*

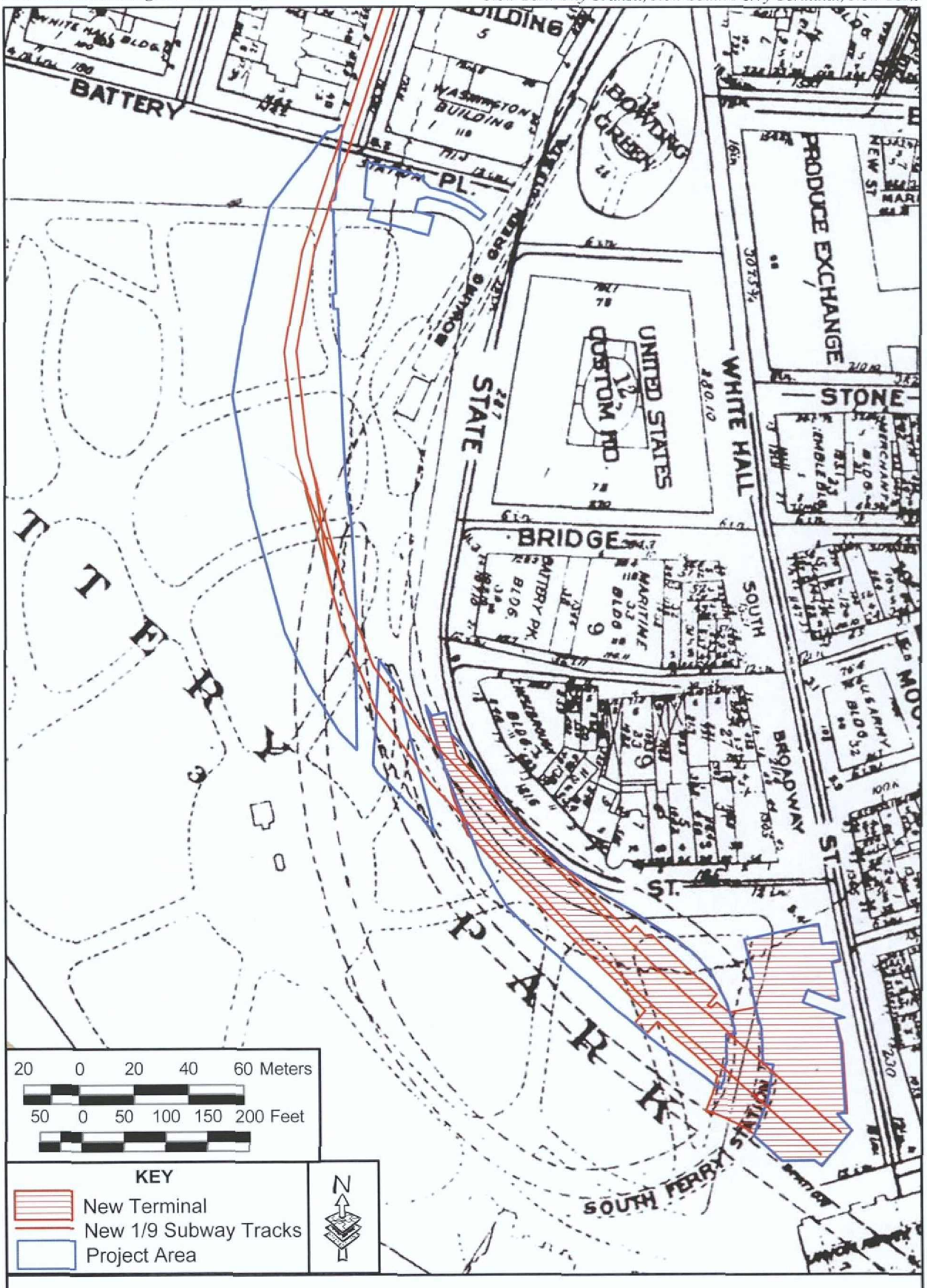

FIGURE 36: New South Ferry Terminal Project Area in 1908 *Source: Bromley 1908*

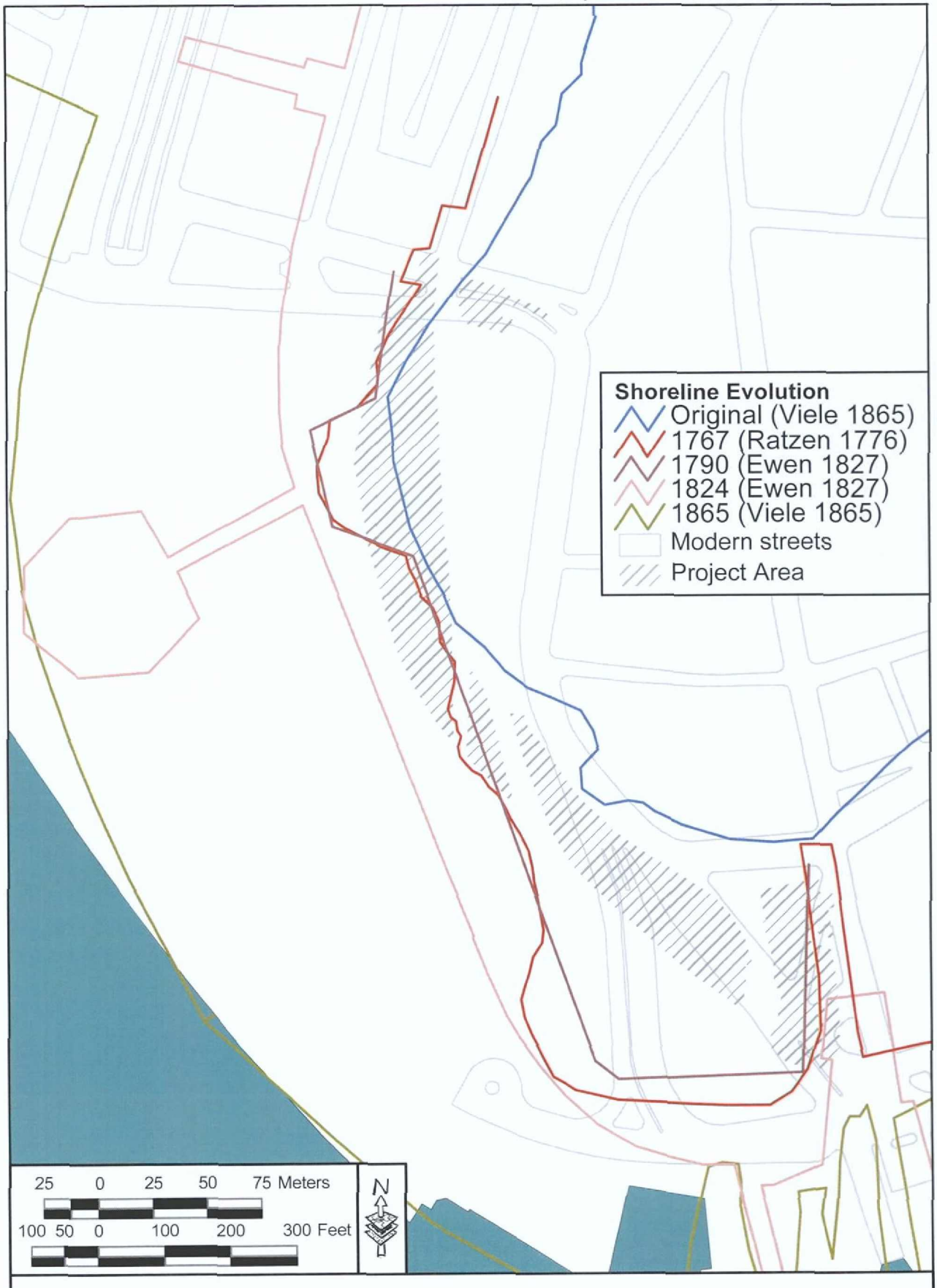

FIGURE 37: Shoreline Evolution of the Project Area

Source: NYCMap GIS, Ewen (1827), Ratzen (1776), Viele (1865)

Manhattan Island land. From the time the Dutch and British occupied Manhattan to the years before the Revolutionary War, some land was added to the project area, such as the expansion of the battery, but for the most part, the land was left relatively untouched. Dongan's Half-Moon Battery was located within the original shoreline of Manhattan. In 1767 (shoreline in red), there is a large increase in the southern portion of the project area, creating Whitehall Slip at the eastern edge of the project area. The western battery was also extended, pushing the battery beyond the western extent of the project area. In 1790, once the fort had been razed, the shoreline was evened out, and a bulkhead was created along the eighteenth-century shoreline, forming the western edge of Battery Park (brown shoreline). Whitehall Slip remained in place at this time. The northern edge of the project area cut through the 1790 bulkhead, and the southern end of the project area would have been located partially within Whitehall Slip. When Battery Park was expanded in 1824 (pink shoreline), Whitehall Slip was partially filled in, thereby decreasing the length of the slip. The bulkhead of Battery Park was pushed out, and the southern end of the project area would have been located within a small portion of the 1824 bulkhead. With the expansion of Battery Park in the 1850s (dark green shoreline), Castle Clinton was encompassed by the park, and Whitehall Slip was filled in. Since the 1850s, there have been no changes to the shoreline within the project area.

A similar reconstruction can be made of the historic archaeological structures that were built within the project area. These archaeological structures include the fortifications/military installations built during the Dutch and British occupation and the Ninth Avenue El. Figure 38 provides the spatial location of the elevated railway and four different military fortifications. The earliest fortification shown is taken from Miller (1695) and depicts the location of the original battery, Dongan's Half-Moon Battery (shown in red). This battery is located in the northern section of the project area. In 1767 (shown in blue), the battery appears to have shifted westward as a result of the expansion of the fortifications surrounding the fort in the mid-eighteenth century. Along Battery Place, the proposed fan plant may be positioned over the potential location of a structure situated inside the fort's external fortification walls. Both the central portion of the project area, along State Street, and the southern portion containing the Terminal station cut through the military fortifications that were in place in 1767. The military barracks shown on the 1789 map (in orange) are also within a portion of the proposed Terminal station. On the Hayward 1803 map, the battery has shifted away from the area of the 1695 and 1767 batteries. However, as indicated above, this map (Mangin and Goerck 1803) took great liberties in depicting the location of streets and structures, such that it is considered to be less accurate than the other maps consulted for this project. Despite these inaccuracies, this map points to a battery located in the northern portion of the project area. The last archaeological structure indicated on Figure 38 is the Ninth Avenue El, which ran through Battery Park to State Street and down to the southern end of Whitehall Street (in black and yellow). The elevated railway crossed the project area in three places: at Battery Place; in the middle of the project area (south of State Street and into Peter Minuit Plaza); and at the eastern side of Peter Minuit Plaza. Following the construction of the Ninth Avenue El in the 1870s, the project area has not been the focus of any additional improvements that could have created potential archaeological resources. However, the Ninth Avenue El was in use into the twentieth century and can be considered as a nineteenth- and a twentieth-century resource.

3. Boring Logs

Figure 5 presented the location of soil borings excavated in the 1930s and 40s, and Appendix A presents information regarding the composition of the borings. The logs for six soil borings, Numbers TB-21, TB-22, TB-23, TB-24, TB-25, and TB-26, indicate the presence of potential archaeological material. The majority of the archaeological material identified in the logs is brick, cinders, or timbers. The six borings with potential archaeological material are located in areas where historic maps indicate potential archaeological structures. Borings TB-21, TB-22, and TB-26, indicating the presence of a timber (at 12.5 feet) cinders, and brick, are located in the area of the 1767 fortification shown in Figure 28. Borings TB-23, TB-24, and TB-25, indicating the presence of cinders, brick, and mortar, are in the approximate location of the military

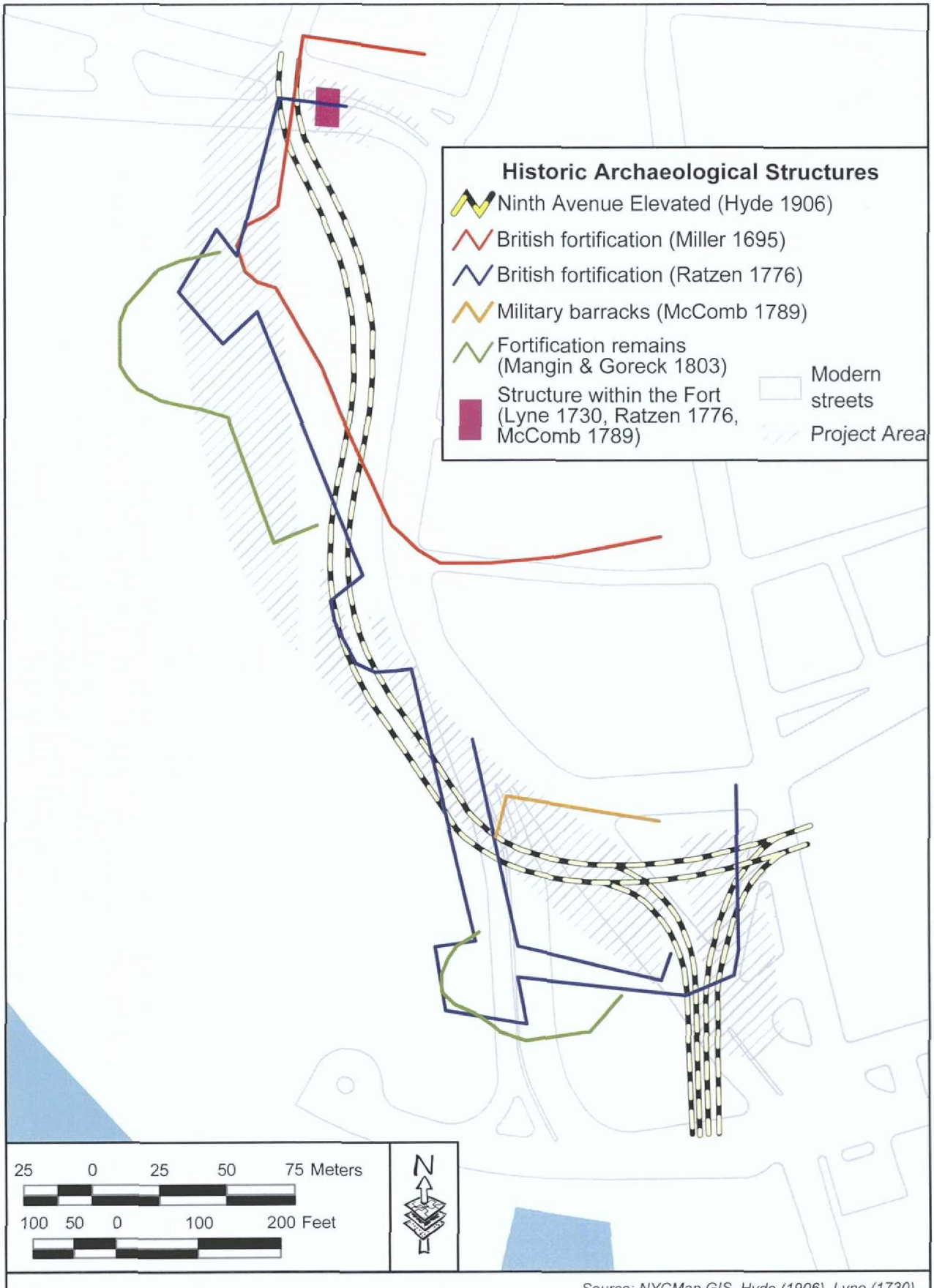

FIGURE 38: Military Fortifications Around Fort Orange/ Fort George and the Ninth Avenue Elevated Railway

Source: NYCMap GIS, Hyde (1906), Lyne (1730), Mangin & Goreck (1803), McComb (1789), Miller (1695), Ratzen (1776),

barracks and internal fortifications, as shown in Figure 28. The presence of timbers at Boring location TB-21 suggests the possibility that the fortification along the eastern side of Peter Minuit Plaza, the remnants of the military barracks, and the internal military fortifications within Peter Minuit Plaza may remain intact at these locations.

4. Industrial-Era Intrusions into the Project Area

The detailed plans of Battery Park drafted by the TBTA for the construction of the Brooklyn-Battery Tunnel were consulted to identify any previously undocumented utilities, below ground structures, or the like within the project area. A total of ten drawings of the park (Singstad 1941b, 1941c, 1941d, 1941e, 1941f, 1941g,1941h, 1941i, 1941j, 1946) were digitally scanned, stitched together, and georeferenced to the modern NYCMap GIS. From this georeferenced image, all utilities, underground structures, and elevated railway footings were digitized. Utility data supplied by NYCT for Peter Minuit Plaza were also incorporated into the utility mapping. Figure 39 presents the utility information for the project area. Numerous utilities run through the project area, including electrical, sewer, water, gas, telephone, and a U.S. Treasury mail tube. This Treasury tube ran from the north of the park to the old U.S. Customs House at Bowling Green. Located in the northern portion of the project area along Battery Place are five elevated railway footings, three located west of Greenwich Street and three east of the existing IRT 1/9 subway. Battery Place also contains the remnants of the streetcar tracks that used to run from Greenwich Street down to State Street. The 1941 maps of Battery park indicate that the streetcar tracks were removed while the underground yokes, ducts, and appurtenances were abandoned in place (Singstad 1941b, 1946). Judging from the view of Battery Place at Greenwich Street shown in Figure 20, considerable underground structures associated with the streetcar tracks may remain underneath Battery Place in this portion of the project area. Despite the abundance of utilities throughout the project area, it is not anticipated that such utilities have disturbed the deeply buried archaeological resources. However, the presence of these utilities will impose severe constraints during the field work phase of this project.

5. Areas of Archaeological Resource Potential

Based on the historic period maps, areas of archaeological resource potential were plotted from the digitized GIS data. The reconstructed shorelines and historic archaeological structures depicted in Figures 37 and 38 were buffered by 50 feet (25 feet on each side) to create a linear corridor of archaeological potential. These areas of archaeological potential were then mapped on the project area (Figure 40), indicating eight areas with the potential to yield archaeological resources. From north to south, these areas include: **1**) a single footing from the Ninth Avenue El, located in the middle of Battery Place and south of Greenwich Street (footing mapped from the 1940s plans of Battery Park drawn by the TBTA [Singstad 1946]); **2**) the seventeenth-century battery and the original Manhattan Island boundary, located in the northern section of Battery Park area and covering the Eisenhower Mall area (area determined from Miller [1695], Ratzen [1776] and Viele [1865]); **3**) portions of the area within the outermost fortification walls of Fort Orange/George, the footprints of two structures associated with Fort George, the northwest corner of Fort George, part of the original Manhattan island, and remnants of street-level trolley track supports (determined from Miller [1695], Carwitham [1730], Lyne [1730], Ratzen [1776], McComb [1789], and Singstad [1941b, 1946]); **4**) remnants of the battery, located south of Area 2 (determined from Mangin and Goerck [1803] and Ewen [1827]); **5**) a portion of the eighteenth-century British battery and several elevated footings (determined from Ratzen [1776] and Singstad [1941g]); **6**) a combination of several potential archaeological resources, including a 1767 military fortification and battery, the 1789 military barracks, and the footings for the Ninth Avenue El, (digitized from Ratzen [1776], McComb [1789], and Hyde [1906]); **7**) a small area of the 1767 military fortification (digitized from Ratzen [1776]); and **8**) a combination of several potential archaeological resources, including the 1767 fortification, the edge of the Whitehall Slip in 1767, the 1790 bulkhead, the

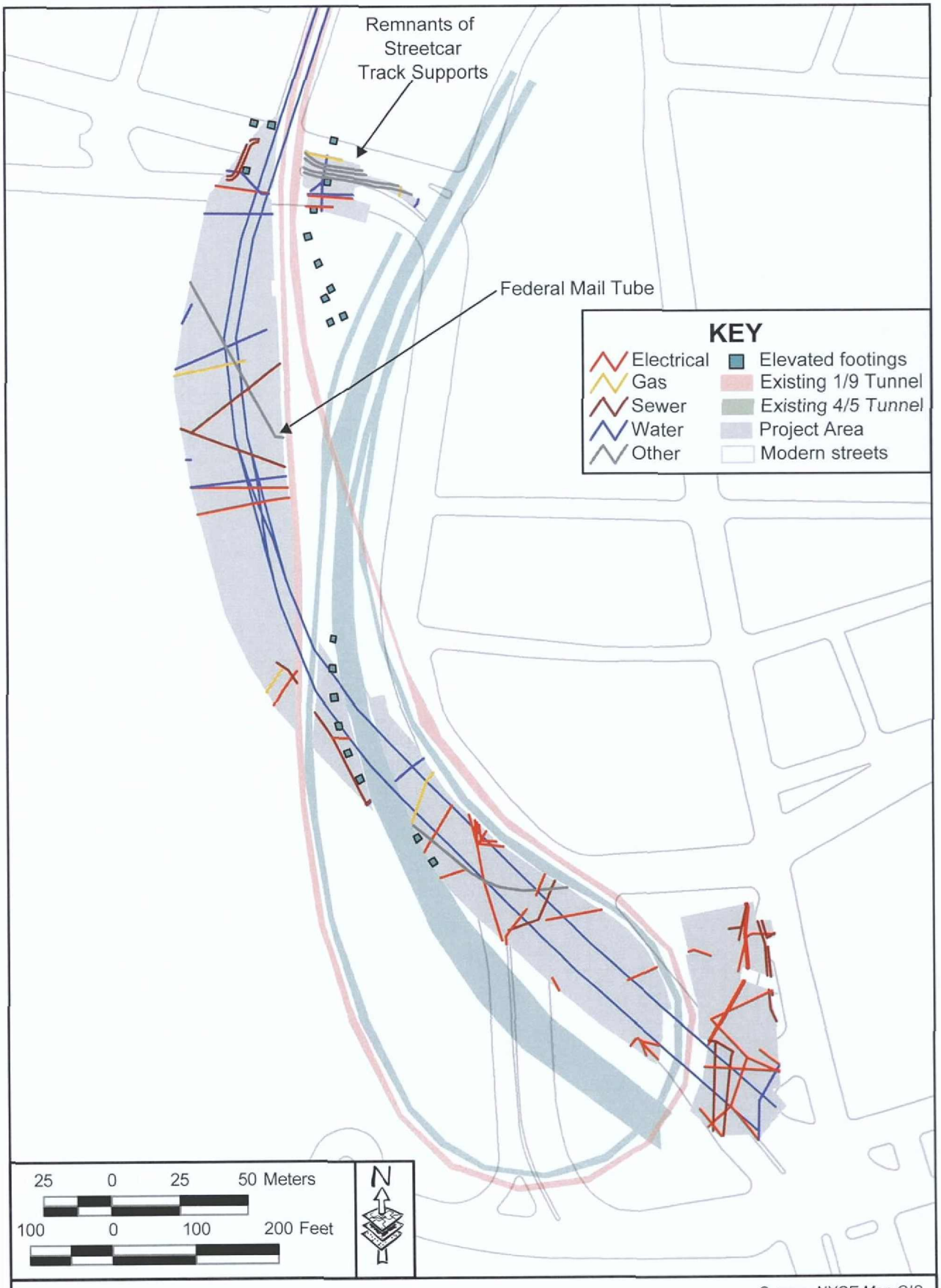

FIGURE 39: Utilities and Other Industrial-Era Disturbances to the Project Area and Vicinity

Source: NYCE Map GIS, Singstad 1941b-j, 1946, NYCT Data 2003

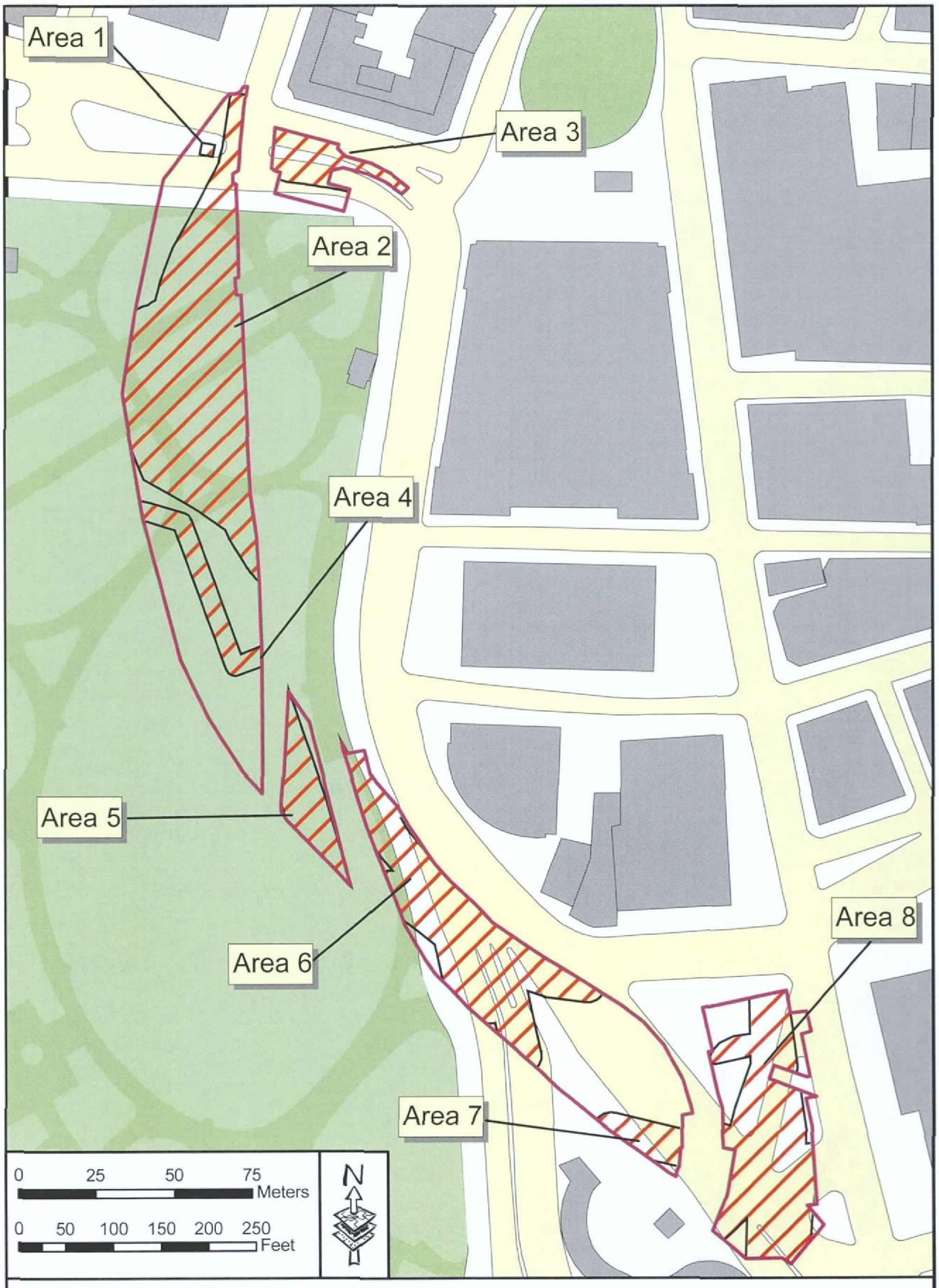

FIGURE 40: Areas of Archaeological Potential Within the Project Area *Source: NYCE Map GIS*

1827 bulkhead, and the footings for the Ninth Avenue El (digitized from Ratzen [1767], McComb [1789], Ewen [1827], and Hyde [1906]).

6. Prehistoric Archaeological Resource Potential

Of the eight areas identified as possessing potential for archaeological resources, only Areas 2 and 3 hold potential for prehistoric archaeological resources. They are located within the area of the original Manhattan Island, based on the Viele 1865 map. Although there have been subsequent historic-era modifications to this area, based on historic descriptions of the area, it is known that oyster shells littered the southern shore of Manhattan Island. There is potential to encounter similar oyster shell deposits along the shore of the island cutting through the project area. Although Native Americans were not known to have established habitations at the southern end of Manhattan, the abundant shell deposits attest to some form of prehistoric activity occurring in this section of Manhattan. If prehistoric archaeological resources are encountered, they would most likely be non-diagnostic stone tools used for processing shellfish (such as battered hammerstones or flakes with chipped edges resulting from sharpening tools for opening shellfish), charcoal residues deriving from small campfires, or possibly shell middens like those encountered further up the Hudson River (Brennan 1974; Claassen 1995). As this section of Manhattan Island was used as a landing spot by the Native Americans, there is also the possibility, though very small, of encountering remnants of prehistoric dugout canoes.

7. Historic Archaeological Resource Potential

The remainder of the eight areas possess varying potential for early colonial and late nineteenth-/early twentieth-century transportation-related historic archaeological resources. Colonial resources, from pre-Revolutionary War Dutch and British occupation, derive from three periods. The first period relates to resources associated with the destruction of Fort George, as the debris from the fort was used to fill in the area of the battery along the western shore of Manhattan up to the first construction of the bulkhead for Battery Park in 1790. Therefore, this area may contain building debris from the seventeenth-century Fort Amsterdam through 1790, the period associated with the British Fort George. Building debris would include brick (possibly yellow Dutch bricks from Holland), wood, mortar, and possibly the "quarry stone" used for the base of the northwestern bastion (Goodwin 1897:6). These pre-Revolutionary resources would be dispersed across Areas 2, 3, and 4.

The second period for pre-Revolutionary archaeology relates to Dongan's Half-Moon Battery constructed along the western shore of Manhattan. Dating to the 1680s and further modified in the late seventeenth century, this battery contained several cannons and was located within Area 2. Improvements to the Half-Moon Battery in the eighteenth century created a large military fortification, also located in Area 2 and possibly in Area 4. Historic archaeological resources associated with the Half-Moon Battery would include remnants of the military fortification, the natural stone platform upon which the cannons rested, and various military-related items, including cannonballs, wood palisades, and remnants of the cannons from the battery. Area 3 also holds the potential for late seventeenth- and early eighteenth-century archaeological resources associated with the fort. The western portion of Area 3 is located at the position of two structures within the confines of the fort, while the eastern portion of Area 3 may be located over the northwestern corner of the fort.

The third period of pre-Revolutionary archaeology centers on the expansion of Manhattan in the central and southern portions of the project area. In the years leading up to the Revolutionary War, the British expanded the military defenses around Fort George as land was added to the island south of State Street. By 1767, the military fortification surrounding Fort George had expanded southward and contained defensive walls, an interior defensive structure, and military barracks. Areas 2, 3, 4, 5, 6, 7, and 8 are expected to contain

remains of the military fortifications surrounding Fort George; the military barracks are potentially located within Area 6.

If historic archaeological resources from the Dutch or British occupation of Fort Amsterdam/Fort George were documented, they would provide significant information regarding the construction and design of one of the earliest European structures constructed in America. Additionally, evidence of the Half-Moon Battery would likewise provide significant information on early military and defensive fortifications in lower Manhattan, resources that provided the name for Battery Park. Recovering evidence of the 1790 bulkhead from Battery Park would provide significant information on early bulkhead construction in lower Manhattan. Most research on the Manhattan waterfront has focused on pier and wharf construction on the East River, which could be compared to the evidence from the 1790 bulkhead. Lastly, the presence of the military barracks on the south side of Fort George has been known from historic maps and documents but has never been identified by previous archaeological surveys.

Revolutionary War-era historic archaeological resources could be located in Areas 2, 3, 4, 5, 6, 7, and 8, where the Ratzen 1776 and the McComb 1789 maps indicate military fortifications and military barracks ran across the project area. Potential archaeological resources would include wood, brick, mortar, cannonballs, and various personal effects potentially lost by British soldiers in the eighteenth century. Recovery of the military fortification in these seven areas would provide significant information on the design and construction of British defensive structures in lower Manhattan during the Revolutionary War.

Potential historic archaeological resources are also associated with the Ninth Avenue El, which ran through portions of the northern, central, and southern parts of the project area, located in Areas 1, 5, 6, and 8. This structure was constructed in the 1870s and was in use up until 1941. One of the elevated railway footings is located in Area 1, and there are potential footings located in Areas 5, 6, and 8. These footings would be represented by a 7x7-foot structure, composed of 9-1/2 feet of brick at the top, followed by 6 inches of blue slate stone at the base, creating a 10-foot tall structure (measurements derive from plans housed at NYCT's offices at 370 Jay Street in Brooklyn). Although the design of the elevated railway footings are well documented from the drawings, it is unknown if these footings remain intact within the project area. Documenting and exposing an elevated railway footing would provide useful information regarding the engineering and construction of late nineteenth-century transportation structures in New York City. Additionally, Area 3 has the potential to encounter the remnants of street-level trolley track supports. Owing to the extensive documentation regarding the routes, technology, and construction of Manhattan's trolleys, these former trolley line features do not in themselves constitute potentially significant archaeological resources. However, if encountered during testing or project construction, they may warrant some degree of documentation.

VI. RECOMMENDATIONS

VI. RECOMMENDATIONS

The Louis Berger Group, Inc., has completed a Phase IA Archaeological Assessment of the proposed New South Ferry Terminal, to be located in Lower Manhattan, New York. The purpose of the investigation was to evaluate the archaeological potential of the site.

The site as presently defined may present significant archaeological resource constraints on the proposed project. The project area possesses a low potential for prehistoric archaeological resources. The northern portion of the project area is located in an area corresponding to the original island of Manhattan. As this area of Manhattan was known to contain abundant shellfish resources, it is possible that prehistoric shellfish processing areas or middens could be preserved in the northern section of the project area. Since prehistoric archaeological resources are almost unknown for lower Manhattan, any recovered prehistoric archaeological resources would represent a significant contribution to our understanding of the prehistory of Manhattan and the metropolitan region.

The project area possesses a high potential for historic archaeological resources, spanning from the 1620s through the early twentieth century. Specifically, potential historic archaeological resources are associated with the Dutch and British military occupation of Fort Amsterdam/Fort George during and leading up to the Revolutionary War, the post-Revolutionary War destruction of Fort Amsterdam/Fort George and construction of Battery Park, and the construction of the Ninth Avenue El in 1870, which functioned up until 1941. The preceding sections have outlined the prehistoric and historic context of the project area and provide the background to the potential archaeological resources for each era.

As the project is currently designed, the proposed New South Ferry Terminal has the potential to disturb significant archaeological resources relevant to the history and prehistory of lower Manhattan. Therefore, a Phase IB Archaeological Investigation would be required to determine the presence or absence of any intact archaeological deposits and/or features. The New York State Office of Parks Recreation and Historic Preservation (NYSOPRHP) recommends a Phase IB Archaeological Investigation if a proposed project could result in significant changes in the character of archaeological properties and if such properties may be located in the area of potential effect. Project activities that could result in such changes usually involve earthmoving but may also include construction staging areas and areas from which fill is to be borrowed.

According to the NYSOPRHP, a Phase IB Archaeological Investigation is designed to identify archaeologically sensitive areas and to locate all prehistoric and historic cultural/archaeological resources that may be present within a proposed project site. A Phase IB Archaeological Investigation includes, but is not limited to, a systematic surface survey, subsurface shovel testing, and remote sensing studies. Standards set by the NYSOPRHP for subsurface testing consist of the excavation of test units with a minimum diameter of 30 to 50 centimeters at a rate of 17 test units per acre, and the screening of all excavated soils through 0.25-inch mesh. For the proposed New South Ferry Terminal project, the use of shovel test pits is not expected to sample the soils to a sufficient depth because of the large volume of historic-era fill present in the project area. In conjunction with the geotechnical boring program for the New South Ferry Terminal, test pits of approximately two feet square will be excavated in advance of the geotechnical borings. An archaeologist will be present for the excavation of these test pits and will be allowed to screen the soil through 0.25-inch mesh. It is anticipated that a total of 36 test pits for the geotechnical program will be excavated in the presence of an archaeologist. The purpose of these geotechnical test pits is to identify the locations of utilities prior to the excavation of the geotechnical borings, not for the identification of archaeological resources. However, NYCT has recognized the benefit that these geotechnical test pits would add to the archaeological assessment of the project area. It is for this added information that an archaeologist will be present for the excavation of the geotechnical test pits. All geotechnical test pits will be excavated by heavy machinery and/or hand excavated.

Following the geotechnical test pit program and immediately preceding construction, the Phase IB Archaeological Investigation will commence. This survey may necessitate a combination of manual and machine-assisted excavations to expose the potential historic and prehistoric layers and to investigate the historic-era fill. Backhoe excavated trenches would be excavated in the eight areas of high archaeological potential and would measure between 5 and 8 feet wide and up to 50 feet long. In the northern portion of the project area where depth to bedrock is shallow the trenches should be excavated to bedrock to expose the entirety of the historic-era fill and the natural muddy deposits. In areas where the depth of historic-era fill is deep, such as the areas south and west of the original shoreline, trenches should expose a sufficient portion of the fill to ascertain the extent of modern fill and potential buried military or pier/wharf structures. The shallow water table (approximately 7 to 8 feet below surface) may require premature termination of the backhoe trenches, or alternatives will need to be explored to prevent the water table from seeping into the trenches (e.g., through the construction of a slurry wall encompassing the entire project area). NYCT and Berger have begun preliminary discussions regarding the timing of the Phase IB Archaeological Investigation relative to the commencement of construction.

If the Phase IB Archaeological Investigation indicates that no significant archaeological resources will be affected by the proposed project, then no further work will be required. However, if significant archaeological resources are identified by the Phase IB Archaeological Investigation, further evaluation may be required to determine the potential eligibility of the resources for listing in the State or National Registers of Historic Places.

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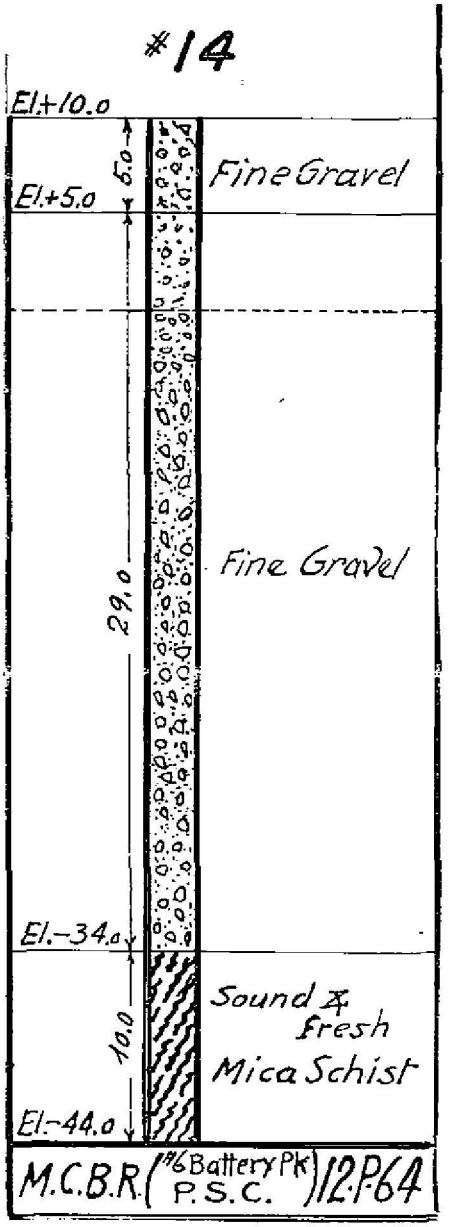
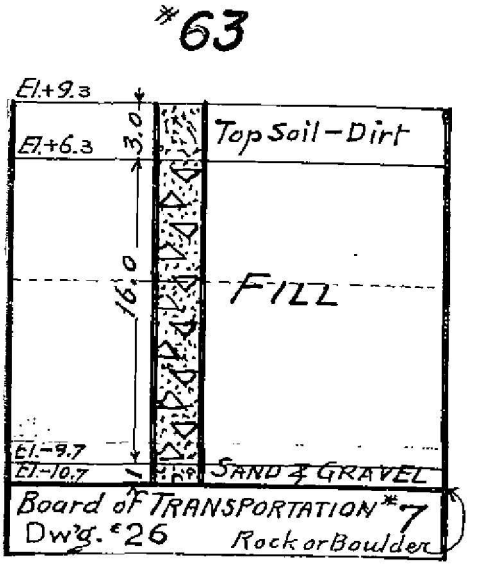
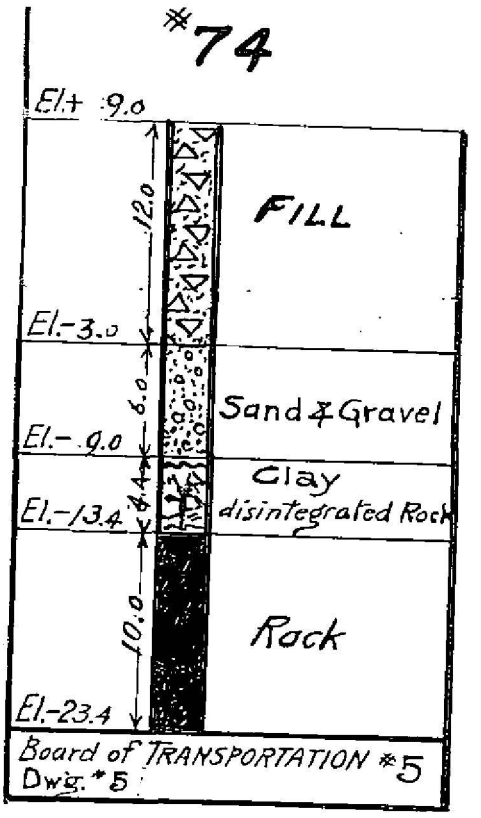
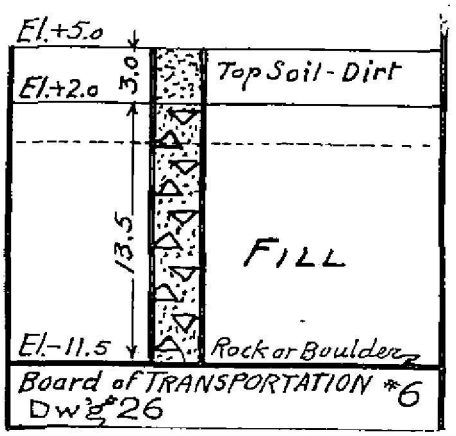
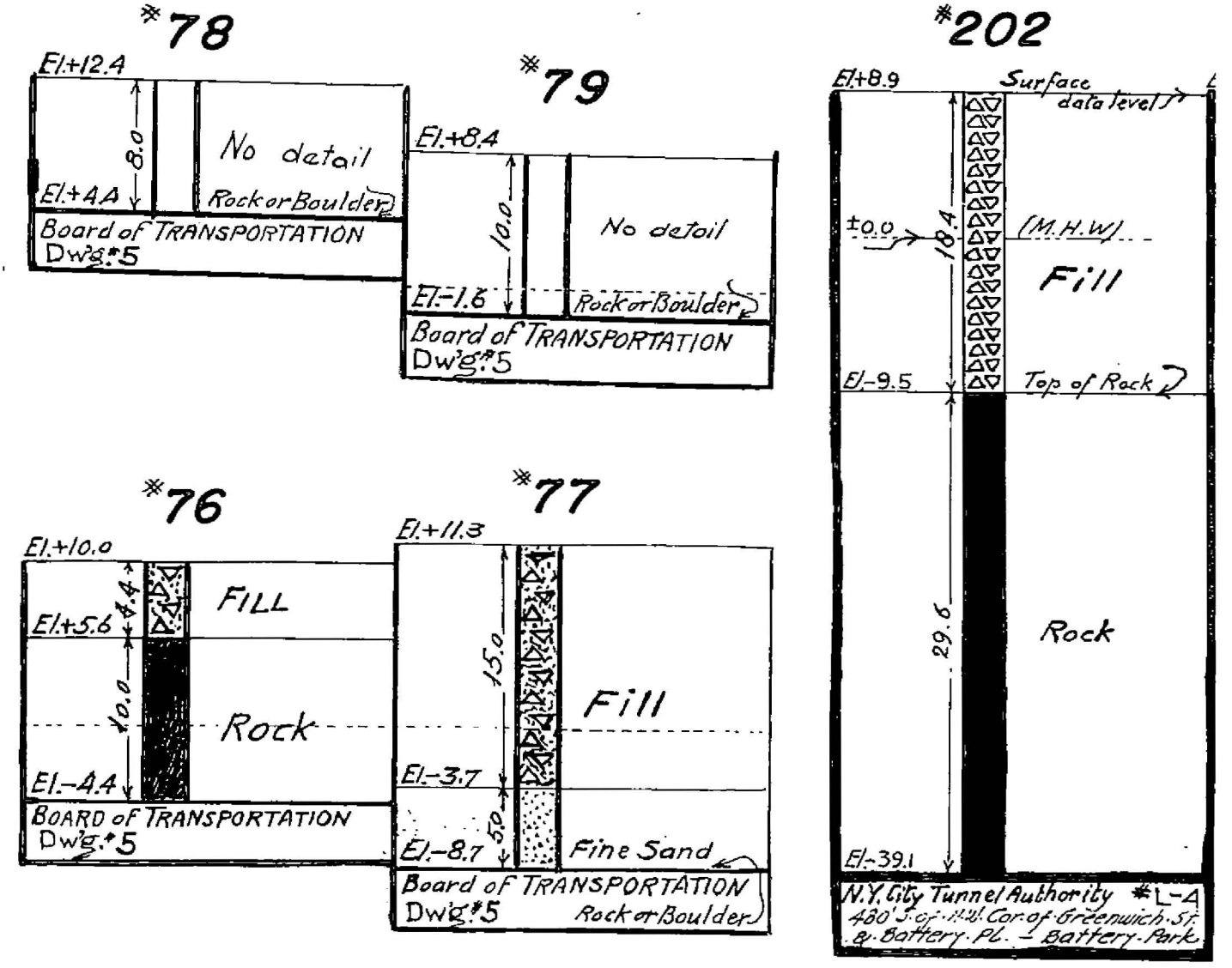
APPENDIX A: PREVIOUSLY EXCAVATED SOIL BORINGS


#14
El.+10.0
5.0
El.+5.0
Fine Gravel
29.0
Fine Gravel
El.-34.0
10.0
Sound & fresh Mica Schist
El.-44.0
M.C.B.R. (#6 Battery Pk) 12-P-64
P.S.C.

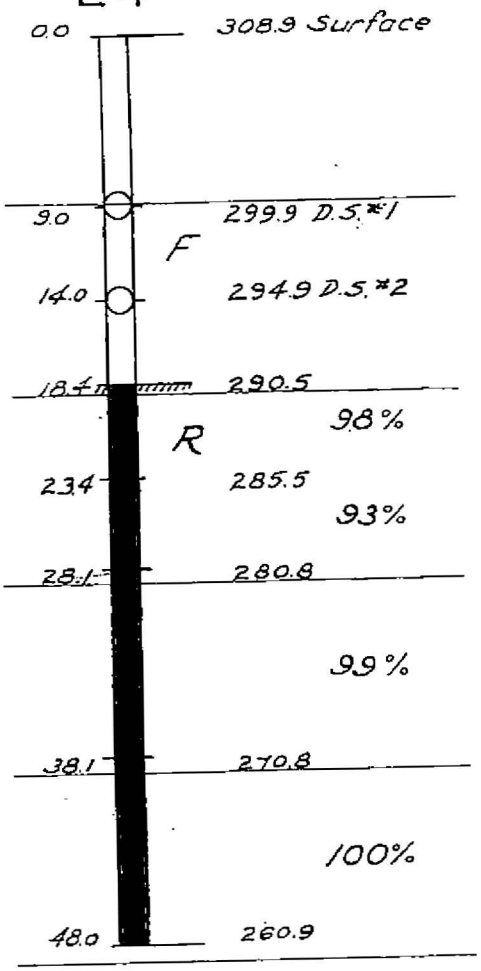

#63
El.+9.3
3.0
El.+6.3
Top Soil-Dirt
16.0
FILL
El.-9.7
El.-10.7
SAND & GRAVEL
Board of TRANSPORTATION #7
Dwg. #26
Rock or Boulder


#74
El.+ 9.0
12.0
FILL
El.-3.0
6.0
Sand & Gravel
El.- 9.0
4.4
Clay disintegrated Rock
El.-13.4
10.0
Rock
El.-23.4
Board of TRANSPORTATION #5
Dwg. #5

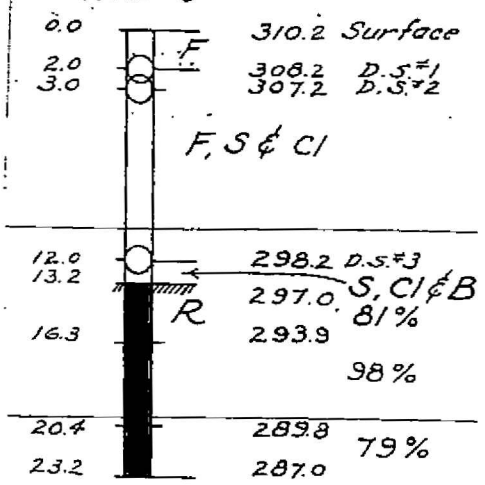

#59
El.+5.0
3.0
El.+2.0
Top Soil-Dirt
13.5
FILL
El.-11.5
Rock or Boulder
Board of TRANSPORTATION #6
Dwg #26


*78
El.+12.4
8.0
No detail
El.+4.4
Rock or Boulder
Board of TRANSPORTATION
Dwg.*5
*79
El.+8.4
10.0
No detail
El.-1.6
Rock or Boulder
Board of TRANSPORTATION
Dwg.*5
*202
El.+8.9
Surface
data level
±0.0
18.4
(M.H.W.)
Fill
El.-9.5
Top of Rock
29.6
Rock
El.-39.1
N.Y. City Tunnel Authority *L-A
480' S. of N.W. Cor. of Greenwich St.
& Battery Pl. - Battery Park
*76
El.+10.0
4.4
FILL
El.+5.6
10.0
Rock
El.-4.4
BOARD of TRANSPORTATION
Dwg.*5
*77
El.+11.3
15.0
Fill
El.-3.7
5.0
El.-8.7
Fine Sand
Board of TRANSPORTATION
Dwg.*5
Rock or Boulder

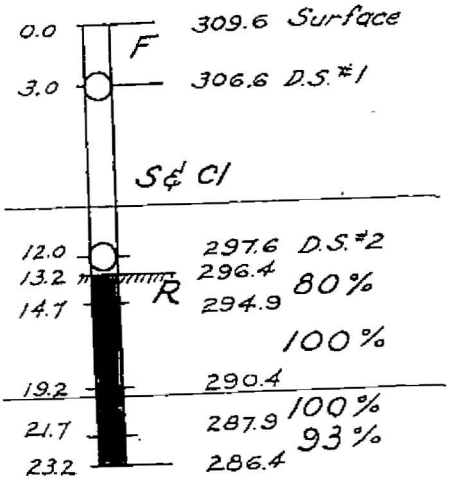
L-4



ML-9



ML-11



LEGEND

F	Fill
M	River Mud
Si	Silt
S	Sand
fS	Fine Sand
cS	Coarse Sand
Cl	Clay
G	Gravel
B	Boulders
Sh	Shells
DR	Decomposed Rock
R	Rock
○	Completed Hole
•	Attempt.

TAMS CONSULTANTS, INC.
Engineers, Architects & Planners

BORING NO. TB-21

SUBSURFACE EXPLORATION LOG

SHEET 1 OF 2

JOB NO: 5573 JOB TITLE: Whitehall Ferry Terminal

LOCATION: Borough of Manhattan, NYC COORDINATES: N 1599 W 8282 DATE: 3 May 1994

DRILL: Dietrich D-50 DIR: - ANGLE: 90° ELEV: 6.12 ft 16.21 DATUM: Borough Pres. of Manh.

CONTRACTOR: Warren George, Inc. DRILLER: G. Tirabo INSPECTOR: W.Y. Suen

CASING and HAMMER				SAMPLER and HAMMER				GROUNDWATER LEVELS:			
Type	ID	Depth	Wt/Drop	Type	ID	Weight	Drop	Date	Time	Depth	Elevation
HW	4"	16'	300#/30"	Split-Sp NXM-DTCB	1-3/8" 2-1/8"	140# --	30" --	3 May 1994	3:00 pm	7.0'	-0.9'

DEPTH (ELEV.) feet ▼ GWL	BLOWS/6" (REC %) [RQD %]	UCS GROUP SYMBOL	DESCRIPTION OF MATERIAL	SAMPLE NO.	SAMPLE TYPE	SAMPLE DEPTH	CASING SIZE	CASING BL/12"	LAB TEST RESULTS WC	LL	PI
(5.9)	4-11-5-11 (50)	SP	Cobble stone, 4". (Removed & replaced.) Dark brown fine SAND and CINDERS, tr. shell.	1	2" SS	2.0	4"	6 9			
	4-6-6-15 (75)	SM	Lt. brown fine to med. SAND and SILT, trace gravel and brick.	2	2" SS	4.0		12 22	18		
5.0	16-23-29-18 (75)	SP	Dark gray fine to med. SAND, some shells, trace brick. [MISC. FILL]	3	2" SS	6.0		29 22			
▼ (-0.9)	9-11-20-20 (25)	SP	Dark brown med. SAND, trace shells.	4	2" SS	8.0		17 8			
	23-29-22-21 (25)	SP	Brown and white fine SAND, trace silt and shells.	5	2" SS	10.0		14			
10.0	25-22-20-100/5" (35)	SP	Greenish gray SAND, trace silt and shells. Reddish brown med. SAND, some gravel.	6 t b	2" SS	11.9					
			TIMBER.			14.0					
(-7.9)	63-20-100/6"(50)	ML	Greenish gray sandy SILT.	7	2" SS	15.5			21		
15.0			[TILL]			16.0					
	19-30-30-40 (67)	ML	Same as above, trace brown gravel and mica.	8	2" SS	18.0	OPEN		24		
	27-100/5" (73)	SM	Top, same as above. Bottom, light brownish green silty med. SAND, some decomposed rock.	9	2"SS	18.9					
20.0											
(-14.9)	(97) [95]	/ /	MICA SCHIST. Gray, fresh, moderately hard, moderately spaced joints.	R-1	NXM D T C B	21.0					

BORING NO. TB-21

TAMS CONSULTANTS, INC.
Engineers, Architects & Planners

SUBSURFACE EXPLORATION LOG

BORING NO. TB-21

SHEET 2 OF 2

JOB NO: 5573 JOB TITLE: Whitehall Ferry Terminal DATE: 3 May 1994

DEPTH (ELEV.) feet ▼ GWL	BLOWS/6" (REC %) [RQD %]	UCS GROUP SYMBOL	DESCRIPTION OF MATERIAL	SAMPLE NO.	SAMPLE TYPE	SAMPLE DEPTH	CASING SIZE	CASING BL/12"	LAB TEST RESULTS WC	LL	PI	
				R-1		26.0	OPEN					
	(100) [87]		Gray, faintly weathered, moderately hard, moderately spaced joints.	R-2	NXM D T C B							
30.0 (-24.9)			Bottom of Hole = 31.0', El -24.9 ft									
35.0												
40.0												
45.0												
50.0												

BORING NO. TB-21

TAMS CONSULTANTS, INC.
Engineers, Architects & Planners

SUBSURFACE EXPLORATION LOG

BORING NO. TB-22

SHEET 1 OF 2

JOB NO: 5573 JOB TITLE: Whitehall Ferry Terminal
LOCATION: Borough of Manhattan, NYC COORDINATES: N 1682 W 8257 DATE: 5 May 1994
DRILL: Dietrich D-50 DIR: - ANGLE: 90° ELEV: 4.61 ft 104.70 DATUM: Borough Pres. of Manh.
CONTRACTOR: Warren George, Inc. DRILLER: G. Tirabo INSPECTOR: W.Y. Suen

CASING and HAMMER				SAMPLER and HAMMER				GROUNDWATER LEVELS:			
Type	ID	Depth	Wt/Drop	Type	ID	Weight	Drop	Date	Time	Depth	Elevation
NW	3"	18'	drilled	Split-Sp NXM-DTCB	1-3/8" 2-1/8"	140# --	30" --	5 May 1994	2:00 pm	7.0'	-2.4'

DEPTH (ELEV.) feet ▼ GWL	BLOWS/6" (REC %) [RQD %]	UCS GROUP SYMBOL	DESCRIPTION OF MATERIAL	SAMPLE NO.	SAMPLE TYPE	SAMPLE DEPTH	CASING SIZE	CASING BL/12"	LAB TEST RESULTS WC	LL	PI	
(4.4)			Concrete Sidewalk, 3".			1.0	3"	D R I L L E D				
	100/3" (100)	SP	Dark gray med. SAND and fine COBBLE stone fragments.	1	2" SS	3.0						
			Cobble stones.									
5.0(-0.4)	8-1-1-1 (15)	SP	Brown medium SAND, some silt, trace brick and cinder.	2	2" SS	5.0						
▼ (-2.4)			[MISC. FILL]			7.0						
	5-5-3-6 (0)			3	2" SS							
10.0	2-1-1-2 (10)	SP	Brown medium to coarse SAND, trace brick, silt and shells.	4	2" SS	9.0						
	3-3-100/5" (35)	SP	Dark grayish green medium to coarse SAND, some brick and gravel.	5	2" SS	11.0						
						13.0						
(-9.4) 15.0	9-10-100/1" (46)	SP	Grayish green gravelly SAND, some silt, trace mica. [TILL]	6	2"SS	14.0						
			Boulder encountered and cored, 15' to 17'.	R-1	NXM DT CB	15.1						
(-13.4)	30-100/4" (0)			7	2"SS	17.0 17.8 18.0						
20.0	(95) [83]	/ / /	MICA SCHIST. Gray, hard, fresh, some quartz, closely spaced joints.	R-2	NXM D T C B		O P E N					
	(100) [67]	/ / /	Gray and white, hard, fresh to slightly weathered, some quartz, closely spaced joints.	R-3	NXM DT CB	23.0						

BORING NO. TB-22

TAMS CONSULTANTS, INC.
Engineers, Architects & Planners

SUBSURFACE EXPLORATION LOG

BORING NO. TB-22

SHEET 2 OF 2

JOB NO: 5573 JOB TITLE: Whitehall Ferry Terminal DATE: 5 May 1994

DEPTH (ELEV.) feet ▼ GWL	BLOWS/6" (REC %) [RQD %]	UCS GROUP SYMBOL	DESCRIPTION OF MATERIAL	SAMPLE NO.	SAMPLE TYPE	SAMPLE DEPTH	CASING SIZE	CASING BL/12"	LAB TEST RESULTS WC	LL	PI
				R-3	NXM D T C B	28.0	OPEN				
	(95) [60]		Gray and black, fresh, hard, some quartz, closely spaced joints.	R-4	NXM D T C B						
30.0											
(-28.4)			Bottom of Hole = 33.0', El -28.4 ft								
35.0											
40.0											
45.0											
50.0											

BORING NO. TB-22

TAMS CONSULTANTS, INC.
Engineers, Architects & Planners

SUBSURFACE EXPLORATION LOG

BORING NO. TB-23

SHEET 1 OF 2

JOB NO: 5573 JOB TITLE: Whitehall Ferry Terminal

LOCATION: Borough of Manhattan, NYC COORDINATES: N 1596 W 8437 DATE: 21 April 1994

DRILL: Dietrich D-50 DIR: - ANGLE: 90° ELEV: 5.81 ft (05.90) DATUM: Borough Pres. of Manh.

CONTRACTOR: Warren George, Inc. DRILLER: R. Gregory INSPECTOR: W.Y. Suen

CASING and HAMMER				SAMPLER and HAMMER				GROUNDWATER LEVELS:			
Type	ID	Depth	Wt/Drop	Type	ID	Weight	Drop	Date	Time	Depth	Elevation
HW	4"	15'	drilled	Split-Sp NXM-DTCB	1-3/8" 2-1/8"	140# --	30" --	22 April 1994 23 April 1994 29 April 1994	2:00 pm 2:15 pm 12:00 pm	6.0' 6.0' 7.0'	-0.2' -0.2' -1.2'

DEPTH (ELEV.) feet ▼ GWL	BLOWS/6" (REC %) [RQD %]	UCS GROUP SYMBOL	DESCRIPTION OF MATERIAL	SAMPLE NO.	SAMPLE TYPE	SAMPLE DEPTH	CASING SIZE	CASING BL/12"	LAB TEST RESULTS WC	LL	PI
(4.8)			Pavement. ACC, 3". PCC, 9".			1.0					
	38-32-14-15 (50)	SP	Dark brown med. SAND, some cinders and brick fragments. [MISC. FILL]	1	2" SS	3.0	4"	DRILLED			
	4-10-13-19 (15)	SP	Dark brown fine to coarse SAND, some silt, cinders and brick, trace gravel.	2	2" SS	5.0			14		
5.0 ▼ (-0.2)	10-34-32-17 (20)	SP	Dark brown medium SAND, some silt, trace gravel.	3	2" SS	7.0					
	11-11-15-15 (15)	SP	Dark brown medium SAND, trace brick, gravel and shell.	4	2" SS	9.0					
10.0	10-22-44-15 (25)	SP	Dark brown medium SAND, some gravel, trace brick.	5	2" SS	11.0					
(-6.2)	10-8-13-27 (50)	SP	Dk. brownish green fine to med. SAND, some brick, trace shell.	6 t b	2" SS	13.0					
		SM	Green micaceous SAND. WEATHERED ROCK.								
15.0		WR					OPEN				
(-11.2)	(100) [88]	/ / /	MICA SCHIST. Gray, fresh to very slightly weathered at joints, moderately hard, closely spaced joints.	R-1	NXM DTCB	17.0					
20.0		/ / /									
	(83) [78]	/ / /	Gray, slightly weathered to moderately weathered at joints, moderately hard to soft, closely spaced joints.	R-2	NXM DTCB	22.0					

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SUBSURFACE EXPLORATION LOG

BORING NO. TB-23

SHEET 2 OF 2

JOB NO: 5573 JOB TITLE: Whitehall Ferry Terminal DATE: 21 April 1994

DEPTH (ELEV.) feet ▼ GWL	BLOWS/6" (REC %) [RQD %]	UCS GROUP SYMBOL	DESCRIPTION OF MATERIAL	SAMPLE NO.	SAMPLE TYPE	SAMPLE DEPTH	CASING SIZE	CASING BL/12"	LAB TEST RESULTS WC	LL	PI	
		/ / / / / / / / /		R-2	NXM DT CB		OPEN					
(-21.2)			Bottom of Hole = 27.0', El -21.2 ft Observation well installed after drilling. Top of riser flush with pavement. Well tip at 15' depth. 4" slotted PVC pipe from 10 to 15' depth. Boring backfilled with sand. 12" deep cement seal flush with top of pavement.									
30.0												
35.0												
40.0												
45.0												
50.0												

TAMS CONSULTANTS, INC.
Engineers, Architects & Planners

SUBSURFACE EXPLORATION LOG

BORING NO. TB-24

SHEET 1 OF 2

JOB NO: 5573 JOB TITLE: Whitehall Ferry Terminal

LOCATION: Borough of Manhattan, NYC COORDINATES: N 1651 W 8386 DATE: 23 April 1994

DRILL: Mobile B61 Truck Rig DIR: - ANGLE: 90° ELEV: 4.68 ft 104.77 DATUM: Borough Pres. of Manh.

CONTRACTOR: Warren George, Inc. DRILLER: E. Thomas INSPECTOR: D. Wordes

CASING and HAMMER				SAMPLER and HAMMER				GROUNDWATER LEVELS:			
Type	ID	Depth	Wt/Drop	Type	ID	Weight	Drop	Date	Time	Depth	Elevation
HW HW NW	4" 4" 3"	15 20 23	300#/30" drilled drilled	ThinWall Split-Sp NXM-DTCB	4" 1-3/8" 2-1/8"	-- 140# --	-- 30" --	23 April 1994		7' (during drilling)	-2.3'

DEPTH (ELEV.) feet ▼ GWL	BLOWS/6" (REC %) [RQD %]	UCS GROUP SYMBOL	DESCRIPTION OF MATERIAL	SAMPLE NO.	SAMPLE TYPE	SAMPLE DEPTH	CASING SIZE	CASING BL/12"	LAB TEST RESULTS WC	LL	PI
(3.7)			Pavement. ACC, 4-1/2". PCC, 7-1/2".		4"TW	1.0	4"	DRILLED			
	19-7-14-23 (46)	SP	Moist brown fine to med. SAND, some silt, pieces of cobblestones, brick fragments and angular fine gravel.	1	2" SS	2.0					
5.0	17-16-7-11 (50)	--	Moist BRICK and MORTAR, some gravel, trace brown coarse sand. [MISC. FILL]	2	2" SS	4.0					
▼ (-2.3)	15-32-100/5" (58)	--	BRICK (6"). BRICK, CEMENT & rock fragments, tr. cinder, gravel and brown sand. (6"). CONCRETE, gray mortar (2").	3	2" SS	6.0 7.4					
	4-10-14-13 (21)	SM	Wet gray silty fine SAND, tr. grass, shells, brick and fine gravel.	4	2" SS	8.0					
10.0 (-5.8)	17-17-18-22 (83)	ML	Moist br. sandy SILT, trace gravel (top 8").	5	2" SS	10.0			23		
(-7.3)		MH	Wet gray SILT, tr. grass & shells (bottom 12"). [RIVER DEPOSITS]			12.0					
	100/5" (100)	GP-GM	Moist dark gray sandy GRAVEL, tr. black silt [TILL]	6	2"SS	12.4					
15.0			Cobbles or gravel encountered at 15'.								
20.0 (-15.3)	21-50-->60/5" (89)	SM	WEATHERED ROCK. Yellow, orange-brown, gray black and white SAND with mica flakes. Relict structure of parent rock visible.	7	2" SS	20.0 21.4	3"				
(-18.3)	(100) [92]	/ / / / / / / / /	MICA SCHIST. Slightly weathered gray moderately hard, with closely to moderately spaced rust stained almost horizontal joints	R-1	NXM DT CB	23.0	OPEN				

TAMS CONSULTANTS, INC.
Engineers, Architects & Planners

SUBSURFACE EXPLORATION LOG

BORING NO. TB-24

SHEET 2 OF 2

JOB NO: 5573 JOB TITLE: Whitehall Ferry Terminal DATE: 23 April 1994

DEPTH (ELEV.) feet ▼ GWL	BLOWS/6" (REC %) [RQD %]	UCS GROUP SYMBOL	DESCRIPTION OF MATERIAL	SAMPLE NO.	SAMPLE TYPE	SAMPLE DEPTH	CASING SIZE	CASING BL/12"	LAB TEST RESULTS WC	LL	PI
			Slickensided joint 70° from horizontal at 27' depth. Highly weathered, fractured zone at 27.5' depth.	R-1	NXM D T C B	28.0	OPEN				
30.0	(100) [85]		Slightly weathered gray moderately hard with closely to moderately spaced rust stained almost horizontal joints. Very closely spaced horizontal joints at 29.5' depth.	R-2	NXM D T C B						
(-28.3)			Bottom of Hole = 33.0', El -28.3 ft								
35.0			See Log of Pavement Core.								
40.0											
45.0											
50.0											

BORING NO. TB-24

TAMS CONSULTANTS, INC.
Engineers, Architects & Planners

BORING NO. TB-25

SUBSURFACE EXPLORATION LOG

SHEET 1 OF 2

JOB NO: 5573 JOB TITLE: Whitehall Ferry Terminal

LOCATION: Borough of Manhattan, NYC COORDINATES: N 1559 W 8508 DATE: 9 May 1994

DRILL: CME-55 DIR: - ANGLE: 90° ELEV: 6.73 ft 106.82 DATUM: Borough Pres. of Manh.

CONTRACTOR: Warren George, Inc. DRILLER: G. Tirabo INSPECTOR: W.Y. Suen

CASING and HAMMER				SAMPLER and HAMMER				GROUNDWATER LEVELS:			
Type	ID	Depth	Wt/Drop	Type	ID	Weight	Drop	Date	Time	Depth	Elevation
HW NW	4" 3"	7' 19'	pushed drilled	Split-Sp NXM-DTCB	1-3/8" 2-1/8"	140# --	30" --	9 May 1994	1:00 pm	6.0'	0.7'

DEPTH (ELEV.) feet ▼ GWL	BLOWS/6" (REC %) [RQD %]	UCS GROUP SYMBOL	DESCRIPTION OF MATERIAL	SAMPLE NO.	SAMPLE TYPE	SAMPLE DEPTH	CASING SIZE	CASING BL/12"	LAB TEST RESULTS WC	LL	PI	
(5.7)			Pavement, ACC, 6". PCC, 6".				4"					
	7-11-4-3 (15)	SM	Dark gray silty fine to med. SAND, trace gravel, cinder and brick. [MISC. FILL]	1	2" SS	2.0		PUSHED	19			
5.0	2-8-5-17 (25)	SM	Same as above.	2	2" SS	4.0						
▼ (0.7)	12-6-30/0" (50)	SM	Same as above.	3	2"SS	6.0						
			Boulder.			7.0	3"	DRILLED				
	6-5-6-8 (25)	SP	Brown med. to coarse SAND, some brick, ash and boulder fragments.	4	2" SS	8.0						
10.0	9-13-10-22 (40)	SP	Brown med. to coarse SAND, some brick, timber and ash.	5	2" SS	10.0						
(-6.8)	21-18-12-38 (25)	SP	Dark brown gravelly medium to coarse SAND, some brick and timber.	6 t b	2" SS	12.0						
		SM	Green silty fine SAND.			14.0						
15.0	10-10-13-24 (0)	SP	Washed sample, green med. SAND, trace brick.	7	2" SS							
	12-11-20-31 (25)	SM	Green fine to medium SAND and SILT.	8	2" SS	16.0			17			
			[TILL]			18.0						
	50/0" (0)			9	2"SS	19.0	OPEN					
20.0 (-13.3)	(100) [100]	///	MICA SCHIST. Gray, fresh, moderately hard, moderately spaced joints.	R-1	NXM DTCB	20.0						

BORING NO. TB-25

TAMS CONSULTANTS, INC.
Engineers, Architects & Planners

BORING NO. TB-25

SUBSURFACE EXPLORATION LOG

SHEET 2 OF 2

JOB NO: 5573 JOB TITLE: Whitehall Ferry Terminal DATE: 9 May 1994

DEPTH (ELEV.) feet ▼ GWL	BLOWS/6" (REC %) [RQD %]	UCS GROUP SYMBOL	DESCRIPTION OF MATERIAL	SAMPLE NO.	SAMPLE TYPE	SAMPLE DEPTH	CASING SIZE	CASING BL/12"	LAB TEST RESULTS WC	LL	PI	
	(100) [95]	///	Gray, fresh (top) to slightly weathered, soft to moderately hard, moderately spaced joints.	R-2	NXM DTCB		OPEN					
30.0	(100) [100]	///	Gray, fresh, moderately hard, moderately spaced joints.	R-3	NXM DTCB	30.0						
35.0 (-28.3)			Bottom of Hole = 35.0', El -28.3 ft									
40.0												
45.0												
50.0												

BORING NO. TB-25

TAMS CONSULTANTS, INC.
Engineers, Architects & Planners

SUBSURFACE EXPLORATION LOG

BORING NO. TB-26

SHEET 1 OF 1

JOB NO: 5573 JOB TITLE: Whitehall Ferry Terminal

LOCATION: Borough of Manhattan, NYC COORDINATES: N 1680 W 8317 DATE: 11 May 1994

DRILL: CME-55 DIR: - ANGLE: 90° ELEV: 4.39 ft 1.64.48 DATUM: Borough Pres. of Manh.

CONTRACTOR: Warren George, Inc. DRILLER: G. Tirabo INSPECTOR: W.Y. Suen

CASING and HAMMER				SAMPLER and HAMMER				GROUNDWATER LEVELS:			
Type	ID	Depth	Wt/Drop	Type	ID	Weight	Drop	Date	Time	Depth	Elevation
HW NW	4" 3"	13.5' 17'	300#/30" drilled	Split-Sp	1-3/8"	140#	30"				

DEPTH (ELEV.) feet ▼ GWL	BLOWS/6" (REC %) [RQD %]	UCS GROUP SYMBOL	DESCRIPTION OF MATERIAL	SAMPLE NO.	SAMPLE TYPE	SAMPLE DEPTH	CASING SIZE	CASING BL/12"	LAB TEST RESULTS WC	LL	PI
(4.1)			Concrete Sidewalk, 4". A 4" deep void was encountered underneath the sidewalk.			1.0	4"				
	10-7-4-3 (35)	SM	Reddish brown silty fine to coarse SAND, some shells and gravel. [MISC. FILL]	1	2" SS	3.0		10	8		
	2-2-4-6 (10)	SM	Same, trace shells.	2	2" SS	5.0		5 6			
5.0	5-3-2-1 (5)		Dark brown med. to coarse SAND and BRICK, some shells.	3	2" SS	7.0		2 2			
	3-3-5-9 (25)		Same as above.	4	2" SS	9.0		4 7			
10.0						10.0		4			
(-6.6)	18-10-3-10 (50)	SP	Coarse SAND, some brick (top).	5	2" SS	12.0		8 11	27		
	16-22-30-34 (25)	SM SP	Green silty fine to coarse SAND, trace gravel. Green fine to coarse SAND, some silt, trace gravel.	6	2" SS	14.0	3"	21 130/1"	26		
15.0			[TILL]			15.0		DRILLED			
	17-20-15-21 (50)	SM	Green silty fine to medium SAND.	7	2" SS	17.0					
(-13.2)	34-100/1" (86)	SM	Same, some gravel, trace mica.	8	2"SS						
20.0			Bottom of Hole = 17.6', El -13.2 ft Broken core barrel. Boring relocated 1' west and 2' south. See Boring Log TB-26A.								

APPENDIX B: ARCHAEOLOGICAL MATERIAL FROM BATTERY PARK HOUSED AT THE NEW-YORK HISTORICAL SOCIETY

Appendix B - Record of Archaeological Material from Battery Park Housed at the New-York Historical Society

Inventory Number	Item	Date excavated	Date of object	Detailed Description
INV.7875.1-29	31 ceramic fragments	1948-50	1820-1870	Types include salt-glazed stoneware, transfer printed whitewares, blue shell-edged pearlware and Rockingham ware
INV.7875.51	Metal fragments	1948-50	1820-1879	Found during excavation of Brooklyn-Battery Tunnel
INV.7875.30-50	Bottleglass fragments	1948-50	1820-1870	Most fragments are from dark-green wine or liquor bottles
INV.7875.52	Bone fragment	1948-50	1820-1870	Found during excavation of Brooklyn-Battery Tunnel
INV.7875.53-59	7 clay pipe fragments	1948-50	1820-1870	Fragments include plain and ornamental stems and bowls
INV.7875.60	Jackknife	1948-50	1820-1870	Bone handle with metal blade
1949.239a	Bottle	1949	1830-1850	Complete olive green, non-lead, blown glass bottle
1949.239b	Bottle	1949	1821-1850	Complete black bottle blown in three-part Ricketts-type mold with base molded separately
1949.239c	Bottle	1949	1800-1830	Complete olive-green, non-lead, blown glass bottle
1949.239e	Bottle	1949	1840-1860	Complete blue glass with iridescent patina bottle, blown in two part-mold, inscribed with "ALBANY GLASS WORKS / D / NEW YORK" on front and "J. & A. DEARBORN N.Y." on reverse
1947.27	Tip of piling	1947	1780-1800	Piling was found between Greenwich and Washington streets near Battery Park, material is iron
INV.6038	Coin	1911	1734	Copper coin, stamped profile bust on front and Britannia female figure on back; front stamped "GEORGE II REX"; back stamped "BRITANNIA/1734"
INV.5740.1	Cannonball	1904-18	1770-1820	Cannonball found imbedded in cinders during a subway excavation

APPENDIX C: KEY PERSONNEL

ZACHARY J. DAVIS
The Louis Berger Group, Inc.
Archaeologist

EDUCATION

- Interdepartmental Doctoral Program in Anthropological Science, State University of New York at Stony Brook
- M.A., Anthropology, State University of New York at Stony Brook, 2000
- M.A., Archaeology, Institute of Archaeology, University of London, 1994
- B.A., Archaeological Studies, Boston University, 1993

PROFESSIONAL REGISTRATIONS

- Register of Professional Archaeologists (RPA)

TECHNICAL TRAINING

- Introduction to Section 106 Review (Ralston Cox, instructor), February 20-21, 2002
- Introduction to GPS using the Trimble Pro XR Training Class (Mike Popoloski, instructor), March 19, 2001.

PROFESSIONAL AFFILIATIONS

- Society for American Archaeology
- Geological Society of America
- Paleoanthropology Society of America
- Society for Archaeological Sciences
- Archaeological Society of New Jersey

PROFESSIONAL EXPERIENCE

Mr. Davis's background includes archaeological investigations at prehistoric sites dating from the Paleoindian through the Late Woodland period and historic sites dating from the seventeenth century through the early twentieth century. As Principal Investigator, he is responsible for the implementation and execution of archaeological research projects involving historic and prehistoric resources in the Northeast. His responsibilities include coordinating and supervising interdisciplinary multitask studies, planning and conducting surveys and excavations of historic and prehistoric sites and their resources, interfacing with clients and subconsultants, maintaining project schedules, and preparing research proposals and technical reports. In addition, Mr. Davis has extensive experience with lithic material analysis and Geographic Information Systems database development and analysis for cultural resources. Since joining Berger, Mr. Davis's major projects include:

- **Phase IA Archaeological Assessment, Proposed Vent Plant Installation, Chrystie and Stanton Streets, New York, New York.** Principal Investigator for an archaeological resource assessment of a proposed vent plant installation, located in Manhattan's Lower East Side. Employed GIS technology to georeference historic maps to trace potential historic archaeological resources within the project area. For New York City Transit.

- **Phase IA Archaeological Assessment, Niagara Mohawk, Hudson (Water Street) Site, City of Hudson, New York.** Principal Investigator for the Phase IA archaeological assessment of a late 19th /early 20th century coal-to-gas generating facility located on the banks of the Hudson River. Study involves the research and analysis of past disturbances and potential for historic archaeological resources associated with the industrial use of the project area. For Blasland, Bouck and Lee, Inc..

- **Phase I Archaeological Investigation, Sweet Brook Drainage Area, Carlton Boulevard, Annadale, Staten Island, New York.** Principal Investigator for a Phase I archaeological survey for sewage installation project along the Sweet Brook in southern Staten Island. For JRC Construction Corporation at the request of NYC DEP.

- **Phase I Archaeological Survey, Luzerne County Road No. 9, Jackson, Lehman, and Dallas Townships, Luzerne County, Pennsylvania.** Documented the results of a previously conducted road-way survey, located along Luzerne County Road 9, designed to assess the project's potential impact on late historic period archaeological deposits. For Pennsylvania Department of Transportation Engineering District 4-0.

- **Cultural Resource Constraints Assessment, Route 9 and Garden State Parkway, Cape May County, New Jersey.** Conducted background research on archaeological and historic architectural resources within the project corridor. Prepared GIS files for cultural resources and summary cultural resource assessment of the project corridor. For the South Jersey Transportation Planning Organization.

- **Stage IA Archaeological Assessment, Cross Harbor Freight Improvement Project, Greenville Yards, Jersey City, New Jersey**. Co-Principal Investigator for the Phase IA archaeological assessment of the Greenville Yard. Study involves the research and analysis of past disturbances and potential for prehistoric and historic period resources. For Allee King Rosen & Fleming, Inc. in association with New York City Economic Development Corporation (NYCEDC).

- **Cultural Resource Constraints Assessment, Route 17, Bergen County, New Jersey.** Conducted background research on archaeological and historic architectural resources within the project corridor. Prepared GIS files for cultural resources and summary cultural resource assessment of the project corridor. For the North Jersey Transportation Planning Organization.

- **Cultural Resource Constraints Assessment, Route 22, Essex and Union Counties, New Jersey.** Conducted background research on archaeological and historic architectural resources within the project corridor. Prepared GIS files for cultural resources and summary cultural resource assessment of the project corridor. For the North Jersey Transportation Planning Organization.
- **Cultural Resource Constraints Assessment, Route 57, Warren County, New Jersey.** Conducted background research on archaeological and historic architectural resources within the project corridor. Prepared GIS files for cultural resources and summary cultural resource assessment of the project corridor. For the North Jersey Transportation Planning Organization.

- **Phase IA Archaeological Assessment, East 126th Street Bus Garage, New York, New York.** Responsible for the archaeological and architectural site file review at New York City Landmarks

Commission (LPC), background research, and archaeological assessment for the half block project area. For New York City Transit.

- **Cultural Resource Eligibility/Effects Documentation for Final Scope Development of Routes 1 and 9 at North Avenue, City of Elizabeth, New Jersey.** Principal Investigator for the identification and evaluation of archaeological resources (Phase I/II) and historic architectural properties (eligibility/effect) within the proposed project area for roadway improvements. Also conducted all background research and prepared archaeological report. For the New Jersey Department of Transportation.

- **Hudson Energy Project, Hudson River Bulkhead at Pier 92, Manhattan, New York.** Responsible for the archaeological and architectural site file review at New York City Landmarks Commission (LPC), background research, and field inspection of the study area from the bulkhead at Pier 92 to the ConEd substation at West 94th Street in Manhattan. For Genpower Hudson Energy.

- **New Jersey Cellular Telecommunications.** Principal Investigator for several Phase IA Archaeological Assessments and Historic Architectural Resource assessments for proposed Nextel cell tower installation in Essex, Berger, Morris, Sussex, Warren, Hunterdon, Somerset, Middlesex and Monmouth counties. For IVI Environmental, Inc.

- **La Tourette Park, Staten Island, New York.** Principal Investigator for a Historic Architectural Resource assessment of a proposed Omnipoint cell tower installation in Richmond County, New York. For Goodkind and O'Dea, Inc.

- **Bradley Beach, New Jersey.** Principal Investigator for a Historic Architectural Resource assessment of a proposed Verizon cell tower installation in Monmouth County, New Jersey. For Innovative Engineering, Inc.

- **U.P.N. Pallet Co. Cell Tower, Penns Grove, New Jersey.** Principal Investigator for a Phase IB archaeological assessment of a proposed AT&T cell tower installation in Salem County, New Jersey. For Rescom Environmental Corporation.

- **Clayton Cell Tower, Clayton, New Jersey.** Principal Investigator for a Phase IB archaeological assessment of a proposed AT&T cell tower installation in Gloucester County, New Jersey. For Rescom Environmental Corporation.

- **Peach County Cell Tower, Mantua, New Jersey.** Principal Investigator for a Phase IB archaeological assessment of a proposed AT&T cell tower installation in Gloucester County, New Jersey. For Rescom Environmental Corporation.

- **P.S. 234-Q, Long Island City, Queens, New York.** Principal Investigator for a Phase IB archaeological assessment for a proposed New York City public school in Astoria, Queens. For Parsons Brinckerhoff, Inc and the New York City School Construction Authority (SCA).

- **Arthur Kill Road Bus Maintenance Facility, Staten Island, New York.** Principal Investigator for a Phase IB archaeological survey for prehistoric and historic resources. For New York City Transit.

- **Arbutus Avenue Sewer Project, Staten Island, New York.** Principal Investigator for a Phase I archaeological survey for sewage installation project along the Arbutus Creek. For JRC Construction Corporation.

- **Two Bridges Road Bridge, Lincoln Park, Wayne and Fairfield, New Jersey.** Principal Investigator for cultural resource screening of archaeological and historic architectural properties, including five known prehistoric Native American sites, several historic residences pre-dating 1950, and the 1887 National Register-eligible steel truss bridge. Project involved assessing archaeological sensitivity for the area surrounding the confluence of the Passaic and Pompton rivers. For the County of Passaic.

- **Interchange 142 (Garden State Parkway and I-78), Hillside, Irvington, and Union, New Jersey.** Principal Investigator for a Phase IB archaeological survey along the Garden State Parkway at Exit 142, straddling the Union/Essex County line. For the New Jersey Highway Authority.

- **Interchange 142 (Garden State Parkway and I-78), Hillside, Irvington, and Union, New Jersey.** Contributed to the Historic Architectural Evaluation with background research on and evaluation of the Elizabeth River Park, a National Register-eligible park in Union County. For the New Jersey Highway Authority.

PREVIOUS PROFESSIONAL EXPERIENCE

- **Calverton Naval Weapons Industrial Reserve, Calverton, New York.** Geographic Information Systems analyst. Integrated GIS analysis with lithic analysis to interpret prehistoric activity patterns.

- **PS 56R Site, Staten Island, New York.** Lab Director. Analysis, curation, and data entry for cultural material derived from the mitigation of a primarily Late Archaic prehistoric site.

- **Calverton Naval Weapons Industrial Reserve, Calverton, New York.** Field Supervisor. Cultural resource survey of 6,000-acre parcel with several early mid-twentieth-century buildings and several Late Archaic and Late Woodland prehistoric sites.

- **Russian Mission, The Bronx, New York.** Lithic Analyst. Cultural resource survey of a Late Archaic/Woodland quartz quarry site.

- **Long Island College Hospital, Brooklyn, New York**. Excavator. Monitoring heavy machine excavation of eighteenth-, nineteenth-, and twentieth-century historical archaeological deposits for the construction of a parking garage along Atlantic Avenue.

- **Robin's Island, Southold, New York.** Field Supervisor and Lithic Analyst. Survey of 450-acre island located in the Peconic Bay, revealing several prehistoric and historic sites.

- **Hudson Valley Rod & Gun Club, Pawling, New York.** Excavator. Mitigation of a Middle and Late Archaic prehistoric site.

- **Umm el Tlel, Syria.** Excavator. Long-term excavations of an open-air site containing cultural material spanning from the terminal Lower Palaeolithic, through the Middle, Upper, and Epi-Palaeolithic, to the Neolithic.

- **Abri Castanet, Sergeac (Perígord), France.** Excavator. Long-term excavations of an early Upper Palaeolithic rockshelter in the southwest of France.

- **Le col de Jiboui, Haut-Diois (Drôme), France.** Excavator. Salvage excavations of an open-air Middle Palaeolithic site in the French Alps.

- **Fouilles Préhistoriques à Cagny, Cagny (Nord), France.** Excavator. Excavation of two open-air Lower Palaeolithic sites located in northern France.

- **Spencer-Pierce-Little Farm, Newbury, Massachusetts.** Excavator. Boston University archaeological field school at a late seventeenth-century homestead.

ACADEMIC POSITIONS

Graduate Teaching Associate, Department of Anthropology, SUNY at Stony Brook. Primary Instructor: Anthropology 402, Problems in Archaeology - Landscape exploitation strategies in the Eurasian Palaeolithic.

Graduate Teaching Assistant, Department of Anthropology, SUNY at Stony Brook. Primary Teaching Assistant for Anthropology 102, Introduction to Cultural Anthropology; Primary Teaching Assistant for Anthropology 356, Urban Anthropology; Primary Teaching Assistant for Anthropology 104, Introduction to Archaeology; Primary Teaching Assistant for Anthropology 290, Ancient Science and Technology.

Graduate Teaching Assistant, Department of Anthropology, SUNY at Stony Brook. Lab Instructor for Anthropology 418, Lithic Technology; Lab Instructor for Anthropology 420, Geographic Information Systems in Environmental Analysis.

HONORS/AWARDS

- Graduate Council commendation for excellence in teaching by a graduate student, SUNY at Stony Brook.
- General grant for thesis research, L.S.B. Leakey Foundation.
- Grant for thesis research, Geological Society of America.
- Grant for thesis related research, IDPAS, SUNY at Stony Brook.
- Travel grant to the Annual Meeting of the Paleoanthropology Society, Columbus.
- Travel grant to the 63rd Annual Meeting of the Society for American Archaeology, Seattle.
- Travel grant for summer fieldwork, Sigma Xi Research Foundation.
- General research grant, IDPAS, SUNY at Stony Brook.
- Travel grant to the 62nd Annual Meeting of the Society for American Archaeology, Nashville.

PUBLICATIONS

- Experimental Test of Middle Palaeolithic Spear Points Using a Calibrated Crossbow. By J.J. Shea, Z.J. Davis, and K.S. Brown. *Journal of Archaeological Science* 28:807-816. 2001.

- Quantifying Lithic Curation: An Experimental Test of Dibble and Pelcin's Original Flake-Tool Mass Predictor. By Z.J. Davis and J.J. Shea. *Journal of Archaeological Science* 25:603-610. 1998.

PAPERS PRESENTED

- Costs and Benefits of Levallois Flake Production: An Economic Perspective on the Variability in Middle Palaeolithic Stone Tool Assemblages. Paper presented at the 65th Annual Meeting of the Society for American Archaeology, Philadelphia. 2000.

- Levantine Mousterian Mobility Patterns: The View from Mt. Carmel, Israel. Paper presented at the 1999 Paleoanthropology Society Meetings, Columbus. 1999.

- Experimental Test of Middle Paleolithic Hunting Weapons: Preliminary Results. Paper presented at the 64th Annual Meeting of the Society for American Archaeology, Chicago. 1999 (with J.J. Shea and K.S. Brown).

- The Analytical Potential of Refitting Studies: History and Synthesis of Applications. Paper presented at the 63rd Annual Meeting of the Society for American Archaeology, Seattle. 1998.

- The PS 56R Site: A Vosburg Habitation on Staten Island, New York. Paper presented at the 62nd Annual Meeting of the Society for American Archaeology, Nashville. 1997 (with A.M. Pappalardo).

CONFERENCE SYMPOSIA ORGANIZED

- Refitting Studies in New and Old World Lithic Analyses. Symposium organized for the 63rd Annual Meeting of the Society for American Archaeology, Seattle. 1998.