# LMCR-Battery Phase 1A Archaeological Assessment
# The Battery
# Lower Manhattan (Block 3, Lot 1)

Project No. 21PR01137

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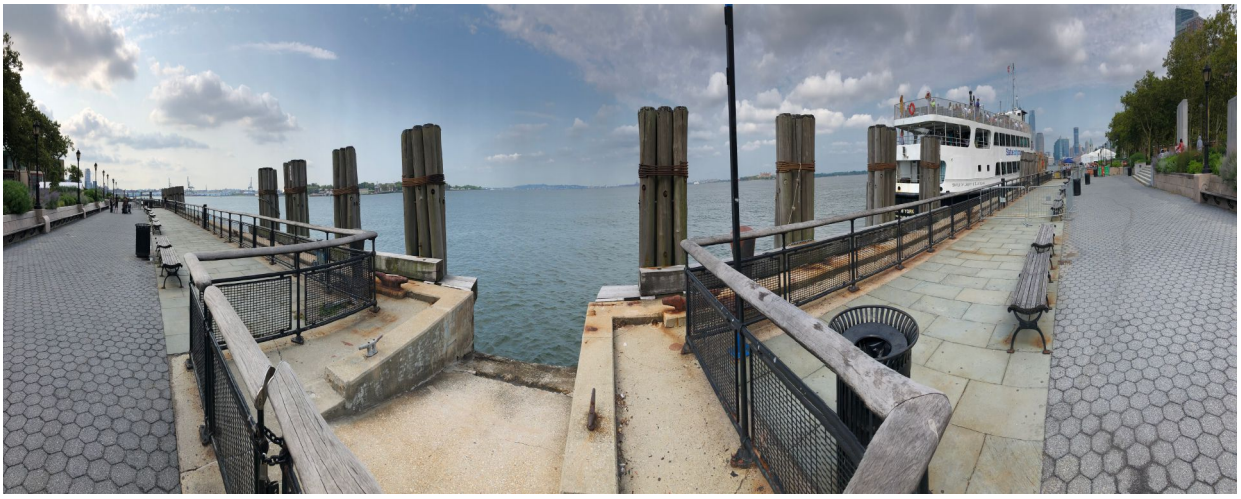

Panoramic View of New York Harbor with the Project APE to the right (J. Geismar 7-28-21)

Prepared for the New York City Economic Development Corporation (NYCEDC)
Through Stantec Consulting Services
By Joan H. Geismar, Ph.D., LLC
September 2021

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MANAGEMENT SUMMARY

Project Review Number: 21PR01137
Involved Agency: Army Corps of Engineers; also NYCEDC, NYSDEP, NYCDPR
Phase of Survey: 1A

**Location**: The Battery, formerly known as Battery Park
Manhattan
County of New York

**Survey Area**: Project/APE corridor c.1,600 ft. (487.7 m) long and c. 80 ft. (24.4 m) wide. Also considered is c. 803,373 sq. ft. (74,635.794 sq. m) of adjacent park land.
USGS 7.5 Minute Quadrangle Map: Jersey City

**Archaeological Survey Overview**:

This Phase 1A archaeological survey of the LMCR-Battery Project, a New York City Capital project seeking permits from the Army Corps of Engineers, was prepared for the New York City Economic Development Corporation (NYCEDC) by Joan H. Geismar, through Stantec Consulting, the project designers and engineers. The project, replacement of the park's deteriorated 1941 sea wall and wharf, is in response to current and potential effects of climate change that include sea level rise and inundation of Manhattan's vulnerable coast. Of concern are impacts to archaeological resources in the project's archaeological area of potential affect (APE). Also considered are currently unidentified but possible construction related impacts to the associated park area beyond the archaeological APE where excavation for a subway tunnel (the South Ferry Terminal Project) in 2005 and 2006 documented National Register eligible remnants of the colonial fortification that give The Battery its name. These finds were made despite extensive ground disturbance that includes the introduction of an elevated train in the late-19th-centuy and subway and vehicular tunnels in the 20th century. Of note is Castle Clinton, a National Monument listed in the National Register of Historic Places and a designated New York City landmark, situated adjacent to the APE. In addition to project specific research, several archaeological Phase 1A and 1B reports provided excellent information. Although archaeological potential in the APE is low, it cannot be ruled out in the adjacent park should project plans extend beyond the specified archaeologial APE.

**Results of Archaeological Survey**
Number and Name of Pre-contact Sites Identified: (0)
Number and Name of Historic Sites Identified: (2) Colonial Battery Walls and early-19th-century Castle Clinton, beyond the APE
Number and Name of Sites Recommended for Phase II or Avoidance: Avoidance of the above historical resources is recommended.

**Recommendations**

Archaeological review of final construction plans is recommended to identify excavations of potential concern (known depths of concern are from 2.0 ft. [0.6 m] to 9.6 ft. [2.9 m]) BGS. Avoidance of potential resources is the preferred recommendation but, if not feasible, testing or monitoring may be called for. As a precaution, an archaeological unanticipated discovery plan and protocol should be included in construction documents and in effect during all construction-related excavations.

**Report Author**: Joan H. Geismar, Ph.D.
**Date of Report:** September 17, 2021

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PHOTOS



Report Research, Writing, and Production: Joan H. Geismar, Ph.D.
Graphics: Amy Geller

## INTRODUCTION

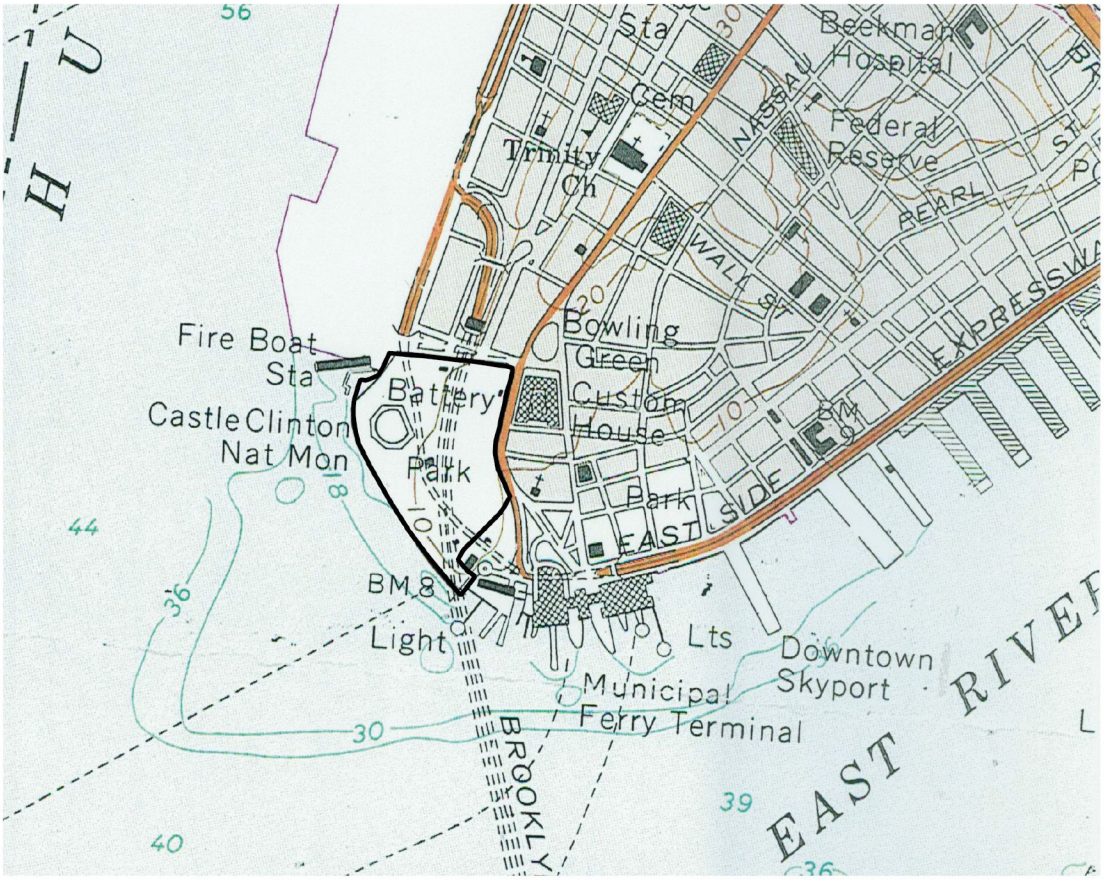
This Phase 1A documentary report considers the archaeological potential of the Lower Manhattan Coastal Resiliency effort to protect and preserve Battery Park (the LMCR-Battery; Project No. 21PR01137) with historical associations that extend back at least to the mid-18th-century fortifications that give it its name. Battery Park, now identified as "The Battery," also referred to in this report as "the battery" or "the adjacent park," is located on the southern tip of Manhattan (Tax Block 3, Lot 1; Figure 1). Joan H. Geismar, Ph.D., the archaeological consultant to Stantec Consulting, Inc., prepared the report for the New York City Economic Development Corporation (NYCEDC). The project, to replace a deteriorated 1941 sea wall and wharf, was initiated in response to the current and potential effects of climate change, including the potential for sea level rise and the inundation of Manhattan's vulnerable coastal area.

The assessment was triggered by the project's status as a New York City Capital project seeking permits from the Army Corps of Engineers (ACOE), the federal lead agency for the undertaking, and the New York State Department of Environmental Conservation (NYSDEC). It is therefore subject to environmental review in compliance with the Historic Preservation Act of 1906 as amended. In addition to the ACOE and NYCEDC, other involved agencies include New York City Parks (Parks) and the New York City Landmarks Preservation Commission (NYCLPC). Therefore, state and city agencies will review the report.

Specifically, the assessment considers the project's archaeological area of potential effect (APE) where reconstruction and elevation of the park's deteriorating 1941wharf and sea wall will cause direct impacts (Figure 2 ). Also considered is the possibility that project-related activities could impact potential archaeological resources in the park beyond but adjacent to the APE. This might include introduction of new infrastructure or construction staging areas not identified at this writing. The total area of concern is defined by New York Bay to the west, Battery Place to the north, State Street to the east, and The Battery's Playscape, a park south of the project area (see Figure 2). The APE, a corridor along New York Bay, is approximately 1,600 ft. (487.7 m) long by 80 ft. (24.4 m) wide, or 164,162 sq. ft. (15,251.2 sq. m); the park area of concern is approximately 803,373 sq. ft. (74,635.8 sq. m).

On-going consultation with the New York State Historic Preservation Office (NYSHPO) preliminarily determined the project APE lacks archaeological potential. However, previous archaeological assessments and investigations established the archaeological sensitivity of the park grounds adjacent to the APE. Here, between 2005 and 2006, excavation for a new subway tunnel, a component of the Metropolitan Transit Authority (MTA) South Ferry Terminal project then undergoing archaeologically monitored excavation, uncovered segments of the 1755 colonial "New Stone Battery" wall (AKRF *et al.* 2012). Recently, Phase 1B field testing associated with alterations to the Playscape uncovered large stones and stone fragments that potentially are additional wall components (AKRF 2018). And evidence of three known episodes of land reclamation that required landfill retaining features, such as rip-rap sea walls, to create Battery Park as we know it, may remain. Another concern is early-19th-century Castle Clinton, a National Monument and a National Register listed property as well as a New York City individual landmark, adjacent to the project APE.

With all this in mind, the archaeological potential of the APE and adjacent park is considered here with the methods and findings presented in the following sections.


Fire Boat Sta
Castle Clinton Nat Mon
Battery Park
Bowling Green
Custom House
Park
EAST SIDE
Trinity Ch
Cem
Sta
Beekman Hospital
Federal Reserve
PEARL
WALL ST
EXPRESS
BM
BM 8
Light
Lts
Downtown Skyport
Municipal Ferry Terminal
BROOKLY
EAST RIVER
56
44
36
30
40
39
project location (approx.)
0
1000 ft
0
304.8 m
N

**LMRC-BATTERY** Project APE and Adjacent Park **2**


Base: Stantec 2021

0 200 ft
0 60.96 m
N

project APE

park (approx.) adjacent to APE

Battery Park Underpass

Battery Tunnel

subway tunnel

interceptor sewer

METHOD

Many and varied cited and other resources were researched to assess the archaeological potential of the LMCR-Battery APE and adjacent park grounds. Among them were maps (always a starting point) and, of great relevance, several archaeological reports that provided pertinent information (see below). Castle Clinton's 1960 Historic Structures Report (HSR) also offered excellent information as did numerous historical resources, both in print and on-line (in this time of Covid 19, hard copies of maps in the collection of the Lionel Pincus and Princess Firyal Map Division of the New York Public Library were accessed in a one-on-one meeting with a representative of the Map Division). In addition, Greg Sprich, the LMCR-Battery Project Manager and Stantec Principal, generously made project-related records and documents available. On July 28, 2021, a site visit was made and photos taken of the APE and adjacent Castle Clinton (Photos 1 and 2).

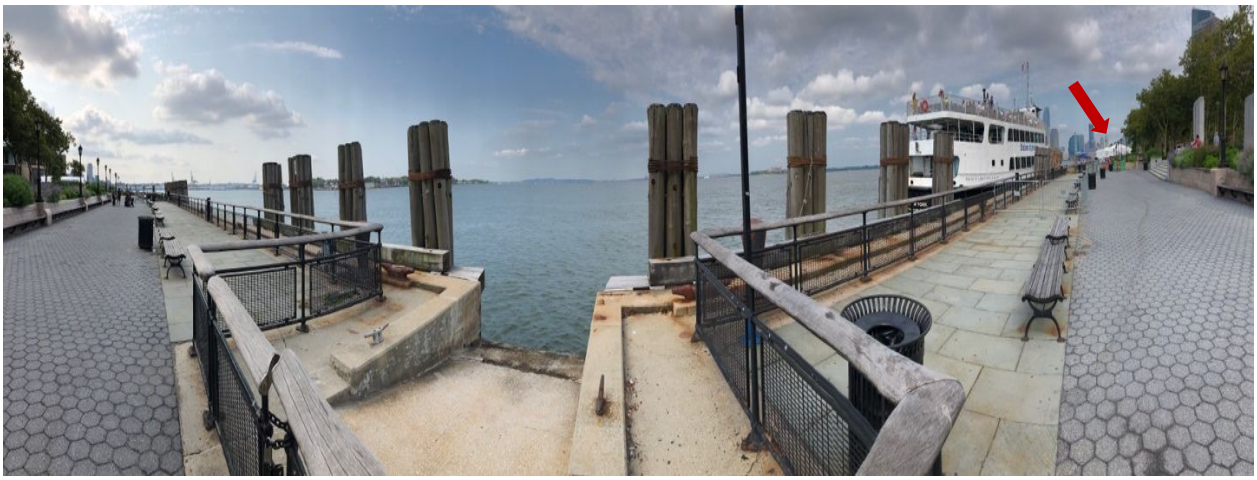


**Photo 1.** A panoramic view of park's wharf and sea wall looking out on Upper New York Bay. The project APE is mainly to the right with Pier A (arrow) beyond the APE in the far right background. A Statue of Liberty Ferry is moored to the 1941 sea wall/wharf in the APE. (Photo: J. Geismar 7/28/21)

**Photo 2.** Castle Clinton is seen undergoing repair of its exterior wall in this panoramic view taken from the walkway (left) in the APE. Pier A (arrow) is in the far left background. (Photo: J. Geismar 7/28/21)

## SUMMARY OF RELEVANT ARCHAEOLOGY REPORTS

Five archaeological reports were central to the LMCR-Battery archaeological assessment. Two focused on the South Ferry Terminal project (Berger 2003 and AKRF *et al.* 2012), two addressed the Battery Park Bikeway project (Geismar 2010 and 2011), and one was related to the Battery Park Playscape project (AKRF 2019). All provided excellent information specific to the LMCR-Battery project. In addition, a table that lists and describes known archaeological sites within approximately 0.25 miles of the LMCR-Battery project site was extracted from a recent South Battery Park City Authority Resiliency Consultation document (Stehling in AECOM 2019:Table 2) and is presented in Appendix A of this report.

Proposed New South Ferry Terminal, Lower Manhattan, New York, New York, Phase 1A Archaeological Assessment (The Louis Berger Group, Inc., 2003)

In 2003, The Louis Berger Group prepared a Phase 1A archaeological study for the South Ferry Terminal project, a federally-funded undertaking. It entailed an assessment of proposed excavations for a new subway terminal and related approach tunnels. Excavations through Battery Park were to extend south, approximately from the intersection of Battery Place and Greenwich Street, run to and under Peter Minuet Plaza, and end at the Whitehall Ferry Terminal. Planned excavations comprised 2.3 acres of cut-and-cover and tunnelling with low prehistoric sensitivity and high pre-Revolutionary War potential. This was despite the past disturbance caused by the introduction of supports for an 1878 elevated line and later excavations for a subway tunnel. Also, historic wharves and bulkheads were considered a potential issue in the vicinity of the South Ferry terminal well beyond the LMCR-Battery project site. Based on these findings, 1B testing was recommended that culminated in the 2004-2006 South Ferry Terminal Project (see AKRF *et al.* 2012, below).

Battery Park Bikeways Project (Geismar, Joan H., Ph.D., LLC, 2010 and 2011)

A 1A letter report and a report on 1B field testing addressed the archaeological potential of the Battery Park Bikeways Project (Geismar 2010 and 2011, respectively). The 2010 letter report identified areas of potential sensitivity through historical research, map review, and a narrative history of New York City's 17$^{th}$ and 18$^{th}$-century shoreline fortifications compiled by Paul Huey, Scientist (Archaeology), now Emeritus, in the Bureau of Historic Sites in the New York State Office of Parks and Recreation, Division of Historic Preservation. It also considered new information recovered from the 1B South Ferry Terminal project kindly shared by Linda Stone, RPA, the project's Principal Investigator in the field (at the time, the report on the 2005-2006 field investigations was still in progress [see below]). Research determined that excavation for new utilities planned for the Bikeways project potentially could impact National Register eligible resources and, therefore warranted field testing. This entailed excavation of eight shallow test pits and one that was 6 ft. (1.8 m) deep, with locations and depths determined by the proposed impacts within the project APE. However, testing did not identify an archaeological concern. Consequently, no further investigation was recommended with the caveat that should excavation at greater depths occur, any encountered structural remains should be subject to archaeological assessment.

South Ferry Terminal Project (AKRF *et al.* 2012)

Under the field direction of Linda Stone, RPA, archaeologically monitored excavations of the corridor for the MTA's new South Ferry Terminal and data recovery were carried out between 2004 and 2006. The project's extremely comprehensive final report was researched and produced by Diane Dallal of AKRF (Principal Investigator) in association with Linda Stone. (Meta Janowitz , Ph.D., a ceramics specialist, Ed Morin, and Rebecca White with the URS Corporation, and Molly MacDonald and Elizabeth Meade with AKRF, contributed). Fieldwork determined that, despite the introduction of an elevated line and excavation for a subway tunnel in 1905, both in the vicinity of the mid-18th-century colonial battery, four intact segments of the 1755 Battery Wall eligible for
listing in the National Register of Historic Places were exposed and excavated. All were located beyond the LMCR-Battery APE but within the limits of the adjacent park. Human remains (but no intact burials) were found in Wall Segment 1 (see Figure 4 for location) and elsewhere, and a log feature believed to predate construction of the 1755 Battery was uncovered in Wall 3. Artifacts mainly indicated the soils were secondary deposits typical of landfill and comprised a multi-century fill. Artifacts were processed (for example, ceramics were washed, numbered, cataloged, and analyzed). Volume 1 of the extensive two-volume final report includes an expansive and detailed history of the historic Battery (AKRF *et a*l. 2012: 4-1 to 4-27); Appendix A in Volume 2 provides a catalog of recovered artifacts as well as other information.

Battery Playscape Project (AKRF, 2018)

An archaeological Phase 1B survey was undertaken in anticipation of replacing a deteriorated 1950a playground situated on a 1.4-acre, roughly triangular, site located in the park adjacent to the southern limit of the LMCR- Battery project. The Playscape project, which has HUD involvement, is subject to review under Section 106 of the National Historic Preservation Act (NHPA). The field report, prepared by A. Michael Pappalardo, Elizabeth D. Meade, and Kelly Britt., presents the survey's methods and findings that include evidence of the Battery Wall in test trenches where they "might be expected" based on the earlier South Ferry Terminal excavations. Data recovery was recommended to confirm the National Register eligibility of these finds. Although landfill-retaining structures were considered a possibility, none were found to the "depth of expected project impacts" [6.0 ft. (1.8 m) BGS]. Artifacts from historical landfill were recovered and processed. The stone finds confirmed the possibility of encountering "persistent though reduced" National Register eligible archaeological resources in undisturbed portions of the Battery Wall's expected alignment. Mitigation measures were recommended as was monitoring during the project's construction phase.

## LMCR-BATTERY COMPONENTS IN AN ARCHAEOLOGICAL PERSPECTIVE

### The Colonial Battery

The Battery was a major component of colonial defensive measures that began when the Dutch constructed Fort Amsterdam at the foot of Broadway in 1626 and ended when the English demolished it in 1790. The defenses were a response to known or perceived colonial-era threats.

To the Dutch, this included possible attacks by local indigenous populations; after the English takeover in 1664,[1] to the English, it was the threat of the French.

In his narrative history of the battery, Paul Huey tells us, "The New Stone Battery, situated along the shore under Fort George, was erected in 1755" (Huey 2006:17), a date that both historical and archaeological research has supported (AKRF 2012 *et al:*4-19, 4-20). However, different construction techniques noted in two excavated Battery Wall segments may reflect earlier or additional construction episodes (AKRF *et al*. 2012:5-38). Whatever the exact construction date or dates, coordinating the excavated stone wall segments with the 1766/67 Ratzer survey of the English town (Ratzer 1766/67;[2] Figure 3 this report) indicated they are remnants of the "New Stone Battery." Of concern in this assessment, the four National Register eligible Battery Wall segments, while not located in the LMCR-Battery APE, were discovered in the eastern part of the adjacent park (Figure 4). One segment was exposed 4.4 ft (1.3 m) below the ground surface (BGS) while the others were between 8.2 and 9.6 ft. (2.5 and 2.9 m) BGS (AKRF *et al.* 2012:5-3; see Appendix B this report for more complete information).

As mentioned, the 2018 Playscape 1B investigators found stones and stone fragments that, like those from the South Ferry Terminal project, appear to be remnants of the Battery Wall. And like the earlier South Ferry discoveries, they were found despite the extensive disturbance caused by introduction of the park's former elevated lines and old and new subway tunnels in the vicinity of the discoveries. If data recovery confirms these recent finds are from the historic Battery Wall, they too will be National Register eligible.

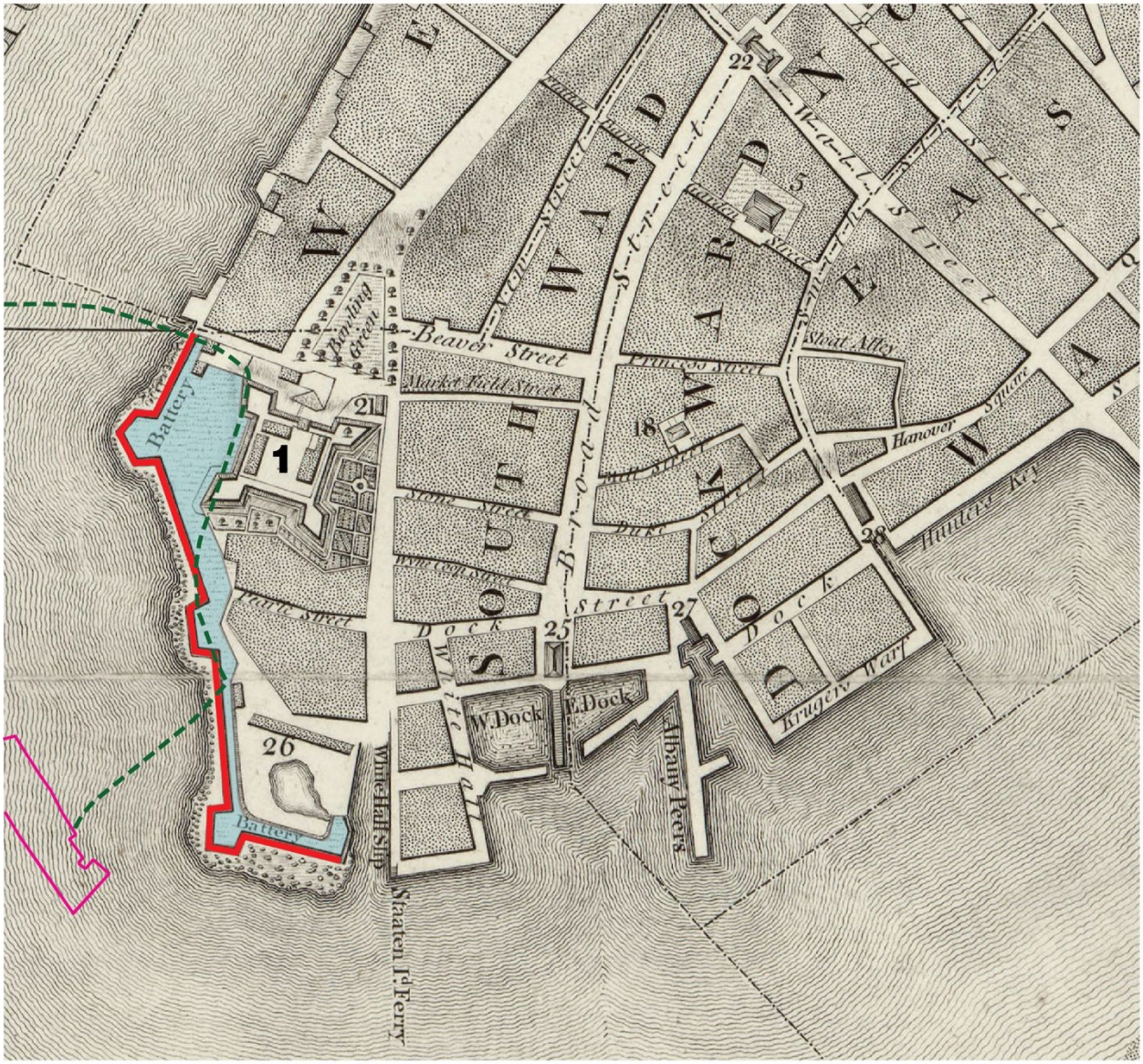
Land Reclamation

The 1728 Lyne map identifies a "Ledge of Rocks" on the beach below the colonial fort (Figure 5)[3] that included the Cropsey Rocks, a late-17th -century defense with five small cannons (AKRF *et. al.* 2012:4-1), a precursor to the 1755 Stone Battery. It's more than likely the rock-strewn beach and associated high water (Ewen 1827-1830; Figure 6) required fill to create the mid-18th-century Battery. With this and three documented episodes of land reclamation—one in 1820 (Ewen 1827-1830; see Figure 6), another in 1824 (as per Ewen 1848 [not illustrated]), and the third proposed in 1848 but not implemented until 1853 (Ass't Board of Alderman 1853: see Figure 7)—Battery Park in 1854 was almost the size and configuration of the modern park. However, the new portion, with its fill process ongoing, was then a park in name only (see Dripps 1854:Figure 8).

Perhaps the impending use of Castle Garden as the nation's first immigration center, which occurred in 1855, was the impetus for the 1853 expansion that called for a new rip-rap sea wall as a landfill feature and absorption of the former fort into the park. Unfortunately, under the management of "ruthless municipal officials…the new land became a colossal dust-heap on one side and a mouldering reminiscence of vegetation on the other" and apparently was still far from filled more than twelve years later (Gilder 1936:217 citing an 1869 article in the *New York Illustrated*).

[1]The Dutch briefly took back the settlement in 1673, but the English recovered it the next year.
[2]Bernard Ratzer's surveys of New York (1766, 1767), the earlier one with a misspelling of his name (Ratzen), were published in 1776. Slightly more detail, such as street names, was included in 1767 (Cohen & Augustyn 1997:73-77).
[3] Although citing Lyne 1728, the 1827-1830 Ewen map indicates landfill rather than a rock ledge (see Figure 6).

**LMRC-BATTERY** 1766/67 Ratzer Survey of New York City Showing 1755 Stone Battery Wall (Ratzer 1776, detail) **3**




project APE (approx.), part of

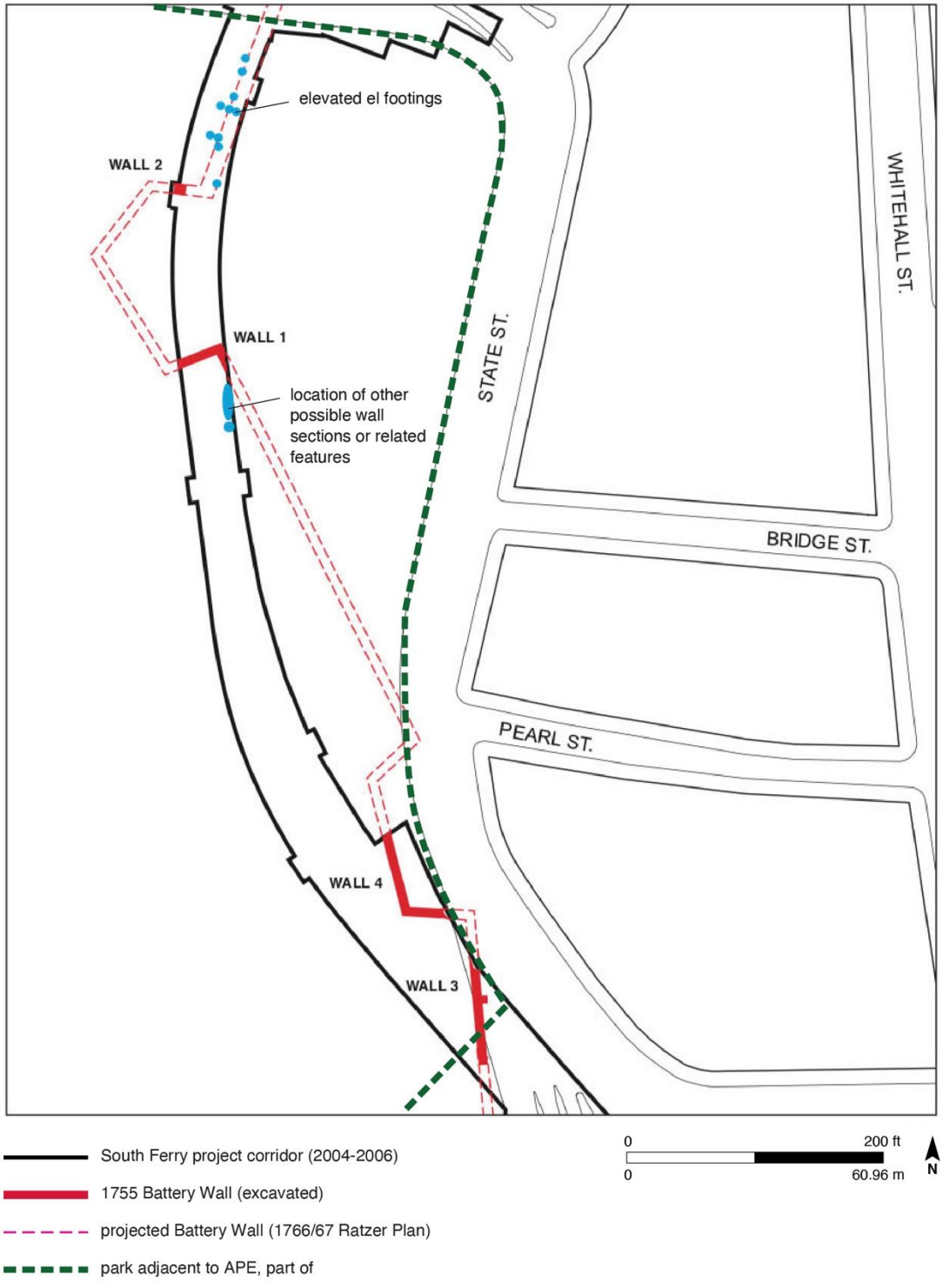
park adjacent to APE (approx.), part of

Battery Wall

beach and "Ledge of Rocks"

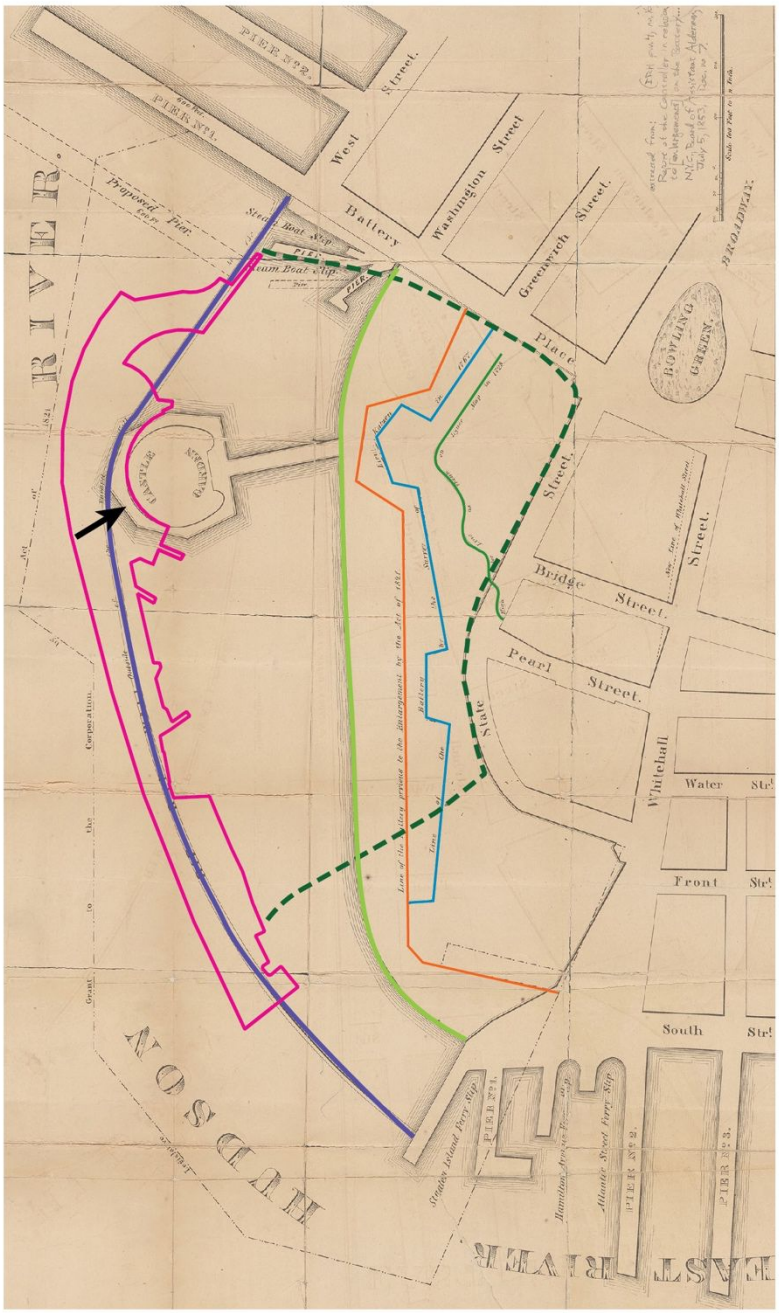
1 colonial fort

0 400 ft
0 121.9 m
N


elevated el footings
WALL 2
WALL 1
location of other possible wall sections or related features
STATE ST.
WHITEHALL ST.
BRIDGE ST.
PEARL ST.
WALL 4
WALL 3
South Ferry project corridor (2004-2006)
1755 Battery Wall (excavated)
projected Battery Wall (1766/67 Ratzer Plan)
park adjacent to APE, part of
0
200 ft
0
60.96 m
N

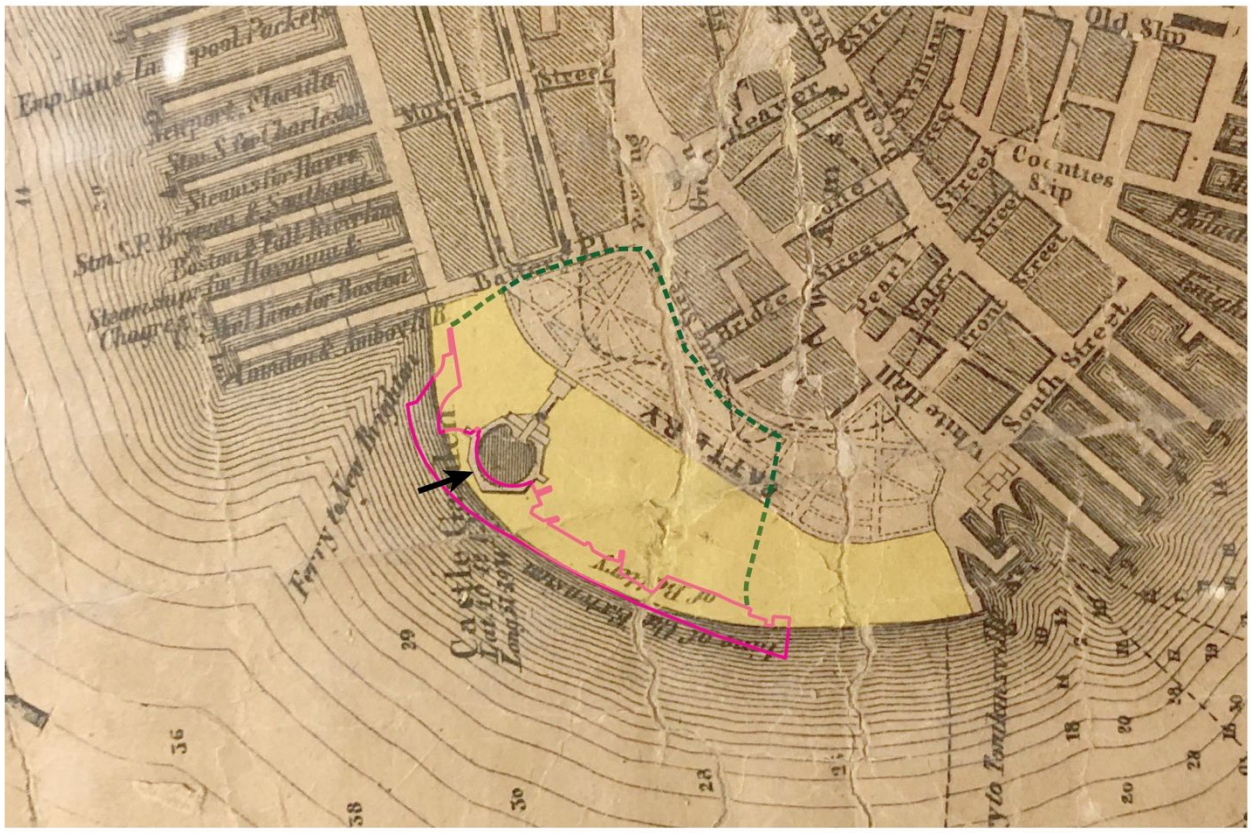

A Scale of Feet 660 Feet
One ⅛ of a Mile
BROAD
WARD
Beaver Street
Princes Street
Bridge Street
Broad Street
Dock Street
White Hall
W. Dock
E. Dock
1
eastern part of park (approx.)
beach and "Ledge of Rocks"
1
colonial fort
0
400 ft
0
121.9 m
N


HUDSON RIVER.
Greenwich
Beaver
Markefield
Kennedy's Lane
Stone
Bridge
Peard
Water
Front
Whitehall
GOVERNMENT GROUND
PRIVATE PROPERTY
PRIVATE PROPERTY
GROUND
BATTERY
project APE (approx.), part of
park adjacent to APE (approx.)
Battery Wall (Ratzer Survey 1766/67)
Battery grounds 1820 (bulkhead)
high water line (c. 1728)
0
200 ft
0
60.96 m
N


PIER No 2.
PIER No 1.
West Street.
Battery Place
Washington Street.
Greenwich Street.
BROADWAY.
BOWLING GREEN.
Proposed Pier.
Steam Boat Slip.
PIER
CASTLE CLINTON
Bridge Street.
Pearl Street.
State Street.
Whitehall
Water Ste
Front Ste
South Ste
Corporation
Grant
Battery
Line of the Battery present to the Improvement by the Act of 1851
HUDSON RIVER
EAST RIVER
Staten Island Ferry Slip
Hamilton Avenue Ferry Slip
Atlantic Coast Ferry Slip
PIER No 3.
project APE (approx.)
park adjacent to APE (approx.)
high water line (c. 1728)
1755 Battery Wall (Ratzer 1766/67)
Battery Park 1820 (Ratzer 1766/67)
Battery Park 1824 (Ewen 1848)
rip-rap sea wall Battery Park 1853 (Ass't Alderman 1853)
fort counterguard
0
400 ft
0
121.9 m
N

**LMRC-BATTERY** Topographical Map of New York City Showing Battery Park in 1854 (Dripps 1854, detail)

**8**



Over the years, the Board of Commissioners of the Department of Public Parks considered making repairs to the 1853 sea wall (Board of Commissioners 1883:218; 1893:323) but, according to the Board's minutes, nothing happened until 1896 (Board of Commissioners 1896:315). It's likely that implementation of the repairs, like the original 1853 expansion, was associated with an impending new use for the fort, this time to become the New York Aquarium.

The park's most recent extensive shoreline modification was not land reclamation but the 1941 introduction of the extant timber and rip-rap supported wharf (Parks 1941; Figure 9), an undertaking that coincided with construction of the Brooklyn-Battery Tunnel (now the Hugh L Carey Tunnel).[4] As noted, the now deteriorated 1941 wharf, which the LMCR-Battery project will replace, is not considered an archaeological resource. Elsewhere however, where the park comprises reclaimed land, the possibility of finding evidence of historical fill and fill-retaining features cannot be dismissed.

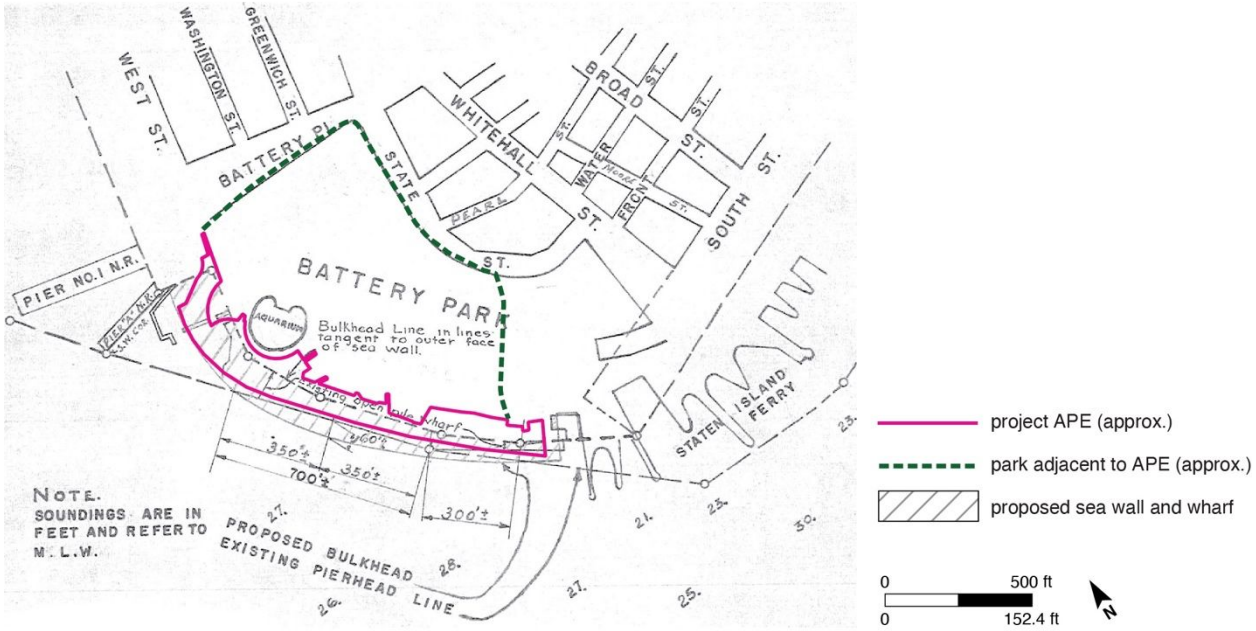
Castle Clinton

Castle Clinton, a brownstone fort erected between 1808 and 1811 in response to European unrest and perceived threats from Britain among other issues, is a survivor of New York City's early-19th-century defense system. Initially named the West Battery and, in 1811, renamed Castle Clinton, the building's comprehensive 1960 Historic Structure Report (HSR), compiled by Thomas M. Pitkin, then Supervisory Park Historian, offers detailed information about the Fort's history, its alterations, and its restoration.

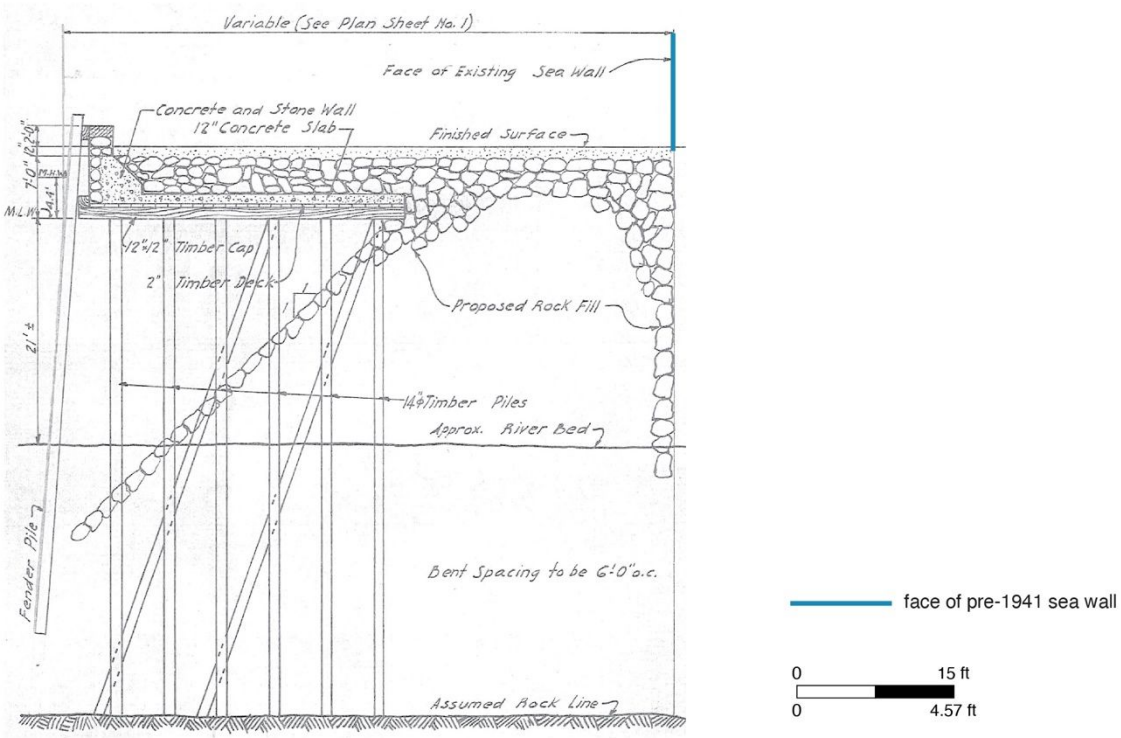
Briefly, its history began in 1807 when the city ceded the federal government water lots to move the project forward (Pitkin 1960:9). By 1808, construction was underway on the almost circular building erected on a man-made "island" of stone approximately 200 ft. (c. 61 m ) into New York Bay. A wood bridge or "causeway" with a drawbridge connected the fort to Battery Park, a park since 1790. By 1817, however, "serious deterioration" made it necessary to rebuild three supporting piers and almost the entire bridge (Pitkin 1960:17-18). Unfortunately, no plans exist for the original bridge, but an 1817 sketch in the HSR (Pitkin 1960:17; see Figure 10) suggests it was similar to the block-and-bridge construction of the contemporaneous North Fort (Valentine 1859: 252; Photo 3). Located in the Hudson River at the foot of Hubert Street, this small fort or battery, like Castle Clinton, was a component of the city's new defense system.

In 1823, with the fort no longer considered necessary for defense, as per the 1807 agree= ment between New York City and the Federal government, the land and the fort reverted back to the city (Data Trace 2021:Liber 79:79) and, in 1824, became a popular public entertainment venue renamed Castle Garden. By virtue of the park's 1853 land reclamation, the fort became a park feature now adjacent to the project APE. At the time, the fort's counterguard, a partially surrounding wharf, 39 ft. wide at the base and 20 ft. wide at the top, made of stone blocks "surfaced with a framework of connected logs" (Pitkin 1960:14), remained. Between 1855 and 1890, the fort served as the nation's first Emigration Center and, from 1895 until 1941, housed the New York City Aquarium. The building was declared a National Monument in 1950, renamed Castle Clinton, and partially restored by the National Park Service (Pitkin 1960:1). In November 1965, the fort and "the land it stands on" were designated a New York City Landmark (Data Trace 2021:39) and, in1966, was listed in the National Register of Historic Places (NRHP Record No. 66000537).

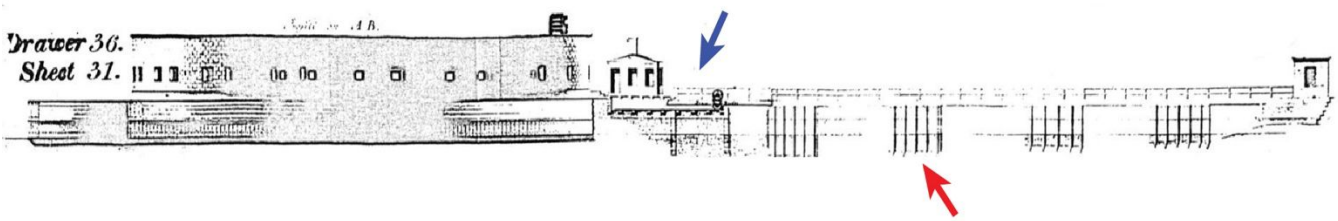
[4] WWII hiatuses caused tunnel construction that began in 1940 to take ten years to finish.




**9a** Location of Proposed 1941 Sea Wall and Wharf




**9b** Profile of Timber Pile and Rip-Rap (Rock Fill) Sea Wall in APE




drawbridge pier/block?

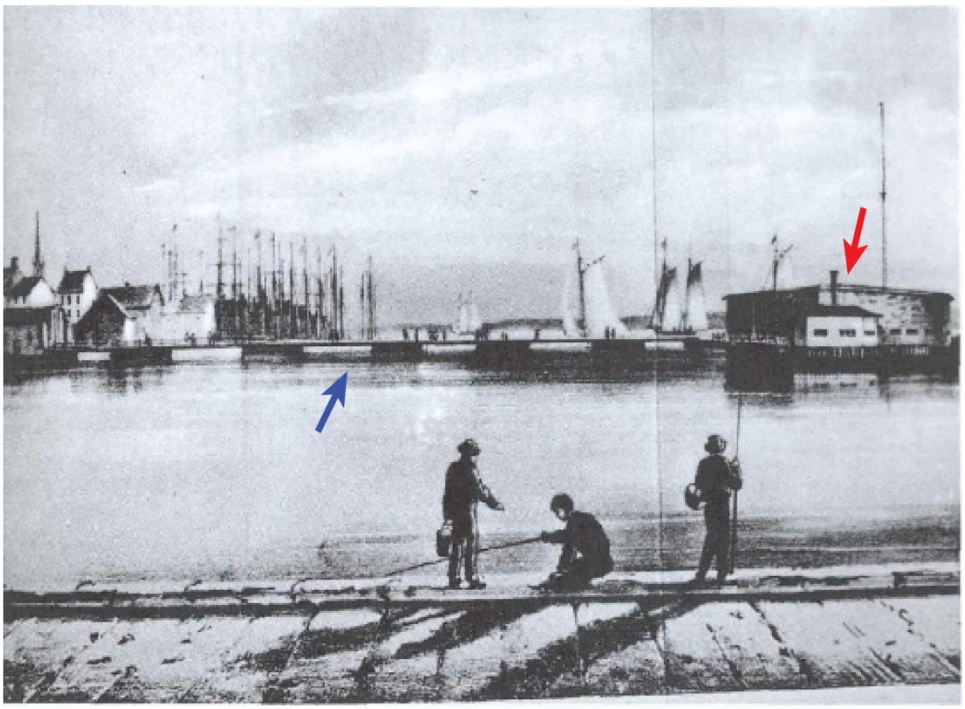


**Photo 3.** This 1820 rendering is of the North Fort or Battery (red arrow) in the Hudson River at the foot of Hubert Street (Valentine 1859:252). The view, which is south, indicates that a block-and-bridge construction (blue arrow) connected the fort to the land.

Plans, maps, and photos document development associated with the former fort. According to an 1885 map, it included unidentified wood structures adjacent to the building when the fort served as the Castle Garden Emigration Center. The map also shows an elevated rail line that was introduced into the park about seven years earlier (Robinson 1885:Section 1; Figure 11). An undated photo with a notation indicating it was taken between 1890 and 1897 shows a high fence around the grounds and more extensive development than in 1885 (Photo 4). Also shown in the photo foreground are the tracks and a station platform associated with the elevated rail line that ran through the park (See the section on Railroads). The platform suggests the view is looking southwest from at or near Bridge Street, said to be the only train stop within the park.

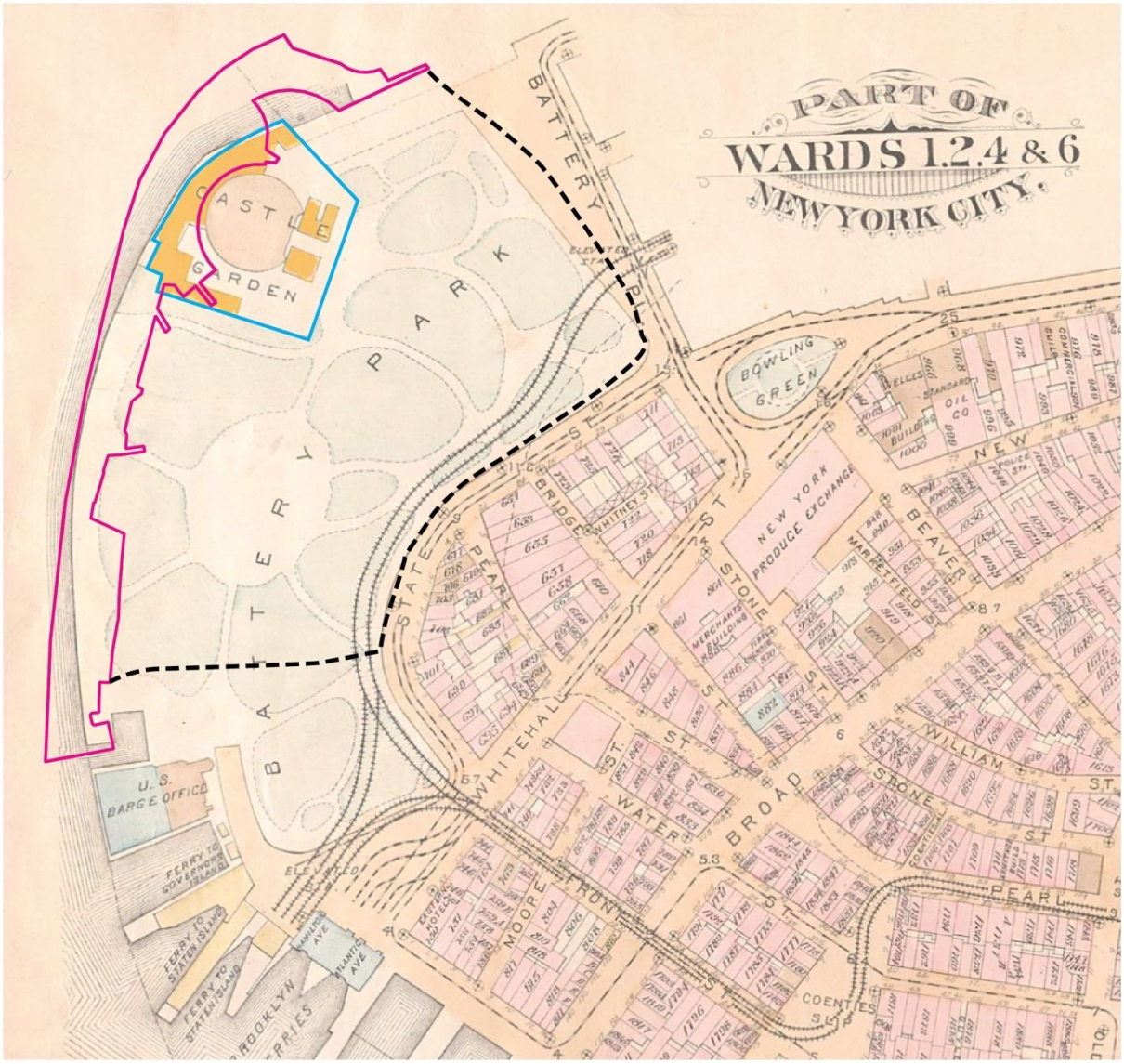

**Photo 4.** The Castle Garden Emigration Center, the nation's first immigration processing center, with many associated structures, in an undated photo (Jackson n.d.). The tracks and platform/station of the elevated train that ran through the park beginning in early 1877 are in the foreground (also see Railroad and Subway Development below). A notation on the photo dates it between 1890, the year the immigration facility vacated the building, and 1897, the year after the New York Aquarium became the new occupant.

To convert the Castle Garden Emigration Center—a somewhat haphazard conversion at best with the permanent chairs of the Castle Garden entertainment venue left in place (Gilder 1936:197)—into the New York Aquarium in 1895, the building underwent extensive internal and external alterations: seven great interior pools were added to the first floor as were glass fronted wall tanks in two tiers with a corridor created between the tanks and the building's outer wall (Bristol 1901:206, 210). In addition, an exterior brick support wall was introduced around the entire building, an undertaking that undoubtedly caused extensive ground disturbance.

After the aquarium moved to Coney Island in 1941, the exterior brick wall was dismantled, undoubtedly again causing great disturbance to the fort and the grounds (see Photo 5). As noted,

**LMRC-BATTERY** Project APE with Castle Garden Emigration Center Grounds and Elevated Rail Line (Robinson 1885:Plate 1, detail)

**11**



1941 also was when the sea wall and wharf supported by wood piles and rip-rap were introduced (see Figures 8a and 8b) that the LMRC-Battery project will now replace.

**Photo 5.** The photo shows the fort in 1941 after demolition of the exterior brick wall introduced earlier to support the the building's use as an aquarium. The view is northeast with the Customs House in the far right background. (Anonymous 1941)

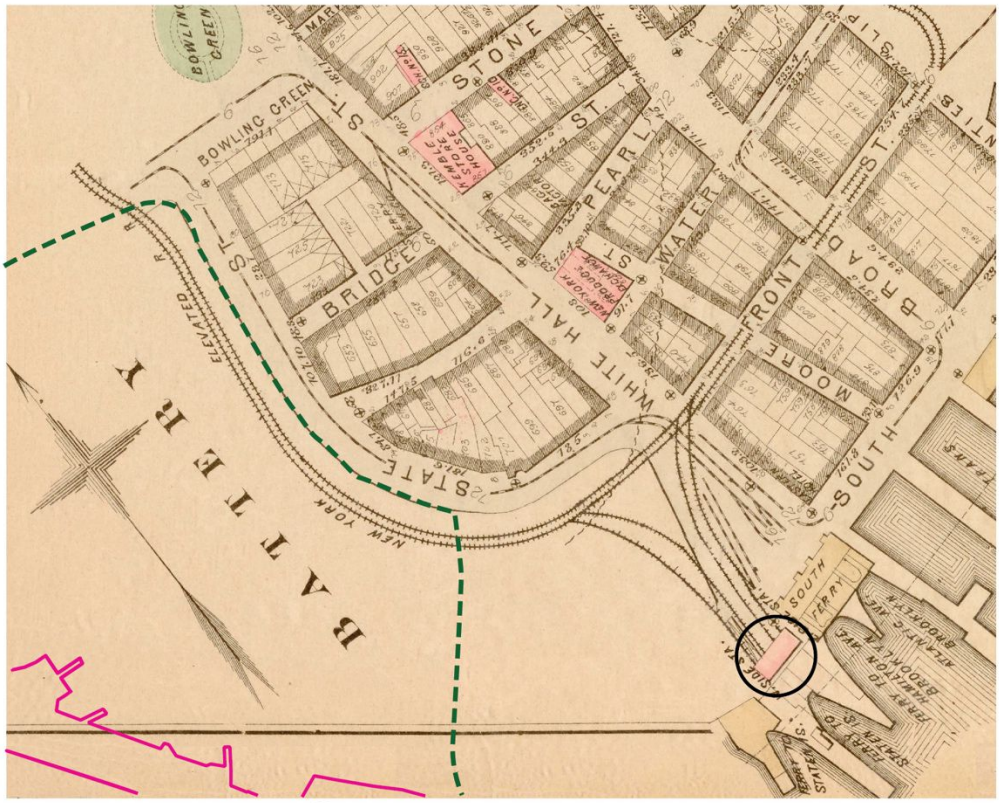
An archaeological assessment of Castle Clinton cannot ignore the potential to find remnants of sanitary features that predate indoor plumbing. Typically found outdoors, they include cisterns usually of mortared brick or stone to collect and hold water and privy pits of dry-laid stone to manage human waste. When no longer in use, they were filled for safety and sanitary reasons and often contain objects (albeit trash) that provide unique information about daily life and practices. The fort's privy accommodations remain a question.

An 1810 plan by John McComb, Jr.[5] shows what appear to be six chambers on either side of the fort's gorge, or outer wall, that may have served as multi-seater privies before becoming storage chambers in 1813. Also in 1813, the fort's Quartermaster was ordered to "cause privies to be erected over the water on the outside of the West Battery" (Pitkin 1960:28). And work done on the locks of the privy doors in 1823 (Pitkin 1960:29) indicate there were then still privy accommodations with the new locks perhaps introduced in anticipation of the fort reverting back to the city and its conversion to a public entertainment center, the first of its new uses. Whatever the fort's privy accommodations, once its military use was over and the building was landlocked by land reclamation,[5] sanitary facilities associated with the Castle Garden Emigration Center, or those meant to accommodate parkgoers, could be a potential archaeological issue in the parkland adjacent to the APE.

A Brief Look at Railroad and Subway Development in the Park

Beginning with negotiations in 1876, and with stops and starts (NY Times February 12, 1877) the New York Elevated Railroad Co. finally introduced an elevated line into Battery Park.

[5] John McComb is often credited as the fort's architect, however, although he contributed, it was Colonel Jonathan Williams, the army engineer in chard of all fortifications, who apparently was most responsible (Pitkin 1960:4).



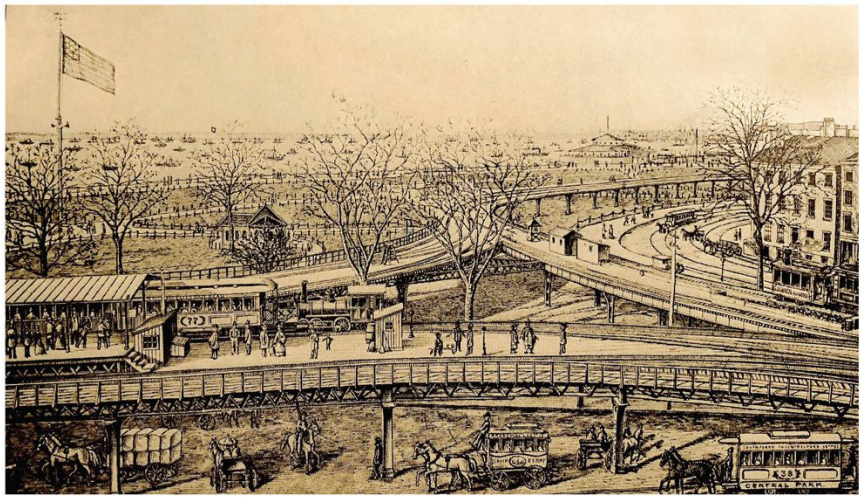



**Photo 6.** A line drawing of the Battery from the foot of South Street in about 1885 (Gilder 1936:opp. P. 224). The view is northwest with curving State Street and the elevated line in the park to the far right. The structure in the bottom left foreground is probably the West Side station shown on the 1879 Bromley map (above).

Trains crossed the park from a station at Morris Street (later moved to Battery Place) to South Ferry (Gilder 1936:212), or according to an 1879 map, to the Westside Station adjacent to the South Ferry Station (Bromley 1879; Figure 12; and Photo 6). Despite the transportation opportunities, many park goers considered the train's noisy and smoke-belching steam driven engines a blight on the park and, as recorded in newspaper articles and park documents, many city officials agreed (NY Times 1878). Electrified in 1902, what became the 9th Avenue El traveled through the park until its final run on June 12, 1940 (NY Times 1940), with the tracks removed a year later (Berger 2003:27). Underground track supports, or their remains, are still to be found and several were encountered during the 2005-2006 South Ferry excavations (See Figure 4 this report for locations) but are considered "non-significant" features (AKRF *et al*.:7-450).

Running parallel to State Street, the subway, like the el, crossed the park from Battery Place to the Whitehall Terminal. Installed in 1905 as a component of the year-old Independent Rail Transit system (IRT), it has functioned for well over a century and, as the MTA South Ferry Terminal project demonstrates, was upgraded rather than demolished.

Introduction of both the el and the subway caused major park impacts. However, a bonus of the South Ferry Terminal project upgrades was that excavation of the new subway tunnels revealed segments of the historical colonial Battery Walls that somehow survived these impacts. It also suggested that additional wall segments may remain in the adjacent park beyond the project LMRC-Battery APE.

## SOIL BORINGS

A soil-boring program to determine subsurface conditions in the APE was carried out in 2021 (Matrix 2021). Several borings were located adjacent to or near Castle Clinton. Logs from three borings within the APE (LB-4, LB-5, and LB-11) adjacent to Castle Clinton in the vicinity of the fort's original counterguard feature were reviewed for this analysis. In addition, the boring log from LB-1, located in the park near Castle Clinton but further away from the fort than the other three, was reviewed for comparison (see Appendix C for the four boring locations, the logs, and a "Log Graphical Legend" that graphically identifies deposits).

Upper fill deposits were recorded to depths between 30 ft. (9.1 m) and 52 ft. (15.9 m) BGS in LB-4, LB 5, and LB-11 with a boulder at 35 ft. to 39 ft. (10.7 to 11.9 m) in LB-5. In LB-1, the upper fill was shallower (between 12 ft. and 15 ft. (3.7 and 4.6 m) BGS but with brick and wood in deeper samples that also appear to be fill. What was not found was evidence of Castle Clinton's aforementioned counterguard, the stone feature that once protected the fort and served as a wharf.

## FINDINGS AND RECOMMENDATIONS

Research to determine the archaeological potential of the LMCR-Battery APE established that the likelihood of archaeological sensitivity in the APE is low. That said, it cannot be ignored that Castle Clinton's stone counterguard that originally surrounded the fort and served as both protection and a wharf, partially was located within APE (see Figures 7-8). However, soil boring data did not offer any evidence of the stone feature. In the park, adjacent to but beyond the APE,

where currently unidentified project-related activities may impact archaeological resources eligible for listing in the National Register of Historic Places, warrants consideration. Mainly the resources of concern include those associated with Castle Clinton, a National Monument also listed in the National Register of Historic Places and a designated New York City Landmark. They also include any components of the historic 18th-century colonial Battery Wall documented during the South Ferry Terminal Project's 2005-2006 excavations.

Viewed in an archaeological perspective, Castle Clinton's documented renovations and additions, and perhaps others that are unknown, not only altered the fort but also its immediate surroundings. And construction in the park during the late-19th-century and throughout the 20th century clearly caused great disturbance. This included the introduction of elevated train lines on in-ground supports in the late 19th century and subway and automobile tunnels, an interceptor sewer that crossed the park immediately adjacent to the APE, and archaeological test pits in the 20th century (Figure 13). Yet, it's possible that remnants of fort features or buildings associated with the Castle Garden Emigration Center (1855-1890) or the New York Aquarium(1895-1941) may remain. While not all are necessarily eligible for listing in the National Register of Historic Places, these features are historically of interest. It's also possible that evidence of Castle Clinton's aforementioned counterguard may endure in the park, as might components of the 19th-century bridge or causeway that joined Castle Clinton to the park.

In addition to features related to the fort, there could be evidence of sea walls or other landfill-retaining features associated with the park's several episodes of 19th-century-land reclamation, possibly with artifacts in the soil matrix defining the fill episodes. While not necessarily National Register eligible, they, like the above mentioned buildings, are of historical interest and may be worthy of documentation.. There also might be filled privy pits, the remains of outdoor sanitary features meant to accommodate late-18th-,19th -, and perhaps early-20th-century park goers.

Despite disturbed contexts, evidence of potentially significant archaeological resources may remain in "pockets" of undisturbed soil. A case in point are the historical 18th-century Battery Wall segments discovered during the MTA's 2005-2006 subway tunnel excavations. And, as was also found during the South Ferry Terminal excavations, isolated (scattered) human remains, perhaps associated with 17th -century Dutch Fort Amsterdam, could be a concern in the vicinity of the historical Battery or in the park's landfill.

To address these issues, a review of final construction plans in an archaeological perspective is recommended to identify any excavations, possibly as shallow 2.0 ft. (0.61 m) BGS but definitely if greater than 6.0 ft. (1.8 m) BGS, in potentially archaeologically sensitive areas where previous disturbance cannot be verified. Based on the findings, avoidance would be recommended, but if not feasible, archaeological testing or monitoring may be called for. As a precautionary measure, an archaeologically-specific unanticipated discovery plan and protocol should be included in construction documents and be in effect during all construction-related excavations.

**LMRC-BATTERY** Documented Late19th- and 20th-C. Disturbances in Battery Park Adjacent to Project APE

13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LMCR-BATTERY APPENDIX A

Known Archaeological Sites within a c. 0.25 Mile Radius of The Project Site (AECOM 2019)

| SHPO/NYSM SITE NUMBER | MAP REF. # | RESOURCE NAME | RESOURCE TYPE | LOCATION/ ADDRESS | DATE/TIME PERIOD | DESCRIPTION | NATIONAL REGISTER STATUS |
|---|---|---|---|---|---|---|---|
| 06101.08120 NYSM 12322 | 1 | Pier 7 Complex | Structures | South end of West Thames Park, north of West Thames Street | 19th Century Historic | Includes portion of ca. 1903 Hudson River bulkhead, ca. 1908 Pier 7 of Baltimore & Ohio RR concrete foundation and shed | Eligible |
| 06101.013876 | 2 | Federal Hall Archaeological Site | Potential Site | 26 Wall Street | Historic | 2005 Phase IB monitoring report by Hartgen Archeological Associates for the NPS for sub-basement foundation repairs encountered 7 features, none of which were determined to be National Register eligible | Tested areas: Not eligible Potential areas: Undetermined |
| NYSM #554 | 3 | Stadt Huys Site | Structures | Now 85 Broad Street | 17th -19th Century Historic | Site of Dutch State House and English Lovelace Tavern; fast land block | Excavated |
| NYSM #624 | 4 | 7 Hanover Square Site | Structures | Now 7 Hanover Square | 18th Century Historic | Part fast land/ part early landfill block of 18th Century residences | Excavated |
| 06101.001272 | 5 | 64 Pearl Street Site | 17th Century Landfill | 64 Pearl Street | Late 17th Century Historic | Artifacts dating to the last quarter of the 17th Century | Excavated |
| 06101.001282 | 6 | Broad Financial Center (Ronson Project Site 33 Whitehall) | 17th Century fast land site | Bounded by Pearl, Whitehall and Bridge Streets | 17th-19th C Historic Occupations | Four 17th Century structures; 6 features identified; 43,318 artifacts recovered | Excavated |
| 06101.015768 | 7 | 18th Century Battery Wall | Structure | South Ferry Corridor in Battery Park | ca. 1730-1789 | 4 sections of cut sandstone and schist stone wall; mid-18th C artifacts recovered | Eligible |
| 06101.000491 | 8 | Municipal Ferry Pier/Battery Maritime Building Site | Structure | Bounded by Water, Broad, South and Whitehall Streets | 1909 | Municipal Ferry | Listed, NHL |

Battery Wall Data (AKRF *et al*. 2012:5-3 [Table 5-1])

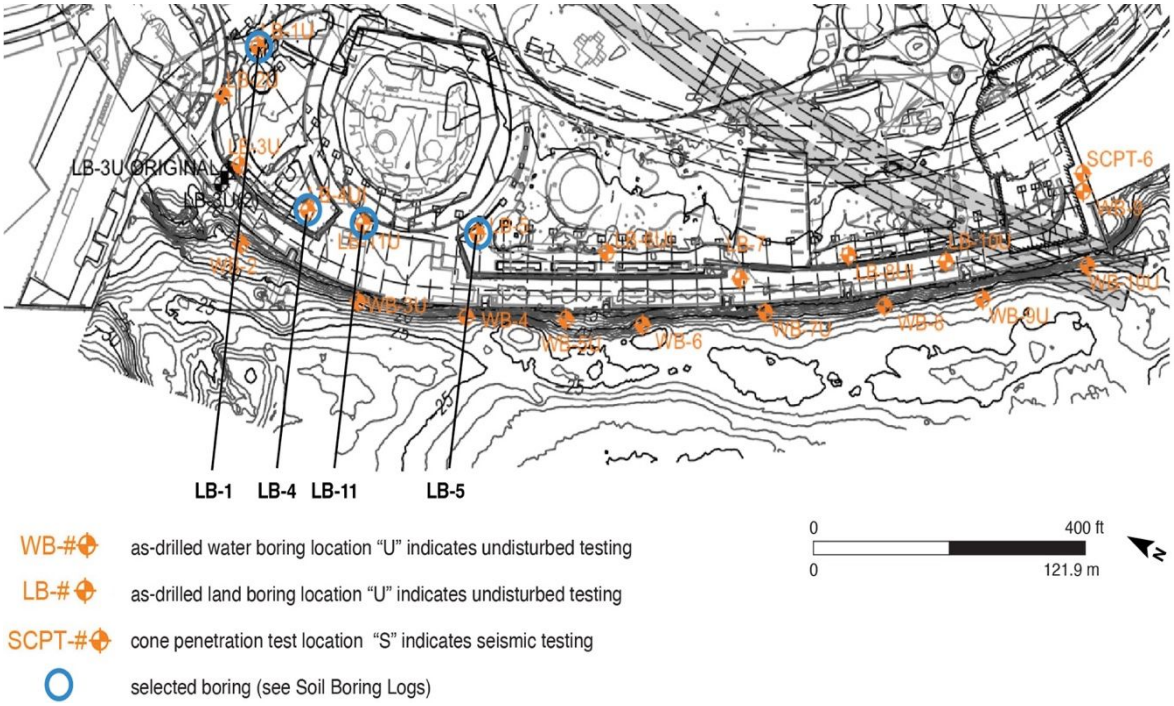
**Summary of Battery Wall Sections**

| | Wall 1 | Wall 2 | Wall 3 | Wall 4 |
|---|---|---|---|---|
| Depth Found* (highest–lowest) | 9.1 – 11.3 feet bgs | 9.6 – 11.7 feet bgs | 4.4 – 8.2 feet bgs | 8.2 – 16.0 feet bgs |
| Elevations Above/Below Sea Level (highest–lowest) | 2.4 – 0.2 feet | 2.5 – 0.6 feet | 3.6 – -3.9 feet | -0.2 – -8.0 feet |
| Maximum Extant Wall Height | 2.1 feet | 2.0 feet | 4.7 feet | 3.4 feet |
| Average Width of Wall Segment | 8 feet | 8 feet | 8.5 feet | 8.5 feet |
| Average Length of Wall Segment and direction | 43 feet east-west 6.5 feet north-south | 4.5 feet east-west | 85 feet north-south | 65.5 feet north-south 33 feet east-west |
| Contains Bastion | Yes | No | No | Yes |
| Construction Method | Two stone faces with fill interior | Two stone faces with fill interior | Two stone faces with fill interior | Two stone faces with fill interior |
| Face Stones | Primarily sandstone | Primarily sandstone | Primarily Schist | Primarily Schist |
| Mortar | Still present joining face stones to each other and to bedrock | Still present joining face stones to each other and to bedrock. | Largely washed away below high water line | Largely washed away below high water line. |
| Foundation | Bedrock | Bedrock | Cobbles | Sand |
| Wooden Elements/ Features | None | None | Large log feature; Wall partially sheeted with wood on landward side. | Wall sheeted with wood on landward side. |
| Data Recovery Conducted | Yes | No | Yes | Yes |
| Number of Excavation Units Completed | 18 | 0 | 16 | 4 |
| Soil Screened for Artifact Recovery | Yes | No | Yes | Yes |
| Flotation Soil Samples Taken/Processed | 35/All | No samples taken | 58/All | No samples taken |
| Geochemical Study Samples Taken/ Analysis Conducted | 27/5 | No samples taken | 83/19 | No samples taken |
| Pollen or Phytolith Samples Taken/ Analysis Conducted | 285/13 phytolith 4 pollen | No samples taken | 211/12 phytolith | No samples taken |

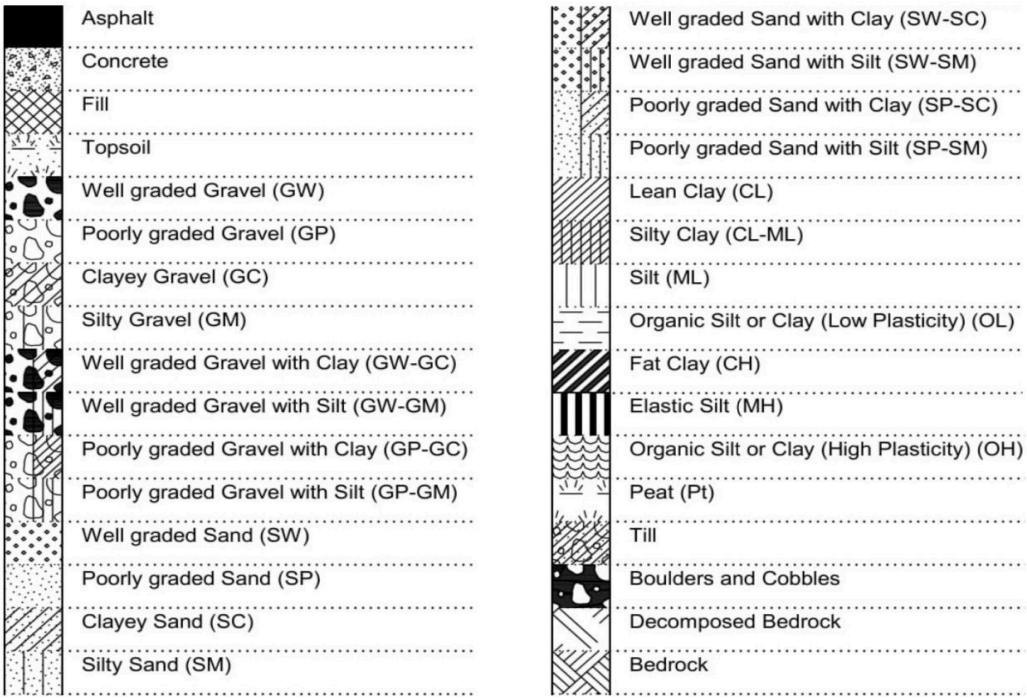
**Note:** * bgs = below ground surface

LMCR-BATTERY APPENDIX C

Soil Boring Locations, Graphic Log Legend, and Soil Boring Logs (Matrix 2021)




Soil Boring Location Plan

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Graphic Log Legend

MATRIXNEWORLD
Engineering Progress

# BORING LOG

BORING NO.: **LB-01U**

SHEET **1** OF **3**

PROJECT NO.: **19-492** PROJECT: **NYCEDC Lower Manhattan Coastal Resiliency - Battery** DATE: **3/29/21 - 3/31/21**
PROJECT LOCATION: **The Battery, NY** BORING LOCATION: **N: 195810.929, E: 979554.438**
DRILLING EQUIPMENT: **LC 55** ANGLE: **-90.0** DIR.: **------** ELEV.: **9.9** DATUM: **NAD83, NAVD 88**
DRILLING CONTRACTOR: **Aquifer Drilling and Testing** DRILLER: **Chris Chaillou** INSPECTOR: **L. Martin**

| CASING and HAMMER | | | | SAMPLER and HAMMER | | | | GROUNDWATER LEVELS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Type | I.D. | Weight | Drop | Type | I.D. | Weight | Drop | Date | Time | Depth | Casing Depth |
| **Auto** | | **140 lbs** | **30"** | **AUTO** | | **140 lbs** | **30"** | | | | |
| **FJ Steel** | **4"** | | | **SS** | **1 3/8"** | | | | | | |
| | | | | **U** | **2 7/8"** | | | | | | |
| | | | | **NX** | **2"** | | | | | | |

| Depth Feet (Elev.) | CASING Blows/ Foot | SAMPLE No. | Type | Depth Feet | Blows/6" (REC. %) [RQD %] | Graphic Symbol | Description Of Material | Laboratory Tests |
|---|---|---|---|---|---|---|---|---|
| (9.7) | | 1 | HA | 0-2 | | | 3" Hex Block<br>Brown c GRAVEL with some mf Sand, geotextile. (GP) | |
| | | 2 | HA | 3-5 | | | Black cmf SAND with brick and concrete fragments. (SP) | |
| 5 | | 3 | SS | 6-8 | 17-17-15-12 (83%) | | Black/gray mf GRAVEL and cmf Sand with brick and concrete fragments. (GP) | |
| | | 4 | SS | 8-10 | 18-27-27-20 (54%) | | Same as above. (GP) | |
| 10 | | 5 | SS | 10-12 | 10-10-10-9 (21%) | | Black cm SAND, some mf Gravel, brick fragments. (SP) | |
| (-3.6) | | | | | | | | |
| 15 | | 6 | SS | 15-17 | 1-1-1-2 (63%) | | Black f SAND and Clay with organics. (SC/OL) | Pass No 200 |
| | | U-1 | U | 17-19 | (75%) | | Undisturbed Sample. | Sieve |
| 20 | | 7 | SS | 20-22 | 1-1-2-2 (71%) | | Black mf SAND and Clay with organics, little brick fragments. (SC/OL) | Pass No 200 |
| 25 | | | | | | | | |

NEWORLD NO GROUT LAND BORINGS 5-21-21.GPJ MATRIX EGS.GDT 5/21/21

BORING NO.: **LB-01U**

MATRIXNEWORLD
Engineering Progress

# BORING LOG

BORING NO.: **LB-01U**

SHEET **2** OF **3**

PROJECT NO.: **19-492** PROJECT: **NYCEDC Lower Manhattan Coastal Resiliency - Battery** DATE: **3/29/21 - 3/31/21**

| Depth Feet (Elev.) | CASING Blows/ Foot | SAMPLE No. | Type | Depth Feet | Blows/6" (REC. %) [RQD %] | Graphic Symbol | Description Of Material | Laboratory Tests |
|---|---|---|---|---|---|---|---|---|
| | | 8 | SS | 25-27 | 1-1-1-2 (17%) | | Black CLAY with f Sand, trace m Gravel, trace organics. (CL/OL) | Atterberg Limits |
| (-18.6) | | | | | | | | |
| 30 | | 9 | SS | 30-32 | WOR-3-7-12 (83%) | | Black CLAY, wood piece at bottom of spoon. (CH/OH) | Atterberg Limits |
| (-21.6) | | | | | | | Wood. Drilled through. | |
| (-24.1) | | 10 | SS | 34-36 | 3-5-2-4 (63%) | | Black CLAY, wood chips at top of spoon. (CH/OH) | Atterberg Limits |
| 35 | | U-2 | U | 36-38 | (0%) | | Undisturbed Sample. | |
| | | 11 | SS | 39-41 | WOH/24" (100%) | | Black CLAY. (CH/OH) | Atterberg Limits |
| 40 | | U-3 | U | 41-43 | (100%) | | Undisturbed Sample. | Atterberg Limits; Unconfined Comp.; Organic Content; Pass No 200 |
| (-33.1) | | | | | | | | |
| 45 | | 12 | SS | 44-46 | 6-8-7-8 (71%) | | Dark gray m SAND. (SP) | |
| | | 13 | SS | 49-51 | 5-5-3-3 (79%) | | Dark gray mf SAND, trace Silt. (SP) | Pass No 200 |
| 50 | | | | | | | | |
| (-42.6) | | R-1 | NX | 53-58 | (85%) [75%] | | MICA SCHIST. Verical foliations, solid, slightly jointed, slightly weathered joints, 7" void near bottom. (BEDROCK)<br>3m 10s<br>4m 5s | |
| 55 | | | | | | | | |

NEWORLD NO GROUT LAND BORINGS 5-21-21.GPJ MATRIX EGS.GDT 5/21/21

BORING NO.: **LB-01U**

MATRIXNEWORLD
Engineering Progress

# BORING LOG

BORING NO.: **LB-01U**

SHEET **3** OF **3**

PROJECT NO.: **19-492** PROJECT: **NYCEDC Lower Manhattan Coastal Resiliency - Battery** DATE: **3/29/21 - 3/31/21**

| Depth Feet (Elev.) | CASING Blows/ Foot | SAMPLE No. | SAMPLE Type | SAMPLE Depth Feet | SAMPLE Blows/6" (REC. %) [RQD %] | Graphic Symbol | Description Of Material | Laboratory Tests |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | 3m 55s<br>3m 22s<br>2m 11s | |
| 60 | | R-2 | NX | 58-63 | (100%) [95%] | | MICA SCHIST. Verical foliations, solid, slightly jointed, slightly weathered joints. (BEDROCK)<br>2m 40s<br>2m 27s<br>2m 18s<br>2m 6s<br>2m 39s | |
| (-53.1) | | | | | | | Bottom of Borehole @ 63 ft. | |

NEWORLD NO GROUT LAND BORINGS 5-21-21.GPJ MATRIX EGS.GDT 5/21/21

BORING NO.: **LB-01U**

MATRIXNEWORLD
Engineering Progress

# BORING LOG

BORING NO.: **LB-04**

SHEET **1** OF **3**

PROJECT NO.: **19-492** PROJECT: **NYCEDC Lower Manhattan Coastal Resiliency - Battery** DATE: **4/01/21 - 4/06/21**
PROJECT LOCATION: **The Battery, NY** BORING LOCATION: **N: 195635.304, E: 979409.04**
DRILLING EQUIPMENT: **LC 55** ANGLE: **-90.0** DIR.: **------** ELEV.: **8.4** DATUM: **NAD83, NAVD 88**
DRILLING CONTRACTOR: **Aquifer Drilling and Testing** DRILLER: **Chris Chaillou** INSPECTOR: **L. Martin**

| CASING and HAMMER | | | | SAMPLER and HAMMER | | | | GROUNDWATER LEVELS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Type | I.D. | Weight | Drop | Type | I.D. | Weight | Drop | Date | Time | Depth | Casing Depth |
| **Auto** | | **140 lbs** | **30"** | **AUTO** | | **140 lbs** | **30"** | | | | |
| **FJ Steel** | **4"** | | | **SS** | **1 3/8"** | | | | | | |
| | | | | **U** | **2 7/8"** | | | | | | |
| | | | | **NX** | **2"** | | | | | | |

| Depth Feet (Elev.) | CASING Blows/ Foot | SAMPLE No. | SAMPLE Type | SAMPLE Depth Feet | SAMPLE Blows/6" (REC. %) [RQD %] | Graphic Symbol | Description Of Material | Laboratory Tests |
|---|---|---|---|---|---|---|---|---|
| (8.1) | | 1 | HA | 0-2 | | | 3" Hex Block<br>3" concrete. Black mf SAND and cm Gravel. (SP) | |
| | | 2 | HA | 2-4 | | | Brown mf SAND and cmf Gravel and cobbles. (SP) | |
| 5 | | 3 | HA | 4-6 | | | Same as above. (SP) | |
| | | 4 | SS | 6-8 | 10-6-3-2 (25%) | | Gray mf SAND, trace mf Gravel, decomposed mica schist. (SP) | |
| | | 5 | SS | 8-10 | 22-8-14-14 (50%) | | Gray mf SAND with mf Gravel, decomposed mica schist. (SP) | |
| 10 | | 6 | SS | 10-12 | 20-40-38-28 (67%) | | Same as above. (SP) | Sieve |
| 15 | | 7 | SS | 15-17 | 4-2-4-6 (25%) | | Same as above. (SP) | Pass No 200 |
| 20 | | 8 | SS | 20-22 | 8-8-11-16 (25%) | | Gray cmf SAND, little mf Gravel, decomposed mica schist. (SP) | |
| 25 | | | | | | | | |

NEWORLD NO GROUT LAND BORINGS 5-21-21.GPJ MATRIX.EGS.GDT 5/21/21

BORING NO.: **LB-04**

MATRIXNEWORLD
Engineering Progress

# BORING LOG

BORING NO.: **LB-04**

SHEET **2** OF **3**

PROJECT NO.: **19-492** PROJECT: **NYCEDC Lower Manhattan Coastal Resiliency - Battery** DATE: **4/01/21 - 4/06/21**

| Depth Feet (Elev.) | CASING Blows/ Foot | SAMPLE No. | Type | Depth Feet | Blows/6" (REC. %) [RQD %] | Graphic Symbol | Description Of Material | Laboratory Tests |
|---|---|---|---|---|---|---|---|---|
| | | 9 | SS | 25-27 | 8-8-14-13 (42%) | | Same as above. (SP) | |
| 30 | | 10 | SS | 30-32 | 5-7-17-13 (42%) | | Same as above. (SP) | |
| 35 | | 11 | SS | 35-37 | 9-12-11-10 (38%) | | Gray cmf SAND, trace mf Gravel, trace Silt, decomposed mica schist. (SP) | |
| 40 | | 12 | SS | 40-42 | 10-8-7-7 (50%) | | Same as above. (SP) | Sieve |
| 45 | | 13 | SS | 45-47 | 17-9-13-8 (25%) | | Gray cmf SAND, some mf Gravel, trace Silt, decomposed mica schist. (SP) | |
| 50 | | 14 | SS | 50-52 | 2-9-13-17 (46%) | | Gray cmf SAND, trace mf Gravel, trace Silt, decomposed mica schist. (SP) | |
| (-45.1) 55 | | | | | | | | |

NEWORLD NO GROUT LAND BORINGS 5-21-21.GPJ MATRIX EGS.GDT 5/21/21

BORING NO.: **LB-04**

MATRIXNEWORLD
Engineering Progress

# BORING LOG

BORING NO.: **LB-04**

SHEET **3** OF **3**

PROJECT NO.: **19-492** PROJECT: **NYCEDC Lower Manhattan Coastal Resiliency - Battery** DATE: **4/01/21 - 4/06/21**

| Depth Feet (Elev.) | CASING Blows/ Foot | SAMPLE No. | Type | Depth Feet | Blows/6" (REC. %) [RQD %] | Graphic Symbol | Description Of Material | Laboratory Tests |
|---|---|---|---|---|---|---|---|---|
| | | 15 | SS | 55-57 | 2-2-3-4 (100%) | | Dark gray CLAY, some Silt, trace f Sand, trace organics. (CL/OL) | Atterberg Limits |
| (-50.1) | | | | | | | | |
| 60 | | 16 | SS | 60-62 | WOR/12"-3-3 (100%) | | Dark gray f SAND and Silt, some Clay. (SM) | Sieve |
| (-55.1) | | | | | | | | |
| 65 | | 17 | SS | 65-65.8 | 4-50/3" (100%) | | Brown SILT, some Clay, wood pieces, mica flakes. (ML) | |
| (-58.6) | | R-11 | NX | 67-72 | (95%) [52%] | | MICA SCHIST. Verical foliations, solid, moderately jointed, slightly weathered joints. (BEDROCK)<br>7m 19s<br>4m 20s<br>2m 4s<br>3m 18s<br>2m 34s | |
| 70 | | | | | | | | |
| (-63.6) | | | | | | | Bottom of Borehole @ 72 ft. | |

NEWORLD NO GROUT LAND BORINGS 5-21-21.GPJ MATRIX EGS.GDT 5/21/21

BORING NO.: **LB-04**

MATRIXNEWORLD
Engineering Progress

# BORING LOG

BORING NO.: **LB-05U**

SHEET **1** OF **3**

PROJECT NO.: **19-492** PROJECT: **NYCEDC Lower Manhattan Coastal Resiliency - Battery** DATE: **3/31/21 - 4/08/21**
PROJECT LOCATION: **The Battery, NY** BORING LOCATION: **N: 195411.231, E: 979533.673**
DRILLING EQUIPMENT: **LC 55** ANGLE: **-90.0** DIR.: **------** ELEV.: **8.5** DATUM: **NAD83, NAVD 88**
DRILLING CONTRACTOR: **Aquifer Drilling and Testing** DRILLER: **Chris Chaillou** INSPECTOR: **L. Martin**

| CASING and HAMMER | | | | SAMPLER and HAMMER | | | | GROUNDWATER LEVELS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Type | I.D. | Weight | Drop | Type | I.D. | Weight | Drop | Date | Time | Depth | Casing Depth |
| **Auto** | | **140 lbs** | **30"** | **AUTO** | | **140 lbs** | **30"** | | | | |
| **FJ Steel** | **4"** | | | **SS** | **1 3/8"** | | | | | | |
| | | | | **U** | **2 7/8"** | | | | | | |
| | | | | **NX** | **2"** | | | | | | |

| Depth Feet (Elev.) | CASING Blows/ Foot | SAMPLE No. | Type | Depth Feet | Blows/6" (REC. %) [RQD %] | Graphic Symbol | Description Of Material | Laboratory Tests |
|---|---|---|---|---|---|---|---|---|
| (8.3) | | 1 | HA | 0-2 | | | 3" Hex Block<br>4" concrete. Gray/brown cmf GRAVEL with f Sand and cobbles. (GP) | |
| | | 2 | HA | 2-4 | | | Brown mf SAND and Silt, trace mf Gravel, brick fragments. (SP) | |
| 5 | | 3 | HA | 4-6 | | | Same as above. (SP) | |
| | | 4 | SS | 6-8 | 7-3-3-9 (38%) | | Brown cmf SAND, brick and concrete pieces. (SP) | Pass No 200 |
| | | 5 | SS | 8-10 | 5-3-6-5 (42%) | | Borwn mf SAND. (SP) | Pass No 200 |
| 10 | | 6 | SS | 10-12 | 6-4-6-5 (46%) | | Brown mf SAND, little fine Gravel. (SP) | Sieve |
| 15 | | 7 | SS | 15-17 | 2-4-8-2 (38%) | | Dark gray/brown mf SAND, trace m Gravel, brick fragments. (SP) | Pass No 200 |
| 20 | | 8 | SS | 20-22 | 15-8-10-16 (54%) | | Dark gray mf SAND, little m Gravel. (SP) | |
| 25 | | | | | | | | |

BORING NO.: **LB-05U**

MATRIXNEWORLD
Engineering Progress

# BORING LOG

BORING NO.: **LB-05U**

SHEET **2** OF **3**

PROJECT NO.: **19-492** PROJECT: **NYCEDC Lower Manhattan Coastal Resiliency - Battery** DATE: **3/31/21 - 4/08/21**

| Depth Feet (Elev.) | CASING Blows/ Foot | SAMPLE No. | Type | Depth Feet | Blows/6" (REC. %) [RQD %] | Graphic Symbol | Description Of Material | Laboratory Tests |
|---|---|---|---|---|---|---|---|---|
| | | 9 | SS | 25-26.3 | 10-9-50/3" (40%) | | Dark gray mf SAND, trace m Gravel. (SP) | |
| 30 | | | | 30-30.4 | 50/5" (0%) | | No recovery. Basalt boulders. | |
| (-25.0) | | | | | | | | |
| 35 | | 10 | SS | 35-37 | 2-3-3-3 (17%) | | Dark gray CLAY. (CH/OH) | Atterberg Limits; Organic Content |
| (-28.5) | | | | | | | Boulder. | |
| (-30.5) | | U-6 | U | 39-41 | (100%) | | Undisturbed Sample. | Atterberg Limits; Unconfined Comp. |
| 40 | | | | | | | | |
| (-32.0) | | 11 | SS | 41-42.7 | 2-3-47-50/2" (59%) | | Dark gray SILT, trace f Sand. (ML) | |
| | | | | | | | Boulder | |
| 45 | | 12 | SS | 46-46.8 | 24-50/3" (100%) | | Gray Silt, little f Gravel, trace f Sand. (ML) | |
| | | 13 | HS | 48-53 | | | Boulders and Till. (TILL) | |
| 50 | | | | | | | | |
| | | 14 | SS | 53-54.7 | 24-45-49-50/2" (69%) | | Brown/gray cmf SAND with mf Gravel and Silt, Till. (SP) | Sieve |
| 55 | | | | | | | | |

BORING NO.: **LB-05U**

MATRIXNEWORLD
Engineering Progress

# BORING LOG

BORING NO.: **LB-05U**

SHEET **3** OF **3**

PROJECT NO.: **19-492** PROJECT: **NYCEDC Lower Manhattan Coastal Resiliency - Battery** DATE: **3/31/21 - 4/08/21**

| Depth Feet (Elev.) | CASING Blows/ Foot | SAMPLE No. | SAMPLE Type | SAMPLE Depth Feet | SAMPLE Blows/6" (REC. %) [RQD %] | Graphic Symbol | Description Of Material | Laboratory Tests |
|---|---|---|---|---|---|---|---|---|
| | | 15 | SS | 58-58.2 | 50/2" (83%) | | Gray cmf SAND, trace mf Gravel, decomposed mica schist. (SP) | |
| 60 | | | | | | | | |
| (-54.5) | | R-12 | NX | 63-68 | (100%) [63%] | | MICA SCHIST with Quartz. Verical foliations, slightly jointed, slightly weathered joints. (BEDROCK)<br>4m 11s<br>4m 58s<br>4m 23s<br>4m 11s<br>2m 48s | |
| 65 | | | | | | | | |
| (-59.5) | | | | | | | Bottom of Borehole @ 68 ft. | |

NEWORLD NO GROUT LAND BORINGS 5-21-21.GPJ MATRIX EGS.GDT 5/21/21

BORING NO.: **LB-05U**

MATRIXNEWORLD
Engineering Progress

# BORING LOG

BORING NO.: **LB-11**

SHEET **1** OF **3**

PROJECT NO.: **19-492** PROJECT: **NYCEDC Lower Manhattan Coastal Resiliency - Battery** DATE: **4/21/21 - 4/22/21**
PROJECT LOCATION: **The Battery, NY** BORING LOCATION: **N: 195557.650, E: 979451.071**
DRILLING EQUIPMENT: **LC 55** ANGLE: **-90.0** DIR.: **------** ELEV.: **7.1** DATUM: **NAD83, NAVD 88**
DRILLING CONTRACTOR: **Aquifer Drilling and Testing** DRILLER: **Chris Chaillou** INSPECTOR: **L. Martin**

| CASING and HAMMER | | | | SAMPLER and HAMMER | | | | GROUNDWATER LEVELS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Type | I.D. | Weight | Drop | Type | I.D. | Weight | Drop | Date | Time | Depth | Casing Depth |
| **Auto** | | **140 lbs** | **30"** | **AUTO** | | **140 lbs** | **30"** | | | | |
| **FJ Steel** | **4"** | | | **SS** | **1 3/8"** | | | | | | |
| | | | | **U** | **2 7/8"** | | | | | | |
| | | | | **NX** | **2"** | | | | | | |

| Depth Feet (Elev.) | CASING Blows/ Foot | SAMPLE No. | Type | Depth Feet | Blows/6" (REC. %) [RQD %] | Graphic Symbol | Description Of Material | Laboratory Tests |
|---|---|---|---|---|---|---|---|---|
| (6.9) | | 1 | HA | 0-2 | | | 3" Hex Block<br>Brown cmf GRAVEL and cmf Sand, cobbles, brick & asphalt fragments. (GP) | |
| | | 2 | HA | 2-4 | | | Same as above. (GP) | |
| 5 | | 3 | HA | 4-6 | | | Same as above. (GP) | |
| | | 4 | SS | 6-8 | 18-12-5-7 (33%) | | Gray cmf SAND, some mf Gravel. (SP) | |
| | | 5 | SS | 8-10 | 16-15-20-14 (38%) | | Brown cmf SAND, some mf Gravel. (SP) | |
| 10 | | 6 | SS | 10-12 | 13-8-8-10 (25%) | | Brown cmf SAND, trace f Gravel, brick fragments. (SP) | |
| 15 | | 7 | SS | 15-17 | 9-6-4-8 (25%) | | Dark gray cmf SAND, little mf Gravel, trace decomposed mica schist. (SP) | Pass No 200 |
| 20 | | 8 | SS | 20-22 | 7-2-5-10 (33%) | | Dark gray cmf SAND, trace mf Gravel, brick fragments. (SP) | Pass No 200 |
| 25 | | | | | | | | |

NEWORLD NO GROUT LAND BORINGS 5-21-21.GPJ MATRIX EGS.GDT 5/21/21

BORING NO.: **LB-11**

MATRIXNEWORLD
Engineering Progress

# BORING LOG

BORING NO.: **LB-11**

SHEET **2** OF **3**

PROJECT NO.: **19-492** PROJECT: **NYCEDC Lower Manhattan Coastal Resiliency - Battery** DATE: **4/21/21 - 4/22/21**

| Depth Feet (Elev.) | CASING Blows/ Foot | SAMPLE No. | Type | Depth Feet | Blows/6" (REC. %) [RQD %] | Graphic Symbol | Description Of Material | Laboratory Tests |
|---|---|---|---|---|---|---|---|---|
| | | 9 | SS | 25-27 | 10-10-5-3 (29%) | | Dark gray cmf SAND, some f Gravel, little Silt. (SP) | Sieve |
| 30 | | 10 | SS | 30-32 | 6-3-5-6 (21%) | | Dark gray m GRAVEL, mf Sand. (GP) | Pass No 200 |
| (-26.4) | | | | | | | | |
| 35 | | 11 | SS | 35-37 | 50/2" (4%) | | Dark gray m GRAVEL. (GP) | |
| 40 | | 12 | SS | 40-42 | 11-WOR-3-50/3" (8%) | | Dark gray SILT with f Gravel. (ML) | |
| 45 | | 13 | SS | 45-47 | 50/0" (0%) | | No recovery. | |
| 50 | | 14 | SS | 50-52 | 4-4-5-4 (79%) | | Gray SILT, some Clay, trace f Gravel. (ML) | Sieve |
| 55 | | | | | | | | |

NEWYORKLD NJ GEOJOB LANG BORINGS 5-27-21.GPJ MATRIX ES.GDT 5/27/21

BORING NO.: **LB-11**

MATRIXNEWORLD
Engineering Progress

# BORING LOG

BORING NO.: **LB-11**

SHEET **3** OF **3**

PROJECT NO.: **19-492** PROJECT: **NYCEDC Lower Manhattan Coastal Resiliency - Battery** DATE: **4/21/21 - 4/22/21**

| Depth Feet (Elev.) | CASING Blows/ Foot | SAMPLE No. | SAMPLE Type | SAMPLE Depth Feet | SAMPLE Blows/6" (REC. %) [RQD %] | Graphic Symbol | Description Of Material | Laboratory Tests |
|---|---|---|---|---|---|---|---|---|
| | | 15 | SS | 55-57 | 5-50/2" (29%) | | Gray cmf SAND, trace decomposed mica schist. (SP) | |
| (-50.9) | | R-27 | NX | 58-63 | (100%) [100%] | | MICA SCHIST. Verical foliations. (BEDROCK)<br>2m 47s<br>2m 51s<br>2m 56s<br>2m 38s<br>3m 26s | |
| 60 | | | | | | | | |
| | | R-28 | NX | 63-68 | (100%) [100%] | | MICA SCHIST. Verical foliations. (BEDROCK)<br>1m 45s<br>1m 27s<br>1m 55s<br>1m 31s<br>2m 13s | |
| 65 | | | | | | | | |
| (-60.9) | | | | | | | Bottom of Borehole @ 68 ft. | |

BORING NO.: **LB-11**