

HISTORICAL **PERSPECTIVES** INC.



**Refinement of Archaeological Area of Potential Effect
East Side Coastal Resiliency Project
Montgomery Street to East 25th Street
Manhattan, New York County, New York**

**DDC # SANDRESM1
NYSOPRHP # 15PR02961
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CEQR # 15DPR013M**

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EXECUTIVE SUMMARY

The proposed East Side Coastal Resiliency project is designed to reduce the risks to Manhattan's East Side from extreme weather and climate change, as well as improve quality of life. This project focuses on neighborhoods along the East River waterfront between Montgomery and East 23rd Streets (and, in one alternative up to East 25th Street) (Figure 1). The proposed project will require ground disturbance within two defined locations, the Project Area One and Project Area Two corridors (the project site) (Figure 2). Therefore, the New York City Office of Management and Budget and the New York City Department of Parks & Recreation have begun consultation with the New York City Landmarks Preservation Commission (LPC) and the State Historic Preservation Office (SHPO) (also known as the New York State Office of Parks, Recreation, and Historic Preservation or NYSOPRHP) and have received correspondence indicating that the site requires an Archaeological Documentary Study (LPC 6/10/15). Similarly, SHPO has determined that the project area is archaeologically sensitive and a Phase IA archaeological study is required. This study by Historical Perspectives, Inc. (HPI), as per the *City Environmental Quality Review Technical Manual* (2014), will establish the project site's potential archaeological sensitivity.

The first task in response to LPC and SHPO comments is narrowing the project site to establish the Area of Potential Effect (APE), defined as those locations that have potential archaeological sensitivity and that will experience either direct or indirect impacts. The established APE will then be subjected to the more comprehensive Phase IA Archaeological Documentary Study. The scope for establishing the APE was developed in consultation with LPC and SHPO (Sutphin 7/9/15, 8/10/2015; Perazio 7/20/15).

The overall project consists of two large sections. Project Area One includes the southern section of the project site, from Montgomery Street north to East 13th Street, including portions adjacent to Pier 42 and all of East River Park. Project Area Two includes the northern section of the project site, from East 13th Street north to East 23rd Street (and, in one alternative up to East 25th Street), including Captain Patrick J. Brown Walk and Stuyvesant Cove Park (Figure 2). The FDR Drive runs through each of these Areas, with pedestrian bridges over the FDR Drive connecting to locations west of the FDR Drive. Each of the design alternatives includes construction of engineered berms, floodwalls and deployable systems at certain locations and in various configurations.

The project archaeological APE includes all of the locations where subsurface impacts or associated earthmoving is proposed for two design alternatives (referred to as Alternatives 2 and 3) that would be constructed within Project Areas One and Two. Projected depths below grade for project floodwalls, engineered berms, and deployable systems, as well as locations and depths of additional project components are not known as of this writing, although all would be located in the overall Project Area. The purpose of the following report is to refine the APE. This initial examination will determine whether any locations within the currently proposed APE may be confidently eliminated from further in-depth archaeological study due to a lack of potential archaeological sensitivity.

With the exception of the upper reaches of the Montgomery Street and East 23rd Street portions of the project area, which were at or near the natural shoreline of the East River prior to landfilling, the remainder of the project area was once under water. Some locations within the project site experienced landfilling during the early nineteenth century, while others remained under water until the twentieth century.

It is not expected that there is any precontact period archaeological sensitivity in the project site for those areas that were once under water. Soil borings uniformly show thick deposits of historic fill strata across the project site, in many cases extending well below the former water line. Precontact resources, if they ever existed, would have been located below these massive fill deposits and beneath strata of river mud, which in some cases were up to 20 feet in thickness. Given the extreme depths at which any precontact period resources would have been located, combined with the low probability of actually encountering such resources, HPI concludes that there is little to no precontact sensitivity for the project site.

Rather, the most common types of potential subsurface resources in the project site should consist of landfill, landfill retaining devices, and piers and wharves. Some areas of the project site had nineteenth-century development after landfilling. Archaeologists and historians have determined that after the mid-nineteenth century, construction of waterfront piers and wharves became standardized, and the general consensus is that waterfront resources that post-date the mid-nineteenth century likely have minimal archaeological significance (e.g. Raber 1985, Bone 2005, Meade 2007, Schaefer 2007, and McDonald 2011).

As noted in the soil boring log review (Appendix B), timbers and wood were recorded frequently in the soil borings throughout the project site, as would be expected in an area with an abundance of former waterfront features. However, from the soil borings it is not possible to distinguish among any pre-1850 landfill retaining devices and piers, post-1850 piles, and timber deposits that represent disassembled pier work that managed to evade removal during modern dredging or disassembly of the features when they were no longer in use. Photographs from the 1930s during construction of the East River Drive and East River Park clearly show that there were large numbers of often derelict piers and wharves in the project site prior to this time, but that they were removed prior to final landfilling for these areas (Appendix A). While it is assumed that some components of these structures, especially below the water line, may have been left in place, whether intentionally or inadvertently, from an archaeological perspective the significance of any such disassociated elements is limited at best.

The following table summarizes the recommendations for this study by segment. Figure 12 illustrates the segments and recommendations.

Segment location	Previous investigations	Recommendations
A. Montgomery Street (Cherry to South Streets)	Yes, Phase IA report on file with SHPO and LPC (Meade 2009)	No additional Phase IA study necessary. Revisit conclusions of previous study when impacts are finalized to determine if Phase IB testing is necessary.
B. Pier 42 vicinity (Montgomery to Jackson Streets)	Yes, Pier 42 outboard portion of segment study on file with SHPO and LPC (Schaefer 2007)	Phase IA study recommended for segment, which had areas landfilled prior to 1850.
C. East River Park, Jackson Street to Grand Street	No	Phase IA study recommended for entire segment, which had areas landfilled prior to 1850.
D. East River Park: Grand Street to East Houston Street	No	Phase IA study recommended for portion of segment from Grand Street to Rivington Street, which had areas landfilled prior to 1850. No further study recommended for Rivington Street to East Houston Street, which should be eliminated from the APE.
E. East River Park: East Houston Street to East 13 th Street	No	No further study recommended for this entire segment, which should be eliminated from the APE.
F. East 13 th Street to East 18 th Street/Avenue C, including Captain Patrick J. Brown Walk	No	No further study recommended for this entire segment, which should be eliminated from the APE.
G. Stuyvesant Cove Park: East 18 th Street/Avenue C to East 23 rd Street	No	No further study recommended for this entire segment, which should be eliminated from the APE.
H. East 23 rd Street to East 25 th Street	No	Phase IA study recommended for entire segment to clarify history and potential sensitivity.

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I. Introduction

The proposed East Side Coastal Resiliency project is designed to reduce the risks to Manhattan's East Side from extreme weather and climate change, as well as improve quality of life. This project focuses on neighborhoods along the East River waterfront between Montgomery and East 23rd Streets (and, in one alternative up to East 25th Street) (Figure 1). The proposed project will require ground disturbance within two defined locations, the Project Area One and Project Area Two corridors (the project site) (Figure 2). Therefore, the New York City Office of Management and Budget and the New York City Department of Parks & Recreation have begun consultation with the New York City Landmarks Preservation Commission (LPC) and the State Historic Preservation Office (SHPO) (also known as the New York State Office of Parks, Recreation, and Historic Preservation or NYSOPRHP) and have received correspondence indicating that the site requires an Archaeological Documentary Study (LPC 6/10/15). Similarly, SHPO has determined that the project area is archaeologically sensitive and a Phase IA archaeological study is required. This study by Historical Perspectives, Inc. (HPI), as per the *City Environmental Quality Review Technical Manual* (2014), will establish the project site's potential archaeological sensitivity.

The first task in response to LPC and SHPO comments is narrowing the project site to establish the Area of Potential Effect (APE), defined as those locations that have potential archaeological sensitivity and that will experience either direct or indirect impacts. The established APE will then be subjected to the more comprehensive Phase IA Archaeological Documentary Study. The scope for establishing the APE was developed in consultation with LPC and SHPO (Sutphin 7/9/15, 8/10/2015; Perazio 7/20/15).

The overall project consists of two large sections. Project Area One includes the southern section of the project site, from Montgomery Street north to East 13th Street, including portions adjacent to Pier 42 and all of East River Park. Project Area Two includes the northern section of the project site, from East 13th Street north to East 23rd Street (and, in one alternative up to East 25th Street), including Captain Patrick J. Brown Walk and Stuyvesant Cove Park (Figure 2). The FDR Drive runs through each of these Areas, with pedestrian bridges over the FDR Drive connecting to locations west of the FDR Drive. Within the total Project Area four Alternatives are proposed:

- **Alternative 1:** No Action
- **Alternative 2:** Coastal Flood Risk Reduction System with Park Improvements
- **Alternative 3:** Coastal Flood Risk Reduction System with Park and Neighborhood Connection Improvements
- **Alternative 4:** To be defined at a later date

The following text describes the overall components of Alternatives 2 and 3, taken from the Draft Scoping document (October 2015). Figures 3-5 illustrate these components.

- **Alternative 2 – Coastal Flood Risk Reduction System with Park Improvements**

The Coastal Flood Risk Reduction System with Park Improvements Alternative meets the project objectives by providing flood protection using a combination of berms and floodwalls with a reconstructed shared use path (bikeway/walkway) along the west side of East River Park. Under this alternative, the park and street improvements currently proposed as separate capital projects by the New York City Department of Parks & Recreation and the New York City Department of Transportation, including the improvements proposed at Pier 42 and the Houston Street overpass, would also be completed. In Project Area One, depending on the location within the Project Area, the essential design features in East River Park include terraced and landscaped berms, floodwalls with architectural finishes that avoid or minimize impacts to existing recreational facilities and other park features, improved park-side bridge landings to integrate with the berms and floodwalls, and enhanced passive recreation and landscaped spaces. In Project Area Two, portions of Stuyvesant Cove Park would be raised as a landscaped berm with the objective of enhancing access to and increasing utilization of the waterfront. Outside of Stuyvesant Cove Park, this alternative would be composed

primarily of floodwalls along the west side of the FDR Drive and the east side of Murphy's Brother's Playground at Avenue C and the FDR Drive and deployable systems along East 23rd Street (with an alternative alignment along East 25th Street) and across and under the FDR Drive.

- **Alternative 3 – Coastal Flood Risk Reduction System with Park and Neighborhood Connection Improvements**

The Coastal Flood Risk Reduction System with Park and Neighborhood Connection Improvements Alternative would similarly achieve flood protection, but would provide additional park amenities and neighborhood connections, including a meandering bikeway and walkway, redesign of several pedestrian bridges to provide both enhanced access and flood protection, and more extensive landscaped features in East River Park. A key feature of this alternative that distinguishes it from Alternative 2 is the proposed enhancement of the existing pedestrian bridges at Delancey and East 10th Streets. This alternative also includes the reconstruction of Stuyvesant Cove Park. Outside of Stuyvesant Cove Park this alternative would be composed primarily of floodwalls along the west side of the FDR Drive and the east side of Murphy's Brother's Playground at Avenue C and FDR Drive; a reconstruction of Stuyvesant Cove Park with a new flood protection berm and landscaping; and deployable systems along East 23rd Street (or along East 25th Street) and across and (under) the FDR Drive.

- **Additional Alternatives**

In addition to Alternatives 2 and 3 described above, other alternatives that would implement the Proposed Action and meet its objectives will continue to be developed and refined during the scoping process for the Environmental Impact Statement (EIS), which will include input from and consultation with local, state, and federal agencies that are either involved, interested, or cooperating in this environmental review process.

The following text, from the Notice of Intent to Prepare an Environmental Impact Statement (EIS) For East Side Coastal Resiliency, Borough of Manhattan, NY (HUD October 2015) describes the different possible components of the proposed project.

- **Engineered and landscape berm (also referred to as a “bridging berm”).** Engineered berms elevate the existing topography to form a line of coastal flood protection and, therefore, require a relatively wide space to be installed. They are typically constructed of a core of compacted fill material, capped by stiff clay to withstand storm waves, with a stabilizing landscaped cover. To avoid seepage, the coastal flood reduction berm has an interior cutoff wall that is constructed of either a stiff clay or slurry. These coastal protection berms can be integrated into a park setting and are also considered adaptable to provide increased risk reduction or accommodate sea level rise to meet future design needs. Floodwalls (see below) are also used in conjunction with a berm at locations where there are horizontal space limitations. In certain reaches of Project Area One, these berms would be integrated with the pedestrian bridges that cross the FDR Drive and touch down in the park; these landings in the park (i.e., the “bridging berms”) then provide the dual benefit of improved access and flood risk reduction. Engineered berms are proposed to be used for coastal flood risk reduction within East River Park in Project Area One and within Stuyvesant Cove Park in Project Area Two. Floodwalls (see the description below) can also be used in conjunction with a landscaped berm in design reaches where there are horizontal space limitations. (In this combination, the floodwall provides the coastal protection and the berm is an associated landscape feature.)
- **Floodwalls.** Floodwalls are narrow vertical flood protection structures with below-grade foundations that are designed to withstand both tidal storm surges and waves. They are typically constructed of steel, reinforced concrete, or a combination of materials, with a

reinforced concrete cap, and can be integrated as a design feature into a park setting. Floodwalls can be strategically sited along project reaches where there are horizontal space limitations for berms and to protect existing recreational facilities by narrowing the footprint of the flood protection system. Floodwalls are proposed to be used as flood protection (in combination with berms) along the interior limits of East River Park in Project Area One (adjacent to the FDR Drive) and along the west (or inland) side of the FDR Drive between about East 13th and East 18th Streets in Project Area Two.

- **Deployable Systems.** It is necessary in many flood protection systems where an opening must be provided to accommodate day-to-day vehicular or pedestrian mobility along a street or sidewalk. In this situation, deployable systems are used. There are several types of deployable systems that may be used, each of which is made of steel and structurally reinforced. These deployable systems include swing flood gates, roller floodgates, crest gates, and demountable gates. The type of system to be used depends upon a number of factors that include length of the opening that is required. With the Proposed Action, deployable systems are proposed as flood protection along inland streets and sidewalk crossings including the FDR Drive main line and ramps in both Project Area One and Project Area Two, and along East 23rd and East 25th Streets in Project Area Two.
- The Proposed Action would also require water main, sewer, and utility relocations, an operations and maintenance plan, utility and lighting plans, connections to other flood protection structures (e.g. the Veterans Affairs Medical Center New York on East 23rd Street), and the repair and replacement of parkland and streets affected by construction. Construction activities may also require improvements to waterfront structures and limited dredging along the East River to provide barge access. Each of the project alternatives also include approaches for managing upland drainage with infrastructure improvements that would impound stormwater along with other improvements that are necessary to maintain sewer system operations during storm conditions.

Both Alternatives 2 and 3 include construction of Engineered Berms, Floodwalls and Deployable Systems at certain locations and in various configurations. Alternative 2 contains the fewest components and Alternative 3 contains the greatest number of components, as well as additional infrastructure such as pedestrian ramps connecting the west side of the FDR Drive with the East River Park.

The project archaeological APE includes all of the locations where subsurface impacts or associated earthmoving is proposed for Alternatives 2 and 3 within the overall Project Areas One and Two. Projected depths below grade for project Floodwalls, Engineered Berms, and Deployable Systems, as well as locations and depths of additional project components are not known as of this writing, although all would be located in the overall Project Area. The purpose of the following report is to refine the APE. This initial examination will determine whether any locations within the currently proposed APE may be confidently eliminated from further in-depth archaeological study due to a lack of potential archaeological sensitivity.

II. Methodology

A. Sources and tasks

In order to refine the APE, HPI has undertaken the following tasks:

- **Provide a list of blocks/lots, street beds, and waterfront locations that would be disturbed by the proposed actions.** At this time, only those general locations that would experience direct subsurface impacts from Engineered Berms, Floodwalls and Deployable Systems are known. Any above-grade actions that could potentially cause compaction or indirect impacts (such as construction staging and soil mounding locations) have yet to be identified, as have any areas associated with additional tasks such as utility relocations, street and parkland reconstruction, and dredging activities.

- **A determination of any areas of proposed subsurface disturbance that have been severely disturbed by prior twentieth and/or twenty-first century development.** To the extent possible, this involved checking modern maps and historic maps and comparing them to existing site conditions to establish the extent of development that has occurred in the last fifty years that may have severely impacted potential resources.
- **A general photo-recordation of existing conditions of Project Areas One and Two.** A site inspection of the full corridor lengths was undertaken to conduct photography and identify evidence of subsurface impacts. Selected photographs are included in this report.
- **A determination of archaeologically sensitive land areas, where archaeological resources may once have been deposited.** Historic maps consulted for the initial review include: 1820 Randel Surveys, 1836 Colton (Figure 6), 1844 U.S.C.S. (Figure 7), 1852 Dripps (Figure 8), 1865 Viele (Figure 9), 1885 Robinson (Figure 10a and 10b), and Sanborn Insurance maps from the late nineteenth through the twentieth century. A selection of historic maps is provided with this report. A 1924 aerial photograph (Figure 11), representing conditions in the project site just prior to construction of the East Side Drive (now FDR Drive) and the East River Park, was studied as well. Photographs of the project site from the 1930s on file at the New York City Municipal Archives and the New York Public Library also were reviewed; a selection is included as Appendix A.
- **Identification of archaeological projects that have been undertaken in the vicinity of the project corridors via a site file search at LPC/SHPO/NYSM.** There have been a tremendous number of archaeological sites recorded within a one mile radius of the project site, both in Manhattan and across the East River in Brooklyn and Queens. For the purposes of this study site, identification was limited to a one-half mile radius in Manhattan, and only those archaeological surveys in the general vicinity of the project site were reviewed in detail.
- **Synthesis of pertinent subsurface data for the project corridors.** There have been various programs of subsurface soil borings conducted within the overall project site, totaling more than 450 individual borings. These include Rock Data Maps from the 1930s, several subsequent boring programs from the 1950s through the 1980s, depending on location, and recent 2015 hazardous materials borings for the targeted project site. While the pre-2015 logs are not likely to represent current conditions, they do provide a baseline with which to compare later logs and thereby extrapolate subsequent subsurface disturbance caused by later construction. Due to the vast number of borings across the project site, a general synopsis of soil conditions is provided below, and a more detailed review is included in Appendix B. Maps showing existing subsurface utilities (sewer, gas and steam) also were reviewed. Visual observation indicates water lines throughout the project site and under most streets. Depths of utilities vary depending on type and location, with sewers generally the deepest buried. For the purposes of this general screening the presence/absence of utilities is discussed but not the specific depths below grade.
- **Review of archaeological significance of waterfront resources in East River settings.** The large majority of the project site was once under water of the East River and later contained waterfront features such as piers and wharves. Archaeologists and historians have determined that after the mid-nineteenth century, construction of these features became standardized, and the general consensus is that waterfront resources that post-date the mid-nineteenth century likely have minimal archaeological significance (e.g. Raber 1985, Bone 2005, Meade 2007, Schaefer 2007, and McDonald 2011). A fuller discussion of waterfront resources is included in the Conclusions section of this report.

B. Definition of Segments within Project Areas

For ease of understanding, HPI has divided Project Areas One and Two into smaller segments. From south to north, these are:

Project Area One

- Montgomery Street
- Pier 42 vicinity (Montgomery to Jackson Streets)
- East River Park (Jackson Street to East 13th Street; several sub-sections included)

Project Area Two

- East 13th Street to East 18th Street/Avenue C, including Captain Patrick J. Brown Walk
- Stuyvesant Cove (East 18th Street to East 23rd Street)
- East 23rd Street to East 25th Street

Within each segment, HPI has included the relevant portion of the FDR Drive and any adjacent areas west of the FDR Drive.

The subsequent sections of this report address each segment separately, and address the proposed APE components within each segment.

III. Previously documented archaeological sites and surveys

Research conducted using data from the SHPO, the LPC, and the library of HPI revealed a number of archaeological sites that have been documented within an approximate one-half mile radius of the overall project site. The closest documented site is the Lower East Side Girls Club site, located on Avenue D between East 7th and 8th streets (Mascia 2009). Like many of the historical archaeological sites on the Lower East Side, this site yielded remains from domestic water/waste management features, e.g., privies and cisterns. Most notable among the sites is the late nineteenth century cistern complex on Block 378 (Grossman 1995), which yielded over 24,000 artifacts, mostly from the late 1860s. Those sites within a one-half mile radius (in Manhattan) are listed in Table 1, below.

Table 1: Archaeological Sites within One-Half Mile of the Project Site

NYSM or NYSOPRHP Site Number	Site Name/Description	Location	Site Type/Time Period
NYSM 4060 ACP-NYRK	NYSM 4060 Nechtanc	Corlears Hook	Native American Village/Woodland? & Contact
A06101.017934	Lower East Side Girls Club	E 7 th & Ave D Block 377 Lot 42	Foundation and privy/Historical
A06101.017933	Lower East Side Girls Club	E 7 th & Ave D Block 377 Lot 47	Privy/1830s–1850s
A06101.015708	School privy	Delancey and Allen Sts.	Privy/Historical
A06101.015723	Historical features	321 E 21 st St., E of 2 nd Ave	Brick cesspools, bldg. remains/nineteenth cent.
A 06101.009530	Bernard Baruch College B	E 25 th St., E of Lexington	Horse stables/ nineteenth cent.
	Block 405, Lot 1	Avenue A, E 10 th –11 th Sts.	Privy/drainage system/late nineteenth cent.
	Congregation Moshcisker Chevrah Gur Arye Mikvah	308 E 3 rd St., Aves C to D	Mikvah/early twentieth cent.
	Block 378 Lots 58 & 59	E 8 th St, Aves C to D	Cistern Complex/mid- to late nineteenth cent.

The single Precontact site, NYSM 4060, was near modern Corlears Hook (about 500 feet west of the southern end of the project site), which Grumet records as *Nechtanc*, possibly meaning “sandy point” (Grumet 1981:39). Bolton calls it *Rechtanck*, suggesting it was adjacent to a fresh water brook that emptied into the East River there (Bolton 1971:133). In February 1643, during the Governor Kieft War (1640–

1645), the Dutch conducted a sneak attack against Nechtanc and brutally massacred a nonhostile group of lower Hudson River Delewaran refugees, who had gathered there for safety (Grumet 1981:61).

There have been numerous archaeological studies completed for Manhattan's Lower East Side. Most of the archaeological sites in the above table were discovered as part of specific investigations. However, the archaeological studies that were most pertinent in terms of comparing expected results for this project were those that were in the immediate vicinity of the project site, four of which fall within the project site. These include Phase IA Archaeological Documentary Studies (or their equivalent) for Montgomery Street between Madison and South Streets (Meade 2009), and the shoreline area, both "inboard" and "outboard," between Montgomery and Jackson Streets for the East River Waterfront Access Project (Schaefer 2007a, 2007b). The fourth more general study was the East River Reach/Removal of Drift project for the East River between Battery Street and 90th Street (Kardas and Larrabee 1977).

IV. Segment discussions

A. Montgomery Street

1. Project segment description

The Montgomery Street project site segment includes the roadbed and sidewalks of Montgomery Street from Cherry Street on the north to South Street (formerly called Front Street) on the south (Photographs 1 and 2). Montgomery Street was widened 40 feet to the east after 1959 to its present width, so that until 1959, part of the roadbed and the current sidewalk on the eastern side were part of the adjacent city block.

Within Montgomery Street, water and steam lines run under the eastern sidewalk (which has recently been paved with Belgian blocks). Sewer lines are within the roadbed itself and not under the sidewalk. Gas lines are under the western side of the street.

Proposed components for this segment are limited to the sidewalk on the southeast side of the block between Water and South Streets, where a floodwall is proposed to be installed.

2. Previous investigations

Montgomery Street from Madison Street to South Street, including the present project area, was subjected to a thorough Phase IA Documentary Study by AKRF in 2009 as part of the East River Waterfront Access project (Meade 2009). The report is on file with both the SHPO and LPC. AKRF identified several areas of archaeological sensitivity within the current project site, corresponding to locations of potential shaft features and landfill and landfiling retaining devices. It does not appear that these sensitive areas were subjected to archaeological testing because the proposed street improvements at the time did not extend into these areas at the depths where the resources might be found.

3. General history

According to the AKRF report, the terminus of Montgomery Street, where the proposed floodwall is to be located, was at the edge of the natural high and low water line for the East River. What is now Montgomery Street was established in 1765 as Little Division Street, and landfiling eventually extended Montgomery Street to South Street (then called Front Street) by the end of the eighteenth century. The area where the floodwall is proposed contained structures by at least the mid-nineteenth century. Until ca. 1959 when Montgomery Street was widened, that location was part of the adjacent city block and contained structures and areas of open yards.

4. General soil boring results

For this segment of the project site, four soil boring logs were reviewed. All dated from the 1930s, prior to the widening of Montgomery Street. One was at the intersection of Cherry Street and the other three were south of Front Street (now South Street). The boring at Cherry Street recorded a surface elevation of 21.4

ft. above sea level, and 97.0 ft. of “sand, gravel, & boulders” reaching to bedrock. The water table is not noted. No “fill” stratum is identified, suggesting that downward grading or other street-bed preparation for Cherry Street removed historical fill and pre-development land surfaces. The other borings were in areas of made land, which originally were under water. Surface elevations ranged between 7-9 feet above mean sea level. They recorded a miscellaneous fill stratum ranging from 17 to 33 ft. in thickness, followed by sand strata with gravel and boulders. Wood was recorded at the base of the fill stratum in one boring, at elevation -26.7 ft. The absence of river mud or silt indicates that some dredging was done in preparation for landfill, and that the procedure was completed in a fairly short time, preventing the accumulation of river deposits before fill deposition.

5. Disturbance and Archaeological Sensitivity

The Montgomery Street project site was included in the 2009 Phase IA Archaeological Documentary Study completed by AKRF (Meade 2009). That study addressed disturbance for the entire corridor and concluded that there were loci of historic period archaeological sensitivity remaining within the present project site. However, it does not appear that any archaeological testing occurred in these locations because the proposed street improvements at the time (which appear to have been completed) did not extend into these areas at the depths where the resources might be found.

B. Pier 42 vicinity (Montgomery to Jackson Streets)

1. Project segment description

The segment of the project site in the vicinity of Pier 42, from Montgomery to Jackson Streets, contains portions of South Street, the FDR Drive, the entrance ramp to the FDR Drive, and Pier 42 (Photographs 3-7). The Pier 42 section is part of Block 241, Lots 13, 18, and 22. The portion just south of the FDR Drive is part of Block 243, Lot 1. FDR Drive is elevated from Montgomery Street to just east of Gouverneur Slip West (with surface parking underneath), and then at grade for the remainder of the segment.

There are sewers under portions of South Street, the parking lot south of FDR Drive for Pier 42, and crossing the segment at Gouverneur Slips East and West and Jackson Street. A gas line crosses Montgomery Street and runs along South Street to service the pier area. Steam lines run along the north side of the FDR Drive, generally under the sidewalks, and cross into the East River Park at Jackson Street.

Proposed project component locations include portions of the South Street sidewalks and streetbed, where floodwalls and deployable gates are proposed. Additional deployable gates are proposed crossing the FDR Drive and on the FDR Drive entrance ramp to the south. Floodwalls also are proposed along the south side of the FDR Drive and entrance ramp. Several options include narrow engineered berms adjacent to and south of the floodwalls.

2. Previous investigations

The “outboard” section of Pier 42, meaning that section that is located on the river side of the existing bulkhead line, was included in a large study of the East River Esplanade project (Schaefer 2007b). Results of that study, which is on file at both the SHPO and LPC, indicated that the outboard Pier 42 locus did not have any archaeological sensitivity. The remainder of the segment has not been subjected to archaeological study, other than being part of the early and general study of the East River Reach/Removal of Drift project for the East River between Battery Street and 90th Street (Kardas and Larrabee 1977).

3. General history

This entire segment was originally under the water of the East River. Landfilling began at least by the early nineteenth century, creating Front Street (today’s South Street along the north side of the FDR Drive) and South Street (to the south of the FDR Drive). Nineteenth-century historic maps (e.g. Dripps 1852 [Figure 8], Robinson 1885 [Figure 10a]) indicate there were many structures on the blocks between Front and South Streets until the East River Drive (now the FDR Drive) was created in the 1930s. Additional

land was taken when the FDR Drive was widened in the late 1940s. There were also a number of nineteenth-century piers within the segment, including a ferry landing at the foot of Gouverneur Street. All of these and subsequent piers are no longer standing. The present Pier 42 was constructed in the second half of the twentieth century.

4. General soil boring results

For this segment of the project site, 38 soil boring logs were reviewed, 26 from the 1930s and the remainder from the 1960s. All of the borings were in areas once under water of the East River. In general, with the exception of the soil borings performed outside contemporary bulkheading, i.e., directly in the waters of the East River, the logs show a strong similarity, with thick fill strata extending down from the surface paving/asphalt to well below mean high water (mhw—considered elevation “0”), as would be expected in a filled, formerly inundated location. Fill stratum thickness ranged from 6 ft. to as much as 48 ft. Bedrock depths, where recorded, tended to be most elevated (25 to 42 ft. below mhw) adjacent to Corlears Hook Park, north of the line of Jackson Street, and south of Cherry Street. In the other parts of the segment the bedrock ranged from 50 to 90 ft. below mhw, and in a few cases as much as 128 ft. below mhw in outboard borings in what was then (1939) unfilled riverbed. Pockets of river mud/silt deposits, as well as timbers and rip rap, the latter two the components of old piers and landfilling devices were noted in several parts of the project site during the 1930s–1950, including, but not limited to, 7 to 16 ft. thick strata of river silt with some wood, ca. 10 to 25 ft. below mhw between Gouverneur Slips West and East. A boring from 2015 records river mud in the Gouverneur Slip area but further outboard, and beneath 40 ft. of fill. Deeply buried timbers were recorded in 1962 in fill at 14.5 ft. below mhw about 500 ft. west of the Jackson Street line and in 1939 north of the Cherry Street line in mud ca. 30–35 ft. below mhw.

5. Disturbance and Archaeological Sensitivity

As noted above, the “outboard” portion of the Pier 42 segment was part of a large archaeological study which determined there was no archaeological sensitivity here beyond the bulkhead line. The remainder of this segment, however, corresponding to the blocks between Front and South Streets, and the early nineteenth-century piers and wharves adjoining them, may retain some archaeological sensitivity. More localized and detailed review of boring logs and other resources would be needed to further estimate the level of disturbance in these areas.

C. East River Park, Jackson Street to Grand Street

East River Park comprises the majority of Project Area One. It begins at Jackson Street and extends north to East 13th Street. The Park contains multiple recreational features, including an amphitheater, numerous athletic fields and facilities, comfort stations, walkways and esplanades, and lawns and other landscaped areas. For ease of discussion, East River Park is discussed in several sub-sections, beginning on the south and ending on the north. This first sub-segment consists of the area from Jackson Street to Grand Street.

1. Project segment description

The portion of this sub-segment, from Jackson Street to Grand Street, includes the FDR Drive and East River Park, which is known as Block 262, Lot 25 (Photographs 8-14). A pedestrian bridge links this section of East River Park with Corlears Hook Park to the northwest of the FDR Drive. From south to north, East River Park includes a large storage yard, a large amphitheater (constructed in 1941), and a large athletic field with two baseball diamonds and a soccer field. The East River Bikeway runs along the east side of the FDR Drive and the East River Promenade runs along the edge of the waterfront. The Lower East Side Ecology Center, also known as the Fire Boat House, is located at the Grand Street end of the sub-segment. It is a two story brick building with a hose tower, constructed around 1941.

There are sewers crossing the FDR Drive in two locations from Corlears Hook Park, from Cherry Street, and from Grand Street. The Cherry and Grand Street sewers meet in the East River Park. There is an outfall at the East River just south of Grand Street.

Proposed project component locations include floodwall construction on the southeast side of FDR Drive and in areas near the amphitheater, and engineered berms at various locations within the park, including around the amphitheater.

2. Previous investigations

This section of the project site has not been subjected to any previous archaeological investigations, other than being part of the early and general study of the East River Reach/Removal of Drift project for the East River between Battery Street and 90th Street (Kardas and Larrabee 1977).

3. General history

The large majority of this sub-segment was originally under water of the East River. The exception was one small strip that was part of Corlears Hook, corresponding roughly to the location of the northeastern part of the FDR Drive between Jackson Street and the pedestrian bridge. Landfilling began at least by the early nineteenth century, with the area south of Grand Street filled first followed by the area northeast of Jackson Street, the sequence shown on the 1836 Colton (Figure 6), 1844 U.S.C.S. (Figure 7), and 1852 Dripps (Figure 8) historic maps. The last area to be filled was the section roughly corresponding to the current amphitheater location. Unlike other waterfront locations, there were fewer piers in this area of the project site, although there was a ferry landing at the foot of Grand Street within the project site by the mid-nineteenth century. Uses of the waterfront in this area were for commercial and industrial facilities during the nineteenth century (Robinson 1885, Figure 10a). In 1905, the rectangular-shaped Corlears Hook Park was created, bounded by Cherry Street, South Street, Jackson Street, and Corlears Street (which no longer exists) and extending into what is now East River Park. When the East River Drive was created in the 1930s, the park was bisected by the new road, and the southeastern area of Corlears Hook Park, as well as the area north to Grand Street became part of East River Park, which opened in 1939. Photographs from the 1930s show that piers were removed prior to the landfilling that created the park (Appendix B).

4. General soil boring results

For this sub-segment of the project site, 100 soil boring logs were reviewed. Of those, 59 were from the 1930s, 16 were from the 1950s, 4 were from the 1960s, and 21 were from 2015. All of the borings were in areas once under water of the East River. In general, with the exception of the soil borings performed outside contemporary bulkheading, i.e., directly in the waters of the East River, the logs show a strong similarity, with thick fill strata extending down from the surface paving/asphalt to well below mhw, as would be expected in a filled, formerly inundated location. Fill stratum thickness ranged from 6 ft. to as much as 48 ft. Bedrock depths, where recorded, tended to be most elevated (25 to 42 ft. below mhw) adjacent to Corlears Hook Park, north of the line of Jackson Street, and south of Cherry Street. In the other parts of the segment the bedrock ranged from 50 to 90 ft. below mhw, and in a few cases as much as 128 ft. below mhw in outboard borings in what was then (1939) unfilled riverbed. Pockets of river mud/silt deposits, as well as timbers and rip rap, the latter two the components of old piers and landfilling devices were noted in several parts of the project site during the 1930s–1950. Deeply buried timbers were recorded in 1939 north of the Cherry Street line in mud ca. 30–35 ft. below mhw.

5. Disturbance and Archaeological Sensitivity

This sub-segment was landfilled in stages during the early nineteenth century, with some waterfront features visible on the 1836 Colton (Figure 6) and 1844 U.S.C.S. maps (Figure 7). By issuance of the 1852 Dripps map (Figure 8) the area contained numerous structures. The blocks northeast of Jackson Street endured until just after the turn of the twentieth century, when Corlears Hook Park was created. The remaining blocks continued to support structures until the East Side Drive was built in the 1930s. While there has been obvious disturbance in much of this sub-section from park and roadway creation, as well as from building construction and demolition, more localized and detailed review of boring logs and other resources would be needed to further estimate the level of disturbance in these areas. Portions of this sub-segment might still retain some archaeological sensitivity.

D. East River Park: Grand Street to East Houston Street

1. Project segment description

The portion of this sub-segment, from Grand Street to East Houston Street, includes the FDR Drive and East River Park, which is known as Block 316, Lot 200 (Photographs 15-20). There is a pedestrian bridge just south of Delancey Street. The Williamsburg Bridge crosses the project site at Delancey Street as well, with bridge foundations located within East River Park. South of the Williamsburg Bridge, East River Park includes recreational parkland and several basketball courts. North of the bridge, there are a series of tennis courts, a W.P.A.-era one-story comfort station (currently out of service), additional recreational parkland, and two baseball diamonds. The East River Bikeway runs along the east side of the FDR Drive and the East River Promenade runs along the edge of the waterfront.

There are sewers that cross the FDR Drive and East River Park from the former line of Broome Street, Delancey Street, the former line of Rivington Street, the former line of Stanton Street, and East Houston Street. Locations in the East River Park also have sewers running north-south. Some stretches of the FDR Drive also have sewers.

Proposed project component locations include floodwall construction on the east side of the FDR Drive and engineered berms at various locations within the park, generally in proximity to the floodwalls and the FDR Drive.

2. Previous investigations

This section of the project site has not been subjected to any previous archaeological investigations, other than being part of the early and general study of the East River Reach/Removal of Drift project for the East River between Battery Street and 90th Street (Kardas and Larrabee 1977).

3. General history

This entire sub-section was originally under water of the East River. The area between Grand and Rivington Streets contained some piers and wharves as shown on the 1836 Colton map (Figure 6) and 1844 U.S.C.S. map (Figure 7), as well as new projected roads called Tompkins and East Streets. By publication of the 1852 Dripps map (Figure 8), the blocks bounded by Grand, Rivington, Tompkins and East Streets had been landfilled, creating new blocks with structures, including some industrial facilities. Piers were located east of East Street, and ferry landings were located within the project site at the foot of Grand Street and East Houston Street. Additional piers were located along Tompkins Street from Rivington to East Houston Street during the second half of the nineteenth century and uses of the waterfront in this area were for commercial and industrial facilities through the first decades of the twentieth century (Robinson 1885, Figure 10a). The East River Drive (now FDR Drive) was created in the 1930s and widened in the 1940s. Photographs from the 1930s show that the piers were removed prior to the landfilling that created the park (Appendix B).

4. General soil boring results

For this segment, 88 soil boring logs were reviewed. Of those, 38 were from the 1930s and located in what was then the East River; 13 were from the 1940s along East River Drive; and the remainder, from the 1960s through 2015, was located in East River Park. In general, with the exception of the soil borings performed outside contemporary bulkheading, i.e., directly in the waters of the East River, the logs show a strong similarity, with thick fill strata extending down from the surface paving/asphalt to well below mhw, as would be expected in a filled, formerly inundated location. Fill stratum thickness ranged generally from 16 ft. to as much as 50 ft., with a few outliers. The most substantial fill strata of ca. 30 to 40 ft. thick tended to be found in the East River Park, as recorded in the 1962 Newtown Creek PCP and 2015 boring logs. Bedrock depths, where recorded, tended to vary between 40 and 60 ft. below mhw. Beneath fill strata, areas of thick river mud/silt deposits, as well as timbers embedded in both the fill and the mud (possible components of old piers and landfilling devices) were noted in several areas in 1949, including, but not

limited to the area of 6 to 20 ft. thick strata of river mud with some wood, extending ca. 20 to 30 ft. below mhw between the line of Stanton Street and East Houston Street, both in the East River Drive and the park. Boring logs of 1962 record the continued survival of these river deposits within this segment of the East River Park, as well as the widespread presence of deeply buried timbers.

5. Disturbance and Archaeological Sensitivity

This segment has mixed archaeological sensitivity. The area from Grand Street to Rivington Street contained piers and wharves by the 1830s, and subsequently was landfilled by about 1850, creating four new blocks bounded by Tompkins Street on the west and East Street on the east. Although there clearly has been subsequent disturbance to this area since that time, most notably from construction of the buildings on the blocks and later their demolition and the creation of East River Drive, there could be some archaeological sensitivity in this area. Further in-depth study is necessary to confirm if this is the case.

By contrast, the area from Rivington to East Houston Street remained unfilled east of Tompkins Street through the end of the nineteenth century, and only contained piers and wharves. These former piers and wharves, which have been removed, dated to a period when construction of waterfront features had become highly standardized. Although soil borings indicated some embedded timbers in or below the fill strata, which could be remains associated with the former waterfront features, these would not necessarily constitute significant archaeological resources.

E. East River Park: East Houston Street to East 13th Street

1. Project segment description

The portion of this sub-segment, from East Houston Street to East 13th Street, includes the at-grade FDR Drive and East River Park, which is known as Block 316, Lot 200 (Photographs 21-28). The northernmost tip of this sub-section, near East 13th Street, is known as Block 316, Lot 114. There are three pedestrian bridges over the FDR Drive, at East Houston Street, south of East 6th Street, and north of East 10th Street. From south to north, East River Park facilities include two baseball fields; a combination soccer field and track with a large W.P.A.-era comfort station at the foot of East 6th Street; two additional baseball fields and a small comfort station near East 10th Street; and a playground and two basketball courts. Recreational parkland and pathways are interspersed between the athletic facilities. The East River Bikeway runs along the east side of the FDR Drive and the East River Promenade runs along the edge of the waterfront.

There are sewers that cross the FDR Drive and the East River Park at East 3rd, East 6th, East 8th, East 10th, and East 11th Streets, and connect to each other in north-south branches within the park. Some sections of the FDR Drive also have sewers.

Proposed project component locations include a floodwall installation on the east side of the FDR Drive and engineered berms at various locations within the park, generally in proximity to the floodwalls and FDR Drive. Some plans also include engineered berms further east in the park in the vicinity of East Houston Street and south of East 6th Street. Alternative 3 includes a redesigned and enhanced pedestrian bridge over the FDR Drive near East 6th Street.

2. Previous investigations

This section of the project site has not been subjected to any previous archaeological investigations, other than being part of the early and general study of the East River Reach/Removal of Drift project for the East River between Battery Street and 90th Street (Kardas and Larrabee 1977).

3. General history

This entire sub-section was originally under water of the East River. By the 1830s, landfilling had extended east to about the line of the present FDR Drive from East Houston Street to East 8th Street, although the remainder of the segment was still part of the river (Colton 1836, Figure 6). Several piers and

a dry dock were located along the shoreline at this time, with some of the piers overlapping the project site. Landfilling continued during the following decades, and by the 1850s the shoreline had extended further east into the river, with additional piers constructed at the terminus of many numbered streets (U.S.C.S. 1844 [Figure 7]; Dripps 1852 [Figure 8]). Most of the industry along the mid-nineteenth century waterfront was for shipbuilding. A number of piers and some of the wharves overlapped the project site. Conditions were similar through the end of the nineteenth century (Robinson 1885, Figures 10a and 10b). Prior to the creation of East River Park in the 1930s, this segment still contained numerous piers, many of which were in a deteriorated state (Bureau of Engineering 1924, Figure 11). Photographs from the 1930s show that piers were removed prior to the landfilling that created the park (Appendix B).

4. General soil boring results

For this segment, 76 soil boring logs were reviewed. Of those, 40 were from the 1940s and located along East River Drive; 7 were from the 1960s and located in East River Park; 2 were from 2000 in East River Park, and the remainder was completed in 2015 in East River Park. In general, the logs show a strong similarity, with thick fill strata extending down from the surface paving/topsoil to well below mhw, as would be expected in a filled, formerly inundated location. Fill stratum thickness ranged generally from 10 ft. to as much as 40 ft., with a few outliers. Bedrock depths, where recorded, tended to vary between 50 and 70 ft. below mhw. Beneath fill strata, areas of thick, river mud/silt deposits, as well as timbers embedded in both the fill and the mud (possible components of old piers and landfilling devices) were noted in several areas.

5. Disturbance and Archaeological Sensitivity

This segment has low archaeological sensitivity because the area east of the FDR Drive, where proposed project components will be located, was nearly all under water through the mid-nineteenth century. During the second half of the nineteenth century, a number of piers and some of the wharves overlapped the project site, a condition that continued into the twentieth century. However, these former piers and wharves, which have been removed, dated to a period when construction of waterfront features had become highly standardized. Although soil borings indicated some embedded timbers in or below the fill strata, which could be remains associated with the former waterfront features, these would not necessarily constitute significant archaeological resources.

F. East 13th Street to East 18th Street/Avenue C, including Captain Patrick J. Brown Walk

1. Project segment description

This segment includes FDR Drive and the area to the east of the road, from East 13th Street to East 18th Street/Avenue C (Photographs 29-34). The FDR Drive begins at grade and transitions to an elevated structure at about East 16th Street. From East 13th Street to East 15th Street the area east of the FDR Drive is known as Block 988, Lot 75. The remainder of the segment is unlotted; the East River Bikeway in this segment is classified as part of FDR Drive. The section from East 13th to East 15th is part of the large Con Edison facility on the west side of the FDR Drive. It contains both industrial buildings and visible above-grade utility conduits. The East River Bikeway runs between the Con Edison facility and the FDR Drive. North of East 15th Street, the segment contains Captain Patrick J. Brown Walk, a brick-paved esplanade that carries the East River Bikeway along the east side of FDR Drive.

There are sewers that cross the FDR Drive at East 14th, East 15th and East 16th Streets. Some portions of the FDR Drive also have sewers.

Proposed project components include a combination of floodwalls and deployable gates along the west side of the FDR Drive, combined with additional deployable gates in several locations of the FDR Drive roadway. There are no engineered berms proposed for this segment.

2. Previous investigations

This section of the project site has not been subjected to any previous archaeological investigations, other than being part of the early and general study of the East River Reach/Removal of Drift project for the East River between Battery Street and 90th Street (Kardas and Larrabee 1977).

3. General history

This segment was originally under water of the East River. By the 1850s, landfilling had extended to about the edge of the FDR Drive from East 14th to East 17th Street, although the remainder of the segment was still under water, and remained that way through the end of the nineteenth and into the twentieth century (Dripps 1852 [Figure 8], Viele 1865 [Figure 9], Robinson 1885 [Figure 10b]). Piers in this segment were constructed in the twentieth century. The East River Drive (now the FDR Drive) was constructed through this segment in the 1930s and was widened in the 1940s.

4. General soil boring results

For this segment, 62 soil boring logs were reviewed, from the 1930s through the 1950s, both inboard (on firm ground) and outboard (in the East River). In general, excluding the earliest borings that were done outboard in the East River, the logs show a strong similarity, with thick fill strata extending down from the surface paving/topsoil to well below mhw, as would be expected in a filled, formerly inundated location. Fill stratum thickness ranged from 10 ft. to as much as 45 ft. The most substantial fill strata of ca. 30 to 45 ft. seemed to be generally distributed throughout the segment. Bedrock depths, where recorded, tended to vary between 67 and 132 ft. below mhw, with a concentration of the greatest bedrock depths between East 17th and 18th Streets. Beneath fill strata, areas of thick river mud deposits were recorded near East 17th and East 18th Streets, including, but not limited to, the area of 10 to 17 ft. of river mud beneath 20 to 30 ft. of fill under the FDR Drive. Among these borings performed in 1944 were timber strata and timber piles embedded in both the fill and the mud (possible components of old piers and landfilling devices).

5. Disturbance and Archaeological Sensitivity

This segment has little to no archaeological sensitivity because the majority of it was under water through the end of the nineteenth century (the exception was the narrow strip along the western side of the FDR Drive, which was at the mid-nineteenth century shoreline). Former piers in this segment, which have been removed, dated to the twentieth century, a time when construction of waterfront features had become highly standardized. Although soil borings indicated some embedded timbers in or below the fill strata, which could be remains associated with the former waterfront features, these would not necessarily constitute significant archaeological resources.

G. Stuyvesant Cove Park: East 18th Street/Avenue C to East 23rd Street

1. Project segment description

This segment includes the elevated FDR Drive, surface parking beneath the FDR Drive, and the adjacent Stuyvesant Cove Park on the east (Photographs 35-41). The segment is unlotted. The park was completed in 2002. It includes the East River Bikeway, pedestrian paths, seating and plantings. There is a one-story park facility (the Solar One building) on the northern end, followed by a BP Gasoline Station at the East 23rd Street terminus.

Sewers in this segment generally run under the FDR Drive, and not within the park area, except for areas where there are storm outfalls at Avenue C and north of East 20th Street, and East 23rd Street. Steam lines run along the west side of the FDR Drive.

Proposed project components in this segment include a combination of floodwalls, deployable gates, and engineered berms. At East 18th Street/Avenue C, the floodwalls and deployable gates would cross the FDR

Drive from the west to the east side, and then all components in this segment would be located on the east side of the FDR Drive in Stuyvesant Cove Park.

2. Previous investigations

This section of the project site has not been subjected to any previous archaeological investigations, other than being part of the early and general study of the East River Reach/Removal of Drift project for the East River between Battery Street and 90th Street (Kardas and Larrabee 1977).

3. General history

This entire segment was located under the water of the East River through the end of the nineteenth century (Colton 1836 [Figure 6]; U.S.C.S. 1844 [Figure 7]; Dripps 1852 [Figure 8]; Viele 1865 [Figure 9]). Several late nineteenth-century piers, located at the foot of adjacent streets, overlapped the segment (Robinson 1885, Figure 10b). These and additional twentieth-century piers have been removed. Later, the area became a brownfield site from dumping associated with a cement plant, and was used as a parking lot. Stuyvesant Cove Park was completed in 2002.

4. General soil boring results

For this segment, 86 soil boring logs were reviewed. Chronologically they range from 1934 through 2015, both before and after the construction of the East River (FDR) Drive. Excluding the earliest borings that were done outboard in the East River, the logs show a strong similarity in general, with thick fill strata extending down from the surface paving/topsoil to well below mhw, as would be expected in a filled, formerly inundated location. The thickness of identified fill stratum was 10 to 42 ft, and generally in the range of 20 to 40 ft. throughout the segment. Outliers came from a number of the 2015 borings that failed to identify all fill strata, since they were performed in filled sections of the East River bed but noted only 4 to 7 ft. of fill. Bedrock depths, where recorded, tended to vary between 110 and 137 ft. below mhw, with a concentration of the shallowest bedrock depths between East 18th and 19th Streets. Beneath fill strata, areas of thick river mud deposits were recorded throughout this segment, with some borings including embedded timbers in or below the fill (possible components of old piers and landfilling devices).

5. Disturbance and Archaeological Sensitivity

This segment has little to no archaeological sensitivity because it was under water through the end of the nineteenth century. Former piers in this segment, which have been removed, also dated to the later nineteenth century, a time when construction of waterfront features had become highly standardized. Although soil borings indicated some embedded timbers in or below the fill strata, which could be remains associated with the former waterfront features, these would not necessarily constitute significant archaeological resources.

H. East 23rd Street to East 25th Street

1. Project segment description

This segment includes the roadbed and sidewalks of East 23rd Street from the FDR Drive west to First Avenue, as well as portions of the elevated FDR Drive and the areas beneath and adjacent to it from East 23rd Street to East 25th Street, where an Alternative Flood Protection System is proposed (Photographs 42-43). These areas are all unlotted.

Sewers run down the center of East 23rd Street, the former line of East 24th Street, Asser Levy Place, and along the north side of the FDR Drive. Steam lines run under the sidewalks on both sides of East 23rd Street between Asser Levy Place and First Avenue.

Proposed project components in this segment include a combination of floodwalls and deployable gates. The components would cross the FDR Drive just north of East 23rd Street and then contain floodwalls and

deployable gates along the sidewalks on the north side of East 23rd Street, the west side of FDR Drive, and the south side sidewalks of East 25th Street, depending on the Alternative.

2. Previous investigations

This section of the project site has not been subjected to any previous archaeological investigations, other than being part of the early and general study of the East River Reach/Removal of Drift project for the East River between Battery Street and 90th Street (Kardas and Larrabee 1977).

3. General history

The section of East 23rd Street east of First Avenue was originally on firm ground, with the East River shoreline crossing what is now East 23rd Street between First Avenue and Avenue A. The area was part of the colonial era Bellevue Estate, the riverfront retreat of Quaker merchant Lindley Murray. Beginning in 1793, the estate was leased by the City of New York as a quarantine hospital for Yellow Fever patients. The “fever hospital” was followed by additional city facilities for the sick and indigent. In 1816, Bellevue was formally dedicated, and at that time contained a “pest house” for fever victims, a public school, a penitentiary, a bakery, a morgue, a wash house, a soap factory, a greenhouse, an icehouse and a workshop (Digital Almshouse Project 2013). The Randel farm map of 1820 shows that these buildings all were located north of what would become East 24th Street. However, the 1836 Colton map (Figure 6) shows that a “fever hospital” was located abutting the East 23rd Street project site just east of First Avenue. At this time, East 23rd Street had been landfilled to Avenue A, although the portions of the project site north of East 23rd Street remained under water of the East River. In 1839, the City’s “House of Refuge” was moved to a new building on the north side of East 23rd Street between First Avenue and Avenue A, next to the Fever Hospital. It is shown on the 1852 Dripps map (Figure 8), along with a pier at the foot of East 23rd Street and a ferry landing noted as the ferry to Calvary Cemetery. The House of Refuge moved to Randall’s Island in 1854 (*New York Times* 1860), after which time the facilities on the block were replaced with other residential, commercial and industrial buildings. The current Asser Levy Recreation Center building, a New York City Landmark, opened in 1908. It replaced a ferry building that had been located on the block prior to that time. The portion of the project site from East 23rd to East 25th Street was part of the East River waterfront until the East River Drive was constructed in the 1930s.

4. General soil boring results

No soil borings were available for this segment.

5. Disturbance and Archaeological Sensitivity

Further study is necessary to determine whether there may be archaeological sensitivity for this area. Although it appears that the proposed project components for this segment are within areas formerly under water, it is unclear whether there may have been resources associated with the late eighteenth-century Bellevue Estate and the late eighteenth through mid-nineteenth century Bellevue city facility (which included a fever hospital and House of Refuge north of East 23rd Street) that may overlap with the project site. The degree to which this area has been disturbed by later earthmoving is additionally unclear, as no soil borings were available for this segment.

V. Conclusions and Recommendations

This initial screening for general archaeological sensitivity is intended to refine the APE by potentially eliminating areas of the large project site that HPI concludes may not require a full Phase IA Archaeological Documentary Study. As described above, with the exception of the upper reaches of the Montgomery Street and East 23rd Street portions of the project site, which were at or near the natural shoreline of the East River prior to landfilling, the remainder of the project site was once under water. Some locations within the project site experienced landfilling during the early nineteenth century, while others remained under water until the twentieth century.

It is not expected that there is any precontact period archaeological sensitivity in the project site for those areas that were once under water. Soil borings uniformly show thick deposits of historic fill strata across the project site, in many cases extending well below the former water line. Precontact resources, if they ever existed, would have been located below these massive fill deposits and beneath strata of river mud, which in some cases were up to 20 feet in thickness. Given the extreme depths at which any precontact period resources would have been located, combined with the low probability of actually encountering such resources, HPI concludes that there is little to no precontact sensitivity for the project site.

Rather, the most common types of potential subsurface resources in the project site should consist of landfill, landfill retaining devices, and piers and wharves. Some areas of the project site had nineteenth-century development after landfilling. A brief discussion of these resources along the East River follows.

A. Landfill Retaining Structures, Wharves and Piers Review

Historical cribbing and bulkheads—devices for retaining fill—have been a subject of archaeological investigation for many decades (see e.g., Historic Sites Research 1978), and docks and wharves, some of which eventually functioned as landfill retainers may have existed in some parts of the project site. All utilized similar construction techniques, which evolved from a vernacular tradition in the seventeenth and eighteenth centuries, to be replaced by the documented, standardized construction practices of the late nineteenth century.

Research by archaeologist McDonald (2011) on pre-1850s landfill retaining devices and other waterfront features has argued that previous discussions of these features, in attempting to create the neat typologies beloved by archaeologists, have led to a certain amount of confusion, and that instead archaeologists should describe basic attributes of the features, making clear distinctions between the various aspects of construction: structural material, fill material, form, structure type, and construction method. In New York City, most pre-1850s waterfront features employed log-construction techniques that, McDonald argues, were likely derived from a Germanic/Scandinavian vernacular architectural tradition—these methods and materials are not used in either the UK or the Netherlands, and, in New York City, were rarely, if ever, employed in aboveground structures beyond wharves and bulkheads. With technological advances facilitating efficient, deep pile driving, the log-construction tradition was phased out after mid-nineteenth century, in favor of standardized, pile-supported piers and bulkheading.

1. The “Vernacular” Tradition—the Eighteenth to Mid-nineteenth Centuries

- **Sheet Piling**

Prior to the late eighteenth century, the chief method of land extension and wharf construction in the New York City area was by the creation of sheet-pile seawalls. Debarked logs of American white oak, sharpened to a point at one end and shaped at the head to accommodate a pile cap, would be driven side by side into the mud of the river floor with a log or stone drop hammer. They would then be anchored together with heavy horizontal wood planking secured to the outboard face of the piles. The planking would retain the fill which would be deposited on the landward side. Sheet piling was also employed to surround riprap embankments; and combinations of piles, planks, stone embankments, and sheet piling were the dominant construction methods to the time of the American Revolution and are mentioned as late as 1840 (Small 1941). The method was also employed in the construction of docks and wharves (Bone 1997:92–96).

- **Cribworks and Cobb-type Log Construction**

By the late eighteenth century, log cribworks—wood-frame, “boxlike receptacles” with solid bottoms and open sides, filled with loose stone and sunk to river bottom—provided larger, sturdier supports for retaining walls and wharves, where pile-supported structures could not be built or proved unstable in the face of strong river currents and ice. The river floor would be dredged, clearing mud and loose debris down to the bedrock or hardpan substratum. The crib bottom was fitted to the river floor’s contours, and the cribwork was carefully filled with stone, mud, sand, and sometimes even concrete, and pinned to the bottom. If the

crib facing was constructed so tightly that earth alone could be used as the fill, it was called a “solid-filled crib” (Bone 1997:96–99; Joseph et al. 2004:178–179).

A cruder construction form, using notched, unhewn logs, and larger fill cells, was known as a cobb wharf, and the fill supposedly consisted entirely of stone (Joseph et al. 2004:179). Often the fill included other materials, such as ballast rock and coral, brush, and tree stumps (Louis Berger 1990:V-3). Cobb construction, with its less accurate joints, was less durable and stable than cribwork (Bone 1997:96–99). The 1690s cobb structure excavated at the Barclays Bank Site (75 Wall Street, corner of Wall and Water Streets) was built with rough logs joined to form a series of 5-foot-square compartments. The structure was secured in place by pilings, and filled with rock and coral (Louis Berger 1983).

Data illuminating eighteenth- and nineteenth-century wharf construction practices in Lower Manhattan has been accumulating since the 1960s, as examples of cobb-type construction have been uncovered at a number of archaeological sites, including Cruger’s Wharf, at present Old Slip and Water Street, ca. 1740 (Huey 1984); the Telco Block (site bounded by Water, Fulton, Front and John Streets), a mid-eighteenth-century cobb wharf complex (Rockman et al. 1982:60, 64–68, Figures 3.10, 3.12); Assay Office site, on the block between Front and South Streets, and Wall Street and Gouverneur Lane, plank bulkheads, as well as a cobb wharf complex dating to the 1790s (Greenhouse 1984: 2, 3, 4, 10, 13–14; Louis Berger 1990:Fig. 4.2, IV 3, 14–17; 1991; Cantwell and Wall 2001:230–233).

- **Grillage/Raft Type**

A grillage/raft type wharf employed construction techniques similar to that of a cobb wharf. As the name implies, it was a solid raft-like structure built of timbers laid as headers and stretchers, incorporating layers of stone. Additional “rafts” were built and stacked until the required height was reached. It would then be floated out to the intended location, filled with stones, and sunk (Joseph et al. 2004:179). The 175 Water Street site (on the block surrounded by John, Fletcher, Water, and Front Streets) uncovered wharf construction of this type, dating to ca. 1750 (Geismar 1983:117, 203; Louis Berger 1990).

2. Post-1850s—Modern Construction Techniques

It is no coincidence that McDonald (2011) closes her discussion of the “vernacular” period of pier and bulkhead construction by the 1850s. As archaeologist Michael Raber contends, this was the period in which the vernacular log-building styles were replaced with “modern” construction techniques of a “common type” (Raber et al. 1985:55), i.e., supported on deep piles (Meade 2007:V-2). This change was initiated by two inventions of the Scottish engineer James Nasmyth: the steam hammer in 1838/39, and from there his development of the steam pile driver in 1845. Nasmyth’s inventions permitted the driving of a pile in an astounding 4 minutes, when before it would have taken 12 hours (Bensel 1905:7; Tames 2005:84–85).

Although cobb construction did survive, even in New York City, due to its cheapness and simplicity of construction (Greene 1917:52–53, fig. 10), it was eschewed for the rehabilitation/reconstruction of the Manhattan waterfront. A comparison of nineteenth-century historic maps shows a rapid escalation of pier construction in the project site after 1845 and the invention of the steam pile driver (e.g. Colton 1836 [Figure 6], U.S.C.S. 1844 [Figure 7], Dripps 1852 [Figure 8]).

By the 1870s, with the establishment of the New York City Department of Docks (1870) and the advent of Manhattan’s upgraded bulkhead and pier system, East River bulkheads and piers/wharves were constructed with deep vertical pilings, following standardized methods and designs, well documented by engineer Carleton Greene and others (Goodrich 1905:21, figs. 4–6; Greene 1917:figs. 44, 47–49). Also supporting Raber’s (1985:55) contention that this late-nineteenth-century pier and bulkhead construction was of a “common form,” built from “a generally well-understood, common set of designs,” is the 1904 statement of J. A. Bensel, engineer-in-chief of New York’s Department of Docks and Ferries. Bensel observed that “the manner of building has varied little during the time in which the Port of New York has been in existence,” and “nearly all piers along the East River” are pile platforms (Bensel 1905:7). The 1885 Robinson map (Figure 10a and 10b) shows the continued standardization of piers in the project site by the end of the nineteenth century.

On the new waterfront, crib/cobb structures were no longer employed. Substantial preparatory dredging was involved, and piles, in various combinations, were driven down to bedrock (except where depth of bedrock made this impossible), with the spaces between the piles filled with rip rap or cobbles and stones to provide stability to the piles supporting the masonry bulkhead. For piers, decks of wood or concrete were built and paved atop the wooden piles (Greene 1917:28–33). The 1927 aerial photograph montage of the project site (Figure 11) shows that by this time, the project site contained numerous piers along the East River waterfront.

- **Bulkhead Construction**

Because of the general depth of mud—in some places up to 170 feet deep—along the entire East River shoreline, the bulkhead had to rest on piles, even though the piles could not extend to the hard bottom in all cases. According to engineer Carleton Greene, the river mud was dredged “for a width of about 85 feet to a depth of 30 feet, more or less, depending on the consistency.” As seen in Greene’s schematic drawings (Greene 1917:fig. 44, 47–49), this width of dredging extended an equal distance on each side of the proposed bulkhead, therefore, approximately 42.5 ft. both inland and outboard, and to a depth of 35 to 40 feet below mhw.¹ According to Department of Docks annual reports, it was standard practice to remove the timbers of earlier construction (“Removal of old work”) when they were encountered in this dredged area (e.g., Docks 1906:177–179). Into that dredged surface the piles were driven, and the open spaces filled in with cobbles and riprap to serve as a base and support for the concrete and masonry bulkhead. The new street area would have been further filled with “earth, ashes, &c.” as Greene notes in his 1876 bulkhead drawing (Greene 1917:88–94, fig. 44).

- **Dredging**

Dredging was and is a normal part of harbor and pier slip maintenance that would have been carried out in the slips between piers within the project site. Accurate records of dredging, or even maps of pier slip depths prior to 1857 are not available to document routine dredging impact in now-filled sections within the project site. However, as the nineteenth century progressed, slips needed to accommodate larger and larger ships, and regular dredging deepened the slips, removing earlier river mud and any potential embedded cultural deposits.

B. Discussion summary

As noted in the soil boring log review (above and Appendix B), timbers and wood were recorded frequently in the soil borings throughout the project site, as would be expected in an area with an abundance of former waterfront features. However, from the soil borings it is not possible to distinguish among any pre-1850 landfill retaining devices and piers, post-1850 piles, and timber deposits that represent disassembled pier work that managed to evade removal during modern dredging or disassembly of the features when they were no longer in use. Photographs from the 1930s during construction of the East River Drive and East River Park clearly show that there were large numbers of often derelict piers and wharves in the project site prior to this time, but that they were removed prior to final landfilling for these areas (Appendix A). While it is assumed that some components of these structures, especially below the water line, may have been left in place, whether intentionally or inadvertently, from an archaeological perspective the significance of any such disassociated elements is limited at best.

C. Segment conclusions and recommendations

The following is a summary of the conclusions for the segments and sub-segments discussed above.

¹Greene’s calculations were based on a mean low water of 4.85 feet below mean high water (mhw).

- **Montgomery Street**

HPI concludes that no additional Phase IA study is necessary for the Montgomery Street project site, as the 2009 Meade study was thorough and accepted by the SHPO and LPC. However, when depths of the proposed floodwalls are ascertained for the present project and any other subsurface components are finalized, conclusions of this report should be revisited to determine whether Phase IB testing will be necessary.

- **Pier 42 vicinity (Montgomery to Jackson Streets)**

HPI concludes that no additional Phase IA study is necessary for the outboard section of Pier 42, as the 2007 Schaefer study was thorough and accepted by the SHPO and LPC. That study determined there was no archaeological sensitivity in that area beyond the bulkhead line. HPI concludes, however, that the remainder of this segment, corresponding to the blocks between Front and South Streets, and the early nineteenth-century piers and wharves adjoining them, may retain some archaeological sensitivity. This portion of the segment should be included as part of the archaeological APE and subjected to further study as part of a Phase IA Archaeological Documentary Study.

- **East River Park: Jackson Street to Grand Street**

HPI concludes that this segment from Jackson Street to Grand Street should be included as part of the archaeological APE and subjected to further study as part of a Phase IA Archaeological Documentary Study. The segment contained waterfront features by 1836, and portions were landfilled prior to 1852. Although there has been obvious disturbance in much of this sub-section from park and roadway creation, as well as from building construction and demolition, a more localized and detailed review of boring logs and other resources would be needed to further estimate the level of disturbance in these areas.

- **East River Park: Grand Street to East Houston Street**

HPI concludes that the portion of this segment from Grand Street to Rivington Street should be included as part of the archaeological APE and subjected to further study as part of a Phase IA Archaeological Documentary Study. The segment contained waterfront features by 1836, and portions were landfilled prior to 1852. Although there has been obvious disturbance in much of this sub-section from park and roadway creation, as well as from building construction and demolition, a more localized and detailed review of boring logs and other resources would be needed to further estimate the level of disturbance in these areas.

HPI also concludes that the area from Rivington to East Houston Street should be eliminated from further archaeological study. This portion of the segment remained unfilled east of Tompkins Street through the end of the nineteenth century, and only contained piers and wharves. These former piers and wharves, which have been removed, dated to a period when construction of waterfront features had become highly standardized. Although soil borings indicated some embedded timbers in or below the fill strata, which could be remains associated with the former waterfront features, these would not necessarily constitute significant archaeological resources.

- **East River Park: East Houston Street to East 13th Street**

HPI concludes that the area from East Houston to East 13th Street should be eliminated from further archaeological study. The portion of the segment where project components will be situated, east of the FDR Drive, was nearly all under water through the mid-nineteenth century. Beginning in the second half of the nineteenth century, there were piers and wharves that overlapped the segment. These former piers and wharves, which have been removed, dated to a period when construction of waterfront features had become highly standardized. Although soil borings indicated some embedded timbers in or below the fill strata, which could be remains associated with the former waterfront features, these would not necessarily constitute significant archaeological resources.

- **East 13th Street to East 18th Street/Avenue C, including Captain Patrick J. Brown Walk**

HPI concludes that the area from East 13th Street to East 18th Street/Avenue C should be eliminated from further archaeological study. The majority of the segment was under water through the end of the nineteenth century. Former piers in this segment, which have been removed, dated to the twentieth century, a time when construction of waterfront features had become highly standardized. Although soil borings indicated some embedded timbers in or below the fill strata, which could be remains associated with the former waterfront features, these would not necessarily constitute significant archaeological resources.

- **Stuyvesant Cove Park: East 18th Street/Avenue C to East 23rd Street**

HPI concludes that the area from East 18th Street to East 23rd Street should be eliminated from further archaeological study. This segment has little to no archaeological sensitivity because it was under water through the end of the nineteenth century. Former piers in this segment, which have been removed, also dated to the later nineteenth century, a time when construction of waterfront features had become highly standardized. Although soil borings indicated some embedded timbers in or below the fill strata, which could be remains associated with the former waterfront features, these would not necessarily constitute significant archaeological resources.

- **East 23rd Street to East 25th Street**

HPI concludes that this segment should be included as part of the archaeological APE and subjected to further study as part of a Phase IA Archaeological Documentary Study. The study would clarify the relationship of the segment to the late eighteenth-century Bellevue Estate and the late eighteenth through mid-nineteenth century Bellevue city facility (which included a fever hospital and House of Refuge north of East 23rd Street) that may overlap with the project site. The study may also clarify the degree to which this area has been disturbed by later earthmoving, as no soil borings were available for this segment.

D. Summary of recommendations

Table 2 summarizes the recommendations for this study by segment. Figure 12 illustrates the segments and recommendations.

Table 2: Summary of Recommendations by Segment

Segment location	Previous investigations	Recommendations
A. Montgomery Street (Cherry to South Streets)	Yes, Phase IA report on file with SHPO and LPC (Meade 2009)	No additional Phase IA study necessary. Revisit conclusions of previous study when impacts are finalized to determine if Phase IB testing is necessary.
B. Pier 42 vicinity (Montgomery to Jackson Streets)	Yes, Pier 42 outboard portion of segment study on file with SHPO and LPC (Schaefer 2007)	Phase IA study recommended for segment, which had areas landfilled prior to 1850.
C. East River Park, Jackson Street to Grand Street	No	Phase IA study recommended for entire segment, which had areas landfilled prior to 1850.

Segment location	Previous investigations	Recommendations
D. East River Park: Grand Street to East Houston Street	No	Phase IA study recommended for portion of segment from Grand Street to Rivington Street, which had areas landfilled prior to 1850. No further study recommended for Rivington Street to East Houston Street, which should be eliminated from the APE.
E. East River Park: East Houston Street to East 13 th Street	No	No further study recommended for this entire segment, which should be eliminated from the APE.
F. East 13 th Street to East 18 th Street/Avenue C, including Captain Patrick J. Brown Walk	No	No further study recommended for this entire segment, which should be eliminated from the APE.
G. Stuyvesant Cove Park: East 18 th Street/Avenue C to East 23 rd Street	No	No further study recommended for this entire segment, which should be eliminated from the APE.
H. East 23 rd Street to East 25 th Street	No	Phase IA study recommended for entire segment to clarify history and potential sensitivity.

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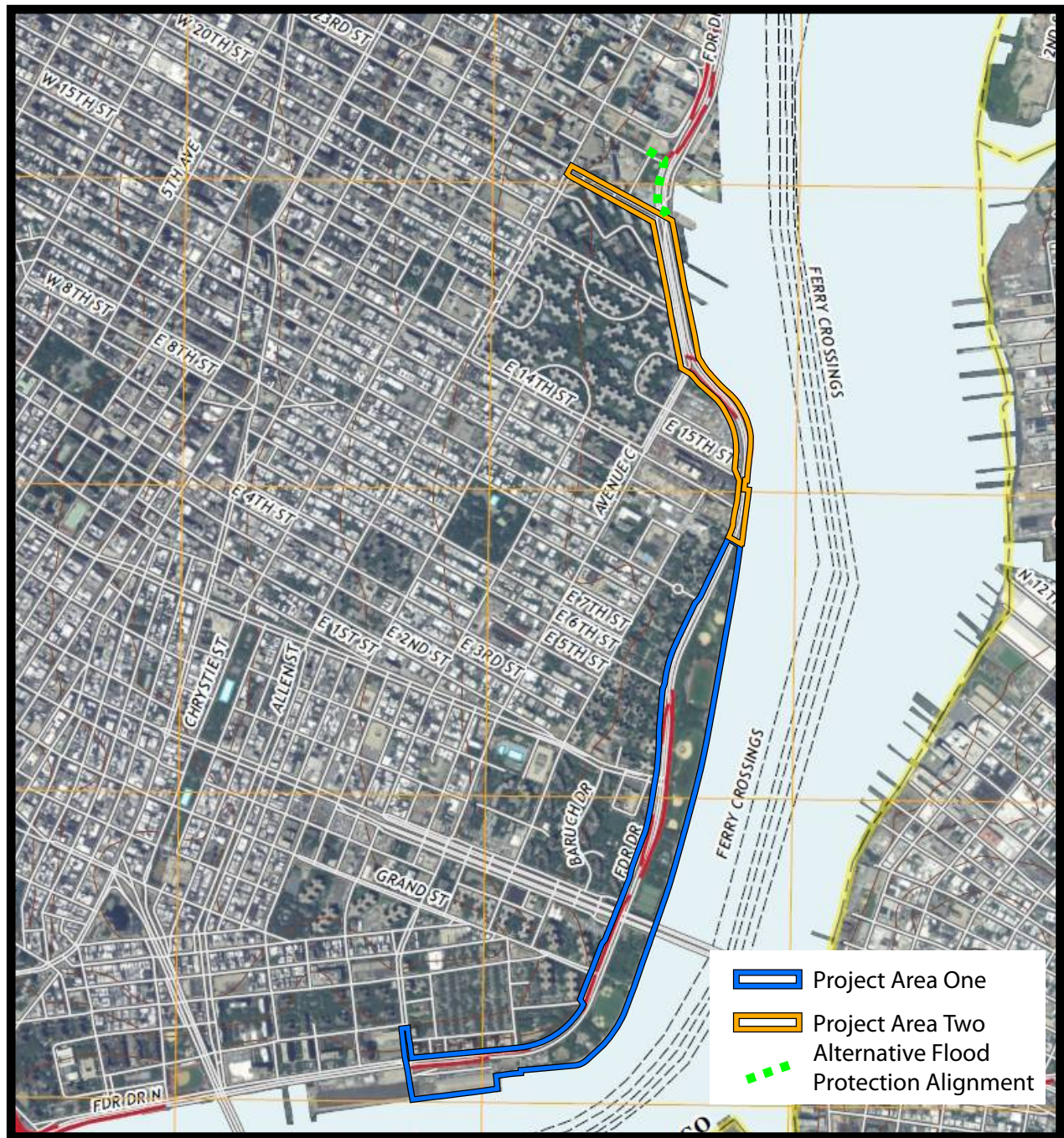
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Figures



Refinement of Archaeological Area of Potential Effect (APE)
 East Side Coastal Resiliency Project
 Montgomery Street to East 25th Street
 Manhattan, New York County, New York

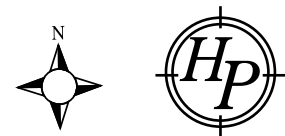
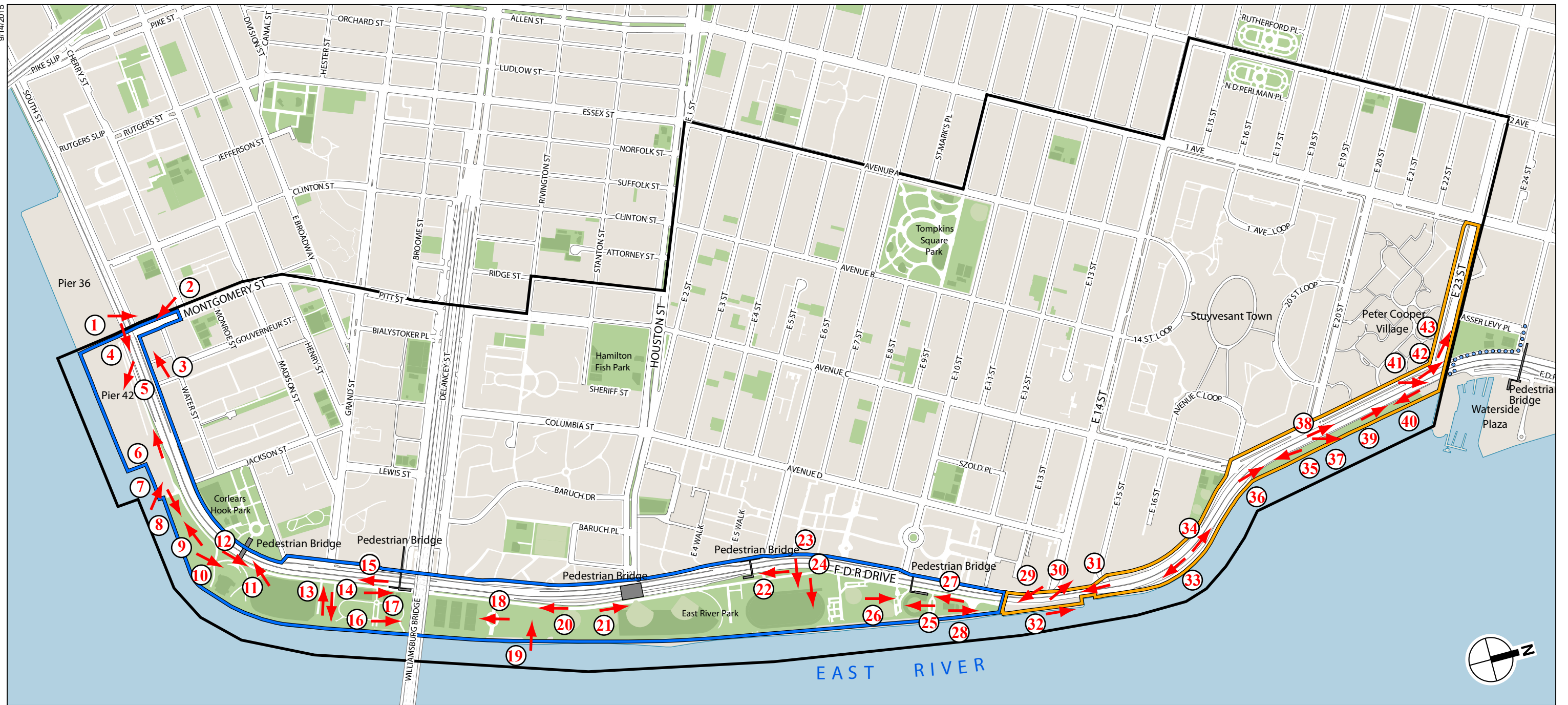


Figure 1: Project site on *Brooklyn, N.Y.-N.J.* topographic quadrangle (U.S.G.S. 2013).

0 1000 2000 3000 4000 5000 FEET



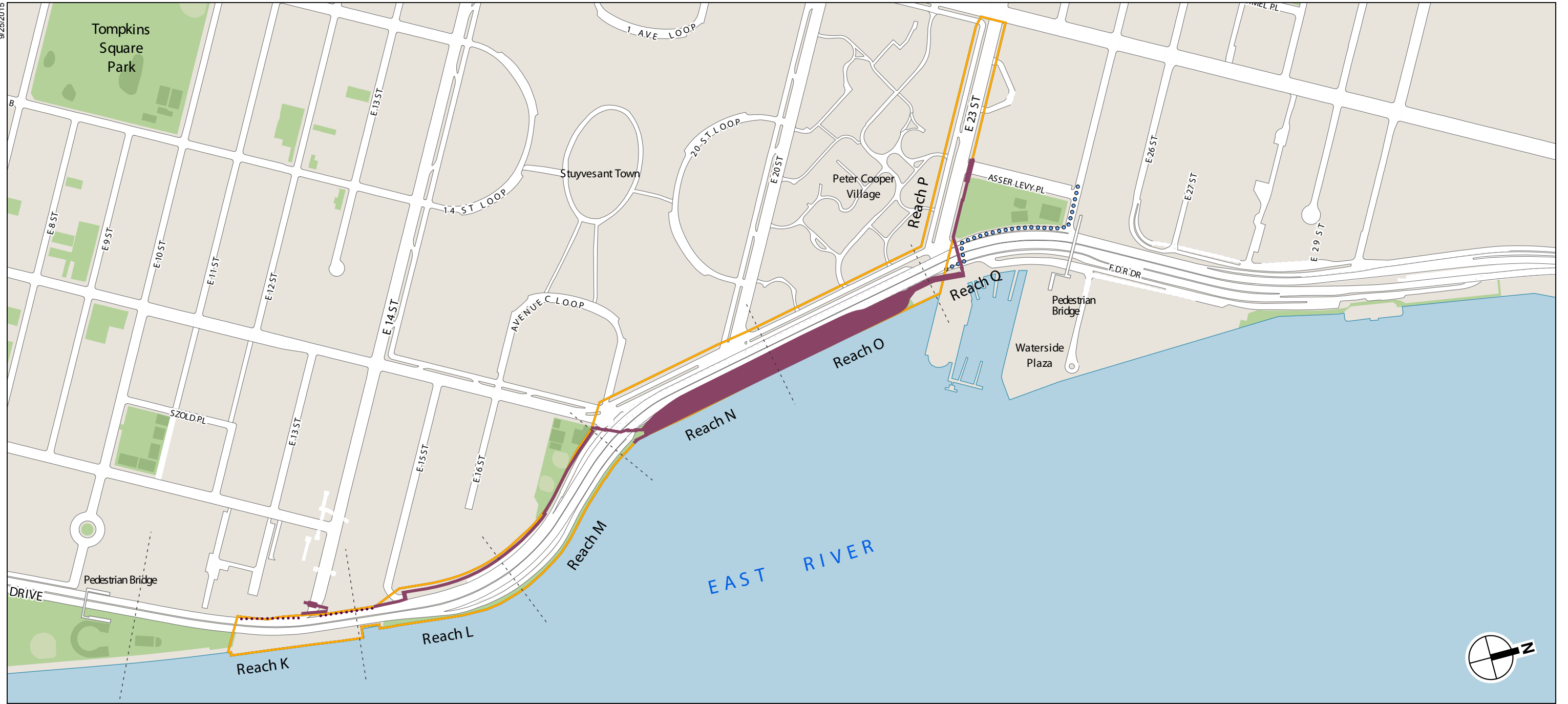


- Project Area One
- Proposed Project Design Reaches
- Existing Open Space
- Proposed Open Space (No-Action Project)

Approximate Limits of Alternative 2 Flood Protection System

NOTE: Based on Preliminary Design Concepts

0 1,000 FEET



- Project Area Two
- Approximate Limits of Alternative 2 Flood Protection System
- Alternative Flood Protection System Alignment
- Existing Con Ed Floodwalls
- Proposed Project Design Reaches

NOTE: Based on Preliminary Design Concepts

0 1,000 FEET

10/5/2015



- Project Area One
- Approximate Limits of Alternative 3 Flood Protection System
- Proposed Project Design Reaches
- Existing Open Space
- Proposed Open Space (No-Action Project)

NOTE: Based on Preliminary Design Concepts

0 1,000 FEET



Figure 6: Project Areas One and Two on *Topographical Map of the City and County of New-York and the Adjacent Country* (Colton 1836).

0 500 1000 1500 2000 2500 FEET



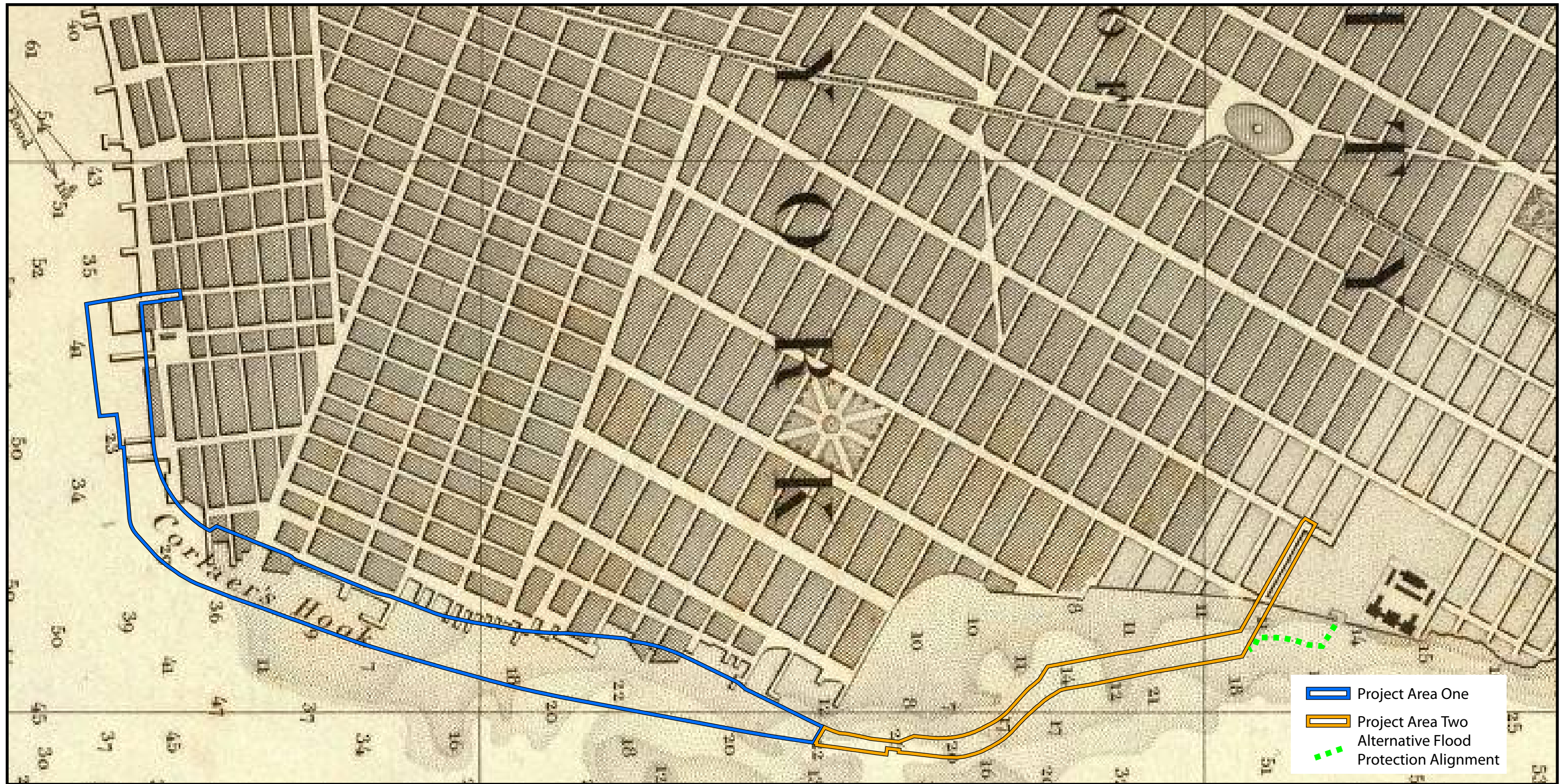
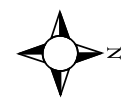


Figure 7: Project Areas One and Two on *Map of New-York Bay And Harbor And The Environs* (U.S.C.S. 1844).

0 500 1000 1500 2000 2500 FEET



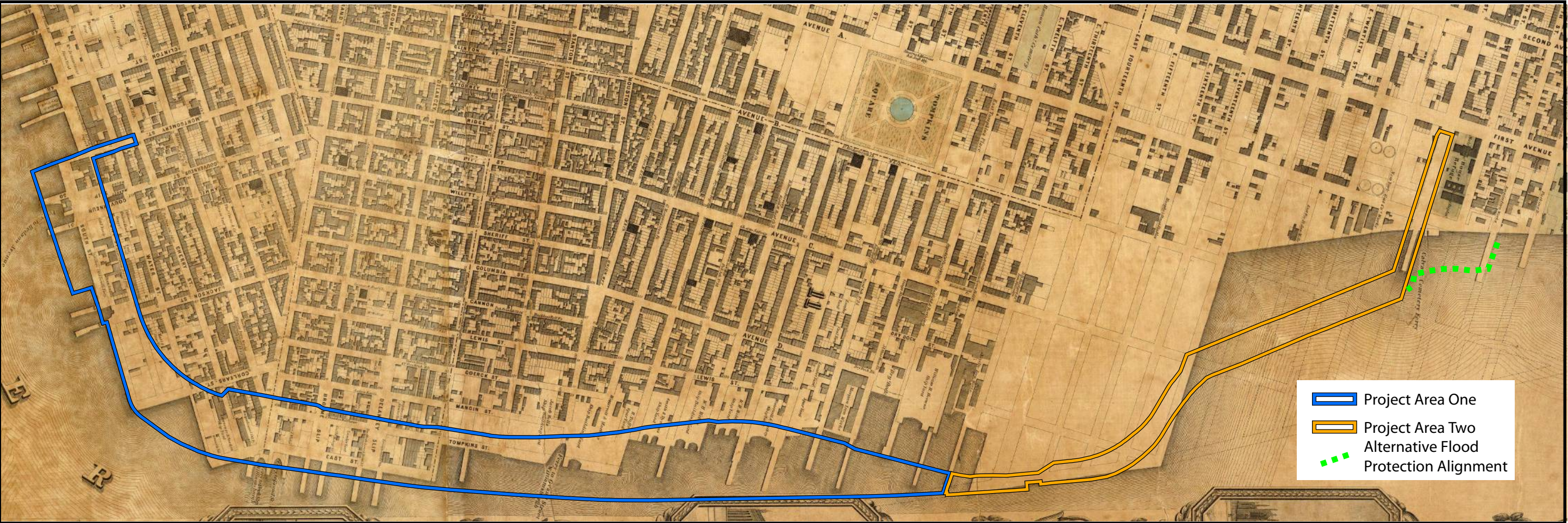
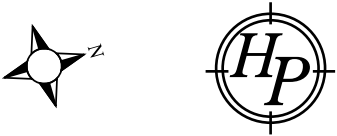


Figure 8: Project Areas One and Two on *Map of the City of New York Extending Northward to Fiftieth Street* (Dripps 1852).

0 500 1000 1500 2000 2500 FEET



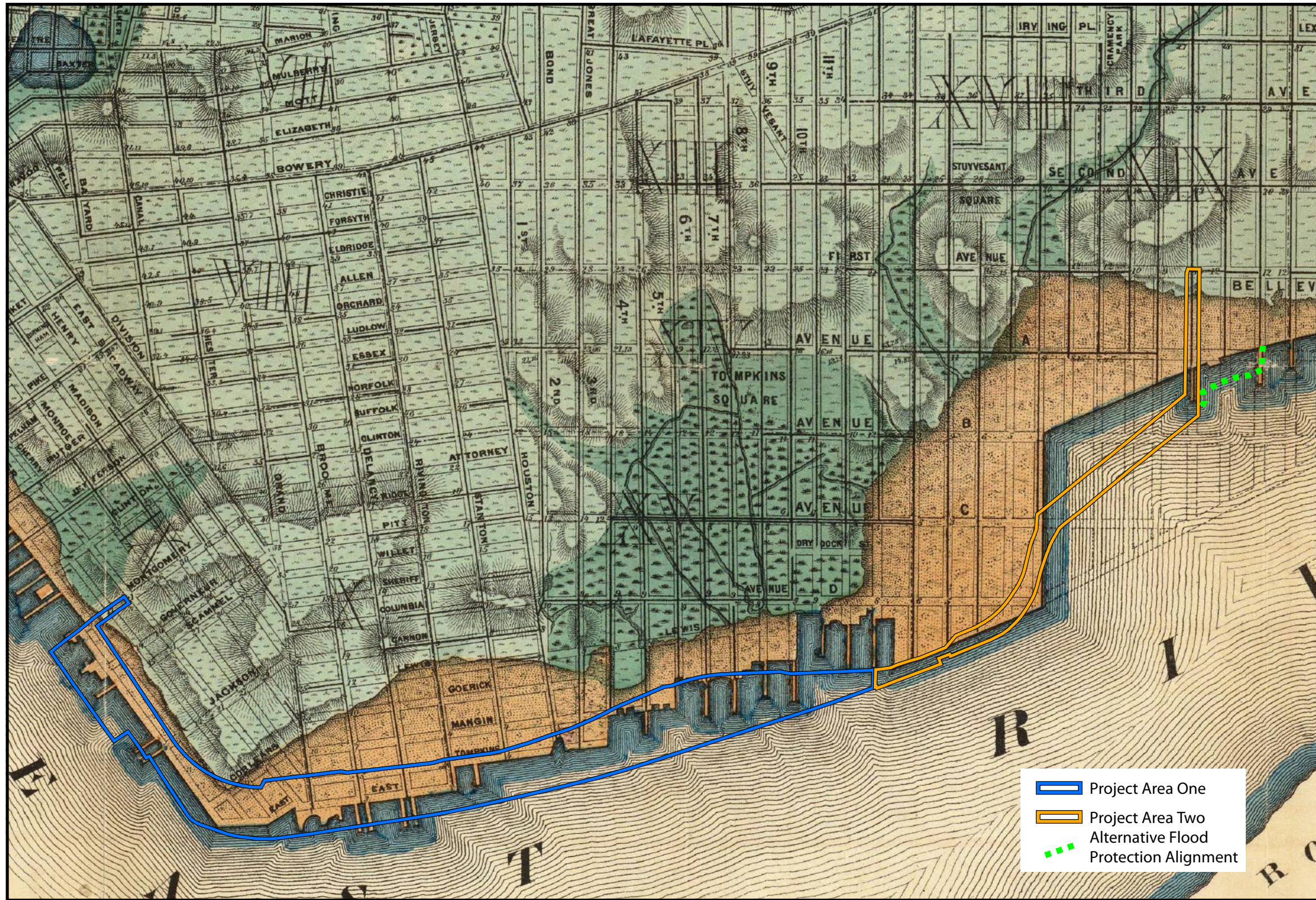


Figure 9: Project Areas One and Two on *Sanitary and Topographical Map of the City and Island of New York* (Viele 1865).

0 500 1000 1500 2000 2500 FEET



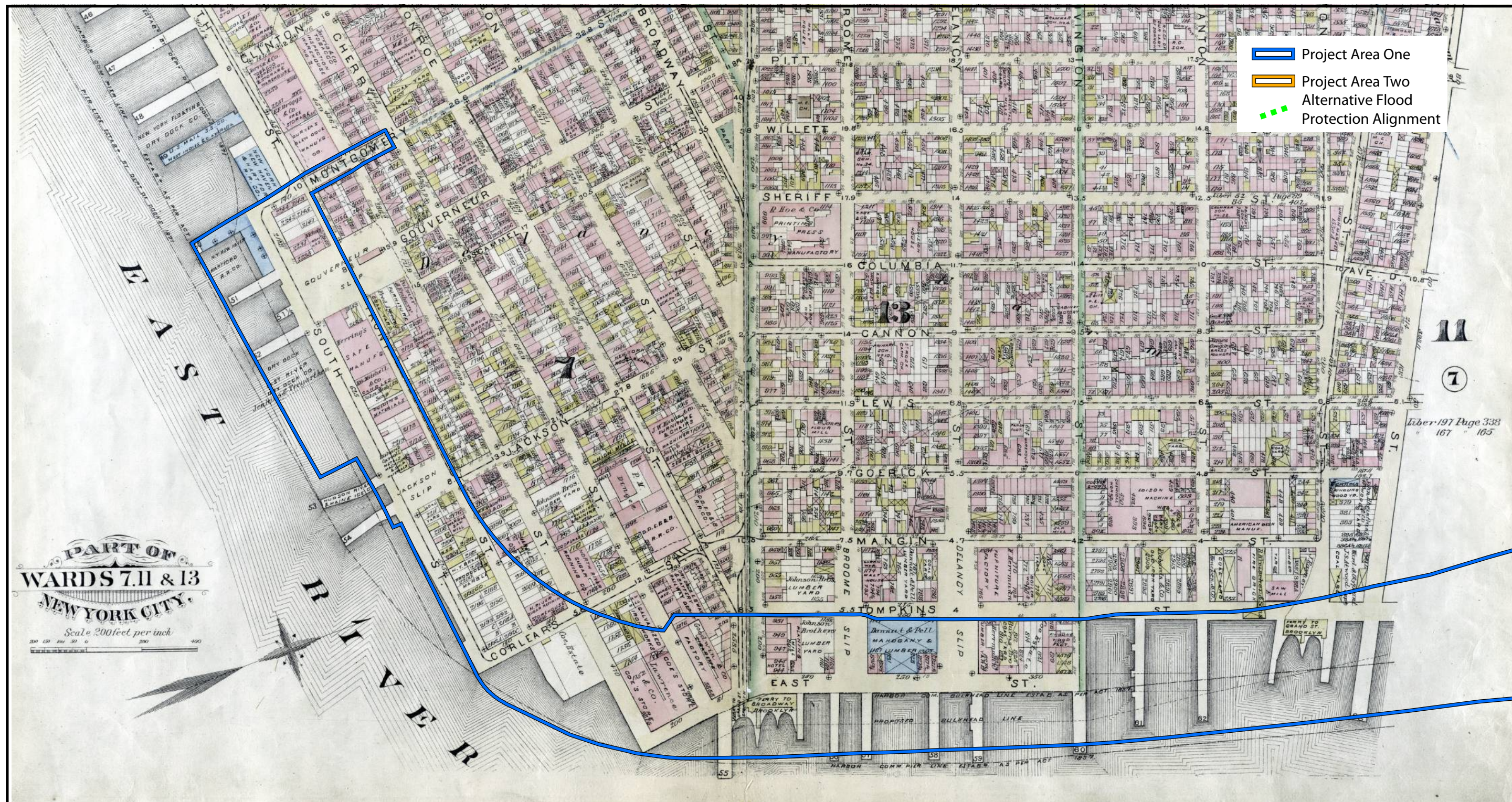
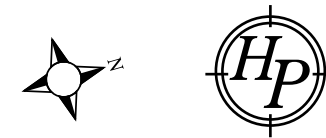


Figure 10a: Project Areas One and Two on *Atlas of the City of New York* (Robinson 1885).

0 250 500 750 1000 1250 FEET



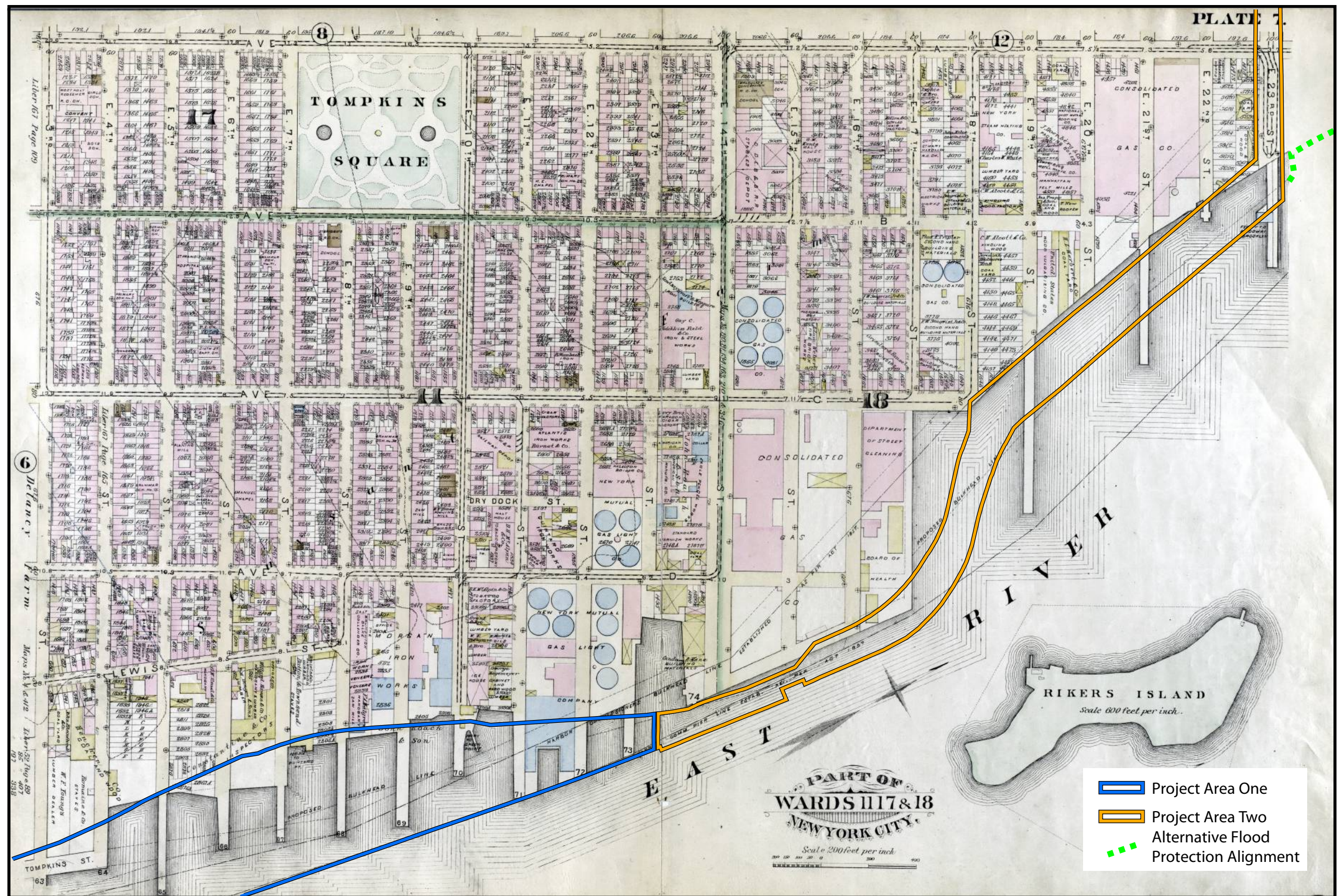


Figure 10b: Project Areas One and Two on *Atlas of the City of New York* (Robinson 1885).

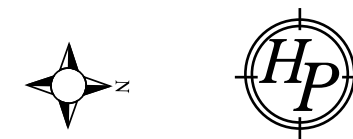
0 250 500 750 1000 1250 FEET

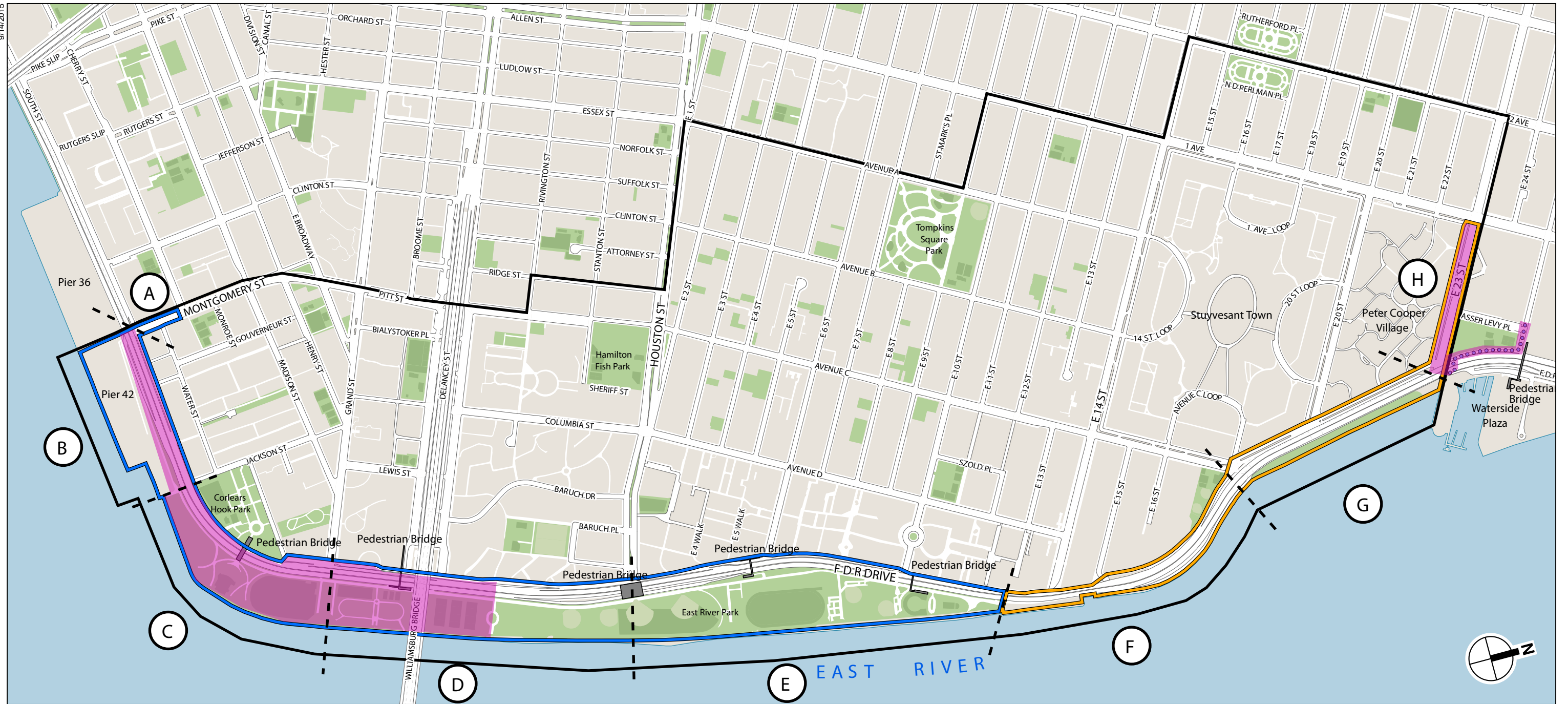




Figure 11: Project Areas One and Two on *Sectional Aerial Maps of the City of New York* (Bureau of Engineering 1924).

0 500 1000 1500 2000 2500 FEET





Project Area One

Project Area Two

Alternative Flood Protection System Alignment

Design Study Area

Existing Pedestrian Bridges

Project segments

A. Montgomery Street

B. Pier 42 vicinity (Montgomery Street to Jackson Street)

C. East River Park: Jackson Street to Grand Street

D. East River Park: Grand Street to East Houston Street

E. East River Park: East Houston Street to East 13th Street

F. East 13th Street to East 18th Street/Avenue C, including Captain Patrick J. Brown Walk

G. Stuyvesant Cove Park: East 18th Street to East 23rd Street

H. East 23rd Street to East 25th Street

Locations proposed for Phase IA study

0 1,000 FEET

Project segments and locations proposed for Phase IA study

Figure 12

Photographs
(see Figure 2 for locations)



Photograph 1: Montgomery Street near Water Street. View looking northeast.



Photograph 2: Montgomery Street between Water and South Streets. View looking southwest.



Photograph 3: South Street, running on north side of elevated FDR Drive. View looking southwest toward Montgomery Street in right background.



Photograph 4: Entrance to elevated FDR Drive at Montgomery Street, with Pier 42 on right. View looking northeast.



Photograph 5: Pier 42. View looking southeast.



Photograph 6: East River Bikeway between Pier 42 and FDR Drive. View looking west.



Photograph 7: Utilities in undeveloped area east of Pier 42 near Jackson Street. View looking northwest.



Photograph 8: Parking area and storage yard east of Jackson Street in East River Park. View looking east.



Photograph 9: East River Park storage yard. View looking west.



Photograph 10: Amphitheatre seating in East River Park. View looking north.



Photograph 11: Bridge connecting East River Park to Corlears Hook Park. View looking northwest.



Photograph 12: East River Bikeway and FDR Drive from Corlears Hook Park Bridge. View looking northeast.



Photograph 13: East River Park near Fire Boat House, with Grand Street in background. View looking northwest.



Photograph 14: Fire Boat House at foot of Grand Street. View looking southeast.



Photograph 15: East River Bikeway near Grand Street. View looking southwest.



Photograph 16: Williamsburg Bridge in East River Park. View looking northeast.



Photograph 17: East River Bikeway crossing by the Delancey Street Bridge and the Williamsburg Bridge. View looking northeast.



Photograph 18: Comfort station, currently out of service, with Williamsburg Bridge in background. View looking southwest.



Photograph 19: Recreational area in East River Park, with FDR Drive in background. View looking northwest.



Photograph 20: East River Bikeway near Stanton Street. View looking southwest.



Photograph 21: East River Bikeway at East Houston Street overpass. View looking north.



Photograph 22: East River Bikeway at East 6th Street overpass. View looking southwest.



Photograph 23: Comfort station and locker house adjacent to track and soccer field near East 6th Street. View looking east.



Photograph 24: Track and soccer field near East 6th Street. View looking east with East River in background.



Photograph 25: Comfort station north of baseball diamonds near East 10th Street. View looking southeast.



Photograph 26: Playground near East 10th Street. View looking northeast.



Photograph 27: East River Bikeway at East 10th Street overpass. View looking southwest.



Photograph 28: Northern end of East River Park. View looking northeast.



Photograph 29: Industrial building of the Con Edison facility, with East River Bikeway in foreground. View looking southeast.



Photograph 30: Con Edison facility on west side of the FDR Drive with East River Bikeway on right. View looking northwest.



Photograph 31: East River Bikeway and the FDR Drive with the Con Edison facility on the left. View looking southwest.



Photograph 32: East River Bikeway running past the Con Edison facility building on the right, with the FDR Drive on the left. View looking north.



Photograph 33: East River Bikeway along the Captain Patrick J. Brown Walk. View looking south.



Photograph 34: East River Bikeway along the Captain Patrick J. Brown Walk, with Stuyvesant Cove Park in the distance. View looking northwest.



Photograph 35: Stuyvesant Cove Park, with elevated FDR Drive on the right. View looking southeast.



Photograph 36: Stuyvesant Cove Park, with elevated FDR Drive on the left. View looking northwest.



Photograph 37: Stuyvesant Cove Park, with elevated FDR Drive on the left. View looking north.



Photograph 38: East River Bikeway running through Stuyvesant Cove Park with elevated FDR Drive on left. View looking northwest.



Photograph 39: Performance stage at rear of Solar One building in Stuyvesant Cove Park. View looking north.



Photograph 40: Solar One building in Stuyvesant Cove Park. View looking southeast.



Photograph 41: BP Gasoline Station at northern end of Stuyvesant Cove Park. Elevated FDR Drive is on left. View looking north.



Photograph 42: East 23rd Street intersection with the FDR Drive overpass. View looking northwest.



Photograph 43: East 23rd Street intersection with the FDR Drive and Avenue C. Asser Levy Recreation Center (brick building) is in right background. View looking northwest.

Appendix A: 1930s photographs



August 28, 1935. Date of East River Drive opening ceremony. Looking north from Williamsburg Bridge. Courtesy NYC Municipal Archives.



August 28, 1935. Date of East River Drive opening ceremony. Looking south from Williamsburg Bridge. Courtesy NYC Municipal Archives.



September 1, 1936. East River Drive, view looking north from the Williamsburg Bridge. Courtesy New York Public Library Digital Gallery.



September 1, 1936. East River Drive, view looking northwest from the Williamsburg Bridge. Courtesy New York Public Library Digital Gallery.



September 1, 1936. East River Drive, view looking northeast from the Williamsburg Bridge. Courtesy New York Public Library Digital Gallery.



May 12, 1937. East River Drive, looking northeast from Grand and East Streets with the Williamsburg Bridge in the background. Courtesy NYC Municipal Archives.



May 12, 1937. East River Drive, looking north from Delancey Street [Williamsburg] Bridge. Courtesy NYC Municipal Archives.



May 12, 1937. East River Drive, looking south from East Houston Street with the Williamsburg Bridge in the background. Courtesy NYC Municipal Archives.



May 12, 1937. East River Drive, looking south from East 6th Street. Courtesy NYC Municipal Archives.



May 12, 1937. East River Drive, looking northeast from East 5th Street. Courtesy NYC Municipal Archives.



May 12, 1937. East River Drive, looking south from East 10th Street. Courtesy NYC Municipal Archives.



May 12, 1937. East River Drive, looking north from East 11th Street. Courtesy NYC Municipal Archives.



June 25, 1937. East River Drive, looking north from the Williamsburg Bridge at Delancey Street. Courtesy New York Public Library Digital Gallery.



June 25, 1937. East River Drive, looking north from the Williamsburg Bridge to East Houston Street and the north. Courtesy New York Public Library Digital Gallery.



June 25, 1937. East River Drive, looking north from the Williamsburg Bridge to East Houston Street and the north.
Courtesy New York Public Library Digital Gallery.



June 25, 1937. East River Drive, looking north from the Williamsburg Bridge to East Houston Street and the north.
Courtesy New York Public Library Digital Gallery.



December 21, 1937. East River Drive, looking north from East 8th Street. Courtesy NYC Municipal Archives.

Appendix B: Detailed soil boring program review

Introduction

There have been various programs of subsurface soil borings conducted within the overall project site, totaling more than 450 individual borings. These include Rock Data Maps from the 1930s, several subsequent boring programs from the 1950s through the 1980s, depending on location, and recent 2015 hazmat borings for the targeted project site. While the pre-2015 logs are not likely to represent current conditions, they do provide a baseline with which to compare later logs and thereby extrapolate subsequent subsurface disturbance caused by later construction. A general synopsis of soil conditions is provided in the main text of this report. Below is a more detailed review of the soil boring programs, organized by segments and sub-segments of the overall project site.

Montgomery Street

For this segment, 4 soil boring logs were reviewed. All dated from the 1930s, prior to the widening of Montgomery Street:

- Rock Data Vol. 1, —Sheet 11, Nos. 2, 95, 96, 97, and 99 (east and west sides of Montgomery Street, at Cherry Street and south of Front Street)

The Montgomery Street project site has two boring logs from the Rock Data Map series on the west side of Montgomery Street, south of the Front Street intersection (Nos. 95 and 96). The widening of Montgomery Street 40 ft. toward the east (Meade 2009:4.20), resulted in the incorporation of additional Rock Data Map boring locations: one at the northeast corner of the Cherry Street intersection (No. 2), and two on the east side of Montgomery Street between Front and South streets (Nos. 97 and 99). These three additional borings represent conditions prior to the widening of Montgomery Street in 1959.

The northernmost boring, No. 2, at Cherry Street shows a surface elevation of 21.4 ft. above sea level, and records 97.0 ft. of “sand, gravel, & boulders” reaching to bedrock. The water table is not noted. No “fill” stratum is identified, suggesting that downward grading or other street-bed preparation for Cherry Street removed historical fill and pre-development land surfaces.

The other four soil borings (Nos. 95–98) form a cluster between Front and South streets, an area the Viele map classifies as “made land” (Viele 1865). With surface elevations between 7.3 and 8.8 ft. above mean sea level, they correspond to the post-landfill elevation range in this area. The data from the logs also support the pre-landfill map reconstructions, which show the boring locations in the East River to be in areas below mean sea level before filling and development. A “Misc. fill” stratum, ranging from 17 to 33 ft. thick, extends below the sea level mark in all the logs. The fill strata are generally preceded by sand strata, sometimes with gravel and boulders. It is possible that the sand represents a natural stratum. The absence of river mud or silt indicates that some dredging was done in preparation for landfill, and that the procedure was completed in a fairly short time, preventing the accumulation of river deposits before fill deposition. Soil borings to the east of the Montgomery Street APE (e.g., No. 99, ca. 70 ft. east of the project site) do record sporadic instances of organic silt, suggesting that dredging activity in preparation for landfill was not quite thorough. Wood was recorded at the base of the fill stratum in No. 96, at elevation -26.7 ft. This may represent cribbing or other sunken wooden structures for piers or landfill.

Pier 42 vicinity (Montgomery to Jackson Streets) and East River Park: Jackson Street to Grand Street

For these two segments, 138 soil boring logs were reviewed. Chronologically they range from the 1930s, prior to the construction of the East River Drive and Park, through 2015. The general dates of each group of logs are provided parenthetically and arranged geographically, where possible, from Montgomery to Grand streets:

- Rock Data Vol. 1, 85 total borings —Sheet 11, Nos. 37–47 (1934, south of South Street, Montgomery Street through Gouverneur Slip); 60, 63, 64 (1939, south side of South Street in Gouverneur Slip); and 97–112 (1950, north side South Street, Montgomery Street through Gouverneur Slip); Sheet 12, Nos. 2–6 (1934, East River Park, east of Corlears Hook Park), 8–21 (East River Park, line of Jackson Street), 27–30 (north to south side of South Street in line of Jackson Street), 31–40, 42–48 (1939, north to south side of South Street from Corlears Street to Jackson Street), 49–50 (1939, Grand Street in East River Drive) 51–56

(1946, East River Park at foot of Grand Street), 57–59 (1950, East River Park at foot of Grand Street); and 75–78 (1965, south side of South Street on east side of Gouverneur Slip).

- NYCDPW Firehouse 66 Grand St. & East River (1953/54) “Profile of Probings,” i.e., 16 borings along the Grand Street bulkhead, presented as a profile rather than logs.
- Newtown Creek PCP Lower East Side Interceptor [*sic*] (Sheet 1 of 5, 1961)—9 borings, A-1 to A-9 (East River Drive, Montgomery through Jackson streets).
- Newtown Creek PCP East Side Branch Sewers (Sheet 1 of 3, 1962)—7 borings, C-1 through C-7 (south side of South Street and East River Park, from Gouverneur Slip East through Cherry Street).
- ESCR Deep Sample Locations (2015)—21 borings in East River Park, SB 82D–73D, SB 70D–66D, and SB 64D–59D.

In general, with the exception of the soil borings performed outside contemporary bulkheading, i.e., directly in the waters of the East River, the logs show a strong similarity, with thick fill strata extending down from the surface paving/asphalt to well below mean high water (mhw—considered elevation “0”), as would be expected in a filled, formerly inundated location. Fill stratum thickness ranged from 6 ft. to as much as 48 ft.

Surface elevations ranged from approximately 4 ft. (above mhw) to as much as 16 ft., the higher elevations being recorded in the 2015 soil borings in the East River Park near the line of Cherry Street (especially SB-62D and -63D). The park areas also had the thickest fill strata.

Bedrock depths, where recorded, tended to be most elevated (25 to 42 ft. below mhw—Rock Data Vol. 1, Sheet 12, Nos. 8–9, 27–30) adjacent to Corlears Hook Park, north of the line of Jackson Street, and south of Cherry Street. In the other parts of the segment the bedrock ranged from 50 to 90 ft. below mhw, and in a few cases as much as 128 ft. below mhw in outboard borings (Rock Data Vol. 1, Sheet 12, Nos. 43, 44) in what was then (1939) unfilled riverbed.

Pockets of river mud/silt deposits, as well as timbers and rip rap, the latter two the components of old piers and landfilling devices were noted in several parts of the APE during the 1930s–1950, including, but not limited to, 7 to 16 ft. thick strata of river silt with some wood, ca. 10 to 25 ft. below mhw between Gouverneur Slip West and East (Rock Data Vol. 1, Sheet 11, Nos. 60, 105, 106, 110–112). Boring SB-80D, from 2015, recorded river mud in the Gouverneur Slip area, but further outboard and beneath 40 ft. of fill. Deeply buried timbers were recorded in 1962 in fill at 14.5 ft. below mhw about 500 ft. west of the Jackson Street line (Newtown Creek PCP East Side Branch Sewers C-2), and in 1939 north of the Cherry Street line in mud ca. 30–35 ft. below mhw (Rock Data Vol. 1, Sheet 12, Nos. 43, 45).

East River Park: Grand Street to East Houston Street

For this segment, 88 soil boring logs were reviewed. Chronologically they range from the 1930s, prior to the construction of the East River Drive and Park, through 2015. The general dates of each group of logs are provided parenthetically and arranged geographically, where possible, from Grand to East Houston streets:

- Rock Data Vol. 1, Sheet 22, 51 total borings—Nos. 1–10 (1934, outboard, Williamsburg Bridge pier), 11–25 (1934, northern edge, East River Park, then outboard, Rivington to Stanton streets); Nos. 26, 32–35 (1936), 37–44 (1936, outboard, Williamsburg Bridge pier) and 47–59 (1949, East River Drive, Stanton to East Houston streets).
- Newtown Creek PCP East Side Branch Sewers (Sheets 2 and 3, 1962)—16 borings in East River Park between Grand and Houston streets, C-9 through C-14,
- NYCDDES Delancey Street Pedestrian Bridge (1984)—3 borings, Nos. 1–3, north edge of East River Park along FDR Drive at Delancey Street.
- ESCR Deep Sample Locations (2015)—18 borings in East River Park, SB 36D–51D, 54D, 56D–58D.

In general, with the exception of the soil borings performed outside contemporary bulkheading, i.e., directly in the waters of the East River, the logs show a strong similarity, with thick fill strata extending down from the surface paving/asphalt to well below mhw, as would be expected in a filled, formerly inundated location. Fill stratum thickness ranged generally from 16 ft. to as much as 50 ft., with a few outliers. The most substantial fill strata of ca.

30 to 40 ft. thick tended to be found in the East River Park, as recorded in the 1962 Newtown Creek PCP and 2015 boring logs.

Surface elevations ranged from approximately 5 ft. (above mhw) to as much as 14 ft., the higher elevations being recorded in the East River Park in the northern half of this segment (especially SB-37D and -43D). Not coincidentally, the park areas also recorded the thickest fill strata.

Bedrock depths, where recorded (Rock Data borings, generally confined to the East River Drive), tended to vary between 40 and 60 ft. below mhw. Borings performed in this section of East River Park did not go deeper than 40 ft. below mhw, and, therefore, generally did not encounter bedrock.

Beneath fill strata, areas of thick river mud/silt deposits, as well as timbers embedded in both the fill and the mud (possible components of old piers and landfilling devices) were noted in several parts of the project site in 1949, including, but not limited to the area of 6 to 20 ft. thick strata of river mud with some wood, extending ca. 20 to 30 ft. below mhw between the line of Stanton Street and East Houston Street, both in the East River Drive and the park (Rock Data Vol. 1, Sheet 22, Nos. 47–55). Boring logs of 1962 record the continued survival of these river deposits within this segment of the East River Park, as well as the widespread presence of deeply buried timbers (Newtown Creek PCP East Side Branch Sewers—C-10, -10-1, -13-1, -14, -15). Most notable was log C-15, which recorded a 17 ft. thick stratum of multiple, layered timbers with gravel, sand, and brick beginning at 8.8 ft. below mhw, on the north edge of the park near East Houston Street.

East River Park: East Houston Street to East 13th Street

For this segment, 76 soil boring logs were reviewed. Chronologically they range from the 1944 through 2015, postdating the construction of the East River Park and East River (FDR) Drive. The general dates of each group of logs are provided parenthetically and arranged geographically, where possible, from East Houston to East 13th streets:

- Rock Data Vol. 1, Sheet 23, 40 total borings—Nos. 23, 44, 45, 59, 60, 72–74, 82, 86 (1944, East River Drive between East Houston and East 6th streets), 87–111 (1949, East River Drive between East Houston and East 6th streets); Sheet 33, Nos. 55–59 (1949, East River Drive between East 10th and 11th streets).
- Newtown Creek PCP East Side Branch Sewers (Sheets 2 and 3, 1962)—7 borings in East River Park between East Houston and East 11th streets, C-16 through C-22,
- NYCDDC East 10th Street Pedestrian Bridge (2000)—2 borings, C-3 and C-4, north edge of East River Park along FDR Drive north of East 11th Street.
- ESCR Deep Sample Locations (2015)—27 borings in East River Park, SB 35D–11D.

In general, the logs show a strong similarity, with thick fill strata extending down from the surface paving/topsoil to well below mhw, as would be expected in a filled, formerly inundated location. Fill stratum thickness ranged generally from 10 ft. to as much as 40 ft., with a few outliers. The most substantial fill strata of ca. 30 to 40 ft. thick tend to be found in the East River Park, as recorded in the 1962 Newtown Creek PCP, 2000 East 10th Street Pedestrian Bridge, and 2015 boring logs.

Surface elevations ranged from 5 to 10 ft. above mhw (although “outliers,” i.e., elevations of 12 and 15 ft. in SB-25D, -28D, -36D were recorded in the park), with the higher elevations (9 and 10 ft.) noted in East River Park. Not coincidentally, these park areas also recorded the thickest fill strata.

Bedrock depths, where recorded (Rock Data borings, generally confined to the East River Drive), tended to vary between 50 and 70 ft. below mhw. Borings performed in this section of East River Park did not go deeper than 40 ft. below mhw, and, therefore, generally did not encounter bedrock.

Beneath fill strata, areas of thick river mud/silt deposits, as well as timbers embedded in both the fill and the mud (possible components of old piers and landfilling devices) were noted in several parts of the project site, including, but not limited to, the area of 4 to 20 ft. of river mud beneath 8 to 33 ft. of fill on East River Drive between East Houston and East 3rd streets (Rock Data Vol. 1, Sheet 23, Nos. 86–94), and the 7 to 25 ft. thick strata of river mud

with some wood, extending ca. 24 to 35 ft. below mhw between the lines of East 10th and 11th streets in East River Drive (Rock Data Vol. 1, Sheet 33, Nos. 55–59). Concentrations of deeply buried timbers were noted in the park between East 6th and 7th Streets at (2005, SB27-D); and notable was C-16 (Newtown Creek PCP East Side Branch Sewers), which recorded a 34 ft. thick layered stratum of fill with multiple timbers, on the north edge of the park near the East Houston Street intersection. This soil boring is adjacent to C-15, which recorded similar timbers and was described in the previous section's discussion.

East 13th Street to East 18th Street/Avenue C, including Captain Patrick J. Brown Walk

For this segment, 62 soil boring logs were reviewed. Chronologically they range from 1934 through 1957, both before and after the construction of the East River (FDR) Drive. The general dates of each group of logs are provided parenthetically and arranged geographically, where possible, from East 13th Street to East 18th Street/Avenue C. (Note: No boring data was available between East 16th and 17th streets)

- Rock Data Vol. 1, Sheet 33, 23 total borings—Nos. 7, 8 (1934, then outboard, east of FDR Drive between East 13th and 14th streets); 18–23, 33–36 (1936); 45–48 (1938); 49–53 (1940); 139, 140 (1957) (FDR Drive, East 13th to East 16th streets).
- Rock Data Vol. 1, Sheet 34, 39 total borings—Nos. 2, 4 (1934); 11–14 (1934); 15, 16 (1935) (then outboard, FDR Drive and east of FDR, East 17th to 18th streets); 19–32, 34, 85, 87–99 (1944, FDR Drive, East 17th to 18th streets).

In general, excluding the earliest borings that were done outboard in the East River, the logs show a strong similarity, with thick fill strata extending down from the surface paving/topsoil to well below mhw, as would be expected in a filled, formerly inundated location. Fill stratum thickness ranged from 10 ft. to as much as 45 ft. The most substantial fill strata of ca. 30 to 45 ft. seemed to be generally distributed throughout the segment.

Surface elevations ranged between 4 and 7.0 ft. above mhw, and do not seem to correlate with the variations in fill-stratum thickness.

Bedrock depths, where recorded, tended to vary between 67 and 132 ft. below mhw, with a concentration of the greatest bedrock depths between East 17th and 18th Streets.

Beneath fill strata, areas of thick river mud deposits, were recorded in the East 17th to 18th street section of the APE, including, but not limited to, the area of 10 to 17 ft. of river mud beneath 20 to 30 ft. of fill under the FDR Drive (Rock Data Vol. 1, Sheet 34, Nos. 31, 89, 90, 91, 93, 99). Among these borings performed in 1944 were timber strata and timber piles embedded in both the fill and the mud (possible components of old piers and landfilling devices), at Nos. 91 and 93. An unusual occurrence is the presence of deeply buried peat in two boring logs (Rock Data Vol. 1, Sheet 33, Nos. 49, 52), adjacent to each other along the western edge of the FDR Drive between East 15th and 16th streets. Boring log No. 52 records 4 ft. of peat and mud beneath 21.8 ft. of fill.

Stuyvesant Cove Park: East 18th Street/Avenue C to East 23rd Street

For this segment, 86 soil boring logs were reviewed. Chronologically they range from 1934 through 2015, both before and after the construction of the East River (FDR) Drive. The general dates of each group of logs are provided parenthetically and arranged geographically, where possible, from East 18th Street/Avenue C to East 23rd Street. (Note: Soil boring coverage in Stuyvesant Cove Park is limited to pre-fill/pre-park borings)

- Rock Data Vol. 1, Sheet 34, 65 total borings—Nos. 4–10 (then outboard, eastern edge of Marginal Street now Stuyvesant Cove Park, East 18th to 23rd streets, 1934); 18 (1935), 33, 35–84 (East River Drive between East 18th and 23rd streets, 1944); 100–104 (western edge of East River Drive between East 18th and 21st streets, 1962).
- Newtown Creek PCP North Branch Interceptor (Sheets 3 and 4 of 12, 1962)—7 borings, Nos. D-8, -9, -10, -11 (western half of East River Drive, East 18th to 20th streets), -11-1 (western half of East River Drive, East 21st Street), -20-1, -20-2 (west side of East River Drive at East 23rd Street intersection).
- ESCR Deep Sample Locations (2015)—14 borings, Nos. SB-10DA–SB-0D.

Excluding the earliest borings that were done outboard in the East River, the logs show a strong similarity in general, with thick fill strata extending down from the surface paving/topsoil to well below mhw, as would be expected in a filled, formerly inundated location. The thickness of identified fill stratum was 10 to 42 ft, and generally in the range of 20 to 40 ft. throughout the segment. Outliers came from a number of the 2015 borings (e.g., SB-6DA, -6, -5 -4, 3DA, -3) that failed to identify all fill strata, since they were performed in filled sections of the East River bed but noted only 4 to 7 ft. of fill.

Surface elevations ranged between 3.4 and 6.9 ft. above mhw, although the 2015 logs show uniformly higher elevations, generally between 7 and 9 ft. The higher elevations in all the logs do not seem to correlate with the variations in fill-stratum thickness.

Bedrock depths, where recorded, tended to vary between 110 and 137 ft. below mhw, with a concentration of the shallowest bedrock depths between East 18th and 19th Streets.

Beneath fill strata, areas of thick river mud deposits, were recorded throughout this segment, including, but not limited to, the area of 6 to 20 ft. of river mud beneath 10 to 31 ft. of fill under the FDR Drive from East 18th to north of East 19th streets (Rock Data Vol. 1, Sheet 34, Nos. 33, 35, 36, 37, 38, 39, 40, 41, 42, 44; Newtown Creek PCP North Branch Interceptor No. D-9). D-9 included embedded timbers in the fill (possible components of old piers and landfiling devices) between 17 and 22 ft. below mhw. "Old Masonry" and rip rap, also suggestive of landfill devices or piers, were recorded at the East 23rd Street intersection under 10 to 20 ft. of fill (Rock Data Vol. 1, Sheet 34, Nos. 79, 82), and rip rap was also noted near East 21st Street (Rock Data Vol. 1, Sheet 34, No. 58).

East 23rd Street to East 25th Street

No soil borings were available for this segment.