HISTORICAL PERSPECTIVES

PHASE I CULTURAL RESOURCES STUDY

PROPOSED CANAL STREET SUBSTATION
OPTION 1: BLOCK 227, LOT 33
AND
OPTION 2: THOMPSON STREET
NEW YORK, NEW YORK

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PROPOSED CANAL STREET SUBSTATION
OPTION 1: BLOCK 227, LOT 33 AND
OPTION 2: THOMPSON STREET
NEW YORK, NEW YORK

Prepared For:

STV, Inc.
225 Park Avenue South
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and

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November 2017

MANAGEMENT SUMMARY

SHPO Project Review Number (if available):

Involved State and Federal Agencies: MTA NYCTA

Phase of Survey: Phase I Cultural Resources Study

Location Information
Location: Option 1: 1-15 Thompson Street, Block 227, Lot 33.
Option 2: Thompson Street between Canal and Grand Streets
Minor Civil Division: 06101
County: New York

Survey Area
Length: varies
Width: varies
Number of Acres Surveyed: .24 [ca. 10,249 square-foot (SF)]

USGS 7.5 Minute Quadrangle Map: Jersey City, NJ 2013.

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

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

Results of Architectural Survey
Number of buildings/structures/cemeteries within Project Site: None
Number of buildings/structures/cemeteries adjacent to Project Site: Option 1: 28 in S/NR Soho Historic District, 19 in NYCL SoHo-Cast Iron Historic District. Option 2: 31 in S/NR Soho Historic District, 21 in NYCL SoHo-Cast Iron Historic District
Number of previously determined S/NRHP listed or eligible buildings/structures/cemeteries/districts: None
Number of identified eligible buildings/structures/cemeteries/districts: None

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

Date of Report: November 2017

EXECUTIVE SUMMARY

The Metropolitan Transportation Authority, New York City Transit (MTA NYCT) proposes to construct and operate a new power substation that will supply traction power to the Eighth Avenue Line (A/C/E) Subway. There are two proposed sites for the substation designated as Option 1 and Option 2.

- Option 1 is located at 1-15 Thompson Street (aka 64 Sixth Avenue) in Manhattan, including all of Block 227, Lot 33 and sections of surrounding sidewalks, and is bounded on the west by Sixth Avenue, on the east by Thompson Street, on the north by the southern building line of The James Hotel, and on the south by Canal Street. Option 1 is an approximately 6,041 square-foot (SF) property that contains the New York City Department of Parks and Recreation's (NYC Parks) 'Grand Canal Court,' comprised of a paved basketball court.
- Option 2 is located in the roadbed at the south end of Thompson Street, between Grand Street and Canal Street immediately east of Block 227, Lot 33 and includes sidewalks on its east, west, and north sides.

MTA NYCT, acting as lead state agency for the environmental review, is preparing an Environmental Assessment Form (EAF) for the Proposed Project and has determined that the project may have significant effects/impacts on the environment. Option 1 of the Proposed Project would be classified as a Type 1 action because it would be within a designated NYC Park. Type 1 actions are likely to have a significant adverse impact on the environment and may require an EIS. Option 2 would be in an active roadbed, is immediately adjacent to the same NYC Park, and thus is also considered a Type 1 action (SEQR 2017).

An initial review of the Option 1 site by the New York City Landmarks Preservation Commission (LPC) concluded that there is no concern for architectural resources (Santucci, March 29, 2017), but that the location may be potentially sensitive for historic archaeological resources. As such, LPC recommended that an archaeological documentary study (ADS) be performed to clarify these initial findings and provide the threshold for the next level of study, if indicated. However, because this study is being prepared for both the New York State Office of Parks, Recreation, and Historic Preservation (OPRHP) and the LPC, it is also addressing historic (architectural) resources as required by the State Environmental Quality Review (SEQR).

Historical Perspectives, Inc. (HPI) has been contracted by STV, Inc. to complete the City Environmental Quality Review (CEQR) and SEQR required Phase I cultural resources assessment for Option 1 and Option 2 of the proposed substation. This study was prepared to comply with the standards of the both the OPRHP and the LPC (New York Archaeological Council 1994; OPRHP 2005; LPC 2002; CEQR 2014, revised 2016).

Archaeological Resources: The documentary study of the Option 1 APE found that while lots may have once had the potential to yield shaft features, subsequent disturbance to the back and center yards of historical lots has obliterated any archaeological potential. The destruction caused by building demolition with the Sixth Avenue Extension, and the breadth and depth of subsurface excavations in conjunction with the Eighth Avenue Subway line in the late 1920s has eliminated all archaeological potential. What remains beneath each of these lots is likely building demolition debris, on the eastern ends fronting onto Thompson Street, and fill material used to backfill the center and eastern ends of the lots after they were excavated, had retaining walls installed, and were stabilized for the subway tunnel. Therefore, no additional archaeological consideration is warranted for Option 1.

The documentary study of the Option 2 APE found that before historical development in Manhattan, the site was a swamp, which later became a roadbed through the process of landfilling. Landfill in the streetbed dates to the 1810s, but the origin of material used to turn the site into usable land is unknown. No historical development ever occurred in the Option 2 APE. Therefore, no additional archaeological consideration is warranted for Option 2.

Historic Resources: Although there are no designated or eligible historic structures within 90 feet of the construction zone for either Option 1 or Option 2, for the larger 400-foot radius Study Areas there are 28 structures that lie within the State/National Register (S/NR) Soho Historic District, and 18 that lie within the New York City Landmark (NYCL) SoHo-Cast Iron Historic District for Option 1, and 31 structures that lie within the S/NR Soho Historic District, and 21 that lie within the NYCL SoHo-Cast Iron Historic District for Option 2. None lie within the view scape of either Option 1 or Option 2, but it is recommended that MTA NYCT employ vibration control measures to minimize, as much as possible, the vibration levels in the historic neighborhoods near the construction

site. Measures may include developing and implementing a vibration-monitoring program during highly disruptive construction activities, such as pile driving, to ensure that historic structures would not be damaged.

TABLE OF CONTENTS

FIGURES

PHOTOGRAPHS

(see Figures 2a-1, 2a-2, 2b-1, and 2b-2 for Photograph locations)

Photograph 1: Facing northeast to Option 1 Archaeological Area of Potential Effect with basketball court, from sidewalk at south end of Thompson Street.

Photograph 2: Facing northeast to Option 1 Archaeological Area of Potential Effect and east side of Sixth Avenue from sidewalk at south end of Thompson Street.

Photograph 3: Facing west from Block 227, Lot 33 Option 1 Archaeological Area of Potential Effect to sidewalk on east side of Sixth Avenue and Sixth Avenue roadbed.

Photograph 4: Facing northwest to sidewalk grates over A/C/E subway line beneath Sixth Avenue in Option 1 Archaeological Area of Potential Effect.

Photograph 5: Facing southeast to Option 1 Archaeological Area of Potential Effect from Sixth Avenue sidewalk, with junction of NYC Park on Block 227, Lot 33 and The James Hotel immediately to the northeast (at left).

Photograph 6: Facing northwest to new bus stop in sidewalk on eastern sidewalk of Sixth Avenue in Option 1 Archaeological Area of Potential Effect.

Photograph 7: Facing northeast to sidewalk on west side of Thompson Street in both the Option 1 and Option 2 Archaeological Areas of Potential Effect.

Photograph 8: Facing south from to Option 1 Archaeological Area of Potential Effect to southern sidewalk on Thompson Street. Roadbed of Thompson Street in foreground is within the Option 2 Archaeological Area of Potential Effect.

Photograph 9: Facing northwest to junction of NYC Grand Court Park on Block 227, Lot 33 (Option 1 Archaeological Area of Potential Effect) and The James Hotel immediately to the north (at right). The Thompson Street roadbed in the foreground encompasses the Option 2 Archaeological Area of Potential Effect.

Photograph 10: Facing west from east side of Thompson Street to southern end of Block 227, Lot33 Option 1 Archaeological Area of Potential Effect with basketball court and Option 2 Archaeological Area of Potential Effect roadbed and sidewalks.

Photograph 11: Thompson Street and Option 2 Archaeological Area of Potential Effect, facing south from Grand Street.

Photograph 12: Buildings at the corner of Thompson Street and Grand Street dating to ca. 1910s, facing south from north side of Thompson Street: 35 Grand Street is at left and 17 Thompson Street is at right. Note the modern buildings surrounding each structure.

Photograph 13: Wide angle photograph of Option 2 Archaeological Area of Potential Effect, facing south from center of Thompson Street. Note that the southern end of Thompson Street veers to the west.

Photograph 14: 393 Canal Street structure dating to ca. 1910 adjacent to southeastern corner of Option 2 Archaeological Area of Potential Effect, facing east from Thompson Street.

Photograph 15: Facing north to Option 1 Archaeological Area of Potential Effect (Grand Canal Court) and Option 2 Archaeological Area of Potential Effect (Thompson Street) from Canal Street.

Photograph 16: Buildings on east side of Thompson Street north of Grand Street dating to the 1910s and 1920s, facing southeast from Thompson Street.

I. INTRODUCTION

The Metropolitan Transportation Authority, New York City Transit (MTA NYCT) proposes to construct and operate a new power substation that will supply traction power to the Eighth Avenue Line (A/C/E) Subway. There are two proposed sites for the substation designated as Option 1 and Option 2.

- Option 1 is located at 1-15 Thompson Street (aka 64 Sixth Avenue) in Manhattan, including all of Block 227, Lot 33 and sections of surrounding sidewalks, and is bounded on the west by Sixth Avenue, on the east by Thompson Street, on the north by the southern building line of The James Hotel, and on the south by Canal Street. Option 1 is an approximately 6,041 square-foot (SF) property that contains the New York City Department of Parks and Recreation's (NYC Parks) 'Grand Canal Court,' comprised of a paved basketball court (Figures 1a and 2a-1).
- Option 2 is located in the roadbed at the south end of Thompson Street, between Grand Street and Canal Street immediately east of Block 227, Lot 33 and includes sidewalks on its east, west, and north sides (Figures 1b and 2b-1).

MTA NYCT, acting as lead state agency for the environmental review, is preparing an Environmental Assessment Form (EAF) for the Proposed Project and has determined that the project may have significant effects/impacts on the environment. Option 1 of the Proposed Project would be classified as a Type 1 action because it would be within a designated NYC Park. Type 1 actions are likely to have a significant adverse impact on the environment and may require an EIS. Option 2 would be in an active roadbed, is immediately adjacent to the same NYC Park, and thus is also considered a Type 1 action under the State Environmental Quality Review (SEQR 2017).

An initial review of the Option 1 site by the New York City Landmarks Preservation Commission (LPC) concluded that there is no concern for architectural resources (Santucci, March 29, 2017), but that the location may be potentially sensitive for historic archaeological resources. As such, LPC recommended that an archaeological documentary study (ADS) be performed to clarify these initial findings and provide the threshold for the next level of study, if indicated. However, because this study is being prepared for both the New York State Office of Parks, Recreation, and Historic Preservation (OPRHP) and the LPC, it is also addressing historic (architectural) resources as required by SEQR.

Historical Perspectives, Inc. (HPI) has been contracted by STV, Inc. to complete the City Environmental Quality Review (CEQR) and SEQR required Phase I cultural resources assessment for Option 1 and Option 2 of the proposed substation. This study was prepared to comply with the standards of the both the OPRHP and the LPC (New York Archaeological Council 1994; OPRHP 2005; LPC 2002; CEQR 2014, revised 2016).

II. METHODOLOGY

Archaeological Area of Potential Effect

The 2014 (revised 2016) CEQR Technical Manual identifies archaeological sites as a location or place that possesses historic, cultural, or archaeological value, either because a significant event or sequence of events took place there, or because an important building or structure, whether now standing, ruined, or vanished, is or was, located there. A site can be important because of its association with significant historic (or prehistoric) events or activities, buildings, structures, objects, or people, or because of its potential to yield information important in prehistory or history. Examples of sites include a Native American habitation site or a battlefield. As such, the Archaeological Area of Potential Effect (Archaeological APE) for each Option is limited to those specific locations where project-related excavation would result in new in-ground disturbance.

- Option 1 Archaeological APE

The Option 1 area of excavation for the proposed substation includes all of Block 227, Lot 33 and extends out into both Sixth Avenue to the west and Thompson Street to the east. It also includes portions of the sidewalks to the west, south, and east (Figure 2a-1).

- Option 2 Archaeological APE

The Option 2 area of excavation for the proposed substation includes the roadbed immediately east of Block 227, Lot 33 from the sidewalk bordering Canal Street to a point just north of the southern end of the Grand Hotel on Block 227, Lot 50 (Figure 2b-1). A small segment of the proposed substation would extend east into the sidewalk on the east side of the road.

Historic Resources Study Area

The 2014 CEQR Technical Manual identifies historic resources as districts, buildings, structures, sites, and objects of historical, aesthetic, cultural, and archaeological importance. This includes designated New York City Landmarks (NYCL); properties calendared for consideration as landmarks by the New York City Landmarks Preservation Commission (LPC); properties listed in the State/National Registers of Historic Places (S/NR) or contained within a district listed in or formally determined eligible for S/NR listing; and, properties designated by the New York State Historic Preservation Office (SHPO) within the Office of Parks, Recreation and Historic Preservation (OPRHP) as eligible for listing on the S/NR, National Historic Landmarks (NHL), and properties not identified by one of the programs or agencies listed above, but that meet their eligibility requirements. Cultural resources are districts, buildings, structures, sites, and objects of historical, aesthetic, cultural, and archaeological importance. Historic resources and archaeological resources require both distinctly different Study Areas and evaluation protocols specific to above- and below-grade sensitivity.

The historic resources study area (Study Area) is defined as the footprint to be altered by the substation installation plus an approximate 400-foot radius, which is typically adequate for the assessment of historic resources, in terms of physical, visual, and historical relationships (Figures 2a-2 and 2b-2). This 400-foot radius accounts for both direct physical impacts and indirect impacts. Direct impacts include demolition of a resource and alterations to a resource that cause it to become a different visual entity. A resource could also be damaged by adjacent construction activities such as blasting, pile driving, falling objects, subsidence, collapse, or damage from construction machinery unless proper protection measures are put in place. Adjacent construction is defined as any construction activity that would occur within 90 feet of a historic resource, as defined in the NYCDOB TPPN #10/88. Indirect impacts can be contextual impacts and can include the isolation of a property from its surrounding environment, or the introduction of visual, audible, or atmospheric elements that are out of character with a property or that alter its setting.

- Option 1 Historic Resources Study Area

The Option 1 area of excavation for the proposed substation includes all of Block 227, Lot 33 and extends out into both Sixth Avenue to the west and Thompson Street to the east. It also includes portions of the sidewalks to the west, south, and east. The Study Area includes the outer limits of excavation activities plus a buffer area of 400 feet (Figure 2a-2).

- Option 2 Historic Resources Study Area

The Option 2 area of excavation for the proposed substation includes the roadbed immediately east of Block 227, Lot 33 from the sidewalk bordering Canal Street to a point just north of the southern end of the Grand Hotel on Block 227, Lot 50. A small segment of the proposed substation would extend east into the sidewalk on the east side of the road. The Study Area for Option 2 includes the outer limits of excavation activities plus a buffer area of 400 feet (Figure 2b-2).

Documentary Research Tasks

This study entailed a review of various resources to establish the history of the Option 1 and Option 2 sites, and assess prior disturbances as well as potential impacts to any potential archaeological and historic resources. Undertaken research is described below.

- Historic maps were reviewed at the Map Division of the New York Public Library and online using various websites. These maps provided an overview of the topography and a chronology of land usage for the project site.

- Additional maps and street opening data were provided by the Manhattan Borough President's Office Topographical Bureau (MBPO).
- Photographs of the site over time were reviewed using the New York Public Library's Digital Gallery and other websites.
- Index books, selected deeds and other records pertaining to the project site were reviewed at the Manhattan Borough City Register's Office.
- New York City Department of Buildings (DOB) and nineteenth-century tax assessment records (in roughly 5-year intervals after initial building episodes) for the property were reviewed at the New York City Municipal Archives.
- City directory and federal census records pertaining to the property's former owners and occupants were reviewed at the New York Public Library and using various websites. Of note, only one nineteenth-century state census is available for Manhattan, from 1855.
- Selected historic newspapers were searched for information about former residents of the Option 1 APE.
- Project plans provided by MTA NYCT were reviewed.
- Previous archaeological sites and surveys were reviewed using data available at the OPRHP and LPC.
- The results of soil borings undertaken in the vicinity were reviewed and are included as Appendix A.
- A site file search for all listed and eligible historic sites and districts was undertaken using New York Cultural Resource Information System (NYCRIS).
- Last, site visits were undertaken to assess any obvious or unrecorded subsurface disturbance and establish existing conditions. The Option 1 Site was reviewed by Cece Saunders of HPI on June 25, 2017, and the Option 2 site was reviewed on November 7, 2017 (Photographs 1-16, Photo Key on Figures 2a-1, 2a-2, 2b-1 and 2b-2).

III. ENVIRONMENTAL SETTING AND CURRENT CONDITIONS

For the following discussions, the locations of Options 1 and 2 are together referenced as the Project Site due to their proximity. Where information pertains to one Option alone, it is referenced singularly.

Environmental Setting

The history of Manhattan was in part shaped by the topography, ecology, and economic conditions that prevailed at various times. Understanding the city's geologic history aids in understanding the land use history. During the Pleistocene period, ice advanced in North America several times. In the last 50,000 years, the Wisconsonian period, ice was 1,000 feet thick over Manhattan. Gravel and boulders deposited at the melting margins of ice sheets formed Long Island about 15,000 years ago (Kieran 1982). For a brief period Manhattan was largely covered by a glacial lake. Glacial Lake Flushing occupied broad, low lying areas when deglaciation of the region produced vast volumes of meltwater. Higher elevations of Manhattan may have been marginal to this lake (Church and Rutsch 1984). By 12,000 years ago the lake drained and sea levels have gradually risen as glaciers retreated.

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

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

The prevalent gneissoid formation is known as Hudson River metamorphosed rock. The city is characterized by a group of gneissoid islands, separated from each other by depressions which are slightly elevated above the tide and filled with drift and alluvium. Beneath most of the Project Site is the Manhattan schist formation, a highly foliated mica schist known to have once outcropped throughout the island.

Historical development has altered many of the natural topographic features that once characterized Manhattan (Gratacap 1909). Soil within Manhattan is mostly glacial till, clays, sand, gravel, mud, and assorted debris (Kieran 1982). In lower Manhattan the glacial till is a mix of sand, silt, clays and random boulders and cobblestones. Glacial lake deposits, a remnant of the Pleistocene period, contain varved silt, clay, and fine sand, often over the gneiss and schist bedrock.

Current Conditions

- Option 1

The Option 1 Archaeological APE is dominated by the Grand Canal Court, a fenced NYC Park with a paved basketball court (Photographs 1-10, 15). The basketball court is elevated slightly above the street level (Photographs 9 and 10). Surrounding the south, west, and east sides of the park are wide concrete sidewalks with benches and trees (Photographs 1, 2, 7, 9, 10, and 15).

The buildings formerly located on the project site in the nineteenth and early twentieth century were demolished when the Sixth Avenue Extension was completed in the late 1920s, leaving the site virtually vacant. The IND A/C/E Eighth Avenue Subway line followed the route of Sixth Avenue here, and lays beneath part of western section of the Archaeological APE (see Figures 2a and 13a). The subway here was constructed in the early 1930s by the cut-and-cover method, and there are sidewalk grates above it along the west side of the site (Photograph 4).

- Option 2

The Option 2 Archaeological APE is a paved one way southbound street that wraps around the east and south sides of the park on Block 227, Lot 33 (Photographs 7-15). There are multiple manhole covers in the roadbed, as well as catch basins at the edge of the roadbed adjacent to sidewalks. Subsurface utility maps show sewer, water, and other utility lines beneath the street.

- Soils

A soil study of the metropolitan New York area reported that soils within both Option 1 and Option 2 are characterized as Pavement & buildings, wet substratum, 0 to 5 percent slopes - (New York City Soil Staff 2005). This soil type is described as “Nearly level to gently sloping, highly urbanized areas with more than 80 percent of the surface covered by impervious pavement and buildings, over filled swamp, tidal marsh, or water; generally located in urban centers” (Ibid.).

- Topography and Hydrology

According to historic maps (e.g. Ratzer 1766-1767, Montresor 1766, British Headquarters 1782, Viele 1865), both Option 1 and Option 2 were once situated in salt meadows, or marshland surrounding a perennial stream that emptied into the Hudson River north of the modern line of Canal Street. Canal Street itself was named for the series of canals that were built within this drainage area to carry water from the Collect Pond near modern day Foley Square in Lower Manhattan and to drain the marshland of the area (Sanderson 2009:94). The Ratzer map (Figures 3a and 3b) indicate that one of these canals was just north of both Option 1 and Option 2. Both the location of Option 1 and Option 2 were landfilled in the early 1800s, allowing for the creation of Thompson Street and Block 227.

- Grading and Regulating Streets

- Option 1

Changes to the natural pre-development topography of streets surrounding the Option 1 APE are evident on historical maps and atlases that show a change in elevations (see Figures 3a-14a) and as reported on Table 1.

Table 1: Elevation Changes in Street Intersections Surrounding the Option 1 Area of Potential Effect

INTERSECTION	ELEVATION ON 1865 VIELE (Above Sea Level)	ELEVATION ON 1885 ROBINSON (FIGURE 9a) (Above Sea Level)	DIFFERENCE
Sullivan St x Grand St	3.7' ASL	8.5' ASL	+4.8'
Thompson St x Canal St	2.3' ASL	7.2' ASL	+4.9'
Sullivan St x Canal St	3.7' ASL	8.5' ASL	+4.8'

The increase in elevation between 1865 and 1885 may be the result of a change in the established New York City datum that was in use in 1865, or changes to the surrounding topography as development intensified, and roads were repaved and improved.

- Option 2

Minor changes to the natural pre-development topography of streets surrounding the Option 2 APE are evident on historical maps and atlases that show a change in elevations (see Figures 3b-14b) and as reported on Table 1.

Table 2: Elevation Changes in Street Intersections Surrounding the Option 2 Area of Potential Effect

INTERSECTION	ELEVATION ON 1865 VIELE	ELEVATION ON 1885 ROBINSON (FIGURE 9b)	DIFFERENCE
Thompson St x Grand St	3.3' ASL	7' ASL	+3.7'
Thompson St x Canal St	2.3' ASL	7.2' ASL	+4.9'

The increase in elevation at intersections to the north and south on Thompson Street are inconsistent and may result from changes to the surrounding topography as development intensified, and roads were repaved and improved.

- IND Eighth Avenue Subway and Sixth Avenue Extension

In the early twentieth century, plans were made to extend Sixth Avenue south from its then terminus at Carmine Street. As early as 1899 the idea to extend Sixth Avenue southward was discussed, but it was not until the 1910s after Seventh Avenue had successfully been extended south that plans to create another north-south traffic route began to congeal (*New York Times* April 12, 1914). Roadway construction was proposed to take place in conjunction with the construction of the IND Eighth Avenue (A, C, E) Subway line that was planned to run beneath it. When the new avenue was built, it extended Sixth Avenue south to Canal Street, and through Block 227, including the Option 1 APE. Its creation necessitated the demolition of hundreds of buildings in the process, including all of those that were standing in the APE (Figures 15 through 19). The city purchased all lots in the path of the extension – rather than just a portion thereof – and ultimately displaced over ten thousand residents who had to be relocated (*New York Times* September 19, 1926).

The IND Eighth Avenue Line, constructed in the late 1920s and opened in 1932, was simultaneously constructed in the path of Sixth Avenue in the Option 1 APE. South of 64th Street, the plan for the subway called for four tracks in Eighth Avenue, Greenwich Avenue, and the planned extension of Sixth Avenue. The subway was built using the cut and cover method (Figure 18), which entailed excavating down from the surface to the base of the planned tunnel. Various photographs of the Eighth Avenue subway being constructed in Sixth Avenue confirm this, and document the extent of disturbance both in the Sixth Avenue roadbed, and the Option 1 APE on Block 227 (NYPL; Kramer 1990:22; Figures 18 and 19).

Photographs show that there is obviously extensive disturbance with the demolition of structures and excavations for the subway in Block 227 and into the Option 1 Archaeological APE (Figures 18 and 19). Construction clearly extended eastward beyond the footprint of the subway tunnel, which runs beneath the western side of the Option 1 APE, as can be seen in the photographs. While the western ends of lots in the APE were definitively obliterated, it appears that the center sections of the lots were also extensively disturbed. Retaining walls were constructed across the lots, presumably to hold back demolition debris and landfill, and water is observed filling the lots in the Option 1 APE (Figure 19). Clearly, a high degree of disturbance was experienced on the center and eastern ends of the Block 227 lots.

- Soil Borings

No soil borings were taken for this project within the Option 1 APE, and none were provided to review. One soil boring was undertaken in 1994 in the Option 2 Archaeological APE at the southeast corner of Thompson Street where it veers west to form an "L" shape along the southern boundary of Block 227 and the Option 1 Archaeological APE. Boring B-2, placed in the sidewalk, encountered densely compacted medium fine sand, gravel, and silt immediately beneath the pavement (Testwell Craig Test Boring Co. 1994; see Appendix A). While levels were dry down to two foot two inches below grade, the same strata became wet from that point and continuing down to 10 feet below grade. From 10 to 12 feet below grade a layer of loose moist sand with clayey silt was encountered, and beneath this to 17 feet below grade was a wet loose stratum with sand and clayey silt (Ibid.). A relatively thin layer of moist peat and silt was encountered between 20 and 22 feet below grade, and beneath this was alternating layers of wet sand, some layers with silt and some with traces of shell fragments, to a final depth of 60 feet below grade where decomposing bedrock was encountered.

Also in 1994, Boring B-1 was taken about two blocks southeast of the Option 1 and Option 2 Archaeological APEs (Testwell Craig Test Boring Co. 1994; see Appendix A). It also revealed fill material from just beneath the concrete sidewalk to 15 feet below grade. Unconsolidated material (sand, silt, gravel) was present from 15 feet below grade to approximately 35 feet below grade, with moist levels reported immediately beneath the fill at 15 feet below grade. Beneath this were decomposed rock fragments to 36 feet below grade, with slightly fractured schist with traces of quartz bedrock encountered at 36 feet below grade. No groundwater depths were recorded.

More recently, a series of soil borings was completed prior to construction of the James Hotel immediately north of the Option 1 Archeological APE on Block 227 (see Appendix A). Boring B1 had fill with concrete fragments and brick from the surface down to seven feet below grade. Beneath this was coarse sand, silt, and gravel of various densities to 24 feet below grade, and beneath this were levels of clay interspersed by levels of sand and gravel to 114 feet below grade (Mueser Rutledge 2004, Boring B-1). Boring B-2 also contained fill with demolition debris from the surface down to 17 feet below grade. Beneath this was gravel and sand to 30 feet below grade, at which point peat with some wood fiber was encountered. This level transitioned to gray silty fine sand and alternating levels of silt and clay down to a final depth of 107 feet below grade (Mueser Rutledge 2004, Boring B-2). Boring B-3 also produced fill from the surface down to 10 feet below grade, followed by levels of coarse to fine sand, gravel, and silt to 30 feet below grade. Beneath this was a 10-foot level of peat with wood to 38 feet below grade, and beneath this was clay and clayey silt. The boring terminated at 109 feet below grade (Mueser Rutledge 2004, Boring B-3).

RA Consulting (2007) completed additional soil borings on Block 227 north of the Option 1 Archaeological APE, and provided a summary of findings based on their and Mueser Rutledge's earlier borings. Their conclusions are directly relevant to both the Option 1 and Option 2 Archaeological APEs, and their full geotechnical report is included in Appendix A of this report. The report summarized subsurface strata as follows:

> Stratum F: The uppermost fill level that ranged in thickness form 7 to 23.5 feet, with it generally thicker in the south and thinner in the north.
> Stratum S1: Upper sand that is possible fill, extending to a depth of about 23 to 30 feet below grade, containing loose to medium compact brown fine to coarse sand. It is postulated that this sand layer may be fill placed in the 1800s using nearby sand hills to initially fill the marsh.
> Stratum O: Peat. In all borings the fill and sand layers are underlain by a 10 to 11.5 foot level of peat with organic soils representing marsh deposits. The upper portion of the majority of the meadow deposit is a medium to stiff dark gray to brown fibrous peat and wood with traces of find sand. It is often underlain by soft organic silt with clay and fine sand. Obstructions in the peat indicate that tree trunks or old pilings are also present.
> Stratum M: Is a silt, clay and sand deposit beneath the peat that is interpreted as a 20 to 25 foot glacial lake deposit. It is found in all the borings immediately beneath the peat.

The summary noted that the water table ranged from approximately 7.6 feet to 9.6 feet below grade (RA Consulting 2007:4; see Appendix A). While additional stratigraphic levels were observed beneath the glacial lake deposits (Stratum M), they are not summarized herein since the glacial lake till level coincides with deglaciation and the earliest period of known human occupation in the Northeast.

IV. BACKGROUND RESEARCH/HISTORICAL OVERVIEW

Precontact Summary

For this report, the word precontact is used to describe the period prior to the use of formal written records. In the western hemisphere, the precontact period also refers to the time before European exploration and settlement of the New World. Archaeologists and historians gain their knowledge and understanding of precontact Native Americans in the metropolitan New York area from three sources: ethnographic reports, Native American artifact collections, and archaeological investigations.

Based on data from these sources, a precontact cultural chronology has been devised for the New York City area. Scholars generally divide the precontact era into three main periods, the PaleoIndian (c. 14,000-9,500 years ago), the Archaic (c. 9,500-3,000 years ago), and the Woodland (c. 3,000-500 years ago). The Archaic and Woodland periods are further divided into Early, Middle, and Late substages. The Woodland was followed by the Contact Period (c. 500-300 years ago). Artifacts, settlement, subsistence, and cultural systems changed through time with each of these stages. Characteristics of these temporal periods have been well documented elsewhere, and in keeping with guidelines issued by the OPRHP (2005), will not be fully reiterated here.

Scholars often characterize precontact sites by their close proximity to a fresh water source, available game, and exploitable natural resources (i.e., plants, raw materials for stone tools, clay veins, etc.). These sites are often separated into three categories: primary (campsites or villages), secondary (tool manufacturing, food processing), and isolated finds (a single or very few artifacts either lost or discarded). Primary sites are often situated in locales that are easily defended against both nature (weather) and enemies. Secondary sites are often found in the location of exploitable resources (e.g., shell fish, lithic raw materials).

A review of maps and atlases from the historical period indicates that the Archaeological APE for both Option 1 and Option 2 was in the middle of swampland interspersed with streams from the period of European Contact through the early nineteenth century. It was artificially landfilled in the late 1810s. Native Americans would have been drawn to these streams and marshlands for their aquatic life, wild game, and vegetation. As well, wetlands peat could have been used for fuel and a number of wetland plants served as materials for clothing, basketry and weaving. As importantly, the use of certain aquatic plants for medicinal purposes is ethnographically documented (Herrick 1995).

Historical Period Summary

As noted above, historic documents and maps (e.g. Ratzer 1766-1767 [Figures 3a and 3b], Montresor 1766, British Headquarters 1782, Viele 1865) identify the Option 1 and Option 2 APEs as being within swampland surrounding a perennial stream that emptied into the Hudson River north of the modern line of Canal Street. Originally the Project Site fell within what was Abram Isaac Verplank's land, and was later conveyed by his heirs to William Huddleston in 1697, although the conveyance records on file at the City Register's office have no instrument of record prior to 1703. Huddleston sold the Project Site land to Captain Richard Hill in 1703, who sold it to Anthony Rutgers in 1726 (Stokes 1915:82; Liber 25:114; Liber 31:115). Rutgers acquired a larger portion of his farm after it had been granted to the Governor of New York from King George II in 1731, and then conveyed to Rutgers by royal patent in 1733 (Stokes 1928:102). Rutgers owned several large landholdings, including the Option1 and 2 APEs, which were part of his 70-acre tract in the early eighteenth century.

Rutgers died in 1746 and his land was inherited by his wife, Cornelia, and his children, Elsie (wife of Leonard Lispenard), Mary (who afterwards married Henry Barclay), Alletta (wife of Dirck Lefferts), and a grandson also named Anthony Rutgers (Stokes 1928:102). The Project Site property then passed to and was divided between the heirs of Anthony Rutgers in 1767 (Liber 38:110; Appendix B). At that time Dirck and Elsie Lefferts granted the land to Leonard and Elsie Lispenard, and Henry and Mary Barclay, all descendants (through blood or marriage) of Rutgers (Appendix B). In 1807, Anthony & Sarah Lispenard conveyed the Option 1 APE lots to Thomas Miller and Stephen Baker (Holmes 1882; Liber 277:231; Appendix B). The future site of the Option 2 APE in Thompson Street was not formally subdivided since it was intended to be a thoroughfare.

In 1803 Block 227, Thompson Street, and the surrounding area was swampland (Mangin and Goerck 1803), but landfilling began shortly thereafter. By the early 1800s, much of the swampland, known as Lispenard's Meadow, was being filled and streets were being laid out. In 1808 the Common Council of the City of New York noted that

the heirs of Lispenard had made progress in filling their swamp, and had requested information from the City about the final elevation of roads so they could plan for development accordingly. The Council ordered that unregulated streets immediately north of Canal Street be surveyed so that streets and lots could be regulated (MCC Jan. 13, 1808:745). Resultantly, the streets in the Project Site, part of the newly created city grid, were opened sequentially. Canal Street south of the APE was regulated in 1809 and opened in 1810. Grand Street to the north was opened as far west as Sullivan Street in 1819 (MCC Feb. 28, 1819:230), and the Option 2 APE in Thompson Street was regulated and opened between Canal and Grand Street between 1817 and 1819 (MCC July 12, 1819:478).

Tax records show that concurrently, Block 227, including the Option 1 APE, was being to be divided into individual building lots, all under the ownership of George Lorillard who had acquired the block from Leonard Lispenard in 1811 (Appendix B). In both 1819 and 1820 Lorillard was paying taxes on vacant lots, but shortly thereafter he began selling individual lots in the APE for development. The Option 2 APE was not subjected to subdividing.

Option 1 Site History

The earliest nineteenth century maps and atlases to depict Block 227 encompassing Option 1 show that it contained structures, but do not depict individual lots (Colton 1836; Figure 4a). The more detailed 1853 Perris atlas shows the Option 1 APE as divided into four lots fronting onto Thompson Street, with the addresses, from south to north, of 3, 5, 7, and 9 Thompson Street, historically corresponding to what were Lots 62, 61, 60, and 59, which now form all of Lot 33 (Figure 5a). The development and residence history of each of these individual lots in Option 1 is presented using these historic designations.

- **3 Thompson Street, Lot 59**

Deeds reported that in 1824, Stephan and Jane Baker, together with Charles Sanford, sold the lot to David Ogden, who passed it back to Charles Sandford for individual ownership (Liber 172:414, Liber 181:389; Appendix B). The tax assessment in 1821 reported George Lorillard paying for a vacant lot valued at $350, while the 1825 assessment reported Charles Sanford owning a house and lot here valued at $3,000 (Appendix B). This suggests that the house was built in in 1823 or possibly in 1824 following Sanford's acquisition of the lot. Directories reported different residents in 1825 (Stephen Clark), 1827 (Theodore Barrell) and 1828 (James Delameter), suggesting the house was occupied by short term renters. No residents were found in the directories at this address prior to 1825.

In 1828 the property was sold by the Sandfords [sic] to Jasper Seaman (Liber 231:316), but this must have been redacted because six months later, a Master in Chancery for Charles Sandford et al passed the lot to Henry Yates (Liber 239:482; Appendix B). In 1830 Mary Piggot, Mary Hester, and John J. Sab…[?] resided on the lot (U.S. Census 1830), while the partnership of Yates & McIntire owned the house and lot, assessed at $3,200 (Appendix B). It appeared that Yates & McIntyre were speculators as they owned several lots on the block in the 1830s. In 1833, Mary Hester, widow of John, and Mary Pigot, widow of William, resided on the lot, which then passed through several hands in the conveyance records, ultimately remaining with Yates & McIntire through 1835 (Appendix B). In 1836 it was granted to Henry Yates, who paid taxes on the lot through 1870 (Liber 395:510; Appendix B).

During the years of Yates ownership, directories showed that William A. Pigot (painter) and Edward N. Pigot (merchant) lived on the lot through at least 1851 (Appendix B), recalling that Mary Piggot [sic] was listed there in the 1830 census (Appendix B). Joseph Hawxhurst also lived there in 1845-1846, and in 1850 George and Marie Warner, as well as Catherine Shaw also resided there with the William A. and Maria Pickett (likely a modernized derivation of Pigot) family.

Tax records reported the building as a two-story house measuring 21'10" by 42' on a lot measuring 21'10" by 76'4" through 1860, after which it was reported as three stories. Its recorded footprint would have left an open backyard on the west end of the lot measuring roughly 21'10" in width by 66' in length (Appendix B). Of this, roughly half would have been in the APE, as depicted on historical maps and atlases (Perris 1853, 1857; Figures 5a and 6a). In 1867 the lot was shown as vacant (Harrison 1867; Figure 7a), while in 1879 it was again shown with a structure (Bromley 1879; Figure 8a). Mary Kehoe paid taxes on the house and lot from 1875 through 1895, and during this time the brick structure appeared to cover the eastern end of the lot, and continued to do so through at least 1922 (Robinson 1885; Figure 9a; Appendix B). Kehoe was assessed for a four-story building from 1880 onward. In 1894, a small one-story addition colored green with a "C" and one dot on the Sanborn map, indicating it was a one-story brick warehouse, covered the west end of the lot in the APE, with a small one-story connector that attached it with the

dwelling, then classified as a four-story brick building (Sanborn 1894; Figure 10a). Only a small "L" shaped section of the lot at the extreme southwest corner of the APE was left uncovered by structures. The buildings appeared the same in 1904 (Sanborn 1904; Figure 11a), and 1922 (Sanborn 1922; Figure 12a).

In 1955, the full extent of the changes to the lot with the construction of the Sixth Avenue Extension became clear (Bromley 1955; Figure 13a). All buildings were gone, and the subway line was outlined beneath the eastern end of the lot. Comparing the location of the former vacant portion of the lot to the subway line indicates that this location has been fully disturbed.

- **5 Thompson Street, Lot 60**

Deeds reported that in 1818 William Proctor sold this lot to George Lorillard (Liber 125:599), and then later that year it passed by Master in Chancery for Theophilact [sic] Lispenard et al to William Proctor (Liber 125:602; Appendix B). Regardless, the tax assessment in 1821 reported George Lorillard paying for a vacant lot valued at $350, while the 1825 assessment reported Charles Sanford owning a house on this lot valued at $3,500 (Appendix B). This suggests that a house was built on it in 1823 or possibly in 1824 following Sanford's acquisition of the lot.

By 1827, the first directory with an entry for this lot, Charles W. Sandford, attorney and counselor, lived on the lot, and he continued to be listed in directories and the U.S. Census at this address through at least 1841 (Appendix B). Despite this, in 1828 he sold the lot to Jasper Seaman, and later that year it was re-conveyed by Sandford et al to Henry Yates (Liber 231:316; Liber 237:326; Appendix B). Although the parcel transferred several times between the Yates and McIntyres between 1828 and 1835, it was finally granted to Henry Yates alone in 1836 (Liber 369:510; Appendix B). It appeared that Yates & McIntyre were speculators as they owned several lots on the block in the 1830s. While the house and lot were valued at $5,000 in 1835, it was valued between $7,500 and $8,000 during Yates ownership through 1850 (Tax Assessments; Appendix B).

After 1850, it appeared that the structure on the lot became a partial boarding house as Mary Willington was listed as boarding there with Henry Parsons, a physician, in 1851 (Appendix B). By 1855, Mrs. John Satterlee was assessed for the house and lot, and it remained in Satterlee family ownership through at least 1895 (Tax Assessments; Appendix B). In 1853 and 1857 it was depicted as a brick second-class building covering only the east half of the lot with a portion of the west half of the lot in the APE vacant (Perris 1853, 1857; Figures 5a and 6a). Sometime between 1875, when it was first described in the tax assessments as a three-story 33'6" by 42' building on a 33'6" by 120' lot, and 1880, when it was described as a four-story 33'6" by 90' building on the same sized lot, the original structure had been replaced or expanded to cover most of the lot (Tax Assessments; Appendix B).

While the 1879 atlas did not show the footprint of the building (Bromley 1879; Figure 8a), in 1885 and 1894 it was depicted as a four-story brick second class building with a basement covering the entirety of the lot (Robinson 1885; Sanborn 1894; Figures 9a and 10a). In contrast, a decade later in 1894 the building was a five- and six-story brick apartment building labeled "lodging house," built in a "U" shape with an open yard area mid-lot (Sanborn 1894; Figure 11a). The structure had the same configuration through 1922 (Sanborn 1922; Figure 12a). The tax assessments continued to describe the structure as 33'6" wide by 90' long through 1895, making no distinction between the configuration of the structures observed in 1885 and 1894, with the configuration observed in 1904 and 1922 (Tax Assessments; Appendix B).

Like #3 Thompson Street to the immediate south, the 1955 Bromley atlas showed the full extent of the changes to the lot with the construction of the Sixth Avenue Extension (Sanborn 1955; Figure 13a). The building on the lot is gone, and the subway line is outlined beneath the eastern end of the lot. It was disturbed extensively by the construction of the Eighth Avenue Subway that caused extensive subsurface disturbance to the center and western end of the lot. Figures 18a and 19a show the extent of disturbance, and the installation of a retaining wall at or near the center of the site. Comparing the location of the former vacant portion of the lot to the subway line strongly suggests that this location has been fully disturbed. In addition, between at least 1885 and 1894, a four-story building with a basement covered the entire lot, further disturbing any vacant yards where shaft features might have once existed.

- **7 Thompson Street, Lot 61**

Conveyance records reported that like Lot 60 to the immediate south, in 1818 William Proctor sold this lot to George Lorillard (Liber 125:599), and later that year it passed by Master in Chancery for Theophilact [sic] Lispenard et al to

William Proctor (Liber 125:602; Appendix B). Regardless, the tax assessment in 1821 reported George Lorillard paying for a vacant lot valued at $500. In 1822 it passed from George Lorillard to Stephen and Jane Baker and Charles Sandford, and two years later they sold it to David Ogden (Liber 162:29, Liber 172:414; Appendix B). Ogden sold it to Sandford later that same year (Liber 181:389), and four years later, Charles and Mary Sandford sold it to Jasper Seaman (Liber 231:316; Appendix B).

The first directory entry for this lot dated to 1827 when Ellen Meigs resided here (Appendix B). No additional residents could be located in directories, but the 1830 U.S. Census reported that John and Ewen Lyons lived on the lot (U.S. Census 1830; Appendix B). In 1832, James P. Swain and H. Thompson resided on the lot. During these early years, the lot was granted to Henry Yates, and then re-granted by the Assignees of Robert Livingston to Henry Yates and Archibald McIntyre in 1833 (Liber 295:389; Liber 295:546; Appendix B). It appeared that Yates and McIntyre were speculators as they owned several lots on the block in the 1830s. In 1836, it was sold by Yates and McIntyre to Henry Yates individually (Liber 369:510; Appendix B).

In 1840 and 1841, Joseph R. Latourette, a dry goods merchant, was listed as living at this address and was assessed for his personal estate (value $1,000), while Henry Yates was assessed for the house and lot, valued at $3,800 (City Directory 1840; Tax Assessments; Appendix B). In 1845, Latourette no longer lived on the lot; city directories listed only Rebecca Parker, widow of Jacob, as boarding here (Appendix B). Henry Yates continued to be assessed for the house and lot, valued at $5,000, through 1855 when Mary Morris was assessed for a two-story 22’ by 42’ house on a 22’ by 100’ lot (Tax Assessments; Appendix B). Residents between 1851 and 1860 were transient and almost all were listed as boarders in city directories including Hannah Foster (1851), Robert Woodbury and Eliza Salter, widow of John (1855), and William Goddard (1860 and 1861) (City Directories; Appendix B). However, the 1850 U.S. Census reported many more residents including Hannah Foster, J. Hills, - Robinson, Henry Roberts, Charles McQuinley, W. McElroy, James Gordon, Augustus Wright, Nelson Foster, Maisy Fitzpatrick, and Jane McKenna (U.S. Census 1850; Appendix B). While most of these tenants were born in the United States, several were from Ireland. None of these residents were found at this address in the 1850 City Directory, likely due to lower economic status. This suggests that by this time, the structure on the lot served as a low-cost tenement.

Maps and atlases portrayed the lot developed in 1836 (Colton; Figure 4a), and in 1853, 1857, and 1867 it is had a brick second class structure fronting onto Thompson Street with a vacant yard to the west in the APE (Perris 1853, 1857; Harrison 1867; Figures 5a, 6a, and 7a). While details of the building’s size were not shown on the 1879 atlas (Bromley 1879; Figure 8a), in 1885, 1894 and 1904 the structure appeared unchanged in shape, and was depicted as four stories in height (Robinson 1885; Sanborn 1894, 1904; Figures 9a, 10a, and 11a). The 1894 Sanborn map is the first to show additional one-story wood frame second-class structures, listed as stores or dwellings, at the west end and along the north and south boundaries of the lot at its center (Figure 10a). This configuration remained unchanged through 1922, and shortly thereafter the entire lot was razed in anticipation of the Sixth Avenue Extension (Sanborn 1922; Bromley 1955; Figures 12a and 13a). In 1934 a one-story car 46’ wide repair shop was built on this lot in the APE at 64 Sixth Avenue (Certificate of Occupancy #20012, December 4, 1934). It was razed sometime between 1955 and 1968 (Bromley 1955; Sanborn 1968; Figure 13a).

When the Sixth Avenue Extension was constructed all the historical buildings on the lot were razed. However, it was the construction of the Eighth Avenue Subway that caused extensive subsurface disturbance to the center and western end of the lot, where there would have been potential sensitivity for historical period shaft features. Figures 18 and 19 show the extent of disturbance, and the installation of a retaining wall at or near the center of the site; to the east of this is what appears to be the foundation of the building on Lot 61 filled with demolition debris.

- **9 Thompson Street, Lot 62**

Lot 62 at 9 Thompson Street shares a similar early history to Lots 60 and 61, immediately to the south. Deeds reported that in 1818 William Proctor sold this lot to George Lorillard (Liber 125:599), and later that year it was passed by Master in Chancery for Theophilact [sic] Lispenard et al to William Proctor (Liber 125:602; Appendix B). Regardless, the tax assessment in 1819 and 1821 both reported George Lorillard paying for a vacant lot valued at $500 and $350, respectively. The 1825 tax assessment reported Lorillard owning the lot with a house on it, together valued at $2,500 (Tax Assessments; Appendix B). This suggests that the earliest building on the lot was built between 1821 and 1825.

In 1827 Paul William and Peter Crawford lived at this address, and in 1828 Margaret M. Williams, widow (presumably of Paul) resided here (City Directories; Appendix B). That same year, conveyance records reported that Charles and Mary Sandford, who also owned Lot 61 to the south, sold the lot to Jasper Seaman (Liber 231:316; Appendix B) despite the fact that there is no record of Proctor having sold it to Sandford. George Lorillard continued to be taxed on the house and lot through 1830, at which time multiple people resided there including Margaret Williams, Hannah Abrams, Hannah Clark, John Brewerton, Joseph Coleman, and Philip Brown (City Directory; Appendix B). In 1832-33, widow Abrams, Philip Brown (musician), and Joseph Coleman (mason) were living on the lot (City Directory; Appendix B).

In 1833 the lot was sold by John Missing, the Assignee of Robert Livingston, to Henry Yates and Archibald McIntyre, while a second transaction shortly thereafter passed it from Robert & Sarah Livingston to Yates and McIntyre (Liber 294:546; Liber 295:389; Appendix B). There must have been questions over the title as a third conveyance in 1834 by William Van Wyck, Master in Chancery for Charles W. Sandford, again granted the lot to Yates and McIntyre (Liber 310:389). In 1835 Yates and McIntyre were assessed for taxes on the house and lot (Tax Assessments; Appendix B). Residents included Hetty Moses, widow of Isaac, Philip Brown, musician, and Patrick Murray, jeweler (City Directory; Appendix B). In 1840, only Elizabeth Drake, widow of Lewis, was listed in the directory as living on the lot, while Henry Yates alone was assessed for taxes on it (Appendix B).

In 1843, a partition deed on behalf of the Trustees for Peter Lorillard Jr. and his children Peter Lorillard Jr., Maria Ronalds, Catherine Lorillard, and Dorothea Wolfe, passed the lot as part of a larger tract to Peter Lorillard, Maria Ronalds, Catherine Lorillard, Eleanor Spencer, and Trustees for Dorothea (Lorillard) Wolfe and her children (Liber 442:81). Dorothea and her husband John, a real estate developer, were assessed for taxes on the house and lot from 1845 through 1865, after which their daughter, noted philanthropist Catherine Lorillard (C.L.) Wolfe, was assessed for the house and lot through 1885 (Tax Assessments; Appendix B). Catherine maintained land holdings throughout the metropolitan area. The parcel was described as a 23'6" by 100' lot with a two-story 20' by 36' house through 1890 (Tax Assessments; Appendix B). After that time, the two-story dwelling was replaced by a five-story 23'6" wide by 89' long structure (Tax Assessments; Appendix B).

Residents of the lot changed considerably over the years. In 1845/46, Elizabeth Blatchley (teacher), Oscar Falconi (shipmaster) and Christian Kline (laborer) lived there, while in 1850 multiple families lived there including those of Adam Hencke (brewer), Wendell Shepard (cartman), Nicholas Grier (tobacconist), Francis Randall (laborer), Christopher Grieg (carpenter), and John Doerr (carpenter), Elizabeth Blatchley, and John (laborer) Mills. Most residents were born in Germany, although some were born in New York (U.S. Census 1850; Appendix B). The 1851 city directory only listed Elizabeth Blatchley (school), Nicholas Grier (tobacconist) and Anthony Schultz (locksmith) as living on the lot (Appendix B). In 1855, William Marx was the only listed resident in the city directory (Appendix B). The 1855 New York Census likewise listed multiple families living on the site with the sir names of Reinhardt, Grier, Agato, Schindler, Loughlin, and Williams (Appendix B), while the 1859/60 directly listed Joseph Arnold (carpenter) Nicholas Grier (peddler), William Gross (upholsterer), Patrick Kelly (moulder), and William Marx (box maker) in residence (Appendix B).

Clearly there was a fairly high turnover of residents on the lot as further evidenced by the presence of three families and multiple boarders living there in 1860 (U.S. Census 1860; Appendix B). Despite this, the contemporaneous city directory for the lot listed only one resident, William Marx (paper boxes), at this address (Appendix B). Again, this may be due to the lower economic status of residents who were predominantly transient boarders from Germany, Ireland, and New York.

After Catherine Wolfe's death in 1887, the lot was partitioned by her descendants and in 1888 was sold to Jeremy Morrissey (Liber 2110:190; Liber 2111:480; Appendix B). Following this point, it was transferred between multiple owners (Appendix B).

Maps and atlases depicted a structure on the lot in 1836 (Colton 1836; Figure 4a), while later 1853, 1857, and 1867 maps depict the building as a fourth-class brick structure on the east end of the lot fronting onto Thompson Street, with a large open yard to the west (Perris 1853, 1857; Harrison 1867; Figures 5a through 7a). It appeared unchanged through 1885 (Bromley 1879; Robinson 1885; Figures 8a and 9a). The 1894 Sanborn map was the first to show additional one-story wood frame second-class structures, labeled as stores or dwellings, at the west end and along the north and south boundaries of the lot at its center in the APE (Sanborn 1894; Figure 10a). By 1904, all buildings on the lot had been replaced by a five-story dumbbell shaped brick building with a basement covering virtually the

entirety of the lot (Sanborn 1904: Figure 11a). The building stood through at least 1922 (Sanborn 1922; Figure 12a), but was razed in the late 1920s as part of the Sixth Avenue Extension project. In 1934 a one-story car 46' wide repair shop was built on this lot in the APE at 64 Sixth Avenue (Certificate of Occupancy #20012, December 4, 1934). It was razed sometime between 1955 and 1968 (Bromley 1955; Sanborn 1968; Figure 13a).

The lot was disturbed first by the demolition of the original (ca.1825) structure and the construction of a five-story brick building with a basement across almost the entire lot in the early twentieth century. It was next disturbed by the demolition of the five-story building (Figures 16a and 17a), and then more extensively by the construction of the Eighth Avenue Subway that virtually obliterated the center and western end of the lot where there may have been potential sensitivity for historical period shaft features. Figures 18a and 19a show the extent of disturbance, and the installation of a retaining wall at or near the center of the site; to the east of this is what appears to be the eastern end of the foundation of the building on Lot 62, filled with demolition debris.

Option 2 Site History

As reiterated above, historic documents and maps (e.g. Ratzer 1766-1767 [Figure 3b], Montresor 1766, British Headquarters 1782, Viele 1865) identify the Option 2 Archaeological APEs as being within swampland surrounding a perennial stream that emptied into the Hudson River north of the modern line of Canal Street. By the early 1800s, much of the swampland was being filled and streets were being laid out in the vicinity of the Option 2 Archaeological APE. In 1808 the Common Council of the City of New York called for surveying unregulated streets immediately north of Canal Street so they could be properly regulated (MCC Jan. 13, 1808:745). Resultantly, Thompson Street and the Option 2 Archaeological APE was regulated and opened between Canal and Grand Street between 1817 and 1818 (MCC July 12, 1819:478).

In 1818, the Common Council ordered that "a sewer be made in Thompson Street from Canal to the centre [sic] of the block between Grand and Broome" (MCC June 29, 1818:724). A year later the project clearly had not been completed as the Common Council was again pursuing plans for drainage sewers in the Project Site vicinity. It was reported that there was an extremely high water table and issues with standing water that were preventing passage on the streets. The Committee on Canal Street confirmed that Thompson Street north of Canal Street had sufficient slope to allow for the installation of sewers and head pipes, but that the sewers had to be extended to at least 150 feet north of its intersection with Broome Street (two blocks north of the Option 2 Archaeological APE) to meet the necessary grade for water to flow downhill to Canal Street (MCC July 12, 1819:478). Complaints were lodged against the plan citing the fact that the streets were already paved, and their excavation would create extensive mud, mess, and expense to adjacent lot owners (Ibid.). This did not thwart the City's efforts, and the sewers were installed within a year (Ibid.: 479). A bond was issued by the Mechanics Bank to cover the costs of the Canal Street Sewer project (MCC February 28, 1820:745).

By the 1830s, the Option 2 Archaeological APE was depicted as a street on cartographic sources (Colton 1836; Figure 4b). It remained virtually unchanged throughout the nineteenth and twentieth centuries (Perris 1853, 1857; Harrison 1867; Bromley 1879; Robinson 1885; Sanborn 1894, 1904, 1922, 1968; Bromley 1955; Figures 5b through 14b). At some point between 1966 and 1980 a sidewalk plaza was created along the north side of Canal Street (Historicaerials.com 1966, 1980). This diverted the south end of Thompson Street west to form an "L" around the south end of Block 227 instead of continuing south to intersect with Canal Street (compare Figure 2b with Figure 14b).

Previously Identified Archaeological Sites in the Vicinity

Research conducted using data from the OPRHP, the LPC, and the library of HPI revealed no archaeological sites within or adjacent to either the Option 1 or Option 2 Archaeological APEs. However, numerous archaeological sites have been documented within a one mile radius. These previously inventoried archaeological sites are listed in Table 3 and, where known, their locations are also reported.

Table 3: Previously Identified Archaeological Sites within a One Mile Radius of the Project Site

NYSM or OPRHP Site No.	Site Name/Description	Location	Site Type/Time Period
NYSM 4059	Shell Point	Near Canal St.*	Unknown Precontact
NYSM 4060	N/A	Lower East side vicinity	Unknown Precontact

NYSM or OPRHP Site No.	Site Name/Description	Location	Site Type/Time Period
A06101.001286	Sullivan Street Historic Site	Sullivan Street (NYU campus)	Early 19th century resources
A06101.001303	Greenwich Mews Site	East side of Greenwich Street between W. 10th St. and Christopher St.	Historic
A06101.017265	Spring Street Presbyterian Church Cemetery/Vaults	244-266 Spring St.	Burials, 19th century
A06101.015708	97 Orchard Street	97 Orchard St.	School privy
A06010.007671	Broome Street Historic Site	576 Broome St.	Unknown
A06101.001273	Sheridan Square	Christopher St.	18th/19th century features
A06101.016915	Washington Square Park Potters Field	Washington Square Park	Burials, 19th century
A06101.018212	50 Bayard Street	Bowery Historic District	19th century
A06101.015243	3-5 Weehawken Street	3-5 Weehawken St., Far West Village	Unknown
A06101.015244	304 W. 10th Street	304 W. 10th St., 1 Weehawken St., Far West Village	Unknown
A06101.013209	219-227 W. 4th Street	219-227 West 4th St.	Unknown
A06101.013210	229 W. 4th Street	229 West 4th St.	Unknown
A06101.001285	Washington Street Urban Renewal Project	West and Washington Sts.	Early 19th century
A06101.017777	145-147 Mulberry Street former pianoforte factory	Chinatown and Little Italy Historic District	19th century
A06101.001304	City Hall Park	City Hall Park	18th-19th century
A06101.013335	Tweed Courthouse Area Deposits	City Hall Park	Burials, structures, deposits, 19th century
A06101.006980	African Burial Ground	North of City Hall Park	18th-19th century
A06101.015825	Block 100, Lot 1	New York Downtown Hospital	19th century
A06101.015801	WTC- Vesey Street Site	Vesey Street	Unknown
A06101.018000	WTC-VSC Ship	Vehicular Security Center/ World Trade Center	18th or early 19th century ship
A06101.000503	*Tyjger*	Greenwich and Dey Sts.	Ship, ca. 1613

* The Shell Point site, reported by Arthur C. Parker, is described as a "Village site on a small line overlooking a small lake near Canal Street" (Parker 1922:630). While the NYSM reports it as encompassing the Project Site, Parker received information about its location from Alanson Skinner, who described it as a shell heap overlooking the Collect Pond, near the southeast end of Canal Street and out of the Project Site (Skinner 1915:44).

Previously Inventoried Historic Sites and Districts in the Study Areas

The Study Areas for both Options 1 and 2 fall within the boundaries of the S/NR-listed Soho Historic District (90NR00770 1978/1980), a large portion of which coincides with the New York City Landmark (NYCL) SoHo-Cast Iron Historic District (LP-00768 1973) and the SoHo-Cast Iron Historic District Expansion (LP-02362 2010) (see Figures 20a and 20b). While 28 structures and sites in the S/NR-District are within the 400-foot Study Area for Option 1, 31 are within the Study Area for Option 2 (see Figures 20a and 20b). No structures fall within 90 feet of the construction footprint of either Option. Appendix C provides the nomination forms for these districts (S/NR and NYCL), and includes information about contributing structures, where available.

Table 4 below lists structures that are designated as contributing to the S/NR Soho Historic District and/or the NYCL SoHo-Cast Iron Historic District, and indicates if they are in either or both the Option 1 and Option 2 Study Areas (see Figures 20a and 20b for locations).

Table 4: Structures and Sites in the S/NR-listed Soho Historic District/NYCL SoHo-Cast Iron Historic District in the Option 1 and/or Option 2 Study Areas

# ON FIGURES 20a & 20b	STREET ADDRESS	USN DESIGNATION	S/NR District	NYCL District	OPTION 1	OPTION 2
1	369 Canal Street (non-contributing vacant lot)	6101.000673	IN	IN	IN	IN
2	371 Canal Street	6101.000766	IN	IN	IN	IN
3	373 Canal Street	6101.001391	IN	IN	IN	IN
4	375 Canal Street	6101.0014	IN	IN	IN	IN
5	377-387 Canal Street	6101.001427	IN	OUT	IN	IN
6	46 Grand Street	6101.003675	IN	OUT	IN	IN
7	48 Grand Street	6101.003676	IN	OUT	IN	IN
8	50 Grand Street (aka 338 West Broadway)	6101.003677	IN	OUT	IN	IN
9	60 Grand Street	6101.003678	IN	IN	IN	IN
10	62 Grand Street	6101.003679	IN	IN	OUT	IN
11	43-45 Grand Street (non-contributing garage)	6101.003695	IN	OUT	IN	IN
12	47-51 Grand Street (non-contributing garage)	6101.003696	IN	OUT	IN	IN
13	55 Grand Street	6101.003698	IN	IN	IN	IN
14	57 Grand Street	6101.003699	IN	IN	IN	IN
15	59 Grand Street	6101.0037	IN	IN	IN	IN
16	61-69 Grand Street (non-contributing vacant lot)	6101.003701	IN	IN	OUT	IN
17	306 West Broadway	6101.003734	IN	OUT	IN	IN
18	344-354 West Broadway (aka 350 West Broadway)	6101.003735	IN	OUT	IN	IN
19	307-309 West Broadway	6101.003768	IN	IN	IN	IN
20	323 West Broadway	6101.003769	IN	IN	IN	IN
21	325 West Broadway	6101.00377	IN	IN	IN	IN
22	327-329 West Broadway	6101.008409	IN	IN	IN	IN
23	331-335 West Broadway (aka 53 Grand St)	6101.00841	IN	IN	IN	IN
24	337 West Broadway	6101.003771	IN	IN	IN	IN
25	339 West Broadway	6101.008411	IN	IN	IN	IN
26	341 West Broadway	6101.003772	IN	IN	IN	IN
27	343 West Broadway	6101.008412	IN	IN	IN	IN
28	345 West Broadway	6101.003773	IN	IN	OUT	IN
29	310 West Broadway	6101.008249	IN	OUT	IN	IN
30	311 West Broadway**	NONE	IN	IN	IN	IN
31	41 Grand Street***	NONE	IN	OUT	IN	IN

** 311 West Broadway was built in 2007. It is in both the S/NR and NYCL historic districts, but it is not included in the S/NR inventory and therefore has no USN number. Since it is less than 50 years old and lacks a USN, it is considered non-contributing.
*** 41 Grand Street was built ca.1900. It is in the S/NR historic district, but it is not included in the S/NR inventory and therefore has no USN number. Since it is more than 50 years old, it could be considered a contributing structure.

In addition, two historic districts abut the Option 1 and Option 2 Study Areas, but no structures or features fall within either (see Figures 20a and 20b). These are:

- The Tribeca North Historic District (S/NR-eligible [2003/2015] USN 06101.018903 and a NYCL Historic District [1992] LP-01714) to the immediate southwest; and,

- The South Village Historic District (S/NR [2014] USN 13PR05827), a large portion of which coincides with the Sullivan-Thompson Historic District (NYCL [2006] LP-02590 immediately to the north.

The individually listed NYCL Holland Plaza Building is also west of, but immediately outside, the Study Area for Option 1 at 75 Varick Street (see "A" on Figure 20a). In addition, the Canal Street Pumping Station (USN 6101.019059) at the corner of Canal Street and Varick Street to the east of the Project Site is in the Study Area for both Option 1 and Option 2, but when reviewed by OPRHP, it was determined to be ineligible for S/NR-listing. It is not a NYCL.

There are three buildings dating to ca.1910 within 90 feet of both the Option 1 and Option 2 Study Areas located at 17 Thompson Street, 35 Grand Street, and 393 Canal Street. None of these buildings appear to have retained historic integrity, and all are surrounded by more modern buildings. The facades of each of these buildings are undistinguished. Their preclusion from the historic districts immediately north and east is likely indicative of the fact that they lack historic significance (see Photographs 12, 14, and 15). While there are also buildings dating to the 1910s and 1920s on Thompson Street north of Grand Street, they too are surrounded by more modern buildings, lack architecturally distinguished features, and have been extensively modified (Photograph 16). As such, none appear to be individually eligible for S/NR-listing or NYCL designation.

V. SUMMARY OF POTENTIAL RESOURCES AND POTENTIAL IMPACTS

Option 1

Archaeological Resources: The new power substation, which is proposed to supply traction power to the Eighth Avenue Subway Line (A/C/E), has a very low likelihood of impacting potential precontact archaeological resources in the Option 1 Archaeological APE. A review of maps and atlases from the historical period indicates that prior to filling in the 1810s the site was located in marshland interspersed with streams. Soil borings, taken immediately north of the site on Block 227, report the presence of an upper fill level that ranged from 7 feet to 23.5 feet in depth. Below the fill, a 10 to 11.5-foot layer of peat was identified (see Appendix A and Soil Boring discussion above). The peat contained organic soils and wood, as well as shell fragments, representing marsh deposits with tree or pile remains. Peat is a potential indicator of precontact sensitivity since marshlands provided food, fibers, and fuel for Native Americans. However, all of the soil borings reviewed produced a thick level of glacial lake till immediately beneath the peat (see Appendix A). It is likely that these deposits were left by the receding glacial Lake Hudson that once covered and drained the lower Hudson Valley (USGS 2017).

There is no evidence in the soil borings of a habitable living surface between the level of peat and the glacial lake till beneath it. Regardless, there is the marginal possibility that a shallow paleo-period deposit of wind-blown soils (loess) or arable land was present for a brief period of time before the site became a marsh. Following deglaciation, sections of the continental shelf would have been exposed and used by Native Americans during the PaleoIndian period, and these locations were far south of Manhattan and the project site (TRC 2012:96). Known PaleoIndian sites in the Hudson Valley are rare, and those in the immediate vicinity are even more so. In the lower Hudson Valley, known PaleoIndian sites are on ridges and elevated locations in proximity to fresh water, such as the Port Mobile site in Staten Island that was elevated about 75 feet above sea level when the site was populated (Lothrop and Bradley 2012:17; Cantwell and diZerega Wall 2001:42). Therefore, there is only the minimal possibility that Native American inhabitants utilized the project site during the PaleoIndian period. As sea levels rose, later precontact people would have likely encountered the post-glacial marsh and utilized it for resources, but their encampments would have also been on ridges and terraces surrounding the marsh, not necessarily in the marsh itself (Ibid.).

Construction plans for Option 1 show excavations to at least 42 feet below grade for the substation (NYCT Contract Drawing C-204). However, no soil borings were completed in the Option 1 Archaeological APE, so the exact depth of fill and/or peat is currently unknown. It is probable that excavations will encounter a peat level like those found in the soil borings to the north. If peat is encountered during excavation, a sampling plan may be warranted for the marginal possibility of a thin post-glacial deposit immediately beneath it.

There is no sensitivity for historical period archaeological resources in the Option 1 Archaeological APE due to disturbance in the late 1920s and early 1930s. Documentary research found that the parcel was an undeveloped swamp through the early 1810s, and development began on it in the mid-1820s. Public water and sewer were available in surrounding roadbeds in the 1840s and 1850s (Croton Aqueduct Department 1853, 1868). From ca. 1820s-1840s, before the introduction of piped city water, residents would have relied on rear yard shaft features, such as wells and cisterns. Privies and cesspools would have been used at least until the introduction of municipal sewers. Although it is possible that residents made use of public water and sewers around the time that they were installed, it is also likely that they continued to use rear yard shaft features for a number of years afterwards. Archaeological investigations in the vicinity of the project site have shown that often shaft features were not abandoned and/or sealed off until many years after public water and sewers became available. At the Sullivan Street Site, for example, dates of deposition ranged from 1840 through ca. 1900, with the well and cisterns having the latest dates of deposition, from the 1890s through the early 1900s (Howson 1992-1993:138). At the 81-85 West Third Street site a cistern contained deposits dating to the 1890s (John Milner Associates 2003).

Maps and atlases indicate that the earliest ca. 1820s development on each of the four historic lots (59 through 62) fronted onto Thompson Street, and each lot had an undeveloped back yard to the west, where potential shaft features (wells, cisterns, privies) may have once been located. Two of the lots, 60 and 62, had later construction episodes when the original buildings were razed and replaced by four- and five-story buildings with basement that covered virtually the entirety of each lot. After these later construction episodes, all buildings in the APE were razed, and the center and western ends of each lot were excavated in conjunction with the construction of the Eighth Avenue Subway. Historical photographs show that disturbance was not limited to the subway tunnels, but extended considerably eastward encompassing all of the historically open yard areas where shaft features might have once been (Figures 15 through 19). Therefore, the Option 1 Archaeological APE does not retain any historic period archaeological potential, so construction of the substation would cause no impacts. No further archaeological consideration is warranted.

Historic Resources: The Option 1 Study Area encompasses 28 structures that lie within the S/NR Soho Historic District, and 18 that lie within the NYCL SoHo-Cast Iron Historic District. No NYCL or S/NR individually listed structures or structures designated as eligible for listing lie within the 400-foot Study Area. No designated or eligible structures lie within 90 feet of the proposed construction site, and the construction site will not be within the viewshed of any of these historic structures.

Option 2

Archaeological Resources: The new power substation may impact potential precontact archaeological resources in the Option 2 Archaeological APE as discussed for the Option 1 APE. A review of maps and atlases from the historical period indicates that prior to filling in the 1810s, the site was located in marshland interspersed with streams. Soil borings, taken immediately north on Block 227, report the presence of an upper fill level that ranged from 7 feet to 23.5 feet in depth. Below the fill, a 10 to 11.5-foot layer of peat was identified (see Appendix A and Soil Boring discussion above). As previously discussed, peat is a potential indicator of precontact sensitivity since marshlands provided food, fibers, and fuel for Native Americans. Therefore, there is the possibility that Native Americans utilized the site.

Construction plans for Option 2 show excavations to at least 47 feet below grade for the substation, with a deeper secant pile extending to bedrock (NYCT Contract Drawing C-204). Only one soil boring was completed in the Option 2 Archaeological APE, and it showed fill to a depth of 10 feet below grade. From 10 to 20 feet below grade were moist to wet sand and silts, and between 20 and 22 feet below grade peat was encountered. Beneath this were alternating layers of wet sand, some layers with silt and some with traces of shell fragments, to a final depth of 60 feet below grade where decomposing bedrock was encountered. The two foot thick layer of peat is vastly thinner than the thick layer of peat encountered to the north on Block 227. While it is probable that excavations for Option 2 will encounter a peat level, it is unknown how extensive it would be. If peat is encountered during excavation, a sampling plan may be warranted for the marginal possibility of a thin post-glacial deposit immediately beneath it.

The proposed project would not have potential impact to any historical period archaeological resources in the Option 2 Archaeological APE due to the lack of any potential resource types. Documentary research found that the site of the Thompson Street roadbed was once an undeveloped swamp, and was filled between 1817 and 1818. Since this

time, it has remained as a road, with no structures or yards crossing the Archaeological APE. Utility lines lie beneath the roadbed, but there are no anticipated historical period archaeological deposits.

Historic Resources: The Option 2 Study Area encompasses 31 structures that lie within the S/NR Soho Historic District, and 21 that lie within the NYCL SoHo-Cast Iron Historic District. No NYCL or S/NR individually listed structures or structures designated as eligible for listing lie within the 400-foot Study Area. No designated or eligible structures lie within 90 feet of the proposed construction site, and the construction site will not be within the viewshed of any of these historic structures.

VI. RECOMMENDATIONS

Archaeological Resources

There is the remote possibility that precontact resources may exist within the Option 1 and Option 2 Archaeological APEs. Any potential precontact resources would be buried beneath fill of unknown depth, and would presumably be beneath a peat level, if present. However, the likelihood of encountering an intact deposit representative of a habitation site is low. If peat is encountered during construction, a sampling program may be warranted to determine if there is a potentially sensitive level immediately beneath it. Alternatively, the completion of a series of 3-inch diameter split spoon soil boring cores in ethe two APEs could further address this potential sensitivity.

Historic Resources

The New York City Building Code provides some measures of protection for all NYCL properties against accidental damage from adjacent construction by requiring that all buildings, lots, and service facilities adjacent to foundation and earthwork areas be protected and supported. Additional protective measures apply to designated NYC Landmarks and S/NR-listed historic buildings located within 90 linear feet of a proposed construction site. For these structures, the New York City Department of Buildings' (DOB) Technical Policy and Procedure Notice (TPPN) #10/88 apply. TPPN #10/88 supplements the standard building protections afforded by the Building Code by requiring, among other things, a monitoring program to reduce the likelihood of construction damage to adjacent S/NR or NYCL resources (within 90 feet) and to detect at an early stage the beginnings of damage so that construction procedures can be changed. However, there are no S/NR or NYCL designated or eligible historic structures within 90 feet of the construction zone for either Option.

Historic resources that are listed in the S/NR or that have been found to be S/NR-eligible are given a measure of protection from the impacts of federally sponsored, or federally assisted projects under Section 106 of the NHPA, and are similarly protected against impacts resulting from state-sponsored or state-assisted projects under the SHPA. Although preservation is not mandated, federal agencies must attempt to avoid adverse impacts on such resources through a notice, review, and consultation process.

Construction of the substation would include the use of excavators, pile drivers, jack hammers, air compressors, hand tools, pile drivers, and similar machinery. Construction would begin in March, 2019 and is expected to continue through June or July of 2021/2022. Dump trucks and concrete trucks are expected to frequent the substation site for various actions during this construction period.

Although there are no designated or eligible historic structures within 90 feet of the construction zone for either Option 1 or Option 2, for the larger 400-foot radius Study Areas, there are 28 structures that lie within the S/NR Soho Historic District, and 18 that lie within the NYCL SoHo-Cast Iron Historic District for Option 1, and 31 structures that lie within the S/NR Soho Historic District, and 21 that lie within the NYCL SoHo-Cast Iron Historic District for Option 2. None lie within the view scape of either Option 1 or Option 2, but it is recommended that MTA NYCT employ vibration control measures to minimize, as much as possible, the vibration levels in the historic neighborhoods near the construction site. Measures may include developing and implementing a vibration-monitoring program during highly disruptive construction activities, such as pile driving, to ensure that historic structures would not be damaged.

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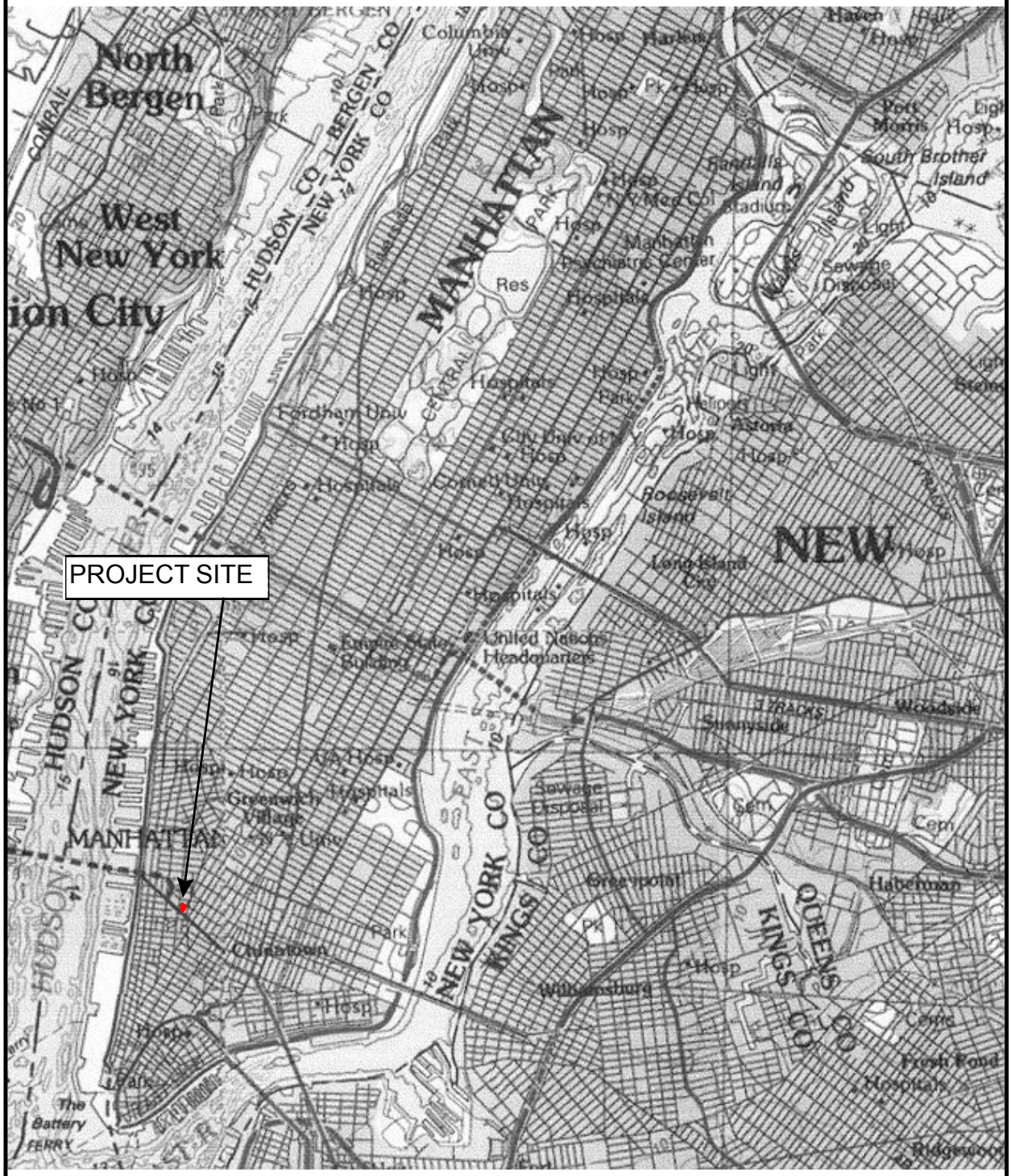
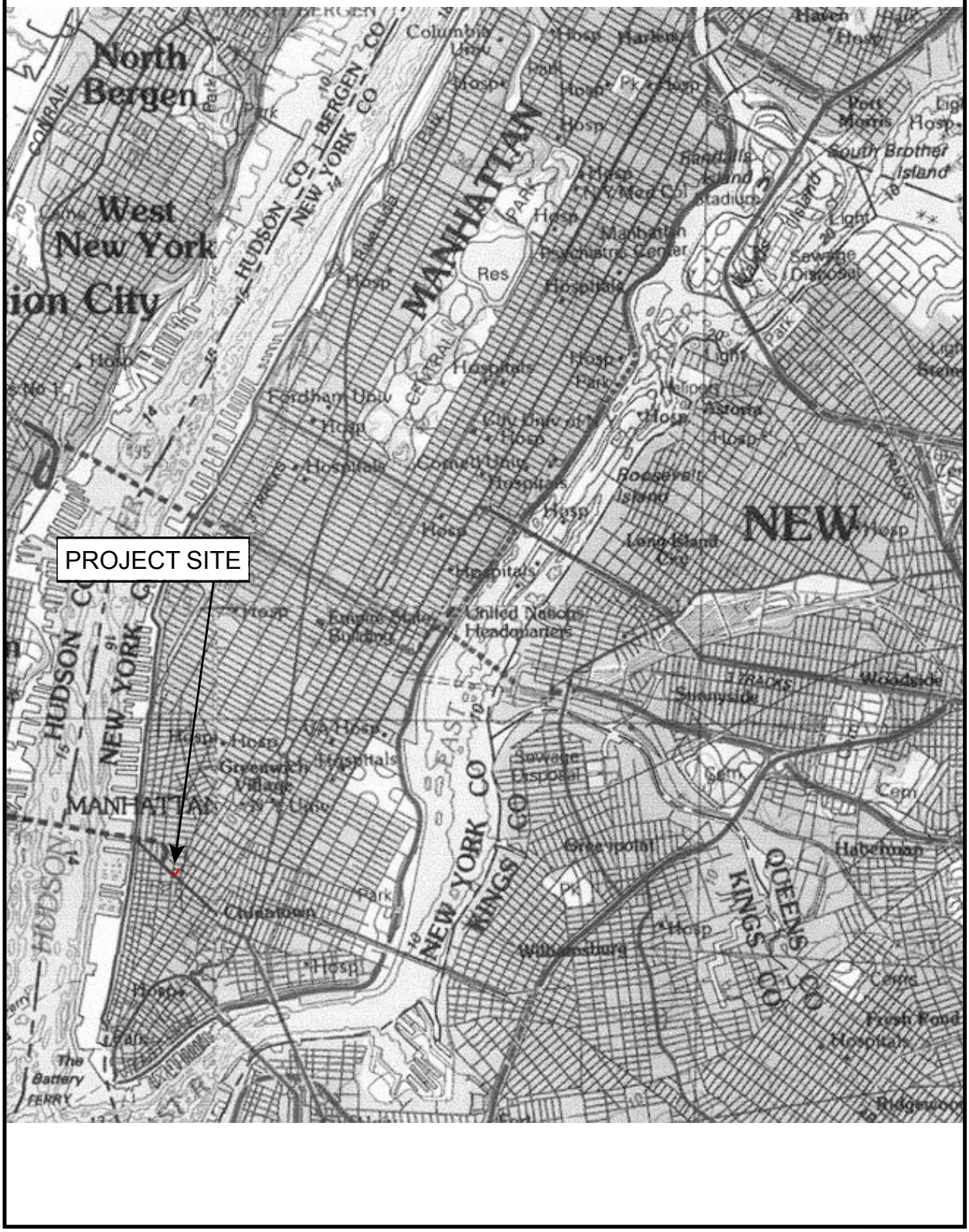


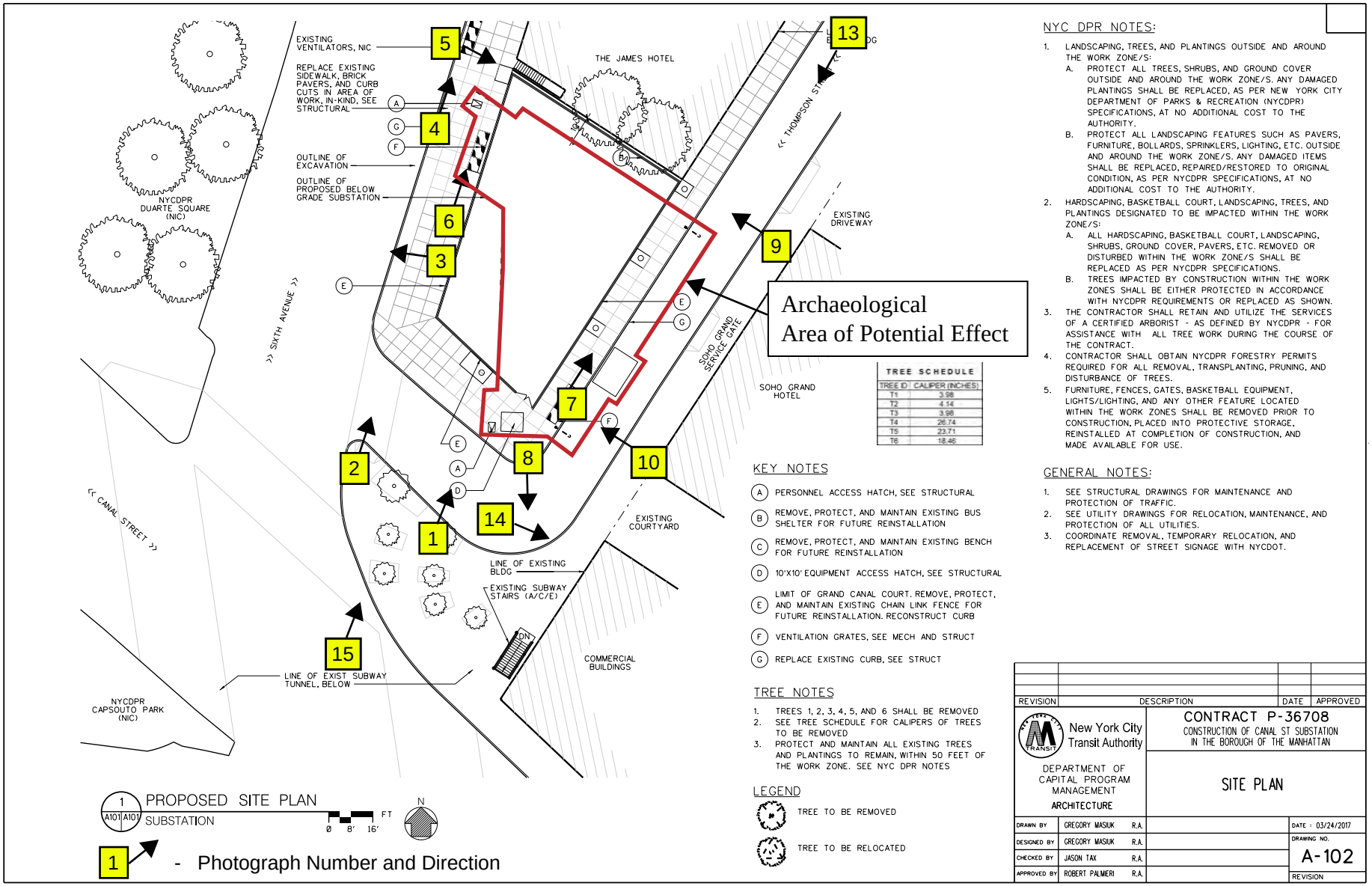
PHASE I CULTURAL RESOURCES STUDY
PROPOSED CANAL STREET SUBSTATION
OPTION 1: BLOCK 227, LOT 33
NEW YORK, NEW YORK

Figure 1a: Option 1 Project Site on USGS on *Central Park, NY* and *Brooklyn, NY* topographic quadrangles (U.S.G.S. 2013).



PHASE I CULTURAL RESOURCES STUDY
PROPOSED CANAL STREET SUBSTATION
OPTION 2: THOMPSON STREET
NEW YORK, NEW YORK

Figure 1b: Option 2 Project Site on USGS on *Central Park, NY* and *Brooklyn, NY* topographic quadrangles (U.S.G.S. 2013).



TREE SCHEDULE	
TREE ID	CALIPER (INCHES)
T1	3.98
T2	4.14
T3	3.98
T4	26.74
T5	23.71
T6	18.46

KEY NOTES

- (A) PERSONNEL ACCESS HATCH, SEE STRUCTURAL
- (B) REMOVE, PROTECT, AND MAINTAIN EXISTING BUS SHELTER FOR FUTURE REINSTALLATION
- (C) REMOVE, PROTECT, AND MAINTAIN EXISTING BENCH FOR FUTURE REINSTALLATION
- (D) 10'X10' EQUIPMENT ACCESS HATCH, SEE STRUCTURAL
- (E) LIMIT OF GRAND CANAL COURT. REMOVE, PROTECT, AND MAINTAIN EXISTING CHAIN LINK FENCE FOR FUTURE REINSTALLATION. RECONSTRUCT CURB
- (F) VENTILATION GRATES, SEE MECH AND STRUCT
- (G) REPLACE EXISTING CURB, SEE STRUCT

TREE NOTES

1. TREES 1, 2, 3, 4, 5, AND 6 SHALL BE REMOVED
2. SEE TREE SCHEDULE FOR CALIPERS OF TREES TO BE REMOVED
3. PROTECT AND MAINTAIN ALL EXISTING TREES AND PLANTINGS TO REMAIN, WITHIN 50 FEET OF THE WORK ZONE. SEE NYC DPR NOTES

LEGEND

TREE TO BE REMOVED

TREE TO BE RELOCATED

NYC DPR NOTES:

1. LANDSCAPING, TREES, AND PLANTINGS OUTSIDE AND AROUND THE WORK ZONE/S:
   - A. PROTECT ALL TREES, SHRUBS, AND GROUND COVER OUTSIDE AND AROUND THE WORK ZONE/S. ANY DAMAGED PLANTINGS SHALL BE REPLACED, AS PER NEW YORK CITY DEPARTMENT OF PARKS & RECREATION (NYCDPR) SPECIFICATIONS, AT NO ADDITIONAL COST TO THE AUTHORITY.
   - B. PROTECT ALL LANDSCAPING FEATURES SUCH AS PAVERS, FURNITURE, BOLLARDS, SPRINKLERS, LIGHTING, ETC. OUTSIDE AND AROUND THE WORK ZONE/S. ANY DAMAGED ITEMS SHALL BE REPLACED, REPAIRED/RESTORED TO ORIGINAL CONDITION, AS PER NYCDPR SPECIFICATIONS, AT NO ADDITIONAL COST TO THE AUTHORITY.
2. HARDSCAPING, BASKETBALL COURT, LANDSCAPING, TREES, AND PLANTINGS DESIGNATED TO BE IMPACTED WITHIN THE WORK ZONE/S:
   - A. ALL HARDSCAPING, BASKETBALL COURT, LANDSCAPING, SHRUBS, GROUND COVER, PAVERS, ETC. REMOVED OR DISTURBED WITHIN THE WORK ZONE/S SHALL BE REPLACED AS PER NYCDPR SPECIFICATIONS.
   - B. TREES IMPACTED BY CONSTRUCTION WITHIN THE WORK ZONES SHALL BE EITHER PROTECTED IN ACCORDANCE WITH NYCDPR REQUIREMENTS OR REPLACED AS SHOWN.
3. THE CONTRACTOR SHALL RETAIN AND UTILIZE THE SERVICES OF A CERTIFIED ARBORIST - AS DEFINED BY NYCDPR - FOR ASSISTANCE WITH ALL TREE WORK DURING THE COURSE OF THE CONTRACT.
4. CONTRACTOR SHALL OBTAIN NYCDPR FORESTRY PERMITS REQUIRED FOR ALL REMOVAL, TRANSPLANTING, PRUNING, AND DISTURBANCE OF TREES.
5. FURNITURE, FENCES, GATES, BASKETBALL EQUIPMENT, LIGHTS/LIGHTING, AND ANY OTHER FEATURE LOCATED WITHIN THE WORK ZONES SHALL BE REMOVED PRIOR TO CONSTRUCTION, PLACED INTO PROTECTIVE STORAGE, REINSTALLED AT COMPLETION OF CONSTRUCTION, AND MADE AVAILABLE FOR USE.

GENERAL NOTES:

1. SEE STRUCTURAL DRAWINGS FOR MAINTENANCE AND PROTECTION OF TRAFFIC.
2. SEE UTILITY DRAWINGS FOR RELOCATION, MAINTENANCE, AND PROTECTION OF ALL UTILITIES.
3. COORDINATE REMOVAL, TEMPORARY RELOCATION, AND REPLACEMENT OF STREET SIGNAGE WITH NYCDOT.

REVISION	DESCRIPTION	DATE	APPROVED

New York City Transit Authority

DEPARTMENT OF CAPITAL PROGRAM MANAGEMENT
ARCHITECTURE

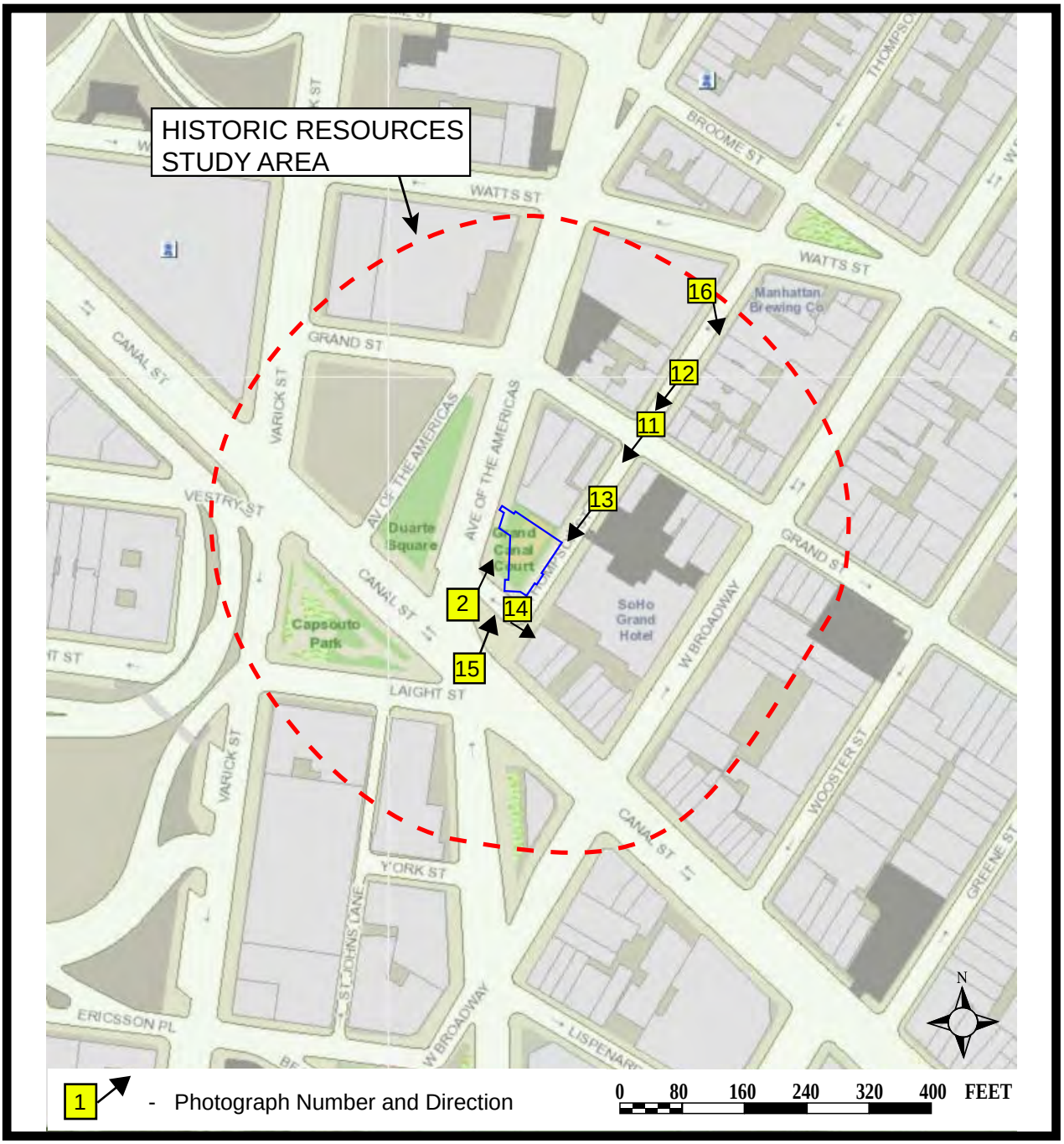
CONTRACT P-36708
CONSTRUCTION OF CANAL ST SUBSTATION IN THE BOROUGH OF THE MANHATTAN

SITE PLAN

DRAWN BY	GREGORY MASIUK	R.A.	DATE : 03/24/2017
DESIGNED BY	GREGORY MASIUK	R.A.	DRAWING NO. A-102
CHECKED BY	JASON TAX	R.A.	
APPROVED BY	ROBERT PALMIERI	R.A.	REVISION

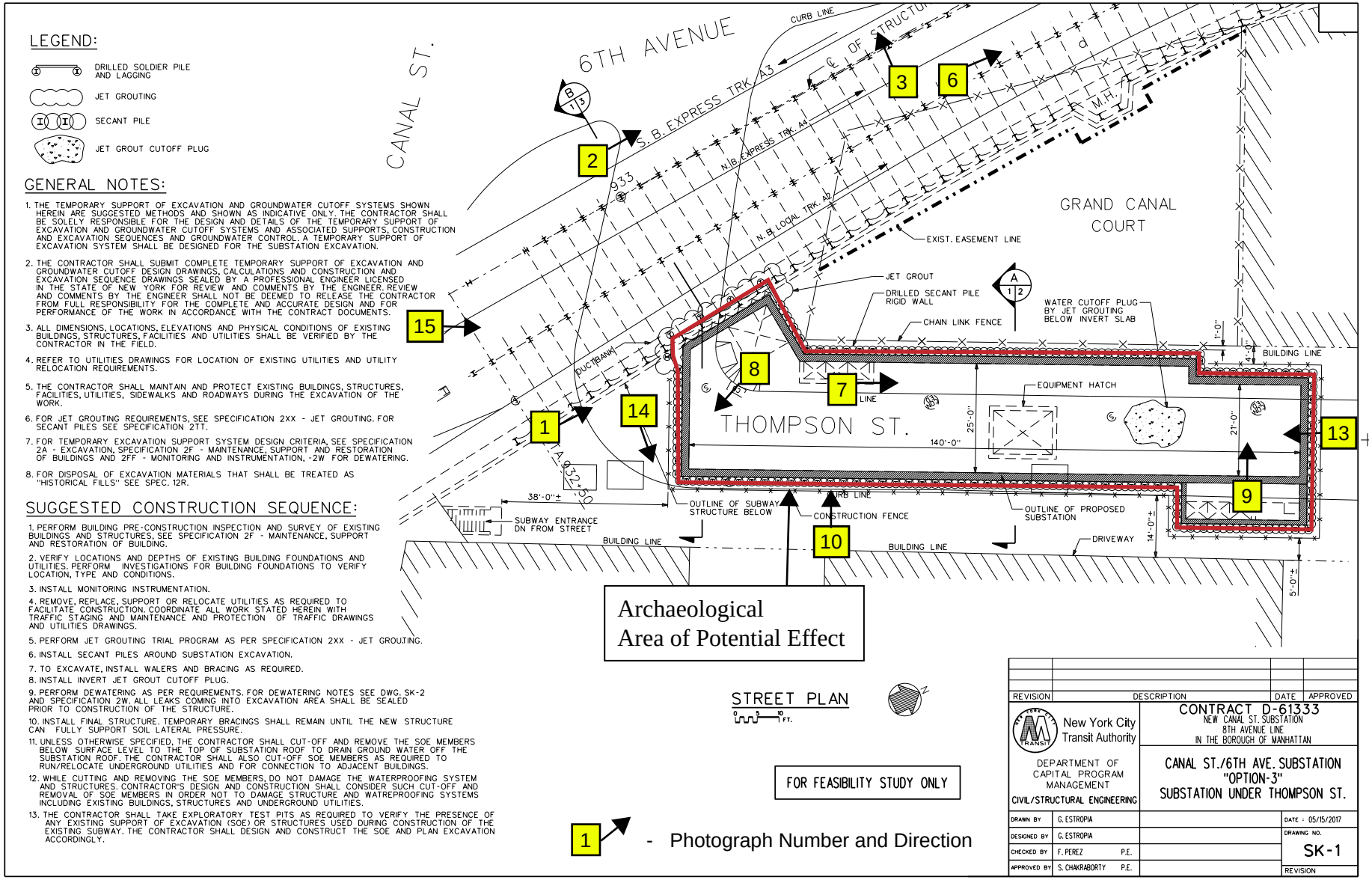
PHASE I CULTURAL RESOURCES STUDY
PROPOSED CANAL STREET SUBSTATION
OPTION 1: BLOCK 227, LOT 33
NEW YORK, NEW YORK

Figure 2a-1: Option 1 Archaeological Area of Potential Effect and Photo Key on Site Plan (New York City Transit Authority 2017).



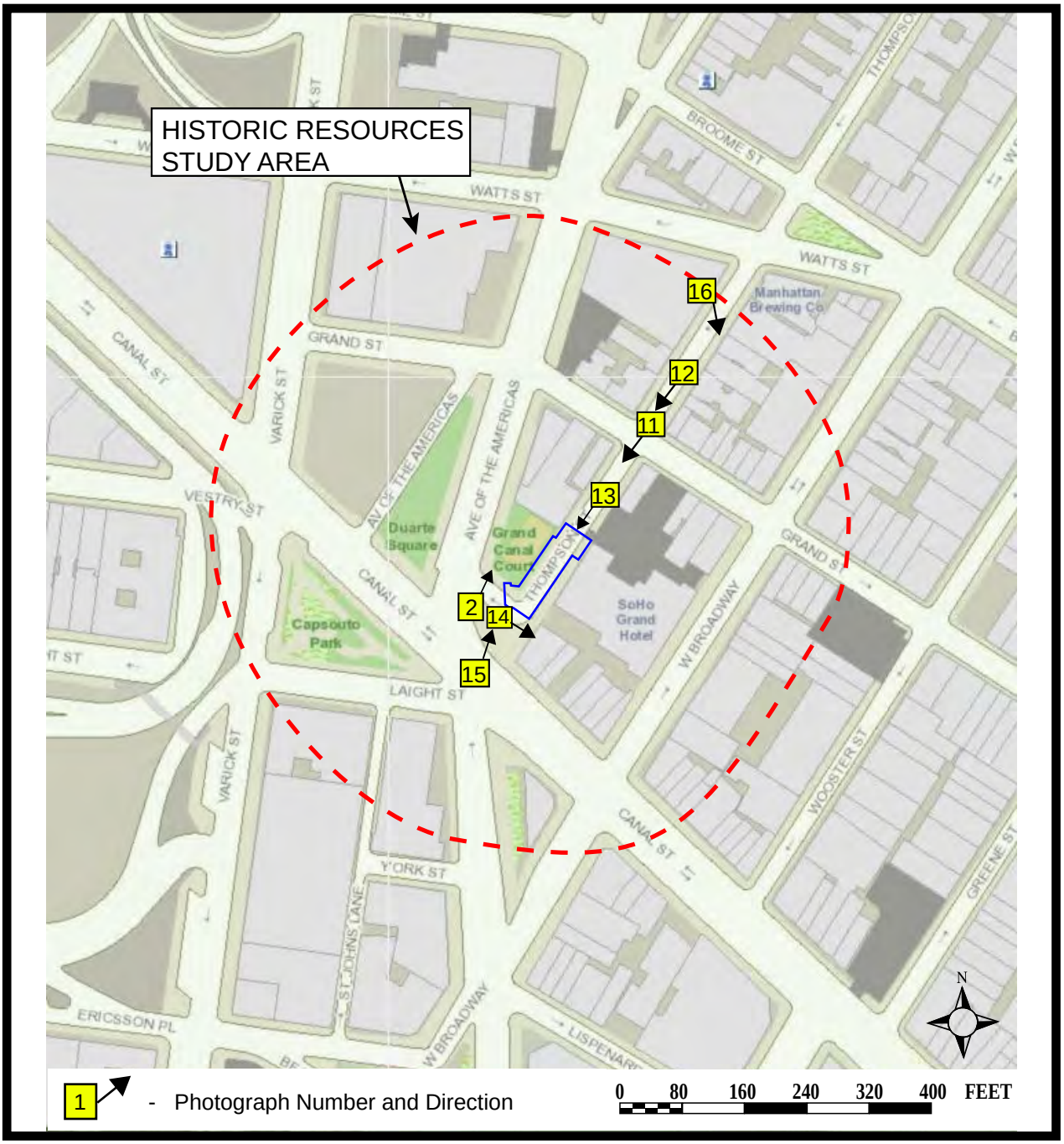
PHASE I CULTURAL RESOURCES STUDY
PROPOSED CANAL STREET SUBSTATION
OPTION 1: BLOCK 227, LOT 33
NEW YORK, NEW YORK

Figure 2a-2: Option 1 Historic Resources Study Area and Photo Key on NYCityMap (City of New York 2017).



PHASE I CULTURAL RESOURCES STUDY
PROPOSED CANAL STREET SUBSTATION
OPTION 2: THOMPSON STREET
NEW YORK, NEW YORK

Figure 2b-1: Option 2 Archaeological Area of Potential Effect and Photo Key on Site Plan (New York City Transit Authority 2017).



PHASE I CULTURAL RESOURCES STUDY
PROPOSED CANAL STREET SUBSTATION
OPTION 2: THOMPSON STREET
NEW YORK, NEW YORK

Figure 2b-2: Option 2 Historic Resources Study Area and Photo Key on NYCityMap (City of New York 2017).

PHASE I CULTURAL RESOURCES STUDY
PROPOSED CANAL STREET SUBSTATION
OPTION 1: BLOCK 227, LOT 33
NEW YORK, NEW YORK

N

HP

Figure 3a: Option 1 Archaeological Area of Potential Effect on *Plan of the City of New York, In North America, Surveyed in the Years 1766 and 1767* (Ratzer 1766-7).

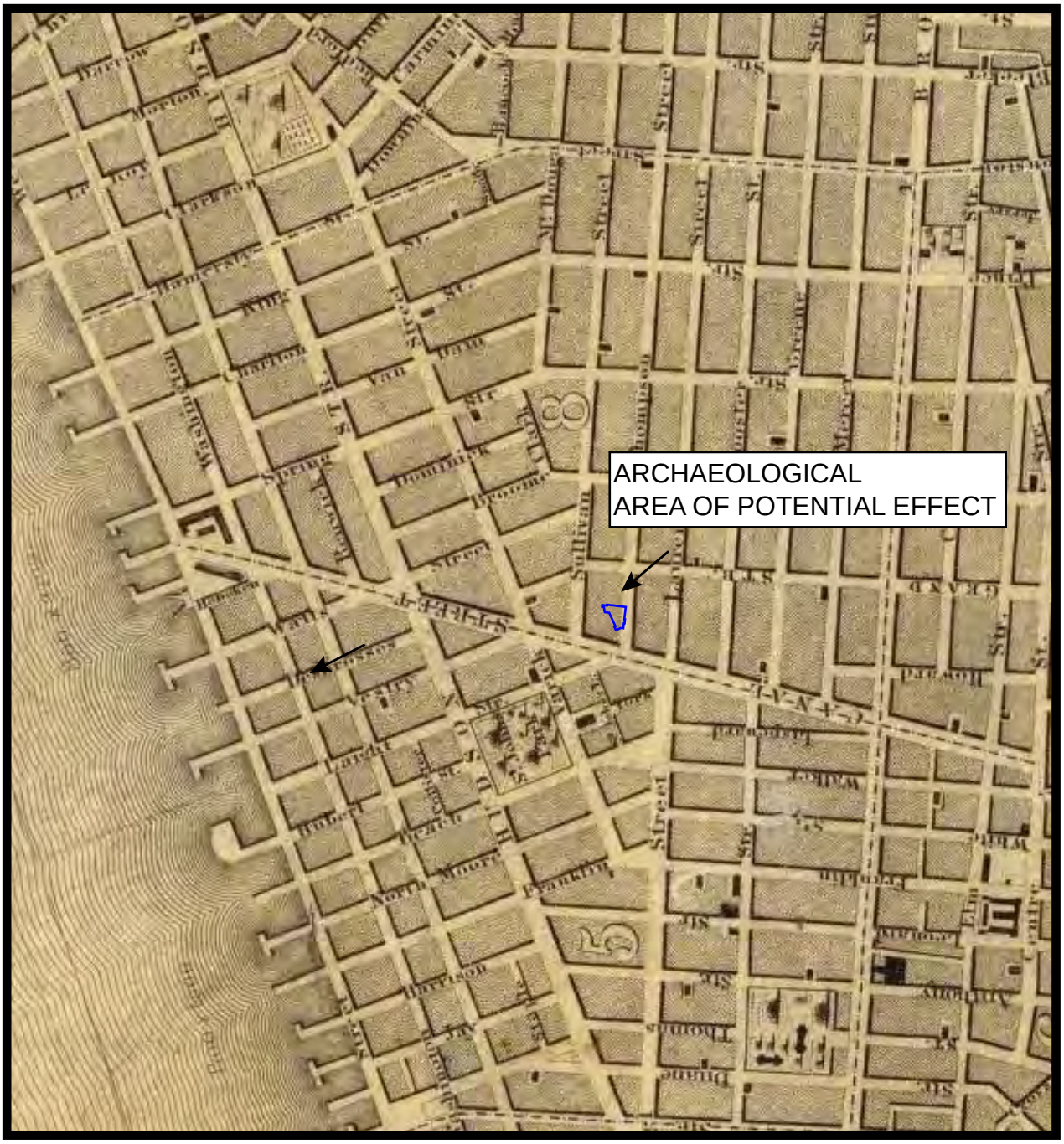
0 250 500 750 1000 1250 FEET

PHASE I CULTURAL RESOURCES STUDY
PROPOSED CANAL STREET SUBSTATION
OPTION 2: THOMPSON STREET
NEW YORK, NEW YORK

N

Figure 3b: Option 2 Archaeological Area of Potential Effect on *Plan of the City of New York, In North America, Surveyed in the Years 1766 and 1767* (Ratzer 1766-7).

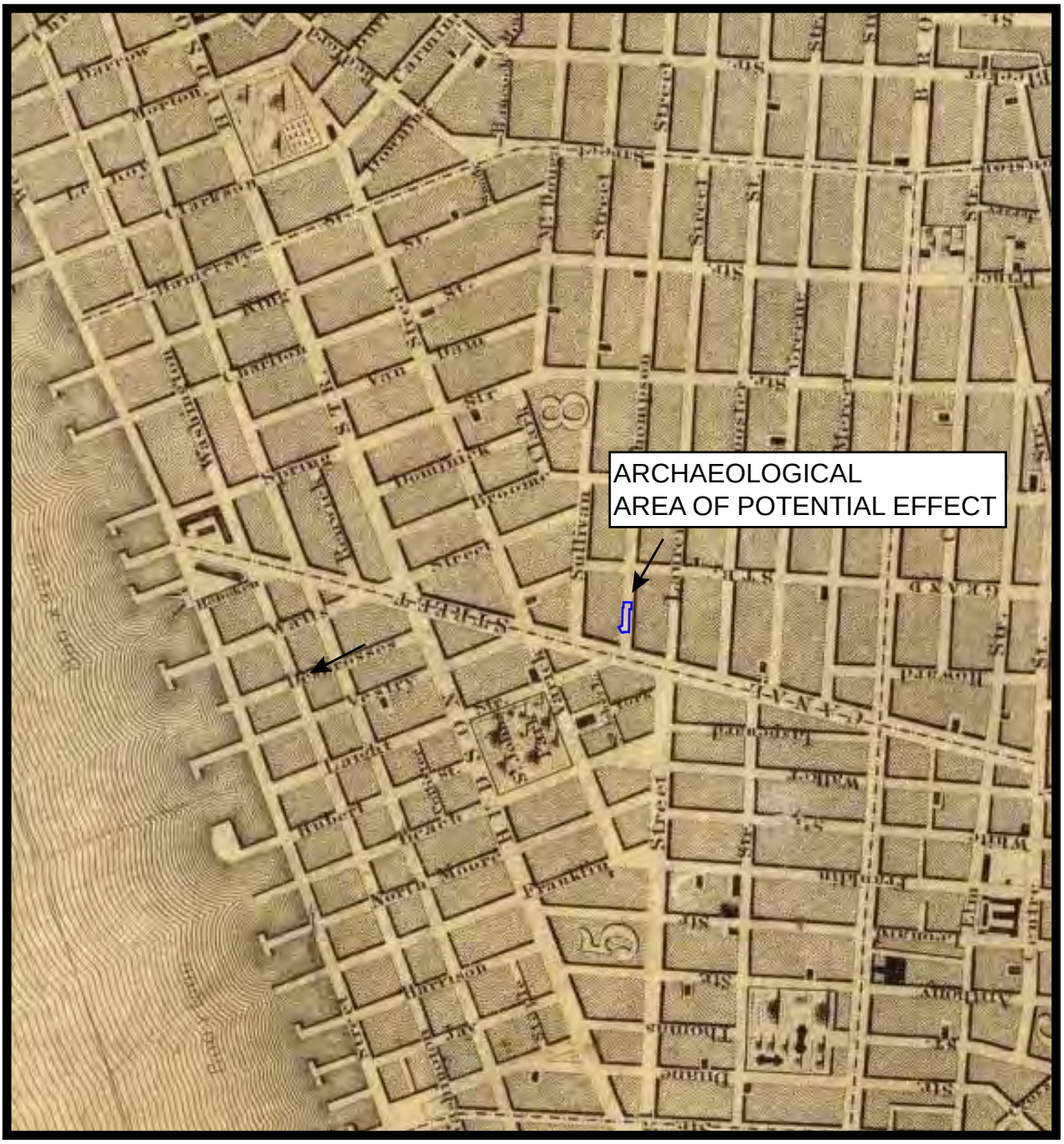
0 250 500 750 1000 1250 FEET



PHASE I CULTURAL RESOURCES STUDY
PROPOSED CANAL STREET SUBSTATION
OPTION 1: BLOCK 227, LOT 33
NEW YORK, NEW YORK

Figure 4a: Option 1 Archaeological Area of Potential Effect on T*opographical Map of the City and County of New-York and the Adjacent Country* (Colton 1836).

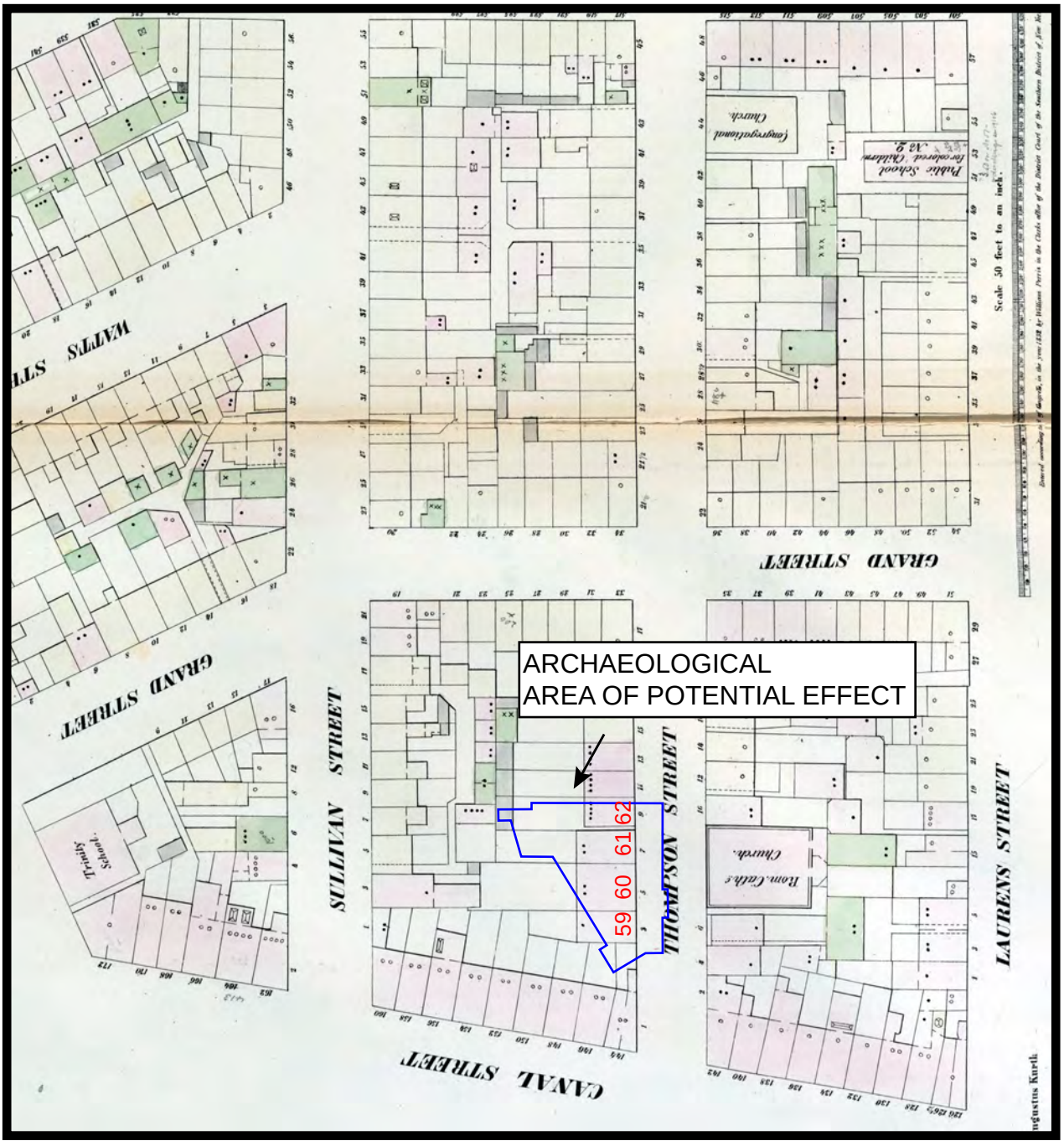
0 500 1000 1500 2000 2500 FEET



PHASE I CULTURAL RESOURCES STUDY
PROPOSED CANAL STREET SUBSTATION
OPTION 2: THOMPSON STREET
NEW YORK, NEW YORK

Figure 4b: Option 2 Archaeological Area of Potential Effect on T*opographical Map of the City and County of New-York and the Adjacent Country* (Colton 1836).

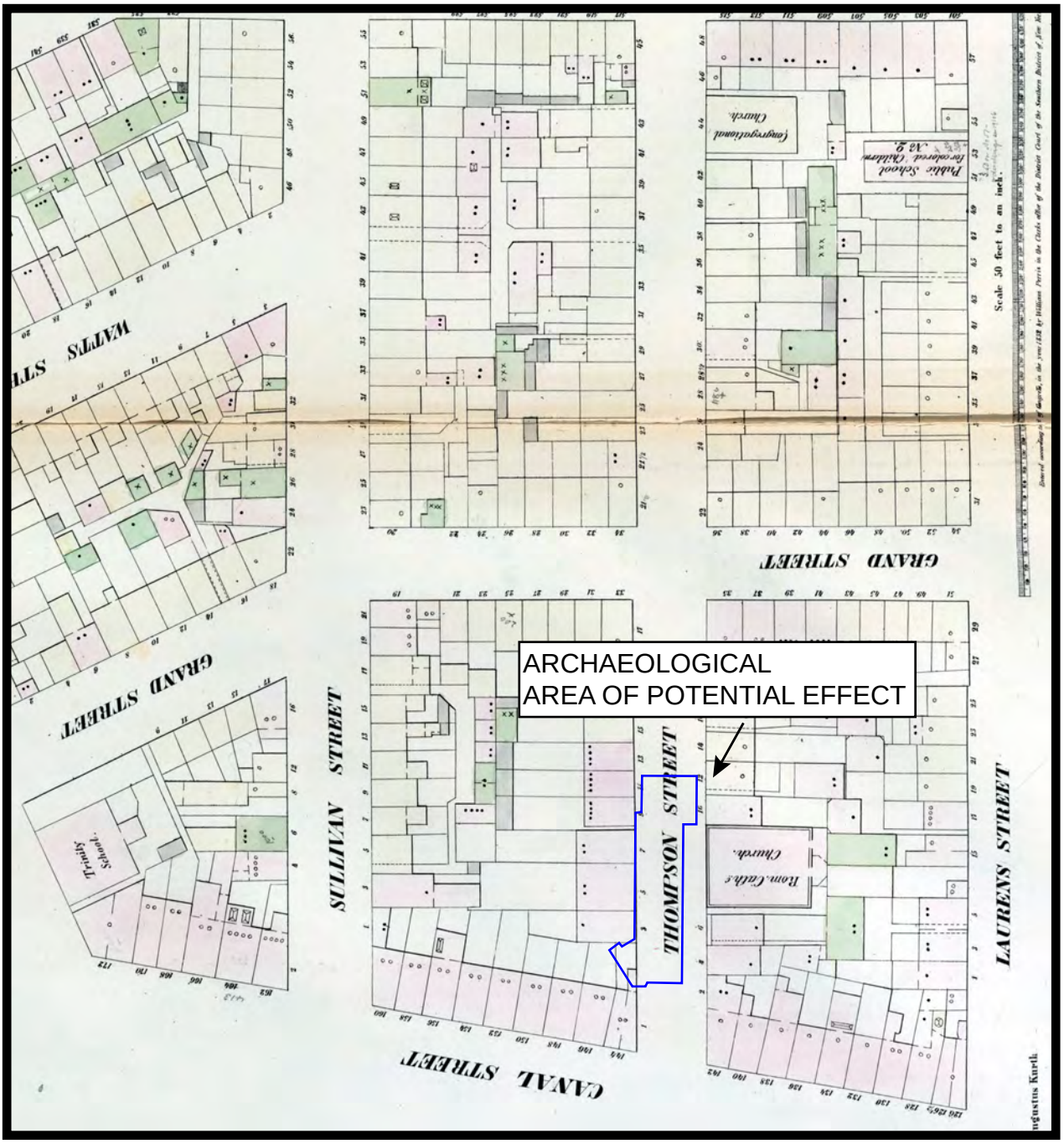
0 500 1000 1500 2000 2500 FEET



PHASE I CULTURAL RESOURCES STUDY
PROPOSED CANAL STREET SUBSTATION
OPTION 1: BLOCK 227, LOT 33
NEW YORK, NEW YORK

Figure 5a: Option 1 Archaeological Area of Potential Effect on *Maps of the City of New York* (Perris 1853).

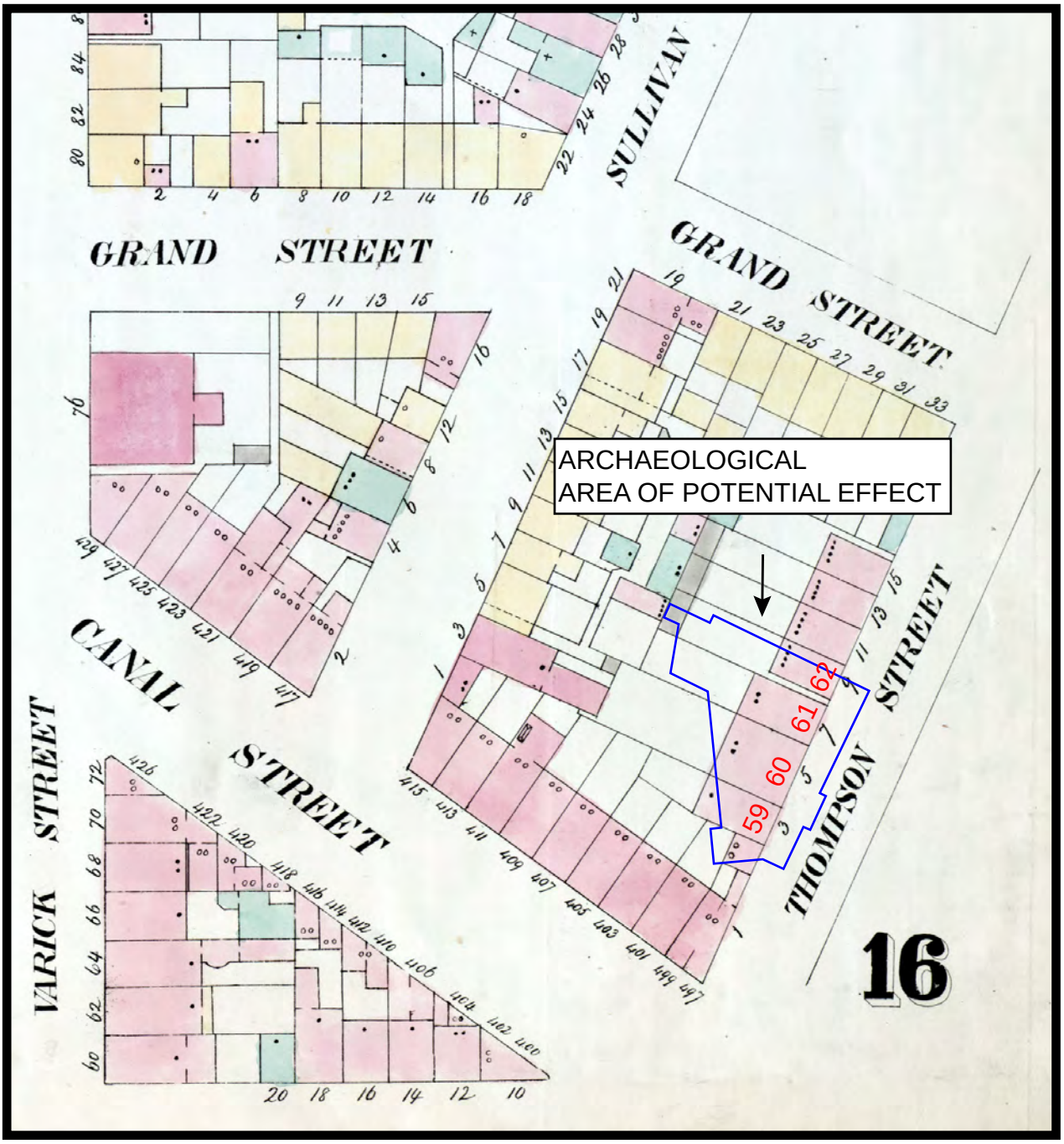
0 100 200 300 400 500 FEET



PHASE I CULTURAL RESOURCES STUDY
PROPOSED CANAL STREET SUBSTATION
OPTION 2: THOMPSON STREET
NEW YORK, NEW YORK

Figure 5b: Option 1 Archaeological Area of Potential Effect on *Maps of the City of New York* (Perris 1853).

0 100 200 300 400 500 FEET

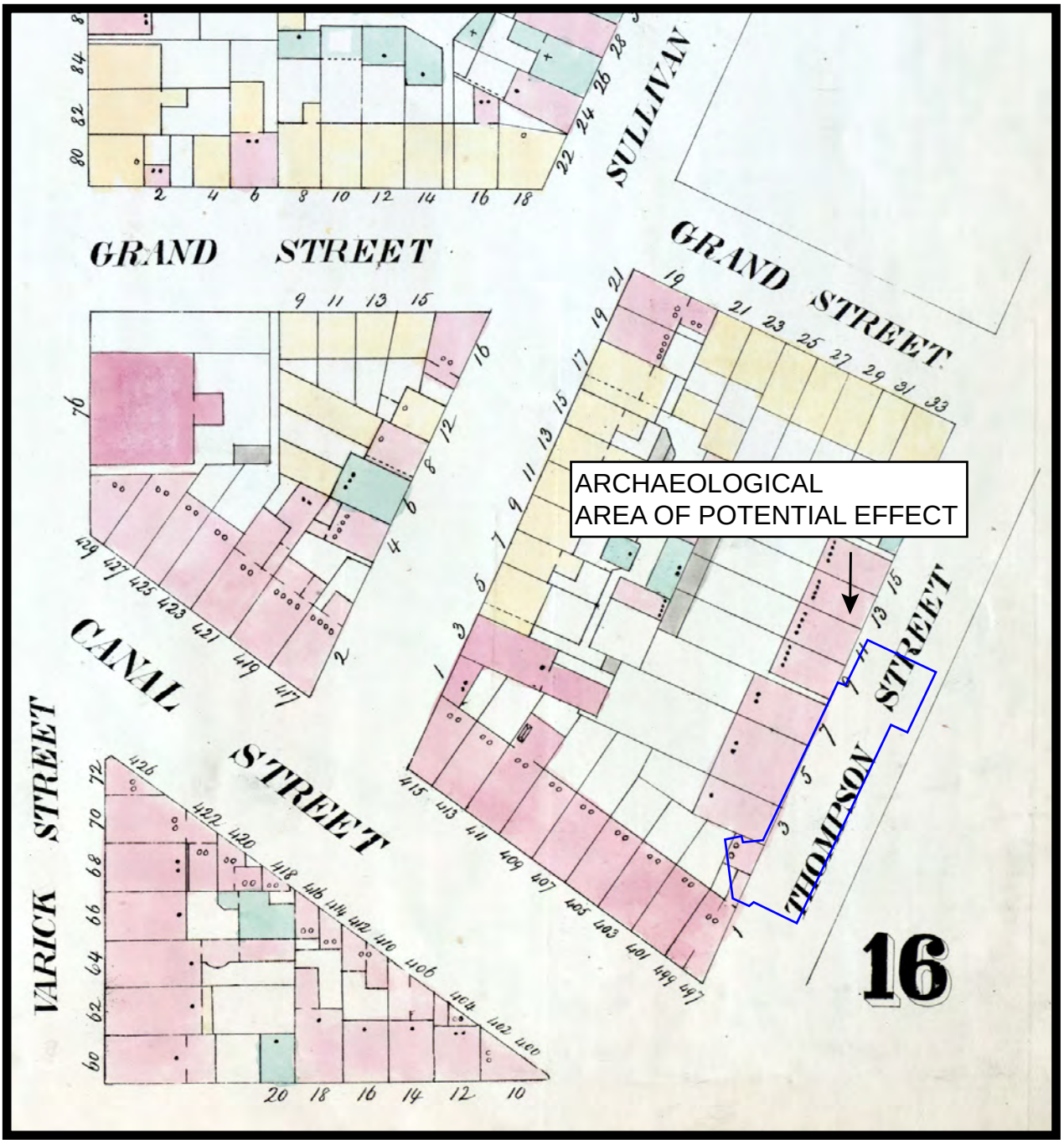


PHASE I CULTURAL RESOURCES STUDY
PROPOSED CANAL STREET SUBSTATION
OPTION 1: BLOCK 227, LOT 33
NEW YORK, NEW YORK

N

Figure 6a: Option 1 Archaeological Area of Potential Effect on *Maps of the City of New York* (Perris 1857).

0 50 100 150 200 250 FEET

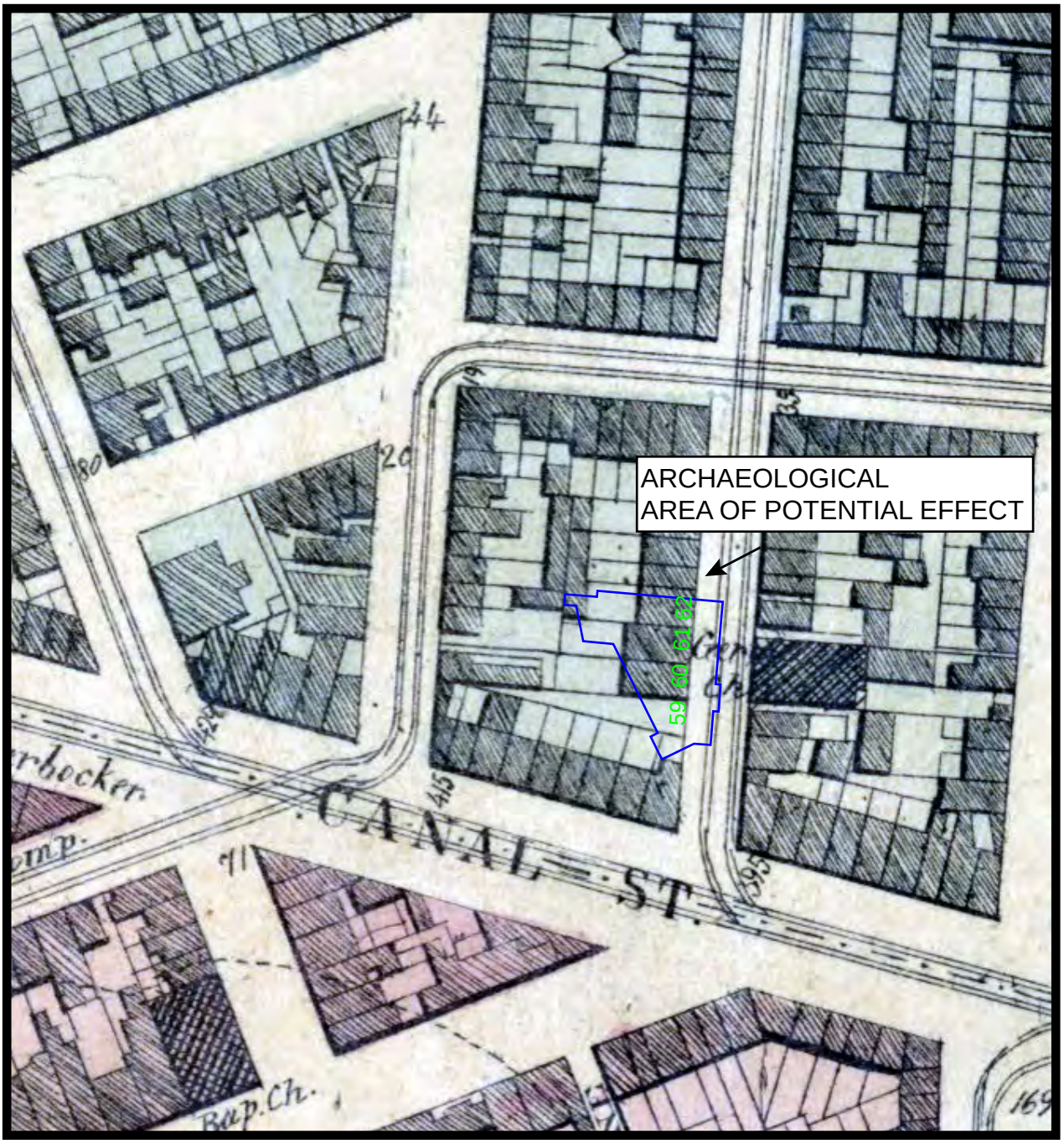


PHASE I CULTURAL RESOURCES STUDY
PROPOSED CANAL STREET SUBSTATION
OPTION 2: THOMPSON STREET
NEW YORK, NEW YORK

N

Figure 6b: Option 2 Archaeological Area of Potential Effect on *Maps of the City of New York* (Perris 1857).

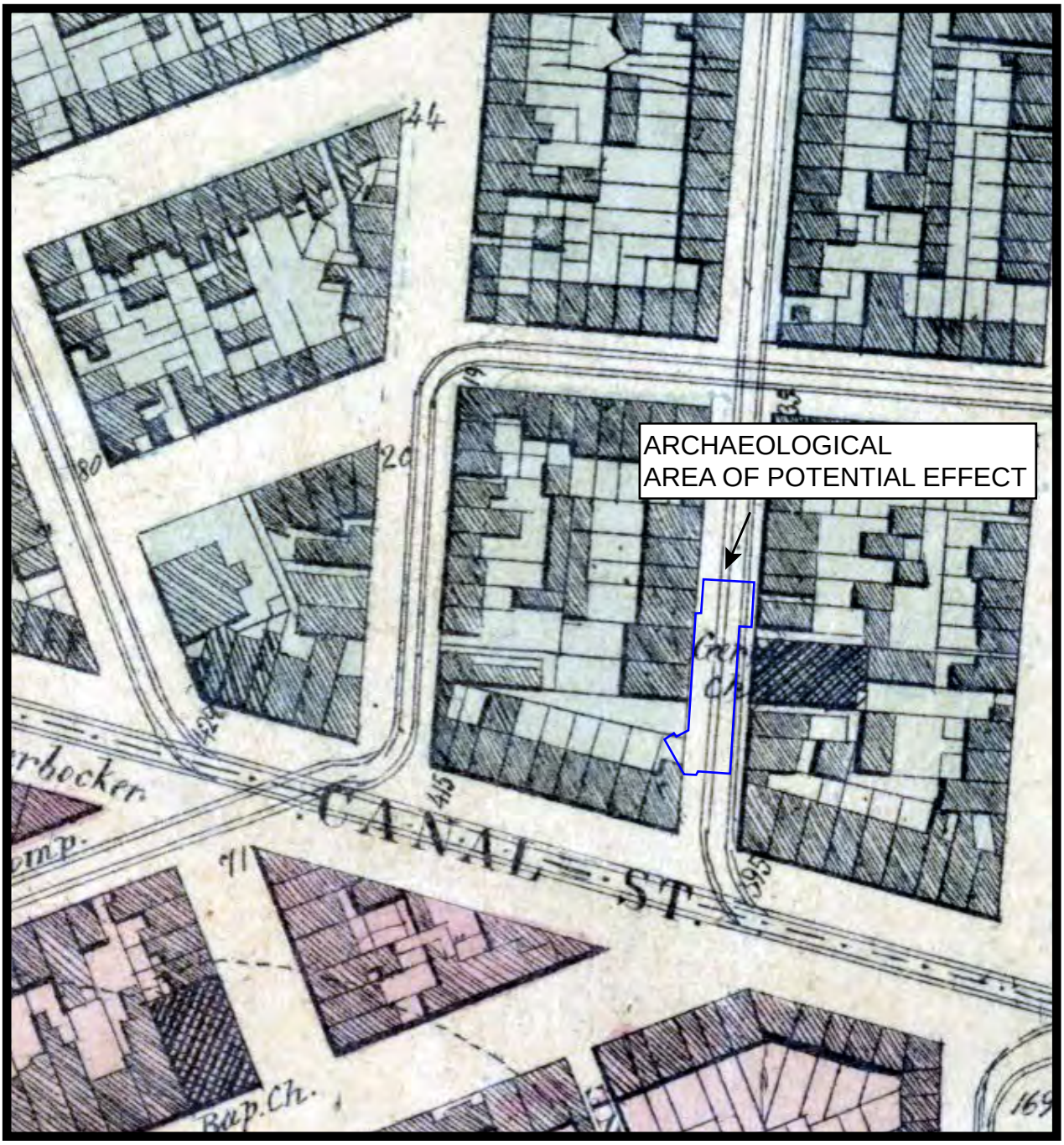
0 50 100 150 200 250 FEET



PHASE I CULTURAL RESOURCES STUDY
PROPOSED CANAL STREET SUBSTATION
OPTION 1: BLOCK 227, LOT 33
NEW YORK, NEW YORK

Figure 7a: Option 1 Archaeological Area of Potential Effect on *Plan of New York City from the Battery to Spuyten Duyvil Creek* (Harrison 1867).

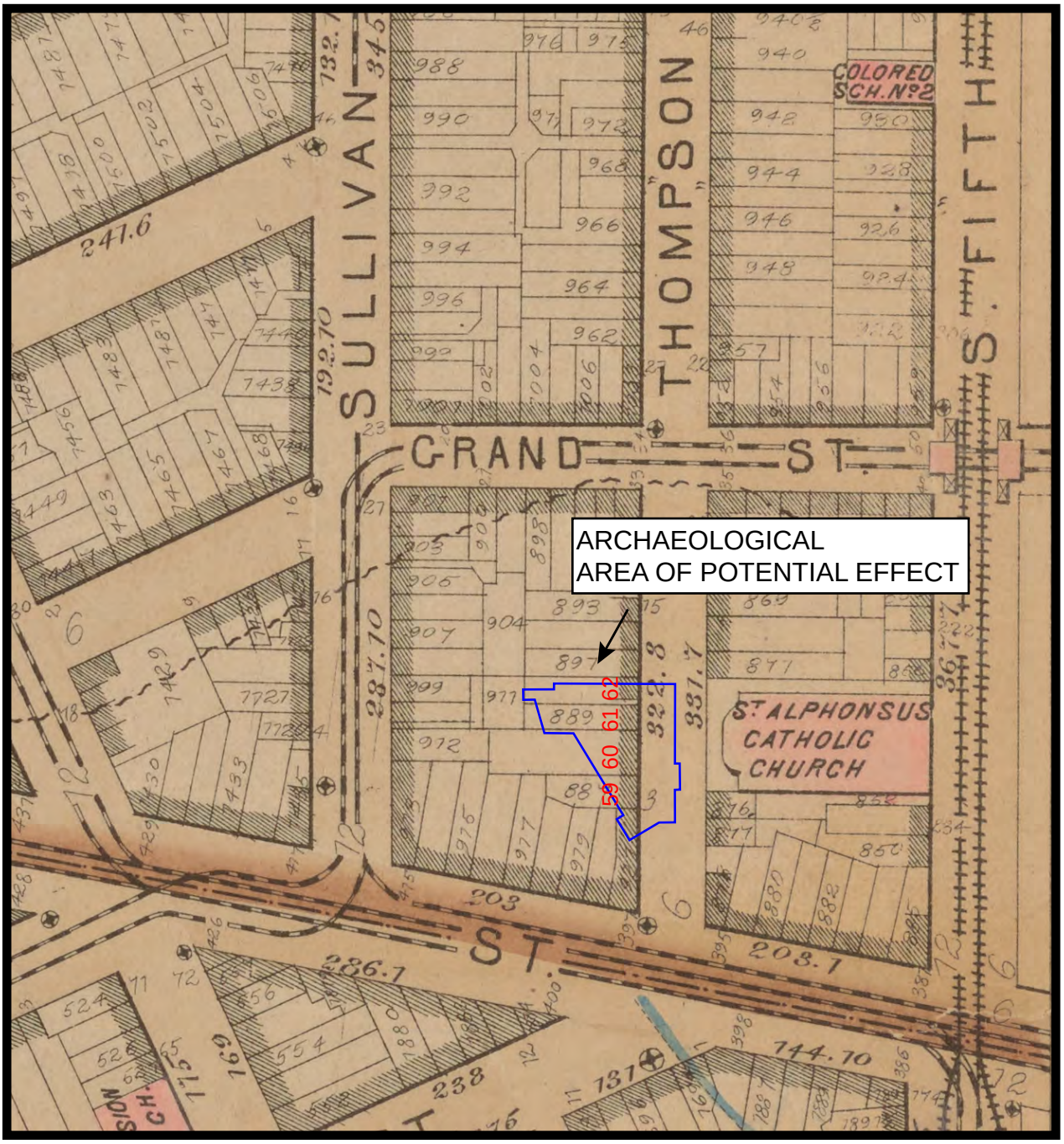
0 100 200 300 400 500 FEET



PHASE I CULTURAL RESOURCES STUDY
PROPOSED CANAL STREET SUBSTATION
OPTION 2: THOMPSON STREET
NEW YORK, NEW YORK

Figure 7b: Option 2 Archaeological Area of Potential Effect on *Plan of New York City from the Battery to Spuyten Duyvil Creek* (Harrison 1867).

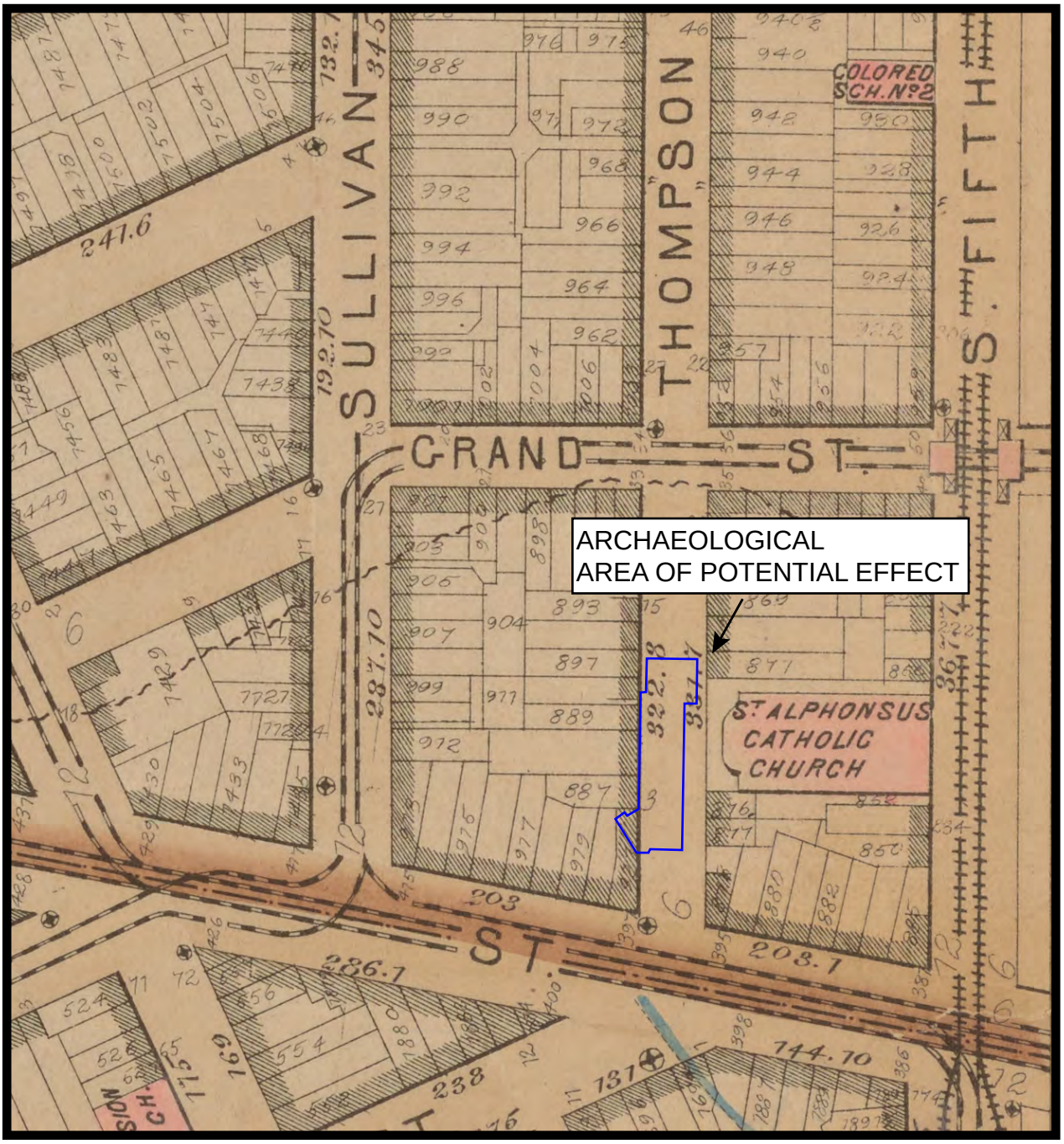
0 100 200 300 400 500 FEET



PHASE I CULTURAL RESOURCES STUDY
PROPOSED CANAL STREET SUBSTATION
OPTION 1: BLOCK 227, LOT 33
NEW YORK, NEW YORK

Figure 8a: Option 1Archaeological Area of Potential Effect on *Atlas of the Entire City of New York...* (Bromley 1879).

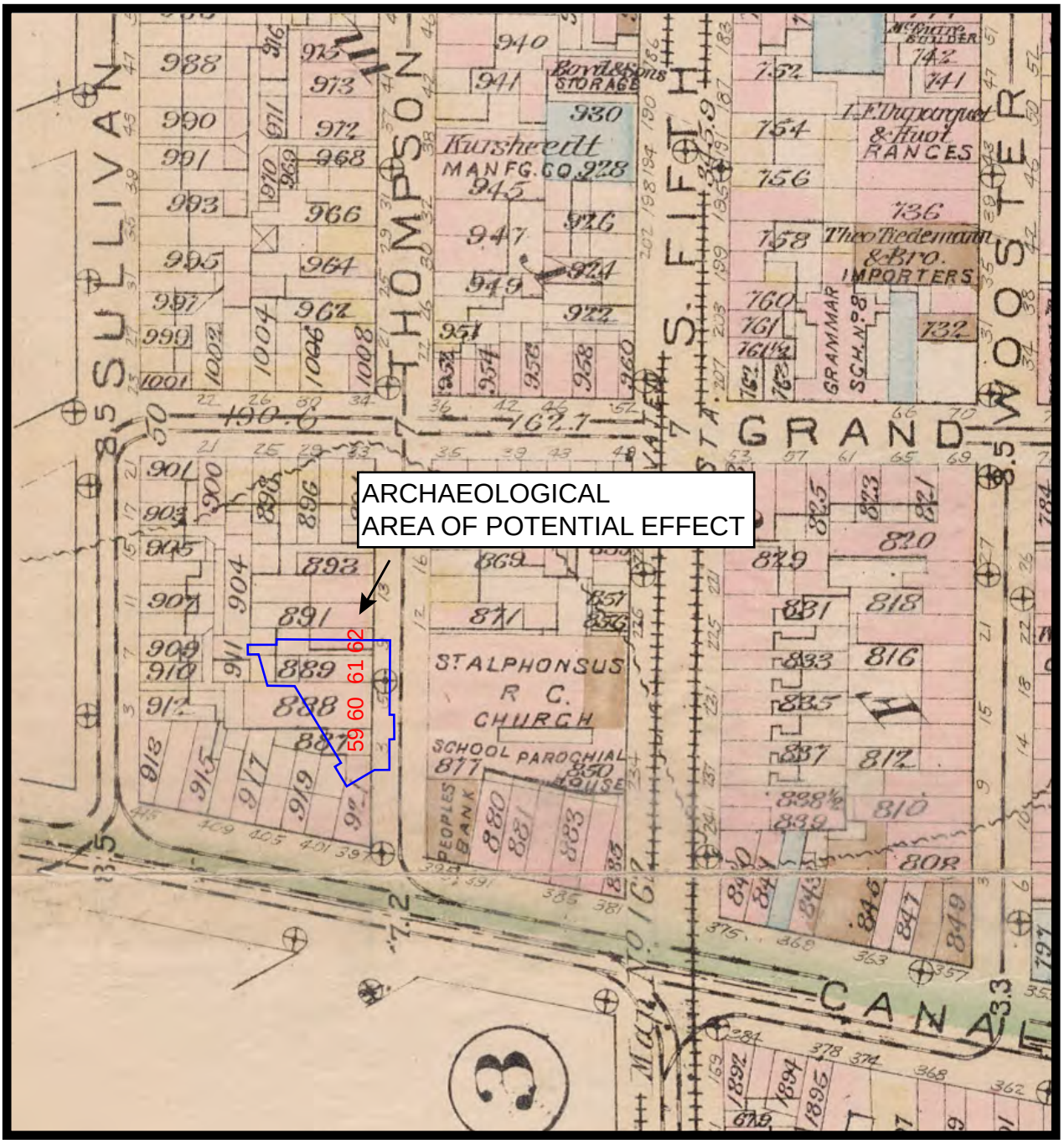
0 100 200 300 400 500 FEET



PHASE I CULTURAL RESOURCES STUDY
PROPOSED CANAL STREET SUBSTATION
OPTION 2: THOMPSON STREET
NEW YORK, NEW YORK

Figure 8b: Option 2 Archaeological Area of Potential Effect on *Atlas of the Entire City of New York...* (Bromley 1879).

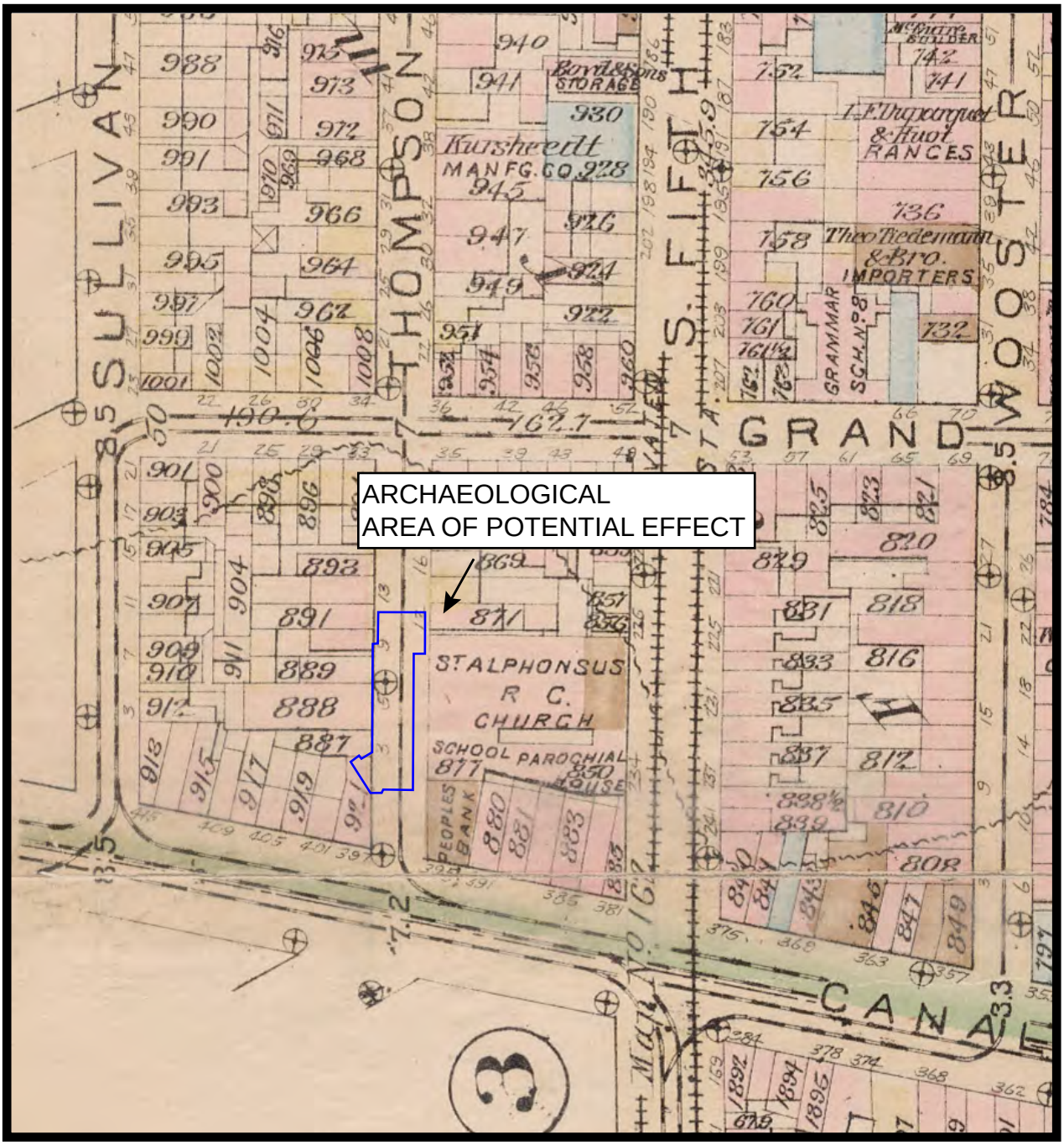
0 100 200 300 400 500 FEET



PHASE I CULTURAL RESOURCES STUDY
PROPOSED CANAL STREET SUBSTATION
OPTION 1: BLOCK 227, LOT 33
NEW YORK, NEW YORK

Figure 9a: Option 1 Archaeological Area of Potential Effect on *Atlas of the City of New York* (Robinson 1885).

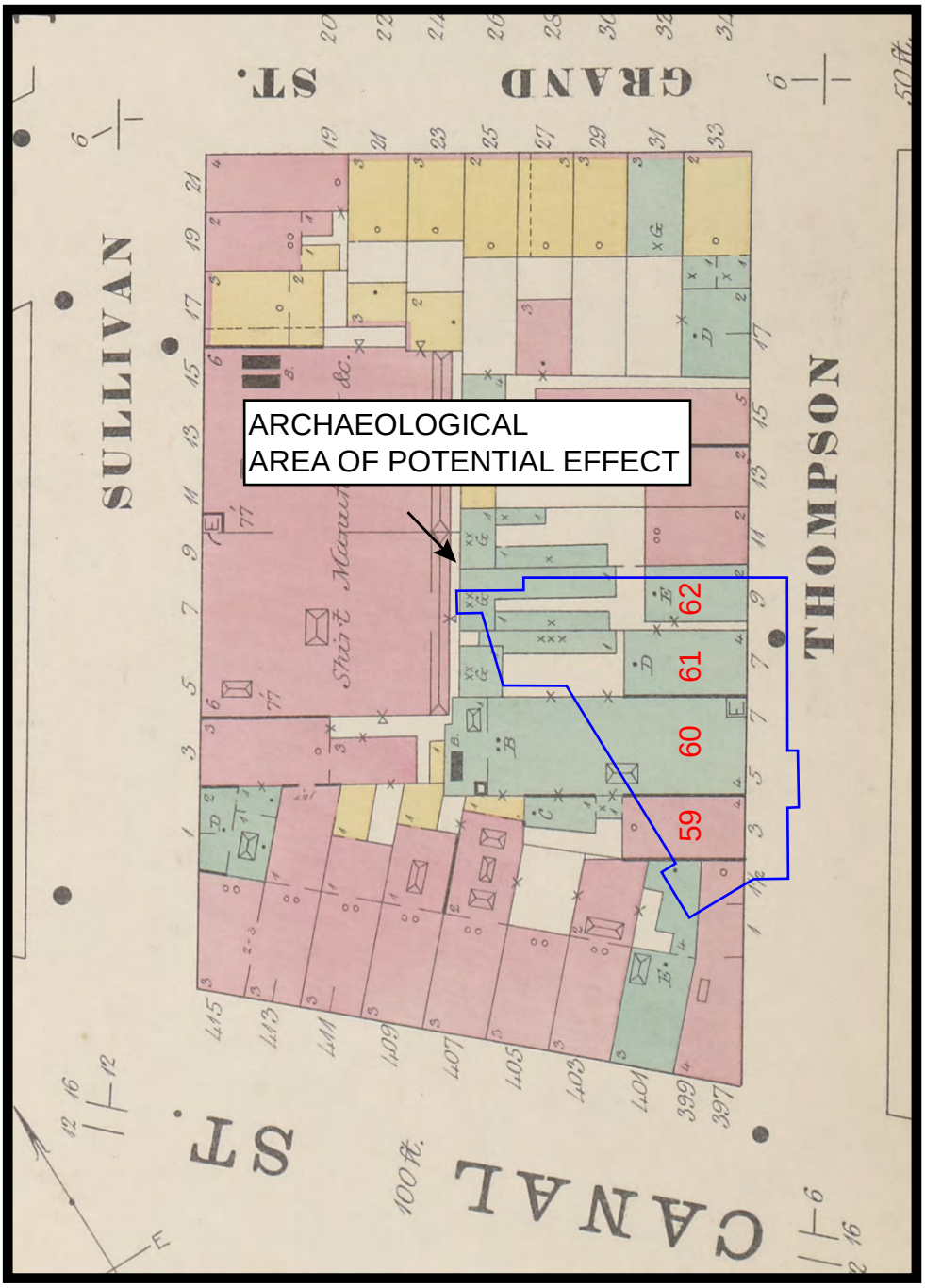
0 100 200 300 400 500 FEET



PHASE I CULTURAL RESOURCES STUDY
PROPOSED CANAL STREET SUBSTATION
OPTION 2: THOMPSON STREET
NEW YORK, NEW YORK

Figure 9b: Option 2 Archaeological Area of Potential Effect on *Atlas of the City of New York* (Robinson 1885).

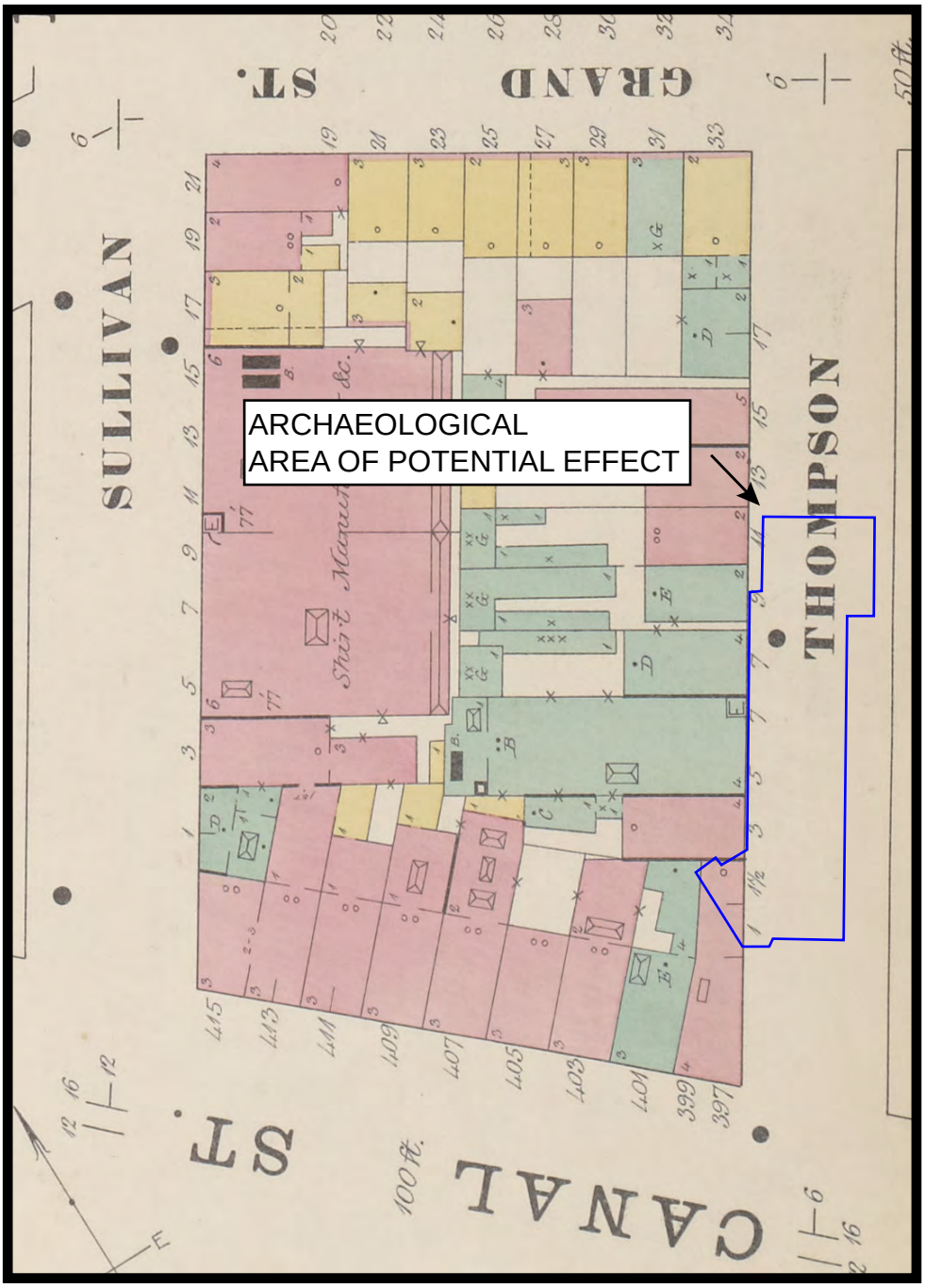
0 100 200 300 400 500 FEET



PHASE I CULTURAL RESOURCES STUDY
PROPOSED CANAL STREET SUBSTATION
OPTION 1: BLOCK 227, LOT 33
NEW YORK, NEW YORK

Figure 10a: Option 1 Archaeological Area of Potential Effect on *Insurance Maps of the City of New York* (Sanborn 1894).

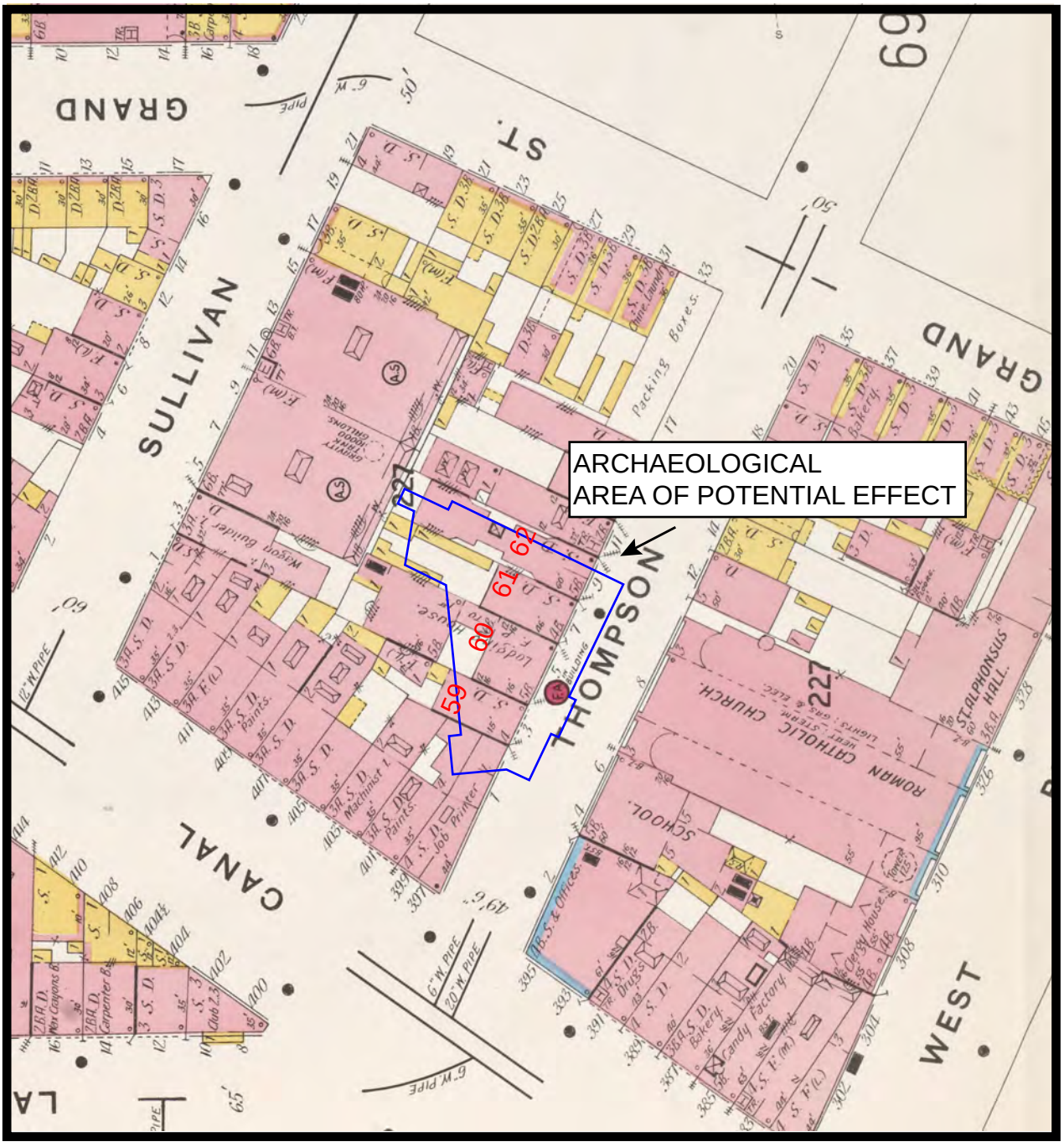
0 50 100 150 200 250 FEET



PHASE I CULTURAL RESOURCES STUDY
PROPOSED CANAL STREET SUBSTATION
OPTION 2: THOMPSON STREET
NEW YORK, NEW YORK

Figure 10b: Option 2 Archaeological Area of Potential Effect on *Insurance Maps of the City of New York* (Sanborn 1894).

0 50 100 150 200 250 FEET



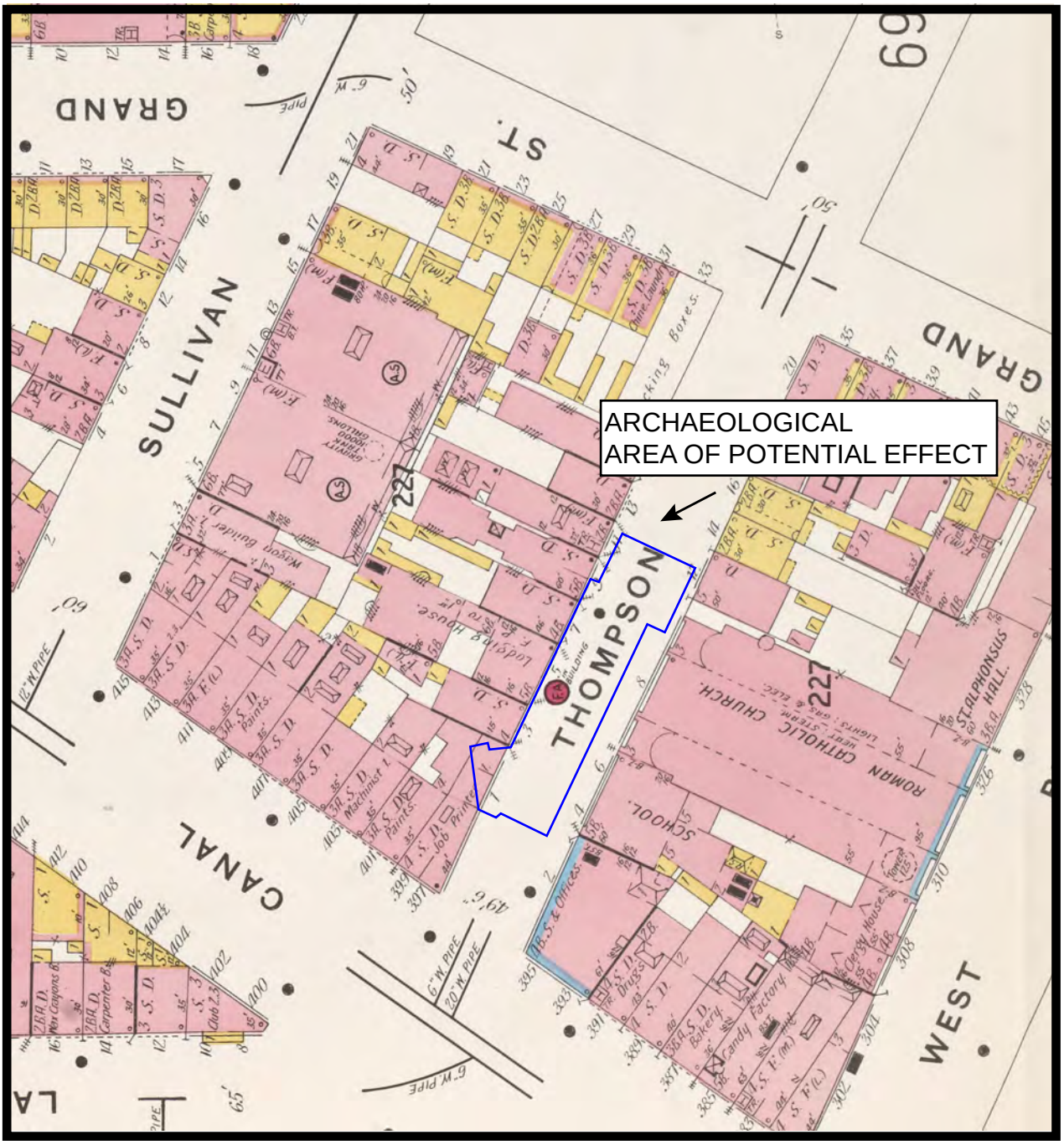
PHASE I CULTURAL RESOURCES STUDY
PROPOSED CANAL STREET SUBSTATION
OPTION 1: BLOCK 227, LOT 33
NEW YORK, NEW YORK

N

HP

Figure 11a: Option 1 Archaeological Area of Potential Effect on *Insurance Maps of the City of New York* (Sanborn 1904).

0 50 100 150 200 250 FEET

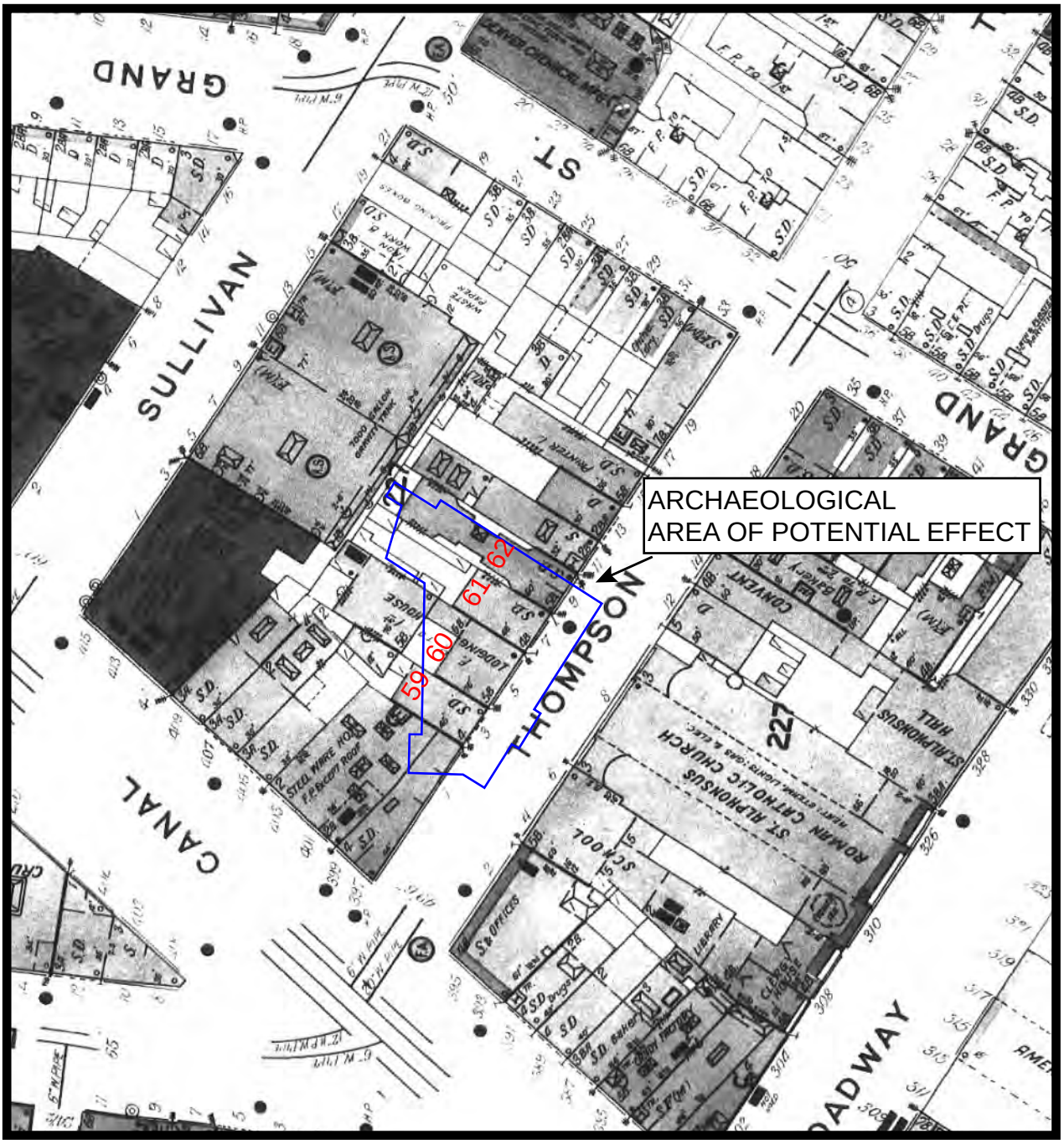


PHASE I CULTURAL RESOURCES STUDY
PROPOSED CANAL STREET SUBSTATION
OPTION 2: THOMPSON STREET
NEW YORK, NEW YORK

N

Figure 11b: Option 2 Archaeological Area of Potential Effect on *Insurance Maps of the City of New York* (Sanborn 1904).

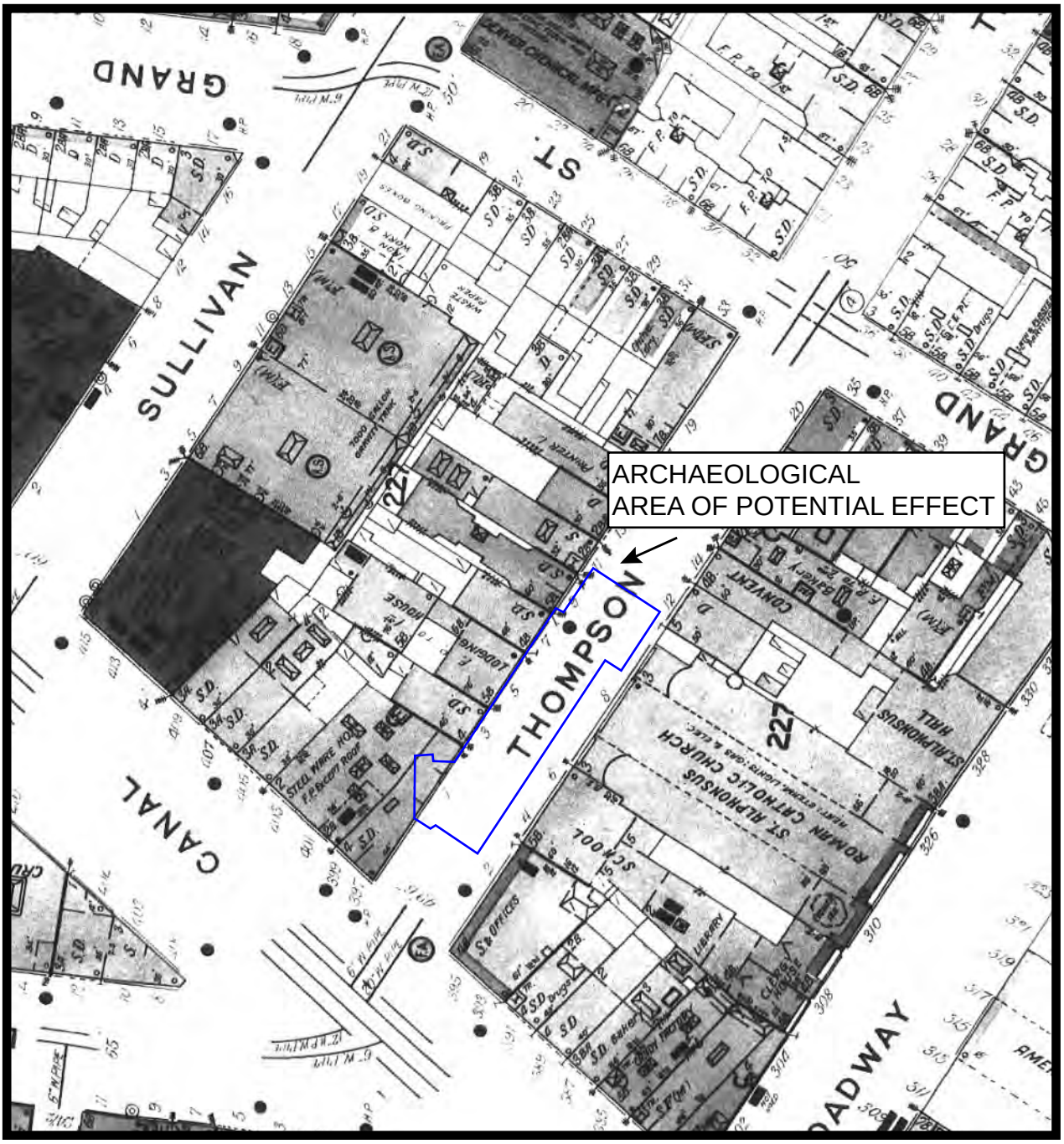
0 50 100 150 200 250 FEET



PHASE I CULTURAL RESOURCES STUDY
PROPOSED CANAL STREET SUBSTATION
OPTION 1: BLOCK 227, LOT 33
NEW YORK, NEW YORK

Figure 12a: Option 1 Archaeological Area of Potential Effect on *Insurance Maps of the City of New York* (Sanborn 1922).

0 50 100 150 200 250 FEET



PHASE I CULTURAL RESOURCES STUDY
PROPOSED CANAL STREET SUBSTATION
OPTION 2: THOMPSON STREET
NEW YORK, NEW YORK

Figure 12b: Option 2 Archaeological Area of Potential Effect on *Insurance Maps of the City of New York* (Sanborn 1922).

PHASE I CULTURAL RESOURCES STUDY
PROPOSED CANAL STREET SUBSTATION
OPTION 1: BLOCK 227, LOT 33
NEW YORK, NEW YORK

N

HP

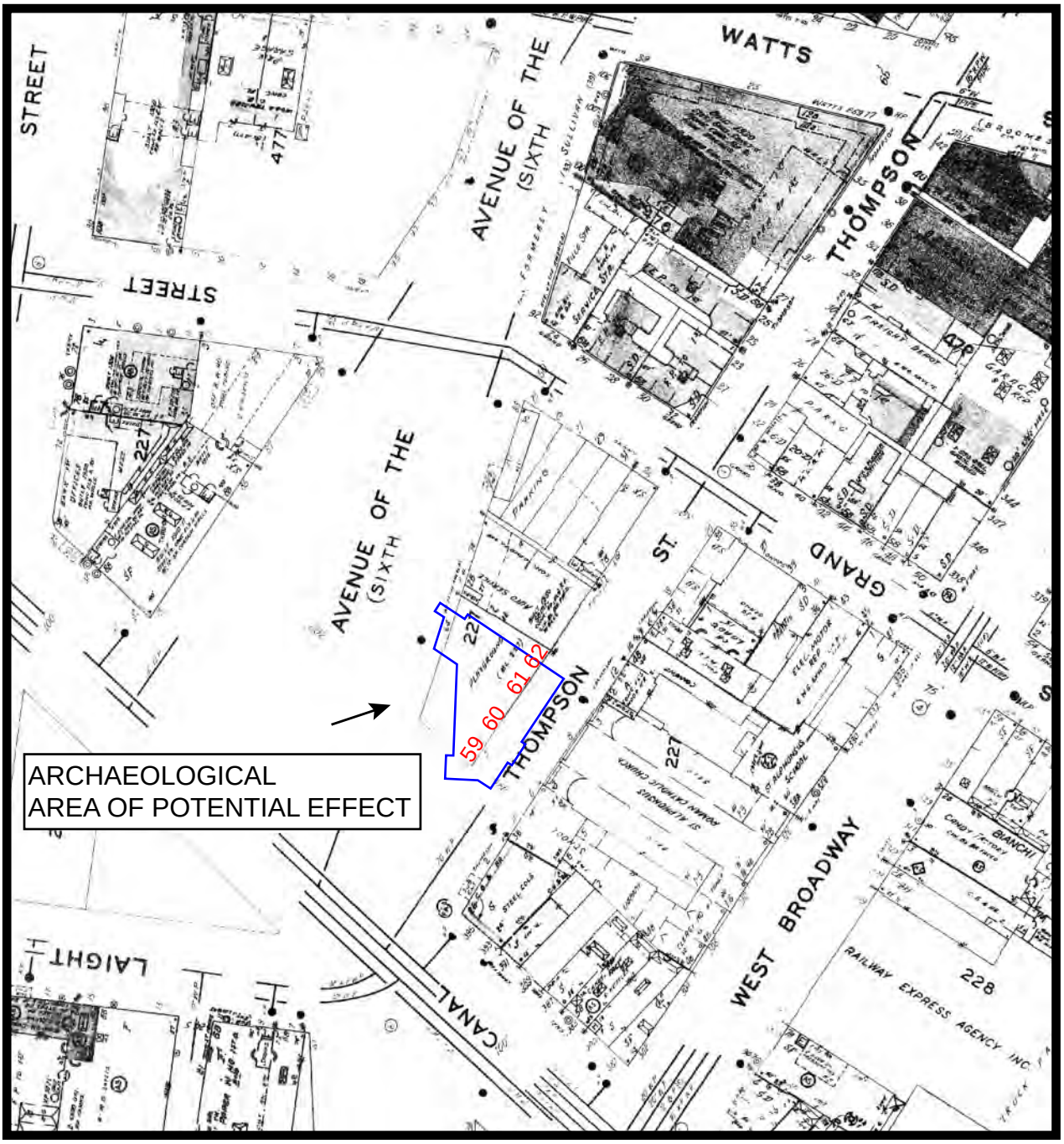
Figure 13a: Option 1 Archaeological Area of Potential Effect on *Manhattan Land Book of the City of New York* (Bromley 1955).

0 100 200 300 400 500 FEET

PHASE I CULTURAL RESOURCES STUDY
PROPOSED CANAL STREET SUBSTATION
OPTION 2: THOMPSON STREET
NEW YORK, NEW YORK

Figure 13b: Option 2 Archaeological Area of Potential Effect on *Manhattan Land Book of the City of New York* (Bromley 1955).

0 100 200 300 400 500 FEET

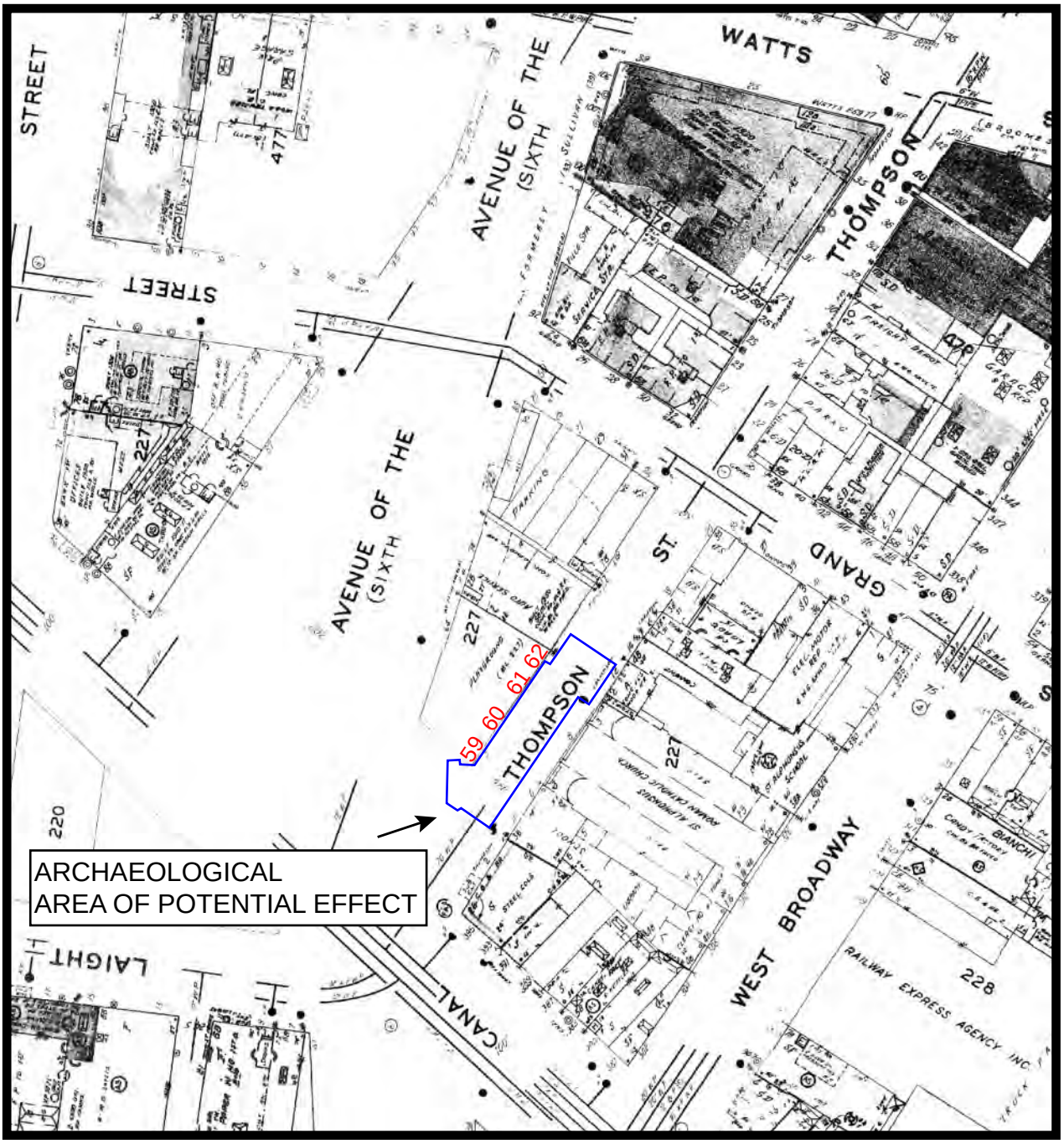


PHASE I CULTURAL RESOURCES STUDY
PROPOSED CANAL STREET SUBSTATION
OPTION 1: BLOCK 227, LOT 33
NEW YORK, NEW YORK

N

Figure 14a: Option 1Archaeological Area of Potential Effect on *Insurance Maps of the City of New York* (Sanborn 1968).

0 50 100 150 200 250 FEET



PHASE I CULTURAL RESOURCES STUDY
PROPOSED CANAL STREET SUBSTATION
OPTION 2: THOMPSON STREET
NEW YORK, NEW YORK

N

Figure 14b: Option 2 Archaeological Area of Potential Effect on *Insurance Maps of the City of New York* (Sanborn 1968).

0 50 100 150 200 250 FEET

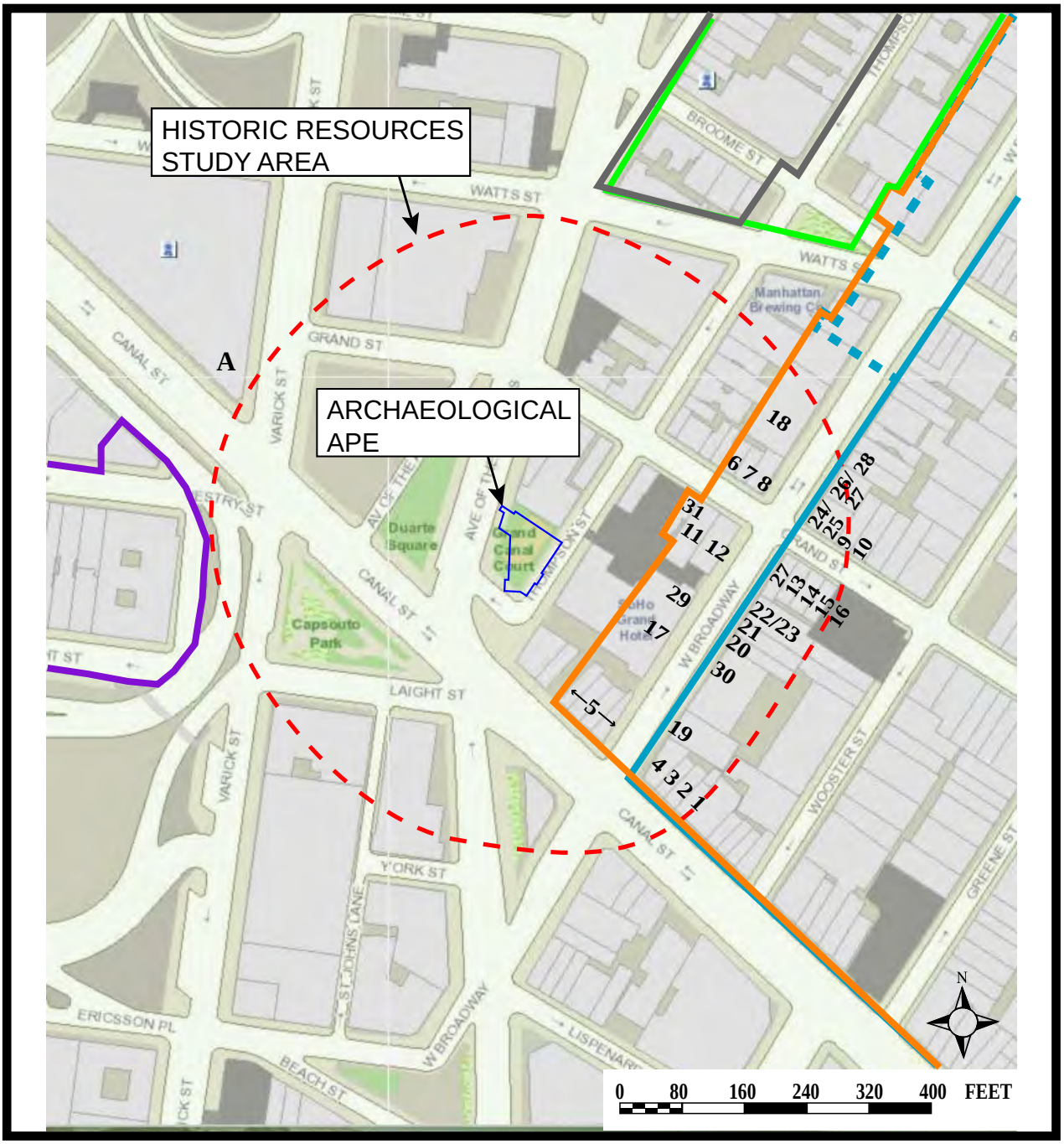
Figure 15. Block 227 (including the Option 1 Archaeolgical Area of Potential Effect) on the north side of Canal Street between Thompson Street and Sullivan Street, February 13, 1927, prior to demolition for the Sixth Avenue Extension and Eighth Avenue Subway, facing northwest. Museum of the City of New York.

Figure 16. Looking north from Canal Street to route of Sixth Avenue Extension demolition. Arrow points to Block 227, Option 1 APE. New York City Municipal Archives.

Figure 17. Looking north from Canal Street during construction of the Sixth Avenue Extension, April 23, 1930. Arrow points to Block 227, Option 1 Archaeological Area of Potential Effect. New York City Municipal Archives.

Figure 18. Block 227 during demolition and construction of the Sixth Avenue Extension and the Eighth Avenue Subway. Photograph is facing southeast toward lots in the Option 1 Archaeological Area of Potential Effect with the Option 2 Archaeological Area of Potential Effect in Thompson Street immediately east of Block 227. From left to right in foreground are Nos. 9, 7, 5, and 3 Thompson Street (Lots 62, 61, 60, and 59) (Sperr, October 19, 1928).

Figure 19. Close up of Block 227 Lots 62, 61, 60, and 59 (Option 1 Archaeological Area of Potential Effect) during construction of the Sixth Avenue Extension and the Eighth Avenue Subway. Photograph is facing east toward Option 1 APE, with Option 2 Archaeological Area of Potential Effect in Thompson Street to the east (between lots and Church). Note the car traveling or parked on Thompson Street, and standing water in front of the retaining walls that were presumably installed to stabilize demolition debris (Sperr, September 9, 1927).



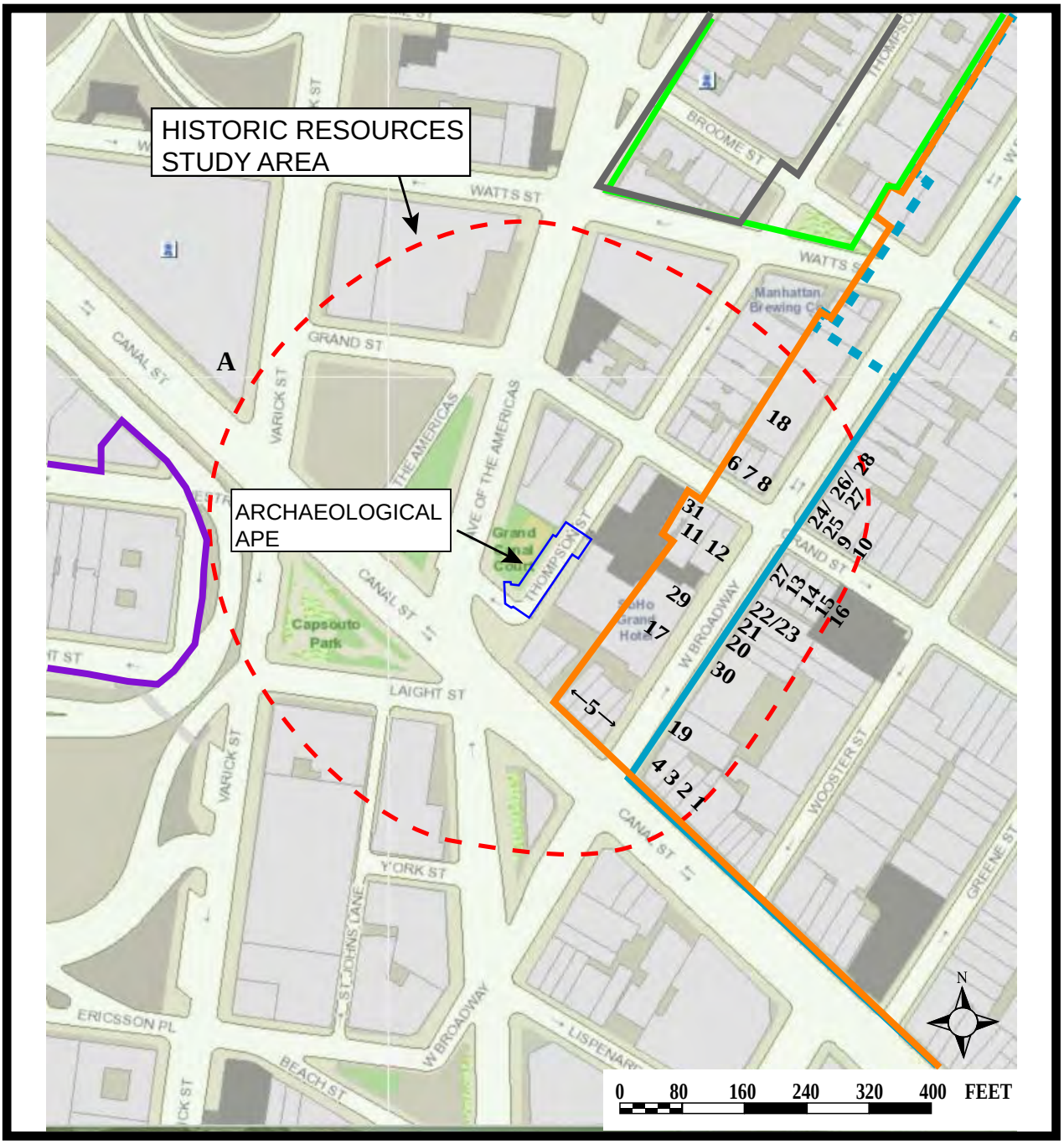
PHASE I CULTURAL RESOURCES STUDY
PROPOSED CANAL STREET SUBSTATION
OPTION 1: BLOCK 227, LOT 33
NEW YORK, NEW YORK

Figure 20a: Option 1 Historic Resources Study Area, Individual Historic Sites and Historic Districts on NYCityMap (City of New York 2017).

Note: Numbered Structures Correspond to Table 4 in Report.

KEY

- Soho Historic District Boundaries (S/NR)
- SoHo-Cast Iron Historic District Boundaries (NYCL)
- SoHo-Cast Iron Historic District Expansion (NYCL)
- South Village Historic District (S/NR)
- Sullivan-Thompson Historic District (NYCL)
- Tribeca North Historic District Boundaries (S/NR-eligible, NYCL)
- **A** - Individually Listed Historic Structure Adjacent to Study Area



PHASE I CULTURAL RESOURCES STUDY
PROPOSED CANAL STREET SUBSTATION
OPTION 2: THOMPSON STREET
NEW YORK, NEW YORK

Figure 20b: Option 2 Historic Resources Study Area, Individual Historic Sites and Historic Districts on NYCityMap (City of New York 2017).

Note: Numbered Structures Correspond to Table 4 in Report.

KEY

- Soho Historic District Boundaries (S/NR)
- SoHo-Cast Iron Historic District Boundaries (NYCL)
- SoHo-Cast Iron Historic District Expansion (NYCL)
- South Village Historic District (S/NR)
- Sullivan-Thompson Historic District (NYCL)
- Tribeca North Historic District Boundaries (S/NR-eligible, NYCL)
- **A** - Individually Listed Historic Structure Adjacent to Study Area

Photograph 1: Facing northeast to Option 1 Archaeological Area of Potential Effect with basketball court, from sidewalk at south end of Thompson Street.

Photograph 2: Facing northeast to Option 1 Archaeological Area of Potential Effect and east side of Sixth Avenue from sidewalk at south end of Thompson Street.

Photograph 3: Facing west from Block 227, Lot 33 Option 1 Archaeological Area of Potential Effect to sidewalk on east side of Sixth Avenue and Sixth Avenue roadbed.

Photograph 4: Facing northwest to sidewalk grates over A/C/E subway line beneath Sixth Avenue in Option 1 Archaeological Area of Potential Effect.

Photograph 5: Facing southeast to Option 1 Archaeological Area of Potential Effect from Sixth Avenue sidewalk, with junction of NYC Park on Block 227, Lot 33 and The James Hotel immediately to the northeast (at left).

Photograph 6: Facing northwest to new bus stop in sidewalk on eastern sidewalk of Sixth Avenue in Option 1 Archaeological Area of Potential Effect.

Photograph 7: Facing northeast to sidewalk on west side of Thompson Street in both the Option 1 and Option 2 Archaeological Areas of Potential Effect.

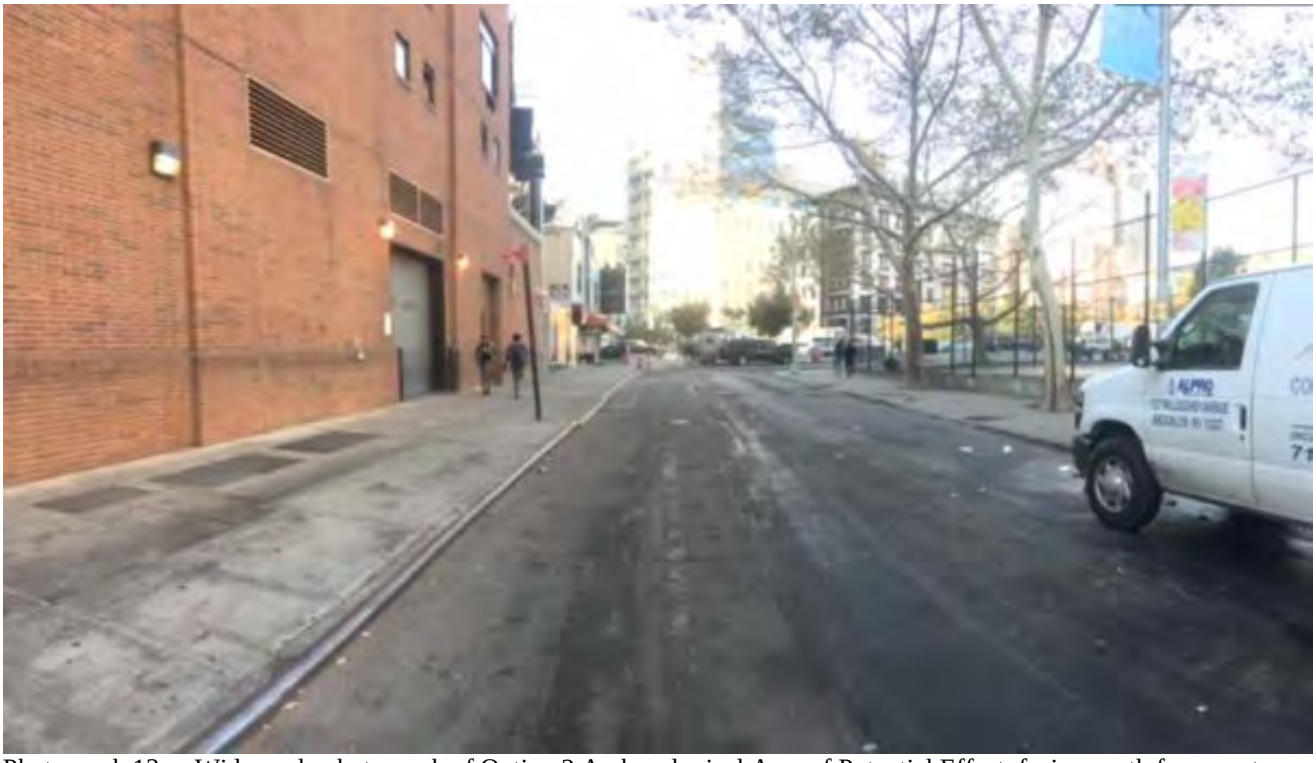
Photograph 8: Facing south from to Option 1 Archaeological Area of Potential Effect to southern sidewalk on Thompson Street. Roadbed of Thompson Street in foreground is within the Option 2 Archaeological Area of Potential Effect.

Photograph 9: Facing northwest to junction of NYC Grand Court Park on Block 227, Lot 33 (Option 1 Archaeological Area of Potential Effect) and The James Hotel immediately to the north (at right). The Thompson Street roadbed in the foreground encompasses the Option 2 Archaeological Area of Potential Effect.

Photograph 10: Facing west from east side of Thompson Street to southern end of Block 227, Lot33 Option 1 Archaeological Area of Potential Effect with basketball court and Option 2 Archaeological Area of Potential Effect roadbed and sidewalks.

Photograph 11: Thompson Street and Option 2 Archaeological Area of Potential Effect, facing south from Grand Street.

Photograph 12: Buildings at the corner of Thompson Street and Grand Street dating to ca. 1910s, facing south from north side of Thompson Street: 35 Grand Street is at left and 17 Thompson Street is at right. Note the modern buildings surrounding each structure.



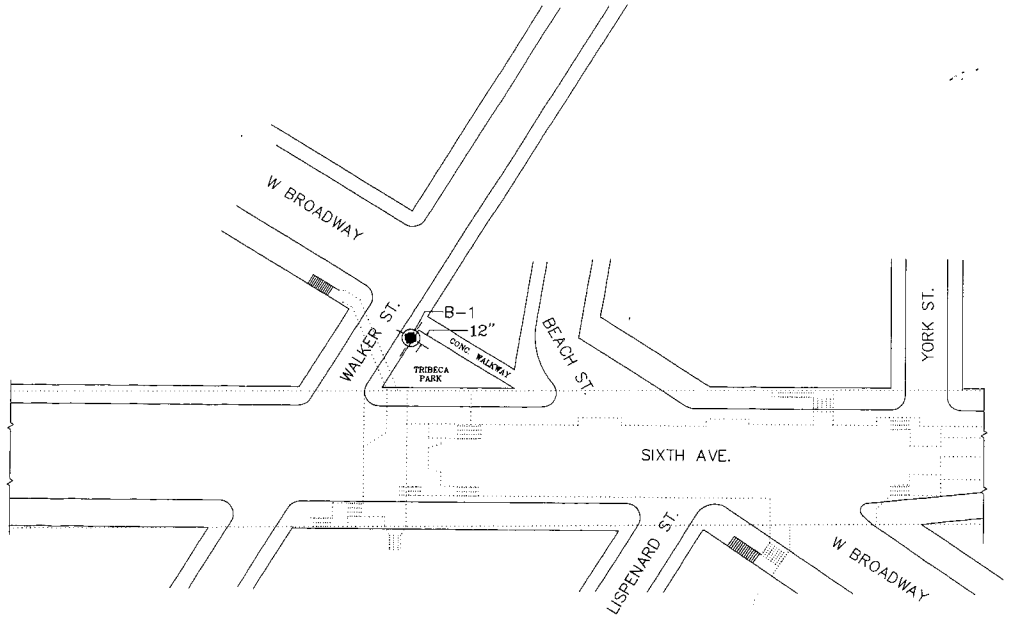
Photograph 13: Wide angle photograph of Option 2 Archaeological Area of Potential Effect, facing south from center of Thompson Street. Note that the southern end of Thompson Street veers to the west.

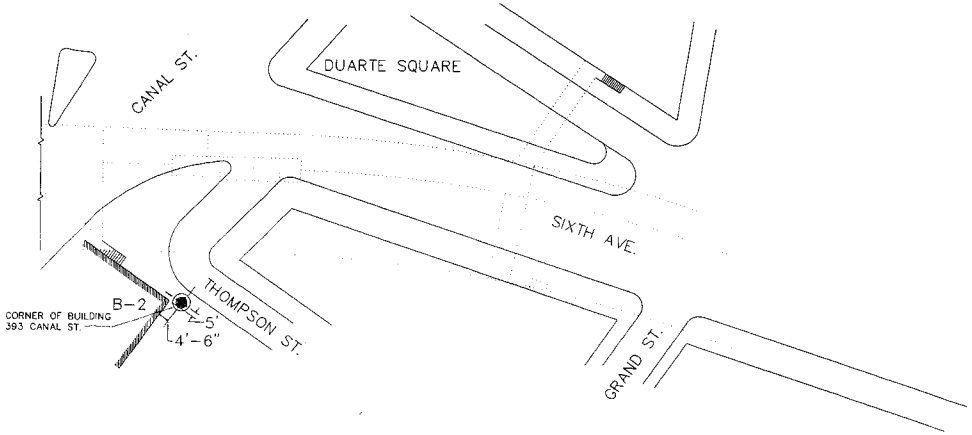
Photograph 14: 393 Canal Street structure dating to ca. 1910 adjacent to southeastern corner of Option 2 Archaeological Area of Potential Effect, facing east from Thompson Street.

Photograph 15: Facing north to Option 1 Archaeological Area of Potential Effect (Grand Canal Court) and Option 2 Archaeological Area of Potential Effect (Thompson Street) from Canal Street.

Photograph 16: Buildings on east side of Thompson Street north of Grand Street dating to the 1910s and 1920s, facing southeast from Thompson Street.

APPENDIX A:
Soil Boring Locations and Logs
and
Geotechnical Report for Block 227





GENERAL NOTES

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2. LOCATION OF BORING SHOWN THUS ⊕
3. LOCATION OF BORING WITH WELL POINT INSTALLED SHOWN THUS ⊕ FRICTION CONE PENETRATION TEST THUS △.

THIS IS TO CERTIFY THAT I HAVE EXAMINED THE SAMPLES & REVIEWED DRILLER'S LOGS, & THAT THE INFORMATION SHOWN ON THE DRAWING CONFORMS THEREWITH.

NEW YORK CITY TRANSIT AUTHORITY

CONTRACT C-31324
TEST BORING FOR CONTRACT A-35672

CANAL ST. STATION
8th. AVE. LINE REHAB.
BOROUGH OF MANHATTAN

BORING LOCATION PLAN

TESTWELL CRAIG
TEST BORING CO., INC.
5430 HARDING HIGHWAY
MAYSLANDING, NJ 08330
(609) 625-4862

PRINCIPAL	DRAWN BY	CHECK BY	DWG No.	SHEET	DATE
FL	PL Platonz	J.S.C	27-1	1 OF 2 SHEETS	1-28-94

DWG 1210 CANAL ST. 8TH. REHAB

BORING # B-1 GROUND SURFACE ELEV. 108.7'

Ground Water Data				* - Method of Advancing Boring	Depth
Depth	Hour	Date	Hrs. After Completion	A 4" CASING	0 to 15'
12.35'		1-25-94	8	B 3 7/8 MUD ROTARY	0 to 35'
12.6'		12/17/93	0	C NX CORE DRILLING	35' to 46'

DEPTH	Sample No.	Depth	N	Soil Classification	Remarks
0				CONCRETE SIDEWALK	4"
	S-1	1'-3'	7-17-7-18	CMF SAND,TR SILT/SH,BLK, MULTI.GRY,MED.DENSE	REC 9",11-65
5	S-2	5'-5'	12-16-9-10	SAME,TR GRAVEL	REC 10",11-65
10	S-3	9'-11'	50-38-46-14	CMF SAND,TR SILT,SH CF GRAVEL/RD,SH,DRY,V.DENSE	REC 12",11-65 BRICK
15	S-4	15'-17'	7-12-15-12	MF SAND,TR C SAND,SH SILT/SH, TAN,MOIST,MED.DENSE	15' FILL ENDS @ 15' REC 15",SP-SM, 7-65
20	S-5	20'-22'	7-13-16-33	MF SAND,TR SILT/SH,BLK,WET, MED.DENSE	REC 14",SP-SM, 7-65
25	S-6	25'-27'	18-25-23-20	CMF SAND,TR SILT & F GRAVEL/ SH,WET,DENSE	REC 14",SM, 7-65
30	S-7	30'-32'	14-16-21-23	SAME	REC 6",SM,7-65
35	S-8	35'-35'2"	50/2"	DECOMPOSED ROCK FRAGMENTS	REC 1",S-65 36' ROCK @ 36' 2-65
	R-1	36'-41'	DRILL 60" REC. 50" (91%) RQD: 4.85 (97%)	SLIGHTLY FRACTURED SCHIST,TR QUARTZ,FEW WEATHER SEAMS	2-65
45	R-2	41'-46'	DRILL 60" REC. 50" (97%) RQD 4.35" (87%)	SAME	46'
50				T.B.C. @ 46'	

INSTALLED 28' OF 2" DIAMETER SCH. 40 PVC WELL PIPE (INCLUDING 10' MACHINE-SLOTTED WELL SCREEN) AT THIS LOCATION TO MONITOR GROUNDWATER LEVELS.

BORING # B-2 GROUND SURFACE ELEV. 104.8'

Ground Water Data				* - Method of Advancing Boring	Depth
Depth	Hour	Date	Hrs. After Completion	A 4" CASING	0 to 20'
8.9'		1-25-94	0	B 3 7/8 MUD ROTARY	0 to 60'
9.3'	10AM	12/15/93	0	C	10

DEPTH	Sample No.	Depth	N	Soil Classification	Remarks
0	S-1	1'-2'2"	30-12-50/3"	CONCRETE SIDEWALK, MF SAND,SH CF GRAVEL,TR SILT/BN,DRY,V.DENSE	8" REC 14",11-65
5	S-2	5'-7'	19-26-14-13	SAME/MOIST	REC 5",11-65
10	S-3	10'-12'	1-1-2-2	CMF SAND,SH CLAYEY SILT/BN, GY,WET,LOOSE	REC 18",11-65
15	S-4	15'-17'	15-21-25-18	CMF SAND,TR F GRAVEL,TR CLAY & SILT/BN,MOIST,DENSE	REC 12",11-65 17'
20	S-5	20'-22'	2-1-3-3	PEAT,TR SILT/BLK,BN,MOIST	REC 18",OL-PT, 11-65
25	S-6	25'-27'	2-4-10-9	F SAND & SILT/BN,MOIST,MED. DENSE,DECAY OF VEGETATION	REC 24",PT-OL, 11-65,SM,10-65
30	S-7	30'-32'	4-3-2-7	F SAND & SILT/GY,MOIST,LOOSE TR OF SHELLS	REC 16",OL, 11-65,SM,10-65
35	S-8	35'-37'	1-2-1-2	F SAND & SILT/GY,WET,LOOSE TR OF SHELLS	REC 9",OL, 11-65,SM,10-65
40	S-9	40'-42'	5-10-13-9	SILT,SH F SAND,TR F GRAVEL/ BN,WET,STIFF	REC 3",ML-SM, 10-65
45	S-10	45'-47'	17-19-16-17	MF SAND & CF GRAVEL/BN,WET, DENSE	REC 1",SM-SM, 7-65
50	S-11	50'-52'	13-11-13-14	CMF SAND,SH SILT & F GRAVEL/ BN,WET,MED.DENSE	REC 12",SM-SM, 7-65
55	S-12	55'-57'	34-32-23-16	CMF SAND & CF GRAVEL,SH SILTY CLAY/BN,MOIST,DENSE	REC 5",SM-SM, 7-65
60	S-13	60'-60'3"	100/3"	DECOMPOSED ROCK T.B.C. @ 60'3"	REC 3",S-65 60'3"

INSTALLED 59' OF 2" DIAMETER SCH. 40 PVC WELL PIPE (INCLUDING 10' MACHINE-SLOTTED WELL SCREEN) AT THIS LOCATION TO MONITOR

LEGEND

A - WATER READING & DATE TAKEN
B - NUMBER OF BLOWS OF A 300LB. HAMMER FALLING 18 INCHES REQUIRED TO DRIVE A 4" CASING (UNLESS OTHERWISE NOTED) EACH 12 INCHES.
C - STRATA DESCRIPTION
D - NUMBER OF BLOWS OF A 140LB. HAMMER (UNLESS OTHERWISE NOTED) FALLING 30 INCHES REQUIRED TO DRIVE A 2 INCH SPLIT SPOON 6 INCHES.
E - SAMPLE NUMBER
F - DEPTH OF SAMPLE
G - SAMPLE RECOVERY IN INCHES
H - UNIFIED SOIL CLASSIFICATION
I - NEW YORK CITY CLASSIFICATION
J - SYMBOLS: S - 2" O.D. SPLIT SPOON SAMPLE
U - UNDISTURBED SAMPLE
RUN - CORE DRILLING
N.R. - NO RECOVERY

ABBREVIATIONS

Bn - brown	Gy - gray	Multi - multi colored
Blk - black	Rd - red	C - Coarse grained
Or - orange	Bl - blue	M - Medium grained
Lt - light	Dk- dark	F - Fine grained

GENERAL NOTES

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2. LOCATION OF BORING SHOWN THUS. -●-
3. LOCATION OF BORING WITH WELL POINT INSTALLED SHOWN THUS -⊕- FRICTION CONE PENETRATION TEST THUS △.
4. M/F, C/F ETC. DENOTES "MEDIUM TO FINE", "COARSE TO FINE".
5. RB DENOTES ROLLER BIT. *-DENOTES 300LB. HAMMER.
6. O.E.S. DENOTES OPEN END SAMPLE
7. 4" CASING USED (OR OTHERWISE NOTED).
8. 2 1/4" CORE BIT USED (OR OTHERWISE NOTED).
9. R.Q.D. DENOTES "ROCK QUALITY DESIGNATION", WHICH IS THE TOTAL LENGTH OF PIECES OVER FOUR INCHES IN A GIVEN RUN DIVIDED BY THE LENGTH OF THE GIVEN RUN.
10. 11-65, 7-65 ETC. REFER TO CLASS OF MATERIAL DESCRIBED IN C26-1103.4, TABLE 11-2 OF THE BUILDING CODE OF THE CITY OF NEW YORK.
11. (SP), (ML), ETC. REFER TO THE UNIFIED SOIL CLASSIFICATION SYSTEM DESCRIBED IN C26-1103.1, TABLE 11-1 OF THE BUILDING CODE OF THE CITY OF NEW YORK.
12. W.O.R. DENOTES WEIGHT OF ROD(S).
13. UD DENOTES UNDISTURBED SAMPLE, 30" LONG, 3"O BRASS TUBE.
14. "TRACE" DENOTES LESS THAN 10%. "LITTLE" DENOTES FROM 10 TO 20%. "SOME" DENOTES FROM 20 TO 40%.

THIS IS TO CERTIFY THAT I HAVE EXAMINED THE SAMPLES & REVIEWED DRILLER'S LOGS, & THAT THE INFORMATION SHOWN ON THE DRAWING CONFORMS THEREWITH.

NEW YORK CITY TRANSIT AUTHORITY

TESTWELL CRAIG
TEST BORING CO., INC.
5438 HARDING HIGHWAY
MAYSLANDING, NJ 08330
(609) 625-4662

CONTRACT C-31324
TEST BORING FOR CONTRACT A-35672

CANAL ST. STATION
8th. AVE. LINE REHAB.
BOROUGH OF MANHATTAN

BORING SECTIONS

PRINCIPAL	DRAWN BY	CHECK BY	DWG No.	SHEET	DATE
	P.L.	J.S.C.	27-2	2 OF 2 SHEETS	1-28-94

P. Lattanzi
S. Scott CRAIG

DWG # 1220 CANAL ST. STA REHAB.

RA Consultants

Geotechnical Engineering

Robert Alperstein, P.E.
Principal

September 18, 2007

07C1028

Lee Samuels
Brack Capital Realty LLC
885 Third Avenue, 24th Floor.
New York, NY 10022

re: Report of
Supplementary Geotechnical Investigation
Proposed Grand Street Hotel
New York, NY

Dear Mr. Samuels:

This report is submitted in accordance with our proposal dated March 29, 2007 and authorized by Elad Madany on April 4, 2007. It covers geotechnical services related to the design and construction of the proposed 18-story hotel building with basement in lower Manhattan.

The site is located at the corner of Grand Street and the Avenue of the Americas on the lower West side of Manhattan just North of Canal Street. It is a roughly trapezoidal shaped lot with approximate dimensions of 142'x 93' and approximate area of 13,200-ft^2. The site is bordered by Grand Street, Thompson Street, Avenue of the Americas and open property on the South. The proposed building's footprint will occupy the 11,500- ft^2 area as estimated from the plans provided to us.

An existing MTA subway lies below grade adjacent to the site along Avenue of the Americas. A seven story brick structure borders the site at the northeast corner and lower rise structures occupy the south portion of the site. The existing open areas of the site are used as a parking lot. The seven story structure shows signs of settlement and tilts away from the site towards the east and towards the site to the south. The low rise structures will be demolished to make way for the project.

Available maps indicate that the general area was once a swamp or traversed by meandering streams. The swamp was drained and filled in the early 1800's. The current site grade ranges from about el 3.5 to the north and 6.0 to the south (Borough of Manhattan Datum [BMD]). We had anticipated that the subsoils at the site probably consist of about 20-ft of granular uncontrolled fill underlain by compressible organic soils underlain by sands. Bedrock was expected at

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about 125-ft or more below existing grade and groundwater should be consistent with the nearby Hudson River level at about el 2, BMD.

A Geotechnical Report dated May 19, 2005 prepared by Mueser Rutledge Consulting Engineers (MRCE) was provided to us. That report provided the logs of seven borings located within the site. We recommended one additional boring and you requested four more borings to supplement the available MRCE data. The MRCE report and the subsequent supplementary geotechnical investigation generally confirmed our expectations with some variations as described below.

Scope of Services

The purpose of our services was to provide recommendations for design and construction of foundations based on the available data and the data obtained during the investigation.

We provided the following services:

1. Assisted Felix Ferrer in obtaining MTA approval to drill borings at the site.
2. Engaged Warren George Inc. (WGI) to implement the exploration program as described above.
3. Observed the drilling operations to log the samples in the field and verify that proper procedures were used.
4. Conducted laboratory index property tests (Atterberg limits, moisture content determinations and grain size analyses) to supplement and confirm field classifications.
5. Evaluated the available data and prepared this report.
6. Prepared technical specifications for mini-caissons
7. Attended meetings and discussed our findings with you and members of the design team.

Investigation

Five borings were drilled WGI during the period August 9 – 23, 2007. A truck mounted Mayhew rotary drill rig was used in the parking lot area and limited access Davey Kent DK-50 rotary rig was used in other areas. Bio-degradable drilling mud was used to stabilize the borehole after variable lengths of steel casing was used to prevent the fill from caving into the borehole. RA Consultations provided full time observation of the drilling operations (controlled inspection). RA Consultants boring logs are presented in Appendix A. MRCE boring logs are presented in Appendix B.

Index property tests were conducted by Geotesting Services Inc. The tests consisted of grain size analyses, moisture contents and Atterberg limits. Test results are presented in Appendix C.

Subsurface Conditions

We have excerpted MRCE's interpretation of the subsurface conditions as follows:

Subsurface conditions are illustrated on Geologic Sections A-A and B-B on Drawings Nos. GS-1 and GS-2.

General descriptions of the subsurface strata encountered are summarized below in order of their occurrence with depth:

Stratum F - Fill (NYC Class 11-65). The uppermost soil encountered in each boring is a layer of fill ranging in thickness from 7 to 23.5 feet. The fill layer is generally thicker in the garage area, becoming thinner to the north. The fill consists of medium compact to loose, brown fine to coarse sand, with some silt, some to trace gravel, and inclusions of bricks, concrete fragments and wood. N- Values typically range from 1 to 27 blows per foot (bpf), with one high value of 50 bpf. The erratic sampling resistance indicated that the amount of large gravel and other potential obstructions may be greater than indicated in the borings, and that the material was not placed in a controlled manner.

Stratum S1 - Upper Sand - Possible Fill (NYC Class 11-65). In all borings except Boring No. B-6P, the fill stratum is underlain by 10 to 21.5 feet of sand. This stratum consistently extends to a depth of about 25 to 30 feet. Stratum S 1 is loose to medium compact, brown fine to coarse sand with some to trace silt and trace to some gravel and occasional organic silty clay layers and inclusions. N-values ranged from 2 to 26 blows per foot, with one value of 60 bpf, and averaged 12 bpf. Based on our involvement with previous projects in the vicinity and historical information, we suspect that this sand layer may be fill placed in the 1800's using nearby sand hills to initially fill the marsh. We have chosen to describe this stratum as sand - possible fill rather than fill, since the layer consists of natural soils without obvious manmade inclusions.

Stratum O - Peat (NYC Class 11-65). In all borings the fill and sand layers are underlain by 10 to 11.5 feet of peat and organic soils representing the marsh deposits. The upper portion and majority of the meadow deposit is a medium to stiff, dark gray to brown fibrous peat and wood with trace of fine sand. In some of the borings the peat is underlain by soft organic silt with clay and fine sand. Obstructions in the peat indicate that tree trunks or old pilings are also present. Natural water contents range from 85 to 429 percent, with an average of 300 percent. Water contents at the low end of the range were measured in the lower, siltier zones in this stratum. Standard Penetration Test values range from 4 to 37 bpf with an average of 11 bpf.

Stratum M - Silt, Clay, and Sand (NYC Class 10-65). In all borings, the organic marsh deposits are underlain by 10 to 20 feet of glacial lake deposits. This stratum consists of soft to medium, gray clayey silt and silty

clay, with layers of silty fine sand and fine sandy silt. Natural water content of cohesive samples ranges from 29 to 50 percent with an average of 38 percent. N-values range from weight of hammer to 12 bpf.

Stratum S2 - Lower Sand (NYC Class 7-65). In all borings the above-described strata are underlain by 11.5 to 40 feet of sand. This lower sand layer consists of medium compact, brown fine to coarse sand, trace to some silt and gravel. SPT values range from 9 to 46 bpf and average 19 bpf.

Stratum T- Till (NYC Class 6-65). In all borings the above-described deposits overlie 3.5 to 29 feet of glacial till. The till consists of medium compact to very compact, brown and redbrown fine to coarse sand, some to trace silt, trace gravel to gravelly, trace of mica and occasional boulders and cobbles. The top of this stratum is at approximately El. -75 to El. -89 in the northern half of the site, and rises to between El. -49 and El. -54 in the southern half of the site. Standard Penetration Test values range from 6 to more than 100 bpf with an average of 37 bpf. This stratum was denser and contained more boulders in borings made in the north portion of the site.

Stratum WR - Weathered Rock (NYC Class 4-65). In Borings Nos. B-6P and B-7, both in the southern portion of the site, the glacial till stratum is underlain by 4 to 11.5 feet of weathered rock. This stratum is described as weathered to intermediate, slightly weathered, gray gneissic schist, broken to closely jointed, with weathered joints. In Boring No. B-7 the weathered rock was not sampled, but rather inferred from the drilling characteristics.

Stratum R - Rock (NYC Classes 2-65 and 1-65). All borings were terminated after penetrating a minimum of 10 feet into intact bedrock, except Boring No. B-6P which penetrated 5 feet into intact bedrock and 11.5 feet of weathered rock. The bedrock is typically medium hard to hard, unweathered to slightly weathered, gray gneissic schist, blocky to jointed, with occasional pegmatite and hard quartz zones, broken zones, and slightly weathered joints. The bedrock surface varies from El. -81 in the southern part of the site to El. -100 in the northwest corner of the site, and is contoured on Drawing No. B-1. Rock core recovery ranged from 60 to 100 percent, averaging 91 percent. RQD ranged from 30 to 100 percent, averaging 83 percent.

Groundwater. The groundwater level was measured in the two observation well piezometers. Water levels ranged in depth from 7.6 to 9.6 feet, corresponding to a range of El. -2.6 to El. -3.2. Logs produced by AKRF indicate that the groundwater level ranged from 9 to 11 feet below the ground surface, corresponding to an approximate range of El. -4 to El. -6.

The stratigraphy based on the borings drilled for this investigation generally was consistent with the MRCE borings and we have maintained the MRCE strata designations. However, in our judgment the upper sand deposit probably is fill because the area was once a swamp or marsh deposit and the soils overlying the organic soils probably are man-made. The MRCE geologic sections are included at the end of this report retaining their original MRCE titles.

The thicknesses of the various strata as reported by MRCE are compared to the thicknesses encountered in this investigation in Table 1 and groundwater measurements are compared in Table 2. Groundwater levels recorded during this investigation were about El. -5. Contours of the top of bedrock as inferred from the MRCE borings and the borings drilled for this investigation are show in Figure 2.

Evaluation and Recommendations

Suitable Foundations

The fill and organic strata are unsuitable for supporting the foundations of the proposed 18-story structure because they are incapable of supporting the heavy building loads without excessive settlements. Therefore deep foundations (piles or caissons) must bypass these materials. Because of the presence of the MTA subway beneath Avenue of the Americas and the potentially unstable conditions of the adjacent seven story structure impact pile driving should be avoided if at all possible.

In areas of high load intensity high capacity mini-caissons foundations cased off to the bedrock and then drilled into the bedrock and filled with cement grout can develop the required support. The design loads would depend on the size of the casing, reinforcing, strength of the concrete and the rock socket length. Typical caisson designs are presented in Table 2. The foundation contractor should be given the option of presenting its own design alternative as these often depend on the contractor's means and methods. In our opinion no load testing of mini-caissons is required, but each caisson should be monitored with down-the-hole TV cameras as part of the controlled inspection process.

Mini-piles penetrating approximately 20-ft into the lower sand and/or till may be used to develop 30-ton design loads without load tests in areas of low load intensity. Typically, these piles would be installed by first rotating a steel casing having a nominal inside diameter of 8-in into the ground and cleaning out the soil. Then, grout is installed by pressure grouting as the steel casing is removed from the ground. Finally, reinforcing is placed as necessary. Other installation methods are available including a self drilling pressure grouted hollow thread bar. Again, the contractor should be given the option of presenting its own design.

Adjacent to the MTA subway structure the deep foundations will require a sleeve extending to the subway's influence line to prevent loads from being applied to the subway structure.

Settlements of mini-caissons may be about equal to the elastic shortening of the element or about ¼ to $^3/_8$-in. Settlements of mini-piles may be about ½-in.

Slab on Grade

The basement slab may be supported on grade since the basement excavation will have removed considerably more load than the design loads on the slab. However, the subgrade should be over excavated at least 12-in and compacted with at least four overlapping passes of a twin-drum walk behind vibratory roller. Observed weak or weaving areas should be compacted until firm or removed and replaced with crushed stone, gravel or equal. Crushed stone or gravel should be placed in 6-in thick lifts and each lift compacted with 4 passes of the same roller to bring the subgrade to its design elevation. The slab may be designed for a coefficient of subgrade reaction of 50-t/cu.ft and maximum edge stress of 2-t/sq. ft.

Groundwater Control

Recent groundwater levels were recorded at about El. -5 and a reasonable long term design level is about El. 0, in our opinion. However, the site is in a flood plain area and a worst case scenario of groundwater level at ground surface should be considered.

During Construction- Localized sump pumping may be necessary where pile cap excavations extend below about el -4, or for elevator pits. Tight sheeting around these areas may be required to minimize the extent of the groundwater lowering

After Construction- In our opinion water level at El 0 should be considered for design purposes, and as a worst case scenario of water main break or flood it should be considered at street grade. The slab may be waterproofed and designed as a pressure slab to resist hydrostatic uplift pressures or an underslab drainage system may be provided to relieve the uplift pressures and protect floor slabs lying below the design levels.

A water proofed pressure slab resisting sustained high water pressures could experience slight leakage through the concrete. Depending on the proposed use of the basement space the slight leakage could be controlled and hidden from view by use of a double slab system with crushed stone or gravel and drainage pipes between the two slabs. The crushed stone or gravel should have a maximum particle size of 1-in and zero passing the No. 200 sieve. The drainage pipes should be perforated 4-in diameter PVC wrapped in a non-woven geotextile spaced about 25-ft apart and pitched to drain to sumps equipped with self activating pumps having a capacity of at least 10-gal/min. The potential for pipe clogging is minimal because the flow would be through fine cracks in the concrete and the geotextile wrap should prevent entrance of any minor fines into the pipes. Therefore, systematic cleanouts are unnecessary, in our opinion. However, providing at least two access points to the pipes would be prudent. Alternatively, if visual exposure of the leakage is acceptable it could be controlled with narrow and shallow troughs around the basement slab perimeter and directed to the sumps.

The underslab drainage system should consist of a granular drainage layer at least 6-in thick with 6-in diameter perforated PVC drainage pipes spaced on approximately 15- ft centers. The drainage layer material should have a maximum particle size of 1-inch with

zero passing the No. 200 sieve. It should be placed over a non-woven geotextile placed directly on the subgrade. The drainage pipes should be surrounded by at least 6-in of the drainage material and should be pitched at a minimum slope of ¼ percent to drain to the sump provided with self-activating sump pump.

Permanent Basement Walls-

The design of basement walls should consider the following two conditions:

1. *Static earth pressures at rest.* The walls may be designed to resist earth pressures at rest with a total lateral triangular distribution increasing at the rate of 63-lbs/ft^2/ft and 93- lbs/ft^2/ft above and below the ground water level, respectively. The walls should be checked to be fail-safe with groundwater level at the ground surface.

2. *Active earth pressures plus seismic pressures.* The active pressures may be computed as 42-lbs/ft^2/ft and 84- lbs/ft^2/ft above and below the design groundwater level, respectively. The seismic force should be distributed as an inverse triangle from the ground surface to the base of wall. The intensity of the seismic pressure may be calculated as 11z and 5.6z above and below the water table, respectively, where z is the depth of the wall in ft below grade (the seismic pressure is in lbs/ft^2/lin ft of wall)

Basement walls should be waterproofed for their full depth.

Underpinning and Temporary Retaining Structures

Underpinning will be necessary if the proposed excavation level is below adjacent foundations. The contractor should verify the existing foundation elevations in the field before proceeding with mass excavation. Because of the poor soil conditions and the uncertain conditions of the adjacent seven story structure underpinning should consist of pin piles drilled below the soft deposits. Tight sheeting or lagging should be used in excavating the approach pits to minimize movement of fines from beneath the adjacent footings or floor slabs. Steel wedges or jacking should be used to transfer the foundation loads to the underpinning. Slight settlements of underpinned structures should be expected during the underpinning process. These movements can be minimized by use of jacking.

The underpinning should be designed to resist lateral earth pressures as well as the vertical foundation loads.

Because of the potential for movements during underpinning as discussed above and the uncertain stability of the existing seven story building we recommend that the proposed building subgrade be matched to that of the seven story building thereby minimizing or eliminating the need for underpinning.

Retaining structures may be required to support the walls of the excavation. These walls will also provide lateral support to maintain the integrity of the ground and nearby structures. With a deep excavation in granular soils some settlement of the adjacent ground (or buildings) should be expected. If the groundwater is controlled properly settlements of about ¼ percent to ½ percent of the excavation depth are typical for braced or pre-stressed tied back soldier pile walls. The zone that may experience settlements should be expected to extend a horizontal distance from the excavation equal to about 1½- to 2-times the depth of the excavation, with the settlement diminishing with distance from the excavation.

The above estimates of adjacent settlements assume no unusual foundation conditions, such as timber piles that might deteriorate (or already be deteriorated) with ground water lowering, or the presence of unknown compressible clays or organic soils. Since organic soils underlie the project site adjacent settlements could be at the high end (or higher) of the expected settlement range. This is another reason to minimize the depth of excavation for the project.

Supported soldier pile walls with lagging and more than one level of tiebacks or braces may be designed for a rectangular pressure diagram with ordinate based on 0.65 x the maximum active pressure. The active pressure may be calculated using the unit weights given above (with due consideration to the drawn down water table and contractor's surcharge) and a soil friction angle (ϕ') of 32°. Surcharges adjacent to the wall should be considered in the design.

The MTA will require submittal of an engineered design of the temporary retaining system adjacent to the subway structures before granting approval for the construction.

A preconditions survey of adjacent buildings and MTA facilities should be undertaken prior to construction to provide information that would help to avoid unjustified claims and allow for fair settlement of legitimate claims. The adjacent buildings and MTA facilities should be monitored for settlement and lateral movement during construction. The retaining system deformations also should be monitored during construction.

Seismic Considerations

Site Factor- More than 40-ft of uncontrolled fill, loose sand, peat and soft clay will underlie the pile caps. Therefore, in our opinion the site should be characterized as S_4 with site factor 2.5 in accordance with Table 23-J of the current New York City Building Code.

Liquefaction Potential- We evaluated the site's liquefaction potential using the Simplified Seed-Idriss Procedures with a Magnitude 6 design earthquake and peak ground acceleration of 0.15g. Analysis of the MRCE borings suggests a significant potential for liquefaction within a depth of about 15- to 20-ft below ground surface. Similar analysis of the borings drilled for this investigation suggests a low potential for liquefaction.

The implication of the significant liquefaction potential is estimated ground settlements of about 2½-in after the design earthquake occurs. Should such settlements occur they would cause downdrag loads on the mini-caissons or mini-piles. These loads would be essentially permanent (after the earthquake) because the resulting settlement of the rock supported mini-caissons would be negligible. Settlements of mini-piles are likely to be quite small such that the downdrag loads would not be relieved by the settlements.

Considering the differences in the results of the two investigations, the probability of the design earthquake occurrence and the overall implications to the project we recommend that the design loads for the mini-piles or caissons include a downdrag allowance of 5-tons per pile or caisson.

Limitations

The recommendations presented above are based on our evaluation of the three borings drilled for this investigation and our understanding of project conditions as provided to us by others. If project conditions change or if subsurface conditions are found to vary from those described herein we should be requested to modify our recommendations accordingly.

We appreciate this opportunity to be of service and look forward to working with you as the project proceeds.

Very truly yours,
RA CONSULTANTS

Robert Alperstein, P.E.

Table 1

Grand Street Hotel

Comparison of Strata Thicknesses

Stratum	Thickness (Ft)	
	MRCE Report	This Investigation
Fill	7 - 23.5	5 - 8.5
Upper Sand	10 - 21.5	20 - 40
Peat	10 - 11.5	5 - 25
Silt, Clay and Sand	10 - 20	5 - 17
Lower Sand	11.5 - 40	5 - 25
Till	3.5 - 29	13 - 36
Weathered Rock	4 - 11.5	Not encountered
Rock	El -81 to -100	El -84.5 to -101.5

Table 2

Grand Street Hotel

Summary of Groundwater Level Data

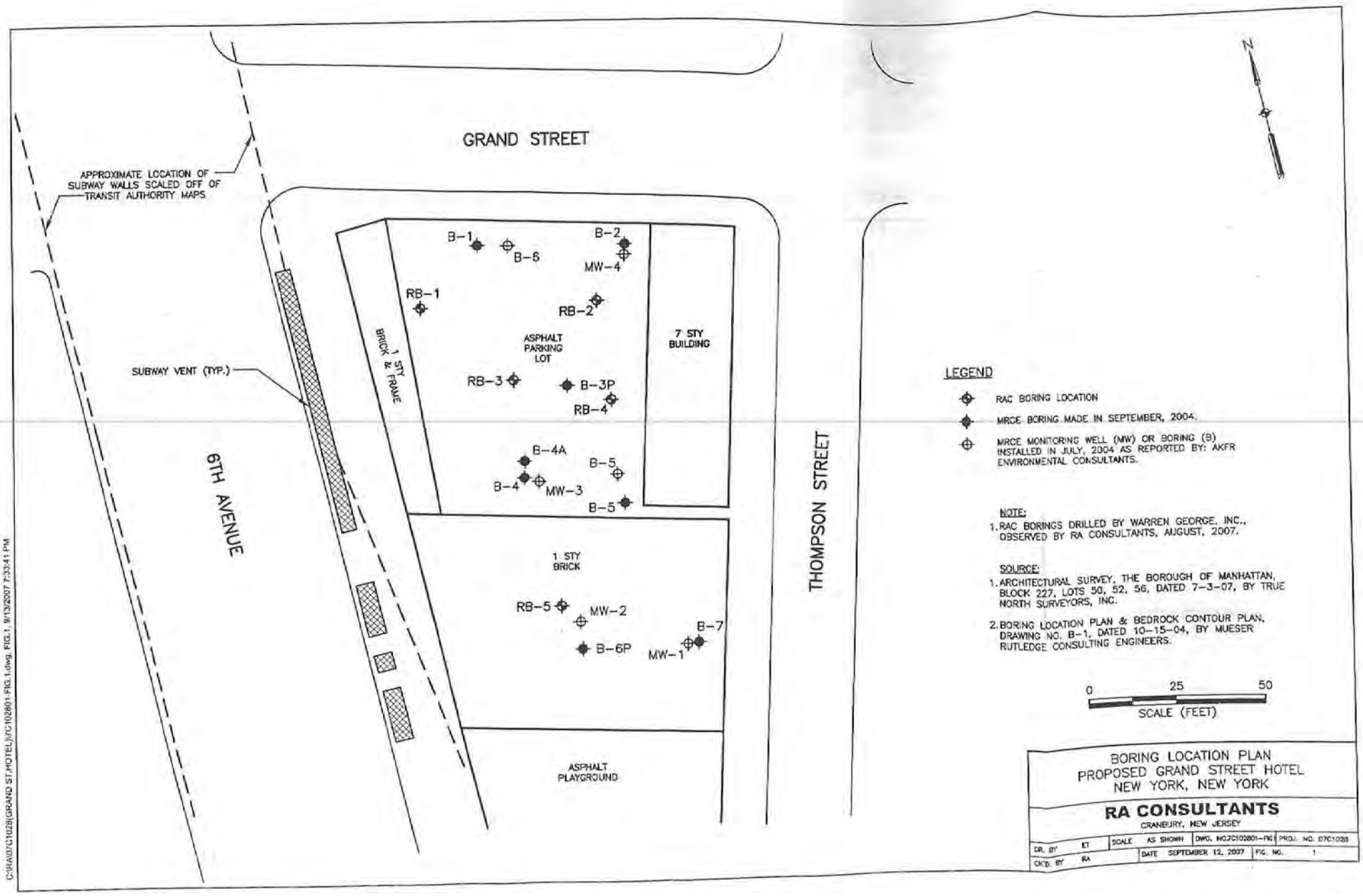
		Depth to water				Water Elevation			
Well No	Approx. Surface Elev	6/8/2007 (1)	8/8/2007 (1)	8/21/2007 (2)	8/22/2007 (2)	6/8/2007 (1)	8/8/2007 (1)	8/21/2007 (2)	8/22/2007 (2)
1	4.73	-7.75	-9.4	-10.03	-9.5	-3.02	-4.67	-5.3	-4.8
2	5.41	-11.5	-10.3	-12.01	-11.2	-6.09	-4.89	-6.6	-5.8
3	3	-9.6	-7.8	NA	-9.5	-6.6	-4.8	NA	-6.5
4	6.55	-10.25	-11	-11.35	-10.6	-3.7	-4.45	-4.8	-4.0
5	6.55	-12.45	-11.2	-12.65	-11.6	-5.9	-4.65	-6.1	-5.0
6	6.55	-12.25	NA	-12.25	NA	-5.7	NA	-5.7	NA
B-1 (3)	4	NA	NA	-11	-9.5	NA	NA	-7	-5.5

Notes:
(1) Water levels provided by BRCE.
(2) Water levels recorded by RA Consultants.
(3) Well closest to Subway.
(4) Groundwater levels taken by Mueser Rutledge Consulting Engineers in 2004 ranged between Elev. -2.6 to Elev. -3.2.
(5) Groundwater levels taken by AKRF in environmental borings ranged between Elev. -4 to Elev. -6.
(6) All wells were flushed with water and appear to be functional.

Table 3

Typical Mini-Caisson Designs

Design Capacity	175 T	275 T	350 T	500 T
Casing Size	9.625" x 0.5"	9.625" x 0.5"	13.375" x 0.5"	13.375" x 0.5"
Reinforcing	1 #20 Gr 75	1 #28 Gr 75	1 #28 Gr 75	2-#28 Gr 75
Grout Strength	3000 psi	8000 psi	6000 psi	8000 psi
Socket Length	7-ft	10.5-ft	9-ft	13-ft



LEGEND

- RAC BORING LOCATION
- MRCE BORING MADE IN SEPTEMBER, 2004.
- MRCE MONITORING WELL (MW) OR BORING (B) INSTALLED IN JULY, 2004 AS REPORTED BY: AKFR ENVIRONMENTAL CONSULTANTS.

NOTE:

1. RAC BORINGS DRILLED BY WARREN GEORGE, INC., OBSERVED BY RA CONSULTANTS, AUGUST, 2007.

SOURCE:

1. ARCHITECTURAL SURVEY, THE BOROUGH OF MANHATTAN, BLOCK 227, LOTS 50, 52, 56, DATED 7-3-07, BY TRUE NORTH SURVEYORS, INC.
2. BORING LOCATION PLAN & BEDROCK CONTOUR PLAN, DRAWING NO. B-1, DATED 10-15-04, BY MUESER RUTLEDGE CONSULTING ENGINEERS.

0 25 50

SCALE (FEET)

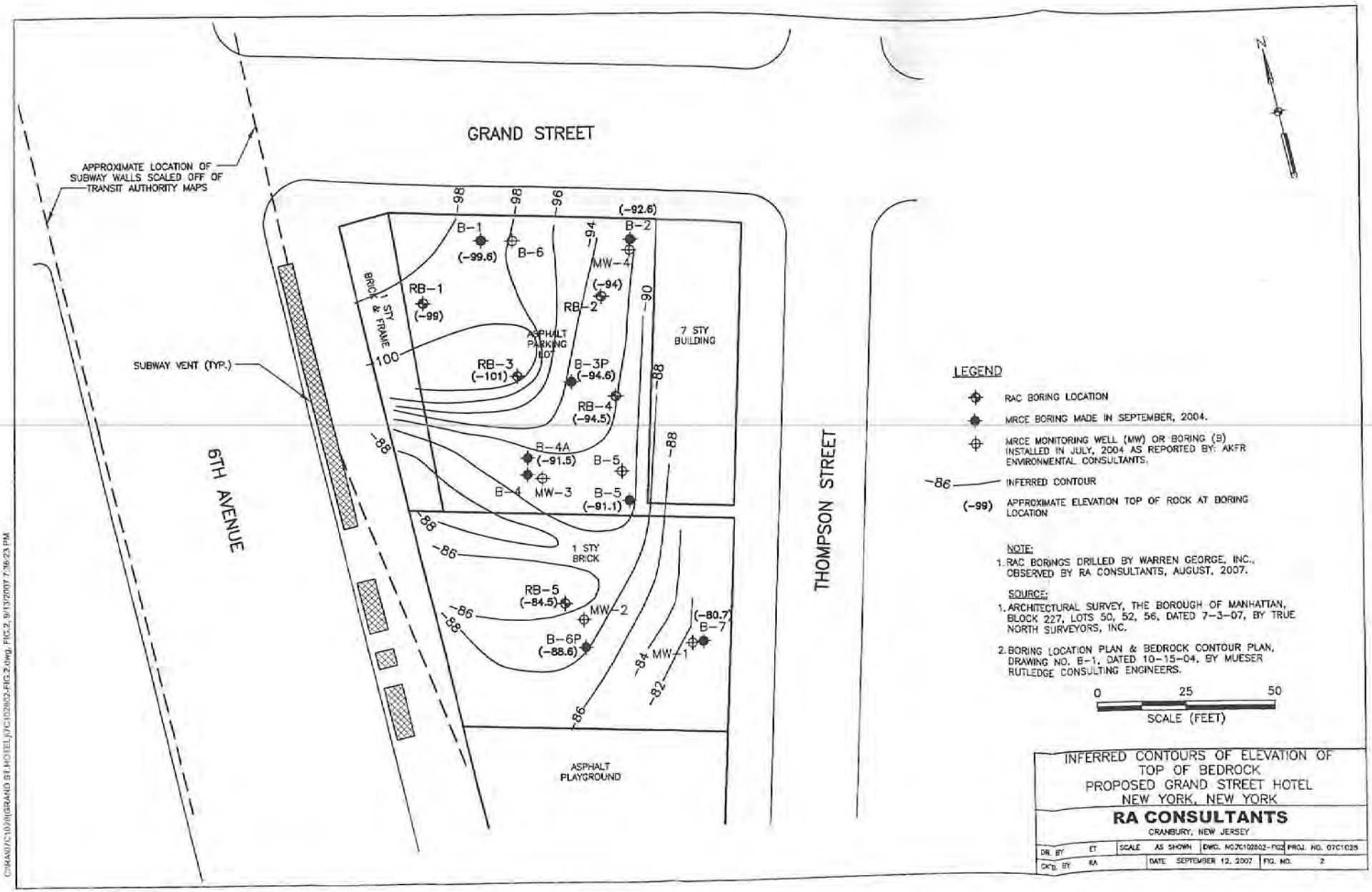
BORING LOCATION PLAN
PROPOSED GRAND STREET HOTEL
NEW YORK, NEW YORK

RA CONSULTANTS

CRANBURY, NEW JERSEY

DR. BY ET	SCALE AS SHOWN	DWG. NO. C102801-FIG	PROJ. NO. 07C1028
CK'D. BY RA	DATE SEPTEMBER 12, 2007	FIG. NO. 1	

C:\RA\07\C1028\GRAND ST.HOTEL\07C102801-FIG.1.dwg, FIG.1, 9/13/2007 7:33:41 PM

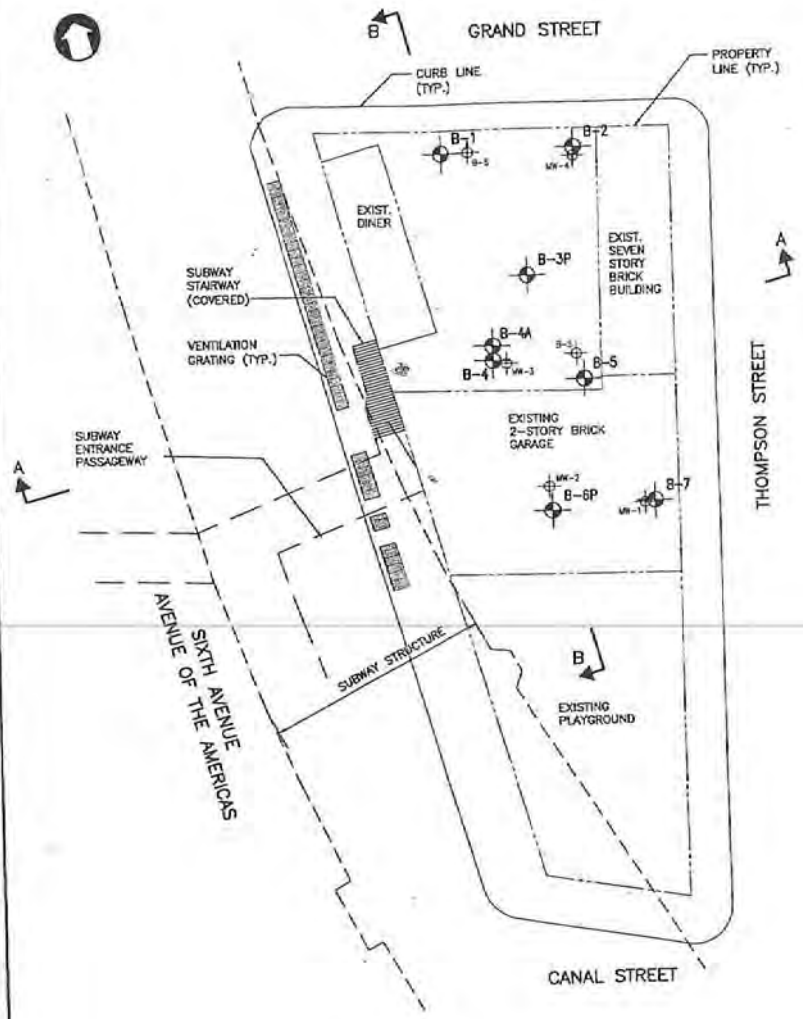


INFERRED CONTOURS OF ELEVATION OF TOP OF BEDROCK
PROPOSED GRAND STREET HOTEL
NEW YORK, NEW YORK

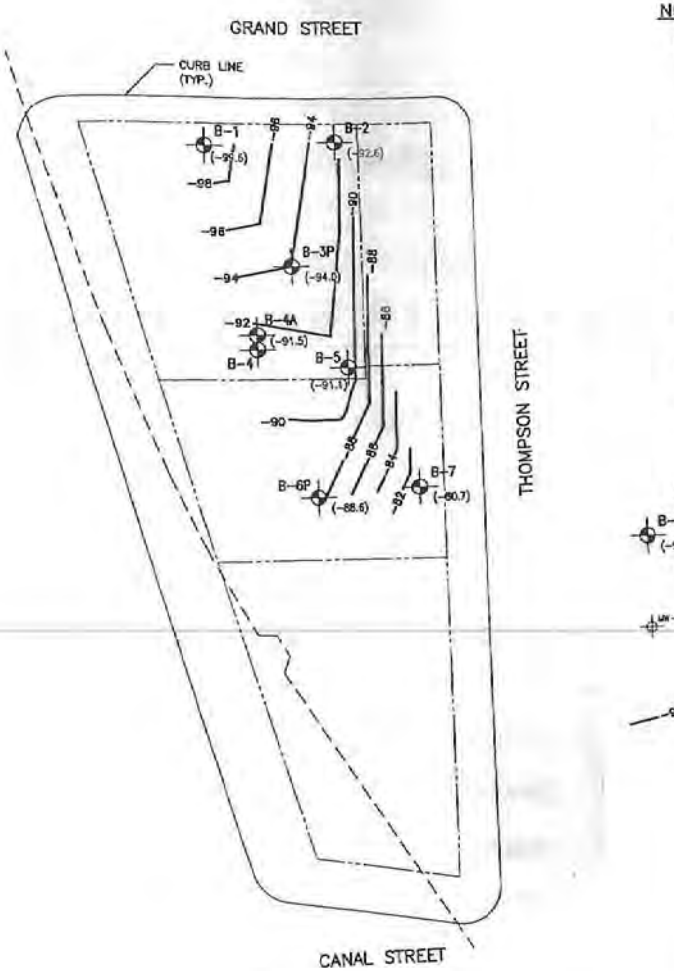
RA CONSULTANTS
CRANBURY, NEW JERSEY

DR. BY	ET	SCALE	AS SHOWN	DWG. NO. 7C102802-FIG2	PROJ. NO. 07C1028
CK'D. BY	RA	DATE	SEPTEMBER 12, 2007	FIG. NO.	2

C:\RA\07C102\GRAND ST HOTEL\07C102802-FIG 2.dwg, FIG 2, 9/13/2007 7:36:23 PM



BORING LOCATION PLAN



BEDROCK CONTOUR PLAN

GRAPHIC SCALE

20' 10' 0 20' 40'

NOTES:

1. BASE PLAN AND AS-DRILLED LOCATIONS AND GROUND SURFACE ELEVATIONS FOR BORINGS NOS. B-1 THROUGH B-7 AND MONITORING WELLS NOS. MW-1 THROUGH MW-4 WERE OBTAINED FROM SURVEY BY TOPOGRAPHIC SERVICES, DATED OCTOBER 11, 2004.
2. LOCATION OF AKRF BORINGS NOS. B-5 & B-6 OBTAINED FROM FIGURE NO. 2 BY AKRF, DATED JULY 30, 2004.
3. SUBWAY STRUCTURE LOCATION OBTAINED FROM CONTRACT DRAWINGS FOR ROUTE NO. 101, SECTIONS NOS. 3 AND 4 OBTAINED FROM NYC TRANSIT FILES.
4. BORINGS NOS. B-1 THROUGH B-7 WERE MADE BETWEEN SEPTEMBER 13 AND 27, 2004 BY AQUIFER DRILLING & TESTING, INC. UNDER CONTINUOUS INSPECTION BY MUESER RUTLEDGE CONSULTING ENGINEERS.
5. FOR GEOLOGIC SECTIONS A-A AND B-B SEE DRAWING NO. GS-1. FOR GEOLOGIC SECTION B-B, SEE DRAWING NO. GS-2.
6. ELEVATIONS OF TOP OF BEDROCK AT BORINGS INTERPRETED FROM BORING LOGS.
7. CONTOURS ILLUSTRATE SIMPLIFIED INTERPRETATIONS OF THE TOP OF BEDROCK AND MAY NOT REPRESENT ACTUAL SUBSURFACE CONDITIONS.

LEGEND

B-3P (-94.0) — BORING MADE IN SEPTEMBER, 2004.
INDICATES ELEVATION OF TOP OF BEDROCK.
"P" INDICATES PIEZOMETER INSTALLATION
"A" INDICATES OFFSET FROM ORIGINAL LOCATION.

MW-1 — MONITORING WELL (MW) OR BORING (B) INSTALLED IN JULY, 2004 AS REPORTED BY: AKRF ENVIRONMENTAL CONSULTANTS.

-94 — CONTOUR OF ELEVATION OF TOP OF BEDROCK.

HUDSON ISLAND 74-88 SIXTH AVENUE
NEW YORK NEW YORK

INTELL MANAGEMENT AND INVESTMENT COMPANY
NEW YORK NEW YORK

MUESER RUTLEDGE CONSULTING ENGINEERS
14 PENN PLAZA – 225 W. 34TH STREET, NY, NY 10122

SCALE	MADE BY A.H.	DATE 10/15/04	FILE NO.
GRAPHIC	CHECKED BY R.T.W.	DATE 10/15/04	10271

BORING LOCATION PLAN & BEDROCK CONTOUR PLAN

DRAWING NO. B-1

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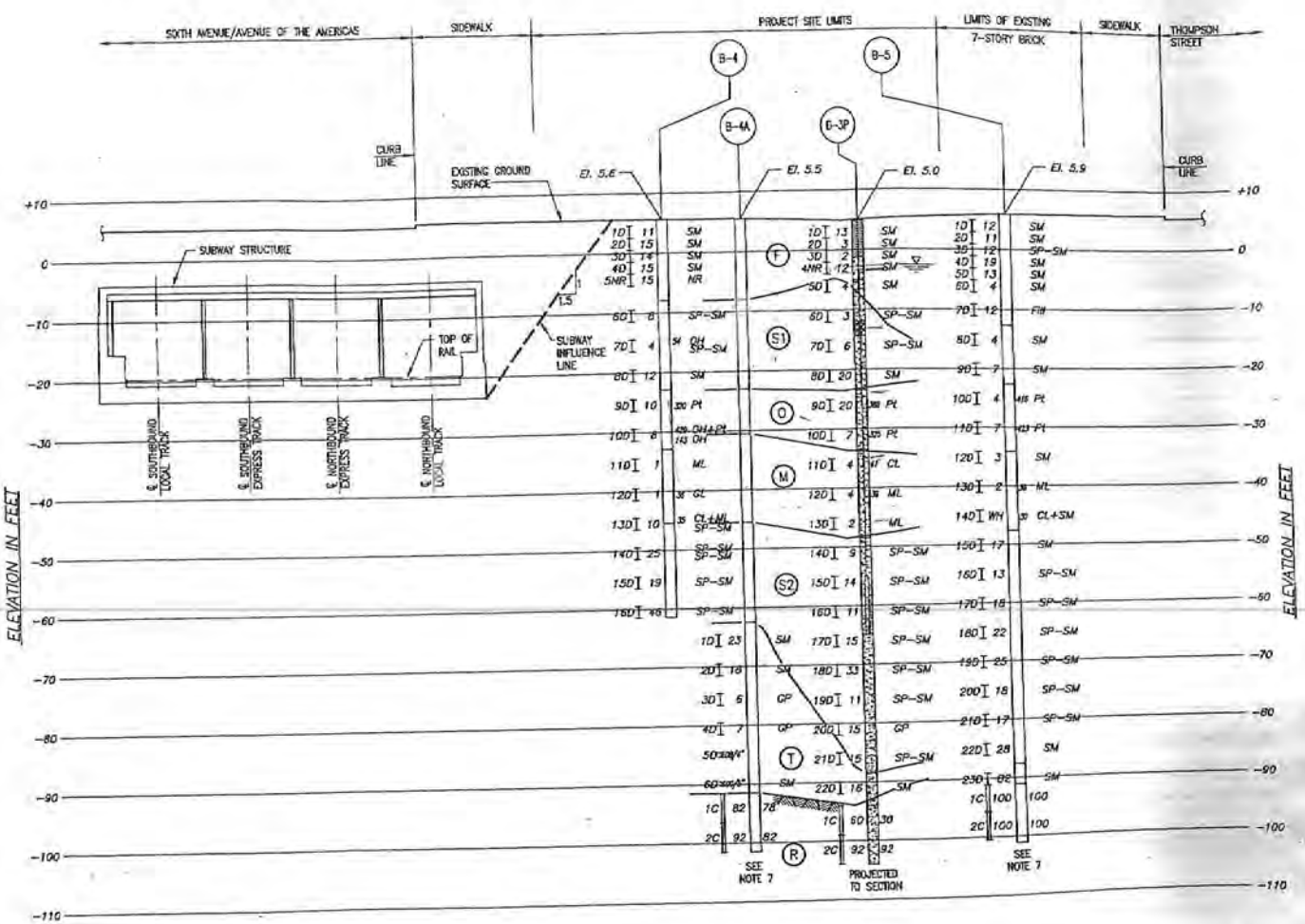

NOTES:

1. FOR SECTION LOCATION, SEE DRAWING NO. B-1.
2. ELEVATIONS SHOWN REFER TO BOROUGH PRESIDENT OF MANHATTAN DATUM WHICH IS 2.75 FEET ABOVE MEAN SEA LEVEL AT SANDY HOOK, NEW JERSEY IN 1929.
3. STRATIFICATIONS SHOWN ARE NECESSARY INTERPOLATIONS BETWEEN BORINGS AND MAY NOT REPRESENT ACTUAL SUBSURFACE CONDITIONS.
4. SAMPLE DESCRIPTIONS AND STRATIFICATIONS SHOWN ARE BY MRCE.
5. SEE DRAWING NO. GS-R FOR BORING LEGEND AND SUMMARY OF UNIFIED SOIL CLASSIFICATION SYSTEM.
6. SEE DRAWING NO. R-1 FOR ROCK CORE CLASSIFICATION CRITERIA.
7. COMPLETE SOIL SAMPLE DESCRIPTIONS ARE PROVIDED ON THE BORING LOGS IN APPENDIX A.
8. BORING ADVANCED WITH MUD ROTARY DRILLING TECHNIQUES; STABILIZED WATER LEVELS WERE NOT OBSERVED IN BORINGS NOS. B-1, B-2, B-4, B-4A, B-5 AND B-7.

GENERAL STRATA DESCRIPTIONS:

(F1) FILL – MEDIUM COMPACT TO LOOSE, BROWN FINE TO COARSE SAND, SOME SILT, SOME TO TRACE GRAVEL, WITH BRICKS, CONCRETE FRAGMENTS, WOOD.

(S1) UPPER SAND POSSIBLE FILL – LOOSE TO MEDIUM COMPACT, BROWN FINE TO COARSE SAND, SOME TO TRACE SILT, TRACE TO SOME GRAVEL, WITH OCCASIONAL ORGANIC SILTY CLAY LAYERS AND INCLUSIONS.

(O) PEAT – MEDIUM TO STIFF, DARK GRAY TO BROWN FIBROUS PEAT AND WOOD, TRACE FINE SAND, OCCASIONALLY UNDERLAIN BY ORGANIC SILT WITH CLAY AND FINE SAND.

(M) SILT, CLAY, SAND – SOFT TO MEDIUM, GRAY CLAYEY SILT AND SILTY CLAY, WITH LAYERS OF SILTY FINE SAND AND FINE SANDY SILT.

(S2) LOWER SAND – MEDIUM COMPACT, BROWN FINE TO COARSE SAND, TRACE TO SOME SILT AND GRAVEL.

(T) TILL – MEDIUM COMPACT TO VERY COMPACT, BROWN AND RED-BROWN FINE TO COARSE SAND, SOME TO TRACE SILT, TRACE GRAVEL TO GRAVELLY, TRACE MICA, OCCASIONAL BOULDERS AND COBBLES.

(WR) WEATHERED ROCK – WEATHERED TO INTERMEDIATE, SLIGHTLY WEATHERED, GRAY GNEISSIC SCHIST, BROKEN TO CLOSELY JOINTED, WITH WEATHERED JOINTS.

(R) ROCK – MEDIUM HARD TO HARD, UNWEATHERED TO SLIGHTLY WEATHERED, GRAY GNEISSIC SCHIST, BLOCKY TO JOINTED, WITH OCCASIONAL PEGMATITE AND QUARTZ ZONES, BROKEN ZONES, AND SLIGHTLY WEATHERED JOINTS.

GRAPHIC SCALE

HORIZONTAL: 20' 10' 0 20' 40'

VERTICAL: 10' 5' 0 10' 20'

HUDSON ISLAND 74-88 SIXTH AVENUE
NEW YORK NEW YORK

INTELL MANAGEMENT AND INVESTMENT COMPANY
NEW YORK NEW YORK

MUESER RUTLEDGE CONSULTING ENGINEERS
14 PENN PLAZA – 225 W. 34TH STREET, NY, NY 10122

SCALE	MADE BY A.H.	DATE 10/15/04	FILE NO.
GRAPHIC	CKED BY R.T.W.	DATE 10/15/04	10271

GEOLOGIC SECTION A-A — DRAWING NO. GS-1

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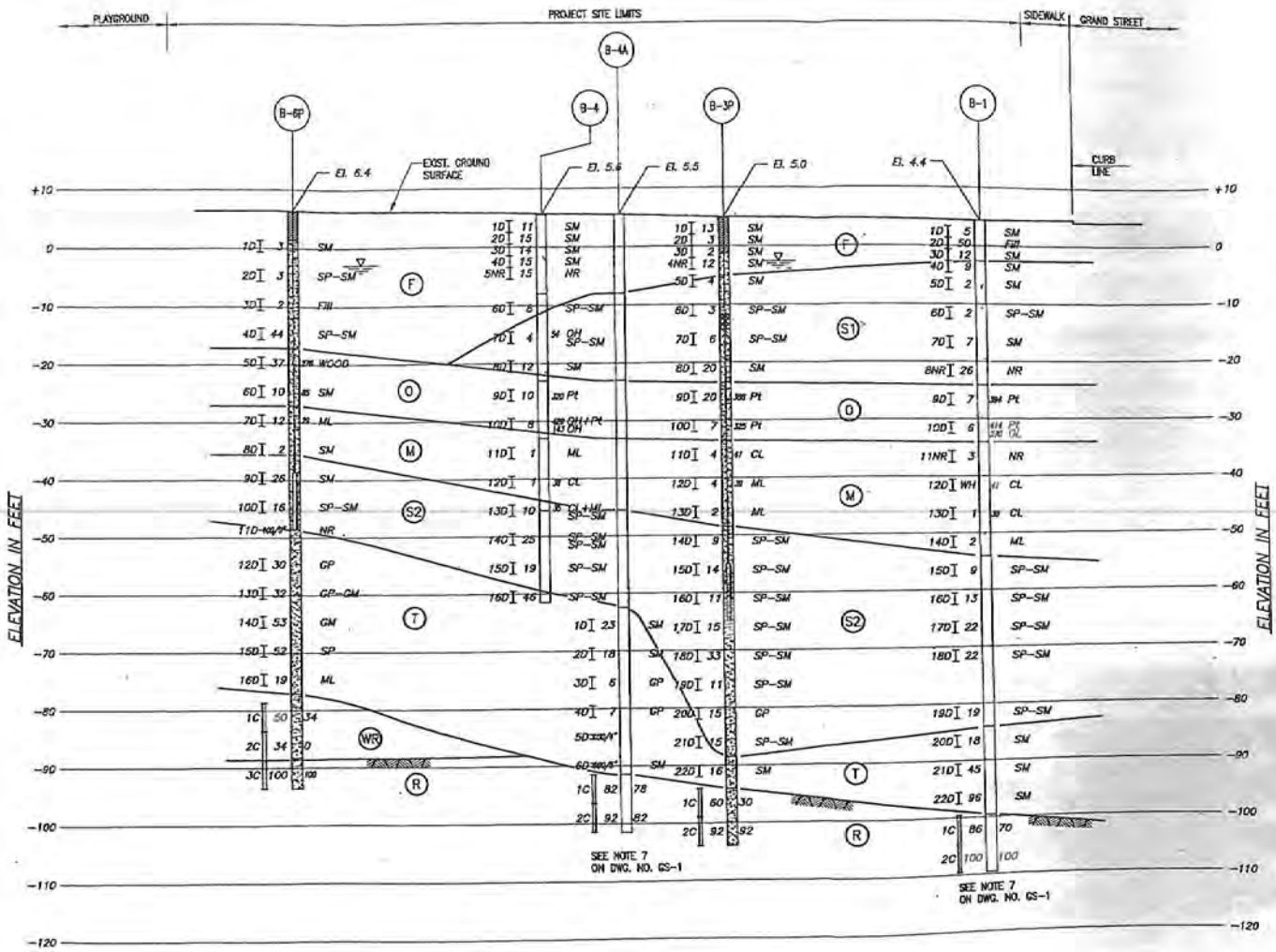

NOTES:

1. FOR NOTES SEE DRAWING GS-1.

GENERAL STRATA DESCRIPTIONS:

- (F1) FILL – MEDIUM COMPACT TO LOOSE, BROWN FINE TO COARSE SAND, SOME SILT, SOME TO TRACE GRAVEL, WITH BRICKS, CONCRETE FRAGMENTS, WOOD.
- (S1) UPPER SAND POSSIBLE FILL – LOOSE TO MEDIUM COMPACT, BROWN FINE TO COARSE SAND, SOME TO TRACE SILT, TRACE TO SOME GRAVEL, WITH OCCASIONAL ORGANIC SILTY CLAY LAYERS AND INCLUSIONS.
- (O) PEAT – MEDIUM TO STIFF, DARK GRAY TO BROWN FIBROUS PEAT AND WOOD, TRACE FINE SAND, OCCASIONALLY UNDERLAIN BY ORGANIC SILT WITH CLAY AND FINE SAND.
- (M) SILT, CLAY, SAND – SOFT TO MEDIUM, GRAY CLAYEY SILT AND SILTY CLAY, WITH LAYERS OF SILTY FINE SAND AND FINE SANDY SILT.
- (S2) LOWER SAND – MEDIUM COMPACT, BROWN FINE TO COARSE SAND, TRACE TO SOME SILT AND GRAVEL.
- (T) TILL – MEDIUM COMPACT TO VERY COMPACT, BROWN AND RED-BROWN FINE TO COARSE SAND, SOME TO TRACE SILT, TRACE GRAVEL TO GRAVELLY, TRACE MICA, OCCASIONAL BOULDERS AND COBBLES.
- (WR) WEATHERED ROCK – WEATHERED TO INTERMEDIATE, SLIGHTLY WEATHERED, GRAY GNEISSIC SCHIST, BROKEN TO CLOSELY JOINTED, WITH WEATHERED JOINTS.
- (R) ROCK – MEDIUM HARD TO HARD, UNWEATHERED TO SLIGHTLY WEATHERED, GRAY GNEISSIC SCHIST, BLOCKY TO JOINTED, WITH OCCASIONAL PEGMATITE AND QUARTZ ZONES, BROKEN ZONES, AND SLIGHTLY WEATHERED JOINTS.

GRAPHIC SCALE

HORIZONTAL: 20' 10' 0 20' 40'

VERTICAL: 10' 5' 0 10' 20'

HUDSON ISLAND 74-88 SIXTH AVENUE
NEW YORK NEW YORK

INTELL MANAGEMENT AND INVESTMENT COMPANY
NEW YORK NEW YORK

MUESER RUTLEDGE CONSULTING ENGINEERS
14 PENN PLAZA – 225 W. 34TH STREET, NY, NY 10122

SCALE	MADE BY A.H.	DATE 10/15/04	FILE NO.
GRAPHIC	CHKD BY R.T.W.	DATE 10/15/04	10271

GEOLOGIC SECTION B-B — DRAWING NO. GS-2

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RA CONSULTANTS

LOG OF BORING RB-1

PROJECT: Grand Street Hotel		PROJECT NUMBER: 07C1028	
LOCATION: New York, NY		ELEVATION AND DATUM: 4' +/- BPM	
DRILLING AGENCY: Warren George, Inc.		DATE STARTED: 8/9/07	DATE COMPLETED: 8/15/07
DRILLING EQUIPMENT: DK-50		COMPLETION DEPTH (FT): 108'	ROCK DEPTH(FT): 103'
SIZE AND TYPE OF BIT 3-7/8" & 2-15/16"	SIZE AND TYPE CORE BARREL: 2" dia. NQ double barrel	NO.SAMPLES: DIST. 21	UNDIST. CORE (FT): 5
CASING SIZE AND TYPE: 3"&4"ID		WATER LEVEL: FIRST	COMPL. 24HR
CASING HAMMER WEIGHT: 300 lb.	DROP: 30 in.	Sampling Hammer Type	FOREMAN: Luis Muniz
SAMPLER: 2-in O.D. Split Spoon	DROP: 30 in.		
SAMPLER HAMMER WEIGHT: 140-lb.	Safety: X	Donut: ATH	INSPECTOR: Walter J. Papp Jr./James Graham

DESCRIPTION	Depth (ft)	Samples: Type Number	Samples: Recov. (ft)	Samples: Penetr. Resist. BL/6in	Rock Core: Recov. (%)	Rock Core: RQD (%)	Lab. Results: water content (%)	Lab. Results: -200 (%)	Strata	REMARKS
	0								6" Asphalt Pavement	
Fill: Brown f/c sand, some gravel, silt, trace brick fragments (11-65)	1	SS 1		7 6 19 20					Fill	
	2									
	3									
	4									
Fill: Red brown f/c sand, some silt, trace gravel (11-65)	5	SS 2		9 27 13 9						
	6									
	7									
	8								8.5'	
	9									
Fill: Red brown f/m sand, some silt, trace gravel (11-65)	10	SS 3		7 7 20 12					Upper Sand	Installed 1-1/4" dia. PVC piezometer with slotted screen from 10' - 20'
	11									
	12									
	13									
	14									
Fill: Same	15	SS 4		6 2 5 5						
	16									
	17									
	18									
	19									
	20									

RA CONSULTANTS

LOG OF BORING RB-1

DESCRIPTION	Depth (ft)	Soil Samples: Type Number	Recov. (ft)	Penetr. Resist. BL/6in	RockCore: Recov. (%)	RQD (%)	Lab. Results: water content (%)	-200 (%)	Strata	REMARKS
Fill: Brown f /c sand, some silt, trace gravel (11-65)	21	SS 5		9 7 5 8					Upper Sand	
	22									
	23									
	24									
	25									
Fill: Same	26	SS 6		9 27 27 30						
	27									
	28								28.5'	
	29									
	30									
Wood, black organic clay (OH) (11-65)	31	SS 7		9 31 37 30						
	32									
	33									
	34									
	35									
Wood fragments, wash	36	SS 8		7 8 12 17					Organic Silt Clay and Peat	
	37									
	38									
	39									
	40									
Dark brown organic clay, some wood fibers, trace gravel (OH) (11-65)	41	SS 9		9 10 4 3						
	42									
	43									
	44									
	45									

RA CONSULTANTS

LOG OF BORING RB-1

DESCRIPTION	Depth (ft)	Soil Samples: Type Number	Soil Samples: Recov. (ft)	Soil Samples: Penetr. Resist. BL/6in	RockCore: Recov. (%)	RockCore: RQD (%)	Lab. Results: water content (%)	Lab. Results: -200 (%)	Strata	REMARKS
Gray organic silt, trace fine sand (OH) (11-65)	46	SS 10		3 3 4 4					Organic Silt Clay and Peat	
	47									
	48									
	49									
	50									
Dark gray organic silty clay (OH) (11-65)	51	SS 11		2 3 4 7						
	52									
	53									
	54									
	55								53.5'	
Red brown clayey silt, trace fine sand (ML&CL) (10-65)	56	SS 12		3 3 18 17					Silt Clay and Sand	
	57									
	58									
	59								58.5'	
	60									
Red brown f/m sand, trace silt, gravel (SP-SM) (7-65)	61	SS 13		24 23 46 90						
	62									
	63									
	64								Lower Sand	
	65									
Same	66	SS 14		23 29 29 30						
	67									
	68									
	69									
	70									

RA CONSULTANTS

LOG OF BORING RB-1

DESCRIPTION	Depth (ft)	Soil Samples: Type Number	Soil Samples: Recov. (ft)	Soil Samples: Penetr. Resist. BL/6in	RockCore: Recov. (%)	RockCore: RQD (%)	Lab. Results: water content (%)	Lab. Results: -200 (%)	Strata	REMARKS
Red brown f/m sand, trace silt, gravel (SP-SM) (7-65)	71	SS 15		31 36 38 31					Lower Sand	
	72									
	73									
	74									
	75									
Same	76	SS 16		23 24 32 40						
	77								77'	Possible boulder or cobbles at 77'
	78									
	79									
	80									
No Recovery	81	SS 17		100/0"						
	82									
	83									
	84									
	85									
Gray fine gravel, trace f/c sand, (GP) (6-65)	86	SS 18		31 27 48 46					Till	Wet
	87									
	88									
	89									
	90									
No Recovery	91	SS 19		50/0"						
	92									
	93									
	94									
	95									

RA CONSULTANTS

LOG OF BORING RB-2

PROJECT: Grand Street Hotel	PROJECT NUMBER: 07C1028
LOCATION: New York, NY	ELEVATION AND DATUM: 4' +/- BPM
DRILLING AGENCY: Warren George, Inc.	DATE STARTED: 8/24/07 / DATE COMPLETED: 8/29/07
DRILLING EQUIPMENT: Mayhew	COMPLETION DEPTH (FT): 103' / ROCK DEPTH(FT): 98'
SIZE AND TYPE OF BIT: 3-7/8" roller / SIZE AND TYPE CORE BARREL: 2" dia. NX double barrel	NO.SAMPLES: DIST. 20 / UNDIST. / CORE (FT) 5
CASING SIZE AND TYPE: 5" ID	WATER LEVEL: FIRST / COMPL. / 24HR
CASING HAMMER: WEIGHT 300 lb. DROP 30 in. Sampling	FOREMAN: Mike McCarthy
SAMPLER: 2-in O.D. Split Spoon / DROP 30 in. Hammer Type	INSPECTOR: J.D. Chastanet
SAMPLER HAMMER: WEIGHT 140-lb. X Safety / Donut / ATH	

DESCRIPTION	Depth (ft)	Samples: Type Number	Samples: Recov. (ft)	Samples: Penetr. Resist. BL/6in	Rock Core: Recov. (%)	Rock Core: RQD (%)	Lab. Results: water content (%)	Lab. Results: -200 (%)	Strata	REMARKS
									6" Asphalt Pavement	
Fill: Brick fragments (11-65)	1	SS 1		24 24 46 17					Fill	Installed 20' of 5" ID casing
Fill: Sand, silt, gravel, trace bricks (11-65)	5	SS 2		40 18 15 15					8.5'	
Fill: Brown f/c sand, trace silt (11-65)	10	SS 3		0 1 4 8					Upper Sand	Wet
No Recovery	15	SS 4		12 8 8 8						
	20									

RA CONSULTANTS

LOG OF BORING RB-2 SHEET 2 OF 5

DESCRIPTION	Depth (ft)	Soil Samples: Type Number	Soil Samples: Recov. (ft)	Soil Samples: Penetr. Resist. BL/6in	RockCore: Recov. (%)	RockCore: RQD (%)	Lab. Results: water content (%)	Lab. Results: -200 (%)	Strata	REMARKS
Fill: Brown red f/c sand, trace gravel, trace brick (11-65)	21	SS 5		8 8 14 27						Moist
	22									
	23									
	24									
	25									
Fill: Brown gray fine gravel, little f/c sand, trace silt (11-65)	26	SS 6		9 7 5 6					Upper Sand	Wet
	27									
	28									
	29									
	30									
Fill: Brown red black f/c sand, trace silt (11-65)	31	SS 7		18 18 22 36						Moist
	32									
	33								33.0'	
	34									
	35									
Brown decayed wood (Pt) (11-65)	36	SS 8		8 8 4 12						
	37									
	38								Organic Silt Clay and Peat	
	39									
	40									
Same	41	SS 9		12 23 51 75/4"						Split spoon stuck in wood.
	42									
	43									
	44									
	45								45.0'	

RA CONSULTANTS

LOG OF BORING RB-2

DESCRIPTION	Depth (ft)	Soil Samples: Type Number	Soil Samples: Recov. (ft)	Soil Samples: Penetr. Resist. BL/6in	RockCore: Recov. (%)	RockCore: RQD (%)	Lab. Results: water content (%)	Lab. Results: -200 (%)	Strata	REMARKS
Gray plastic clay (CH) (9-65)	46	SS 10		15 10 11 12						Wet
	47									
	48									
	49									
	50								Silt Clay and Sand	
Same	51	SS 11		WoR						WoR = Weight of Rods for 2' Wet
	52									
	53									
	54									
	55									
Same	56	SS 12		WoR						Wet
	57									
	58									
	59									
	60								60.0'	
Brown red f/c sand, trace silt (SP) (7-65)	61	SS 13		16 22 12 23						Moist
	62									
	63									
	64								Lower Sand	
	65									
Same	66	SS 14		17 18 15 19						Moist
	67									
	68									
	69									
	70									

RA CONSULTANTS

LOG OF BORING RB-2

DESCRIPTION	Depth (ft)	Soil Samples: Type Number	Soil Samples: Recov. (ft)	Soil Samples: Penetr. Resist. BL/6in	RockCore: Recov. (%)	RockCore: RQD (%)	Lab. Results: water content (%)	Lab. Results: -200 (%)	Strata	REMARKS
Brown red f/c sand, trace silt (SP) (7-65)	71	SS 15		16 28 27 31						Moist
	72									
	73									
	74									
	75									
Brown red f/c sand, little silt (SP) (7-65)	76	SS 16		18 24 25 26					Lower Sand	Moist
	77									
	78									
	79									
	80									
Same	81	SS 17		11 18 16 25						Moist
	82									
	83									
	84									
	85								85.0'	
Brown red f/c gravel and f/c sand, trace silt (GW) (6-65)	86	SS 18		58 49 32 20						
	87									
	88								Till	
	89									
	90									
Brown red f/c sand, trace silt (SP) (7-65)	91	SS 19		28 21 25 29						Moist
	92									
	93									
	94									
	95									

RA CONSULTANTS

LOG OF BORING RB-2

DESCRIPTION	Depth (ft)	Soil Samples: Type Number	Soil Samples: Recov. (ft)	Soil Samples: Penetr. Resist. BL/6in	RockCore: Recov. (%)	RockCore: RQD (%)	Lab. Results: water content (%)	Lab. Results: -200 (%)	Strata	REMARKS
Red f/m sand, some silt (SM) (8-65)	96	SS 20		36 31 32 39					Till	Moist
	97									
	98								98.0'	
Gray mica schist, hard, sound, possible dip at 89 degrees (1-65)	99	Run #1			100	88			Rock	
	100									
	101									
	102									
	103									
END OF BORING AT 103'	104									
	105									
	106									
	107									
	108									
	109									
	110									
	111									
	112									
	113									
	114									
	115									
	116									
	117									
	118									
	119									
	120									

RA CONSULTANTS

LOG OF BORING RB-3

PROJECT: Grand Street Hotel		PROJECT NUMBER: 07C1028	
LOCATION: New York, NY		ELEVATION AND DATUM: 4.7' +/- BPM	
DRILLING AGENCY: Warren George, Inc.		DATE STARTED: 8/20/07	DATE COMPLETED: 8/24/07
DRILLING EQUIPMENT: Mayhew		COMPLETION DEPTH (FT): 111'	ROCK DEPTH(FT): 106'
SIZE AND TYPE OF BIT: 3-7/8" roller	SIZE AND TYPE CORE BARREL: 2" dia. NX double barrel	NO.SAMPLES: DIST. 22	UNDIST. CORE (FT): 5
CASING SIZE AND TYPE: 5" ID		WATER LEVEL: FIRST	COMPL. 24HR
CASING HAMMER: WEIGHT 300 lb.	DROP 30 in.	Sampling	FOREMAN: Mike McCarthy
SAMPLER: 2-in O.D. Split Spoon	DROP 30 in.	Hammer Type	
SAMPLER HAMMER: WEIGHT 140-lb.	X Safety	Donut ATH	INSPECTOR: Jim Graham

DESCRIPTION	Depth (ft)	Samples: Type Number	Recov. (ft)	Penetr. Resist. BL/6in	Rock Core: Recov. (%)	RQD (%)	Lab. Results: water content (%)	-200 (%)	Strata	REMARKS
									6" Asphalt	
Fill: Brown f/c sand, trace silt (11-65)	1	SS 1		10 5 5 4					Fill	Moist Installed 30' of 1" ID casing Used driller's mud below 30.0'
No Recovery	5	SS 2		6 7 7 8						
	8								8.5'	
Fill: Brown f/c sand, trace silt (11-65)	10	SS 3		22 29 15 11					Upper Sand	Moist
Fill: Brown red f/c sand trace fine gravel (11-65)	15	SS 4		10 12 10 9						Wet
	20									

RA CONSULTANTS

LOG OF BORING RB-3

DESCRIPTION	Depth (ft)	Soil Samples: Type Number	Soil Samples: Recov. (ft)	Soil Samples: Penetr. Resist. BL/6in	RockCore: Recov. (%)	RockCore: RQD (%)	Lab. Results: water content (%)	Lab. Results: -200 (%)	Strata	REMARKS
Same as S-4	21	SS 5		5 4 5 6						Installed 20' of 5" ID casing
	22									
	23									
	24									
	25									
Same as S-4	26	SS 6		7 9 10 10						
	27									
	28								Upper Sand	
	29									
	30									
Fill: Brown red f/c sand, trace fine gravel (11-65)	31	SS 7		28 27 10 14						Moist
	32									
	33									
	34									
	35									
No Recovery	36	SS 8		18 11 21 32						
	37									
	38									
	39								40.0'	
	40									
Brown decayed wood	41	SS 9		10 17 16 19						
	42									
	43								Organic Silt Clay and Peat	
	44									
	45								45.0'	

RA CONSULTANTS

LOG OF BORING RB-3 SHEET 3 OF 5

DESCRIPTION	Depth (ft)	Soil Samples: Type Number	Soil Samples: Recov. (ft)	Soil Samples: Penetr. Resist. BL/6in	RockCore: Recov. (%)	RockCore: RQD (%)	Lab. Results: water content (%)	Lab. Results: -200 (%)	Strata	REMARKS
Gray plastic clay (CH) (9-65)	46	SS 10		3 3 4 3						Wet
	47									
	48								Silt Clay and Sand	
	49									
	50									
Same	51	SS 11		WoH						WoH = Weight of Hammer for 2'
	52									
	53									
	54									
	55								55.0'	
Brown red f/c sand, trace silt, (SP) (7-65)	56	SS 12		14 16 16 17						Moist
	57									
	58									
	59									
	60									
Same	61	SS 13		14 19 21 25					Lower Sand	Moist
	62									
	63									
	64									
	65									
Same	66	SS 14		19 24 25 18						Moist
	67									
	68									
	69									
	70									

RA CONSULTANTS

LOG OF BORING RB-3 SHEET 4 OF 5

DESCRIPTION	Depth (ft)	Soil Samples: Type Number	Soil Samples: Recov. (ft)	Soil Samples: Penetr. Resist. BL/6in	RockCore: Recov. (%)	RockCore: RQD (%)	Lab. Results: water content (%)	Lab. Results: -200 (%)	Strata	REMARKS
Brown red f/c sand, trace silt, (SP) (11-65)	71	SS 15		25 21 21 25					Lower Sand	
	72									
	73									
	74									
	75								75.0'	
Brown red fine gravel and f/c sand (GM) (6-65)	76	SS 16		26 22 67 47						
	77									
	78									
	79									
	80									
Brown red fine gravel, trace f/c sand (GP) (6-65)	81	SS 17		33 28 37 31						
	82									
	83								Till	
	84									
	85									
No Recovery	86	SS 18		24 27 19 21						
	87									
	88									
	89									
	90									
Brown red f/c sand (SP) (7-65)	91	SS 19		15 16 21 24						
	92									
	93									
	94									
	95									

RA CONSULTANTS

LOG OF BORING RB-3 SHEET 5 OF 5

DESCRIPTION	Depth (ft)	Soil Samples: Type Number	Recov. (ft)	Penetr. Resist. BL/6in	RockCore: Recov. (%)	RQD (%)	Lab. Results: water content (%)	-200 (%)	Strata	REMARKS
Brown red f/c sand, trace silt (7-65)	96	SS 20		33 30 20 47						
	97									
	98									
	99									
	100									
Red f/c sand and gray fine gravel (GP) (6-65)	101	SS 21		81 50/2"					Till	Moist
	102									
	103									
	104									
Gray gravel (GP) (6-65)	105	SS 22		47 50/1"					106.0'	
	106									
	107									
Gray and white mica schist, hard (1-65)	108	Run #1			100	98			Rock	
	109									
	110									
	111									
END OF BORING AT 111'	112									
	113									
	114									
	115									
	116									
	117									
	118									
	119									
	120									

RA CONSULTANTS

LOG OF BORING RB-4

PROJECT: Grand Street Hotel		PROJECT NUMBER: 07C1028	
LOCATION: New York, NY		ELEVATION AND DATUM: 5' +/- BPM	
DRILLING AGENCY: Warren George, Inc.		DATE STARTED: 8/16/07	DATE COMPLETED: 8/20/07
DRILLING EQUIPMENT: Mayhew		COMPLETION DEPTH (FT): 103.5'	ROCK DEPTH(FT): 98.5'
SIZE AND TYPE OF BIT: 3-7/8" roller	SIZE AND TYPE CORE BARREL: 2" dia. NX double barrel	NO.SAMPLES: DIST. 20	UNDIST. CORE (FT): 5
CASING SIZE AND TYPE		WATER LEVEL: FIRST	COMPL. 24HR
CASING HAMMER: WEIGHT 300 lb. DROP 30 in.	Sampling	FOREMAN: Mike McCarthy	
SAMPLER: 2-in O.D. Split Spoon DROP 30 in.	Hammer Type		
SAMPLER HAMMER: WEIGHT 140-lb. Safety X	Donut ATH	INSPECTOR: Jim Graham	

DESCRIPTION	Depth (ft)	Samples: Type Number	Samples: Recov. (ft)	Samples: Penetr. Resist. BL/6in	Rock Core: Recov. (%)	Rock Core: RQD (%)	Lab. Results: water content (%)	Lab. Results: -200 (%)	Strata	REMARKS
									6" Asphalt	
Fill: Brown red black f/c sand, trace gravel, trace brick (11-65)	1	SS 1		14 6 10 15					Fill	Moist
	5								5'	
Fill: Red brown f/c sand, some fine gravel (11-65)	6	SS 2		12 20 44 10						Wet
Fill: Red brown f/c sand, little fine gravel (11-65)	10	SS 3		14 17 11 8					Upper Sand	Wet
Fill: Brown red f/c sand, trace fine gravel, trace clay (11-65)	15	SS 4		12 9 6 5						
	20									

RA CONSULTANTS

LOG OF BORING RB-4 SHEET 2 OF 5

DESCRIPTION	Depth (ft)	Soil Samples: Type Number	Soil Samples: Recov. (ft)	Soil Samples: Penetr. Resist. BL/6in	RockCore: Recov. (%)	RockCore: RQD (%)	Lab. Results: water content (%)	Lab. Results: -200 (%)	Strata	REMARKS
Fill: Red f/c sand, trace fine gravel (11-65)	21	SS 5		9 7 8 8						Wet
	22									
	23									
	24									
	25									
Fill: Brown red f/c sand, some fine gravel (11-65)	26	SS 6		12 15 16 27					Upper Sand	Wet
	27									
	28									
	29									
	30									
Fill: Red gray f/c sand, little fine gravel (11-65)	31	SS 7		71 63 58 25/2"						Wet
	32									
	33									
	34									Peat in bottom of sample
	35									
Red fiberous peat and organic clay (Pt) (11-65)	36	SS 8		36 23 44 41					36.5'	
	37								Organic Silt Clay and Peat	
	38									Wood in wash water at 38'
	39									
	40									
Brown decayed wood	41	SS 9		70 68 72 80/4"						
	42									
	43								43.0'	
	44									Clay in wash water at 43'
	45									

RA CONSULTANTS

LOG OF BORING RB-4 SHEET 3 OF 5

DESCRIPTION	Depth (ft)	Soil Samples: Type Number	Soil Samples: Recov. (ft)	Soil Samples: Penetr. Resist. BL/6in	RockCore: Recov. (%)	RockCore: RQD (%)	Lab. Results: water content (%)	Lab. Results: -200 (%)	Strata	REMARKS
Gray plastic clay (CL) (9-65)	46	SS 10		14 5 3 5						
	47									
	48									
	49									
	50									
Same	51	SS 11		10 5 4 5					Clay and Silt	
	52									
	53									
	54									
	55									
Same	56	SS 12		WoR 12 15 23						WoR = Weight of Rods
	57									
	58									
	59									
	60								60'	
Brown red f/c sand, trace silt (SP) (7-65)	61	SS 13		15 14 11 10						
	62									
	63									
	64									
	65								Lower Sand	
No Recovery	66	SS 14		42 34 28 32						
	67									
	68									
	69									
	70									

RA CONSULTANTS

LOG OF BORING RB-4

DESCRIPTION	Depth (ft)	Soil Samples: Type Number	Soil Samples: Recov. (ft)	Soil Samples: Penetr. Resist. BL/6in	RockCore: Recov. (%)	RockCore: RQD (%)	Lab. Results: water content (%)	Lab. Results: -200 (%)	Strata	REMARKS
Brown red f/c sand, trace silt (SP) (7-65)	71	SS 15		59 53 61 45						
	72									
	73									
	74									
	75								Lower Sand	
Same	76	SS 16		60 100/5"						
	77									Boulder at 78'
	78									
	79									
	80								80.0'	
Gray gravel, some f/c sand (GP) (6-65)	81	SS 17		66 37 24 23						
	82									
	83									
	84									
	85									
Brown red f/c sand, trace silt (SP) (7-65)	86	SS 18		41 30 40 41						Moist
	87								Till	
	88									
	89									
	90									
No Recovery	91	SS 19		38 36 35 38						
	92									
	93									
	94									
	95									

Readings

Date	Time	Water Level
8/20	8:30am	11'
8/20	9:00am	10'
8/20	9:30am	12'

RA CONSULTANTS

LOG OF BORING RB-4

DESCRIPTION	Depth (ft)	Soil Samples: Type Number	Soil Samples: Recov. (ft)	Soil Samples: Penetr. Resist. BL/6in	RockCore: Recov. (%)	RockCore: RQD (%)	Lab. Results: water content (%)	Lab. Results: -200 (%)	Strata	REMARKS
Brown red f/c sand, trace silt (SP) (7-65)	96	SS 20		45 58 44 34					Till	
	97									
	98								98.5'	
Gray mica schist, hard, sound, no dip observed (1-65)	99	Run #1			95	95			Rock	
	100									
	101									
	102									
	103									
END OF BORING AT 103.5'	104									
	105									
	106									
	107									
	108									
	109									
	110									
	111									
	112									
	113									
	114									
	115									
	116									
	117									
	118									
	119									
	120									

RA CONSULTANTS

LOG OF BORING RB-5

PROJECT: Grand Street Hotel	PROJECT NUMBER: 07C1028
LOCATION: New York, NY	ELEVATION AND DATUM: 6.5' +/- BPM
DRILLING AGENCY: Warren George, Inc.	DATE STARTED: 8/16/07 / DATE COMPLETED: 8/23/07
DRILLING EQUIPMENT: DK 50	COMPLETION DEPTH (FT): 106' / ROCK DEPTH(FT): 91'
SIZE AND TYPE OF BIT 3-7/8" & 2-15/16"	SIZE AND TYPE CORE BARREL: 2" dia. NQ double barrel
CASING SIZE AND TYPE 3"&4" ID	NO.SAMPLES: DIST. 19 / UNDIST. / CORE (FT) 5
CASING HAMMER WEIGHT 300 lb. DROP 30 in.	WATER LEVEL: FIRST / COMPL. / 24HR
SAMPLER 2-in O.D. Split Spoon DROP 30 in.	Sampling Hammer Type
SAMPLER HAMMER WEIGHT 140-lb. Safety X Donut ATH	FOREMAN: Luis Muniz / INSPECTOR: Jim Graham

DESCRIPTION	Depth (ft)	Samples: Type Number	Recov. (ft)	Penetr. Resist. BL/6in	Rock Core: Recov. (%)	RQD (%)	Lab. Results: water content (%)	-200 (%)	Strata	REMARKS
									6" Concrete	
Fill: Brown black f/c sand, trace fine gravel (11-65)	1–2	SS 1		16 28 16 17					Fill	Moist
	3–5									
Fill: Brown red f/c sand, brick fragments (11-65)	5–6	SS 2		3 4 6 5						Wet
	7–8								8.5'	
Fill: Brown red f/c sand, brick, clay (11-65)	9–11	SS 3		5 8 9 10					Upper Sand	Wet
	12–15									
Fill: Brown f/c sand, trace silt (11-65)	15–16	SS 4		8 4 6 13						Moist
	17–20									

RA CONSULTANTS

LOG OF BORING RB-5

DESCRIPTION	Depth (ft)	Soil Samples: Type Number	Soil Samples: Recov. (ft)	Soil Samples: Penetr. Resist. BL/6in	RockCore: Recov. (%)	RockCore: RQD (%)	Lab. Results: water content (%)	Lab. Results: -200 (%)	Strata	REMARKS
Fill: Brown f/c sand, trace silt (11-65)	21	SS 5		6 6 7 17						Moist
	22									
	23								Upper Sand	
	24									
	25									
Same	26	SS 6		6 6 6 7						Moist
	27									
	28									
	29									
	30								30.0'	
Brown decayed wood (11-65)	31	SS 7		9 10 13 27						
	32									
	33								Organic Silt Clay and Peat	
	34									
	35									
Gray plastic clay, trace fiberous peat (CH) (9-65)	36	SS 8		4 4 5 3						Moist
	37									
	38								38.5'	
	39									
	40									
Gray plastic clay (CH) (9-65)	41	SS 9		WoH WoH 2 2					Clay and Silt	WoH = Weight of Hammer
	42									
	43									
	44									
	45									

RA CONSULTANTS

LOG OF BORING RB-5

DESCRIPTION	Depth (ft)	Soil Samples: Type Number	Soil Samples: Recov. (ft)	Soil Samples: Penetr. Resist. BL/6in	RockCore: Recov. (%)	RockCore: RQD (%)	Lab. Results: water content (%)	Lab. Results: -200 (%)	Strata	REMARKS
Gray plastic clay (CH) (9-65)	46	SS 10		WoH 3 2 1					Clay and Silt	WoH = Weight of Hammer
	47									
	48									
	49									
	50								50.0'	
No Recovery	51	SS 11		26 16 11 18					Lower Sand	
	52									
	53									
	54									
	55								55'	
Brown red fine gravel, little f/c sand (GP) (6-65)	56	SS 12		43 50 50/1"						Wet
	57									
	58									Boulder at 58'
	59									
	60									
No Recovery	61	SS 13		100/5"						
	62									
	63								Till	
	64									
	65									
Brown red f/c sand, trace silt (SP) (7-65)	66	SS 14		21 20 50/2"						Moist
	67									
	68									
	69									
	70									

RA CONSULTANTS

LOG OF BORING RB-5

DESCRIPTION	Depth (ft)	Soil Samples: Type Number	Recov. (ft)	Penetr. Resist. BL/6in	RockCore: Recov. (%)	RQD (%)	Lab. Results: water content (%)	-200 (%)	Strata	REMARKS
Cobbles	71	SS 15		51/4"						Piece of cobble in tip of spoon
	72									Installed 4" ID casing to 55'
	73									
	74									
	75			29						
Brown red f/c sand, trace silt (SP) (7-65)	76	SS 16		28 50/4"						Wet
	77									
	78									
	79								Till	
	80			31						
	81	SS 17		28 45						
	82			42						Installed 3" ID casing to 90'
	83									
	84									
	85			22						
Brown red f/c sand, trace silt (SP) (7-65)	86	SS 18		31 32						
	87			34						
	88									
	89									
	90									
Boulder		SS 19		100/1"					91'	Boulders 90'-91'
	91									
Gray mica schist, hard, sound, broken 92.5' to 93.3' Dip 80 degrees (1-65)	92	Run #1			100	72			Rock	
	93									
	94									
	95									

RA CONSULTANTS

LOG OF BORING RB-5

DESCRIPTION	Depth (ft)	Soil Samples: Type Number	Soil Samples: Recov. (ft)	Soil Samples: Penetr. Resist. BL/6in	RockCore: Recov. (%)	RockCore: RQD (%)	Lab. Results: water content (%)	Lab. Results: -200 (%)	Strata	REMARKS
	96								Rock	
END OF BORING AT 96'	97									
	98									
	99									
	100									
	101									
	102									
	103									
	104									
	105									
	106									
	107									
	108									
	109									
	110									
	111									
	112									
	113									
	114									
	115									
	116									
	117									
	118									
	119									
	120									

APPENDIX B

Mueser Rutledge Consulting Engineers Boring logs

ABBREVIATIONS FOR SOIL SAMPLE DESCRIPTIONS

CONSISTENCY

compact	-	cpt
medium compact	-	med cpt
hard	-	hd

GRAIN SIZE AND SHAPE

angular	-	ang
coarse	-	c
coarse to fine	-	c-f
coarse to medium	-	c-m
fine	-	f
fine to coarse	-	f-c
fine to medium	-	f-m
medium	-	m
medium to coarse	-	m-c
medium to fine	-	m-f
round	-	rnd
small	-	sml
subround	-	sbrnd

SOIL TYPE

boulder	-	bldr
brick	-	brk
calcareous	-	calc
carbonaceous	-	carb
cinders	-	cndr
clay	-	cl
clayey sand	-	cl sa
clayey silt	-	cl si
cobble	-	cbl
gravel	-	gvl
meadow mat	-	mdw mat
organic	-	org
peat	-	pt
roots	-	rts
sand	-	sa
sandy clay	-	sa cl
shells	-	sls
silt	-	si
silty clay	-	si cl
vegetation	-	veg

COLOR

black	-	blk
blue	-	bl
brown	-	brn
dark	-	dk
gray	-	gry
green	-	grn
light	-	lt
mottled	-	mtld
orange	-	or
white	-	wht
yellow	-	yel

MISCELLANEOUS

and	-	&
bottom	-	bot
cavities	-	cvts
concretions	-	conc
crystalline	-	xln
decayed	-	dcyd
disintegrated	-	dsntg
ditto	-	do
fragments	-	fgmts
interbedded	-	intrbd
layers	-	lyrs
lenses	-	lns
material	-	mtl
matter	-	mtr
micaceous	-	mic
miscellaneous	-	misc
numerous	-	num
occasional	-	occ
pieces, particles	-	pcs
pocket	-	pkt
porous	-	por
seams	-	sms
solution	-	sol
some	-	sm
trace	-	tr
varved	-	vvd
very	-	v
with	-	w

ABBREVIATIONS FOR ROCK CLASSIFICATION AND IDENTIFICATION

ROCK QUALITY

blocky	-	blky
broken	-	bkn
closely jointed	-	cljtd
decomposed	-	dec
fractured	-	frct
highly weathered	-	HiW
injected	-	inj
jointed	-	jtd
massive	-	mass
moderately jointed	-	mdjtd
moderately weathered	-	MdW
slightly weathered	-	SlW
unweathered	-	UnW
unweathered (excluding joints)	-	UnWExJts
unweathered (including joints)	-	UnWIncJts
weathered	-	wthd

ROCK AND MINERAL TYPE

argillaceous	-	arglcs
dolomitic	-	dolomt
feldspar	-	feld
gneiss	-	gns
granite	-	grt
limestone	-	lms
quartz	-	qtz
quartzofeldspathic	-	qtzofeld
sandstone	-	ss
schist	-	sch
shale	-	sh

ROCK QUALITY MODIFIERS

massive	-	<0.25 jts/ft
blocky	-	<0.25 - 0.5 jts/ft
moderately jointed	-	0.5 - 1.0 jts/ft
jointed	-	1.0 - 2.0 jts/ft
closely jointed	-	2.0 - 4.0 jts/ft
broken	-	>4.0 jts/ft

Minimum Rock Classification and Identification includes the following:

Att. - The length of soil sample attempt or rock core run, expressed in inches.

Rec. - The total length of soil sample recovered, in inches or the length of core recovered expressed as a percentage of the total length of that coring run.

RQD - Rock Quality Designation is the total length of those pieces of core recovered which are 4" in length or longer and which are hard and sound, expressed as a percentage of the total length of that coring run.

Overall description of the major rock type and the degree of weathering, and the depth of change of rock type or quality.

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

BORING NO. B-1
SHEET 1 OF 5
FILE NO. 10271
SURFACE ELEV. 4.4
RES. ENGR. JANE WANG

PROJECT: SOHO ISLAND - 74-88 SIXTH AVENUE
LOCATION: NEW YORK, NEW YORK

DAILY PROGRESS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE BLOWS/6"	SAMPLE DESCRIPTION	STRATA	DEPTH	CASING BLOWS 4"	CASING BLOWS 3"	REMARKS
06:30	1D	1.0	4-1	Brown fine to coarse sand, some silt, concrete					
09-22-04		3.0	4-8	fragments (Fill) (SM)					
Wednesday									
Clear	2D	3.0	10-27	Red ~~and gray brick and~~ concrete fragments	F				
70°F		5.0	23-13	(Fill)		5			
	3D	5.0	6-7	Brown fine to coarse sand, some silt, gravel,					
		7.0	5-5	trace brick (Fill) (SM)		7			
	4D	7.0	4-2	Brown fine to coarse sand, some silt, trace					
		9.0	7-5	gravel (SM)					
						10			
	5D	10.0	4-1	Brown coarse to fine sand, some silt, trace					
		12.0	1-3	gravel (SM)					
						15			
	6D	15.0	2-1	Brown fine to coarse sand, trace silt, gravel					
		17.0	1-2	(SP-SM)	S1				
						20			
	7D	20.0	3-3	Brown fine to coarse sand, some gravel, silt,					
		22.0	4-3	trace fine sandy clay layers (SM)					
						25			
	8NR	25.0	7-11	No recovery					
		27.0	15-10						
						28.5			
					O	30			
	9D	30.0	3-4	Red brown peat, trace wood, sand (Pt)					WC = 394
		32.0	3-6						
						35			
	10D	35.0	1-3	Top 12": Red brown peat, tr wood, sand (Pt)					TOP: WC = 414
		37.0	3-5	Bot 12": Soft gray organic silt, trace wood,					BOT: WC = 270
				fiber, sand (OL)					
						38.5			
						40			
	11NR	40.0	1-2	No recovery					
		42.0	1-2						
						45			
	12D	45.0	WH/24"	Soft gray silty clay (CL)	M				WC = 41
		47.0							
						50			
	13D	50.0	2-1/18"	Medium dark gray silty clay (CL)					WC = 39
		52.0							

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

BORING NO. B-1
SHEET 2 OF 5
FILE NO. 10271
SURFACE ELEV. 4.4
RES. ENGR. JANE WANG

PROJECT: SOHO ISLAND - 74-88 SIXTH AVENUE
LOCATION: NEW YORK, NEW YORK

DAILY PROGRESS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE BLOWS/6"	SAMPLE DESCRIPTION	STRATA	DEPTH	CASING BLOWS 3"	REMARKS
Cont'd 09-22-04 Wednesday Clear 80°F								
					M	55		
	14D	55.0	WH-1	Brown fine sandy silt, trace clay (ML)				
		57.0	1-3					
						58.5		
						60		
	15D	60.0	3-4	Brown fine to coarse sand, trace silt, silt				
		62.0	5-6	layers (SP-SM)				
						65		
	16D	65.0	9-6	Brown fine to coarse sand, trace silt, gravel				
		67.0	7-8	(SP-SM)				
						70		
	17D	70.0	9-15	Brown fine to coarse sand, trace silt, gravel				
		72.0	7-9	(SP-SM)				
					S2	75		
	18D	75.0	11-10	Brown fine to coarse sand, trace silt, gravel				
		77.0	12-21	(SP-SM)				
						80		Driller counted wrong and missed sample.
						85		
	19D	85.0	5-7	Brown coarse to fine sand, trace silt, gravel				
		87.0	12-17	(SP-SM)				
						88.5		
						90		
	20D	90.0	24-9	Brown fine to coarse sand, some gravel,				
		92.0	9-9	silt (SM)				
						95		
	21D	95.0	12-26	Brown fine to coarse sand, some gravel, silt	T			
		97.0	19-14	(SM)				
						100		
	22D	100.0	24-25	Brown fine to coarse sand, some gravel, silt				
		102.0	71-66	(SM)				

MRCE Form BL-1

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

BORING NO. B-1
SHEET 3 OF 5
FILE NO. 10271
SURFACE ELEV. 4.4
RES. ENGR. JANE WANG

PROJECT: SOHO ISLAND - 74-88 SIXTH AVENUE
LOCATION: NEW YORK, NEW YORK

DAILY PROGRESS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE BLOWS/6"	SAMPLE DESCRIPTION	STRATA	DEPTH	CASING BLOWS	REMARKS
06:30							3"	
09-23-04					T		↓	
Thursday							↓	
Clear						104		*Coring time in
80°F	1C	104.0	REC=86%	Hard, slightly weathered to unweathered gray		105	3*	minutes per foot.
		109.0	RQD=70%	gneissic schist, blocky (Top 0.7': broken)			4*	
				slightly weathered joints			2*	
							4*	
							6*	
	2C	109.0	REC=100%	Hard, unweathered gray gneissic schist, blocky	R	110	6*	
		114.0	RQD=100%				7*	
							8*	
							5*	
10:00						114	6*	End of boring at 114'.
						115		
								WC=Water Content
								in percent of dry
								weight.
						120		
						125		
						130		
						135		
						140		
						145		
						150		

MRCE Form BL-1

BORING NO. B-1

MUESER RUTLEDGE CONSULTING ENGINEERS
ROCK CORE SKETCH

BORING NO. B-1
SHEET 4 OF 5
FILE NO. 10271
SURFACE ELEV. 4.4
RES. ENGR. J. WANG

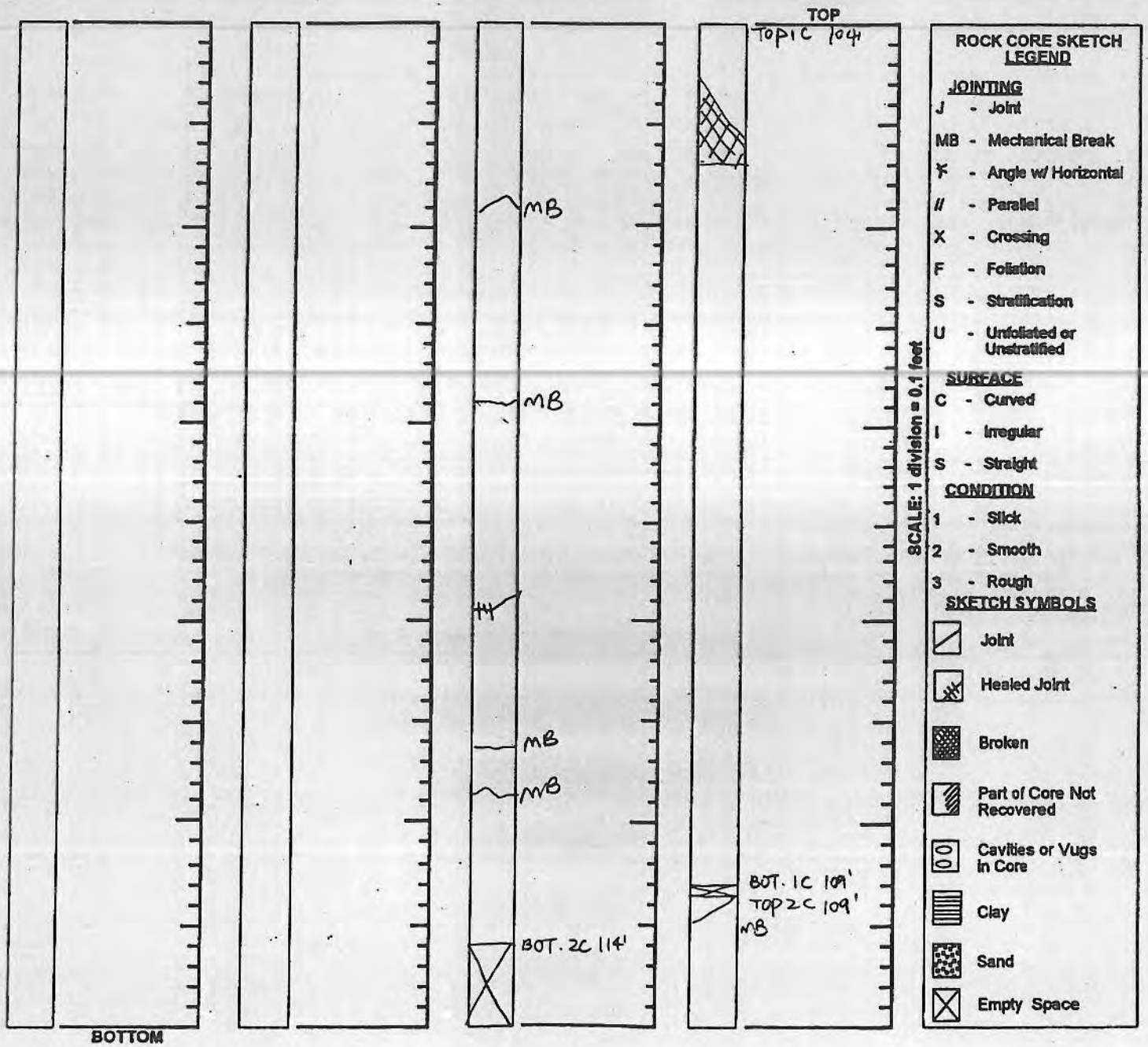
PROJECT 74-88 Sixth Ave.
LOCATION New York, NY

Run No.	REC / RQD

Run No.	REC / RQD

Run No.	REC / RQD
2C	100/100

Run No.	REC / RQD
1C	86/70
2C	100/100



NOTES

MUESER RUTLEDGE CONSULTING ENGINEERS

PROJECT	SOHO ISLAND - 74-88 SIXTH AVENUE	BORING NO.	B-1
LOCATION	NEW YORK, NEW YORK	SHEET	5 OF 5
BORING LOCATION	SEE BORING LOCATION PLAN	FILE NO.	10271
		SURFACE ELEV.	4.4
		DATUM	BOROUGH PRESIDENT OF MANHATTAN

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG		TYPE OF FEED DURING CORING	
TRUCK	X	MECHANICAL	
SKID		HYDRAULIC	X
BARGE		OTHER	
OTHER			

CASING USED		[X] YES [ ] NO			
DIA., IN.	4	DEPTH, FT. FROM	0	TO	35
DIA., IN.	3	DEPTH, FT. FROM	0	TO	104
DIA., IN.		DEPTH, FT. FROM		TO	

TYPE AND SIZE OF:

D-SAMPLER	2" O.D SPLIT SPOON
U-SAMPLER	
S-SAMPLER	
CORE BARREL	DOUBLE TUBE NX
CORE BIT	DIAMOND NX
DRILL RODS	N

DRILLING MUD USED	[X] YES	[ ] NO	
DIAMETER OF ROTARY BIT, IN.	3-7/8		
TYPE OF DRILLING MUD	QUICK-GEL		
AUGER USED	[ ] YES	[X] NO	
TYPE AND DIAMETER, IN.			
CASING HAMMER, LBS.	140	AVERAGE FALL, IN.	30
*SAMPLER HAMMER, LBS.	140	AVERAGE FALL, IN.	30

*AUTOMATIC HAMMER

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION
					NO OBSERVATIONS MADE.

PIEZOMETER INSTALLED [ ] YES [X] NO SKETCH SHOWN ON

STANDPIPE:	TYPE		ID, IN.		LENGTH, FT.		TOP ELEV:
INTAKE ELEMENT:	TYPE		OD, IN.		LENGTH, FT.		TIP ELEV.
FILTER:	MATERIAL		OD, IN.		LENGTH, FT.		BOT. ELEV.

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING	LIN. FT.	104	NO. OF 3" SHELBY TUBE SAMPLES	
3.5" DIA. U-SAMPLE BORING	LIN. FT.		NO. OF 3" UNDISTURBED SAMPLES	
CORE DRILLING IN ROCK	LIN. FT.	10	OTHER:	

BORING CONTRACTOR AQUIFER DRILLING AND TESTING, INC.

DRILLER DOUG WOOD HELPERS LEONID MALUKOV

REMARKS

RESIDENT ENGINEER JANE WANG DATE 09-23-04

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

BORING NO. B-2
SHEET 1 OF 5
FILE NO. 10271
SURFACE ELEV. 3.5
RES. ENGR. JANE WANG

PROJECT: SOHO ISLAND - 74-88 SIXTH AVENUE
LOCATION: NEW YORK, NEW YORK

DAILY PROGRESS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE BLOWS/6"	SAMPLE DESCRIPTION	STRATA	DEPTH	CASING BLOWS 4"	CASING BLOWS 3"	REMARKS
11:00									
09-20-04	1D	1.0	7-11	Red bricks, some fine to coarse sand, trace					
Monday		3.0	16-3	concrete fragments (Fill) (GP)					
Clear	2D	3.0	3-12	Red brick and concrete fragments, some fine					
70°F		5.0	4-6	to coarse sand, silt (Fill) (GM)		5			
	3D	5.0	3-3	Brown fine to medium sand, some silt (Fill)					
		7.0	3-3	(SM)					
	4D	7.0	2-2	Brown fine to medium sand, some silt, trace					
		9.0	3-4	gravel, clay pockets (Fill) (SM)	F				
						10			
	5D	10.0	3-1	Brown fine to coarse sand, trace silt, brick,					
		12.0	2-2	gravel (Fill) (SP-SM)					
						15			
	6D	15.0	2-2	Black and brown fine to coarse sand, some					
		17.0	2-4	silt, gravel (Fill) (SM)		17			
						20			
	7D	20.0	6-4	Gravel (GP)					Poor recovery.
		22.0	4-5						
					S1				
						25			
	8D	25.0	7-6	Brown fine to coarse sand and gravel, some					Poor recovery
		27.0	3-6	silt (SM)					
						28.5			
						30			
	9D	30.0	3-4	Black peat, some gravel, trace fine sand (Pt)					WC = 119
		32.0	5-7						
					O				
						35			
	10D	35.0	3-2	Dark brown peat, some wood, fiber (Pt)					WC = 305
		37.0	3-6						
						38.5			
						40			
	11D	40.0	3-5	Gray silty fine sand (SM)					
		42.0	5-7						
						45			
	12D	45.0	WH/12"	Soft gray clayey silt, trace fine sand (ML)	M				
		47.0	3-2						
						50			
	13D	50.0	WH/18"	Soft gray silty clay (CL)					WC = 50
		52.0	1						

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

BORING NO. B-2
SHEET 2 OF 5
FILE NO. 10271
SURFACE ELEV. 3.5
RES. ENGR. J. WANG/M. QUASSARANO

PROJECT: SOHO ISLAND - 74-88 SIXTH AVENUE
LOCATION: NEW YORK, NEW YORK

DAILY PROGRESS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE BLOWS/6"	SAMPLE DESCRIPTION	STRATA	DEPTH	CASING BLOWS	REMARKS
Cont'd 09-20-04 Monday Clear 70°F							3"	
					M	55		
	14D	55.0	WH/18"	Soft gray and brown silty clay and clayey silt				WC = 32
		57.0	2	(ML&CL)				
						58		
						60		
	15D	60.0	12-7	Red gravel, some fine coarse sand, trace silt				
		62.0	10-17	(GP-GM)				
						65		
	16D	65.0	25-9	Brown fine to coarse sand, trace silt, gravel				
		67.0	7-8	(SP-SM)	S2			
						70		
	17D	70.0	11-9	Brown fine to coarse sand, some gravel, trace				
15:00		72.0	7-6	silt (SP-SM)				
06:30 09-21-04 Tuesday Clear 70°F						75		
	18D	75.0	8-8	Brown fine to coarse sand, trace silt, gravel				
		77.0	8-8	(SP-SM)				
						78.5		
						80		
	19D	80.0	7-5	Red brown fine sand, some silt, trace mica				
		82.0	6-13	(SM)				
								Hard drilling at 84'
						85		probable boulder.
	20D	85.0	20-14	Red brown fine sand, some silt, trace gravel,				
		87.0	16-9	layered with green micaceous decomposed	T			
				rock (SM)				
						90		
	21D	90.0	20-18	Red brown fine to coarse sand, some silt,				
		92.0	17-30	trace gravel, layers of soft red brown fine				
				sandy silt, rock fragments at tip (SM)				
						95		
	22D	95.0	14-100/5"	Brown coarse to fine sand, some silt, gravel,		96		
		95.9		decomposed rock at tip (SM)				
	1C	97.0	REC=100%	Top 1.3': Hard, unweathered gray mica schist,			7*	*Coring time in
		101.3	RQD=84%	blocky			8*	minutes per foot.
				Bot 3': Hard, unweathered light gray quartz	R	100	10*	Core barrel blocked
				pegmatite, jointed			9*	up at 101.3'.
							5**	**Corng time for 4".

MRCE Form BL-1

BORING NO. B-2

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

PROJECT: SOHO ISLAND - 74-88 SIXTH AVENUE
LOCATION: NEW YORK, NEW YORK

BORING NO. B-2
SHEET 3 OF 5
FILE NO. 10271
SURFACE ELEV. 3.5
RES. ENGR. J. WANG/M. QUASSARANO

DAILY PROGRESS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE BLOWS/6"	SAMPLE DESCRIPTION	STRATA	DEPTH	CASING BLOWS	REMARKS
Cont'd								
09-21-04	2C	101.3	REC=100%	Do 1C Bot			3*	
Tuesday		101.9	RQD=100%				3*	
Clear	3C	102.0	REC=100%	Hard, ~~unweathered~~ light gray pegmatite, trace	R		3*	
80°F		107.0	RQD=100%	gneissic schist, jointed to moderately jointed		105	4*	
							3*	
14:05						107	3*	End of boring at 107'.
								WC=Water Content
						110		in percent of dry
								weight.
						115		
						120		
						125		
						130		
						135		
						140		
						145		
						150		

MRCE Form BL-1

BORING NO. B-2

MUESER RUTLEDGE CONSULTING ENGINEERS

ROCK CORE SKETCH

BORING NO. B-2
SHEET 4 OF 5
FILE NO. 10271
SURFACE ELEV. 3.5
RES. ENGR. J. Wang / M. Rasarano

PROJECT 74-88 Sixth Avenue

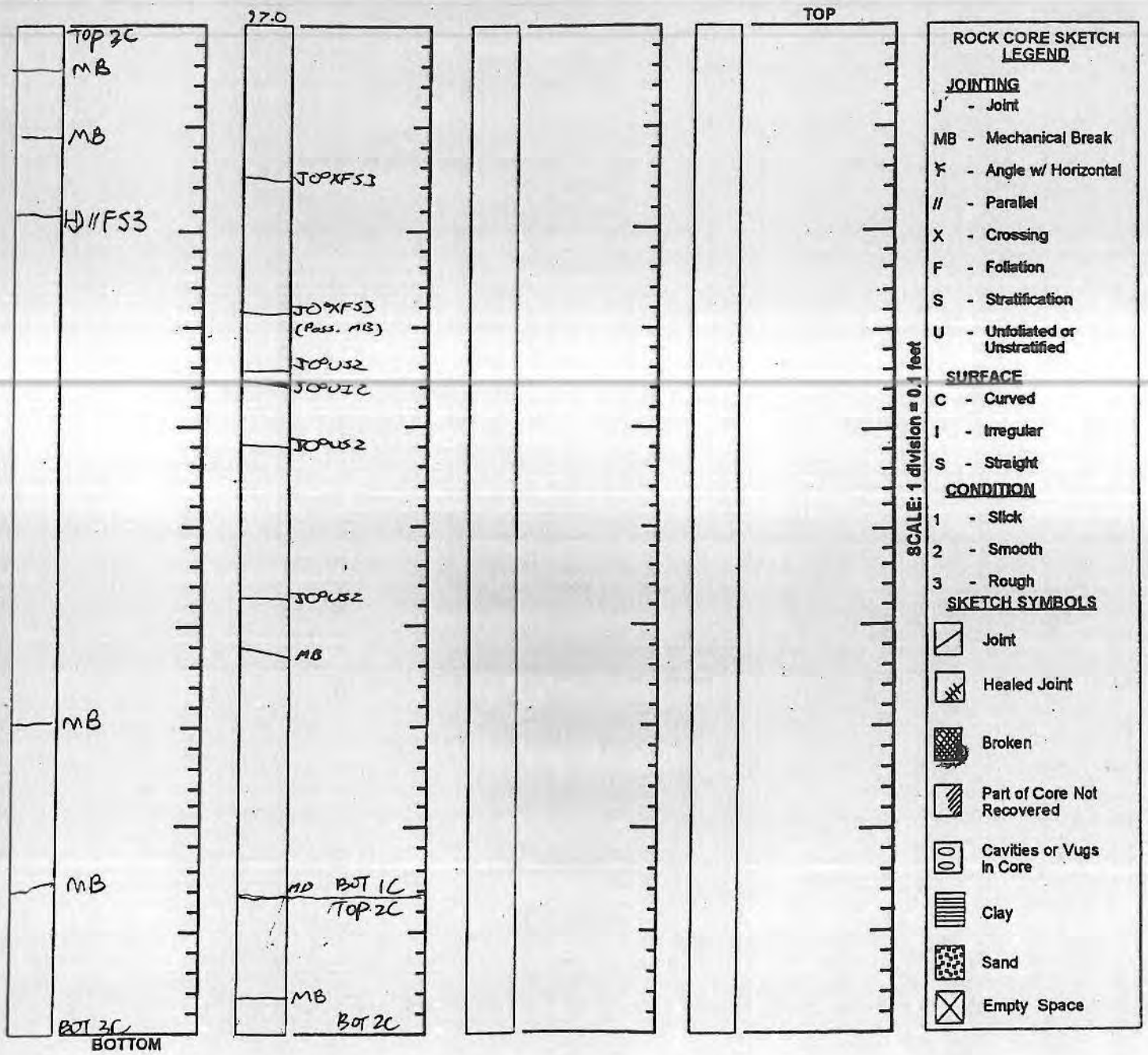
LOCATION New York, NY

Run No.	REC / RQD
3C	100/100

Run No.	REC / RQD
1C	100%
2C	94% / 100/100

Run No.	REC / RQD

Run No.	REC / RQD



ROCK CORE SKETCH LEGEND

JOINTING
- J - Joint
- MB - Mechanical Break
- ^ - Angle w/ Horizontal
- // - Parallel
- X - Crossing
- F - Foliation
- S - Stratification
- U - Unfoliated or Unstratified

SURFACE
- C - Curved
- I - Irregular
- S - Straight

CONDITION
- 1 - Slick
- 2 - Smooth
- 3 - Rough

SKETCH SYMBOLS
- Joint
- Healed Joint
- Broken
- Part of Core Not Recovered
- Cavities or Vugs In Core
- Clay
- Sand
- Empty Space

NOTES

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING NO. B-2
SHEET 5 OF 5
FILE NO. 10271
SURFACE ELEV. 3.5
DATUM BOROUGH PRESIDENT OF MANHATTAN

PROJECT SOHO ISLAND - 74-88 SIXTH AVENUE
LOCATION NEW YORK, NEW YORK
BORING LOCATION SEE BORING LOCATION PLAN

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG		TYPE OF FEED DURING CORING		CASING USED		[X] YES [ ] NO		
TRUCK	X	MECHANICAL		DIA., IN.	4	DEPTH, FT. FROM	0	TO 40
SKID		HYDRAULIC	X	DIA., IN.	3	DEPTH, FT. FROM	0	TO 97
BARGE		OTHER		DIA., IN.		DEPTH, FT. FROM		TO
OTHER								

TYPE AND SIZE OF:
D-SAMPLER 2" O.D. SPLIT SPOON
U-SAMPLER
S-SAMPLER
CORE BARREL DOUBLE TUBE NX
CORE BIT DIAMOND NX
DRILL RODS N

DRILLING MUD USED [X] YES [ ] NO
DIAMETER OF ROTARY BIT, IN. 3-7/8
TYPE OF DRILLING MUD QUICK-GEL

AUGER USED [ ] YES [X] NO
TYPE AND DIAMETER, IN.

CASING HAMMER, LBS. 140 AVERAGE FALL, IN. 30
*SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30
*AUTOMATIC HAMMER

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION
					NO OBSERVATIONS MADE.

PIEZOMETER INSTALLED [ ] YES [X] NO SKETCH SHOWN ON

STANDPIPE: TYPE ID, IN. LENGTH, FT. TOP ELEV.
INTAKE ELEMENT: TYPE OD, IN. LENGTH, FT. TIP ELEV.
FILTER: MATERIAL OD, IN. LENGTH, FT. BOT. ELEV.

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING	LIN. FT.	97	NO. OF 3" SHELBY TUBE SAMPLES	
3.5" DIA. U-SAMPLE BORING	LIN. FT.		NO. OF 3" UNDISTURBED SAMPLES	
CORE DRILLING IN ROCK	LIN. FT.	10	OTHER:	

BORING CONTRACTOR AQUIFER DRILLING DRILLING AND TESTING, INC.
DRILLER DOUG WOOD HELPERS LEONID MALUKOV
REMARKS
RESIDENT ENGINEER JANE WANG/MIKE QUASARANO DATE 09-21-04
BORING NO. B-2

MRCE Form BS-1

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

BORING NO. B-3P
SHEET 1 OF 7
FILE NO. 10271
SURFACE ELEV. 5.0
RES. ENGR. JANE WANG

PROJECT: SOHO ISLAND - 74-88 SIXTH AVENUE
LOCATION: NEW YORK, NEW YORK

DAILY PROGRESS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE BLOWS/6"	SAMPLE DESCRIPTION	STRATA	DEPTH	CASING BLOWS 4" 3"	REMARKS
12:00								
09-23-04	1D	1.0	8-8	Brown silty fine to coarse sand, some gravel,				
Thursday		3.0	5-5	trace brick, concrete fragments (Fill) (SM)				
Clear	2D	3.0	4-2	Brown ~~fine to coarse~~ sand, some gravel, silt				Poor recovery.
80°F		5.0	1-1	(Fill) (SM)		5		
	3D	5.0	3-1	Brown fine to coarse sand, some gravel, silt,	F (10)			Recovered on 2nd attempt.
		7.0	1-1	trace brick (Fill) (SM)				
	4NR	7.0	9-6	No recovery				
		9.0	6-6			10		
	5D	10.0	1-2	Brown fine to coarse sand, some silt, trace				
		12.0	2-5	gravel (SM)				
						15		
	6D	15.0	2-2	Brown coarse to fine sand, some gravel, trace				
		17.0	1-2	silt (SP-SM)				
					S1 (18.5)	20		
	7D	20.0	4-3	Dark brown fine to coarse sand, some gravel,				
		22.0	3-3	trace silt (SP-SM)				
						25		
	8D	25.0	6-10	Brown fine to coarse sand, some silt, trace				
		27.0	10-7	gravel (SM)				
						28.5		
						30		
	9D	30.0	6-8	Soft red brown peat, some wood fiber, trace				WC = 388
		32.0	12-27	gravel, wood at the tip (Pt)	O (10)			
						35		
	10D	35.0	3-3	Hard red brown peat, some wood fibers (Pt)				WC = 325
		37.0	4-7					
						38.5		
						40		
	11D	40.0	2-3	Soft gray silty clay (CL)				WC = 41
		42.0	1-1					
						45		
	12D	45.0	1-1	Soft to stiff gray to green gray clayey silt (ML)	M (15)			WC = 39
		47.0	3-1					
						50		
	13D	50.0	1-1	Soft gray clayey silt (ML)				
15:00		52.0	1-1					

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

BORING NO. B-3P
SHEET 2 OF 7
FILE NO. 10271
SURFACE ELEV. 5.0
RES. ENGR. JANE WANG

PROJECT: SOHO ISLAND - 74-88 SIXTH AVENUE
LOCATION: NEW YORK, NEW YORK

DAILY PROGRESS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE BLOWS/6"	SAMPLE DESCRIPTION	STRATA	DEPTH	CASING BLOWS	REMARKS
06:30							3"	
09-24-04					M			
Friday								
Clear						53.5		
80°F						55		
	14D	55.0	5-4	Brown medium to fine sand, trace silt, coarse				
		57.0	5-7	sand (SP-SM)				
						60		
	15D	60.0	6-7	Brown fine to coarse sand, trace silt, gravel				
		62.0	7-9	(SP-SM)				
						65		
	16D	65.0	5-4	Do 15D (SP-SM)				
		67.0	7-8					
						70		
	17D	70.0	7-8	Brown coarse to fine sand, trace silt, gravel				
		72.0	7-6	(SP-SM)				Hard drilling from 72'.
					S2			
					(40)	75		
	18D	75.0	14-18	Brown gravelly fine to coarse sand, trace silt				
		77.0	15-11	(SP-SM)				
						80		
	19D	80.0	5-5	Brown fine to coarse sand, trace gravel, silt				
		82.0	6-7	(SP-SM)				
						85		
	20D	85.0	9-8	Gravel (GP)				Gravel blocked spoon
		87.0	7-6					tip.
						90		
	21D	90.0	7-6	Brown coarse to fine sand, trace silt (SP-SM)				
		92.0	9-12					
						93.5		
					(55)	95		
	22D	95.0	6-7	Brown fine to coarse sand, some silt, gravel	T			
		97.0	9-9	(SM)				
						99	3*	
	1C	99.0	REC=60%	Intermediate (top 1.5') to medium hard, slightly		100	2*	
		104.0	RQD=30%	weathered to moderately weathered gray	R		2*	
				gneissic schist, broken to jointed			4*	

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

BORING NO. B-3P
SHEET 3 OF 7
FILE NO. 10271
SURFACE ELEV. 5.0
RES. ENGR. JANE WANG

PROJECT: SOHO ISLAND - 74-88 SIXTH AVENUE
LOCATION: NEW YORK, NEW YORK

DAILY PROGRESS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE BLOWS/6"	SAMPLE DESCRIPTION	STRATA	DEPTH	CASING BLOWS	REMARKS
Cont'd 09-24-04 Friday								
	2C	104.0	REC=92%	Hard, ~~unweathered~~ gray gneissic schist, blocky			4*	*Coring time in minutes per foot.
		109.0	RQD=92%		R	105	4*	
							5*	
							7*	
							3*	
15:00						109	4*	End of boring at 109'.
						110		WC=Water Content in percent of dry weight.
						115		
						120		
						125		
						130		
						135		
						140		
						145		
						150		

BORING NO. B-3P

MUESER RUTLEDGE CONSULTING ENGINEERS
ROCK CORE SKETCH

BORING NO. B-3P
SHEET 4 OF 7
FILE NO. 10271
SURFACE ELEV. 5.0
RES. ENGR. J. WANG

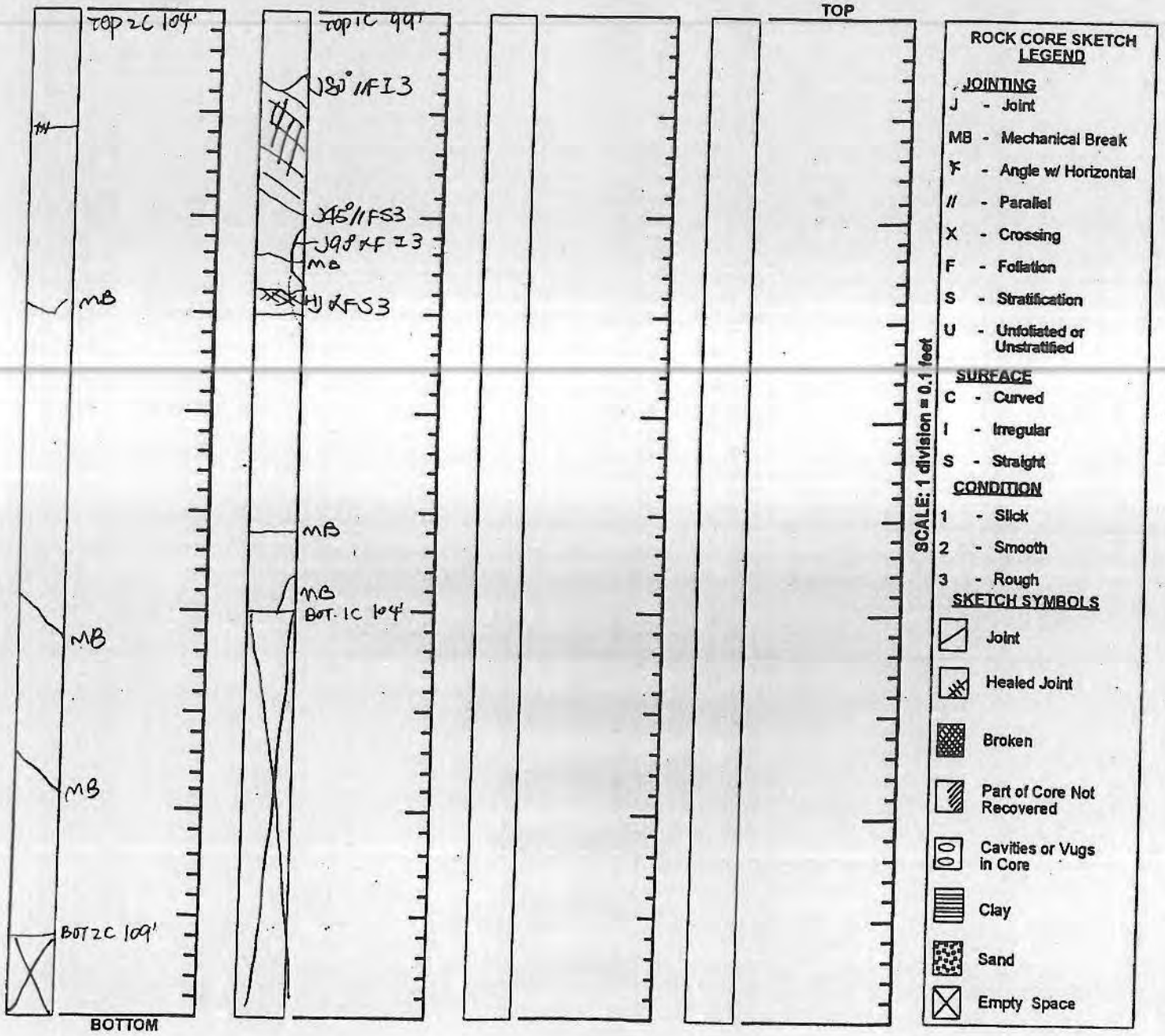
PROJECT 74-88 6th Ave
LOCATION New York, NY

Run No.	REC / RQD
2C	92/92

Run No.	REC / RQD
1C	60/30

Run No.	REC / RQD

Run No.	REC / RQD



NOTES _____

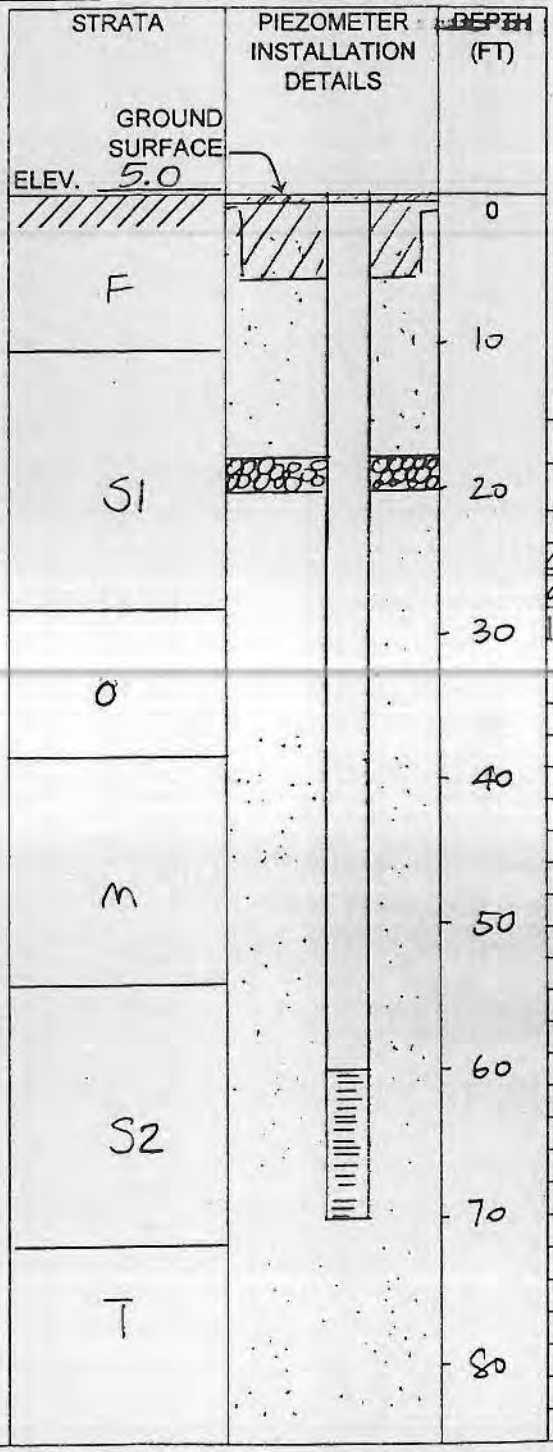
Mueser Rutledge Consulting Engineers
14 Penn Plaza - 225 W. 34th St.
New York, NY 10122

SHEET 5 OF 7
FILE NO. 10271
SUBCODE

PIEZOMETER RECORD

PROJECT: 7A-88 SIXTH AVENUE
LOCATION: NEW YORK, NY
PIEZOMETER LOCATION: SEE BORING LOCATION PLAN
☐ SEE SKETCH ON BACK

PIEZOMETER NO. B-3P
DATE OF INSTALLATION 9-24-04
RESIDENT ENG. J. WANG



PIEZOMETER TYPE PVC

INTAKE POINT
depth to bottom, ft = 70
depth to top, ft = 60
length, ft = 10 = L
diameter, in = 2½, ft = 0.21 = 2R

STANDPIPE/RISER
elevation of rim, ft = 5.0
diameter, in = 2½, ft = 0.21 = 2r

READING TIME		DEPTH – RIM TO WATER	ELEVATION OF WATER	REMARKS
DATE	CLOCK			
9-25-04	10:00	7.6'	-2.6	
9-27-04	9:30	7.6'	-2.6	
9-28-04	9:10	7.8'	-2.8	
10-7-04	10:00	7.8'	-2.8	

SAND
GRAVEL
BENTONITE
GROUT

GROUND SURFACE ELEV. 5.0
PIEZOMETER NO. B-3P

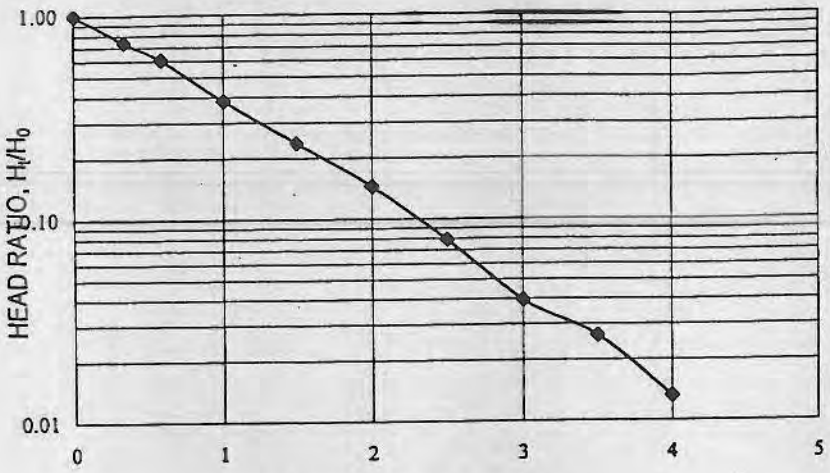
MUESER RUTLEDGE CONSULTING ENGINEERS

SHEET 6 OF 7
FILE NO. 10271
SUBCODE

VARIABLE HEAD PERMEABILITY TEST

☐ BOREHOLE OR ☒ PIEZOMETER NO. B-3P
TEST NO. 1
RESIDENT ENG. JANE WANG
CALC. BY JW DATE 9/28/04
CH'KD BY ____ DATE ____

PROJECT: 76-88 SIXTH AVENUE
LOCATION: NEW YORK, NY
PIEZOMETER LOCATION: SEE BORING LOCATION PLAN



INTAKE POINT
depth to bottom, ft = 70
depth to top, ft = 60
length, ft = 10 = L
diameter, in = 2 1/2, ft = 0.21 = 2R

STANDPIPE/RISER
elevation of rim, ft = 5.0
diameter, in = 2 1/2, ft = 0.21 = 2r

depth of casing, ft = —

depth to which stand-pipe was bailed, ft = — = Z

READING TIME			ORIGINAL TEST DEPTH, H_0 (ft.)	DEPTH AT TIME t, H_t (ft.)	UNBALANCED HEAD $\Delta H_t = H_t - H_0$ (ft.)	HEAD RATIO $\Delta H_t/\Delta H_0$	REMARKS
DATE	CLOCK	Δt MIN.					
9/27/2004	9:30	0	7.6	0	7.6	1.00	
		0.33		2	5.6	0.74	
		0.58		3	4.6	0.61	
		1		4.7	2.9	0.38	
		1.5		5.8	1.8	0.24	
		2		6.5	1.1	0.14	
		2.5		7	0.6	0.08	
		3		7.3	0.3	0.04	
		3.5		7.4	0.2	0.03	
		4		7.5	0.1	0.01	

PIEZOMETER NO. B-3P

MUESER RUTLEDGE CONSULTING ENGINEERS

PROJECT	SOHO ISLAND - 74-88 SIXTH AVENUE	BORING NO.	B-3P
LOCATION	NEW YORK, NEW YORK	SHEET	7 OF 7
BORING LOCATION	SEE BORING LOCATION PLAN	FILE NO.	10271
		SURFACE ELEV.	5.0
		DATUM	BOROUGH PRESIDENT OF MANHATTAN

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG		TYPE OF FEED DURING CORING		CASING USED		[X] YES [ ] NO			
TRUCK	X	MECHANICAL		DIA., IN.	4	DEPTH, FT. FROM	0	TO	35
SKID		HYDRAULIC	X	DIA., IN.	3	DEPTH, FT. FROM	0	TO	99
BARGE		OTHER		DIA., IN.		DEPTH, FT. FROM		TO	
OTHER									

TYPE AND SIZE OF:

D-SAMPLER	2" O.D. SPLIT SPOON
U-SAMPLER	
S-SAMPLER	
CORE BARREL	DOUBLE TUBE NX
CORE BIT	DIAMOND NX
DRILL RODS	N

DRILLING MUD USED	[X] YES	[ ] NO	
DIAMETER OF ROTARY BIT, IN.	3-7/8		
TYPE OF DRILLING MUD	REVERT		
AUGER USED	[ ] YES	[X] NO	
TYPE AND DIAMETER, IN.			
CASING HAMMER, LBS.	140	AVERAGE FALL, IN.	30
*SAMPLER HAMMER, LBS.	140	AVERAGE FALL, IN.	30
*AUTOMATIC HAMMER			

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION
					NO OBSERVATIONS MADE IN BOREHOLE.
					FOR PIEZOMETER READINGS SEE SHEET 5.

PIEZOMETER INSTALLED [X] YES [ ] NO SKETCH SHOWN ON SHEET 5

STANDPIPE:	TYPE	PVC	ID, IN.	2	LENGTH, FT.	60	TOP ELEV.	
INTAKE ELEMENT:	TYPE	SCREENED PVC	OD, IN.	2.5	LENGTH, FT.	10	TIP ELEV.	
FILTER:	MATERIAL	SAND	OD, IN.	3	LENGTH, FT.	70	BOT. ELEV.	

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING	LIN. FT.	99	NO. OF 3" SHELBY TUBE SAMPLES	
3.5" DIA. U-SAMPLE BORING	LIN. FT.		NO. OF 3" UNDISTURBED SAMPLES	
CORE DRILLING IN ROCK	LIN. FT.	10	OTHER:	

BORING CONTRACTOR AQUIFER DRILLING AND TESTING, INC.

DRILLER DOUG WOOD HELPERS LEONID MALUKOV

REMARKS

RESIDENT ENGINEER JANE WANG DATE 09-24-04

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

PROJECT: SOHO ISLAND - 74-88 SIXTH AVENUE
LOCATION: NEW YORK, NEW YORK

BORING NO. B-4
SHEET 1 OF 3
FILE NO. 10271
SURFACE ELEV. 5.6
RES. ENGR. JANE WANG

DAILY PROGRESS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE BLOWS/6"	SAMPLE DESCRIPTION	STRATA	DEPTH	CASING BLOWS	REMARKS
08:00							4"	
09-13-04	1D	1.0	11-7	Brown black silty fine to coarse sand, trace				
Monday		3.0	4-2	gravel, gray silt layers, brick (Fill) (SM)				
Clear	2D	3.0	3-6	Brown ~~fine to coarse~~ sand, some silt, gravel,				
70°F		5.0	9-10	trace brick, vegetation (Fill) (SM)				
	3D	5.0	7-8	Brown fine to coarse sand, some silt, trace		5		
		7.0	6-12	brick, gravel (Fill) (SM)				
	4D	7.0	8-7	Brown fine to coarse sand, some silt, trace	F			
		9.0	8-5	gravel, brick (Fill) (SM)				
	5NR	9.0	6-6	No recovery				
		11.0	9-10			10		Slow advancement 9.5' to 11'.
	6D	15.0	5-3	Red brown coarse to fine sand, trace silt,		13.5		
		17.0	5-6	gravel (SP-SM)		15		
	7D	20.0	2-1	Top 12": Soft black organic silty clay (OH)		20		
		22.0	3-3	Bot 12": Brown fine to coarse sand, trace silt,	S1			TOP: WC = 54
				gravel (SP-SM)				
	8D	25.0	8-8	Brown gray coarse to fine sand, some gravel,		25		
		27.0	4-5	silt (SM)				Poor recovery.
	9D	30.0	4-5	Wood and peat, trace gravel (Pt)		28.5		
		32.0	5-7			30		2nd attempt using 3" spoon. WC = 320
	10D	35.0	2-3	Top 12": Organic silt and peat (OH+Pt)	O	35		
		37.0	5-7	Bot 12": Dark gray organic clayey silt, trace				TOP: WC = 429
				wood, fiber (OH)				BOT: WC = 143
	11D	40.0	WR/12"	Soft gray clayey silt, trace fine sand, wood		38.5		
		42.0	1-1	fiber (ML)		40		
	12D	45.0	WH/12"	Soft gray and brown silty clay, trace fine sand	M	45		
		47.0	1-1	(CL)				WC = 36
15:00	13D	50.0	1-4	Top 12": Intlyrd soft brn si cl & f sa si (CL+ML)		50		
		52.0	6-6	Bot 12": Dk brn f-c sand, tr silt, gravel (SP-SM)		51		TOP: WC = 35
					S2			

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

BORING NO. B-4
SHEET 2 OF 3
FILE NO. 10271
SURFACE ELEV. 5.6
RES. ENGR. JANE WANG

PROJECT: SOHO ISLAND - 74-88 SIXTH AVENUE
LOCATION: NEW YORK, NEW YORK

DAILY PROGRESS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE BLOWS/6"	SAMPLE DESCRIPTION	STRATA	DEPTH	CASING BLOWS	REMARKS
07:00							4"	
09-14-04								
Tuesday								
Clear								
70°F						55		
	14D	55.0	8-11	Top 12": Dark brown fine to coarse sand, trace				
		57.0	14-16	silt, gravel (SP-SM)				
				Bot 12": Brown medium to fine sand, trace				
				silt, coarse sand (SP-SM)				
					S2	60		
	15D	60.0	7-9	Brown medium to fine sand, trace silt, coarse				
		62.0	10-12	sand (SP-SM)				
						65		
	16D	65.0	9-19	Brown fine to coarse sand, trace silt, gravel				
		67.0	27-40	(SP-SM)				
						68		Rig chattering at 68'. Probable boulder. Tried to core at 69', failed because casing lost in hole. Attempted to retrieve by drilling to 75'.
13:30								
07:00						70		
09-15-04					T			
Wednesday								
Cloudy								
70°F						75		End of boring at 75'.
13:00								
								Offset to Boring B-4A.
								WC=Water Content in percent of dry weight.
						80		
						85		
						90		
						95		
						100		

MRCE Form BL-1

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING NO. B-4
SHEET 3 OF 3
FILE NO. 10271
SURFACE ELEV. 5.6
DATUM BOROUGH PRESIDENT OF MANHATTAN

PROJECT SOHO ISLAND - 74-88 SIXTH AVENUE
LOCATION NEW YORK, NEW YORK
BORING LOCATION SEE BORING LOCATION PLAN

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG
TRUCK X
SKID
BARGE
OTHER

TYPE OF FEED DURING CORING
MECHANICAL
HYDRAULIC X
OTHER

CASING USED [X] YES [ ] NO
DIA., IN. 4 DEPTH, FT. FROM 0 TO 65
DIA., IN. DEPTH, FT. FROM TO
DIA., IN. DEPTH, FT. FROM TO

TYPE AND SIZE OF:
D-SAMPLER 2" O.D. SPLIT SPOON
U-SAMPLER
S-SAMPLER
CORE BARREL DOUBLE TUBE NX
CORE BIT DIAMOND NX
DRILL RODS N

DRILLING MUD USED [X] YES [ ] NO
DIAMETER OF ROTARY BIT, IN. 3-7/8
TYPE OF DRILLING MUD QUICK GEL

AUGER USED [ ] YES [X] NO
TYPE AND DIAMETER, IN.

CASING HAMMER, LBS. 300 AVERAGE FALL, IN. 18
SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION
					NO OBSERVATIONS MADE.

PIEZOMETER INSTALLED [ ] YES [X] NO SKETCH SHOWN ON

STANDPIPE: TYPE ID, IN. LENGTH, FT. TOP ELEV.
INTAKE ELEMENT: TYPE OD, IN. LENGTH, FT. TIP ELEV.
FILTER: MATERIAL OD, IN. LENGTH, FT. BOT. ELEV.

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING LIN. FT. 75
3.5" DIA. U-SAMPLE BORING LIN. FT.
CORE DRILLING IN ROCK LIN. FT.

NO. OF 3" SHELBY TUBE SAMPLES
NO. OF 3" UNDISTURBED SAMPLES
OTHER:

BORING CONTRACTOR AQUIFER DRILLING AND TESTING, INC.
DRILLER TERRY HELPERS RUSHI MALUKOV
REMARKS
RESIDENT ENGINEER JANE WANG DATE 09-15-04

MRCE Form BS-1

BORING NO. B-4

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

BORING NO. B-4A
SHEET 1 OF 5
FILE NO. 10271
SURFACE ELEV. 5.5
RES. ENGR. JANE WANG

PROJECT: SOHO ISLAND - 74-88 SIXTH AVENUE
LOCATION: NEW YORK, NEW YORK

DAILY PROGRESS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE BLOWS/6"	SAMPLE DESCRIPTION	STRATA	DEPTH	CASING BLOWS	REMARKS
13:00 09-15-04 Wednesday Cloudy 70°F							4"	Offset from Boring No. B-4.
						5		Drilled without sampling to 70'. See Boring B-4 for sample descriptions above 70'.
					F	10		
						13.5		
						15		
						20		
					S1	25		
						28.5		
						30		
					O	35		
15:00						36		
07:00 09-16-04 Thursday Cloudy 70°F						40		
					M	45		
						50		
						51		
					S2			

MRCE Form BL-1

BORING NO. B-4A

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

BORING NO. B-4A
SHEET 2 OF 5
FILE NO. 10271
SURFACE ELEV. 5.5
RES. ENGR. JANE WANG

PROJECT: SOHO ISLAND - 74-88 SIXTH AVENUE
LOCATION: NEW YORK, NEW YORK

DAILY PROGRESS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE BLOWS/6"	SAMPLE DESCRIPTION	STRATA	DEPTH	CASING BLOWS 4"	CASING BLOWS 3"	REMARKS
Cont'd									
09-16-04									
Thursday									
Cloudy									
70°F						55			
					S2	60			
						65			
						68			Hard drilling at 68' - probable boulder.
						70			
	1D	70.0	17-11	Brown red gravelly coarse to fine sand, some					
15:00		72.0	12-16	silt (SM)					
07:00									
09-17-04									
Friday						75			
Cloudy	2D	75.0	13-12	Brown gravelly coarse to fine sand, some silt					
70°F		77.0	6-5	(SM)					
						80			
	3D	80.0	6-2	Brown coarse to fine sand and gravel, trace					
		82.0	4-5	silt (GP)					
					T				
						85			
	4D	85.0	9-3	Gravel, trace coarse sand (GP)					
		87.0	4-7						
									Slow advancement at 88' - probable boulder.
						90			
	5D	90.0	94-100/4"	Steel					
		90.8							
						95			
	6D	95.0	11-100/5"	Brown fine to coarse sand, some silt, trace					
15:00		95.7		gravel, silty clay seam (SM)		97			
07:00	1C	97.0	REC=82%	Hard, unweathered to slightly weathered, gray			5*		*Coring time in minutes per foot.
09-20-04		102.0	RQD=78%	and white gneissic schist, moderately jointed,			4*		
Clear				slightly weathered joints	R	100	4*		
60°F							3*		
							4*		

MRCE Form BL-1

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

PROJECT: SOHO ISLAND - 74-88 SIXTH AVENUE
LOCATION: NEW YORK, NEW YORK

BORING NO. B-4A
SHEET 3 OF 5
FILE NO. 10271
SURFACE ELEV. 5.5
RES. ENGR. JANE WANG

DAILY PROGRESS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE BLOWS/6"	SAMPLE DESCRIPTION	STRATA	DEPTH	CASING BLOWS	REMARKS
	2C	102.0	REC=92%	Hard, slightly weathered gray gneissic schist,			4*	
		107.0	RQD=82%	jointed ~~to massive~~, slightly weathered joints	R		4*	
						105	4*	
							3*	
11:00						107	3*	End of boring at 107'.
						110		
						115		
						120		
						125		
						130		
						135		
						140		
						145		
						150		

MRCE Form BL-1

BORING NO. B-4A

MUESER RUTLEDGE CONSULTING ENGINEERS
ROCK CORE SKETCH

BORING NO. B-4A
SHEET 4 OF 5
FILE NO. 10271
SURFACE ELEV. 5.5
RES. ENGR. J. WANG

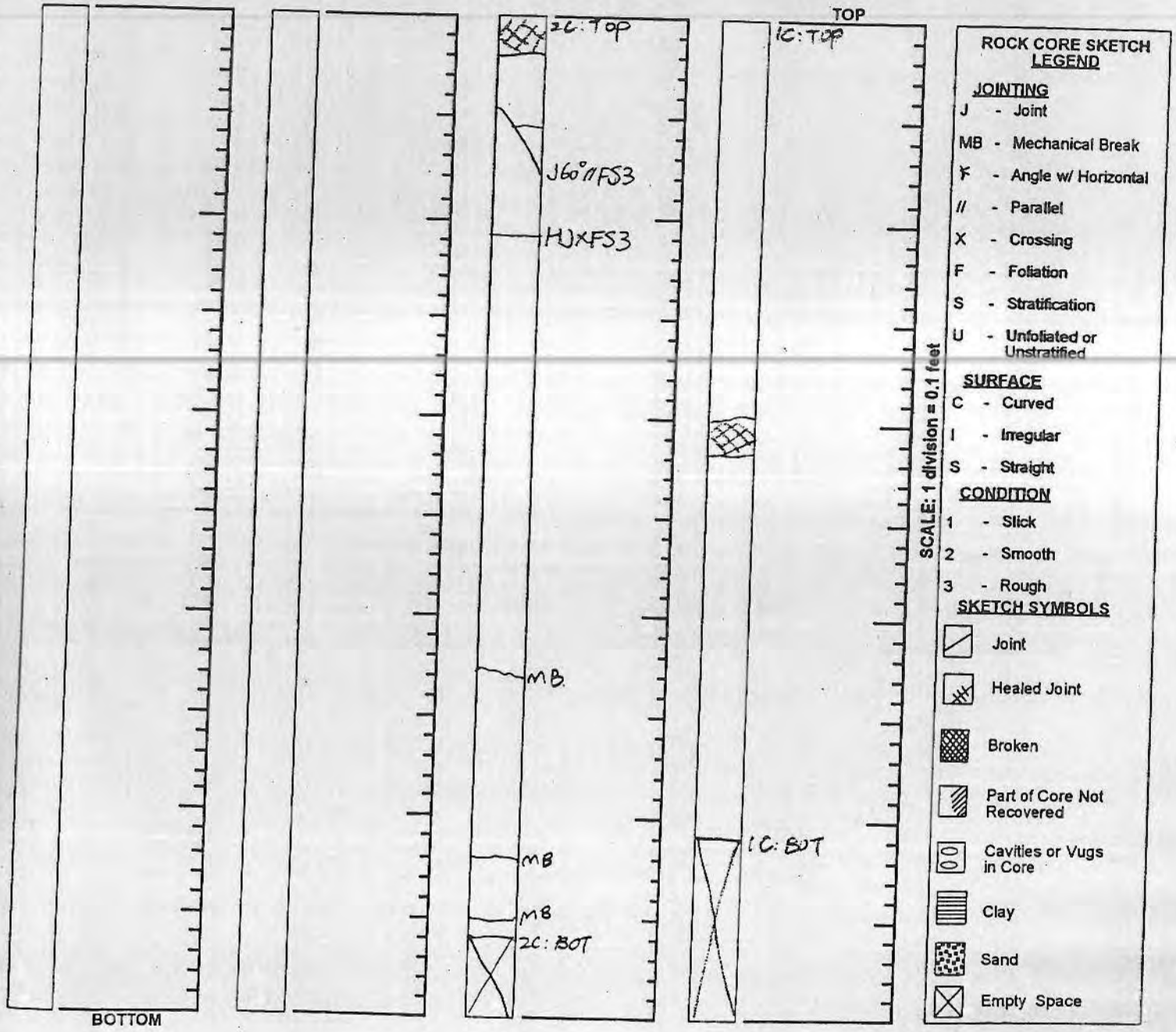
PROJECT 74-88 SIXTH AVENUE
LOCATION NEW YORK, NY

Run No.	REC / RQD

Run No.	REC / RQD

Run No.	REC / RQD
2C	92/82

Run No.	REC / RQD
1C	82/78



NOTES

MUESER RUTLEDGE CONSULTING ENGINEERS

PROJECT	SOHO ISLAND - 74-88 SIXTH AVENUE	BORING NO.	B-4A
LOCATION	NEW YORK, NEW YORK	SHEET	5 OF 5
BORING LOCATION	SEE BORING LOCATION PLAN	FILE NO.	10271
		SURFACE ELEV.	5.5
		DATUM	BOROUGH PRESIDENT OF MANHATTAN

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG		TYPE OF FEED DURING CORING		CASING USED	[X] YES	[ ] NO		
TRUCK	X	MECHANICAL		DIA., IN. 4	DEPTH, FT. FROM	0	TO	80
SKID		HYDRAULIC	X	DIA., IN. 3	DEPTH, FT. FROM	0	TO	97
BARGE		OTHER		DIA., IN.	DEPTH, FT. FROM		TO	
OTHER								

TYPE AND SIZE OF:

D-SAMPLER	2" O.D. SPLIT SPOON
U-SAMPLER	
S-SAMPLER	
CORE BARREL	DOUBLE TUBE NX
CORE BIT	DIAMOND NX
DRILL RODS	N

DRILLING MUD USED [X] YES [ ] NO

DIAMETER OF ROTARY BIT, IN. 3-7/8

TYPE OF DRILLING MUD QUICK GEL

AUGER USED [ ] YES [X] NO

TYPE AND DIAMETER, IN.

CASING HAMMER, LBS. 300 AVERAGE FALL, IN. 18

*SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30

*AUTOMATIC HAMMER

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION
					NO OBSERVATIONS MADE.

PIEZOMETER INSTALLED [ ] YES [X] NO SKETCH SHOWN ON

STANDPIPE:	TYPE	ID, IN.	LENGTH, FT.		TOP ELEV.		
INTAKE ELEMENT:	TYPE	OD, IN.	LENGTH, FT.		TIP ELEV.		
FILTER:	MATERIAL	OD, IN.	LENGTH, FT.		BOT. ELEV.		

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING	LIN. FT.	97	NO. OF 3" SHELBY TUBE SAMPLES	
3.5" DIA. U-SAMPLE BORING	LIN. FT.		NO. OF 3" UNDISTURBED SAMPLES	
CORE DRILLING IN ROCK	LIN. FT.	10	OTHER:	

BORING CONTRACTOR AQUIFER DRILLING AND TESTING, INC.

DRILLER DOUG WOOD HELPERS LEONID MALUKOV

REMARKS

RESIDENT ENGINEER JANE WANG DATE 09-20-04

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

PROJECT: SOHO ISLAND - 74-88 SIXTH AVENUE
LOCATION: NEW YORK, NEW YORK

BORING NO. B-5
SHEET 1 OF 5
FILE NO. 10271
SURFACE ELEV. 5.9
RES. ENGR. JANE WANG

DAILY PROGRESS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE BLOWS/6"	SAMPLE DESCRIPTION	STRATA	DEPTH	CASING BLOWS 4" 3"	REMARKS
07:00								
09-25-04	1D	1.0	21-7	Dark gray fine to coarse sand and concrete fragments, some silt, brick, gravel (Fill) (SM)				
Saturday		3.0	5-3					
Clear	2D	3.0	4-6	Brown fine to coarse sand, some brick, gravel, silt, trace concrete fragments (Fill) (SM)				
80°F		5.0	5-3					
	3D	5.0	4-6	Brown fine to coarse sand, some gravel, brick, trace silt, concrete fragments (Fill) (SP-SM)		5		
		7.0	6-8					
	4D	7.0	7-10	Dark brown fine to coarse sand, some gravel, silt, trace concrete fragments (Fill) (SM)				
		9.0	9-9					
	5D	9.0	7-6	Brown silty fine to medium sand, trace coarse sand (Fill) (SM)	F	10		
		11.0	7-9					
	6D	11.0	3-2	Brown fine to coarse sand, some silt, trace gravel (Fill) (SM)				
		13.0	2-2					
						15		
	7D	15.0	3-5	Brown fine to coarse sand, some silt, trace gravel, silt layers, concrete fragments (Fill) (SM)				
		17.0	7-7					
						18.5		
	8D	20.0	1-2	Brown fine to coarse sand, some silt, trace gravel (SM)		20		
		22.0	2-4					
					S1			
	9D	25.0	2-1	Brown fine to coarse sand, some silt, trace gravel, organic silty clay layer (SM)		25		OH: WC = 60
		27.0	6-10					
						28.5		
	10D	30.0	1-3	Red brown silty peat, some wood fibers (Pt)		30		WC = 416
		32.0	1-2					
					O			
	11D	35.0	3-3	Dark brown silty peat, some wood fibers (Pt)		35		WC = 423
		37.0	4-5					
						40		
	12D	40.0	3-1	Brown fine to coarse sand, some silt (SM)				Poor recovery.
		42.0	2-1					
						45		
	13D	45.0	3-1	Soft gray clayey silt, some fine sand (ML)	M			WC = 36
		47.0	1-1					
						50		
	14D	50.0	WH/24"	Soft brown silty clay, some silty fine sand layers (CL+SM)				WC = 30
		52.0						

MRCE Form BL-1

BORING NO. B-5

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

BORING NO. B-5
SHEET 2 OF 5
FILE NO. 10271
SURFACE ELEV. 5.9
RES. ENGR. JANE WANG

PROJECT: SOHO ISLAND - 74-88 SIXTH AVENUE
LOCATION: NEW YORK, NEW YORK

DAILY PROGRESS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE BLOWS/6"	SAMPLE DESCRIPTION	STRATA	DEPTH	CASING BLOWS	REMARKS
Cont'd							3"	
09-25-04					M			
Saturday								
Clear						53.5		
80°F						55		
	15D	55.0	7-9	Brown fine to coarse sand, some gravel, silt				Gravel piece blocked
		57.0	8-8	(SM)				spoon tip.
						60		
	16D	60.0	5-6	Brown fine to medium sand, trace silt, gravel				
		62.0	7-8	(SP-SM)				
						65		
	17D	65.0	7-8	Brown fine to medium sand, trace silt (SP-SM)				
		67.0	10-11					
						70		
	18D	70.0	9-11	Brown fine to medium sand, trace silt, gravel				
13:00		72.0	11-23	(SP-SM)				
07:00								
09-26-04								
Sunday					S2			
Cloudy	19D	75.0	12-10	Brown fine to coarse sand, some gravel, trace		75		
80°F		77.0	15-14	silt (SP-SM)				
						80		
	20D	80.0	7-9	Brown coarse to fine sand, some gravel, trace				
		82.0	9-9	silt (SP-SM)				
						85		
	21D	85.0	6-9	Brown fine to medium sand, trace silt, coarse				
		87.0	8-9	sand (SP-SM)				
						90		
	22D	90.0	7-14	Brown fine sand, some silt (SM)				
		92.0	14-20					
						93.5		
						95		
	23D	95.0	25-32	Brown fine to coarse sand, some silt, trace	T			Decomposed rock
		97.0	50-38	gravel, mica (SM)		97		at spoon tip.
	1C	97.0	REC=100%	Hard, unweathered gray gneissic schist, blocky			4*	
		101.6	RQD=100%				3*	
					R	100	4*	*Coring time in
							5*	minutes per foot.
							6*	

MRCE Form BL-1

BORING NO. B-5

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

PROJECT: SOHO ISLAND - 74-88 SIXTH AVENUE
LOCATION: NEW YORK, NEW YORK

BORING NO. B-5
SHEET 3 OF 5
FILE NO. 10271
SURFACE ELEV. 5.9
RES. ENGR. JANE WANG

DAILY PROGRESS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE BLOWS/6"	SAMPLE DESCRIPTION	STRATA	DEPTH	CASING BLOWS	REMARKS
Cont'd								
09-26-04	2C	101.6	REC=100%	Do 1C				
Sunday		106.4	RQD=100%				5*	
							6*	
					R	105	5*	
							5*	
16:30						107	5*	End of boring at 107'.
								WC=Water Content in percent of dry weight.
						110		
						115		
						120		
						125		
						130		
						135		
						140		
						145		
						150		

MRCE Form BL-1

BORING NO. B-5

MUESER RUTLEDGE CONSULTING ENGINEERS
ROCK CORE SKETCH

BORING NO. B-5
SHEET 4 OF 5
FILE NO. 10271
SURFACE ELEV. 5.9
RES. ENGR. J. WANG

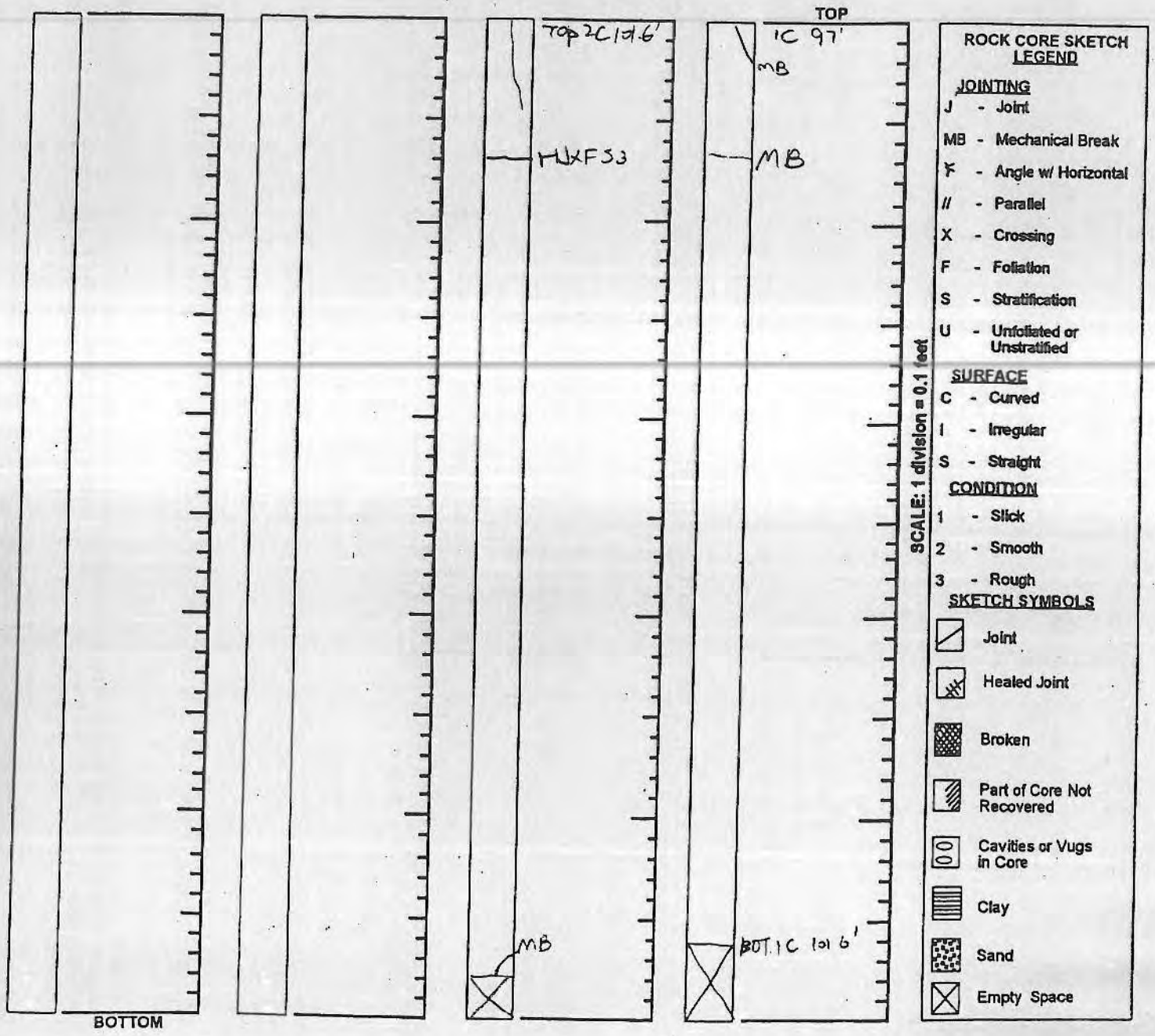
PROJECT 74-88 SIXTH AVENUE
LOCATION NEW YORK, NY

Run No.	REC / RQD

Run No.	REC / RQD

Run No.	REC / RQD
2C	100/100

Run No.	REC / RQD
1C	100/100



NOTES

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING NO. B-5
SHEET 5 OF 5
FILE NO. 10271
SURFACE ELEV. 5.9
DATUM BOROUGH PRESIDENT OF MANHATTAN

PROJECT SOHO ISLAND - 74-88 SIXTH AVENUE
LOCATION NEW YORK, NEW YORK
BORING LOCATION SEE BORING LOCATION PLAN

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG: TRUCK X; SKID; BARGE; OTHER
TYPE OF FEED DURING CORING: MECHANICAL; HYDRAULIC X; OTHER

CASING USED: [X] YES [ ] NO
DIA., IN. 4 DEPTH, FT. FROM 0 TO 40
DIA., IN. 3 DEPTH, FT. FROM 0 TO 97
DIA., IN. DEPTH, FT. FROM TO

TYPE AND SIZE OF:
D-SAMPLER 2" O.D. SPLIT SPOON
U-SAMPLER
S-SAMPLER
CORE BARREL DOUBLE TUBE NX
CORE BIT DIAMOND NX
DRILL RODS N

DRILLING MUD USED [X] YES [ ] NO
DIAMETER OF ROTARY BIT, IN. 3-7/8
TYPE OF DRILLING MUD QUICK-GEL

AUGER USED [ ] YES [X] NO
TYPE AND DIAMETER, IN.

CASING HAMMER, LBS. 140 AVERAGE FALL, IN. 30
*SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30
*AUTOMATIC HAMMER

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION
					NO OBSERVATIONS MADE.

PIEZOMETER INSTALLED [ ] YES [X] NO SKETCH SHOWN ON

STANDPIPE: TYPE ID, IN. LENGTH, FT. TOP ELEV.
INTAKE ELEMENT: TYPE OD, IN. LENGTH, FT. TIP ELEV.
FILTER: MATERIAL OD, IN. LENGTH, FT. BOT. ELEV.

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING LIN. FT. 97
3.5" DIA. U-SAMPLE BORING LIN. FT.
CORE DRILLING IN ROCK LIN. FT. 10
NO. OF 3" SHELBY TUBE SAMPLES
NO. OF 3" UNDISTURBED SAMPLES
OTHER:

BORING CONTRACTOR AQUIFER DRILLING AND TESTING, INC.
DRILLER DHANRAJ GOPAUL HELPERS GLENN STRINGHAM
REMARKS
RESIDENT ENGINEER JANE WANG DATE 09-26-04

MRCE Form BS-1

BORING NO. B-5

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

BORING NO. B-6P
SHEET 1 OF 6
FILE NO. 10271
SURFACE ELEV. 6.4
RES. ENGR. JANE WANG

PROJECT: SOHO ISLAND - 74-88 SIXTH AVENUE
LOCATION: NEW YORK, NEW YORK

DAILY PROGRESS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE BLOWS/6"	SAMPLE DESCRIPTION	STRATA	DEPTH	CASING BLOWS 4" 3"	REMARKS
07:00 09-17-04 Friday Cloudy 70°F								
	1D	5.0	1-1	Brown fine to coarse sand, some gravel, silt,		5		
		7.0	2-2	trace brick, concrete fragments (Fill) (SM)				
	2D	10.0	4-1	Brown fine to coarse sand, some gravel, brick,		10		
		12.0	2-6	trace silt (Fill) (SP-SM)	F			Slow advance at 12'- probable boulder.
	3D	15.0	4-1	Brown fine to coarse sand, some gravel, silt,		15		
		17.0	1-1	trace concrete fragments, wood, brick (Fill) (SM)				
	4D	20.0	12-25	Brown fine to coarse sand, some gravel, trace		20		
		22.0	19-18	wood, silt, glass (Fill) (SP-SM)				
						23.5		Boulder at 24'.
	5D	25.0	22-19	Wood, trace fine sand, silt		25		
		27.0	18-24					WC = 276
	6D	30.0	4-4	Gray organic silty fine sand, trace wood fiber	O	30		
15:00		32.0	6-10	(SM)				WC = 85
07:00 09-20-04 Monday Clear 60°F						33.5		
	7D	35.0	3-6	Soft gray clayey silt, trace fine sand (ML)		35		
		37.0	6-9					WC = 29
	8D	40.0	2-1	Gray fine to medium sand, some silt (SM)	M	40		
		42.0	1-2			42		
	9D	45.0	11-11	Gray fine to coarse sand, some silt, trace		45		
		47.0	15-19	gravel (SM)	S2			
	10D	50.0	7-6	Brown coarse to fine sand, some gravel, trace		50		
		52.0	10-15	silt (SP-SM)				

MRCE Form BL-1

BORING NO. B-6P

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

BORING NO. B-6P
SHEET 2 OF 6
FILE NO. 10271
SURFACE ELEV. 6.4
RES. ENGR. JANE WANG

PROJECT: SOHO ISLAND - 74-88 SIXTH AVENUE
LOCATION: NEW YORK, NEW YORK

DAILY PROGRESS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE BLOWS/6"	SAMPLE DESCRIPTION	STRATA	DEPTH	CASING BLOWS 4" 3"	REMARKS
Cont'd 09-20-04 Monday Clear 70°F					S2	55		
	11D	55.0	100/0"	No recovery				Probable boulder at 55' to 58'.
		55.0				60	▼	
	12D	60.0	21-15	Gray gravel, some coarse to fine sand, trace silt (GP)				Poor recovery.
		62.0	15-14			65		
	13D	65.0	32-17	Gray gravel, trace fine to coarse sand, silt (GP-GM)				
		67.0	15-16		T	70		
	14D	70.0	37-26	Brown fine to coarse sandy gravel, some silt (GM)				
		72.0	27-30			75		
16:30	15D	75.0	25-30	Brown coarse to fine sand, some gravel, trace silt (SP)				
07:00 09-21-04 Tuesday Clear 80°F		77.0	22-32			80		
	16D	80.0	6-4	Red brown fine sandy silt, trace mica, gravel, clay pockets (ML)				
		82.0	15-22			83.5		Hard drilling 83.5' to 85'.
	1C	85.0	REC=50%	Intermediate, slightly weathered to moderately weathered gray gneissic schist, closely jointed, weathered joints.		85		
		90.0	RQD=34%		WR	90	▼	
17:00 07:00 09-22-04 Wednesday Clear 80°F	2C	90.0	REC=34%	Weathered, gray gneissic schist, broken, weathered joints				
		95.0	RQD=0%			95		
	3C	95.0	REC=100%	Hard, unweathered gray gneissic schist, blocky	R			WC=Water Content in percent of dry weight.
14:00		100.0	RQD=100%			100		End of boring at 100'.

MRCE Form BL-1

BORING NO. B-6P

MUESER RUTLEDGE CONSULTING ENGINEERS
ROCK CORE SKETCH

BORING NO. B-6P
SHEET 3 OF 6
FILE NO. 10271
SURFACE ELEV. 6.4
RES. ENGR. J. WANG

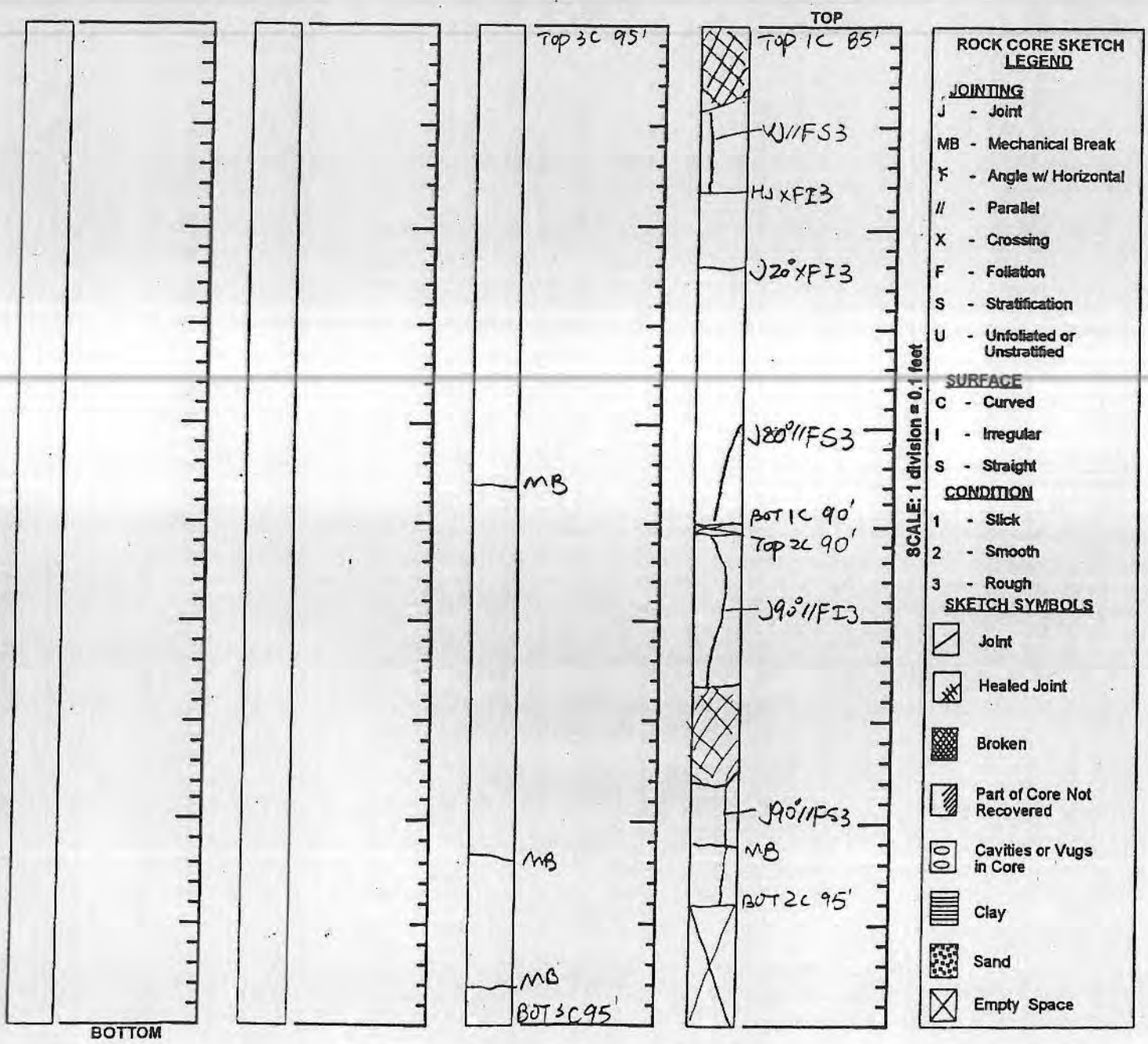
PROJECT A-88 SIXTH AVENUE
LOCATION NEW YORK, NY

Run No.	REC / RQD

Run No.	REC / RQD

Run No.	REC / RQD
3C	100/100

Run No.	REC / RQD
1C	50/24
2C	34/0



NOTES

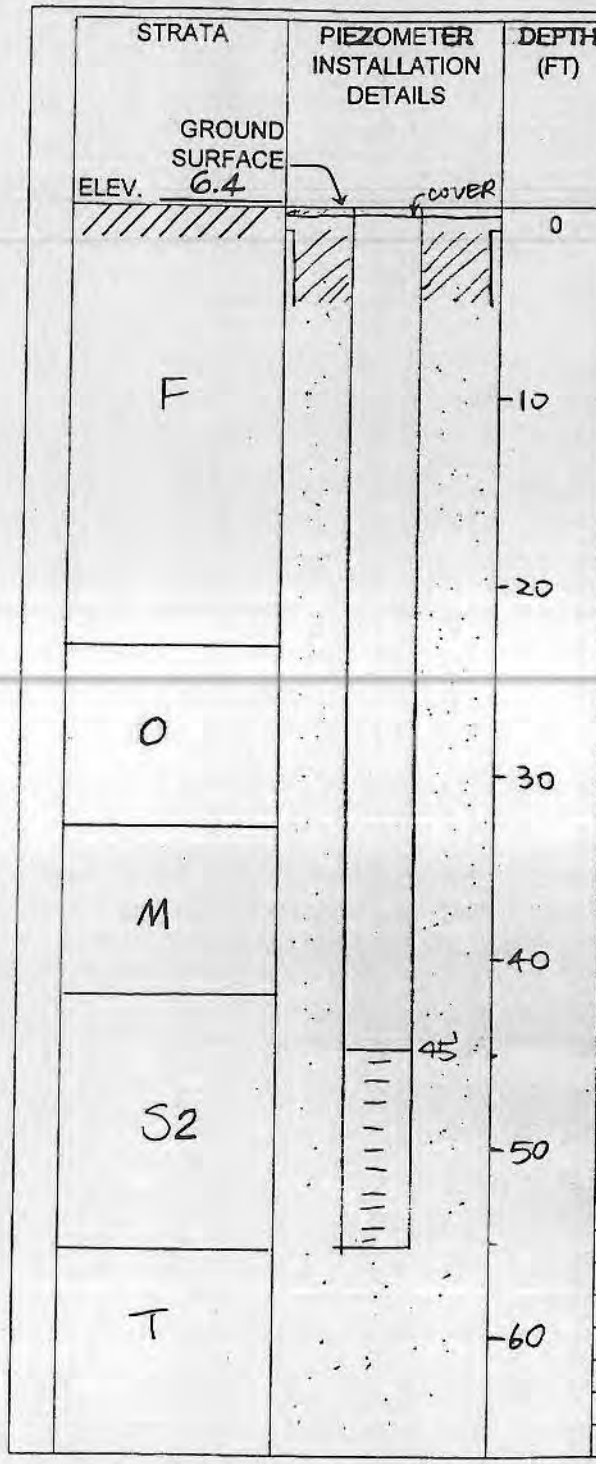
Mueser Rutledge Consulting Engineers
14 Penn Plaza - 225 W. 34th St.
New York, NY 10122

SHEET 4 OF 6
FILE NO. T0271
SUBCODE

PIEZOMETER RECORD

PROJECT: 74-88 SIXTH AVENUE
LOCATION: NEW YORK, NY
PIEZOMETER LOCATION: SEE PLAN
☐ SEE SKETCH ON BACK

PIEZOMETER NO. B-6P
DATE OF INSTALLATION 9-22-04
RESIDENT ENG. J.WANG



PIEZOMETER TYPE PVC

INTAKE POINT
depth to bottom, ft = 55
depth to top, ft = 45
length, ft = 10 = L
diameter, in = 2½ , ft = 0.21 = 2R

STANDPIPE/RISER
elevation of rim, ft = 6.4
diameter, in = 2½ , ft = 0.21 = 2r

READING TIME		DEPTH – RIM TO WATER	ELEVATION OF WATER	REMARKS
DATE	CLOCK			
9-24-04	10:00	9.3'	-2.9	
9-26-04	10:00	9.6'	-3.2	
9-27-04	9:00	9.3'	-2.9	
9-28-04	9:00	9.4'	-3.0	
10-7-04	9:20	9.4'	-3.0	

SAND
GRAVEL
BENTONITE
GROUT

GROUND SURFACE ELEV. 6.4
PIEZOMETER NO. B-6P

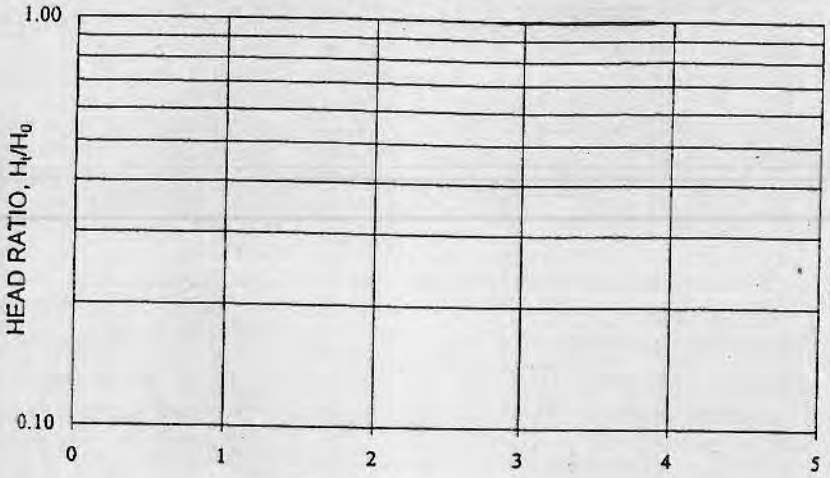
MUESER RUTLEDGE CONSULTING ENGINEERS

SHEET 5 OF 6
FILE NO. 10271
SUBCODE

VARIABLE HEAD PERMEABILITY TEST

☐ BOREHOLE OR ☒ PIEZOMETER NO. B-6P
TEST NO. 1
RESIDENT ENG. JANE WANG
CALC. BY JW DATE 9/28/04
CH'KD BY ____ DATE ____

PROJECT: 76-88 SIXTH AVENUE
LOCATION: NEW YORK, NY
PIEZOMETER LOCATION: SEE BORING LOCATION PLAN



INTAKE POINT
depth to bottom, ft = 55
depth to top, ft = 45
length, ft = 10 = L
diameter, in = 2 1/2 , ft = 0.21 = 2R

STANDPIPE/RISER
elevation of rim, ft = 6.4
diameter, in = 2 1/2 , ft = 0.21 = 2r

depth of casing, ft = —

depth to which stand-pipe was bailed, ft = — = Z

READING TIME			ORIGINAL TEST DEPTH, H_0 (ft.)	DEPTH AT TIME t, H_t (ft.)	UNBALANCED HEAD $\Delta H_t = H_t - H_0$ (ft.)	HEAD RATIO $\Delta H_t/\Delta H_0$	REMARKS
DATE	CLOCK	Δt MIN.					
9/27/2004	9:00	0	9.3				Couldn't add water to
							the top. Water flow too
							fast

PIEZOMETER NO. B-6P

MUESER RUTLEDGE CONSULTING ENGINEERS

		BORING NO.	B-6P
		SHEET	6 OF 6
PROJECT	SOHO ISLAND - 74-88 SIXTH AVENUE	FILE NO.	10271
LOCATION	NEW YORK, NEW YORK	SURFACE ELEV.	6.4
BORING LOCATION	SEE BOIRNG LOCATION PLAN	DATUM	BOROUGH PRESIDENT OF MANHATTAN

BORING EQUIPMENT AND METHODS OF ~~STABILIZING~~ BOREHOLE

TYPE OF BORING RIG		TYPE OF FEED DURING CORING		CASING USED		[X] YES	[ ] NO		
TRUCK		MECHANICAL		DIA., IN.	4	DEPTH, FT. FROM	0	TO	60
SKID	ELECTRIC	HYDRAULIC	X	DIA., IN.	3	DEPTH, FT. FROM	0	TO	90
BARGE		OTHER		DIA., IN.		DEPTH, FT. FROM		TO	
OTHER									

TYPE AND SIZE OF:			
D-SAMPLER	2" O.D. SPLIT SPOON	DRILLING MUD USED	[X] YES [ ] NO
U-SAMPLER		DIAMETER OF ROTARY BIT, IN.	3-7/8
S-SAMPLER		TYPE OF DRILLING MUD	REVERT
CORE BARREL	DOUBLE TUBE NX	AUGER USED	[ ] YES [X] NO
CORE BIT	DIAMOND NX	TYPE AND DIAMETER, IN.	
DRILL RODS	N		

CASING HAMMER, LBS.	140	AVERAGE FALL, IN.	30
SAMPLER HAMMER, LBS.	140	AVERAGE FALL, IN.	30

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION
					NO OBSERVATIONS MADE IN BOREHOLE .
					FOR PIEZOMETER READINGS, SEE SHEET 4.

PIEZOMETER INSTALLED [X] YES [ ] NO SKETCH SHOWN ON SHEET 4

STANDPIPE:	TYPE	PVC	ID, IN.	2	LENGTH, FT.	10	TOP ELEV.		
INTAKE ELEMENT:	TYPE	SCREENED PVC	OD, IN.	2.5	LENGTH, FT.	45	TIP ELEV.		
FILTER:	MATERIAL	SAND	OD, IN.	4	LENGTH, FT.	55	BOT. ELEV.		

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING	LIN. FT.	85	NO. OF 3" SHELBY TUBE SAMPLES	
3.5" DIA. U-SAMPLE BORING	LIN. FT.		NO. OF 3" UNDISTURBED SAMPLES	
CORE DRILLING IN ROCK	LIN. FT.	15	OTHER:	

BORING CONTRACTOR	AQUIFER DRILLING AND TESTING, INC.		
DRILLER	JAMES PHILBIN	HELPERS	MASIM GOLDFIELD
REMARKS			
RESIDENT ENGINEER	JANE WANG	DATE	09-22-04

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

BORING NO. B-7
SHEET 1 OF 4
FILE NO. 10271
SURFACE ELEV. 6.3
RES. ENGR. JANE WANG

PROJECT: SOHO ISLAND - 74-88 SIXTH AVENUE
LOCATION: NEW YORK, NEW YORK

DAILY PROGRESS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE BLOWS/6"	SAMPLE DESCRIPTION	STRATA	DEPTH	CASING BLOWS 4" 3"	REMARKS
06:30								
09-23-04								
Thursday								
Clear								
80°F						5		
	1D	5.0	6-8	Brown fine to coarse sand, some concrete				Chemical odor.
		7.0	9-9	fragments, silt, trace brick (Fill) (SM)				
					F	10		
	2D	10.0	3-2	Brown fine to coarse sand, some silt, trace				Petroleum odor.
		12.0	1-1	gravel (Fill) (SM)				
						15		
	3NR	15.0	2-1/12"	No recovery				
		17.0	2					
						18.5		
						20		
	4D	20.0	20-38	Brown fine to coarse sand, some gravel, silt				
		22.0	22-30	(SM)				
					S1			
						25		
	5NR	25.0	16-11	No recovery				
		27.0	11-41					
						28.5		
						30		Peat on roller bit.
	6D	30.0	3-4	Soft red brown peat, some wood fibers (Pt)				WC = 356
		32.0	5-9					
					O			
						35		
	7D	35.0	3-5	Soft dark brown fine sandy organic silt, trace				WC = 144
		37.0	7-8	gravel (OL)				
						38.5		
						40		
	8D	40.0	WR/12"	Soft gray clayey silt, trace fine sand (ML)				WC = 45
		42.0	WH/12"					
					M			
						45		
	9D	45.0	1-2	Red brown silty fine sand (SM)				
		47.0	2-5					
						48.5		
						50		
	10D	50.0	12-12	Red brown fine to medium sand, some silt,	S2			
		52.0	12-15	trace gravel (SM)				

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

BORING NO. B-7
SHEET 2 OF 4
FILE NO. 10271
SURFACE ELEV. 6.3
RES. ENGR. JANE WANG

PROJECT: SOHO ISLAND - 74-88 SIXTH AVENUE
LOCATION: NEW YORK, NEW YORK

DAILY PROGRESS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE BLOWS/6"	SAMPLE DESCRIPTION	STRATA	DEPTH	CASING BLOWS	REMARKS
Cont'd							3"	
09-23-04								
Thursday								
Clear								
80°F						55		
	11D	55.0	19-19	Brown fine to coarse sand, some silt, trace	S2			
		57.0	15-16	gravel (SM)				
						60		
	12NR	60.0	100/3"	No recovery				Probable boulder. Difficult drilling from 60'.
		60.3						
						65		
	13D	65.0	46-38	Brown and dark brown fine to coarse sand,				
		67.0	31-20	some silt, trace gravel (SM)				
						70		
	14D	70.0	33-25	Dark brown gravelly fine to coarse sand, some				
17:00		72.0	23-18	silt (SM)	T			
06:30								
09-24-04								
Friday						75		
Clear	15D	75.0	22-22	Brown fine to coarse sand, trace silt, gravel,				
80°F		77.0	23-20	gray brown silty clay pocket (SP-SM)				
						80		
	16D	80.0	23-20	Red brown fine to coarse sand, trace silt,				
		82.0	29-25	micaceous silty fine sand layers (SP-SM)				
						83		Hard drilling from 83'- probable weathered rock.
					WR	85		
18:00						87		
07:00	1C	87.0	REC=72%	Medium hard, slightly weathered gray gneissic				Very slow coring due to the machine, typically 20 minutes per foot.
09-26-04		92.0	RQD=40%	schist, broken to closely jointed				
Sunday						90		
Clear								
80°F								
17:00	2C	92.0	REC=88%	Hard, unweathered gray gneissic schist,	R			
07:00		97.0	RQD=82%	jointed, (broken zone 94.9' to 95.2')				
09-27-04						95		
Monday								
Clear						97		End of boring at 97'.
80°F								
16:00								WC=Water Content in percent of dry weight.
						100		

MRCE Form BL-1

BORING NO. B-7

MUESER RUTLEDGE CONSULTING ENGINEERS
ROCK CORE SKETCH

BORING NO. B-7
SHEET 3 OF 4
FILE NO. 1027
SURFACE ELEV. 6.3
RES. ENGR. J. WANG

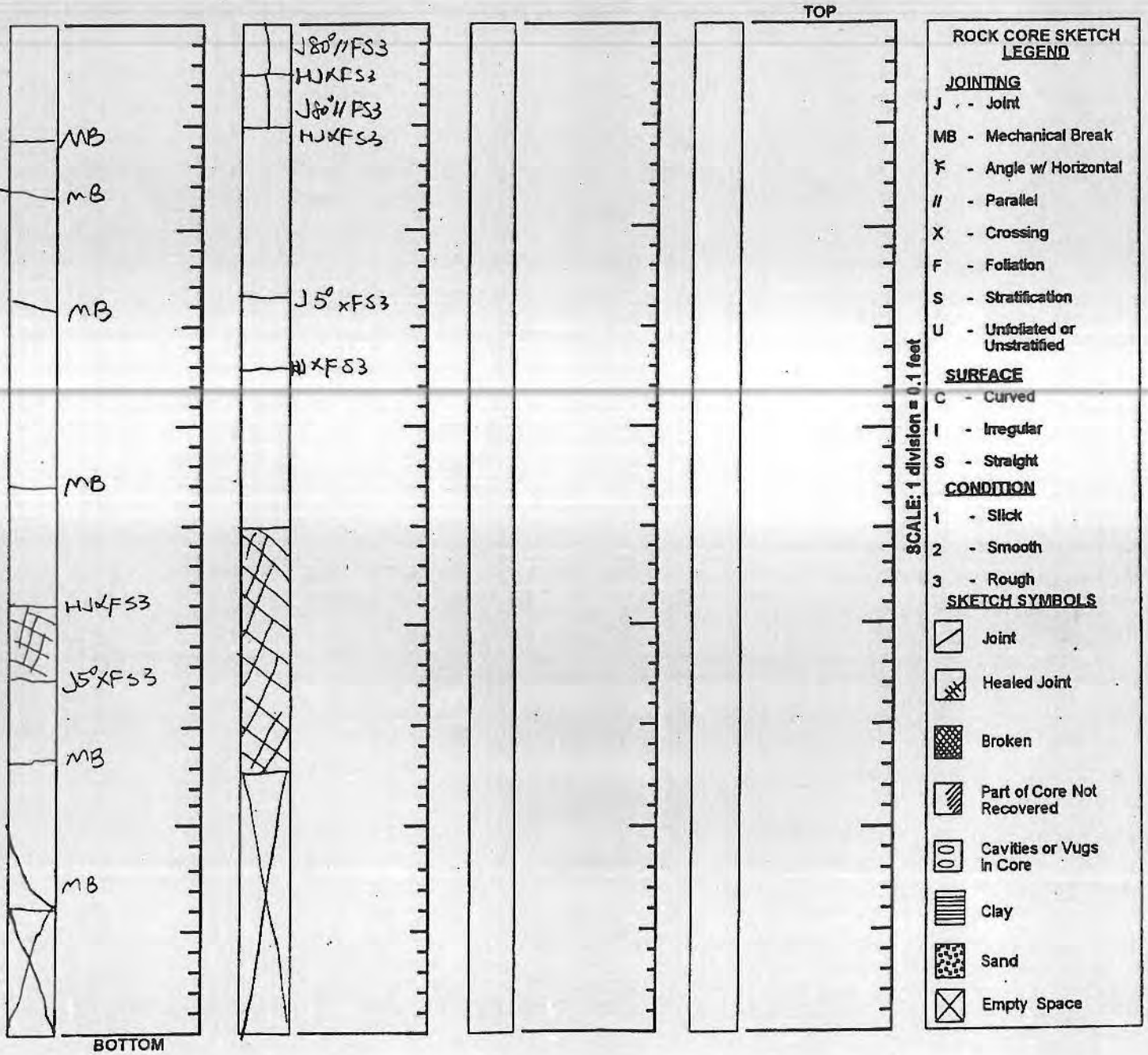
PROJECT 74-88 SIXTH AVENUE
LOCATION NEW YORK, NY

Run No.	REC / RQD
2C	88/82

Run No.	REC / RQD
1C	72/40

Run No.	REC / RQD

Run No.	REC / RQD



NOTES

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING NO. B-7
SHEET 4 OF 4
FILE NO. 10271
SURFACE ELEV. 6.3
DATUM BOROUGH PRESIDENT OF MANHATTAN

PROJECT SOHO ISLAND - 74-88 SIXTH AVENUE
LOCATION NEW YORK, NEW YORK
BORING LOCATION SEE BORING LOCATION PLAN

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG		TYPE OF FEED DURING CORING		CASING USED					
TRUCK		MECHANICAL		DIA., IN.	4	DEPTH, FT. FROM	0	TO	30
SKID	ELECTRIC	HYDRAULIC	X	DIA., IN.	3	DEPTH, FT. FROM	0	TO	87
BARGE		OTHER		DIA., IN.		DEPTH, FT. FROM		TO	
OTHER									

[X] YES [ ] NO

TYPE AND SIZE OF:

D-SAMPLER	2" O.D. SPLIT SPOON
U-SAMPLER	
S-SAMPLER	
CORE BARREL	DOUBLE TUBE NX
CORE BIT	DIAMOND NX
DRILL RODS	N

DRILLING MUD USED [X] YES [ ] NO
DIAMETER OF ROTARY BIT, IN. 3-7/8
TYPE OF DRILLING MUD QUICK-GEL

AUGER USED [ ] YES [X] NO
TYPE AND DIAMETER, IN.

CASING HAMMER, LBS. 140 AVERAGE FALL, IN. 30
SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION
					NO OBSERVATIONS MADE.

PIEZOMETER INSTALLED [ ] YES [X] NO SKETCH SHOWN ON

STANDPIPE:	TYPE		ID, IN.		LENGTH, FT.	TOP ELEV.	
INTAKE ELEMENT:	TYPE		OD, IN.		LENGTH, FT.	TIP ELEV.	
FILTER:	MATERIAL		OD, IN.		LENGTH, FT.	BOT. ELEV.	

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING	LIN. FT.	87	NO. OF 3" SHELBY TUBE SAMPLES	
3.5" DIA. U-SAMPLE BORING	LIN. FT.		NO. OF 3" UNDISTURBED SAMPLES	
CORE DRILLING IN ROCK	LIN. FT.	10	OTHER:	

BORING CONTRACTOR AQUIFER DRILLING AND TESTING, INC.
DRILLER JAMES PHILIBIN HELPERS MASIM GOLDFIELD
REMARKS
RESIDENT ENGINEER JANE WANG DATE 09-25-04

APPENDIX B: CONVEYANCE, CENSUS, TAX, AND DIRECTORY RECORDS

Block 227, Lot 62: 3 Thompson Street
NIOR=No Instrument of Record, H=home/house, L=Lot RE=real estate, PE=personal estate, M=male, F=female, Est.=estate

Year	Grantor	Grantee	Lot #	Census	Directory	Tax Assessment ($)	Remarks
1654 to 1702	NIOR						
1703	William & Sara Huddleston	Richard Hill	not lotted				3/29/1703 Liber 25:114
1704 to 1725	NIOR						
1726	Richard & Hannah Hill	Anthony Rutgers	not lotted				2/14/1726 Liber 31:115
1767	Dirck & Elsie Lefferts	Leonard & Elsie Lispenard, Henry & Mary Barclay	not lotted				12/14/1767 Liber 38:110
1768 to 1806	NIOR						
1807	Anthony & Sarah Lispenard	Thomas Miller, Stephen Baker	not lotted				8/20/1807 Liber 77:261
1810	Leonard & Ann Lispenard	Charles McEvers, James Bleecker, Alexander Stewart	not lotted				3/13/1810 Trust Deed Liber 86:238
1811	Charles & Margaret McEvers, James & Sarah Bleecker, Alexander a7 Sarah Stewart	Leonard Lispenard	not lotted				3/18/1811 Quit Claim Liber 93:372
1817	Campbell James (Master in Chancery) Leonard Lispenard defendant	George Lorillard	not lotted				8/21/1817 Liber 122:503
1819						George Lorillard (L $500 each)	
1821						George Lorillard (L $350 each)	
1824	Stephen & Jane Baker, Charles Sandford	David Ogden	60-62				1/17/1824 Liber 172:414
1824	David & Elizabeth Ogden	Charles Sandford	60-62				12/22/1824 Liber 181:389
1825			no lot #		Stephen R. Clark	Charles Sanford (H&L $3,000)	
1827					Theodore Barrell		
1828					James H. Delameter, grocer		
1828	Charles & Mary Sandford	Jasper Seaman	51-62				2/20/1828 Liber 231:316
1828	Thomas Bolton (Master in Chancery), Charles Sandford et al defendants	Henry Yates	60-62				8/20/1828 Liber 239:482
1828	John & Mary Yates, Archibald & Eliza McIntyre	Henry Yates	60-62				8/20/1828 Liber 239:484
1829	Jasper Seaman	Declaration	51-62				2/17/1829 Liber 246:349
1830			-----	Mary Piggott, Mary Hester John J. Sab…?		Yeats & McIntire (H&L, $3,200)	
1832 to 1833					Mary Hester, widow of John, Mary Pigot, widow of William		

APPENDIX B: CONVEYANCE, CENSUS, TAX, AND DIRECTORY RECORDS

Block 227, Lot 62: 3 Thompson Street

NIOR=No Instrument of Record, H=home/house, L=Lot RE=real estate, PE=personal estate, M=male, F=female, Est.=estate

Year	Grantor	Grantee	Lot #	Census	Directory	Tax Assessment ($)	Remarks
1833	John Missing, Assignee of Robert Livingston	Henry Yates, Archibald McIntyre	1-62				4/8/1833 Liber 295:389
1833	Robert & Sarah Livingston	Henry Yates Archibalt McIntyre	1-62				4/10/1833 Liber 294:546
1834	Willian Van Wyck (Master in Chancery) Charles W. Sandford et al defendants	Henry Yates, Archibald McIntyre	51-62				3/22/1834 Liber 310:389
1835						Yates & McIntire (H&L, $2,800)	
1836	John & Mary Yates, Archibald & Eliza McIntyre, John & Margaret Ely, Archibald McIntyre	Henry Yates	not lotted				12/12/1836 Liber 369:510
1840			1467		Edward N. Pigot William A. Pigot	Henry Yates (H & 8/11 L, $4,800)	
1841			1467			Henry Yates (H & ¾ L, $4,800)	
1845			1468			Henry Yates (H 2/3 L, $4,800)	
1845-1846					Joseph Hawxhurst, artist, William A. Pigot (painter) Edward N. Pigot (comm. merchant)		
1849-1850					Edward N. Pigot (merchant)		
1850			887			Henry Yates (H 2/3 L, $4,800)	
1850				George (broker) & Maria Warner (b. NY) Catherine Shaw (b. Ireland) William A. (merchant, b.NY), Maria (b. NJ), & Mary A., Eliza, Catherine, and Mary Pickett (all b. NY)			
1851					W.A. Pigot George Warner		
1855			887			Chas. Yates (H&L, $4,000)	
1860			887			Charles Yates (L 21’10”x 76’4” H 2 sty 21’10”x 42’, $4,000)	
1865			887			Charles Yates (L 21’10” x 76’4” H 3 sty 21’10” x 42’, $4,000)	
1870			887			Charles Yates (L 21’10” x 76’4” H 3 sty 21’10” x 42’, $9,000)	

APPENDIX B: CONVEYANCE, CENSUS, TAX, AND DIRECTORY RECORDS

Block 227, Lot 62: 3 Thompson Street

NIOR=No Instrument of Record, H=home/house, L=Lot RE=real estate, PE=personal estate, M=male, F=female, Est.=estate

Year	Grantor	Grantee	Lot #	Census	Directory	Tax Assessment ($)	Remarks
1872	Bank of Savings in the City of NY	Josephine Yates					7/25/1872 Release of mortgage Liber 1190:129
1872	Charles (exec of Josephine) Yates	Michael Coleman					7/25/1872 Liber 1190:130
1872	Charles Bosworth	Michael Coleman					7/25/1882 Release of mortgage Liber 1190:134
1875			887			Mary A. Kehoe (L 21'10" x 76'4" H 21'10" x 42', $4,000)	
1877	Michael & Catherine Coleman	Charles & Catherine Haffner					5/10/1877 Liber 1423:29
1880			887			Mary A. Kehoe (L 21'10" x 76' H 4 sty 21'10" x 42', $6,000)	
1885			887			Mary A. Kehoe (L 21'10" x 76' H 4 sty 21'10" x 42', $7,000)	
1890						Mary A. Kehoe (L 21'10" x 76'4", H 4 sty 21'10" x 42', $7,000)	
1892	Charles, Joseph, Catherine Haffner	Joseph Haffner					2/25/1892 Liber 10:91
1892	Joseph Haffner	Catherine Haffner					2/25/1892 Liber 10:93
1895						Mary A. Kehoe (L 21'10" x 76' H 4 sty 21'10" x 42', $7,000)	

APPENDIX B: CONVEYANCE, CENSUS, TAX, AND DIRECTORY RECORDS

Block 227, Lot 61: 5 Thompson Street
NIOR=No Instrument of Record, H=home, RE=real estate, PE=personal estate, M=male, F=female, Est.=estate

Year	Grantor	Grantee	Lot #	Census	Directory	Tax Assessment	Remarks
1654 to 1702	NIOR						
1703	William & Sara Huddleston	Richard Hill	not lotted				3/29/1703 Liber 25:114
1704 to 1725	NIOR						
1726	Richard & Hannah Hill	Anthony Rutgers	not lotted				2/14/1726 Liber 31:115
1767	Dirck & Elsie Lefferts	Leonard & Elsie Lispenard, Henry & Mary Barclay	not lotted				12/14/1767 Liber 38:110
1768 to 1806	NIOR						
1807	Anthony & Sarah Lispenard	Thomas Miller, Stephen Baker	not lotted				8/20/1807 Liber 77:261
1810	Leonard & Ann Lispenard	Charles McEvers, James Bleecker, Alexander Stewart	not lotted				3/13/1810 Trust Deed Liber 86:238
1811	Charles & Margaret McEvers, James & Sarah Bleecker, Alexander a7 Sarah Stewart	Leonard Lispenard	not lotted				3/18/1811 Quit Claim Liber 93:372
1817	Campbell James (Master in Chancery) Leonard Lispenard defendant	George Lorillard	not lotted				8/21/1817 Liber 122:503
1818	William Proctor	George Lorillard	56-61				4/18/1818 Liber 125:599
1818	James Hamilton (Master in Chancery) Theophilact Lispenard et al defendants	William Proctor	56-61				4/18/1818 Liber 125:602
1819			----			George Lorillard (L $500 each)	
1821			----			George Lorillard (L $350 each)	
1824	Stephen & Jane Baker, Charles Sandford	David Ogden	60-62				1/17/1824 Liber 172:414
1824	Alexander & Sarah Stewart	Charles Sandford	inc. 61				10/25/1824 Examine Liber 182:333
1824	David & Elizabeth Ogden	Charles Sandford	60-62				12/22/1824 Liber 181:389
1825						Charles Sandford (H&L, $3,500)	
1827					Charles W. Sandford, atty. & couns		
1828-1829					Charles W. Sandford, atty. & couns.		
1828	Charles & Mary Sandford	Jasper Seaman	51-62				2/20/1828 Liber 231:316
1828	Thomas Bolton (Master in Chancery) Charles Sandford et al defendants	Henry Yates	61				5/21/1828 Liber 237:326

APPENDIX B: CONVEYANCE, CENSUS, TAX, AND DIRECTORY RECORDS

Block 227, Lot 61: 5 Thompson Street

NIOR=No Instrument of Record, H=home, RE=real estate, PE=personal estate, M=male, F=female, Est.=estate

Year	Grantor	Grantee	Lot #	Census	Directory	Tax Assessment	Remarks
1828	Thomas Bolton (Master in Chancery), Charles Sandford et al defendants	Henry Yates	60-62				8/20/1828 Liber 239:482
1828	John & Mary Yates, Archibald & Eliza McIntyre	Henry Yates	60-62				8/20/1828 Liber 239:484
1830					Charles W. Sandford	Yates & McIntire (H&L, $4,200)	
1833	John Missing, Assignee of Robert Livingston	Henry Yates, Archibald McIntyre	1-62				4/8/1833 Liber 295:389
1833	Robert & Sarah Livingston	Henry Yates Archibalt McIntyre	1-62				4/10/1833 Liber 294:546
1834	Willian Van Wyck (master in Chancery) Charles W. Sandford et al defendants	Henry Yates, Archibald McIntyre	51-62				3/22/1834 Liber 310:389
1835			----			Yates & McIntire (H&L, $5,000)	
1836	John & Mary Yates Archibald & Eliza McIntyre John & Margaret Ely Archibald McIntyre	Henry Yates	not lotted				12/12/1836 Liber 369:510
1840			1466			Henry Yates (H & 1 ¾ L, $7,400)	
1841			1466		C.W. Sandford, atty. & couns.	Henry Yates (H & 1¾ L, $7,500)	
1845			1467			Henry Yates (H 1 ¼ L, $7,500)	
1850			888			Henry Yates (H & 1 ¼L, $7,500)	
1851					Mary Willington, boarding Henry Parsons, physician		
1855			888			Mrs. John Satterlee (H&L, $8,000)	
1860			888			C. H. Satterlee (L 33 ½' x 120' H 2 sty 33 ½' x 42', $8,000)	
1860-1861					John G. Kelsey, boarding		
1865			888			J. H. Satterlee (L 33 ½' x 120' H 3 sty 33 ½' x 42', $8,000)	
1870			888			Edward Satterlee (L 33 ½' x 120' H 3 sty 33 ½' x 42', $11,000)	
1875			888			Edward Satterlee (L 33 ½' x 120' H 33 ½' x 42', $9,000)	
1880			888			Edward Satterlee (L 33' x 120' H 4 sty 33'6" x 90', $15,000)	

APPENDIX B: CONVEYANCE, CENSUS, TAX, AND DIRECTORY RECORDS

Block 227, Lot 61: 5 Thompson Street
NIOR=No Instrument of Record, H=home, RE=real estate, PE=personal estate, M=male, F=female, Est.=estate

Year	Grantor	Grantee	Lot #	Census	Directory	Tax Assessment	Remarks
1885			888			Edward Satterlee (L 33' x 120' H 4 sty 33'6" x 90', $16,000)	
1890			888			Edward Satterlee (L 35'6" x 120' H 4 sty 33'6" x 90', $16,000)	
1895			888			Edward Satterlee (L 33' x 120' H 4 sty 3'6" x 90', $16,000)	
1905	Anna Moire	Henry (et al Satterlie	61				11/14/1905 Lease Liber 92:230
1905	Edward Satterlee Henry Satterlee Catlin Satterlee	Pietro Bianchetti	61				5/2/1906 Liber 102:191
1910	Peter Bianchetti	Anna Shipman	61				4/27/1905 Lease Liber 137:370

APPENDIX B: CONVEYANCE, CENSUS, TAX, AND DIRECTORY RECORDS

Block 227, Lot 60: 7 Thompson Street
NIOR=No Instrument of Record, H=home, RE=real estate, PE=personal estate, M=male, F=female, Est.=estate

Year	Grantor	Grantee	Lot #	Census	Directory	Tax Assessment	Remarks
1654 to 1702	NIOR						
1703	William & Sara Huddleston	Richard Hill	not lotted				3/29/1703 Liber 25:114
1704 to 1725	NIOR						
1726	Richard & Hannah Hill	Anthony Rutgers	not lotted				2/14/1726 Liber 31:115
1767	Dirck & Elsie Lefferts	Leonard & Elsie Lispenard, Henry & Mary Barclay	not lotted				12/14/1767 Liber 38:110
1768 to 1806	NIOR						
1807	Anthony & Sarah Lispenard	Thomas Miller, Stephen Baker	not lotted				8/20/1807 Liber 77:261
1810	Leonard & Ann Lispenard	Charles McEvers, James Bleecker, Alexander Stewart	not lotted				3/13/1810 Trust Deed Liber 86:238
1811	Charles & Margaret McEvers, James & Sarah Bleecker, Alexander a7 Sarah Stewart	Leonard Lispenard	not lotted				3/18/1811 Quit Claim Liber 93:372
1817	Campbell James (Master in Chancery) Leonard Lispenard defendant	George Lorillard	not lotted				8/21/1817 Liber 122:503
1817	Campbell James (Master in Chancery) Leonard Lispenard defendant	George Lorillard	not lotted				8/21/1817 Liber 122:503
1818	William Proctor	George Lorillard	56-61				4/18/1818 Liber 125:599
1818	James Hamilton (Master in Chancery) Theophilact Lispenard et al defendants	William Proctor	56-61				4/18/1818 Liber 125:602
1819						George Lorillard (L $500 each)	
1821						George Lorillard (L $350 each)	
1822	George Lorillard	Stephen & Jane Baker, Charles Sandford					6/26/1822 Liber 162:29
1824	Stephen & Jane Baker, Charles Sandford	David Ogden	60-62				1/17/1824 Liber 172:414
1824	David & Elizabeth Ogden	Charles Sandford	60-62				12/22/1824 Liber 181:389
1825						Charles M Sanford	
1827					Ellen Meigs		
1828	Charles & Mary Sandford	Jasper Seaman	51-62				2/20/1828 Liber 231:316

APPENDIX B: CONVEYANCE, CENSUS, TAX, AND DIRECTORY RECORDS

Block 227, Lot 60: 7 Thompson Street

NIOR=No Instrument of Record, H=home, RE=real estate, PE=personal estate, M=male, F=female, Est.=estate

Year	Grantor	Grantee	Lot #	Census	Directory	Tax Assessment	Remarks
1828	Thomas Bolton (Master in Chancery), Charles Sandford et al defendants	Henry Yates	60-62				8/20/1828 Liber 239:482
1828	John & Mary Yates, Archibald & Eliza McIntyre	Henry Yates	60-62				8/20/1828 Liber 239:484
1830					John Lyons Ewen Lyons		
1832 to 1833					James P. Swain, H. Thompson		
1833	John Missing, Assignee of Robert Livingston	Henry Yates, Archibald McIntyre	1-62				4/8/1833 Liber 295:389
1833	Robert & Sarah Livingston	Henry Yates Archibald McIntyre	1-62				4/10/1833 Liber 294:546
1834	Willian Van Wyck (master in Chancery) Charles W. Sandford et al defendants	Henry Yates, Archibald McIntyre	51-62				3/22/1834 Liber 310:389
1835			____			Yates & McIntire (H&L, $3,800)	
1836	John & Mary Yates Archibald & Eliza McIntyre John & Margaret Ely Archibald McIntyre	Henry Yates	not lotted				12/12/1836 Liber 369:510
1840			____ 1465		Joseph R. Latourette, dry goods	Joseph R. Latterette (PE $1,000) Henry Yates (H&L, $3,800)	
1841			____ 1465			Joseph K. Latterette (PE $1,000); Henry Yates (H&L: $5,100)	
1845-1846			1466		Rebecca Parker, widow of Jacob, boarding	Henry Yates (H&L; $5,000)	
1850			889			Henry Yates (H&L, $5,000)	

APPENDIX B: CONVEYANCE, CENSUS, TAX, AND DIRECTORY RECORDS

Block 227, Lot 60: 7 Thompson Street

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Year	Grantor	Grantee	Lot #	Census	Directory	Tax Assessment	Remarks
1850				Hannah Foster (b. .Maine), J.H Hills (b. Mass.), - Robinson (b. Mass), Henry Roberts (druggist b. NY), Charles McQuinley (clerk b. Vermt); W McElroy (printer b.Ohio), James Gordon (clerk, b.RI), Augustus Wright (spectacle maker, b. NY), Nelson Foster (b. Mass), Maisy Fitzpatrick (b. Ireland), Jane McKenna (b. Ireland)			
1851					Hannah Foster, boarding		
1855			889		Robert Woodbury Eliza Salter, widow of John	H. Yates (H&L, $5,000)	
1859-1860					William Goddard, boarding		
1860			889			Mary Morris (L 22'x100', H 2 sty 22' x 42', $5,000)	
1860-1861					William Goddard, boarding		
1865			889			Mary Morris (L 22'x100', H 2 sty 22' x 42', $5,000)	
1870			889			Mary Morris (L 22'x100', H 2 sty 22' x 42', $10,000)	
1875			889			Mary Morris (L 22'x100', H 22' x 42', $7,000)	
1880			889			Mary Morris (L 22'x100', H 3 sty 22' x 50', $6,500)	
1885			889			Mary Morris (L 22'x100', H 3 sty 22' x 50', $8,000)	
1890			889			Mary Morris (L 22'x100', H 4 sty 22' x 50', $8,000)	
1895			889			Mary Morris (L 22'x100', H 3 sty 22' x 50', $8,000)	
1916	Mary Morris, Elizabeth Platt Catherin Harrison Virginia Smith Nathalie Roberts	Heide Morris	60				

APPENDIX B: CONVEYANCE, CENSUS, TAX, AND DIRECTORY RECORDS

Block 227, Lot 59: 9 Thompson Street
NIOR=No Instrument of Record, H=home, RE=real estate, PE=personal estate, M=male, F=female, Est.=estate

Year	Grantor	Grantee	Lot #	Census	Directory	Tax Assessment	Remarks
1654 to 1702	NIOR						
1703	William & Sara Huddleston	Richard Hill	not lotted				3/29/1703 Liber 25:114
1704 to 1725	NIOR						
1726	Richard & Hannah Hill	Anthony Rutgers	not lotted				2/14/1726 Liber 31:115
1767	Dirck & Elsie Lefferts	Leonard & Elsie Lispenard, Henry & Mary Barclay	not lotted				12/14/1767 Liber 38:110
1768 to 1806	NIOR						
1807	Anthony & Sarah Lispenard	Thomas Miller, Stephen Baker	not lotted				8/20/1807 Liber 77:261
1810	Leonard & Ann Lispenard	Charles McEvers, James Bleecker, Alexander Stewart	not lotted				3/13/1810 Trust Deed Liber 86:238
1811	Charles & Margaret McEvers, James & Sarah Bleecker, Alexander & Sarah Stewart	Leonard Lispenard	not lotted				3/18/1811 Quit Claim Liber 93:372
1817	Campbell James (Master in Chancery) Leonard Lispenard defendant	George Lorillard	not lotted				8/21/1817 Liber 122:503
1817	Campbell James (Master in Chancery) Leonard Lispenard defendant	George Lorillard	not lotted				8/21/1817 Liber 122:503
1818	William Proctor	George Lorillard	56-61				4/18/1818 Liber 125:599
1818	James Hamilton (Master in Chancery) Theophilact Lispenard et al defendants	William Proctor	56-61				4/18/1818 Liber 125:602
1819						George Lorillard (L $500)	
1820							
1821			2388			George Lorillard (L $350)	
1825			2388			George Lorillard (H&L $2,500)	
1827					Paul William, Peter Crawford		
1828-1829					Margaret M. Williams, widow		
1828	Charles & Mary Sandford	Jasper Seaman	51-62				2/20/1828 Liber 231:316
1829	Jasper Seaman	Declaration	51-62				2/17/1829 Liber 246:349
1830			2388			George Lorillard (H&L, $2,400)	

APPENDIX B: CONVEYANCE, CENSUS, TAX, AND DIRECTORY RECORDS

Block 227, Lot 59: 9 Thompson Street
NIOR=No Instrument of Record, H=home, RE=real estate, PE=personal estate, M=male, F=female, Est.=estate

Year	Grantor	Grantee	Lot #	Census	Directory	Tax Assessment	Remarks
1830					Margaret Williams, Hannah Clark, Hannah Abrams, John Brewerton, Joseph Coleman, Philip Brown		
1832 to 1833					Abrams, widow, Philip Brown, musician Joseph Coleman, mason		
1833	John Missing, Assignee of Robert Livingston	Henry Yates, Archibald McIntyre	1-62				4/8/1833 Liber 295:389
1833	Robert & Sarah Livingston	Henry Yates Archibald McIntyre	1-62				4/10/1833 Liber 294:546
1834	Willian Van Wyck (Master in Chancery) Charles W. Sandford et al defendants	Henry Yates, Archibald McIntyre	51-62				3/22/1834 Liber 310:389
1835-1836					Hetty Moses, widow of Isaac Philip Brown, musician Patrick Murray, jeweler	Yates & McIntire (H&L, $2,800)	
1840			1465		Elizabeth Drake, widow of Lewis	Henry Yates (H&L, $3,300)	
1840	Estate of George Lorillard	Peter Lorillard					12/2/1840 Report of Commissioners in Partition Liber 410:251
1841			1465			Peter Lorillard (H&L, $3,300)	
1843	Peter & Catherine Lorillard Maria Ronalds John & Dorothea Wolfe William & Eleanor Spencer (heirs of Peter Lorillard)	Nicholas Dean, Ezra Davis, Alexander Ward					12/30/1843 Appointment of Commissioners Liber 442:79
1843	Trustees for Peter Lorillard Jr. and his children: Peter Lorillard, Jr., Maria Ronalds, Catherine Lorillard, Dorothea Wolfe	Peter Lorillard, Maria Ronalds, Catherine Lorillard, Eleanor Spencer, Trustees for Dorothea Wolfe and her children					12/30/1843 Partition Deed Liber 442:81
1845-1846					Elizabeth Blatchley, teacher, Oscar Falconi, shipmaster, Christian Kline, laborer		
1845			1465			John D. Wolf (H&L, $3,400)	
1850			890			J.D. Wolfe (H&L, $3,400)	

APPENDIX B: CONVEYANCE, CENSUS, TAX, AND DIRECTORY RECORDS

Block 227, Lot 59: 9 Thompson Street

NIOR=No Instrument of Record, H=home, RE=real estate, PE=personal estate, M=male, F=female, Est.=estate

Year	Grantor	Grantee	Lot #	Census	Directory	Tax Assessment	Remarks
1850				1) Adam Hencke (brewer b. Germany) & Wendall (engraver), George (brewer), Louisa, Jno, Peter Henck (all b. Germany) 2) Wendall Shepard (cartman b. NY) & Mary, Valentine, Louise Shepard (all b. NY); Nicholas (Tobacconist, b.Prussia) & Ellen (b. France) Grier 3) Francis Randall (laborer b. Germany), Salma (b. Germany), Frederick, Jacob Randall (b. NY) 4) Chropher Grieg (carpenter, b. Germany), John Doerr (carpenter b. Germany) 5) Euphemia (80), Elizabeth, & Moses (shoemaker) Blatchley (all b. NY) 6) John (laborer b. Ireland), Elizabeth (b. Ireland), Mary & John (b. NY) Mills			
1851					Elizabeth Blatchley, school Nicholas Grier, tobacconist [sic] Anthony Schultz, locksmith		
1855			890		William Marx, manufacturer	J.D. Wolfe (H&L, $3,500)	

APPENDIX B: CONVEYANCE, CENSUS, TAX, AND DIRECTORY RECORDS

Block 227, Lot 59: 9 Thompson Street

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Year	Grantor	Grantee	Lot #	Census	Directory	Tax Assessment	Remarks
1855				1) John, Mirana, Barbary, Mary, Enock, Peter, & Francis Reinhardt (all b. Germany) 2) Nicholas (b.Prussia, tobaconist), Ellen (b. France), Jacob, Ellen, Nicholas (all b. NY) Phillip Grier (brother, b. Prussia), Anna Agoto (servant, b. Germany) 3) William (tailor) & Caroline Schindler (b. Germany) 4) Gus (Ice) & Julie Loughlin (b. Ireland) 5) John (machinist b. Germany), Sarah and Sarah Williams (daughter; both b. England)			brick (value 7,000)
1859-1860					Joseph Arnold (carpenter) Nicholas Grier (peddler) William Gross (upholsterer) Patrick Kelly (moulder) William Marx (box maker)		

APPENDIX B: CONVEYANCE, CENSUS, TAX, AND DIRECTORY RECORDS

Block 227, Lot 59: 9 Thompson Street

NIOR=No Instrument of Record, H=home, RE=real estate, PE=personal estate, M=male, F=female, Est.=estate

Year	Grantor	Grantee	Lot #	Census	Directory	Tax Assessment	Remarks
1860			890	1) Joseph (carpenter b.Germany) & Anna Arnold 2) John Westervelt (saloon, b.Germany) 3) Nicholas (cigar maker b. Germany), Helen, Jacob, Ellen, Louisa, Joseph, Philip (cigar maker b. Germany) Greer Nancy Songer (b.Ireland), servant 4) boarders: John, Harriet, John Eugene & Sarah Kelly John Chamberlain (hatter) John Durkee (paper hanger) James Bank (sadler) Bridget Crane (service) Mary (service) & John McNiven John Havelock (mason) Harvey Tyrrell (printer) James Salter (mason) Richard McNally (painter) William Walsh (silversmith) Charles Brown (shoemaker) Patrick Donohoe (carpenter) James Murphy (carpenter) Patrick (moulder, b. Ireland), Mary (b. NY), James & Catherine Kelly		J.D. Wolfe (L 23 ½' x 100' H 2 sty 20' x 36', $3,500)	
1860-1861					William Marx, paper boxes		
1865			890			J.D. Wolfe (L 23 ½' x 100' H 2 sty 20' x 36', $3,500)	
1867-1868					Ellen Grier, wid. Nicholas		
1870			890			C.L Wolfe (L 23'6" x 100' H 2 sty 23'6" x 36', $8,500)	
1875			890			C.L Wolfe (L 23'6" x 100' H 20" x 36', $8,000)	

APPENDIX B: CONVEYANCE, CENSUS, TAX, AND DIRECTORY RECORDS

Block 227, Lot 59: 9 Thompson Street
NIOR=No Instrument of Record, H=home, RE=real estate, PE=personal estate, M=male, F=female, Est.=estate

Year	Grantor	Grantee	Lot #	Census	Directory	Tax Assessment	Remarks
1880			890			C.L Wolfe (L 23'6" x 100' H 2 sty 20" x 36', $7,000)	
1885			890			C.L Wolfe (L 23'6" x 100' H 2 sty 20" x 36', $7,000)	
1887	Addison, Susan, Ronald, Daisy Thomas, Catherine D'Anglemont, George Nora Thomas Alfred, Howard, & Laura Conkling	Addison, Susan, & Ronald Thomas, Catherine D'Anglemont, George & Nora Thomas	59				12/13/1887 Partition deed Liber 2110:190
1888	Addison, Susan, Ronald, Daisy Thomas, Catherine D'Anglemont, George Nora Thomas	Jeremiah Morrissey	59				3/2/1888 Liber 2111:480
1890			890			J. Morrissey (L 23'6" x 100' H 2 sty 20" x 36', $7,000)	
1894	Jane Morrissey (wid. of Jeremiah)	Joseph Btttenwieser					10/9/1894 Liber 26:381
1895			890			J.L. Buttenweiser (L 23'6" x 100' H 5 sty 23'6" x 89', $11,000)	
1895	Benedict Klein	Jaemmlein Buttenwieser	59				4/24/1895 Liber 30:116
1895	Joseph & Lena Buttenwieser	Benedict Klein	59				4/24/1895 Liber 30:118
1896	Laemmlein Buttenwieser	Alexander Di Giacomo	59			lease 10/19/1896 Liber 38:143	
1899	Laemmlein Buttenwieser	Florine Albright	59				2/8/1899 Liber 51:323
1903	Florine Albright	Michele Lemmole	59				12.15.1903 Liber 81:226
1905	Michele Lemmole	Giovannia Lemmole	59				8/21/1905 Liber 96:197
1905	Giovannia Lemmole	Vincenzo Statile	59				8/23/1905 Lease Liber 92:159
1905	Giovannia Lemmole	Sarah Solomon	59				Lease 9/1/1901 Liber 95:377
1905	Giovanni Lemmole	John Palmeri Martin Wechsler	59				10/3/1905 Liber 91:454

APPENDIX C:
S/NR Soho Historic District Designation Form
and
NYCL SoHo-Cast Iron Historic District Report

Form No. 10-300 (Rev. 10-74)

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

NATIONAL REGISTER OF HISTORIC PLACES INVENTORY -- NOMINATION FORM

FOR NPS USE ONLY
RECEIVED OFFICE COPY
DATE ENTERED

SEE INSTRUCTIONS IN *HOW TO COMPLETE NATIONAL REGISTER FORMS*
TYPE ALL ENTRIES -- COMPLETE APPLICABLE SECTIONS

1 NAME

HISTORIC
SoHo Historic District
AND/OR COMMON

2 LOCATION

STREET & NUMBER area bounded approximately by Houston Street, Crosby Street, Canal Street, and West Broadway.

__NOT FOR PUBLICATION

CITY, TOWN
New York __ VICINITY OF

CONGRESSIONAL DISTRICT
19th - Charles B. Rangle

STATE	CODE	COUNTY	CODE
New York	036	New York	061

3 CLASSIFICATION

CATEGORY	OWNERSHIP	STATUS	PRESENT USE	
X DISTRICT	__PUBLIC	X OCCUPIED	__AGRICULTURE	__MUSEUM
__BUILDING(S)	__PRIVATE	__UNOCCUPIED	X COMMERCIAL	__PARK
__STRUCTURE	X BOTH	__WORK IN PROGRESS	__EDUCATIONAL	X PRIVATE RESIDENCE
__SITE	**PUBLIC ACQUISITION**	**ACCESSIBLE**	__ENTERTAINMENT	__RELIGIOUS
__OBJECT	__IN PROCESS	__YES: RESTRICTED	__GOVERNMENT	__SCIENTIFIC
	__BEING CONSIDERED	X YES: UNRESTRICTED	__INDUSTRIAL	__TRANSPORTATION
		__NO	__MILITARY	__OTHER

4 OWNER OF PROPERTY

NAME
Multiple Ownership
STREET & NUMBER

CITY, TOWN STATE

__ VICINITY OF

5 LOCATION OF LEGAL DESCRIPTION

COURTHOUSE, REGISTRY OF DEEDS, ETC. Registry of Deeds
STREET & NUMBER
City Hall, 31 Chambers Street
CITY, TOWN STATE
New York New York

6 REPRESENTATION IN EXISTING SURVEYS

TITLE
See Continuation Sheet
DATE

__FEDERAL __STATE __COUNTY __LOCAL

DEPOSITORY FOR SURVEY RECORDS
CITY, TOWN STATE

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

NATIONAL REGISTER OF HISTORIC PLACES INVENTORY -- NOMINATION FORM

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DATE ENTERED

SoHo Historic District, NY, NY County

INCLUSIVE STREET NUMBERS

W. Houston Street

south side only 19-83

Prince Street

north side: 69-157
south side: 72-156

Spring Street

north side: 79-167
south side: 80-172

Broome Street

north side: 432-510
south side: 419 Broome to 5 Watts Street

Grand Street

north side: 142-46
south side: 143-43

Howard Street

north side: 22 Howard Street to Mercer Street
south side: 29-53

Canal Street

north side only: 269-387

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NATIONAL REGISTER OF HISTORIC PLACES INVENTORY -- NOMINATION FORM

SoHo Historic District, NY, NY County

West Broadway

east side: 301-479
west side: 308-482

Wooster Street

west side: 1-157
east side: 2-160

Greene Street

west side: 15-145
east side: 8-152

Mercer Street

west side: 1-173
east side: 2-172

Broadway

west side: 419-601
east side: 424-602

Crosby Street

west side: 10-140
east side: 5-39

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NATIONAL REGISTER OF HISTORIC PLACES INVENTORY -- NOMINATION FORM

SoHo Historic District
New York, New York
New York County

A Walking Tour of Manhattan Cast-Iron Architecture, 1968, local, Depository for Survey Records: The Victorian Society in America, New York, New York.

SoHo Cast-Iron Historic Designation Report, 1973, local, Depository for Survey Records: Landmarks Preservation Commission, New York, New York.

SoHo Cast Iron District, 1973, state, Depository for Survey Records: New York State Inventory of Historic Resources, Division for Historic Preservation, New York State Office of Parks and Recreation.

7 DESCRIPTION

CONDITION		CHECK ONE	CHECK ONE
X EXCELLENT	__DETERIORATED	__UNALTERED	X ORIGINAL SITE
X GOOD	__RUINS	X ALTERED	__MOVED DATE__ _____
X FAIR	__UNEXPOSED		

DESCRIBE THE PRESENT AND ORIGINAL (IF KNOWN) PHYSICAL APPEARANCE

The SoHo Historic District is an area roughly rectangular in shape comprising about twenty-eight blocks in lower Manhattan. The name "SoHo" is an acronym of South of Houston, adopted by artists who moved into the area in the mid-1960's. Although the district contains many notable examples of stone and brick commercial structures of the second half of the nineteenth century, the area is unique for the high concentration of cast-iron buildings which were built there during the period between 1860-1890. Important examples of the early use of cast-iron are located on the cross streets, while Mercer and Greene Streets in the heart of SoHo, dating predominantly from the 1870's and 1880's, represent the last great wave of cast-iron. The architects of cast-iron fronts imitated the styles of stone buildings, with the result that the district contains representatives of the various styles popular during that period: Renaissance Revival (ca. 1850-ca. 1875), French Second Empire, and neo-Grec (1880's).

Cast-iron as a construction medium was used primarily for facades. Cast-iron buildings in SoHo are generally limited to five stories because they were built without elevators. The lower floors generally have higher ceilings than upper ones, in an effort to increase the amount of light reaching them. The cast-iron medium lent itself to the repetition of design elements, basically the window unit, and to a heavily carved and recessed appearance, giving play to light and shadow on window openings and wall surfaces. There is a different rhythmic quality to each facade which lends a variety of patterns to the streetscapes in SoHo.

The most celebrated, extant, cast-iron building in New York City is the Haughwout Building at the northeast corner of Broadway and Broome Street. Built in 1859 by Brooklyn architect John P. Gaynor, the five-story commercial building is an American version of a Venetian palazzo. It was listed on the National Register in 1973. Other notable examples of the palazzo style are: the A.J. Dittenhofer Building (427 Broadway), designed by Thomas R. Jackson in 1871; 83-87 Grand Street designed by William H. Hume in 1892; and 351-353 Canal Street, a warehouse designed by William H. Gaylor.

The Roosevelt Building (478 Broadway) was designed in the Neo-Grec style by Richard Morris Hunt in 1874. It has a lightness and grace which is compatible with the cast-iron medium, rather than imitating the heaviness of stone.

91 and 93 Grant Street are a pair of four-story houses designed in 1869 by John B. Shook to look as though they were made of large flat-faced ashlar blocks.

In 1873, W.A. Potter designed the narrow, five-story building at 435 Broome Street which resembles an Eastlake-style giant bookcase.

At 453-455 Broome Street stands Griffith Thomas' building designed for Welcome Hitchcock's silk and veilings store. This dignified structure with five floors of Corinthian columns of diminishing height flanking broad rectangular windows is topped on the sixth story with a classic attic.

The block on the south side of Broome Street between Mercer and Wooster Streets has been called Cast-iron City. Built between 1870 and 1885, the window openings have all been treated in a similar manner and the cornice line is nearly uniform along the streetscape.

Griffin Thomas' magnificent Gunther Building, built in 1871, still stands on the corner of Broome and Greene Street. The tiers of flat arched windows articulated at each floor by a marked cornice, rise five floors above an arcaded ground level. At the corner, the windows and arches curve in a manner only to be achieved in cast-iron, not stone.

While most architects designing with cast-iron sought to imitate the effect of stone, Nicholas Whyte in his building at 101 Spring Street did not. Whyte used iron for its own sake and the result is a structure with crisp articulation and slenderness executed with a light touch.

J. Morgan Slade created a robust building in 1882 at 109 Prince Street. This five-story building with chamfered corner and banded pilasters and engaged columns is one of the more unusual designs found in SoHo.

381-383 West Broadway is a six story building with only the ground floor of cast-iron. Built in 1876 by John B. Snook with square pillars and recessed, diamond inserts, the building is one of the most modestly decorated cast-iron fronts in SoHo.

J.F. Duckworth designed 72 Greene Street in 1872. Known as "The King of Greene Street," this imposing structure with commanding presence is actually two cast-iron buildings unified by a central portico which rises from a pedimented porch at the ground floor to a pedimented cornice at the roof.

At 28-30 Greene Street, J.F. Duckworth designed a commanding Second Empire facade which has tall broad windows under segmental arches with keystones. The mansard roof has dormers and a central pavilion and is embellished with balustrades, keystones, pediments with modillions, and finials -- a tour de force in cast-iron.

11 Mercer Street was designed in 1870 by F.E. Graef for Adolph Poppenhuser founder of the Poppenhusen Institute in Queens County (listed on the National Register 8/18/77). 11 Mercer Street has five stories of decreasing height marked by a cornice at each level supported by smooth, three-quarter-round columns. The arches here have been flattened as far as geometry will allow: they are completely flat with squared 90° corners.

Two twin buildings on Broadway at 444 and 452 are located 75 feet apart. Built in 1876 by two New York engineers, August Schweitzer and Emile Gruwe, the buildings have filigree arches which overlay the tops of the square-headed windows, showing a perforated leaf-and-vine design that suggests Art Nouveau. Curiously, these two buildings actually join in a U-shape at the rear spanning the area behind the big 75 foot building which separates their facades.

555 Broadway, known as the Rouss Building, was designed by Alfred Zucker and built in 1889, with a wing added in 1900. The rhythmic, forceful facade was the delight of the flamboyant Charles Rouss whose wholesale store occupied the building.

The Little Singer Building at 561-563 Broadway was designed by Ernest Flagg in 1904 of terra-cotta, glass and steel embellished with delicate wrought iron tracery on balconies and arches. This 12-story office and loft building marks the transition in SoHo from the cast-iron building to the steel frame skyscraper which it inspired.

SoHo contains some structures from the first decades of the twentieth century which, although not cast-iron structures, do contribute to the area's historicity as an industrial district. Examples are the U.S. Post Office at the corner of Prince and Wooster, a bakery at 160 Prince Street, and several 10-12 story tenement buildings along Broadway.

SoHo is remarkable for the small number of intrusions within a district containing a high number of cast-iron and fine masonry buildings. Gas stations can be found on Houston Street and at the intersection of Canal and Broome. Both Canal Street and Broadway have a high percentage of

street floor alterations. The Neo-Colonial style European-American Bank (formerly the Franklin Bank) built in 1967 on the northwest corner of Broadway and Howard Street is out of character with the district but is set back with a large grove of trees around it with the result that the property forms a welcome green oasis in the streetscape. There are several vacant lots throughout SoHo which are often used as parking lots. Some of these replaced fine cast-iron structures, such as the lot at 501 Broadway.

The SoHo District is a compact homogeneous warehouse district: its streets consistent in width, its buildings dating from 1860 to 1890 and standing from five to six stories in height. Its southern and northern boundaries, Canal and Houston Streets, are wide thoroughfares which cause a marked change in sense of place. North of the district are modern residential towers erected as an urban renewal project and apartment buildings which are part of New York University. The district's western boundary separates the warehouses of SoHo from a dense residential neighborhood of brick tenements. Crosby Street, on the east side of the district, is mainly a service street behind the important Broadway buildings, and its use as boundary for several blocks allows the complete inclusion of the Broadway buildings. The east boundary deviates from Crosby Street in order to include several important iron-front structures which pertain to SoHo. East of the district is the Lower East Side, an area of residential structures sharply different in character.

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SoHo photographic key:

INTRUSIONS

1- 37 West Houston Street--service station
2- 128 Mercer Street--garage
3- 151 Mercer--garage
4- 110 Prince--1 story modern structure
5- 101 Greene--garage
6- 325, 327-329 West Broadway--modern brick, multi-story
7- 49 Grand--1½ story garage
8- 341 West Broadway--1 story garage
9- 344-354 West Broadway--brick 1 story garage
10- 374-376 West Broadway--service station
11- 134 Wooster--modern one story garage
12- 140, 150 Wooster--garage
13- 557 Broadway--garage
14- 396-398 West Broadway--stucco houses heavily altered
15- 18 Wooster--2 story modern
16- 158 Wooster--modern garage
17- 345 Canal--2 story modern store
18- 291-299 Canal--1 story modern store
19- 76 Grand--1 story modern store
20- 417 West Broadway--1 story--garage.
21- 41 Mercer--1 story garage
22A- 9 Crosby Street--1 story modern garage

PARKING LOTS

1- 19-35 West Houston
15- 311 West Broadway (3-21 Wooster)
22B- 469 Broadway
23- 81 Mercer Street
24- 89 Mercer Street
25- 109 Mercer Street (same as #31)
26- 501 Broadway
27- 335-341 Canal

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28- 128 Prince Street
29- 27 Wooster (61-69 Grand)
30- 144 Spring Street
31- 92-94 Greene Street (same as #25)
32- 54 Crosby
33- 432-436 Broome (and garage)
34- 397 West Broadway (vacant lot)
35- 481 Broome Street
36- 477-479 West Broadway
(79-83 West Houston)

NO PHOTOGRAPHS--Parking Lots/Vacant Lots

148-150 Wooster
450 West Broadway
455 West Broadway
137-139 Wooster
65-83 West Houston Street
91 Greene Street
132 Mercer
128 Prince (127 Wooster Street)

NO PHOTOGRAPHS--Modern Garages

138-40 Crosby Street
47-49 Wooster Street

8 SIGNIFICANCE

PERIOD	AREAS OF SIGNIFICANCE -- CHECK AND JUSTIFY BELOW				
__PREHISTORIC	__ARCHEOLOGY-PREHISTORIC	__COMMUNITY PLANNING	__LANDSCAPE ARCHITECTURE	__RELIGION
__1400-1499	__ARCHEOLOGY-HISTORIC	__CONSERVATION	__LAW	__SCIENCE
__1500-1599	__AGRICULTURE	__ECONOMICS	__LITERATURE	__SCULPTURE
__1600-1699	X ARCHITECTURE	__EDUCATION	__MILITARY	__SOCIAL/HUMANITARIAN
__1700-1799	__ART	X ENGINEERING	__MUSIC	__THEATER
X 1800-1899	X COMMERCE	__EXPLORATION/SETTLEMENT	__PHILOSOPHY	__TRANSPORTATION
__1900-	__COMMUNICATIONS	__INDUSTRY	__POLITICS/GOVERNMENT	__OTHER (SPECIFY)
		__INVENTION		

SPECIFIC DATES

BUILDER/ARCHITECT various

STATEMENT OF SIGNIFICANCE

The SoHo Historic District, located in lower Manhattan just south of Houston Street, contains the largest concentration of cast-iron structures in the world.[1] The district is significant both for providing an illustration of cast-iron architectural technology and styles during the four decades of the material's prominence, and for its role as the precursor of the twentieth-century urban environment of steel frame, curtain wall skyscrapers. Built between 1850 and 1890, the buildings which comprise SoHo represent the commercial prosperity of New York City during its northward expansion in the second half of the nineteenth century. In addition the district is historically noteworthy as the seventeenth-century site of the first free Black settlement on Manhattan Island.

During the Dutch Colonial period the area now known as SoHo was farmland, much of which had been granted to manumitted slaves of the Dutch West India Company. Until the middle of the eighteenth century, the area in which SoHo is located was largely rural, difficult to reach by road from the lower city because of extensive marshland. With the filling in of the marshlands early in the nineteenth century, the character of the area soon changed to middle-class residential, and by 1825 it had grown to be the most populous ward in the city, with a large freed-slave population. Large, fashionable retail emporiums such as Arnold Constable and Lord & Taylor established themselves along Broadway, while elegant hotels and an array of theatres and music halls soon followed.

Keeping pace with the northward growth of the city, ca. 1860, the entertainment district moved up to 14th Street, and what was left of the former residential section gradually disappeared. In its place came large textil and other mercantile establishments, which commissioned the construction of new buildings, selecting for the most part the new cast-iron front designs. For the next 30 years some of the largest and most prestigious textile firms in the country were housed side-by-side in those cast-iron palaces whose surviving Renaissance facades are reminiscent of Venice's Grand Canal.

[1]Gayle, Margot and Edmund V. Gillon, Jr., Cast-Iron Architecture in New York, inside front cover. Wolfe, Gerard R., New York: A Guide to the Metropolis, p. 131.

[2]Wolfe, Gerald, op. cit., p. 132.

The SoHo District displays exceptional coherence and architectural integrity as a neighborhood of cast-iron architecture spanning the decades of cast-iron's popularity. The success of cast-iron as a structural and architectural medium has been credited to two engineers active in New York City, Daniel Badger and James Bogardus, whose foundries in the 1840's mass-produced the nation's first complete iron-front buildings. The medium, an early form of modular and curtain wall construction, was soon embraced by a variety of architects including Richard Morris Hunt, Griffith Thomas, Samuel Warner, and Jarvis Morgan Slade.

There were many advantages to the novel cast-iron medium which both enhanced its popularity in the nineteenth century and pointed the way for future technological development. It was less combustible than wood, lightning proof, lighter and cheaper than stone, and economical both to erect and maintain. Cast-iron could be mass-produced from standardized molds--the iron parts being interchangeable and easily replaced from the foundry's catalog. Cast-iron, once painted, was weatherproof and required little maintenance. Iron's coefficient of expansion and contraction was similar to that of the brickwork to which it was attached, obviating the danger of separation under extremes of weather. In addition, an iron framework had greater structural integrity than other building materials, and could withstand stresses that would collapse wood or stone structures. A particular advantage was the space gained by the elimination of massive bearing walls; with a cast-iron facade, large windows were now possible for the first time, affording light and ventilation hitherto impossible. The simplicity of erection was such that an iron front could be raised almost overnight, with no more tools than a wrench."[3]

In addition to its structural advantages, cast-iron was an economical means of achieving elaborate architectural decoration. Architects imitated the styles common in stone buildings, copying the ornate French and Italian Renaissance motifs which were so fashionable in this mid-nineteenth century; some went so far as to add sand to the beige-colored paint to give the finished product the look of rough stone.

[3]Wolfe, Gerald, op. cit., p. 134.

The archeological remains may include subsurface features associated with the history of the district.

By the early twentieth century, the industrial pattern in the area of SoHo changed again as the district became New York's millinery manufacturing center. Until recently the area was devoted exclusively to diverse light manufacturing and to warehousing; but it now contains in addition rapidly growing colony of artists. An outstanding historic resource which has survived intact as a nineteenth century urban complex, the SoHo District has been designated a landmark by the New York City Landmarks Preservation Commission.

9 MAJOR BIBLIOGRAPHICAL REFERENCES

See Continuation Sheet.

10 GEOGRAPHICAL DATA

ACREAGE OF NOMINATED PROPERTY approx. 73 acres

UTM REFERENCES

	ZONE	EASTING	NORTHING		ZONE	EASTING	NORTHING
A	18	584 000	4508 110	B	18	584 410	4508 740
C	18	584 760	4508 510	D	18	584 340	4507 800

VERBAL BOUNDARY DESCRIPTION

The following properties are included within the district: 1-83 Houston Street, 69-157 and 72-156 Prince Street, 79-167 and 80-172 Spring Street, 432-510 Broome and 419 Broome to 5 Watts Street, 142-46 and 143-43 Grand Street, 22-54 and 29-53 Howard Street, 269-387 Canal Street, 301-479 and 308-482 West Broadway, 1-157 and 2-160 Wooster Street, 15-145 and 8-152 G Greene Street, 1-173 and 2-172 Mercer Street, 419-601 and 424-602 Broadway, 10-140 and 5-39 Crosby Street.

LIST ALL STATES AND COUNTIES FOR PROPERTIES OVERLAPPING STATE OR COUNTY BOUNDARIES

STATE	CODE	COUNTY	CODE
STATE	CODE	COUNTY	CODE

11 FORM PREPARED BY

NAME / TITLE

E.K. Ralph, Historic Preservation Program Assistant with materials supplied by: Margot Gayle, Friends of Cast-Iron Architecture, 44 West 9th St., New Yo New York, 10011 and Landmarks Preservation Comm., ~~305 Broadway, New York, New York 10007~~

ORGANIZATION DATE 3/9/77

Historic Preservation Field Services, NYS Office of Parks and Recreation

STREET & NUMBER TELEPHONE

Empire State Plaza, Agency Building #1 518-474-0479

CITY OR TOWN STATE

Albany New York 12238

12 STATE HISTORIC PRESERVATION OFFICER CERTIFICATION

THE EVALUATED SIGNIFICANCE OF THIS PROPERTY WITHIN THE STATE IS:

NATIONAL X STATE ____ LOCAL ____

As the designated State Historic Preservation Officer for the National Historic Preservation Act of 1966 (Public Law 89-665), I hereby nominate this property for inclusion in the National Register and certify that it has been evaluated according to the criteria and procedures set forth by the National Park Service.

STATE HISTORIC PRESERVATION OFFICER SIGNATURE

TITLE Deputy Commissioner for Historic Preservation DATE 3/23/78

FOR NPS USE ONLY

I HEREBY CERTIFY THAT THIS PROPERTY IS INCLUDED IN THE NATIONAL REGISTER

DATE

DIRECTOR, OFFICE OF ARCHEOLOGY AND HISTORIC PRESERVATION

ATTEST: DATE

KEEPER OF THE NATIONAL REGISTER

Brooks, Michael W. and Margot Gayle. A Walking Tour of Manhattan Cast-Iron Architecture. New York: The Victorian Society in America, 1968.

Gayle, Margot and Edmund V. Gillon, Jr. Cast-Iron Architecture in New York. New York: Dover Publications, Inc., 1974.

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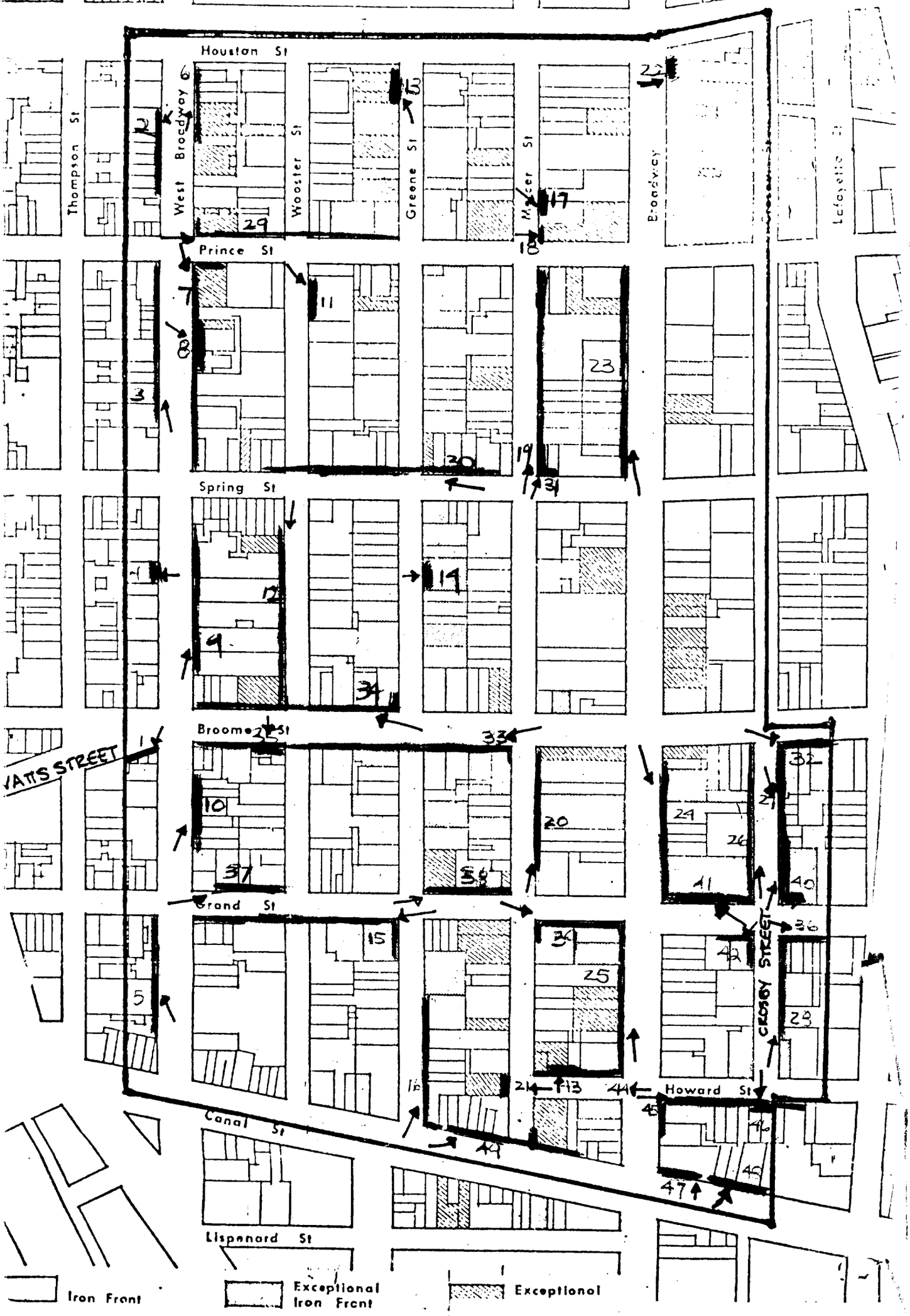


KEY TO PHOTOGRAPHS OF STREETSCAPE AND INDIVIDUAL BUILDINGS IN THE SOHO HISTORIC DISTRICT, NEW YORK COUNTY

SOHO

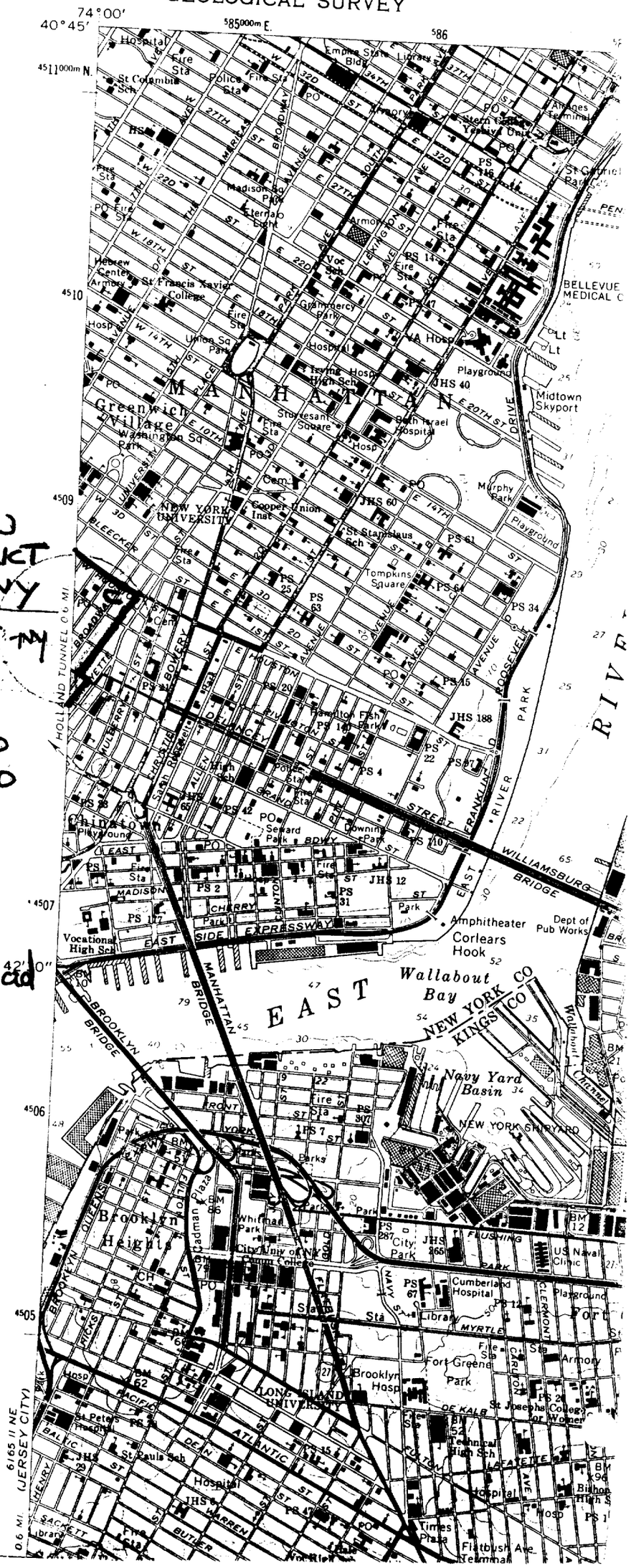
MAP # 2

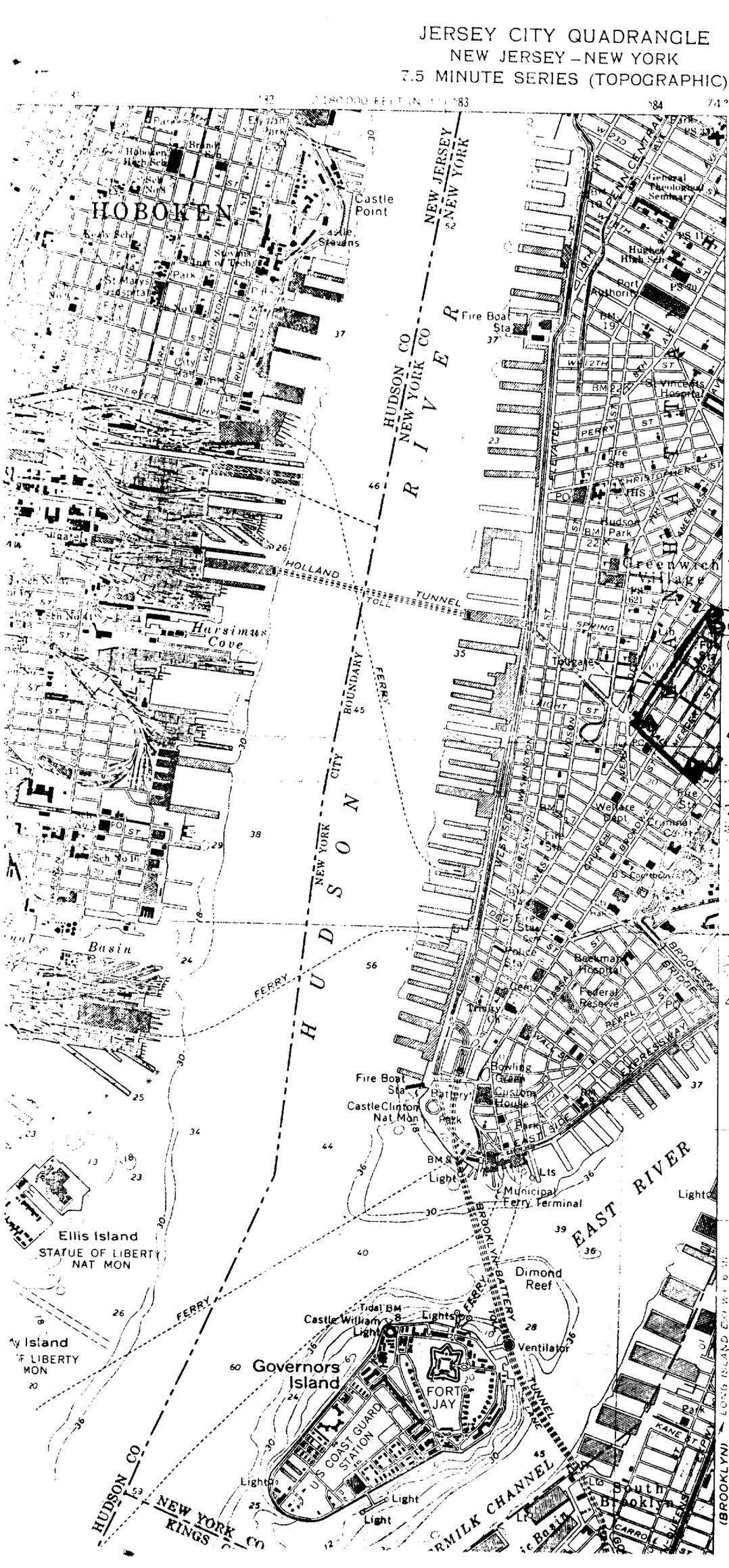
SOHO CAST-IRON HISTORIC DISTRICT
NEW YORK COUNTY

(SEE JERSEY CITY, NJ - NY MAP FOR EASTING AND NORTHING OF OTHER POINTS

EASTING 585/760
NORTHING 4511/510

Brooklyn Quad





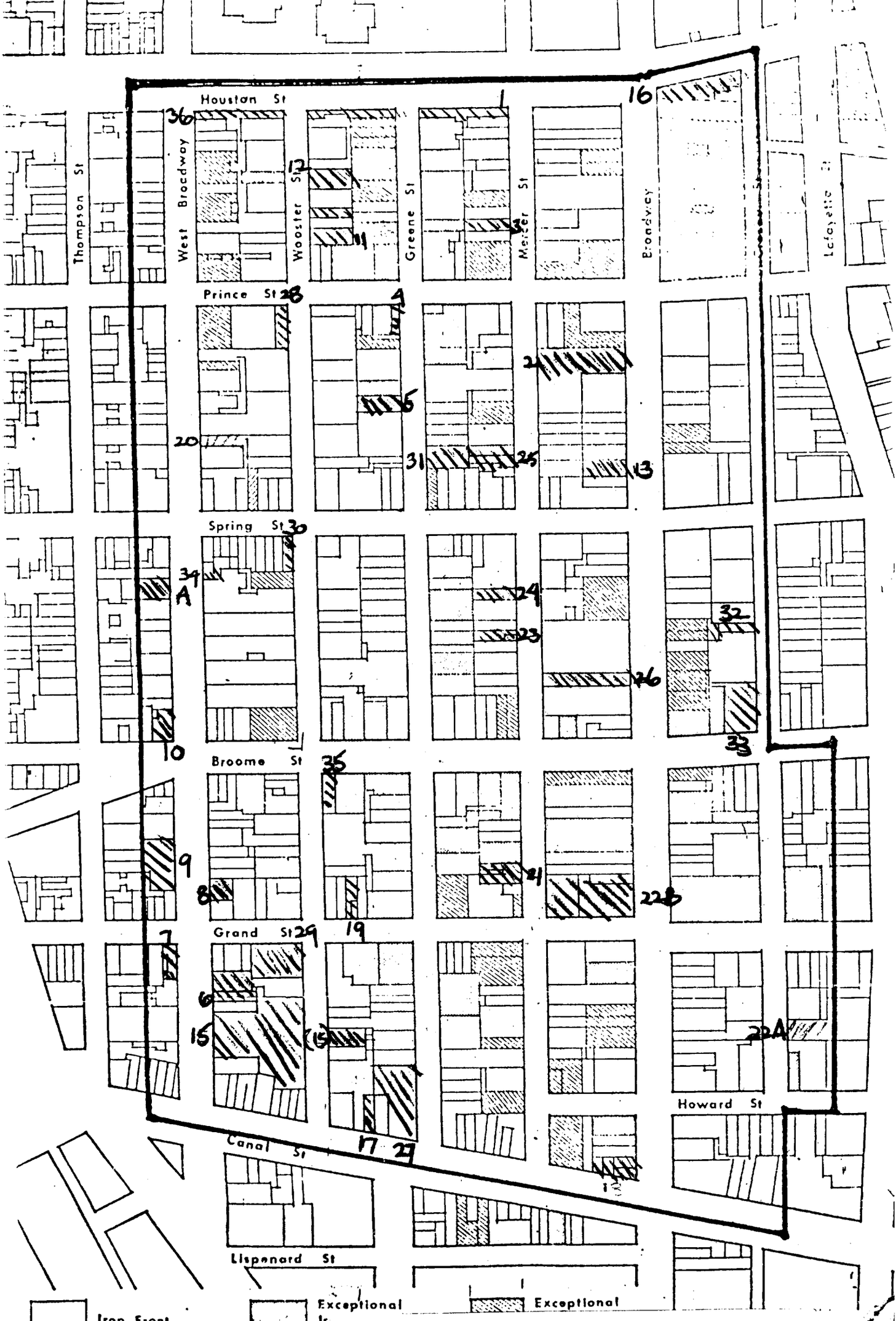
SOHO CAST-IRON HISTORIC DISTRICT
NEW YORK COUNTY
(See BROOKLYN N.Y. MAP FOR REST OF DISTRICT)

A-EASTING 5/84/000
NORTHING 45/08/110

B-EASTING 5/84/910
NORTHING 45/08/740

C-EASTING 5/89/760
NORTHING 45/08/510

D-EASTING 5/89/340
NORTHING 45/07/800


Houston St
Prince St
Spring St
Broome St
Grand St
Canal St
Lispenard St
Howard St
Thompson St
West Broadway
Wooster St
Greene St
Mercer St
Broadway
Lafayette St
Iron Front
Exceptional Ir
Exceptional
KEY:
INTRUSIONS AND PARKING LOTS
1-22A are intrusions
1, 15, 22-36 show parking lots

SOHO

SoHo Historic District, NY Co.

Photo Credit: E. Spencer-Ralph 11/77
Neg. Filed: NYS Parks & Recreation
Historic Preservation

Northside of Grand between West Broadway and Wooster Street 37

SoHo Historic District, New York County

Photo credit: E. Spencer-Ralph - 11/77
Neg. filed: NYS Parks & Recreation, Albany, NY

N side of Grand between Greene Street and Mercer Street. 38

SOHO - CAST IRON HISTORIC DISTRICT DESIGNATION REPORT

1973

City of New York
John V. Lindsay, Mayor

Parks, Recreation and
Cultural Affairs Administration
Richard M. Clurman, Administrator

Landmarks Preservation Commission
Harmon H. Goldstone, Chairman

SH-CI HD

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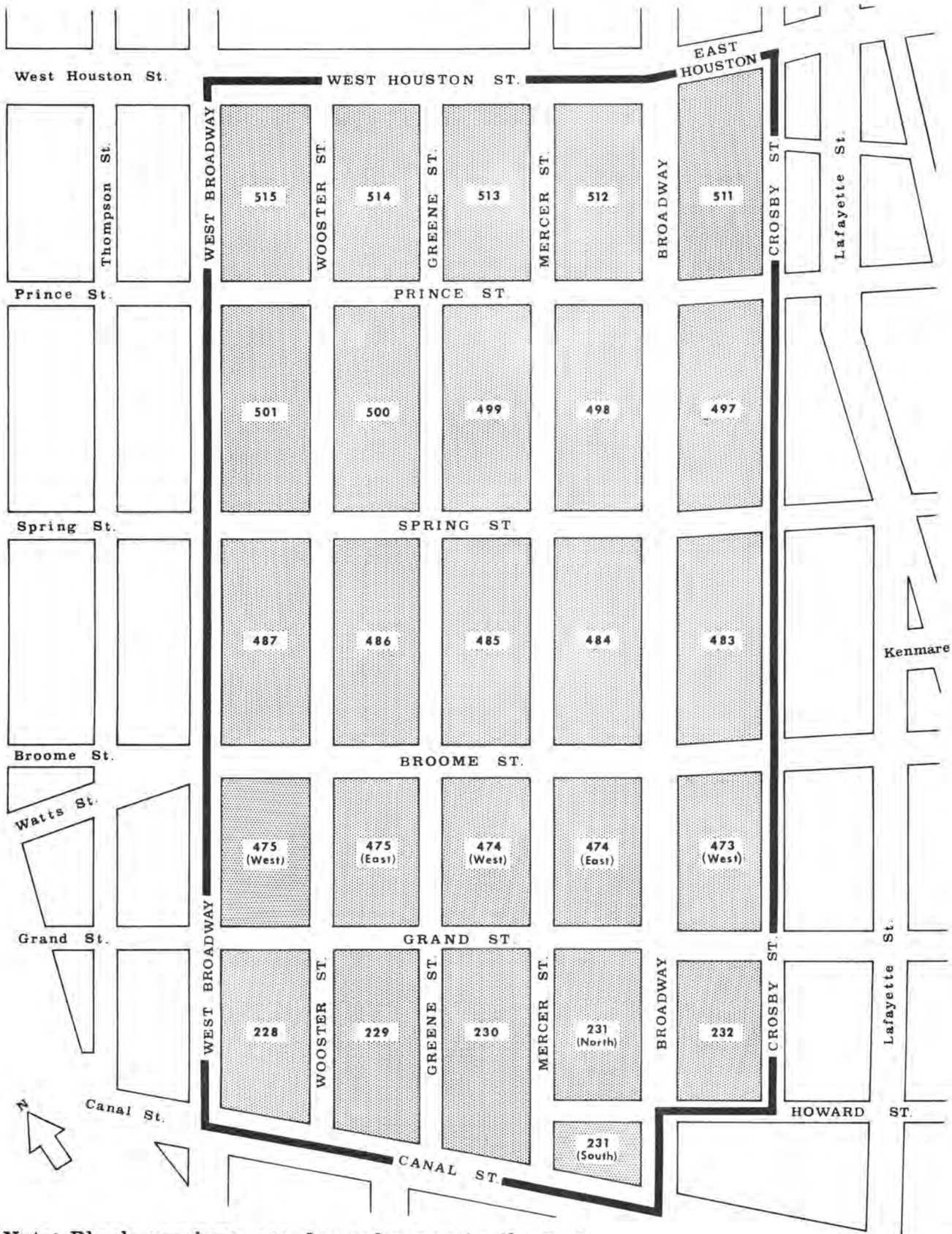
Landmarks Preservation Commission
305 Broadway
New York, New York 10007

SOHO - CAST IRON HISTORIC DISTRICT
MANHATTAN



Note: Block numbers are for reference to the text.

DESIGNATED AUGUST 14, 1973

CONTENTS

CONTENTS (Cont'd.)

CONTENTS (Cont'd.)

CONTENTS (Cont'd.)

CONTENTS (Cont'd.)

CONTENTS (Cont'd.)

BOUNDARIES AND INTRODUCTION

The SoHo-Cast Iron Historic District in lower Manhattan is nearly rectangular in shape and is bounded by Canal Street, Broadway, Howard Street, Crosby Street, East Houston Street, West Houston Street and West Broadway. It consists of 26 city blocks and contains about 500 buildings.

The hyphenated name, 'SoHo-Cast Iron' was chosen for the designation of New York City's twenty-third Historic District in order to suggest some of the diversity of the area. The 'Cast Iron' portion of the name refers to the unique collection of cast-iron structures located within the District. "SoHo," meaning "South of Houston," is the acronym adopted by a group of artists who moved, in the 1960s, into what then seemed to be a doomed neighborhood. They have given it a new life, making feasible the preservation of an irreplaceable part of our cultural heritage. The use of the double name is also intended to suggest that, even architecturally, the District contains more than just cast-iron buildings, important though they are. Indeed, the District contains some of the City's most interesting extant examples of brick, stone and mixed iron-and-masonry commercial construction of the post-Civil War period.

The body of this designation report is divided into three parts:

Part I discusses the social and economic history and the architectural development of the area, and provides background information on the use of cast iron as a building material and its application to architectural forms. Through this analysis, the following factors relating to the unique significance of the District are emphasized:

(1) The social, cultural and economic history of the District has been, and is again becoming, as varied and colorful as any to be found in New York City.

(2) The illustration it provides of 19th-century commercial architectural styles is probably as complete, well documented and geographically compact as any to be found in the United States.

(3) The collection of well preserved cast-iron structures, now unrivalled in the world, demonstrates how cast iron was used in 19th-century commercial construction. It also illustrates in a tangible way all sides of a great aesthetic debate. Some of the more thoughtful 19th-century theorists hoped, through a synthesis between engineering and architecture, to develop a truly representative contemporary style.

In Part II the thirteen streets that either border or run through the District are arranged alphabetically and discussed block by block. In each case there is an introductory section describing the general character of the block in question with detailed descriptions of buildings of particular interest, followed by a tabular listing of all the pertinent information known about each structure in the block.

Part III contains appendices, sources and credits, bibliography as well as the findings of the Landmarks Preservation Commission.

TESTIMONY AT PUBLIC HEARINGS

On July 21, 1970 the Landmarks Preservation Commission held a public hearing on a proposal to designate a Cast Iron Historic District (Item No. 2) within the above described boundaries. This proposed Historic District included a number of buildings in the tier of blocks between Broadway and Crosby Street, from Howard Street to East Houston Street, that were an addition to the buildings contained in a previously proposed Historic District that had been the subject of a public hearing on June 23, 1970 (Item No. 2) and which was also reconsidered on July 21, 1970 (Item No. 1).

The hearings had been duly advertised in accordance with the law. At the July 21, 1970 hearing, thirteen persons spoke in favor of a Cast Iron Historic District and five individuals opposed it. The witnesses favoring designation clearly indicated that there is great support for this proposed Historic District; they also indicated a preference for the enlarged boundaries as proposed on July 21, 1970 (Item No. 2).

ACKNOWLEDGEMENTS

The preliminary research for this report was begun in 1966 by Nancy Steinke, of the staff of the Landmarks Preservation Commission. A search through records of the Department of Buildings and the Municipal Archives and a recording of all relevant data was undertaken by students of Pennsylvania State University in the summer of 1971, under the direction of Winston Weisman, Research Professor of Art History at the College of Arts and Architecture of Pennsylvania State University, with the assistance of Vaughn Glasglow and Regina Kellerman. Their work was supported by a grant from the National Science Foundation which the Commission assisted in obtaining. The tabulated factual information on individual buildings in the District is largely based on the work of this group.

The Pennsylvania State University students -- David Albert, Robert Bantens, Nurith Bornstein, Theodore Dannerth, Dallas DiLeo, Mark Greenburg, Margaret Hamer, Gale Harris, John Burton Harter, Karl Henry, Debra Israel, Christine Kosmark, Julia McLaughlin, Richard Porter, Mary Ann Smith, Linda Vandegrift, Barbara Wentz, and James Yucas -- were assisted by five architectural students from the University of Milan -- Daniella Canali, Andrea Casati, Franco Perfetti, Mario Presutto, and Giuseppe Villa -- who had been sent to join them at the expense of the Italian Government. The participation of these exchange students in an architectural and historical research project in New York City gave tangible proof of the international recognition of the importance of the City's cast-iron heritage; in addition the presence of these students provided a welcome opportunity to return, in small measure the hospitality that Italy has shown to generations of architectural students from the United States.

The research was completed and the final text prepared by Karen Graham Wade, Marjorie Pearson and James T. Dillon, consultants to the Commission, whose work was made possible by a grant from the New York State Council on the Arts. The report was typed in its final form by Sarah Slade and Steven Williams.

The District was first photographed in 1966 by John J. Bayley, then a staff member. A large number of photographic details were taken in 1971 by the students from Pennsylvania State University; the necessary block front and individual facade views were completed in 1973 by John J. Bayley and Merritt Meyer, a volunteer.

Members of the Landmarks Preservation Commission staff who have been directly concerned with the preparation and production of the report include Anne Gewirtz, Mitzi Gevatoff and Irene Mahnken, who typed successive drafts. The final production of the report was carried out under the direction of John W. Benson, Office Administrator.

Grateful acknowledgement is made to the persons in the various City agencies and public and private repositories of information listed in the Sources and Credits Section. We particularly wish to thank the American Institute of Architects-New York Chapter, the Fine Arts Federation, the Friends of Cast Iron Architecture, the Historic District Council, the Municipal Art Society, the SoHo Artists' Association, the Victorian Siciety in America, the Village Home Owners Association, as well as Community Board No. 2, for their support and encouragement.

Though many individuals have been associated with different phases of this report, final responsibility for the facts and opinions expressed rests with the Landmarks Preservation Commission as a whole.

LANDMARKS PRESERVATION COMMISSION
August 14, 1973

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Part I

1. LAND USE: SOCIAL AND ECONOMIC HISTORY

The Colonial Period - Farms and Forts

During the Dutch Colonial period, the area of the present Historic District was farmland that had been granted to some of the manumitted slaves of the Dutch West India Company.(1)* Many of these Blacks had been freed by an order of February 25, 1644 after they had belonged to the Company for almost twenty years. They were then ostensibly on the same footing as other free people in New Netherland and they were expected to earn their livelihood by agriculture but their future was considerably less secure than that of the other citizens. Their children, both those born and those yet to be born, were to be slaves of the Company.(2) This practice was demonstrated on December 6, 1663 when Domingo Angola and his wife, Marycke, free Blacks and owners of a plot of land lying roughly between Houston Street, Prince Street, Greene Street and Broadway,(3) petitioned the Provincial Council for the manumission of Christina, a baptized orphan daughter of Manuel Trumpeter and his wife Anthonya. The Council would grant their request on condition that either another Negro slave be provided for the Dutch West India Company in her place or that three hundred guilders be paid for her release. On September 16, 1664, Govert Loockermans, Orphan-Master of the Province, paid the three hundred guilders for Christina's freedom.(4)

The SoHo-Cast Iron District thus has the added interest of having been the site of the first free Black settlement on Manhattan Island. It retained a Black population for over two hundred years, until the middle of the 19th Century, when the area changed from residential to commercial use.(5)

In the 1660s, Augustine Herrman(c. 1605-1686) began to acquire much of the land in and near the Historic District.(6) He had been born and raised in Prague but was forced to flee in 1618 to Amsterdam with his parents after his father had been outlawed for political activities. After serving for a short time in the army of Gustavus Adolfus of Sweden, Augustine Herrman joined the Dutch West India Company and traded for them in Curacao, Brazil and New Netherland. In 1643, he left the Company and became the agent in New Netherland for the great Amsterdam mercantile firm of Peter Gabry & Sons. He built a large fortune through trade in furs, slaves and indigo while in their service, and became the largest exporter of tobacco in America. Herrman bought extensive tracts of land on Manhattan Island and in New Jersey not only for himself but for Govert Loockermans and his brother-in-law, Nicholas Bayard. Peter Stuyvesant sent him to Maryland in 1659 to conduct negotiations with Lord Baltimore concerning the boundary between his territory and that of the Dutch. The map of the Maryland territory, on which Herrman worked for ten years, so pleased Lord Baltimore that he gave Herrman over thirteen thousand acres of land in Maryland and the hereditary title of Lord of the Manor. Herrman died at Bohemia Manor, Maryland, in 1686. His land holdings in the area of the Historic District passed to his brother-in-law, Nicholas Bayard, near the end of the 17th Century.(7)

Nicholas Bayard (c. 1644-1707), a nephew of Peter Stuyvesant, was born in the Netherlands and was brought to this country by his mother in 1647. He served the government of the Colony in a number of capacities including Surveyor of the Province and Mayor of the City. In 1686, while serving as Mayor, he helped to draw up the Dongan Charter which guaranteed the rights and privileges of colonial citizens. During 1689, when the Colony was convulsed by the "Glorious Revolution", which culminated in New York with Leisler's Rebellion, Bayard fled to Albany to escape assassination at the hands of the Leislerites. When he learned that his son, Samuel, was ill, he returned to the City and was arrested and thrown into prison. He remained in prison until he was released by Henry Sloughter whom King William had newly appointed Governor of the Province.

* See: Footnotes, pp. 26-30

Leisler and his son-in-law, Milbourne, after surrendering the Province to Sloughter, were arrested, tried and on May 16, 1691, hanged and beheaded for the crime of high treason. But the factionalism did not die with Leisler. When Lord Bellomont, who was sympathetic toward the Leislerites, was appointed the chief executive of New York, the Leislerites accused Bayard and others of being Jacobite pirates in league with Captain Kidd. Bayard, in turn, was tried for high treason before Chief Justice Atwood and sentenced to be hanged and dismembered. Before the execution order could be carried out, however, Bayard's appeal was granted and the sentence was annulled. All his lands which had been confiscated were restored to him and Bayard died quietly in New York City in 1707.(8)

The SoHo-Cast Iron Historic District lies in part within the western section of the Bayard Farm and during the 18th Century there was little change in its rural character.(9) This was due to the fact that it was cut off by natural barriers from the settlement at the lower tip of Manhattan. The Collect Pond and the stream flowing from it, Smith's Hill, Bayard's Hill and Lispenard's Meadow (Cripplebush Swamp) all combined to slow the northward expansion of the City.(10) Broadway was not extended north of Canal Street until after 1775(11) and the surrounding land, even at this date, was still being farmed.

When the Revolution erupted, a series of fortifications and redoubts were built across Manhattan. There were two forts on Mercer Street between Broome and Spring streets; a third was located in the center of the block bounded by Grand, Broome, Mercer and Greene streets; and another stood between Grand and Broome Streets, Broadway and Crosby Street,breastworks stretched across Broadway a few feet north of Grand Street.(12)

The Early Republic

As a result of financial difficulties caused by the Revolutionary War, Nicholas Bayard, the third of that name, was forced to mortgage his West Farm. It was divided into lots at the close of the 18th Century but very little development took place until the first decade of the 19th Century.(13)

As early as 1794, the area near the junction of Broadway and Canal Street had attracted a few manufacturing businesses. On the northwest corner of the intersection stood the cast-iron foundry and sales shop of Joseph Blackwell, wealthy merchant and owner of Blackwell's Island.(14) Next to his property was that of Thomas Duggan who owned a number of lots along Canal Street which was then called Duggan Street. He operated a tannery near Blackwell's foundry.(15)

By the early 1800s, landowners in the area had begun to petition the Common Council to drain and fill the Collect Pond, its outlet to the Hudson River and Lispenard's Meadow. What had been a bucolic retreat for the residents of the Dutch and English town had become a serious health hazard to the citizens of the City and an impediment to its development. The shores of the Collect were strewn with garbage and the rotting carcasses of dead animals, the stream along Canal Street was a sluggish sewer of green water and parts of Lispenard's Meadow were a bog that yearly claimed a number of cows. It was also a breeding ground for the mosquitoes that almost every summer spread the dreaded yellow fever plagues. After years of bickering and numerous plans and proposals, Bayard's Hill which stood over one hundred feet above the present grade of Grand Street and the other hills in the vicinity were cut down and used, together with the City's rubbish, to fill in the marshy land.(16)

In 1809, Broadway was paved and sidewalks were constructed from Canal Street to Astor Place and serious development of the area began. However, even before this, a number of prominent men had chosen to build their houses along this section of Broadway. Citizen Genet, James Fennimore Cooper, Samuel Lawrence and the Reverend John Livingston all lived near the intersection of Spring Street and Broadway.(17) Spring Street was one of the earliest streets opened for development and the oldest house in the Historic District still stands on Spring Street. It is No. 107, a frame house with a brick front built by Conrad Brooks, a shoemaker, about 1806.

Another early house on Spring Street is the William Dawes house at No. 129 which was built in 1817. As late as the 1950s a well of Manhattan Company which

used to supply water to the City was located in an alley behind the house. It was in this well that the body of Juliana Elmore Sands was discovered on January 2, 1800, and its discovery electrified the community. A young man named Levi Weeks who was said to be her fiance was arrested for her murder. He was defended, among others, by Aaron Burr, one of the organizers of the Manhattan Company, and by Alexander Hamilton. It is ironic that these two men should join in the defense of Weeks but it indicates the enormous amount of public excitement and iterest in the case. After three days of testimony before a packed courtroom and with hundreds of people crowded in the street outside, the jury found Weeks innocent of the charges It was determined that the young woman had committed suicide in a fit of melancholy. But rumors about the affair persisted and tales of a white robed figure moaning at the well and alarm bells in the night continued for many years after the event.(18 The mystery remained unique in the folklore of the City until the murder of Mary Rogers, a salesgirl in a cigar shop in the St. Nicholas Hotel, forty years later. The sections of the hotel that are still standing on Broadway near Spring Street may occupy the site of this earlier hotel.(19) The murder was described in depth by Edgar Allen Poe in his short story"The Mystery of Marie Roget."

1815-1850 - A Residential Neighborhood

The development of the District was slowed by the War of 1812, but after the economy recovered from the post-war depression, building activity was rapidly renewed in the area. Because wealthy and influential men had settled along the northern section of that part of Broadway which runs through the District and in the area immediately north of Houston Street, the sense of prestige which their names gave to the neighborhood made it attractive to the growing number of middle class families in the City. The period between 1815 and 1825 was a decade of enormous growth for the Eighth Ward in which the Historic District (except for those blocks between Broadway and Crosby Street) formed the easternmost part. Its population more than doubled, changing it from an area that had been described as one of "hill and dale and pleasant valley" to the most populous Ward in the City.(20) Nearly three dozen houses in the District date from this period of growth. Two almost complete rows of Federal houses still stand; one on the south side of Spring Street between Wooster Street and West Broadway and the other on the north side of Canal Street between Mercer and Greene Streets. Samuel F. B. Morse lived at No. 321 Canal Street in 1825.(21)

1850-1900 - Entertainment, Commerce and Industry

For the thirty years between 1820 and 1850, the District remained a stable residential neighborhood, but in the 1850s it began to change, and to change rapidly. The transformation at this time was due in no small part to the new development that had begun to alter Broadway. The decade of the 1850s saw the metamorphosis of Broadway from a street of small brick retail shops into a boulevard of marble, cast-iron and brownstone commercial palazzos. Lord & Taylor, Arnold Constable & Co., Tiffany & Co., E. V. Haughwout and others established their stores on or near Broadway. Major hotels joined them: the Union Hotel, the City Hotel, the Prescott House, the Metropolitan and the magnificent St. Nicholas Hotel. The famous music halls and theaters soon opened: Brougham's Lyceum, the Chinese Rooms, Buckley's Minstrel Hall, the Olympic, Lafayette Hall, the American Art Union, the American Musical Institute and many more, made Broadway between Canal and Houston Streets the entertainment center of the City.(22)

The decade also saw a radical change in the small cobbled streets behind the splendid facades of Broadway. They, too, became an entertainment center and were as famous for their diversions as was Broadway. There were even guide books and directories specifically published for the area. It had become the red light district. Crosby, Mercer and Greene Streets, West Broadway and Houston Street all had their "ton" houses, houses of assignation and ladies' boarding houses that catered to every taste. A lonely traveller could visit Mrs. Hathaway and "view some of her fair Quakeresses" or Mrs. Everett whose "beautiful senoritas are quite accomplished." or Miss Lizzie Wright and her "French belles" or Madame Louisa Kanth's which was run "on the German order" or Miss Virginia Henriques' where "its lady, its boarders, its fixins and fashions" were on the Creole order".(23)

But pleasure was not the only business of the Historic District during the 1850s. As the middle class families began to leave the area, small manufacturing companies took their place. Brady's Iron Foundry, Althouse Iron Works, a number of copper and brass shops, locksmiths, and China and glass manufactories made and sold their products here. There were cabinet makers producing pianos, chairs and tables, together with the lumber yards to supply the wood they needed. Lorillard's Snuff Manufactory occupied most of the block between Broome, Spring, Wooster and West Broadway and Appleton & Co., book publishers, used the Howard building on Greene Street as their warehouse.(24)

The 1860s brought another great change in the character of the area. The Eighth Ward, in the five year period between 1860 and 1865, lost 25% of its population, the highest rate of loss for any of the Wards below 14th Street. This loss was due in part to the increasing sordidness and danger that developed around the brothels but the major cause of the exodus was the movement of factories and warehouses into the Ward.(25) Despite this shift in land use, the value of the real estate actually decreased during the Civil War but the trend was dramatically reversed in 1868. This was the first year of one of the greatest speculative eras in the City's history.(26) At the close of the War, the value of the property in the Eighth Ward had been assessed at a little over $18,000,000, but in 1868 it was assessed at nearly $26,000,000 -- an increase in three years greater than the increas over the twenty year period between 1845 and 1865. This increase and the fact that the Ward was strategically located close to the largest business markets in the City and near the docks along the North River did not go unnoticed. Boss Tweed and his Ring began to make plans for the section but before their schemes could be carried out the Ring was broken and the Panic of 1873 hit the country.(27)

It took six years to recover from the effects of the Panic but, beginning in 1879 and continuing into the 1890s, large factories and stores were built along the streets parallel to Broadway. The District was no longer the City's entertainment center but had now become a center for the mercantile and dry-goods trade. Some of the most important textile firms in the country were located here and conducted world-wide trade worth millions of dollars.

Cheney Brothers, one of the foremost silk-fabric manufacturers in the world, maintained offices at 477-479 Broome Street in a cast-iron building designed by Elisha Sniffen. This remarkable family began their silk manufacturing 1838 in South Manchester, Connecticut, where they constructed a company town that was noted for its humanitarian planning.(28) The family was not only noteworthy for its business acumen but Seth Wells Cheney and his brother, John, also made notable contributions to American arts and letters.(29)

The cast-iron building designed by John Correja on the northeast corner of Grand Street and Broadway was occupied by Mills & Gibb, a world-wide dry-goods firm with offices in Nottingham, Paris, Calais, and major American cities. It was the largest firm of its type in the country.(30)

W. G. Hitchcock & Co. was a prominent import and commission firm that had been established in 1818 by Pierre Becar. Among its early partners were Aaron Arnold and James M. Constable of Arnold Constable & Co. They had their offices in the Griffith Thomas cast-iron building at 453-455 Broome Street and dealt mainly in silks.(31)

The Jennings Lace Works which had its factory in Brooklyn, kept their main office at 77 Greene Street where they introduced into this country Chantilly, Point d'Alencon and Breton lace.(32)

Oelbermann, Dommerich & Co. which had its own building at 57-63 Greene Street was an old dry-goods firm. Its trade was so extensive that there was hardly a branch of the dry-goods business that did not have dealings with the company. Their annual sales by 1893 amounted to about $15,000,000.(33)

The building at 455 Broadway was the main office for Belding Brothers & Co., which, at one time, was one of the most important manufacturing interests in the country. They had mills which produced sewing-silk in Montreal, San Francisco, Northampton, Mass., Rockville, Conn. and Belding, Mic. which had been named after the family.(34)

With the end of the 19th Century came an end to speculative interest and growth in the area. The center of the City had long since moved northward and with it the prominent businesses soon followed. Marginal industries, such as dealers in textile and paper wastes, small apparel firms that produced underwear and standard design women's clothing, that did not change with the fashions, filled the vacancies left by the older businesses.(35)

Decay and Rebirth -- Artists and Industry

For the next sixty years, the District lay unchanged and forgotten by the City in a limbo of small industrial and commercial enterprises. It was not until the 1960s that a new movement began to stir. This, surprisingly enough, was caused by the trend among artists to paint on larger and larger canvasses. The high-ceilinged, empty lofts of SoHo provided the large spaces that they needed for their work and the rents were very low. With the help of City agencies, the zoning laws were imaginatively amended to permit the migration of artists into the area without, at the same time, driving out the marginal industries whose employment of thousands of semi-skilled workers fills a necessary niche in the City's economy. The result has been that the SoHo-Cast Iron Historic District is fast becoming one of the most important creative centers of contemporary art in the nation. At the same time, the innovative zoning provisions are demonstrating how, with appropriate provisions for health and safety, manufacturing, commercial and certain residential uses can exist side-by-side. If the demonstration continues to succeed as it has during the past few years, SoHo may well provide a wider lesson. With a little imagination, effort and ingenuity, exciting alternatives to demolition can be found for the stagnant and decaying areas of our cities. These alternatives have the further advantage, which "slum clearance" lacks, of preserving the continuity of a city's cultural and historic heritage -- in the case of the SoHo-Cast Iron District, the preservation of a unique concentration of structures of great historic significance.

2. STYLISTIC HISTORY

The SoHo-Cast Iron Historic District is significant not only for its historic role in the commercial development of New York City, but also for the survival of the largest concentration of full and partial cast-iron facades anywhere in the world. A majority of the buildings that incorporate full fronts of cast iron date from the decade of the 1870s, though a substantial number of complete masonry structures, as well as those combining masonry and cast iron, date from earlier and later decades.

The earliest extant buildings within the Historic District date back to the first decade of the 19th century when the area was exclusively residential. By mid-century, most of the early houses had either been replaced or converted for commercial purposes, though there remain today over thirty identifiable Federal period buildings within the District boundaries. They are far outnumbered, however, by non-residential structures dating from every decade of the second half of the 19th century plus a few belonging to the 20th. Although the commercial character of the area was firmly established by the 1870s, the broad range of construction dates can be attributed to the need for expansion, the need to keep in step with changing fashions and the need to replace structures lost or damaged by fire.

Early Non-Commercial Architecture

The earliest known building remaining in the Historic District is a c. 1806-08 Federal style brick house, now covered by stucco, located at 107 Spring Street. Although the only discernible Federal characteristics remaining on this building are its handsome stone lintels, three later Federal houses in the Historic District retain their original doorways. One of these is the house at 105 Mercer Street, built in 1819-20, which has kept intact the original wooden columns flanking the door, above which is an outstanding leaded fanlight. Another common treatment of Federal doorways was a rectangular transom outlined by an egg-and-dart molding as exemplified by the entrances to 146 and 156 Spring Street, which also retain their original entry columns. These three houses, though the best preserved, are similar in their basic characteristics to the other extant Federal houses in the Historic District. For the most part they are three stories high with a width of twenty-five feet. Their Flemish bond brickwork is now often covered by stucco, but some of them retain their original peaked roofs with one or two dormers.

Since the area did not develop into a commercial center until the second half of the century, it would be reasonable to assume that quite a number of residential structures must have been built in the Greek Revival style between the late 1820s and the 1840s. Oddly enough, however, only two surviving buildings in the Historic District (589 Broadway and 127 Grand Street) are identifiable, either stylistically or by documented construction date, as belonging to the Greek Revival period.

By mid-century, the area of Broadway lying within the District had developed into the leading entertainment center of the City. The sole survivor of the many theaters and hotels erected during that period is a small portion of the once elegant St. Nicholas Hotel, completed in 1854. The lintels on the remaining section, located at 521-523 Broadway, are embellished by garlands, volutes and elaborate keystones, characteristics of the new French influence. Other contemporary hotels in the area, such as the 1851 Metropolitan Hotel, long since demolished, were, however, built in a strict Italianate manner with arched ground-floor windows and a combination of projecting lintels and curved and peaked pediments over the upper story square-headed windows.

Early Commercial Architecture

During the same period when hotels and theaters were prevalent along Broadway, elegant retail stores, many of which catered to the carriage trade, also began to appear. Although there had previously been food stores and service shops intermingled with the row houses, the new scale of commercial development, which began in 1850s, permanently changed the character of the District.

Two of the more prominent early emporiums, the Haughwout Building and the

Arnold Constable & Co. store, remain today as significant landmarks of the changing era. Their importance lies not only in their imposing commercial grandeur, but also in the use of cast iron in their facades. The two buildings utilize the material in two different ways. The Arnold Constable store uses cast-iron ground-floor columns to support a traditional masonry front. The Haughwout Building facade is made entirely of cast iron.

The practice of using cast iron for storefronts and for architectural ornamentation had begun in the United States much earlier, though a complete cast-iron facade was practically unknown until James Bogardus erected, in 1848, a drugstore with a full cast-iron facade for John Milhau at 183 Broadway.(36) It was soon followed by his own factory building and by five stores for Edgar H. Laing at the corner of Washington and Murray Streets. Although Bogardus served as a forceful catalyst in popularizing the use of cast-iron facades for commercial structures, he was primarily an engineer and inventor. The actual work of casting was left to others. Because of this role Bogardus was soon superseded by Daniel D. Badger, president of Architectural Iron Works, as the dominant figure in the developing use of architecural cast iron in New York City.

Badger, who was first listed in the 1849 Directory as a manufacturer of iron shutters, is most famous for the full Venetian Renaissance facade on the Haughwout Building of 1857. His work is, however, found frequently throughout the District in the form of cast-iron storefronts and roof cornices, the earliest extant examples being on the 1852 granite store built for Seabury Brewster at 535 Broadway. Like many of the masonry facades of the 1850s and 1860s, these early iron storefronts and cornices usually have a classical feeling which mirrors the Italianate style so popular in contemporary residential architecture. The predominant characteristics of these commercial masonry buildings, whether or not they contain cast-iron elements, are round-arched windows and square-headed windows topped by a pediment or cornice slab. Balustrades also frequently appear below second-story windows, and occasionally below the more important windows on other floors. These structures, which are in most cases completely symmetrical, average five stories in height with a width of from three to six bays. The roof cornices, whether of iron or stone, are usually supported by heavy consoles or paired brackets between which frequently appear frieze moldings. The cornices are also at times topped by pediments, as exemplified by the 1854 building at 508 Broadway.

The cast-iron storefronts used in conjunction with these stately Italianate facades are nearly all composed of classic Corinthian columns between which were placed the show windows. Other cast-iron storefronts from the 1850s and 1860s, either from Badger's Architectural Iron Works or other foundries, reflect the much more ornamental character of the French Renaissance style. An identifying element found on this type of storefront is a medallion or cartouche form applied to the columns or pilasters. These are frequently combined with scrolled brackets. Corinthian capitals are found on both French and Italianate designs.

Stylized, geometric capitals were also occasionally used on early cast-iron storefronts, such as those capping the pilasters of the 1855 storefront from Badger's Architectural Iron Works at 44 Mercer Street. Such a direct, "two-dimensional" approach anticipates the predominant neo-Grec influence found on the full cast-iron facades of the 1870s, the period of greatest popularity.

The manner in which many of the cast-iron storefronts combine French and Italian elements is reflected in similar combinations on masonry facades. One of the more outstanding examples of such a building is the previously mentioned Arnold Constable store, dating from 1856 with an identical extension added in 1862. The Corinthian capitals atop the pilasters of the iron storefront, cast by the Merklee & Nichol foundry, as well as the round-arched windows of the second floor are decidedly Italianate components. This Italian influence is again seen on the marble Canal Street facade of the same building where the paired central windows on the second floor of the original section are emphasized by an underlying balustrade and a crowning pediment connecting the two windows. These Italian motifs are, however, tempered by French elements such as the segmental-arched windows on the remaining floors, the elaborate top-floor lintels on the Canal Street side and the horizontal banding on the storefront pilasters that anticipates a common element to be found on French Second Empire buildings.

The combination of classical elements was at times so free that no pre-existing stylistic term or terms can be applied directly in describing a particular building.

The most striking example of such a fabrication is the "sperm candle" style which was extremely popular in New York during the early years of the 1860s. (The name was derived from the use of two-story columns or pilasters that resemble candles made from sperm whale oil.) The only example of a pure "sperm candle" building in the Historic District is the 1860 marble structure at 502-504 Broadway, designed by the reputable firm of Kellum & Son, which originally had a cast-iron storefront from Badger's firm. This building, which will be more fully discussed in the block by block descriptions, is a transitional structure which combines highly classical elements with a non-classical emphasis on verticality and openness. These latter characteristics, which are typical of late 19th and 20th-century commercial architecture, are achieved by the use of large plate glass windows flanked by two tiers of elongated columns which span the second to third and fourth to fifth stories with narrow spandrel panels dividing the two floors of each two-story grouping. Two other contemporary buildings in the Historic District, 464 Broome and 19 Mercer, also incorporate similar two-story units, but in a much heavier and more Italianate manner.

The "sperm candle" style is important not only for its indigenous and progressive character but for the direct connection that it makes between facades that combine both cast iron and stone and those made completely of cast iron. The style was apparently first interpreted in stone, exemplified by the 1858-59 marble building, located at 388 Broadway, just outside the Historic District. In 1860 a cast-iron "sperm candle" building, designed by Kellum, was built at 55-57 White Street, also near the Historic District. The significance of these two buildings is that although they are identical in almost every detail, one was built of marble and the other is composed entirely of cast iron. This copying of a stone facade in cast iron points clearly to the original intent of most cast-iron buildings, which was to erect quickly and cheaply structures which would appear to be made of stone. It is important to note, however, that the "sperm candle" style was particularly well adapted to cast iron due to its lightness and open fenestration.

Although most "sperm candle" buildings were constructed between 1859 and 1861, there are extant marble examples dating as late as 1864. In these instances, it is intriguing to speculate whether or not the cast-iron "sperm candle" facades influenced the designers of these later buildings as much as their stone precursors had influenced the early cast-iron examples. Though not dealing specifically with the "sperm cnadle" style, Walter Knight Sturgis states on page 234 of his October, 1953 article, "Cast Iron In New York" in the Architectural Review:

> "Cast-iron forms, originally designed to imitate masonry, were, in a few years, imitated in the very same material from which they had been derived."

As previously mentioned, the earliest example of a complete cast-iron facade in the Historic District is the 1857 Haughwout Building. The next full cast-iron front in the District did not appear until 1868. Cast iron was used though for complete facades in other areas of New York City as well as in other cities during this eleven year period. This is well substantiated by listings in Daniel Badger's catalog of 1865.

Several of the cast-iron facades produced by the Badger Architectural Iron Works in the late 1850s and early to mid-1860s incorporate the same strong Italianate elements, specifically those derived from Venice, as are seen in the Haughwout Building. By 1868 when Isaac F. Duckworth and Charles Mettam each designed a full cast-iron facade, the Italianate style had, however, become so diluted that only occasional elements of their designs can be so described. Those aspects which still recall the style of the Italian Renaissance are the second-floor balustrades, the heavy pediments and the Corinthian capitals. The capitals are, however, placed atop smooth rather than fluted shafts, a characteristic as non-Italianate as the rounded corners of flat-headed windows or the rosette medallions above the capitals. These elements which are essentially French, are combined with Italianate details in a pleasing and homogeneous manner. The combination is similar to that used on earlier masonry facades, such as the one on the Arnold Constable store. The dominant Italianate influence of the 1850s was, however, gradually replaced in the late 1860s and 1870s by the inspiration of contemporary French styles. Though occasional reliance upon Italian motifs is found on cast-iron facades

of later periods,(especially in the work of Griffith Thomas),the most prevalent influence was that of the French Second Empire, the French neo-Grec and derivations therefrom.

Cast-Iron Architecture

Before discussing the period during which the use of complete cast-iron facades reached its peak, it is interesting to note some of the underlying causes of its popularity and some of the methods employed by its practitioners.

The second half of the 19th century in the United States was time of rapid physical growth and economic expansion. It was also a time of intense competition in which no one was embarassed in flaunting his newly acquired wealth. This phenomenon was manifested in the opulence of the "residential palaces" in Newport no less than in the great "commercial palaces" of New York City. In both instances, if an individual or a company did not have the money to construct a building to surpass that of a competitor, methods were devised to imitate it as closely as possible. This was the case with a vast majority of buildings fronted by cast iron. Although cast iron is a material which by its inherent qualities can be interpreted in a light, almost delicate manner, in most instances it was used to imitate structures built of granite or marble. More grandiose examples of such imitations can hardly be found than the French Second Empire designs of I. F. Duckworth. When comparing the building costs of structures erected in the Historic District during the 1870s and 1880s, there is little appreciable difference between between those with upper stories of masonry and those with full cast-iron facades. Yet, in nearly every instance, the cast-iron facades incorporate a great deal more ornament than do those of brick or stone. When faced with a limited budget, an owner far preferred an elaborate cast-iron facade reflecting the grandeur of Paris or Venice, than a simple masonry wall.

In addition to the ease of casting iron in forms that would have taken weeks to be executed by stone carvers, cast-iron architecture possesses other practical attributes which were attractive to New York businessmen. The use of paint on these building fronts not only made refurbishing simple and relatively inexpensive but also gave the owner great latitude in choosing the paint color or colors. The increased speed of construction over comparable masonry buildings, due to the prefabrication of iron units, was also a consideration.

Closely connected with the prefabricated nature of iron architectural members is the question of the role that the architect played in the design of these structures. There is no question that an architect's professional skills were utilized in planning the basic substructure of a building and in determining the general formula to be followed on its facade. Yet, it is highly questionable whether he had much of a role in the design of the individual members. It seems almost certain that in the case of buildings which are architecturally unique or which are attributed to one of the more prominent architectural firms that it was the architect himself who supplied the iron foundry with specific designs or utilized members which he had previously designed. Did the architectural designer have sole right to these designs however? This may have been the practice in some instances, evidenced by the repeated use of specific motifs by certain individual architects. But there are definite exceptions to this hypothesis. For example, a capital abacus, cast by the Cornell Iron Works, which is characteristic of the work of Henry Fernbach, was used upon occasion by other architects.

When studying the architectural styles used by the more prominent and/or more prolific architects who worked in cast iron within the Historic District, it is possible to pick out distinguishing characteristics that link the work with the individual. Little individuality is evident, however, in the work of the less prominent architects who also designed buildings with cast-iron facades. Apparently the latter were usually confined themselves to choosing stock cast-iron members that had been designed by the iron foundry or by another architect. It is, in fact, probable that even the more noted architects also resorted to the same procedure at times. It is known that Badger's Architectural Iron Works had an entire architectural department, headed by George H. Johnson(37), which was solely responsible for designing stock pieces and serving as consultant to architects ordering cast-iron facades from the firm. Although Badger was not active during the period in which cast iron reached its greatest point of popularity in the Historic District, it can be assumed that the other foundries such as Cornell,

Aetna and Jackson had similar departments.

The uniformity created by the frequent use of stock cast-iron members does not, however, diminish the effect of the facades, because the very essence of a cast-iron facade is its standardization. This disciplined regularity is seen not only in the repetition of bay units on a single structure, but also in the repetition of details from one building to another. With the exception of designs such as those by I. F. Duckworth in the French Second Empire style, the organization of cast-iron facades was based upon a strict balance between horizontals and verticals. Though the buildings are often accented by a crowning pediment, their general effect is one of non-directional uniformity. This aesthetic characteristic, though interpreted in classical forms, was as much a precursor of modern arhcitectural practice as were the prefabricated components of the facades.

As previously mentioned, Italianate elements combined with those derived from France were still utilized in several of the cast-iron facades built during the late 1860s and early 1870s. By 1872, however, motifs derived from contemporary French fashions strongly dominated the new cast-iron designs, though an occasional Italianate window balustrade was still utilized. In addition to the general influence from the French Renaissance, it was then that the grandeur of the Paris of Napoleon III began to have its greatest influence on the commercial cast-iron architecture of New York City. It is seen within the District most notably in the work of Isaac F. Duckworth, who used broken pediments, horizontally banded piers, segmental-arched windows and mansard roofs. Even though these facades were still basically organized on the same repeated bay system as were contemporary cast-iron fronts, they were frequently given focal emphasis by the use of projecting central bays, dormer windows or urns set in the break of a pediment.

The French Second Empire style as interpreted in cast iron was, however, in most instances tempered by neo-Grec ornaments. The French neo-Grec style, the single most important influence found on the full cast-iron facades of the 1870s and 1880s, was a sophistocated and stylized outgrowth of the French Second Empire style. It is characterized by incised linear ornament, stylized floral and geometric forms executed in two-dimensional relief and widely spaced relief or incised parellel lines on columns and pilasters. Light, slender columns topped by stylized Ionic capitals are also a hallmark of the neo-Grec style, though not a universal one.

In addition to the use of neo-Grec elements, such as terminal blocks and modillions, on basically Second Empire facades, these elements were also used in conjunction with derivations from other French styles. By the late 1870s, the characteristic cast-iron capital had changed from the Corinthian mode to a basically geometric form in accordance with neo-Grec principles. Such capitals, typical of the work of Henry Fernbach, are usually characterized by a smooth necking band to define the separation between the capital and column shaft. These capitals are supported by a simple abacus frequently embellished by a neo-Grec apron, under which are set widely spaced geometric or stylized floral forms. Although not strictly neo-Grec in form, these capitals are consistent with the classical principles upon which the style was based. Facades incorporating such capitals also frequently utilize other neo-Grec forms such as incised designs on the spandrel above each capital, antefixae projecting above the roof cornice and decorative terminal blocks at either end of the projecting cornices at each floor level. Such buildings characteristically follow the standard cast-iron formula of repeating throughout the facade the same bay unit. The window heads within these bays usually have rounded corners.

Cast-iron facades that rley exclusively upon neo-Grec forms are as successful aesthetically if not superior to those that combine various styles, though they are fewer in number within the Historic District. It is difficult to generalize about these designs since the architects displayed great individuality. Pure neo-Grec buildings, however, generally have a more linear overall character than those that merely incorporate a few neo-Grec motifs and possess proportions that are more delicate and elongated.

The neo-Grec, French Second Empire, French Renaissance and Italianate styles were by far the most popular choices for cast-iron facades erected in the Historic District between the 1850s and the late 1880s when the full cast-iron facade lost its popularity. An occasional stylistic exception, however, is to be found, such

as W. A. Potter's 1873 Victorian Gothic facade at 435 Broome Street or Richard Morris Hunt's "free-form classic" structure of 1873-74 at 478-482 Broadway. Hunt's now demolished building which stood next door had an elaborate Moorish front also executed in cast iron.

With the exception of the 1894-95 building at 15-17 Greene Street, the last complete cast-iron facades erected within the area were begun in the year 1890. Even though cast iron continued somewhat longer to be used for fenestration detailing and ground-floor facades, it ceased to be a major architectural material due partly to technical difficulties in applying a cast-iron facade to the taller buildings that the newly available steel skeleton construction made possible. There also arose some serious questions as to the effectiveness of cast iron as a fire resistant material which will be discussed more fully in the next section. At the same time new processes were developed for manufacturing architectural ornament in terra cotta which replaced much of the inexpensive decorative function that has made cast iron so popular. Also of importance in the demise of cast-iron architecture was the late 19th-century change in taste toward styles which were more suited to construction in brick and stone.

It is important to remember that masonry buildings, many with cast-iron ground floors, continued to be erected contemporaneously with those having full cast-iron facades. It would be repetitive to review their stylistic development, however, for they either followed the same evolution from the Italianate into neo-Grec as already discussed or their styles can only be described as simple industrial or commercial vernacular. Yet, by about 1890 new developments began to be seen in masonry buildings. They became not only strongly differentiated stylistically from the cast-iron facades but were also soon to supersede them completely.

Later Architectural Developments

The commercial buildings erected in the Historic District at the turn of the century mirror the same general trends that swept across the country. One of the two most influential styles was what can most accurately be described as Richardsonian Romanesque after the great Boston architect, Henry Hobson Richardson. He had been attracted during his studies in Europe by the straightforward way in which buildings of the 11th and 12th centuries expressed the weight of their masonry structure and the natural qualities of their materials. His work and that of his followers, characterized by the use of braod heavy arches, rough-faced stonework and restricted areas of rich decoration was freely adapted in the examples within the District. Owing to their limited sites and commercial requirements, Romanesque buildings in the District had to have simpler and more symmetrical plans than those used in free-standing residential or civic structures. Also, for economy, brick walls were more frequently used than the characteristic rough random ashlar. But despite these limitations, a bit of fanciful romanticism can at times be found in these commercial adaptations, as in the gargoyles on the 1890-91 building at 484-490 Broome Street.

The World's Columbian Exposition held in Chicago in 1893 served as a major catalyst for the resurgence of classical forms in American architecture, promoted initially by architects who had studied at the Ecole des Beaux-Arts in Paris. Although a fairly strict archaeological correctness was followed in most residential and civic buildings of the period, much freer forms had to be developed for commercial structures due to their unprecedented, unclassical height. Such buildings within the Historic District, which average ten to twelve stories, are composed, insofar as possible, in the classic, tri-partite canon. This system is composed of a base consisting of two or three stories, a shaft of another six or eight and the entablature of the top one or two stories. When such facades are only six or eight stories high, a similar tri-partite composition often contributes an imposing, monumental scale. Much use was also made of intricate terra-cotta ornamentation, which, like cast iron, combines richness of effect with the economy of multiple castings from the same mold.

By the first decade of the 20th century this type of heavily decorated classicism was largely replaced by a new emphasis on lightness and a more open fenestration. Many of these buildings, however, still retained intricate detailing as seen on the highly original 1903-04 Singer Building by Ernest Flagg at 561-563 Broadway.

Since 1910 little new construction has taken place within the Historic District, and, with only a few exceptions such as the 1920 bank at 525-527 Broadway, these buildings are of little interest architecturally. Many of the post-1910 structures are garages, lunch stands or gas stations and a number of older buildings have been either entirely refaced or had their ground stories reconstructed.

3. CAST IRON AS A BUILDING MATERIAL

In order to realize the importance of the SoHo-Cast Iron Historic District in the history of architecture and structural engineering some background is needed on the processing and structural characteristics of iron as a building material. Some knowledge is also needed of how these processes were developed and of the various ways in which iron was used in the past. It is only from this perspective that the historic importance of the District can be fully understood and an appreciation grasped of the significance of its contribution to the future development of the skyscraper and its structural techniques.

Cast Iron and Wrought Iron: Early Development and Use

Cast iron and wrought iron are the two forms of iron traditionally used in buildings. Cast iron is a refined form of pig iron whose strenghth is dependent on its carbon content. The refining of cast iron in the western world did not take place until the 12th century when furnaces were developed that could generate temperatures high enough to melt the metal into a liquid state suitable for casting.(38)

Wrought iron was developed as early as the 5th century B.C. by the Greeks.(39) In the Middle Ages it was used for cramps, stays, tie rods, in window frames, and for the spires and pinnacles of Gothic cathedrals. The use of wrought-iron tie rods and beams became common in Renaissance and Baroque buildings.(40) To form the iron, one merely had to heat it to a pliable state, and then the impurities could be hammered out. While the process was very primitive in its beginnings, 19th-century research led to some very complicated refining processes for wrought iron. This was probably one reason for the greater popularity of cast iron during this period. Cast iron merely had to be melted to rid it of impurities and then cast. Moreover, repetitive forms could be cast in large quantities. Wrought iron, on the other hand, had to go through several hammering and rolling processes to rid it of impurities and to form it into the desired shapes, and each piece had to be fashioned individually.

Prior to 1750 cast iron was used chiefly for such items as tools (anvils and mortars), cooking utensils, firebacks and andirons, grave slabs, cannon and other implements of war.(41) Abraham Darby of England began experimenting with the production of cast iron about this time: by using coke, and later coal, instead of charcoal, he was able to turn out the product more cheaply and efficiently. With Darby's discovery, several English engineers began to use cast iron for structural purposes, most notably bridge building. The first cast-iron bridge, spanning the Severn River was manufactured at Darby's Coalbrookdale iron works between 1775 and 1779.(42) Another significant bridge was designed by Thomas Paine, the American Revolutionary War figure of "Common Sense" fame, and built in England under the direction of Rowland Burton across the River Wear at Sunderland between 1793-96. It was a single arch with a 263-foot span: the ribs forming the arch were of cast-iron panels. The technique was that of stone vaulting adapted to iron construction.(43)

Cast iron was also used during this period for decorative features. Although cast iron had been used for this purpose as early as the 1720s, it was the high quality of the designs produced in the 1760s by the brothers John, James and Robert Adam, the noted British architects, and cast by such British foundries as the Carron Co. that brought their popular acceptance.(44)

According to Carl Condit, the British engineer, John Smeaton, was the first to use cast iron for structural columns in 1770-72 in St. Anne's Church at Liverpool.(45 In Paris J. G. Soufflot used cast iron to frame a roof in 1779, and M. Ango used it to carry a floor in 1782.(46)

However, the development of iron framing in English spinning and textile mills in the late 18th century was one of the most significant events in the history of cast iron. To quote Turpin Bannister: "From them (the mills) stemmed directly a novel structural technique that dominated British and American building for a century and which through ingenious improvements conquered at last the hazards of combustibility and limitations of height." (47)

William Strutt of Derby, England was the builder of the first completely iron-framed building in 1792· his Calico Mill was 115 feet long and six stories high. The floors were laid on brick arches, supported by cast-iron beams, and paved with brick. A similar flax mill, possibly designed by Charles Bage, was built in 1796 at Shrewsbury. Probably the main reason for using this type of construction was to minimize the danger from fire which was always a hazard in the textile industry. (Many of the commercial buildings in the SoHo-Cast Iron Historic District were devoted to the dry goods trade, and one of the arguments for adopting cast iron for those structures was its noncombustibility.)

Although the cast-iron frame of mill buildings had important implications, the framing itself was partly hidden.(48) The cast-iron framing technique was visually much more striking in the realm of greenhouse architecture. As early as 1805 Humphrey Repton had designed a cast-iron greenhouse in the 'Gothic style.'(49) John Nash designed a conservatory formed of cast-iron trellised pilasters and glass for the Prince Regent at Royal Lodge, Windsor in 1814.(50) Nash was also renowned for his use of cast iron in the Royal Pavilion at Brighton built in 1818.(51) The cupola was built over an iron framework, and intricately designed iron columns were used for interior supports. Joseph Paxton, who was head gardener to the Duke of Devonshire, designed the Great Conservatory at Chatsworth in 1837, followed by the Lily House at Chatsworth (in which cast-iron columns were used as rainwater pipes as well as for structural purposes.) (52) Paxton's outstanding achievement was the design for the Crystal Palace, built to house the London Great Exhibition in 1851. This structure excited the imagination of virtually every notable contemporary critic.

The French used iron and glass in similar ways during the same period. Among the notable structures were the Galerie d'Orleans of the Palais Royal in Paris designed by P.-F.-L. Fontaine in 1829-31 and the greenhouses of the Paris botanical gardens created by Charles Rohault de Fleury in 1833.(53)

Another building form peculiar to the 19th century in its use of iron and glass was the train shed-- concealed, however, behind a traditional classical masonry waiting room and station. Built between the 1830s and 1860s, these sheds were as unique and expressive in their forms as the contemporary greenhouses and conservatories. To contemporary eyes, however, they seemed to be merely works of engineering, and not at all worthy of the name of 'Architecture.'

Another interesting use for cast iron, especially in England, was in the realm of church construction. As early as 1813, iron was used for the complete internal structures and interiors in three Liverpool churches designed by James Rickman and ironmaster John Cragg.(54) It was also favored for molded decoration, especially for Gothic tracery.

Structural Techniques

It was the research of the Englishmen William Fairbairn and Eaton Hodgkinson from the 1830s through the 1850s, that showed to which purpose the two types of iron were best suited.(55) Cast iron, which has a high compressive strength, they found best suited for columns while wrought iron, which is high in tensile strength, is best suited for beams, the members subject to the most tension. Fairbairn and Hodgkinson were also responsible for publicizing the I-beam: James Bogardus of New York probably learned of it through their publications.

When pieces were cast in iron the designer would make full size drawings of the principal parts from which patterns would be made. Molds were made in sand and the pieces cast in these sand molds. The castings would then be cleaned, chipped and filed, and the ends of a column would be cut smooth in a "double-ended" rotary facing machine. Columns would be bolted together in the fitting shop, and arches, soffits, sills and ornaments would be added. All surfaces would then be given a coating of oxide of iron paint. The parts would then be separated and numbered for re-assembly on the building site.(56)

The actual assembly of a cast-iron building will be described in some detail in the description of several of Bogardus's structures. Such a building as the A. T. Stewart (later Wanamaker) Department Store, designed by John Kellum between 1859 and 1868, was the exception rather than the rule among the buildings within the District. It combined a complete iron frame with wooden floors and joists

its floor, roof and wall loads were transmitted vertically through the cast-iron columns directly to the stone footing.(57)

It appears from the examination of a number of buildings within the District that whether its facade is of cast iron, brick, or stone, the basic structure varied little, especially for buildings erected in the 1860s and 1870s. The building is almost invariably built between bearing party walls of brick. If the front facade was of brick or stone, it would usually have been supported by a cast-iron storefront which permitted larger show windows than would be possible with masonry piers. When there was a complete cast-iron facade it would act as an independent curtain wall and would have little relation to the construction behind it. This is illustrated by the facades of the Laing stores -- except for the Murray Street side of the corner store -- as will be discussed below.

While it is difficult to generalize about the interiors, the following points apply to many of the District buildings from the 1860s through the 1880s. Because these structures were used for warehouses and as lofts, it was desirable to have as much open interior space as possible. The use of interior cast-iron columns to support the floor beams and joists provided the open space that was desired. The columns would be bolted together from floor to floor. The floor joists, often made of wood, but sometimes of wrought iron, would be supported at their outer ends by the brick bearing walls and in the center of the building by girders which would carry the floor loads to a central row of iron columns. If the building was narrow the beams might span its entire width without the need for a center line of column supports. The length of the floor joists might vary from 12 to 25 feet depending on the load they were intended to bear and the material of which they were made. If the required span was greater than about 25 feet, girders had to be used to carry the load of the floor beams to the interior columns. Into the 1870s it was common practice to use wooden girders. Wrought-iron girders only came into widespread use in the next decade. If the girders were of wood, the floor beams would also be of wood, but wrought-iron girders did, on occasion, carry wooden floor beams. If the beams were of wrought iron the spaces between them might be spanned by shallow brick arches with a wooden floor laid on cement fill above them. This added to the fire resistance of the structure as did cross walls of brick -- whether load bearing or not.

Cast-Iron Developments in the United States

In the United States the use of iron in buildings dates from early in the 19th century. In Philadelphia's United States Bank (1818-24) the architect, William Strickland, inserted wrought-iron rods as tie members into the arched openings at the ends of the transverse barrel vault which spanned the banking room.(58) Another Philadelphia building, Strickland's Chestnut Street Theatre of 1820-22, was the first in the United States to use cast-iron interior columns.(59)

When Robert Mill designed the Public Record Office at Charleston, South Carolina, in 1822-23, he aimed to produce the most durable and incombustible structure possible.(60) He made the basement, cornices, stairs, and porticoes of stone, the walls and interior vaults of brick, the roof of wood and copper, and the sash, frames and shutters of iron. (The building withstood both the earthquake and fire of 1886.)

The U.S. Naval Asylum (1826-33) in Philadelphia, had its exterior galleries and roof supported by hollow cast-iron columns, and wrought-iron railings adorned its balconies.(61)

The Miners' Bank at Pottsville, Pennsylvania (1829-30), designed by John Haviland, had a two-story facade made of pieces of iron cast at the foundry and assembled on the site. The iron plates imitated stone. It is not known if the facade acted as a bearing wall.(62)

The Bond Building on Merchants' Row in Boston of about 1830 used iron structural elements. Also about this time, Cyrus Alger, a Bostonian, conceived of a project for a cast-iron dwelling; this idea later influenced Daniel Badger.(63)

The John Travers Library in Paterson, N.J. of 1846 was the first building in the United States in which interior cast-iron beams rested on the brick walls which

carried the floor and roof loads to the foundations.(64)

The New York Crystal Palace of 1853 and Thomas U. Walter's U.S. Capitol Dome of 1855-65 were the two most dramatic uses of cast iron in the United States. While the Crystal Palace burned in 1858, the future of the Capitol Dome appears to be more safely assured.

Cast Iron in New York City

According to the History of Architecture and the Building Trades of Greater New York (1899), the first use of iron in buildings in New York followed the War of 1812,(65) but it was mainly for decorative purposes -- balconies, railings, fences, sashes, door and window frames, roofs and doors.

In 1835 Jordan L. Mott built a foundry on Water Street for the manufacture of iron storefronts, and in 1836 he took out a patent for casting hollow iron columns.(66) The Lyceum of Natural History, built in 1835 on Broadway between Prince and Spring Streets from designs by Alexander Jackson Davis, used iron columns on the first floor instead of massive masonry piers, and thus obtained larger display windows.(67) The U.S. Custom House of 1840, now known as Federal Hall, and still standing on Wall Street at the head of Broad, used no wood in its construction. Iron was used for such elements as the stairs, railings, doors, window frames, etc. The other parts of the building were of marble, and brick arches were used to support the floor and roof loads.(68)

James L. Jackson established an iron foundry in 1840 at 201 Centre St.,later known as the Jackson Architectural Iron Works.(69) Apparently he began manufacturing iron shutters, grates and fenders but soon added the manufacture of columns, lintels, beams and girders which were cast on special order from "housesmiths".(70) Later Jackson added his own smith-shops for parts of his own design. The John B. and William Cornell foundry was established in 1847 at 141 Centre.

About 1847 awning posts of cast iron were erected in the front of many stores.(71) The author of the History of Architecture...of New York (1899) conjectures that this suggested the use of cast-iron columns and pilasters for storefronts. Such an explanation may seem simplistic today, but is nonetheless possibly true.

In the New York Music Hall of 1850 "at Broadway and Mercer" iron columns supported the balconies, and iron was used for the beams.(72) The main section of the Astor Library, 425 Lafayette, built between 1849 and 1853 by Andrew Saelzer, used cast-iron columns for internal supports.(73)

The Work of Daniel Badger and James Bogardus

It was Daniel Badger and James Bogardus, however, who developed some of the most inventive uses of cast iron and also popularized it as an architectural and structural medium.

Daniel Badger began his career in Boston in 1829.(74) His store building of 1842 on Washington Street had cast-iron columns and lintels on the first floor, and he later claimed that this was the first iron storefront. In 1843 he bought Arthur L. Johnson's patent for rolling iron shutters. He moved to New York in 1846 and set up a foundry for the manufacture of iron shutters. He later located his foundry on the block bounded by 13th and 14th Streets, Avenue B and Avenue C. His offices were 42 Duane Street. His first full iron facade was completed in 1853.(75) Badger's business increased at a tremendous pace, not only in New York City, but across the country and around the world, as can readily be seen by examining the listings in his 1865 catalog. Badger himself did not design the components, but several prominent New York City architects designed parts which were cast by his firm. Some of these designs may have been made to special order and were not necessarily carried among the firm's stockpieces. George H. Johnson was Badger's chief architect for a number of years, and his designs were were made specifically for the firm. Although Badger's Architectural Iron Works continued in business until the 1870s, the majority of the ironwork we have been able to attribute to his firm, at least within the District, dates from the 1850s and 60s,

prior to the publication of his 1865 catalog.

James Bogardus, born in 1800, was a prolific inventor and lecturer on technical subjects.(76) Between 1836 and 1840 he made a trip to Europe to study iron construction; he was also impressed by classical forms of architecture, especially those of Italy. These were the forms he adopted in his own designs. He established his New York foundry in 1848 at Duane and Centre Streets to cast columns and beams. His factory was the basis for his patent of 1850 for an all-iron building. It was disassembled in 1859 when Duane Street was widened. It is not certain that his factory was actually all iron, but his theories of iron construction were set forth in the drawings for his patent. While Badger may be credited for popularizing the use of cast iron for facades, Bogardus advanced the use of iron for structural supporting systems, although it is not clear now just how widely his methods were adopted.

Bogardus' factory was assembled on a stone base supporting cast-iron sills. Hollow cylindrical columns were bolted to the sills through the column flanges at the sill joints. Channel-shaped spandrel girders were bolted to the top flanges of the columns. Another set of sills, columns and spandrels was added for each succeeding story. The outer members of the iron frame took the place of a bearing wall. The floors, according to Carl Condit,(77) were carried on wooden beams. In his patent drawings of 1850 Bogardus proposed a floor and roof construction of cast-iron plates with tongue-and-groove joints, floor girders shaped as shallow segmental arches supplemented by wrought-iron tension rods, and floor and roof beams of I-section. Bogardus can thus be credited with introducing the I-beam to the United States. (Incidentally the iron for his first fronts was cast at the Jackson foundry.)

It is interesting to compare the designs for Bogardus' factory, long since demolished, with those for the Edgar Laing stores of 1849 at the northwest corner of Washington and Murray Streets.(78) The building containing five stores divided by brick party walls was built on a trapezoidal site and was constructed with two four-story cast-iron facades consisting of piers with engaged Doric columns, beams, and recessed panel wall units below each window. All these iron components were bolted together. The other parts of the building were constructed in the traditional manner with brick bearing walls supporting wooden floor joists, but along the Murray Street side of 258 Washington Street, the cast-iron front actually carried a part of the floor load. The wooden floor joists were inserted into the channel-shaped iron beams. The wooden roof joists rested on the bottom ledge of the cornice frieze and were further stabilized by means of iron straps attached to the lip of the frieze. (The other sections of the cast iron facade were braced by being simply strapped to the wooden floor joists which were supported by the brick bearing walls.) This actual proof of Bogardus' early use of a cast iron facade for load bearing purposes was not fully confirmed until 1971 when Professor Winston Weisman, under arrangements made by the Landmarks Preservation Commission, supervised the disassembly of this historic structure which is currently planned for re-erection near its original site as part of Manhattan Community College's new Washington Market Campus. Since the Laing Store facades are unquestionably the oldest examples to have survived in the United States, the full documenting of the assembly system and their re-erection on a college campus is of great value to the history of American architecture and technology.

During the same period of disassembly many details of the self-supporting cast-iron screen wall were fully clarified. The frame rested on sills cast in sections and then laid on a stone foundation. The columns stood on the sill joints and were bolted to the sills. Another set of sills or spandrels were bolted to the tops of the columns to raise the building up to the next story. Ornamental castings were used as coverings for the junctions of the cast-iron beams over the columns. The facade was painted with tan-colored paint mixed with sand to give it the texture of stone.

The Harper and Brothers Building of 1854 was Bogardus' first really large commercial building.(79) John B. Corlies, the architect, used Bogardus' system of cast-and wrought-iron framing and applied all the then known precautions against fire. However, even here the construction methods were not as advanced as those advocated by Bogardus in his 1850 patent. The building used a cast-iron facade and masonry bearing walls with brick interior partitions. Interior cast-iron columns supported exposed cast-and wrought-iron girders, across which were placed

partly concealed wrought-iron ceiling beams. Brick arches were constructed between the beams above the girders and leveled with cement to provide a flat surface; a pine floor was laid over this. The girders were of the "bow-string" type, similar to a truss, in which a wrought-iron tie rod resisted the tensile stresses while an arched cast-iron body was under compression. The girders also brought concentrated loads to the supporting interior columns which thus shared the floor loads with the bearing walls. Another important structural innovation was the transmission of floor loads to the girders by means of 7-inch wrought-iron ceiling beams, similar to railroad beams, and developed specifically by Peter Cooper's mills in Trenton, N. J. for wide-bayed iron framing. The first shipment was diverted by the government for use in the U. S. Assay Office in 1854. This building was demolished in 1915, and only the handsome stone facade was saved for re-erection on the face of the American Wing of the Metropolitan Museum of Art. Cooper's beams were then used in the Harper Building, also long since demolished. The third application was in the Cooper Union Foundation Building in 1855, where they may still be seen.

The Virtues and Defects of Cast Iron

Fire was an ever present danger and a constant fear in 19th-century urban life. Lower Manhattan had suffered disastrous fires both in 1835 and 1845; hence there was a great demand for fire resistant buildings. In the Historic District, which was the center of the drygoods trade, protection against fire was of special urgency.

Fireproofing was an inexact science at best through much of the 19th century. The New York City building codes reflected this state of affairs. Previous to the creation of the Department of Buildings in 1860, fire limits established the areas in which frame buildings could not be built. In 1860 this applied to all areas of Manhattan below 52nd Street. In 1871 limitations were placed on the width of "non-fireproof" buildings, but none on their height. Height limitations were not set until 1885.(80)

One of the great claims made for cast iron as a building material was its ability to withstand fire. Badger and Bogardus were both ready to make this assertion. Bogardus' pamphlet states: "Cast-iron houses are perfectly fire-proof...for, it is well known, not only a high and intense heat, but the use of a blast, is required to reduce iron to a molten state and never yet, in any conflagration, has it been found melted, except in pieces of minute dimensions, and in such situation that the current of the flames created around them an artificial blast."(81)

Just how fireproof unprotected iron structural members are remains somewhat of a problem. The controversy was strong throughout the period when most cast-iron buildings in New York City were constructed. However, it must be remembered that despite brick bearing or party walls, and iron facades, the interiors of these buildings were largely of wood. Popular opinion held (and still holds) that the great fires in Chicago of 1871 and in Boston of 1872 proved the instability of cast iron in a conflagration. The material fell into theoretical disfavor for buildings after that time. On the other hand, in New York the great majority of cast-iron facades within the Historic District were built in the 1870s. (Previous to that decade cast iron had been used largely for storefronts and facade decoration.) The only conclusion that can be drawn from this is that New York architects and builders felt that the aesthetic effects obtained by using cast iron outweighed the dangers of fire.

The 20th century has provided some evidence of the stability of iron structures in some interesting ways. When the A. T. Stewart (Wanamaker) store burned in 1956, the iron frame remained completely intact; only the wooden flooring and joists were destroyed. In England during the World War II bombings, cast-iron structural elements were exposed for the first time since the erection of the buildings. Gloag states: "...when buildings were demolished by fire it was amazing to see the cast iron skeleton still standing when the steel joists of later adjoinging buildings were bent and distorted. (82) These experiences seem somewhat to weaken earlier arguments comparing the use of unprotected cast iron to unprotected steel. Yet it is known, on the other hand, that both materials will buckle at relatively low temperatures and that hot cast iron has the further disadvantage of cracking when exposed to the shock of cold water so that the very effort of trying to put out a fire adds an additional hazard.

So perhaps it is best to conclude that while cast iron does not function as an absolutely fire-resistant medium, particularly in its inability to confine a fire within a small area, yet, if the iron is well cast and placed in a well-constructed building, the cast-iron structure itself is apt to remain stable.

It was gradually learned in the 19th century that a brick encasement of iron structural members provided one of the best forms of fire protection. This is, of course, the method that was used in the English textile mills built just prior to the beginning of the 19th century. It is unfortunate that this method was not more widely followed. Since it was both costly and extremely heavy in terms of building weight, most builders turned to the cheaper, quicker, and lighter methods of using unprotected iron beams in combination with wood. The development of hollow-clay tile brought both an inexpensive and light method of fireproofing. The first use in this country of hollow-clay tile for protection of floor beams appears to have been in 1855 in the Cooper Union Foundation Building.(83) However it took another fifteen or more years before a really practicable and inexpensive hollow-clay tile method was developed. Gradually it came into widespread use in the late 1870s.

Of course, the proponents of cast iron extolled it for other advantages besides its fire resistance. Those that Daniel Badger cites in the introduction to his catalog are: "strength, lightness of structure, facility of erection, architectural beauty, economy and cheapness, durability, and renovation." While the claims of strength, lightness and durability seem to have generally been substantiated with time, many critics of cast iron have also attacked it for what they claim to be its lack of these very qualities. In response, it must be remembered that iron was often cast without specifications, foundry control, or expert metallurgical knowledge; moreover it was often used in ways that were illsuited to its physical properties.

A cast-iron structure was easy and quick to erect in comparison with a masonry building, and it was also cheaper. (A cast-iron building could also be easily dismantled and re-erected elsewhere.) Essentially the pieces were an early form of prefabrication; they were cast in multiple units which could be readily combined and assembled in numerous ways. Naturally this was much cheaper than carving each piece individually in stone. If a client ordered a cast-iron building from a foundry, he might also be able to do without the services of an architect, and simply engage a builder to do the work. Certainly this was the case when British foundries shipped cast-iron houses and other buildings around the world. However, when one examines the Building Department records for iron and stone buildings of approximately the same size and from the same period, a contradiction seems to arise. The average construction period for both building types appears to have been about eight to nine months (although some cast-iron buildings were put up in four or five months), and the costs are often very similar. This apparent paradox becomes more understandable when it is realized that the construction of each of the two building types was almost identical except for the facade.

"Ease of renovation" was another reason for the popularity of cast-iron structures. All that needed to be done to give a building a new appearance was to apply a new coat of paint. Moreover, if an iron piece were warped or broken, it could easily be replaced by another stock piece or by recasting the faulty piece from the original mold.

Yet despite these various advantages, the cast-iron facade was rarely used in the Historic District after the late 1880s. There appear to be several reasons for its demise. The change in stylistic taste has already been discussed. The other reasons were of a more practical nature. The problems of fireproofing became of increasing concern as the economic pressure for buildings of even greater size and height increased. By the 1890s the City building codes were regulating building size as a necessary precaution against fire.(84) Developments of better methods of fireproofing with hollow-clay tile and the new availability of rolled steel sections with their high tensile strength made possible these larger buildings. With the obvious advantages of such alternatives at hand, architects and builders would have been foolish to continue to use unprotected cast-iron facades for these larger buildings.

There is an ironic twist to the thoroughness of the reaction against cast iron as a building material. For the next half century, the steel skeleton frame of all New York City's skyscrapers continued to carry, floor by floor, the heavy

weight of masonry enclosing walls. It was not until after the end of World War II that it was realized that this masonry only served the function of keeping out the weather as well as keeping out the light! Furthermore it had to be laboriously laid up brick by brick, tile by tile, or stone by stone, just as in the Middle Ages, even though it was now being supported hundreds of feet in the air by a steel shelf at every story. With the commercial availability of large sheets of glass as well as the development of light, non-ferrous metals (which did not require maintenance by painting) as well as of new, light forms of heat and fire insulation which could be sprayed on or applied in the form of panels - the idea of the curtain wall was born. Or, rather, it was re-born. For Bogardus had forseen, a hundred years before, all the advantages of quickly erected, light, standardized, pre-fabricated panels as an effective and economical method of screening commercial buildings from the weather. He lacked modern materials, tools and techniques, but he had the essential ideas.

In the opinion of 20th-century critics cast iron has played a most important role in the development of the modern skyscraper. The development of the cast-iron facade led to a system of standardization for building units; advocates of cast iron saw this as a virtue because it led to speed and economy of erection. Prefabricated unit standardization has become an essential factor in today's construction methods; individual handwork has beome prohibitive in cost even in the rare cases when it is possible to obtain it.

It was the development of a system of iron framing,however, that had the greatest significance for modern architecture. The skyscraper has become a fact of modern city life because of the high cost of land and the desirability of close proximity within the central city.

Iron-framing techniques, later translated into steel, made possible the construction of tall buildings that were strong yet light, and did not waste valuable rentable areas by filling them with bulky masonry bearing walls and piers. Floor, roof, and wind loads are now generally carried by the steel skeleton, freeing the partitions and exterior walls from any bearing function.

By the 1890s and early 1900s true skyscrapers, ten or more stories high, were being built within the SoHo-Cast Iron District, and, though they literally can look down on the five-and six-story cast-iron structures around them, they are actually the direct descendants of their modest neighbors.

4. CAST IRON AND ARCHITECTURE

The question of "architectural beauty" as well as the larger question of cast-iron structures as "Architecture" is one of the most interesting to be considered.

It will be recalled that cast iron was used first for structural purposes and that no matter what "style" it assumed, the structure was evaluated merely as a work of engineering. However, the implications of cast iron for architectural form were not lost on 19th-century critics. A dominant them in 19th-century architectural thought in Britain, France and the United States was the need to develop a new architectural style appropriate to the new industrial age; what could be better suited to this new style than the new material of the age, cast iron?

One interesting early treatise on this theme was William Vose Pickett's A New System of Architecture (1845). He advocated new forms of architecture based on the use of new materials -- metals and especially iron: "...why should we not avail ourselves of the distinctive properties it possesses for the production of a new and peculiar species of beauty in systematic architectural effect." Pickett advocated a new system of design based on the curve as in nature, not the straight line. Moreover iron should not be used in such a way as to disguise its qualities and be made to appear solid when it was hollow: "'An entire independence' of the several members, parts, or features of pre-existent architecture must at all times be maintained."

Pickett was also ready to describe just how buildings should be built in accordance with his principles: wrought iron was to be fashioned into tie bars and covered with iron plates; prominent or decorative constituents were to be cast in separate molds. The coatings on the iron plates (which he advocated electroplating with copper, zinc and barium) should be in contrasting colors.

Pickett concluded by stating that iron architecture answered the requirements of both beauty and utility and cited those frequently mentioned virtues of cast iron -- fire resistance, economy, repetition of forms, ease of rearrangement of the parts and cleanliness.

Pickett's book is mentioned in the introduction to Badger's 1865 catalog, and his theories seem to have influenced Badger. However, it is interesting to note that Badger's architectural designs bear no resemblance to those advocated by Pickett. The author of the introduction explains: "The allusion to this work of Mr. Pickett (sic) is made not for the purpose of elucidating the principles of Architecture laid down by him, for his ideas would be deemed crude at the present time,..." Instead Badger "relied on the Venetian Renaissance for the basis of form and ornament,since it provided the most architectural expression for the basic functional pattern of columns, spandrels and windows" (to quote Carl Condit.) (85) Bogardus also used Italian forms for his designs. Their aim was not to develop a new system of architectural design; they frankly imitated forms in stone and had no thought of developing new forms for use with iron. Their ideal held that anything that could be done in stone could be done just as well and more cheaply in iron.

As has been earlier discussed, Badger and Bogardus were the two main creators of designs whose forms adhered closely to those of the Venetian Renaissance. There are fascinating structural, economic and functional parallels that made this adherance particularly appropriate.

Most of the later designers in cast iron were much freer in their adaptation of French and Italian Renaissance forms to this medium. But in all these cases, works in iron were considered to be "Architecture" only if they imitated forms that had evolved for stone buildings. By a curious aesthetic twist, a few examples will be found in the detailed discussion that follows, of stone-fronted buildings in the District that actually imitate cast iron !

The London Crystal Palace of 1851 was the first major non-traditional work done in iron which excited the acclaim of the critics as a work of "Architecture," and even they were not completely certain about this. James Fergusson writing in his History of the Modern Styles of Architecture in 1862 about "ferro-vitreous art" claimed that a new style of architecture was inaugurared with the "Exhibi-

tion":"As re-erected at Syndenham, the building has far greater claims to rank among the important architectural objects of the world." Nonetheless, "It has not a sufficient amount of decoration about its parts to take it entirely as an object of Fine Art ... it wants solidity, and that appearance of permanence and durability indispensable to make it really architectural in the strict meaning of the word."(86) Fergusson felt that the way to remedy this situation was to introduce a third material; he advocated the judicious use of colored brick and terra cotta.

But not all critics were so hesistant in their approval of cast iron as a building form. In 1854, New York City held a design competition for a new city hall. In an editorial on September 6 of that year, the New York Times advocated the use of iron to build a new city hall citing such factors as cost and time; moreover the writers saw iron as a proper expression of the age. Using iron for the city hall would furnish the opportunity for the development of a distinctive national system of architecture.

As will be discussed below in the block by block descriptions, Richard Morris Hunt produced two distinctive cast-iron facades at 476 and 478-482 Broadway that employed non-traditional and ron-imitative forms. The non-imitative forms. The noted 19th-century American architectural critic, Montgomery Schuyler, in writing about them stated: (87) "The 'iron age' in commercial building produced nothing better than these two fronts and very few things so good. But, like the other comparative successes they indicated that the problem was not really soluble. It is a matter of congratulation upon architectural grounds that at about the time when these fronts were done, experimentation in iron fronts should have been brought to an end by the demonstration of the fires of Chicago and Boston that fronts of unprotected iron-work were not practically trustworthy, and architects were thus released from the attempt to solve the insoluble."

The author of the History of Architecture ... of New York (1899) in writing about the development of the cast-iron building, expresses his doubts about the form: (88) "It was a puzzle to those students of architecture who saw the hopelessness of looking to the cast-iron building for any architectural development -- a puzzle why these fronts were so common."

Those architects who imitated Venetian Renaissance forms in cast iron found a structural form that was appropriate in lightness and openness. Later architects, such as Henry Fernbach, who adapted neo-Grec forms to cast iron, were also able to use the material in a less traditional way to create light and open structures.

It is interesting to note in passing that when iron was used in non-traditional forms its uniqueness was sometimes emphasized by the use of color. For practical reasons iron had to be painted as a protection against rust. But such vivid colors (red, yellow, and blue) as those used on the Crystal Palace, for example, expressed more than a mere need for protection of structural members. Hunt's non-traditional buildings on Broadway were painted "in at least half a dozen tints." The Paris Eiffel Tower of 1887-89 was a great work in cast and wrought iron and also painted in several different colors. It is also possible to argue that this use of color on metal was less an attempt to express the special qualities of the material than merely another reflection of 19th-century fondness for polychromy, as witnessed by numerous examples in the Victorian Gothic and "Queen Anne" styles.

Many serious observers of their contemporary architecture were deeply disturbed by the conflict between the old traditions and the new technologies. Professor Donaldson is quoted by Sir John Summerson (89) as asking the young men at the 1847 opening of the Architectural Association: "The great question is, are we to have an architecture of our period, a distinct, individual, palpable style of the 19th century?"

We see that the 19th-century view of cast-iron architecture was a contradictory one. For some it was valid only if it was a direct imitation of traditional forms in stone. Others thought that the possibilities inherent in cast iron seemed to point a way towards the development of an architecture appropriate to the age; still others felt it was only partially successful, and sometimes not even that. It is only from the distance of the 20th century that we can recognize that cast-iron architecture developed forms that were significant for their structural innovations and unique in their aesthetic expressions.

FOOTNOTES

1. I. N. Phelps Stokes, Iconography of Manhattan Island, VI (New York: Robert H. Dodd, 1915), 70-76, 100.

2. Stokes, IV, 101.

3. Stokes, VI, 100.

4. Stokes, IV, 230.

5. "Census of 1855," (available: Hall of Records, Surrogate Court Building).
Street Directories - City of New York (available: New York Public Library).

6. Stokes, VI, 72.

7. Appletons' Cyclopaedia of American Biography, III (New York: D. Appleton & Co., 1888), 188.

8. Appletons', I, 198.

Appletons', III, 681-682.

Dictionary of American Biography [henceforth cited as DAB], I, Part 2 (New York: Charles Scribner's Sons, 1964), 68.

DAB, VI, Part 1, 156-157.

Stokes, IV, 348-372.

9. "Conveyance Records," Introductions and Block Histories (available: Hall of Records, Surrogate Court Building).

10. Stokes, III, 560, 947, 965-966.

John A. Kouwenhoven, The Columbia Historical Portrait of New York (New York: Doubleday & Company, Inc., 1953), pp. 94-95.

11. Stokes, III, 995

12. Stokes, IV, pl. 84B-b

Stokes, I, 323.

13. "Conveyance Records," Introductions and Block Histories for property within the Nicholas Bayard West Farm.

14. Stokes, III, 560.

"Conveyance Records", Block 231, Lot 2.

Henry Wysham Lanier, A Century of Banking in New York, The Farmers' Loan and Trust Company Edition (New York: The Gilliss Press, 1922), p. 95.

Walter Barrett, The Old Merchants of New York City (New York: Carleton Publisher, 1870), pp. 132-136.

15. Minutes of the Common Council of the City of New York, 1784-1831, III (New York: City of New York, 1917) 658.

16. Because the controversy over the Collect Pond and Canal Street was carried on for many years, it is beyond the scope of this introduction to give a full listing of sources. For detailed information, one should consult the indices for Stokes' volumes and the Minutes of the Common Council. There is an

FOOTNOTES (Cont'd)

artist's rendering of the proposed canal and a brief history of the area in:

D. T. Valentine, Manual of the Corporation of the City of New York (New York: City of New York, 1860), pp. 562-567.

17. Valentine, 1865, pp. 608-636.

18. Valentine, 1861, pp. 629-636.

19. Stokes, V, 1769-1770.

20. Valentine, 1868, p. 216.

21. "Tax Assessments," 1825, (available: Municiple Archives).

22. Valentine, 1865, pp. 635-636.

"Tax Assessments," 1850s.

"Conveyance Records," 1850s.

23. Directory to the Seraglios in N.Y., Phila., Boston & All the Principal Cities in the Union. Edited and Compiled by a "FREE LOVE YER" (New York, Printed and Published for the Trade, 1859).
(available: New York Historical Society)

24. Perris Insurance Map, 1857, (available: New York Public Library).

Dripps Map, 1852, (available: NYPL).

"Census of 1855."

Street Directories 1850s.

25. Valentine, 1868, p. 216.

26. "Tax Assessments," 1860s.

A History of Real Estate, Building and Architecture in New York City [henceforth cited as History of Real Estate], (New York: The Real Estate Record Association, 1898. Reprinted by Arno Press, 1967), pp. 45-129.

27. Ibid., p. 125

28. Moses King, King's Handbook of New York City (Boston: Moses King, 1892), p. 824.

29. DAB, II, Part 2, 55-56.

30. King, p. 814.

31. Ibid., p. 830

32. Ibid., p. 906

33. Ibid., p. 819.

34. Ibid., p. 335

35. Chester Rapkin, The South Houston Industrial Area (New York: Prepared for the City of New York, City Planning Commission, Department of City Plannin 1963), pp. 8-62.

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36. Turpin C. Bannister, "Bogardus Revisited: Part I, The Iron Fronts," Journal of the Society of Architectural Historians, [henceforth cited as Bannister, SAH, XV], XV(December 1956), 12.

37. Ibid., p. 17.

38. "Cast Iron , Encyclopedia Britannica, 1968.

39. Carl W. Condit, American Building Art: The Nineteenth Century [henceforth cited as Condit, Nineteenth Century] (New York: Oxford University Press, 1960), p. 25.

40. Ibid.

41. John Gloag and Derek Bridgwater, A History of Cast Iron in Architecture (London: W. S. Crowell Ltd., 1948), p. 53.

42. Siegfried Gideon, Space, Time and Architecture, 5th edition (Cambridge, Mass.: Harvard University Press, 1967), pp. 169-170.

Gloag and Bridgwater, pp. 82-83.

43. Gideon, p. 173.

44. Gloag and Bridgwater, p. 70.

45. Condit, Nineteenth Century, p. 25.

46. Henry-Russell Hitchcock, Architecture: Nineteenth and Twentieth Centuries, 3rd edition (Baltimore: Penguin Books, 1969), p. 171.

47. Turpin C. Bannister, "The First Iron-Framed Building," Architectural Review, [henceforth cited as Bannister, AR], CVII (April 1950), 231.

48. The columns were not hidden nor were the bottom flanges of the beams between the brick arches.

49. Gloag and Bridgwater, p. 200.

50. Ibid.

51. Ibid., p. 120.

Hitchcock, p. 144, p. 172.

52. Gloag and Bridgwater, p. 200.

Hitchcock, p. 177.

53. Ibid., p. 176, p. 177.

54. Bannister, AR, p. 246.

55. Gloag and Bridgwater, p. 192, p. 194.

See also: William Fairbairn, Iron, its History, Properties and Processes of Manufacture (Edinburgh, 1965).

56. Alan Burnham, "Last Look at a Structural Landmark (Wanamaker Store)," Architectural Record, CXX (September 1956), 278.

57. Ibid., p. 274.

58. Condit, Nineteenth Century, p. 27.

59. Ibid.

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60. Ibid., p. 26.

61. Ibid., p. 27.

62. Ibid.

63. Ibid., p. 28.

64. Ibid., p. 30.

65. History of Architecture and the Building Trades of Greater New York, [henceforth cited as Building Trades], II (New York: Union History Co., 1899), 161.

66. Condit, Nineteenth Century, p. 28.

67. Ibid.

68. Building Trades, II, 162

69. Ibid., pp. 161-162

70. This is a 19th-century term to describe those who assembled metal "houses", which included other building types as well.

71. Building Trades, II, 167.

72. Ibid., p. 171

73. Ibid., p. 170.

74. For a brief summary of the beginnings of the Badger career see the introduction in:

"Illustrations of Iron Architecture Made by the Architectural Iron Works of the City of New York," The Origins of Cast Iron Architecture in America (New York: Da Capo Press, 1970). (Reprint of 1865 catalog.)

Also see: Condit, Nineteenth Century, p. 30.

75. History of Real Estate, p. 458.

Bannister, SAH, XV, 15; Badger added "cast iron houses" to his notice in the New York City Directory in 1850/51.

76. For a summary of Bogardus's career see: Bannister, SAH, XV, 12-22; XVI (March 1957), 11-19.

Also see: Condit, Nineteenth Century, pp. 32-34.

77. Carl W. Condit, American Building (Chicago and London: The University of Chicago Press, 1968), p. 82.

78. Excellent structural descriptions of the Laing stores are to be found in:

John G. Waite, ed., Iron Architecture in New York City - Two Studies in Industrial Archeology (Albany: New York State Historic Trust, Society For Industrial Archeology, 1972), pp. 3-42; and:

Winston R. Weisman, "The Anatomy and Significance of the Laing Stores by James Bogardus," unpublished paper read at the Society of Architectural Historians Convention, San Francisco, January 1972; abstracted in the Journal of the Society of Architectural Historians, XXXI (October 1972), 221-222.

FOOTNOTES (Cont'd)

(An article on the same topic is currently scheduled to appear in the September 1973 issue of Monumentum, a Belgian periodical dealing specifically with building technology.)

79. For an illustrated description of the Harper Building see: Ada Louise Huxtable, "Harper & Brothers Building - 1854, New York," Progressive Architecture, XXXVIII (February 1957), 153-154.

80. History of Real Estate, p. 288, p. 292.

81. James Bogardus, "Cast Iron Buildings: Their Construction and Advantages," The Origins of Cast Iron Architecture in America (New York: Da Capo Press, 1970) p. 12. (Reprint of 1856 pamphlet.)

82. Gloag and Bridgwater, p. 196.

83. Peter B. Wight, "The Origin and History of Hollow Tile Fire Proof Floor Construction," Brickbuilder, VI (March 1897), 53.

84. History of Real Estate, p. 293.

85. Condit, Nineteenth Century, p. 31.

86. James Fergusson, History of the Modern Styles of Architecture (London: John Murray, 1862), p. 483.

87. Montgomery Schuyler, American Architecture and Other Writings, William H. Jordy and Ralph Coe, editors, II (Cambridge, Mass.: Harvard University Press, 1961), 518.

88. Building Trades, I, 48.

89. Sir John Summerson, Heavenly Mansions (New York: W. W. Norton & Co., 1963), p. 195.

CANAL STREET (Cont'd)

229-4
#345
Function: Taxpayer
Facade: Concrete
2 stories; 3 bays

229-5
#347-349
Commenced: 11/11/1927
Completed: 3/23/1928
Architect: Julius Echmann
Original Owner: Augustus B. Fleck
Original Function: Garage
Facade: Brick
4 stories; 2 bays
Comments: Goes through to #6-10 Wooster

229-6
#351-355
(#2-4 Wooster, northeast corner)
Commenced: 6/22/1871
Completed: 2/29/1872
Architect: W.H. Gaylor
Builder: W. Lamb, Jr.
Original Owner: S. Middlebrook
Original Function: Stores
Facade: Iron
5 stories; 9 bays
Comments: Some ground-floor alterations
Iron from Bailey & DeBrevoise

Wooster Street to West Broadway

An interesting combination of buildings from the early, mid and late 19th century are seen on this block, which is divided in the center by a vacant lot. The buildings begin chronologically with two 1824 structures on the western corner, both of which were converted in the mid-century from three-story dwellings to four-story commercial buildings. (The fourth story on the corner building is a modified mansard.) The commercial period of the Historic District is represented by a simple five-story stone building of 1855 (fifth floor added in 1866,) a five-story brick store and tenement of 1871, a cast-iron structure of 1883, also five stories high, and two masonry buildings dating from 1891 which are five and six stories high.

North Side Only in District: Block 228, Nos. 357-375

No. 365-367, a predominantly stone building sparsely ornamented on its four upper floors, is strongly accented by an elaborate cast-iron storefront, executed in an ornate French manner. This storefront is supported by intricate Corinthian columns which separate the six individual bays. It is interesting that these bays are not of equal width, the second bay in from both of the sides being slightly narrower than the others. Also, the number of storefront bays does not correspond with the five windows which span each of the upper floors. The six-bay width of the storefront is divided in the center by a pier incorporating pseudo-quoins that are alternately ridged and vermiculated. An identical pier treatment is also used to flank the ground floor. Another interesting motif on the cast-iron ground floor is the neo-Grec brackets which appear individually above each column and paired above the central pier. Between these brackets, which support a modillioned cornice, are placed rococo-like foliated ornaments. This extremely elaborate storefront is in strong contrast to the functionally conceived upper floors which served originally as tenements. These floors, simply separated by narrow band courses, are faced with smooth stone around square-headed windows. The only projections are the plain window lintels and sills, with the addition of small brackets supporting the second-floor lintels. The building, which began so elegantly on the ground floor, is terminated by a very plain modillioned cornice, far less elaborate than the storefront cornice.

No. 371 is a five-story building with a three-bay wide cast-iron facade that was designed by Samuel Warner in a modified neo-Grec manner. Nearly all of the cast-

CANAL STREET (Cont'd)

iron elements on this 1883-84 structure remain intact, including the unusually high storefront. The storefront bays are defined by narrow pilasters in the center and slightly wider ones on either side all of which are decorated by projecting vertical ridges, incised neo-Grec ornaments, and rosettes.

The square-headed bay units on the upper four levels are handled in an identical manner. Each floor, separated from the one above and below by a high plain frieze, is flanked by wide fluted pilasters. The pilasters are topped by modified capitals decorated with a neo-Grec ornament that is proto-Art Nouveau in its use of sophisticated, stylized organic forms. A similar treatment is used on the capitals above the slender central columns, which are set on high bases and have a double banding around their otherwise smooth shafts. The entire facade is crowned by a rather high entablature that includes paired neo-Grec brackets above the side pilasters and each column. Between the brackets are panelled friezes and dentils.

228-1
#357
(#1-5 Wooster, northwest corner)
Completed: 1855
Architect: W.T. Beers
Original Owner: Wm. Banta
Original Function: Store and lofts
Facade: Marble, iron
5 stories; 3 bays
Comments: Iron from Architectural Iron Works, ground floor altered, lintels chipped. Common facade with #359, fifth story added in 1866

228-2
#359
Completed: 1855
Architect: W.T. Beers
Original Owner: Asher Rosenblatt
Original Function: Store and lofts
Facade: Marble, iron
5 stories; 3 bays
Comments: Ground floor altered, roof cornice cut for fire escape, common facade with #357. Fifth story added in 1866.

228-3
#361
Commenced: 8/1/1891
Completed: 1/31/1892
Architect: J.B. Snook
Original Owner: Nancy Banta
Original Function: Store and workshop
Facade: Brick, iron
5 stories; 3 bays
Comments: Roof cornice cut, for fire escape, ground floor altered

228-4
#363
Commenced: 4/11/1891
Completed: 10/31/1891
Architect: Leicht & Harrell
Carpenter: Peter Roberts
Mason: Peter Roberts
Original Owner: Charles Moelich
Original Function: Store and workshop
Facade: Brick, iron, ashlar
6 stories; 4 bays

228-5
#365-367
Commenced: 6/23/1871
Completed: 12/31/1871
Architect: Wm. Waring
Original Owner: J. Watson Webb
Original Function: Store and tenement
Facade: Stone and iron
5 stories; 5 windows, 6 bays on ground floor
Comments: Some lintels and stone banding missing, ground floor bays filled in.

228-7
#369
Vacant lot

CANAL STREET (Cont'd)

228-8
#371
Commenced: 6/15/1883
Completed: 6/31/1884
Architect: Samuel Warner
Mason: A.C. Walbridge
Original Owner: O.J. Walbridge
Original Function: Store
Facade: Iron
5 stories; 3 bays

228-9
#373
Completed: 1824
Architect: Unknown
Original Owner: John R. Murray
Original Function: Dwelling
FAcade: Brick, iron
4 stories; 3 windows
Comments: Altered in 1877, cornice and lintels added then.

228-10
#375
(#301-305 West Broadway, northeast corner)
Completed: 1824
Architect: Unknown
Original Owner: John R. Murray
Original Function: Dwelling
Facade: Brick, iron
4 stories; 3 windows
Comments: Mansard roof added in 1860s, Canal Street storefront new.

GRAND STREET

Grand Street, previously known as "Road to Crown Point," was laid out prior to 1766. Although the name of the original portion of the street was officially changed to Grand in 1767, the section west of Broadway was frequently referred to as Meadow Street up to 1799. In 1804, the Common Council of New York gave their approval to have the street regulated and developed.

Unlike the other cross-town streets of the District, the building numbers on Grand Street run from west to east rather than from east to west.

West Broadway to Wooster Street

The construction dates for buildings on this block span nearly three-fourths of the nineteenth century, ranging chronologically from the two Federal houses at Nos. 57 and 59 (later altered for commercial purposes to four stories), to the seven-story neo-Classic office building complex at Nos. 60, 62 and 64 that dates from 1895-96. Although this latter building is not unusually tall for its date, it is the highest on the block. The remaining structures, which range from two to five stories, were all built in the 1880s in the neo-Grec style.

South Side: Block 228, Nos. 53-69

228-22
#53
(#331-335 W. B'way, southeast corner)
Listed on West Broadway
2 bays on Grand

228-23
#55
Commenced: 6/26/1882
Completed: 10/28/1882
Architect: Wm. Jose
Carpenter: J. Daly
Mason: Mathew Powers
Original Owner: Grant Levy
Original Function: Store
Facade: Brick, iron, stone
3 stories; 3 windows

228-24
#57
Commenced: 1825
Completed: 1826
Architect: Unknown
Original Owner: Ferris Pell
Original Function: Dwelling
Facade: Brick and iron
4 stories; 3 windows
Comments: This building was raised to 4 stories in 1891

228-25
#59
Commenced: 1825
Completed: 1826
Architect: Unknown
Original Owner: Ferris Pell
Original Function: Dwelling
Facade: Brick and iron
4 stories; 3 windows
Comments: This building was raised to 4 stories by 1892

228-30
#61-69
(#27 Wooster, southwest corner)
PARKING LOT

North Side: Block 475 (west part), Nos. 54-70

Nos. 60, 62 and 64 form an impressive three-building unit that was designed by Cleverdon & Putzel and erected in 1895-96. These three structures, which are each seven stories high and four bays wide, are constructed of brick with iron and terra-cotta ornamentation in a manner typical of the neo-Classical commercial towers of the 1890s. The facades of the two outer buildings, Nos. 60 and 64, are identical, while the central building is different in detailing though not in feeling. This diversity is handled in a completely symmetrical manner and in no way detracts from the cohesivehess of the three-building unit.

GRAND STREET (Cont'd)

The storefronts, which are identical on all three buildings, are supported by extremely narrow though deep cast-iron pilasters. These pilasters are topped by an iron frieze outlined by an egg-and-dart molding and decorated with rosettes and leaf ornaments. Similar cast-iron pilasters are used to separate the upper window bays except on the seventh floor.

The two identical facades at Nos. 60 and 64 are each flanked by pseudo-quoined piers that are interrupted only below the seventh floors by cornices projecting above terra-cotta plaques. The remaining floors are separated horizontally by elaborate floriated terra-cotta friezes that extend between the side piers. The seventh stories are composed of round-arched windows and stone columns rather than square-headed windows and iron pilasters, as found on the lower floors. The tops of these two upper floors are embellished by terra-cotta friezes incorporating a repeated mask motif, above which are set deep iron cornices supported on modillion blocks.

The lower floors of the central building are handled in a simpler manner. The side piers are completely smooth and the second through fifth floors are topped by simple narrow terra-cotta bandings. The upper three floors are separated by simple friezes formed by an ornamental brick pattern. The top floor of No. 62, however, provides a strong central emphasis for the three-building group with a pediment perched on two capped brackets above projecting brick pilasters. On either side of the pilasters, which flank paired windows, are similar pilaster-and-bracket units that form the two outside bays.

No. 68-70 is an impressive neo-Grec cast-iron building located at the northeast corner of Grand and Wooster. This 1886-87 structure is the work of George DaCunha who was also the architect for the buildings at Nos. 72 and 74 Grand Street and 31 Greene Street. Of the four works by DaCunha remaining in the District, only No. 68-70 has a unique design. (The other three buildings were nearly identical to one another.) This lack of originality may well be explained by the fact that DaCunha was a builder as well as an architect. (He was listed in the Building Department Dockets of 1877 as being the builder of No. 89 Grand Street, designed by William Hume. The previous year he had been listed as architect of No. 31 Greene Street.) Such a builder-architect would have tended to rely on stock cast-iron pieces and concentrated his efforts on building techniques rather than originality in design.

Yet, even if DaCunha's designs are frequently repetitive, they are all attractive examples of the neo-Grec style. No. 68-70 is a five-story building with a width of six bays on its Grand Street cast-iron facade. (The Wooster facade has only two bays fronted by cast iron, the remainder being brick.) The storefront, though greatly altered, still retains its original pilasters which have stylized capitals and are partially fluted on their upper section. Although incorporating the same elements, the end and center pilasters are slightly wider than the intermediates. The same formula, with minor modifications, is also carried out on the four upper floors. The floors are separated by cornices which are given added emphasis by the use of stylized terminal blocks above each of the three major pilasters. The building is capped by a high cornice line which rests upon paired concave brackets placed above the three wide pilasters.

475-1
#54-58
(#337 W. B'way, northeast corner)
Listed on West Broadway
6 bays on Grand
Comments: Ground floor filled in

475-33
#60
Commenced: 4/20/1895
Completed: 4/29/1896
Architect: Cleverdon & Putzel
Original Owner: John Clark
Original Function: Store
Facade: Iron, brick, terra cotta, stone
7 stories; 4 bays
Comments: Joint facade with #62 and #64, identical to #64

GRAND STREET (Cont'd)

475-32
#62
Commenced: 4/20/1895
Completed: 4/29/1896
Architect: Cleverdon & Putzel
Original Owner: John Clark
Original Function: Store
Facade: Iron, brick, terra cotta, stone
7 stories; 4 bays
Comments: Joint facade with #60 and #64

475-31
#64
Commenced: 4/20/1895
Completed: 4/29/1896
Architect: Cleverdon & Putzel
Original Owner: John Clark
Original Function: Store
Facade: Iron, brick, terra cotta, stone
7 stories; 4 bays
Comments: Joint facade with #60 and #62, identical to #60

475-30
#66
Commenced: 6/4/1884
Completed: 1/30/1885
Architect: W. H. Hume
Original Owner: Helina Asinare
Original Function: Business purposes
Facade: Iron
5 stories; 3 bays
Comments: Some ornament missing, ground floor altered

475-28
#68-70
(#29 Wooster, northwest corner)
Commenced: 4/29/1886
Completed: 1/24/1887
Architect: George DaCunha
Original Owner: Morris S. Hermann
Original Function: Store
Facade: Iron from Lindsay & Grafe Ironworks
5 stories; 6 bays
Comments: Ground floor filled in

Wooster to Greene Street

The buildings which line the two sides of this block date primarily from the 1870s and 1880s, the period during which the area was at its peak of development. The only other structures are the 1907 building at No. 75-77 and a mid-20th century taxpayer at No. 76. Although three large buildings on the south side of the block have masonry facades, cast-iron is still the predominant building material to be seen in this block.

South Side: Block 229, Nos. 71-87

No. 71-73 Grand Street, in conjunction with No. 28-30 Wooster Street, form an impressive and powerful corner facade interpreted in a neo-Grec manner. Although the three-bay section of the building, which is numbered No. 73 Grand, was built in 1879, the corner section was not added until 1888. It appears from alteration records that Mortimer C. Merritt, who was the architect for both the original construction and the 1888 addition, added a completely new iron facade to the existing portion at the time that he extended the building.

The ground floor of this four-story building is divided by evenly spaced fluted Corinthian columns that rest on panelled bases. Between these columns are large plate glass show windows above molded spandrel panels. The ground floor is separated from the second level by a projecting cornice, as are all of the remaining floors. Each of these cornices is partitioned by decorative blocks which originally appeared at the end of the building, between the third and fourth bays and in paired groups on either side of the corner diagonal bay. (Today, several of these blocks are missing.) The bays on each of the floors are framed by smooth pilasters that are topped by stylized neo-Grec capitals that incorporate a paired stemmed motif in relief. An incised floral pattern also appears above each column. A final accent is achieved by the use of relief panels placed above the fourth floor. They serve as a transition to the crowning cornice that incorporates paired, elongated brackets above each column and similarly elongated modillions.

No. 83-87 is the Grand Street side of the 1872 building at the southwest corner of Greene Street that was designed by William Hume for James Fisher. The nine-bay cast-iron facade on Grand Street of this five-story building is handled in a modified neo-Grec manner, identical to that on the Greene Street facade. The four lower floors of the building are outlined by quoins which are repeated as a demar-

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WEST BROADWAY

West Broadway was laid out prior to 1797 and had been named Laurens Street by 1799 -- the name it retained through much of the period of development in the District. It was regulated in 1818 and development began at that time. The name of the section north of Canal Street was changed to South Fifth Avenue in 1870. and changed again by 1899 to West Broadway to correspond with the portion of the street south of Canal. West Broadway forms the western boundary of the District, and its nature is quite different from that of Broadway on the east. While Broadway has long been important as a commercial artery, West Broadway was important as an industrial street. The warehouses and factories that line it reflect this difference.

Canal to Grand Street

The buildings remaining on this block are concentrated at both ends. That at the corner of Canal Street and West Broadway is the most striking with its mansard roof. Other buildings date largely from the 20th century.

East Side Only in District: Block 228, Nos. 301-335

Nos. 301, 303, and 305 West Broadway (375 Canal) are three early Federal buildings whose facades were joined in a mid 19th-century remodelling. The building are four stories high including an attic; the No. 301 section has three windows across the brick facade while the No. 303-305 section has five windows. The most striking feature of the joint facade is its roof. The architect retained the original attics with their dormers and converted them into one continuous mansard roof. The dormers are now outlined by flat wooden moldings, and the roof is covered with hexagonal wooden shingles. Crowning it all is an elaborate iron balustrade. The roof is also underlaid by a continuous iron entablature containing panels interspersed by foliated brackets. The facade windows have plain stone sills and lintels. A relatively modern storefront has been cut into the No. 301 section near the corner. The No. 303-305 section has a late 19th-century iron storefront with four projecting bay windows and adjoining doorways. This storefront also has its own simple iron cornice.

No. 307-309 is a seven-story, six-bay building of 1892 employing classical Beaux-Arts formulas. The building rises from a two-story base which is flanked by heavy banded piers; a similar pier, terminating in a giant Ionic capital, divides the base in the center. The ground floor storefront and the window pilasters in the second floor are of iron. The third through sixth floors make up the main unit of the brick facade. The arched windows on the third floor contain fanlights with metal spokes. The windows on these floors are also separated by iron pilasters. The seventh floor is set off above a copper cornice. Two large shallow segmental arches span the seventh-story windows. The main entablature has been removed.

228-10
#301-305
(#375 Canal)
Commenced: 1823
Completed: 1824
Architect: Unknown
Original Owner: John R. Murray
Original Function: Dwelling
Facade: Brick, iron storefront
4 stories; 8 windows
Comments: Altered in mid-19th century when mansard roof and iron balustrade was added

228-11
#307-309
Commenced: 1892
Architect: Douglas Smyth
Original Owner: Alonso Kimball
Original Function: Stores, offices and light manufacturing
Facade: Brick, stone and Bedford limestone
7 stories; 6 bays

WEST BROADWAY (Cont'd)

228-18
#323
Commenced: 5/2/1923
Completed: 7/30/1923
Architect: Herbert O. Weigand
Original Owner: American Railway Express
Original Function: Bus. Purposes
Facade: Brick
2 stories; 22 feet wide

228-19
#325
Commenced: 1968
Architect: Unknown
Original Function: Garage
Facade: Brick
3 stories; 22 feet wide

228-20
#327-329
Completed: c. 1960
Architect: Unknown
Original Function: Warehouse
Facade: Brick
3 stories; 44 feet wide

228-22
#331-335
(53 Grand, southeast corner)
Commenced: 2/14/1882
Completed: 10/28/1882
Architect: Charles Mettam
Carpenter: Jeans & Taylor
Mason: B. Weeks
Original Owner: Ellen O'Brien
Facade: Brick, limestone
5 stories; 6 bays

Grand to Broome Street

This block shows a pattern of late development (or redevelopment). Most buildings date from 1885 to 1895 and are stylistically typical of that period. In strong contrast to this are several early Federal period buildings. As is typical in this section of the District, the buildings were used for light manufacturing and warehouse purposes, hence their exteriors are relatively restrained.

East Side Only in District: Block 475 (west part), Nos. 337-361

No. 349, a seven-story, four-bay building is of a type not commonly found in the District. It was originally built as a tenement with a store on the ground floor, and was probably occupied by workers in the nearby area. Stylistically typical of the early 20th century, its forms and decorative details can be called vernacular Classicism. Presumably such an architectural guise was considered to be uplifting to those who lived there.

While the storefront is of cast iron, the upper floors are of brick trimmed wi terra cotta simulating carved stonework. The windows on each floor are treated differently: some are square and outlined with terra-cotta moldings, others have pediments, both triangular and rounded, and the arched windows are set with key-stones carved with heads. Horizontal stone banding separates each story. That above the second floor is underlaid with a foliated terra-cotta molding. Crowning the building is a Classic cast-iron entablature separated into three sections. That in the center is raised higher than those above the outer sections and its frieze is set with the word "Grand", probably the name of the original building.

Nos. 357 and 361 are two Federal period buildings remaining in the block; both date from about 1825. No. 357, which is two and a half stories high and has two roof dormers, was originally used as a dwelling. The three windows on the second floor retain their original stone sills and incised lintels. The wood moldings on the dormers are also incised. The ground floor has been remodelled for use as a garage.

No. 361, is three stories high and four bays wide, and it has a flat roof. Tax records indicate that it was built at the same time as the corner building, 499 Broome Street, for Alfred Pell. Its original use is questionable; it may have been used as a stable on the ground floor with rooms to let on the upper floors.

WEST BROADWAY (Cont'd)

Although both 499 Broome Street and 361 West Broadway are three stories high, the floors of No. 361 are lower, and its front is lined by a row of closely-spaced windows on each floor. The windows have plain stone sills and lintels. Star-shaped tie rod washers enhance the brickwork between the second and third stories. Topping the building is a simple iron cornice, possibly a later addition.

475-1
#337
(#54-58 Grand, northeast corner)
Commenced: 10/14/1885
Completed: 4/29/1886
Architect: Peter V. Outcault
Carpenter: Peter V. Outcault
Original Owner: Joseph J. West
Original Function: Stores
Facade: Brick
2 stories; 5 bays
Comments: Ground floor altered

475-2
#339
Commenced: 10/14/1885
Completed: 4/29/1886
Architect: Peter Outcault
Original Owner: Joseph West
Original Function: Store
Facade: Brick
2 stories; 15 feet
Comments: New storefront added in 1964, completely rebuilt, now a garage attachment

475-3
#341
Commenced: 4/29/1929
Completed: 10/6/1929
Architect: Louis Chapas
Original Owner: Sarah Guth
Original Function: Restaurant
Facade: Brick
1 story; 1 bay
Comments: Other inf. claims:
Architect: John B. Reschke
Builder: Camille Crowley
Owner: East River Savings
Function: Dining Car

475-4
#343
Completed: 1825
Architect: Unknown
Original Owner: Andrew Surrey
Original Function: Dwelling
Facade: Brick
2 stories; 3 windows
Comments: Building may be cut down, ground floor altered, now a garage. Splayed lintels on 2nd floor

475-5
#345
Commenced: 1895
Architect: Unknown
Original Owner: Wm. Prager
Original Function: Lofts
Facade: Brick, iron
7 stories; 4 bays

475-6
#347
Commenced: 8/6/1895
Completed: 7/24/1896
Architect: G. F. Pelham
Original Owner: Charles S. Sentell
Original Function: Lofts
Facade: Brick, iron
7 stories; 4 bays

475-7
#349
Commenced: 2/28/1900
Completed: 10/24/1900
Architect: George Pelham
Original Owner: Benedict A. Klein
Function: Store and Tenement
Facade: Brick, stone, terra cotta
7 stories; 4 bays

475-8
#351-353
Commenced: 1/7/1889
Completed: 4/25/1889
Architect: F. S. Barns
Original Owner: Frank A. Seitz
Original Function: Store
Facade: Brick, stone
5 stories; 6 bays
Comments: Part of cornice cut for fire escape

WEST BROADWAY (Cont'd)

475-9
#355
Completed: c. 1880s
Architect: Unknown
Original Owner: Unknown
Original Function: Probably lofts
Facade: Brick, stone
3 stories; 3 bays
Comments: Altered in 1958, new ground floor. There has been a 3-story building on this site since the 1830s, present facade appears to date from 1880s.

475-10
#357
Completed: c. 1830
Architect: Unknown
Original Owner: Thomas Rutter
Original Function: Dwelling
Facade: Brick
2 1/2 stories; 3 windows
Comments: Ground floor converted into garage, 2nd floor panelled lintels, remnants of panelling on dormer, similar to that on 139 Greene

475-14
#359
Commenced: 2/27/1895
Completed: 8/17/1896
Architect: George Pelham
Original Owner: Louisa Friedline
Original Function: Lofts
Facade: Brick, iron
7 stories; 3 bays
Comments: Cornice cut for fire escape. This is an L-shaped building with another facade at 495 Broome.

475-12
#361
Completed: 1825
Architect: Unknown
Original Owner: Alfred Pell
Original Function: Dwelling
Facade: Brick
3 stories; 4 windows
Comments: This was lot 11, is now part of lot 12. Ground floor altered

475-12
#363
(499 Broome, southeast corner)
Listed on Broome
7 windows on W. Broadway

Broome to Spring Street
East Side Only in District: Block 487, Nos. 367-401

Between 1867 and 1890 most of this block was developed by the Lorillard family for use in their tobacco industry replacing earlier buildings they had occupied since 1852. The diarist Philip Hone wrote on the occasion of the death of Peter Lorillard on May 23, 1843: 'He was a tobacconist and his memory will be preserved in the annals of New York by the celebrity of 'Lorillard's Snuff and Tobacco.' He led people by the nose for the best part of a century, and made his enormous fortune by giving them that to chew which they could not swallow.'

The Lorillard buildings served a variety of functions: stores, warehouses, and factories for the various tobacco manufacturing processes. Throughout this period the Lorillards retained the same architect, J. B. Snook, for all their buildings on this block. Snook's style varied little in the earlier buildings; all of them exhibit a solid, respectable quality, typical of his brick buildings (several are described on Spring Street.) Snook used a narrow brick for these five and six-story buildings; he used stone trim on the piers and stone sills and lintels at the windows. The buildings are crowned by iron cornices, usually flanked by large console brackets with large terminal blocks; whatever stylistic variation there is in these entablatures no doubt depended on the foundry designs Snook happened to select during a given year. The ground floor facades are also of cast iron -- iron piers support an iron lintel which is flanked by neo-Grec console brackets beneath neo-Grec terminal blocks.

No. 391-393, dating from 1889-90, is also brick, but here Snook's composition is somewhat Romanesque in feeling. This is emphasized by the use of red brick, banded with rusticated stone on the end piers and window pilasters, rusticated stone sills and lintels, and round-arched windows on the top floor. However, the

WEST BROADWAY (Cont'd)

cast-iron storefront is very similar to those Snook used fifteen years earlier (although minus console brackets and terminal blocks). The iron cornice is supported by a row of closely spaced curved brackets.

Taken as a whole these Lorillard buildings give a positive, homogeneous character to the block.

487-7
#367
(#500 Broome, northeast corner)
Listed on Broome
7 bays on West Broadway

487-8
#375-377
(#61-63 Wooster)
Commenced: 7/29/1875
Completed: 11/10/1876
Architect: J. B. Snook
Builder: Edwin Harlow
Original Owner: Lorillard Estate
Original Function: Stores for tobacco
Facade: Brick, stone banding, iron storefront and cornice
5 stories; 6 bays

487-10
#379-381
(#65-67 Wooster)
Commenced: 1867
Architect: J. B. Snook
Original Owner: P. & G. Lorillard
Original Function: Tobacco manufacture
Facade: Brick, iron storefront and cornice, stone banding
5 stories; 6 bays
Comments: Some ground floor windows filled in, cornice cut for fire escape

487-12
#383-385
(#69-71 Wooster)
Commenced: 1868
Architect: J. B. Snook
Original Owner: Pierre Lorillard
Original Function: Factory for drying and moistening tobacco
Facade: Brick, iron storefront and cornice, stone banding
6 stories; 8 bays
Comments: Building raised one story in 1905, when Wooster front removed. Alterations on ground floor

487-14
#387-389
(#73-75 Wooster)
Architect: Unknown
Commenced: 6/7/1929
Completed: 11/21/1929
Original Function: Garage
Facade: Brick
4 stories; 5 bays

487-16
#391-393
(#77-81 Wooster)
Commenced: 4/22/1889
Completed: 1/24/1890
Architect: Jno. B. Snook & Sons
Original Owner: Jacob Lorillard Trustees
Original Function: Warehouse
Facade: Brick, iron, stone banding
6 stories 6 bays
Comments: Some ground floor and upper story windows are filled in

487-18/19
#395-397
Commenced: 1937
Function: Garage and Parking lot
Facade: Brick
1 story

487-20
#399
Completed: c. 1860
Original Function: Store
Facade: Brick
4 stories; 5 windows

487-20
#401
(#162 Spring, southeast corner)
Listed on Spring
3 windows, 40 ft. wide on West Broadway

SOURCES AND CREDITS

This report has been written to describe an area of the City which is significant to the City in terms of its social as well as architectural heritage. It is most notable as the largest extant concentration of full cast-iron facades in the world. It should prove educational and informative to architectural historians, to the property owners and to those working and living in the area. The following notes cover promary sources used in obtaining information for the report.

The documentation of each building has been based on primary research sources, mainly official records of the City of New York. These have been supplemented by special collections of original manuscripts, maps, City directories, newspapers and published histories of the City and of certain institutions, in the collection of such institutions as The New York Public Library, the New York Historical Society and the Avery Architectural Library of Columbia University. Municipal records, drawn upon heavily, which have been of great assistance in establishing the historical documentation of buildings, include:

A. Conveyance records, survey and estate maps and tract reports (Office of the Register).

B. Tax assessment records of the 19th century (Municipal Archives and Record Center).

C. Building and alteration plans, violation indices, building and alteration dockets from 1866 on - the date of the establishment of the Department of Buildings. (Special thanks should be extended to Cornelius F. Dennis, Sebastian Mazzola and Edwin J. Quinlan of the Department of Buildings for their assistance.)

D. Minutes of the Common Council of the City of New York.

E. Manual of the Corporation of the City of New York.

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FINDINGS AND DESIGNATION

On the basis of a careful consideration of the history, the architecture and other features of this area, the Landmarks Preservation Commission finds that the SoHo-Cast Iron Historic District contains buildings and other improvements which have a special character and special historic and aesthetic interest and value and which represent one or more periods or styles of architecture typical of one or more eras in the history of New York City and which cause this area, by reason of these factors, to constitute a distinct section of the City.

The Commission further finds that among its important qualities, the SoHo-Cast Iron Historic District has played a significant role in the residential, entertainment and commercial development of New York City, that, particularly during the last half of the 19th century, a wide range of architectural styles were applied to commercial building, that outstanding examples of these styles have survived here in great number, variety and integrity, that among them is the largest group of cast-iron structures now to be found anywhere in the world, that the use of cast iron as a building material marks a very important stage in the history of structural technology, that its application contributed significantly to the subsequent development of the skyscraper, that the juxtaposition of the cast-iron buildings and their masonry contemporaries illustrates dramatically the 19th-century search for a distinctive architectural style, that this search led directly toward the new architectural aesthetics of the 20th century, that the recent conversion of abandoned lofts into artists' residences, studios and galleries has added new vitality to the area, that this revitalization has been accomplished through imaginative zoning and building code amendments, that the area also continues to contain ongoing and important commercial and industrial activities, and, finally, that this mixed combination of uses demonstrates one way in which the core of an old city can be given new life without the destruction of its cultural heritage.

Accordingly, pursuant to the provisions of Chapter 63 of the Charter of the City of New York and Chapter 8-A of the Administrative Code of the City of New York, the Landmarks Preservation Commission designates as an historic district the SoHo-Cast Iron Historic District, Borough of Manhattan, containing the property bounded by Canal Street, Broadway, Howard Street, Crosby Street, East Houston Street, West Houston Street and West Broadway.

PART III

APPENDICES

A. PROMINENT ARCHITECTS REPRESENTED IN THE DISTRICT

ISAAC F. DUCKWORTH (1850-?) Office at 291 Broadway

343 Canal	1868	iron
28-30 Greene	1872-73	iron
23-25 Greene	1872-73	iron
465-467 Broome	1872-73	iron
72-76 Greene	1872-73	iron
32 Greene	1873	iron

Isaac F. Duckworth was a New York City architect about whom little is known. According to the 1870 U.S. Census records Duckworth was born in Pennsylvania of native-born parents. He was only 30 at the time of the census, which meant that he began his career at an early age, much like J. Morgan Slade. He was listed in the New York City Directories between 1858 and 1883.

With the exception of 343 Canal Street, all of Duckworth's buildings within the Historic District were built in 1872 or 1873. However Daniel Badger's Architectural Iron Works catalog lists a number of Duckworth-designed buildings built prior to 1865.

Although it is unlikely that Duckworth had any formal architectural training, he must have been an avid student of French architectural styles (probably as interpreted in British architectural publications), for his extant buildings are strongly French in character.

While he did design buildings in the sperm-candle style (at 97-101 Reade Street) and in the Venetian Renaissance manner (at 41 Worth Street) both of these buildings have distinctly French touches. All of Duckworth's buildings of 1872 and 1873 within the Historic District are elaborate and elegant interpretations of the French Second Second Empire style in the commercial palace mode. Employing such devices as projecting bay sections, massive pediments, intricate bracketing, and the typical mansard roof, Duckworth gave these buildings a flamboyant character that is unique in the District. Cast iron adapted itself well to these elaborate forms and at far less expense than if they had had to be carved in stone.

HENRY FERNBACH (1828-1883) Office at 346 Broadway

463 Broome	1867	stone, iron storefront
43 Mercer	1867	brick
165-167 Mercer	1870-71	iron
76 Wooster	1871	brick, iron storefront
142-144 Greene	1871	iron
58-60 Greene	1871	iron
19-21 Greene	1871-72	iron
67 Greene	1872-73	iron
62-64 Greene	1872-73	iron
69-71 Greene	1876-77	iron
73,75,77 Greene	1876-77	iron
81 Greene	1877	iron

ARCHITECTS (Cont'd)

113-117 Spring	1878	iron
111 Mercer	1878-79	iron
96 Greene	1879	iron
101 Greene	1879	now altered
103-105 Greene	1879	iron
83-85 Greene - 122-132 Spring	1879-80	now altered
102 Greene	1880	iron
93-95, 97, 99 Greene	1881	iron
96-98, 100 Prince	1881-82	iron
102-104 Prince - 114-120 Greene	1881-82	iron
113 Greene	1882-83	brick, iron storefront
121-123 Greene	1882-83	iron
125 Greene	1882-83	iron
133-135, 137 Greene	1882-83	iron
122-124 Spring - 84-86 Greene	1883	brick
112 Greene	1883-84	iron

Henry Fernbach, born in Germany, came to New York in 1848 to begin a successful architectural practice. His sudden death in November 1883 brought his flourishing career to an end. He was best known for his commercial and institutional buildings; among those listed in his obituary were the Staats-Zeitung building on Tryon Row, at the corner of Spruce and William Streets, the German Savings Bank on Union Square, the Hebrew Orphan Asylum on East 77th Street at Third Avenue, and the Central Synagogue on Lexington Avenue at 55th Street.

Fernbach was the most prolific architect within the boundaries of the Historic District. He worked almost exclusively on Greene Street and designed more buildings on Greene Street than any other architect. Consequently Greene has a remarkable homogeneity.

Despite Fernbach's German background, his architectural styles display a dominant French influence. Two of his early cast-iron buildings, 165-167 Mercer Street of 1870-71 and 142-144 Greene Street of 1871, employ the characteristic French segmental window arch. This motif was used for both stone buildings and their imitations in cast iron.

Yet, Fernbach was essentially not an imitative architect. His use of cast iron was creative and imaginative, and his designs display the lightness and openness of cast-iron architecture to its best advantage. French designs are the inspiration for his decorative details. While French Renaissance and Second Empire details predominate on his earlier buildings, by the mid-1870s his details are almost exclusively his personal stylization of neo-Grec forms. This is especially evident in his designs for capitals, pilasters, moldings and keystones. Another prominent Fernbach characteristic which occurs in his later buildings is his elaborate treatment of the main entablature. Intricate brackets, original moldings, and ornamental terminal blocks all combine to give his entablatures great character. He further elaborated his cornices by adding antefixae projecting above the roof line. Fernbach created a cast-iron architecture that was unique in its combination of forms and details. It adds much to the over-all quality and character of the District.

ARCHITECTS (Cont'd)

JOHN KELLUM (1807-1871) Office at 179 Broadway, later 811 Broadway

565-567 Broadway	1859-60	stone
502-504 Broadway	1860	stone, iron storefront
18 Mercer	1861	iron
597 Broadway –	1867	stone
170 Mercer		brick, iron storefront
94-96 Crosby	1869	brick, iron storefront

John Kellum achieved success as an architect for A. T. Stewart, New York's first department store magnate. Kellum designed Stewart's second major department store at Broadway and 10th Street in 1859-1862. The cast-iron facade is stylistically reminiscent of the Venetian Renaissance; its segmental-arched window arcades are set within columns decorated with simple details. However the design of the cast-iron interior light court is in a French Renaissance style with appropriately ornate details. Kellum was also the architect for Stewart's own mansard-roofed Second Empire palace on Fifth Avenue at 34th Street (1863-69). One of Kellum's last designs for Stewart was the cast-iron Hotel for Working Women, later changed to the Park Avenue Hotel, which opened in 1878. It was designed in an elaborate Second Empire style. This mansard-roofed Second Empire palace style appears on several of Kellum's buildings from the late 1860s; among them was the New York Herald Building.

Although the number of buildings that Kellum designed within the Historic District is small, his contributions are notable.

No. 565-567 Broadway, the Ball, Black and Co. store of 1859-60, is one of the best examples of Italianate architecture within the District. Although later alterations have somewhat changed its original character, one can still get a sense of this popular style. Moreover the style is well suited to the material (which is marble), and the building conveys a sense of solidity and stability particularly appropriate for this old firm of silversmiths and jewelers.

In sharp contrast to this, are the so-called "sperm-candle" buildings, employing a transitional style which was used between 1858 and 1864. Although the invention of this style cannot be attributed with any certainty to Kellum, he used it on 502-504 Broadway, a marble building, and for a virtually identical facade in cast iron at 55-57 White Street. It is quite possible that he was also the architect for several other stone-faced buildings on Broadway south of Canal Street in the "sperm-candle" mode. In addition to being a style which used traditional classical forms in a non-traditional way, it also was well adapted to the particular virtues of cast-iron strength and lightness. What is unique about the style is that in several cases stone was used to imitate these qualities of cast iron.

No. 597 Broadway, a Kellum design of 1867, has these same paradoxical qualities. Although its stylistic details are adopted from French Renaissance sources with touches of neo-Grec, this marble-facaded building has a quality of lightness and openness that is much more expressive of cast iron.

In conclusion it appears that once Kellum discovered the virtues of cast iron for commercial buildings, he used it in such a way as to emphasize its structural and decorative qualities. Moreover, these styles seem to have appealed to him so strongly that he continued to use them when a client requested a building with a stone facade.

ARCHITECTS (Cont'd)

JARVIS MORGAN SLADE (1852-1882) Office at 71 Broadway, later 346 Broadway

489-493 Broome	1873-74	iron
147 Wooster	1876	marble
45 Greene	1882	iron
42-44 Wooster	1882-83	brick, iron piers on ground floor
109-111 Prince - 119 Greene	1882-83	iron

Jarvis Morgan Slade had one of the most promising architectural careers in New York City before his unexpected death at the age of thirty. Slade received his professional training in the office of Edward H. Kendall and began his own practice about 1873. Despite his youth, he received a number of important commissions for commercial buildings, his area of specialty.

Kendall had been trained at the Ecole des Beaux-Arts in Paris, and he presumably passed his preferences for French architectural styles on to Slade. Slade's designs within the District certainly reflect a strong adherence to French design traditions.

While Slade did not use cast iron for all of his commercial buildings, he did employ this material for the majority of those within the District. He utilized the material in such a way so as to emphasize the light and open qualities the material made possible. At the same time he was able to create refined French Renaissance and neo-Grec design forms.

No. 489-493 Broome, a cast-iron building of 1873-74 must have been one of his first independent commissions. Here his use of French Renaissance designs and especially his treatment of the roof line is very similar to several Griffith Thomas designs of about 1869.

Slade's building at 147 Wooster of 1876 is rather unusual because he used marble on the facade to create highly ornate designs which could have been much more easily done in cast iron. While the detailing is predominantly neo-Grec, the forms are in the French Renaissance mode. This is another case of the use of stone to imitate cast-iron forms.

However, it was in some of the last commissions that Slade undertook, that he achieved a true sense of elegance and refinement in translating French Renaissance and classical modes into the cast-iron medium. The magnificent building at 109-111 Prince - 119 Greene is a prime example of his best work.

JONATHAN B. SNOOK (1815-1901) Office at 12 Chambers Street

552-554 Broadway	1855	stone, iron storefront
5-7 Mercer	1861	stone, iron storefront
379-381 W. Broadway	1867	brick, iron storefront
65-67 Wooster	1867	brick, iron storefront
383-385 W. Broadway - 69-71 Wooster	1868	brick, iron storefront now altered
30-32 Howard - Northeast corner Crosby	1868	stone, iron storefront brick, iron storefront
91, 93 Grand	1869	iron
28-30 Mercer - 451-453 Broadway	1869	brick, iron storefront now altered
10-12-14 Greene	1869	iron
83 Mercer	1872	iron
65 Greene	1872-73	iron

ARCHITECTS (Cont'd)

68 Greene	1872-73	iron
66 Greene	1873	iron
375-377 W. Broadway— 61-63 Wooster	1875-76	brick, iron storefront
83-85 Wooster	1876	brick, iron storefront
446-448, 450 Broadway	1876-77	iron
109-111 Spring —	1878	brick, iron storefront
107 Mercer		brick
121 Spring —	1878	brick, iron storefront
90 Greene		brick
503-505, 507-509, 511 Broadway —	1878-79	iron
74-76, 78-80, 82 Mercer		brick, iron storefront
329-331 Canal —	1883-84	brick
2-6 Greene		
8 Greene	1883-84	iron, brick flanking piers
12 Wooster	1883-84	brick, iron storefront
127 Spring —	1886-87	brick, iron storefront
87-89 Greene		
391-393 W. Broadway — 77-81 Wooster	1889	brick, iron storefront
151 Spring	1889-90	brick, iron storefront
361 Canal	1891-92	brick

Jonathan B. Snook (also listed in various sources as John B. Snook) was born in London and came to New York as a child. He studied architecture with Joseph Trench and was in partnership with him for several years.

Like his contemporary Griffith Thomas, Snook had one of the largest architectural practices in New York City, and he designed both residential and commercial buildings for members of New York's most prominent families, among them the Vanderbilts and the Lorillards. One of his most important buildings was the old Grand Central Station built in 1871-72. The firm of Trench & Snook is attributed in several sources with the design of the first A. T. Stewart Store (1845-46) at the corner of Broadway and Chambers (now the Sun Building). This white marble palace was the first Italianate structure in New York City. Stewart, who is also listed as the proprietor of the Metropolitan Hotel on Broadway at Prince (now demolished) in Daniel Badger's catalog, also commissioned Trench & Snook to design that structure. Another of Snook's important hotel attributions was for the St. Nicholas Hotel on Broadway at Spring. This is also listed in Badger's catalog. When two of Snook's sons entered architectural practice about 1887 he opened an office in Brooklyn and renamed the firm, "Jno. B. Snook & Sons."

Within the boundaries of the Historic District, Snook was one of its most prolific architects; his buildings span the wide range of time from 1855 to 1892. As might be expected, the styles are also diverse.

A large number of the buildings from the mid-1860s to the end of the 1880s fall into a category which can be called "vernacular classicism" for want of a better term. These buildings have brick facades above cast-iron storefronts and are usually topped with cast-iron cornices. The buildings vary only slightly in stylistic details from decade to decade. In the 1860s the windows typically have projecting molded lintels and stone sills supported on tiny brackets -- both elements being of an Italianate nature. In the 1870s and 1880s the stone sills and lintels are completely plain and often flush with the brick facade. In the 1880s buildings, sections of the facade are often banded with stone. The iron storefronts and cornices are also of a simple nature, often decorated with geometric forms; in the 1870s and into the 1880s neo-Grec details are frequently used. A large number of these vernacular buildings were of a purely utilitarian nature and used for warehouses and manufacturing purposes. Apparently neither Snook nor the owners of these buildings felt the need to glorify their facades as did the builders of commercial palaces.

ARCHITECTS (Cont'd)

Snook's commercial buildings on and near Broadway are more impressive than his utilitarian structures and are carried out in more distinctive architectural styles.

The earliest building attributed to Snook within the boundaries of the District is at 552-554 Broadway of 1855. He employed the French motif of segmental window arches and topped the building with an elaborate entablature. No. 5-7 Mercer Street is a handsome Italianate composition with a stone facade above an iron storefront. His first complete cast-iron facade was done in 1869 at 91-93 Grand Street; interestingly enough, he used iron to simulate large stone blocks. From this time he use iron for all of his non-vernacular commercial structures within the Historic District. The iron fronts dating from the late 1860s and early 1870s are French in character employing segmental window arches; they are strongly imitative of similar structures in stone. However, he used iron in a much more non-traditional manner at 446-450 Broadway (1876-77) and 503-511 Broadway (1878-79). The details here are neo-Grec, but the iron is used to create a light, open building with wide bays separated only by columns. Such a technique is much more expressive of the functional nature of cast iron.

GRIFFITH THOMAS (1820-1878) Office at 346 Broadway

443-445 Broadway	1860	stone, iron storefront
90-94 Grand – 38-40 Greene	1867	stone, iron storefront brick
97-105 Grand – 31-35 Mercer	1867	stone, iron storefront
470 Broome – Northwest corner Greene	1867	stone, iron storefront brick
42-44 Greene	1868-69	stone, iron storefront
472-474 Broome	1869	stone, iron storefront
425 Broadway	1869	iron
457-459 Broome	1871	iron
461 Broome	1871	iron
469-475 Broome – 55 Greene	1871-72	iron
55 Mercer	1871-72	iron
453-455 Broome – 57-59 Mercer	1872-73	iron
476-478 Broome – 62 Wooster	1872-73	iron
80-82 Greene	1872-73	iron
441 Broadway	1876	now altered

Griffith Thomas was born in England; he came to New York in 1838 at the age of eighteen to join the architectural firm of his father, Thomas Thomas. The firm was known as Thomas & Son for many years, although Griffith did much of the designing. Their clients included some of New York's most prominent people, among them the Astors.

Thomas's work included a good many residences along Fifth Avenue, usually faced in brownstone, as well as numerous important commercial buildings such as the Lord and Taylor store at Broadway and Grand Street (now demolished) and the Arnold Constable store on Broadway at 19th Street.

According to Withey's Biographical Dictionary of American Architects (Deceased), Thomas "designed buildings in the Classic and Palladian styles favored by the elder Thomas." Winston Weisman credits the firm with greatly furthering the commercial palace mode of architecture.

The earliest building which we can attribute to Griffith Thomas still standing within the District, at 443-445 Broadway, dates from 1860. Stylistically it is firmly within the Italianate commercial palace tradition.

ARCHITECTS (Cont'd)

His other buildings within the District date from 1867 to 1873; by this time stylistic taste in commercial buildings had shifted to the French Renaissance and Second Empire styles. Thomas's work from this period reflected this shift but, at the same time, he incorporated Italianate elements, such as second-floor balustrades, into his designs. Other design elements which he favored included curved broken pediments, heavy roof balustrades and roof urns, as well as stylized decorative details, usually foliated; these are usually considered to be French rather than Italian characteristics. But whether French or Italian, these buildings all carried on the commercial palace tradition.

The first complete cast-iron facade which Thomas designed in the District dates from 1869 at 425 Broadway. His buildings previous to this date had had cast-iron storefronts supporting stone facades. But once he adopted the complete cast-iron facade, he used it enthusiastically and imaginatively to create buildings of great elegance. His buildings on Broome Street from 1871 on firmly attest to his design skills.

SAMUEL A. WARNER (1822-1897) Office at 132 Broadway

454 Broome —	1879-80	stone, iron storefront
65-67 Mercer		brick
20-26 Greene	1880	iron
16-18 Greene	1882-83	iron
600-602 Broadway —	1883-84	iron
134-136 Crosby		brick and iron
371 Canal	1883-84	iron
513, 515-517, 519 Broadway —	1884-85	stone, brick, iron
84, 86-88, 90 Mercer		brick, iron storefront
545 Broadway —	1885	iron
116 Mercer		
15-17 Mercer	1886	iron
15-17 Greene	1894-95	iron

Samuel A. Warner received his architectural training in the office of his father Cyrus L. Warner, beginning at the age of sixteen. He was in partnership with his younger brother Benjamin from 1862 to 1868. He achieved prominence with his designs for many large stores in the dry-goods district. H. B. Claflin Co., S. B. Chittenden & Co., Charles St. John, McCurday, Aldrich & Schenck, and H. D. Aldrich are those cited in his New York Times obituary. He was also the architect of the Marble Collegiate Church, a Landmark in its own right.

Within the Historic District his buildings date from 1879 through 1895, and only two do not have cast-iron facades. It is interesting that he would continue to use this medium as late as 1895 for the building at 15-17 Greene Street.

No. 454 Broome Street of 1879-80 is identical in design to 456 Broome, done in 1867 by his brother Benjamin; apparently the owner wanted a continuation of the same facade. Nos. 513-519 Broadway of 1884-85 is the only other non cast-iron building Warner designed in the District. He adapted the popular Queen Anne style to this commercial building, incorporating floriated terra-cotta details on the facade in a vibrant polychromatic fashion.

Warner's designs in cast iron are similar to those used by Fernbach -- that is, basically classical in form with wide-set windows separated only by columns or pilasters. The designer thus achieved a great sense of lightness and openness. While Warner also used neo-Grec details, his over-all designs were quite severe and simple; they lack the elaboration that Fernbach brought to his designs. Warner used such devices as small Corinthianesque or Ionic capitals above his columns, simple entablatures, and wide unadorned frieze panels above the windows. Only in some of his later designs does a hint of elaboration creep in when he placed window arcades at the top floors.

ARCHITECTS (Cont'd)

(1853-1913)

ALFRED ZUCKER (?) Office at 33 Union Square West

132-134, 136, 138-140 Greene	1885-86	iron
549-555 Broadway —	1889-90	stone
120-126 Mercer		brick
484-490 Broome —	1890-91	stone and brick
59 Wooster		
492-494 Broome	1891-92	stone and brick
495-497 Broadway —	1892-93	stone and brick
66-68 Mercer		brick
458 Broadway -123 Grand	1895-96	stone and brick

Alfred Zucker is another New York City architect about whom little is known. He appears in the New York City Directories through 1904. He was considered to be one of the City's leading architects as evidenced by an entry in King's Notable New Yorkers, 1896-99. In A History of Real Estate, Building and Architecture in New York City published in 1898, he is favored with an extensive (although probably not complete) listing of his buildings from 1883 through 1897. His earliest building within the boundaries of the Historic District dates from 1885.

This building at 132-140 Greene Street is his only building with a cast-iron facade. Interestingly enough, it is almost identical to a Henry Fernbach building of 1883 at 112 Greene Street. Both buildings had the same owners: after Fernbach's death in 1883 they must have asked Zucker to carry out the commission for an identical building.

The work of Zucker's firm is best seen, however, as a late 19th-century adaptation of the exuberant Beaux-Arts style as adapted to the skyscraper. Marble and granite in combination with brick and terra-cotta decoration, and iron decorative members (usually defining the windows) are the elements he used to create, in commercial designs, a conspicuous and impressive image for his clients.

An interesting digression from this mode was Zucker's design for 484-490 Broome Street (59 Wooster Street). This bold red granite building is a type of Romanesque, although even here Zucker employed some classical forms.

While most of Zucker's buildings are too ornate to appeal to today's taste, they form nonetheless, a significant part of late 19th-century American architecture. Zucker's buildings are among the most imaginatively designed during this period within the District.

He worked in Argentina in the early 20th Century

B. GLOSSARY OF TECHNICAL TERMS

ABACUS (plural, ABACI) - the flat topmost member of a capital upon which an architrave or other superstructure rests.

ACROTERION (plural, ACROTERIA) - an ornamental "ear-like" protrudance most often placed at the angles of a triangular pediment.

ANTEFIX (plural, ANTEFIXAE) - an ornament projecting above a roof cornice frequently incorporating an anthemion motif.

ANTHEMION - a conventionalized leaf motif based on a honeysuckle or palmette form, originating in Greek ornamental forms.

APRON - a trim member placed at the edge of and extending below a projection such as a window sill or capital abacus.

ARCHITRAVE - see: Entablature

BEARING WALL - a wall upon which the structural load of a building rests.

BRACKET - a projecting L or S-shaped support used frequently below a cornice, balcony or projecting sill.

CONSOLE BRACKET - an elongated ornamental bracket, frequently in the form of an S curve.

CARYATID - a decorative column taking the form of a female figure.

CLASSICAL ORDERS - In discussing the buildings dating from the second half of the 19th century within the Historic District, references to the classical orders must be interpreted very loosely. The architects of these buildings took great liberties in adapting Greek and Roman forms to commercial buildings. In nearly every instance in this report, a reference to a specific order refers only to the capital design and not to the entablature, base, shaft or to proportions or spacing of the columns.

TUSCAN CAPITAL - a very simple unadorned capital, resembling the Doric but frequently of heavier proportions.

DORIC CAPITAL - a relatively simple capital with a flat abacus.

IONIC CAPITAL - a capital with spiral volutes beneath its abacus.

CORINTHIAN CAPITAL - a capital embellished with carved acanthus leaves.

CORINTHIANESQUE CAPITAL - a capital incorporating stylized leaf forms.

COMPOSITE CAPITAL - a capital combining volutes and acanthus leaves, (a composite of the Ionic and Corinthian orders.)

COMPOSITE - see: Classical Orders

CONSOLE BRACKET - see: Brackets

CORBEL - a supporting projection normally produced by extending successive layers of masonry, wood or iron beyond the wall surface. These supports, which are placed in a continuous course, are commonly used beneath a cornice line.

CORINTHIAN - see: Classical Orders

CORINTHIANESQUE - see: Classical Orders

CORNICE - see: Entablature

GLOSSARY (Cont'd.)

CORNICE SLAB - a cornice-like projection placed above a window.

CURTAIN WALL - an exterior wall, separate from the structural framework, which supports only its own weight.

DENTIL - one of a series of small blocks, resembling teeth, used as a molding in a classical entablature.

DORIC - see: Classical Orders

DROP LINTEL - a lintel over an arched or square-headed window which has vertical members continuing down the sides of the window for a short distance.

ECOLE DES BEAUX-ARTS - France's national school of fine arts located in Paris which is the oldest and most celebrated architectural school in the world. During the second half of the 19th century, the school promoted a resurgence of classical forms which became known as the Beaux-Arts style. A description of this style can be found in the "Stylistic History" in Part I.

EGG-AND-DART MOLDING - a classical molding consisting of alternating egg and dart-shaped forms.

ENTABLATURE - the group of horizontal members immediately above column capitals; it consists of :

ARCHITRAVE - the lowest member, resting directly upon the column capitals. An architrave is also occasionally extended to enframe the sides of a door or window opening which is topped by an entablature.

FRIEZE - the middle member of an entablature which in 19th-century architectural styles is frequently embellished by panels or medallions and interrupted by large cornice brackets. 19th-century adaptations of classical orders often combine a frieze and cornice without an architrave.

CORNICE - the horizontally projecting topmost member of an entablature. It is frequently found by itself as the crowning motif of a facade.

FANLIGHT - a semicircular window placed over a door with bars or muntins radiating from its center like the spokes of a fan.

FENESTRATION - the arrangement of the windows of a building.

FINIAL - an ornamental form at the top of a gable, pediment, gatepost, spire, pinnacle, etc.

FRIEZE - see: Entablature

IONIC - see: Classical Orders

IRON VAULT COVERS - a number of iron plates with lights that lie over the vaults and are on the same level as the sidewalk.

KEYSTONE - the central voussoir of a masonry arch.

LIGHT - generally, a pane of glass, but in the section of this report that deals with sidewalks and iron vault covers, it referrs to pieces of glass of various shapes, sizes and colors that are inserted in iron plates.

LIGHT-PLATFORM - a flat, raised area in front of the facade of a building that is made up of a number of iron plates with lights and which stands over the vaults.

GLOSSARY (Cont'd.)

MODILLION - a small ornamental bracket used in a closely spaced, regular series below a projecting cornice.

NECKING - a molding at the top of the shaft of a column just below the capital.

PALAZZO - an Italian "palace", usually associated with those from the Renaissance. When referring to 19th-century architectural styles, however, a "palazzo" can be any large impressive building whose style was derived from Italian Renaissance sources.

PARTY WALL - a single wall separating two adjacent buildings which is jointly owned by the two respective parties and acts as a bearing wall for both structures.

PEDIMENT - a low, usually triangular gable constructed in a classical style that is often filled by sculpture and usually framed by a cornice. It is used decoratively to crown central bays, porticos and important windows of a facade and is sometimes segmental in shape or broken away in the center.

PIER - in masonry architecture, an upright supporting member carrying a structural load. When interpreted in cast iron, an exterior pier is in most instances merely a solid part of the curtain wall placed between the windows and/or on either side of a facade.

PILASTER - a shallow, flat engaged column, normally serving only a decorative function.

QUOIN - in masonry architecture, large stones used to reinforce a corner or salient angle of a building. When interpreted in cast iron, rusticated quoins were used decoratively to emphasize the flanking piers.

RANDOM ASHLAR - system of laying stone walls in which neigher vertical nor horizontal joints are continuous.

RISER - the verticle member between the treads of a stair.

RUSTICATION - in masonry architecture, an emphasis of individual stones by recessing their connecting joints.

SEGMENTAL ARCH - an arch in which the curvature is a segment of a circle, but less than a semicircle.

SOFFIT - the exposed underside of a lintel, arch or cornice.

SOLDIER COURSE - a course of bricks set on their ends.

SPANDREL - the space between the outer curve of an arch and its rectangular enframement or between two adjacent arches and a horizontal member above them.

SPANDREL PANEL - in skeleton-frame construction, the wall panel between the head of one window and the sill of a window directly above it.

TAXPAYER - a nondescript structure of one or two stories erected to produce income to pay for the tax on the property.

TERMINAL BLOCK - a decorative block placed at the extreme ends of a cornice between floor levels, thus interrupting the quoin lines or flanking piers of a facade.

TREAD - the horizontal surface of a step.

TRIGLYPH - a rectangular decorative block, cut with vertical grooves, that is set in a regular series along a Doric frieze.

GLOSSARY (Cont'd.)

TUSCAN - see; Classical Orders

VAULT - a cellar room used for storage and often extended under the sidewalk.

VERMICULATION - a relief cutting on stone that simulates undulating worm tracks.

VOUSSOIR - a wedge-shaped stone forming part of a masonry arch.

C. SIDEWALKS, CURBS AND IRON VAULT COVERS

On November 12, 1845, Thaddeus Hyatt patented a method for making iron vault covers with glass lights. Prior to this time, if the owner of a building wished to make full use of his basement space, he had to illuminate it in one of two ways, both undesirable. He either had to use oil, kerosene or gas lighting, thereby increasing the danger of fire, or he had to resort to having an areaway in front of basement windows, thereby creating space he could not use and forming an obstacle on the street for pedestrians. By contrast, if an owner used Hyatt's invention, he not only could safely illuminate his basement but also could use the space that an areaway wasted and remove the obstacle it created on the street.

Later, when cast iron was used more frequently for storefronts, it was possible to have larger amounts of window space for the display of goods. By using a light platform, raised above the level of the street, instead of an iron vault cover on th level of the sidewalk, a store owner was able to provide an area where potential customers could stand and view his goods without being jostled by pedestrian traffic or blocking its flow. For stores that were on streets too narrow for a light platform, one or two wide steps in front of the display windows served the same purpose.

Although the Historic District has no iron sidewalks -- the only known example of an iron sidewalk still existing in New York City is in front of #77 Chambers Street -- it still retains a wide variety of iron vault covers, stoops and light platforms. Their treatment commonly included a number of pink-tinted, convex circle lights surrounded by six raised metal studs on the tread and another series of convex circle lights framed by a raised metal hexagon on the riser. Although this is the most frequently found arrangement, there are many variations. The Thaddeus Hyatt covers along the Howard Street facade of the Arnold Constable & Co. store have circle lights in diamond-shape frames. The Haughwout building had large pentagonal lights of various tints, and the Whyte building at #101 Spring Street had clear, six-inch-by-six-inch squares on the light platform along its Mercer Street facade.

A number of the iron manufacturers who produced cast-iron storefronts and facades within the District, such as Badger, Cornell, Jackson and Althause, also made iron vault covers, stairs and light platforms. Some of the others who were active in their production were Jacob Mark, G. Vreeland, Lige & Jacobson and L. P. Case.

Builders continued to use light vault covers until the end of the 19th century, when electric lighting made them no longer necessary.

The Historic District also has many sidewalks made of granite or bluestone that were laid during the last half of the 19th century. The following list indicates where they appear and also notes the location of cast-iron lampposts.

CANAL STREET (Cont'd)

Canal Street: North Side
Wooster to West Broadway (Block 228)

The iron vault covers and light platforms have been resurfaced or removed.

The sidewalk along this block is concrete with metal edging, with one exception.

#365-367	Iron vault cover: The three-step light platform has been resurfaced and cut at points to provide access to the basement.
#371	Sidewalk: Granite.

GRAND STREET

The iron vault covers or light platforms have been resurfaced or removed.

The sidewalk is generally concrete with bluestone curbs.

The roadway of Grand Street is paved with Belgian blocks, except at the intersections.

Grand Street: South Side
West Broadway to Wooster Street (Block 228)

The iron vault covers, if there were any, have been removed.

The sidewalk is concrete with bluestone curbs.

#53 — Iron vault covers: Bluestone covers the vaults.

Grand Street : North Side
West Broadway to Wooster Street (Block 475)

The iron vault covers that still remain have been resurfaced.

The sidewalk is concrete with bluestone curbs.

#70 — Iron vault covers: Resurfaced with asphalt.

Grand Street: South Side
Wooster to Greene Street (Block 229)

The iron vault covers have been resurfaced or removed.

The sidewalk is concrete with bluestone curbs.

There is the stem of a 19th-century lamppost on the southwest corner of Grand and Greene Street.

Grand Street: North Side
Wooster to Greene Street (Block 475)

The iron vault covers and steps have been resurfaced or removed.

The sidewalk is concrete with bluestone curbs. However, it is granite around #80-88.

#72 — Iron vault cover: Resurfaced with metal sheets.

#74 — Iron vault covers: The three steps in front of the building have been resurfaced.

Grand Street: South Side
Greene to Mercer Street (Block 230).

The iron vault covers have been resurfaced.

The sidewalk is mostly concrete with bluestone curbs, but there is some bluestone.

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WEST BROADWAY

Most of the remaining light platforms along West Broadway have been resurfaced or covered with new loading platforms.

The sidewalks are usually concrete with granite curbstones.

The roadway along West Broadway is paved with Belgian blocks.

West Broadway: East Side Only
Canal to Grand Street (Block 228)

The only iron vault covers along this block are in front of #307-309 and on th West Broadway facade of #53 Grand Street. Those in front of #307-309 have been resurfaced with asphalt and those at #53 Grand are covered with bluestone slabs.

The sidewalk is concrete with granite curbstones with the exception of #307-309, which is granite slabs with incised curbs.

West Braodway: East Side Only
Grand to Broome Street (Block 475)

There are two iron stoops with lights that have been resurfaced.

The sidewalk is concrete with granite curbstones.

#351-353 — Iron vault covers: The five-step vault stoop and light platform which originally had circle lights surrounded by six raised metal studs on the treads and circle lights in hexagonal metal frames on the risers, has been covered by a loading platform.

#359 — Iron vault covers: There is a resurfaced six-step iron stoop.

West Broadway: East Side Only
Broome to Spring Street (Block 487)

The iron vault covers and light platforms have been resurfaced.

The sidewalk is concrete with granite curbstones.

#367 — Iron vault covers: Resurfaced with cement, but the origina granite banding around the covers is still there.

#383-385 — Iron vault covers: The original five-step light platform is still there.

#391 — Iron vault covers: Resurfaced.

West Broadway: East Side Only
Spring to Prince Street (Block 501)

The iron vault covers and light platforms have been resurfaced or removed.

With two exceptions, the sidewalk is concrete with granite curbstones.

#407-409 — Iron vault covers: Open areaway

#419 — Sidewalk: Granite with incised curbs.