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Ø **MANHATTAN EAST  
SIDE TRANSIT  
ALTERNATIVES**

**ARCHAEOLOGICAL  
ASSESSMENT**

MTA

SEQR-A-M

**418**

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**HISTORICAL**  
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## TECHNICAL SUMMARY

### A. INTRODUCTION AND METHODOLOGY

As described in Chapter 7, Section 106 of the National Preservation Act of 1966 and the New York State Historical Preservation Act of 1980 both require government agencies (federal and state, respectively) to consider the effects of their actions on any properties listed on or determined eligible for the National and State Registers of Historic Places. The National Environmental Policy Act and the State Environmental Quality Review Act also require such consideration.

Properties listed on or determined eligible for the National and State Registers can include historical resources, not a part of this study, and also archaeological resources. Because of the long history of activity in parts of the MESA study area, archaeological sites containing artifacts, features, and architectural remains may be buried in the project area. Many of these locations that once contained archaeological resources have since been disturbed or destroyed by later grading, excavation, installation of utilities, construction of subway lines, and other development activities. In some locations, however, archaeological resources may remain. If present, these could provide information about Manhattan's early history and therefore may be eligible for listing on the State and National Registers of Historical Places.

Build Alternatives 1 and 2 both have the potential to disturb or destroy archaeological resources, if present, in locations where surface excavation would occur. Therefore, this documentary research was undertaken by Historical Perspectives, Inc., to determine whether locations that would be disturbed for the project alternatives could contain archaeological resources.

As detailed below, the archaeological study encompassed five steps:

- Definition of the Area of Potential Effect, or APE. This is the area where project activities could disturb the ground enough so that if any archaeological resources are present, they could be affected. The APE is the study area for archaeological resources.
- Identification of Potential Resources within the APEs. Once the APEs for the project were defined, preliminary documentary research was undertaken to identify any possible archaeological resources within the APE.
- Documentation of Disturbance and Identification of Potential Undisturbed Resources. Construction activities and other ground disturbance were evaluated to determine whether these may have disturbed or destroyed any potential archaeological resources identified through documentary research in the previous step. The result of this assessment was an inventory of potential archaeological resources that may remain in the project area.

APE

- Assessment of Impact. The project alternatives' effects on the potential archaeological resources identified was then assessed.
- Identification of Mitigation. For all potential significant adverse impacts identified, mitigation measures were developed.

Each of these steps is described in more detail below.

## **DEFINITION OF THE AREA OF POTENTIAL EFFECT (APE)**

In spring 1997, it was determined in consultation with the State Historical Preservation Office (SHPO) at the New York State Office of Parks, Recreation and Historical Preservation (OPRHP) that the No Build Alternative and Transportation Systems Management (TSM) Alternative would not have any potential for adverse effects on archaeological resources. Therefore, the alternatives to be studied were Build Alternatives 1 and 2. The first step in the analysis was to establish, in consultation with SHPO and the New York City Landmarks Preservation Commission (LPC), Areas of Potential Effect (APEs) for archaeological resources for these project alternatives. APEs are areas where any archaeological resources, if present, could be affected by project activities. These are the areas to be studied in the analysis.

The APEs for archaeological resources encompass any locations where excavation or ground disturbance would be required for the project alternatives. The APEs include locations on the Upper East Side and in East Harlem where cut and cover construction would occur for the new subway proposed as part of Build Alternatives 1 and 2, and the site proposed as a construction staging location for the new subway for those alternatives. The APEs do not include areas where an existing tunnel would be used or where deep-bore tunneling would take place, since these activities would not affect locations where archaeological resources could be located.

The APEs also include the entire route of the LRT in Lower Manhattan and on the Lower East Side, except where existing tunnel is proposed to be used beneath Centre Street. The LRT route has no potential to disturb any archaeological resources along Centre Street. The APEs for the LRT also include the site on the Lower East Side proposed for use as a maintenance and storage yard for the LRT and the route to be used by LRT vehicles to reach that yard.

The various ventilation shafts and fan chambers required for the subway (in Build Alternatives 1 and 2) throughout its alignment and the six new below-grade electric substations required for the LRT (in Build Alternative 2) would also disturb the ground and therefore could affect archaeological resources. However, at this point in the study, the specific locations to be affected have not yet been determined, so site-specific analysis of the potential for the presence of archaeological resources is not possible.

## IDENTIFICATION OF POTENTIAL RESOURCES WITHIN THE APES

Despite the intensive development activities that have taken place in Manhattan, archaeological resources remain buried at different locations throughout the city. For example, important resources from the 17th and 18th centuries have been found throughout Lower Manhattan, on sites that were covered by 19th or 20th century structures. Subsurface features from early uses can remain in small portions of a property that are not disturbed by later buildings, or can be buried beneath buildings, roadways, and parking lots that were constructed later. The types of archaeological resources that may be present in Manhattan are described below.

For each of the APEs for Build Alternatives 1 and 2, documentary and cartographic research was conducted to determine past uses that may have resulted in important archaeological resources. These include any Prehistoric use and various historical uses, predominantly from the 17th, 18th, and early 19th centuries. To structure the study, the resources that might be found in the APEs were divided into the following categories, based on categories created by LPC for its Draft Predictive Model for Archaeological Resources developed in 1983.

- *Prehistoric (Native American)*. Native American sites that have been identified in the New York City region are typically located on high ground near freshwater ponds, streams, and tidal inlets and coves. Because Native American archaeological sites in Manhattan are extremely rare, any site would be considered extremely valuable. To help ensure that no possible sites are missed, any locations that had appropriate topographic features before development and any locations noted in historical sources as former sites of Native American camps, villages, etc., are considered potential prehistoric sites unless later activities have disturbed them.
- *Residential*. Before municipal water and sewer services were available in the mid-19th century, residences throughout Manhattan typically had privies, wells, and cisterns in their yards. The shafts of the privies and wells and the deep holes for the cisterns were often filled with refuse once they were no longer in use, and consequently can be valuable archaeological time capsules. Foundations of early residential development could also be important, but later residential structures would typically not be. Early residential development occurred throughout Lower Manhattan and the Lower East Side, with scattered residences (mostly farms and estates) in the rest of the MESA study area.
- *Governmental and Institutional*. Early civic structures such as town halls or other governmental buildings and early institutions (for example, almshouses or medical facilities) can provide valuable archaeological evidence of those activities. In the study area, these structures would be most likely in Lower Manhattan or on the Lower East Side.
- *Military*. During the Revolutionary War, garrisons and forts were built throughout southern Manhattan, and additional fortifications were built prior to the War of

1812. Evidence of these structures and the activities that took place in and near them would be considered significant.

- *Commercial and Industrial.* Early (particularly 17th, 18th, and early 19th century) commercial and industrial ventures, like residences, may have left archaeological evidence behind. This information can be particularly valuable when it is from the city's earliest development periods, such as occurred in Lower Manhattan. Archaeological remains can include deposits in the yards, privies, wells, and cisterns, and the foundations of the buildings themselves.
- *Cemeteries.* Cemeteries can be a significant archaeological resource, and can also be important sites that should be left in place rather than disturbed by project activities. The most obvious example is the African Burial Ground discovered in Lower Manhattan, just north of City Hall, which is now protected as a New York City Historic District. Because cemeteries are not always clearly marked on historical maps, the research also focused on churches from before the mid-19th century, assuming that those could have had cemeteries nearby.
- *Made land (landfill).* Landfill can be an important archaeological resource, if the materials used to create the land can be tied to a specific time and group of people or individual. This connection provides context and association to the materials in the fill. Landfill without that associative value is not generally significant. Another valuable resource that can be associated with landfill is sunken ships, which were sometimes used in the process of creating land, which can be preserved beneath the existing ground surface. All of the APE along Water Street, much of the APE along Avenue D, the easternmost portion of the 14th Street APE, and some of Second Avenue APE in East Harlem were created through landfilling.
- *Docks and wharves.* These features were often used to create landfill, and consequently such waterfront features may be buried in what is now dry land. In the study area, this is most likely along Water Street and possibly along Avenue D. Docks and wharves can be valuable archaeologically when they may provide information on construction techniques that is not otherwise available.
- *Transportation.* Former trolley lines are now buried in many of the street beds throughout Manhattan. While surviving tracks are not necessarily worthy of further consideration, other features should be considered as potential archaeological resources such as cast iron saddles, which was a support structure for the earliest electrified trolleys. In addition, elevated railroad lines extended through much of Manhattan and there may be truncated piles and/or pylons, which once supported the trestles, remaining in some of the street beds. These resources are pervasive throughout Manhattan and have minimal archaeological research potential.
- *City water systems.* Evidence of the city's earliest water system, if still present, would be considered a significant archaeological resource. However, such features are unlikely in the study area since most are located in southern Manhattan, and would be deeply buried below the anticipated depths of impact.

- *Other.* LPC's categories also include agriculture and parks and recreation. However, neither would be expected to be significant archaeological resources in the MESA study area. Much of Manhattan north of the original settlement south of Wall Street has been used for agriculture, and in particular, historical maps show agricultural land including fields related to the Stuyvesant estate in the study area from the Lower East Side north through Harlem. This type of resource is unlikely to have survived the intensive development that later occurred through the study area. Similarly, little evidence of parks is expected to have survived the later development that occurred.

Preliminary documentary research was conducted to identify locations where these types of archaeological resources might be located in the APEs. This involved using information and files available at the offices of OPRHP and LPC, including predictive models, neighborhood studies, planning documents, and site inventory forms; the New York State Museum's site files; and secondary sources (including reference books and archaeological studies completed for other projects) and historical maps and atlases at the New York Public Library. Because Lower Manhattan was developed earliest, followed by the Lower East Side, most of the historical activities that may have resulted in archaeological sites were concentrated in those two zones of the study area. The results of this research are summarized below under B, "Existing Conditions."

## **DOCUMENTATION OF DISTURBANCE AND IDENTIFICATION OF POTENTIAL UNDISTURBED RESOURCES**

For any locations where potential resources were identified, utility maps and historical and topographic maps were reviewed to identify areas where later activities may have caused subsurface disturbance to any archaeological resources present there. The culmination of this effort was the identification of areas that, based on their original topography and later development, are determined to have the potential to contain intact archaeological resources. Such areas are referred to as archaeologically "sensitive." The results of this research and the potentially archaeologically sensitive areas throughout the MESA study area are described below in B, "Existing Conditions."

## **ASSESSMENT OF PROJECT IMPACTS AND IDENTIFICATION OF MITIGATION**

For each area that was identified as archaeologically sensitive, the project alternatives' potential for significant adverse impact to archaeological resources was assessed, and mitigation measures developed. The results of these steps are described later in this summary under C. "Probable Impacts of the Project Alternatives," and D. "Mitigation Measures."

## B. EXISTING CONDITIONS

### LOWER MANHATTAN

#### WATER STREET (FROM BROAD TO FULTON STREET)

- Potential Resources

*Prehistoric Period.* The land along what is now Water Street from Broad Street to its intersection with Pearl Street (at Fulton Street) was under water when Manhattan was first settled by Europeans and therefore could not have been occupied by Native Americans. Some of the area may have been dry land thousands of years ago, when sea levels were lower, but these areas are now buried beneath many feet of fill material and is therefore outside (below) the APE for MESA. No potential prehistoric resources are located in the Water Street APE. ✓

*Historical Period.* Potential archaeological resources from the historical period are tightly clustered in Lower Manhattan, particularly south of Fulton Street. Water Street was created beginning at the end of the 17th century, when landowners along Pearl Street were required to build a wharf behind (east of) their properties for use as a public street. Over the next decades, docks and piers were built and then the east side of Water Street was gradually filled in. The first buildings were constructed along Water Street by the early 18th century.

Water Street was widened considerably (in some cases, more than doubling its width) in the 1960's, taking in land once occupied by buildings. LPC's files identify a long list of potential archaeological resource locations along Water Street, and the files of SHPO list at least eight inventoried archaeological sites within or abutting the Water Street APE.

- Documentation of Disturbance/Identification of Potential Undisturbed Resources

The numerous utility lines beneath Water Street have probably adversely affected potential buried archaeological resources there. However, most of these utilities are clustered in a 25-foot-wide band in the center of the pre-widened Water Street, leaving the easternmost portion of the street (once the location of 18th century buildings) undisturbed. The subway tunnels that cross Water Street at William Street and Broad Street would have eliminated any archaeological sensitivity in those two locations. The Water Street APE is sensitive for historical-period cultural resources except at William and Broad Streets. ✓

## PEARL STREET (FROM FULTON TO FRANKFORT STREET)

- Potential Resources

*Prehistoric Period.* At what is now Fulton Street, the eastern portion of Pearl Street (the part that falls into the MESA APE) was land underwater when European settlers arrived in New York, and therefore could not be occupied by Native Americans. North of Fulton Street, however, Pearl Street ran along the East River shoreline. It is possible that prehistoric encampments could have been located along this shoreline. Consequently, if undisturbed, this area has a moderate sensitivity for prehistoric cultural resources.

*Historical Period.* Pearl Street was laid out by 1707, and was lined with buildings by the 1720's. Along the eastern part of Pearl Street (the part within the APE) from Fulton Street to Beekman Street, fill had been added by the 1720's to create Beekman Slip. This was surrounded on the north, west, and south by buildings; the northern terminus of Water Street was at these buildings along Beekman Slip. By the 1760's, the slip had been filled in, and by the end of the century the buildings had been removed to allow continuation of Fulton and Water Streets.

As first laid out, Pearl Street was narrow and curving, since it followed the original East River shoreline. In 1814 it was widened to 50 feet and straightened, by removing numerous buildings. In the 20th century, Pearl Street was widened again, and has cut into properties that lined the original roadway as well as the wider roadway of the 19th century. Similarly, Fulton Street was widened considerably in the 1920's by cutting through former private property on the north side of the street, on the block at the northeast corner of Fulton and Pearl Streets also over the site of former 18th century structures.

LPC's archaeological sensitivity maps identify the eastern side of Pearl Street from approximately Fulton to Beekman Street as the original shoreline of Manhattan (and therefore possibly sensitive for archaeological resources). They also identify a number of early structures within or abutting this part of the APE, including an early 17th century structure in Pearl Street at Peck Slip.

- Documentation of Disturbance/Identification of Potential Undisturbed Resources

Utilities are clustered in a 20-foot-wide band beneath the original width of these streets. Consequently, the former building lots now in the roadway may be undisturbed. In addition, an elevated railroad line ran along Pearl Street, with stations at Fulton and Frankfort Streets. The footings for this line caused limited disturbance. The subway tunnel built in the 1930's beneath Fulton Street was not constructed using the cut and cover method and therefore would not have disturbed archaeological resources.

The Pearl Street APE is sensitive for historical-period archaeological resources, including 17th and early 18th century commercial and residential structures, associated shaft features (cisterns, privies, wells), and landfill materials. Also, some areas of the street have remained undisturbed and have the potential for prehistoric resources.

## FRANKFORT STREET

- Potential Resources

*Prehistoric Period.* If undisturbed, the APE along Frankfort Street has a moderate sensitivity for prehistoric cultural resources, because of its former location along the East River shoreline.

*Historical Period.* Frankfort Street was cut through from Centre Street eastward to Gold Street by 1730, and to midway between Gold and Pearl Streets by the 1750's. East of its terminus was a swampy area occupied by a tannery dating from the early 1700's or before. This tannery was closed, the swamp filled, and Frankfort Street completed by the 1790's. The street was completely lined by buildings by 1800, including Tammany Hall at Centre Street, a church on the north side of Frankfort Street at William Street, and numerous other commercial and residential structures dating from as early as the 1720's.

Before construction of the Brooklyn Bridge, Frankfort Street was a narrow street located in a slightly different location than today. As originally built, Frankfort Street bent northward from Centre Street to Pearl Street, where it terminated at the northern end of a square called Franklin Square, some 120 feet farther north than its current terminus. When the bridge and its approaches were constructed in the 1880's, Frankfort Street was widened from Centre to Gold Street, so that the north part of today's existing street crosses former city blocks. From Gold to Pearl Street, Frankfort Street was relocated to the south of its former location, also cutting through what had been the sites of buildings and yards which contained early commercial, residential, and industrial sites, as well as a possible cemetery. The early 18th century tannery mentioned above also operated in this area. The church was located in the APE from the early 18th century into the 19th, and although no cemetery is shown on historical maps, interments may have taken place beneath the floor of the building itself.

- Documentation of Disturbance/Identification of Potential Undisturbed Resources

The Brooklyn Bridge and associated ramps and utilities have caused disturbance. However, some of the former building lots once located alongside Frankfort Street and now within the APE may have remained undisturbed. The exact extent of disturbance from construction of the bridge cannot be determined without additional research, and most of the utilities are clustered in the center of the street,

leaving the current and former sidewalk areas undisturbed. Some areas may have remained undisturbed and therefore are sensitive for prehistoric resources too. ✓

## LOWER EAST SIDE

### CANAL STREET (THE BOWERY TO EAST BROADWAY)

- Potential Resources

*Prehistoric Period.* A site file search at the New York State Museum and documentary sources identified one prehistoric site in this area, a Native American village site that was near the East River in the vicinity of Canal Street. The precise location of this village is unknown, but it may have been within the APE. ✓

*Historical Period.* Canal Street was laid out from the Bowery to approximately Division Street (one block west of its current terminus at East Broadway) between 1757 and 1767, and structures were built all along the north side and portions of the south side of the street. The south side was fully built up by 1800. In 1855, the street was widened from 50 to 75 feet, by removing or cutting back houses on the north side of the street. The extension east from Division Street to East Broadway was completed. Two city blocks were truncated, affecting 12 lots with buildings. The easternmost portion of Canal Street and Strauss Square now occupy the locations of those former building lots.

- Documentation of Disturbance/Identification of Potential Undisturbed Resources

Major subsurface disturbance was caused by construction of the Manhattan Bridge approaches in 1909 and of four subway tunnels on or crossing Canal Street between the Bowery and Christie Street. Additional subway construction at Strauss Square would have destroyed any archaeological resources there. In addition, the elevated railroad that crossed Canal Street at Allen Street, with a station at Canal Street, caused disturbance as did the numerous utility lines. However, these utilities are not likely to be concentrated in the northern portion of Canal Street, and they do not run along Canal Street east of Division Street.

The Canal Street APE from Christie Street to East Broadway is considered potentially sensitive for historical and prehistoric archaeological resources. The northern side of Canal Street from Christie Street to East Broadway is potentially sensitive for residential and/or commercial remains from the mid-18th through mid-19th century. In addition, the easternmost block of Canal Street, which crosses former building lots, is also considered archaeologically sensitive. ✓✓

## EAST BROADWAY AND GRAND STREET

- Potential Resources

*Prehistoric Period.* As described above in the discussion of Canal Street, a prehistoric site was reported in this area near the East River in the vicinity of Canal Street. The precise location of this village is unknown, but it may have been within the APE.

*Historical Period.* This part of the study area was first developed as agricultural land east of the Post Road (now the Bowery). During the Revolutionary War, a fortification extended eastward from the Post Road approximately along the route of what is now Grand Street dating to 1775-1776.

By the end of the 1790's, the fortifications were gone and Grand Street had been built. East Broadway was laid out from Canal Street to Montgomery Street, with structures along both sides, but did not yet extend to Grand Street. In its future path just south of Grand Street a building stood. In the first decade of the 1800's, East Broadway was completed to Grand Street, and both streets were lined with numerous small buildings.

- Documentation of Disturbance/Identification of Potential Undisturbed Resources

Numerous utility lines have caused disturbance, but some of the streetbed most likely remains undisturbed. Major subsurface disturbance was caused by construction of the subway station at the intersection of East Broadway and Rutgers Street (at Strauss Square).

Outside of areas disturbed by utilities and the Strauss Square area, the East Broadway and Grand Street APE is potentially sensitive for prehistoric and historical-period archaeological resource including Revolutionary War fortifications and possible remains associated with the single building that once stood in the route of East Broadway near Grand Street. These may be in the first 150 feet of the roadbed of East Broadway west of Grand Street. ✓

## KAZAN/COLUMBIA STREET (FROM GRAND TO EAST HOUSTON STREET)

- Potential Resources

*Prehistoric Period.* The land at what later became Kazan Street between Grand and Delancey Streets was a series of knolls south of an East River inlet and, therefore, is considered potentially sensitive for prehistoric archaeological resources.

*Historical Period.* Historical maps indicate that a large swampy area was located at Columbia Street around Delancey Street until the 1760's, but was apparently filled when the Revolutionary War fortifications described above (in the discussion of East Broadway and Grand Street) were constructed. These fortifications occupied an area along Grand Street, including present-day Columbia Street from Delancey to Stanton Street. The fill materials, which would be associated with construction of the fort, have archaeological potential, as do any remains from the fort itself.

Columbia Street was first opened in 1795. By 1811 both sides of the street were developed from Grand Street to Stanton Street. In the 20th century, the small buildings along Kazan and Columbia Streets were gradually replaced with larger structures, including Amalgamated Dwellings, Hillman Housing, Masaryk Towers, and Baruch Houses. Along with this construction, Columbia Street was widened in the 1950's from 50 to 80 feet with 30' of land along the east side of the street gained from building lots. The side yards and backyards on each block also faced onto this section of Columbia Street within the APE. These may have contained cisterns, wells, or privies associated with previous residents there.

- Documentation of Disturbance/Identification of Potential Undisturbed Resources

Utilities are clustered beneath the older (western) side of the street, while the majority of the remainder of the street has no utilities. Between Grand and Delancey Streets, areas of Kazan Street that have been unaffected by utilities are considered potentially sensitive for prehistoric archaeological resources. The extent of grading that has occurred here is unknown. ✓

Between Grand and Houston Streets, areas of Kazan and Columbia Streets undisturbed by utilities are potentially sensitive for remains related to filling of the marsh near Grand Street, the Revolutionary War fortifications, and early 19th century residences and businesses that had backyards and side yards that are now within the APE. ✓

#### AVENUE D (FROM EAST HOUSTON TO 14TH STREET)

- Potential Resources

*Prehistoric Period.* No potentially sensitive areas were identified within this portion of the APE.

*Historical Period.* The first buildings along Avenue D were constructed between 1811 and 1836, and probably postdate 1823, when the width of the street was set. These buildings extended as far north as 10th Street. Development was a mix of residential and commercial uses on small lots as far north as 9th Street; to the north, where Avenue D had not yet been built, were large-scale manufacturing concerns.

By the 1830's, a dry dock occupied the area from 10th to 12th Streets, including the future location of the Avenue D roadbed. Railroad tracks crossed Avenue D to connect shipyard buildings on the east with Dry Dock Street (now Szold Place) on the west. By the 1850's, a ship plank and timber yard were located in the future Avenue D roadbed. Farther north, the Novelty Iron Works was established before the 1850's between Avenue C and the river from 12th to 13th Street. The iron works extended across the future location of Avenue D. By 1857, it had expanded to occupy both sides of Avenue D from 11th to 14th Streets. In addition, a second ironworks occupied the east side of Avenue D between 9th and 10th Streets by the 1850's.

By the 1880's, Avenue D had been extended north to 14th Street, cutting through the industrial properties. The area between 10th and 11th Streets was occupied by a tobacco factory, and the portion of the shipyard north of 11th Street as well as the entire Novelty Iron Works had been replaced by the New York Mutual Gas Light Company. The smaller ironworks between 9th and 10th Streets was still present in the 1880's.

In the 1960's the street was widened to encompass the front portions of earlier building lots which are not archaeologically significant.

- Documentation of Disturbance/Identification of Potential Undisturbed Resources

Numerous utility lines beneath Avenue D have disturbed any archaeological resources in the western portion of the street, and a ca. 1960 interceptor sewer disturbed the easternmost portion of Avenue D. These have destroyed archaeological resources in these areas. Buried resources below these utilities are beneath the APE, and therefore, the Avenue D portion of the APE is not considered archaeologically sensitive. ✓

#### FOURTEENTH STREET

- Potential Resources

*Prehistoric Period.* Avenue A appeared to have once had a large knoll between two streams which would have been suitable for prehistoric occupation, and therefore if undisturbed would be considered potentially sensitive. In addition, LPC's sensitivity map indicates that areas at 14th Street and Second Avenue and at Broadway (the west side of Union Square) may also be archaeologically sensitive, based on their pre-development topography and proximity to fresh water.

*Historical Period.* A single building identified on maps by the name "Taylor", stood in the current 14th Street roadbed west of Irving Place between the 1780's and circa 1811.

Fourteenth Street was opened from Union Square to the East River shoreline (between Avenues A and B) in 1829. This required removing all buildings in the roadbed prior to construction. Filling of the marshes east of Avenue A continued through the middle of the 19th century, so that the shore was pushed to Avenue C by the 1830's and to Avenue D by around 1850. The landfill materials lack associative and thus archaeological value.

The sites of industrial concerns that once operated near 14th Street and Avenue D, including the Novelty Iron Works, would not be considered archaeologically important. In this location was the iron works' coal yard, which would not be an archaeologically significant resource.

- Documentation of Disturbance/Identification of Potential Undisturbed Resources

The prehistoric topography of 14th Street was clearly substantially altered when hills were graded and wetlands filled. The L subway line runs beneath 14th Street, with stations at First, Third, and Fourth Avenues and associated vents in the sidewalks along 14th Street, and has disturbed any potential archaeological resources. Between Fourth Avenue and Broadway (on the south side of Union Square), the Union Square subway station construction destroyed any potential archaeological resources in that area. Finally, additional disturbance could also have resulted from the construction and later dismantling of the elevated railroad lines on Avenue A, First, Second, and Third Avenues. Each of these railroad lines had a stop on 14th Street.

Consequently, no potential archaeological resources are likely to remain in the 14th Street APE. However, if the depth or width of expected construction disturbance should ever change in the future, additional historical and archaeological research and study would be required to determine the effects on the former industrial complexes between 10th and 13th Streets and possible deeply buried prehistoric sites that may once have been located along the East River shoreline. ✓

## POTENTIAL LRT STORAGE AND MAINTENANCE YARD

- Potential Resources

*Prehistoric Period.* Early topographic maps show that the area was once level land near a series of knolls and a stream, and thus has a moderate sensitivity for prehistoric cultural resources.

*Historical Period.* The Revolutionary War fortifications centered on Grand Street (discussed above in the description of East Broadway and Grand Street) extended as far north as the yard site. After the war, the first structures on the yard site were three buildings that faced Broome Street, erected some time in the late 1700's. By 1811, the entire block had been built up with structures. An 1836 map indicates a building at the

northeast corner of Norfolk and Broome Streets, but it is not identified and does not appear on later maps. An 1852 map shows numerous buildings with large open back yards in the center of the block. The 1884 atlas also identifies Apollo Hall, a meeting or concert hall on the east side of Clinton Street, as well as a furniture factory on the northwest corner of Suffolk and Broome Streets.

By the 1920's, many of the earlier structures had been replaced by brick tenements, and the buildings along Delancey Street had been demolished to allow construction of the Williamsburg Bridge approach. A number of open back yards remained on the truncated blocks south of the new wider Delancey Street. The present route of Delancey Street South (the portion of Delancey Street south of the Williamsburg Bridge approaches) occupies the sites of former building lots that were previously on the south side of Delancey Street.

- Documentation of Disturbance/Identification of Potential Undisturbed Resources

Utility lines, and more significantly, the construction of the Williamsburg Bridge in 1903 had a major impact on this APE, causing the removal of all the buildings on the project block from Columbia Street to west of Pitt Street. Construction of the subway station beneath part of the block also would have destroyed archaeological resources.

The full extent of the disturbance to the block is unknown, and consequently it is possible that undisturbed areas remain in the APE. Areas that have escaped historical-period development (such as yards) may contain buried prehistoric resources. The entire APE must be considered sensitive for resources from the Revolutionary War fort once located nearby. In addition, the entire APE must be considered sensitive for residential and commercial structures from the late 18th century. ✓

## **EAST MIDTOWN**

As discussed above under "Definition of the Areas of Potential Effect (APEs)," the APEs include specific areas where construction activities associated with Build Alternatives 1 and 2 may disturb potential archaeological resources. No areas within East Midtown are included in any APE. Consequently, no analysis of potential archaeological resources in East Midtown is necessary.

## **UPPER EAST SIDE**

- Potential Resources

*Prehistoric Period.* The area between 69th and 72nd Streets was identified as moderately sensitive for prehistoric resources, because early topographic maps show that it was once at the top of a hill near a freshwater stream. Similarly, the area between 83rd and 86th Street is identified on sensitivity maps prepared by LPC as

potentially sensitive for prehistoric resources because of its location uphill from a freshwater stream. The APE between 92nd and 96th Streets has no potential for prehistoric archaeological resources, because before development it was inundated by a series of streams and was, therefore, not habitable.

*Historical Period.* No historical period development was identified in the APE between 69th and 72nd Streets. Between 83rd and 86th Streets, early 19th century maps show as many as five houses in or near the APE. The streams and marshes that formerly occupied the APE between 92nd and 96th Streets precluded the presence of any historical-period structures there. The material used to fill these wetlands is not expected to be archaeologically significant, given its late date and the lack of association.

- **Documentation of Disturbance/Identification of Potential Undisturbed Resources**

The hill shown on early topographic maps at Second Avenue near 72nd Street has since been leveled and no longer exists. The grading associated with removal of that hill would certainly have disturbed any potential archaeological resources once located there. In addition, installation of the numerous utility lines now located beneath Second Avenue would have caused impacts to any potential archaeological resources throughout the 69th-72nd Street and 83rd-86th Street APEs. Bedrock in these areas is shallow, and in some locations is so close to the surface that some blasting was required to install the utility lines. In much of those two APEs, boring logs taken in 1970 indicate that no natural soils remain above the bedrock, only fill. The combination of grading, creation of the Second Avenue roadway itself, installation of utilities, and construction and later demolition of the Second Avenue elevated train would certainly have destroyed any possible archaeological resources once located in the APEs. For the 93rd-96th Street APE, no potential archaeological resources were identified and consequently documentation of disturbance is unnecessary.

In all likelihood, no potential archaeological resources are located in the APEs on the Upper East Side. ✓

## **EAST HARLEM**

### **SECOND AVENUE**

- **Potential Resources**

*Prehistoric Period.* The APE between 96th and 99th Streets has no potential for prehistoric archaeological resources, because before development it was inundated by a series of streams and was therefore not habitable. The APE between 105th and 111th Streets, was once crossed by Harlem Creek and surrounding marshlands. The areas north, including the East 124th and 125th Street APEs, and south of the creek ✓

have been identified as former Native American planting fields, although no habitation sites were reported nearby.

*Historical Period.* The streams and marshes that formerly occupied the APE between 96th and 99th Streets precluded the presence of any historical-period structures. The material used to fill these wetlands is not expected to be archaeologically significant, given its late date and the lack of association with particular individuals or groups. Farther north, several early 19th century residential structures were located near the APE between 105th and 111th Streets, but the only features associated with these structures that would fall into the APE were the roads and drives leading to them, which crossed the APE. As with the 96th-99th Street APE, the material used to fill the marshlands surrounding Harlem Creek is not expected to be archaeologically significant.

The East 124th Street APE was identified as potentially sensitive for an early nineteenth century dwelling owned by Raub (sic) which stood from at least 1811 through at least 1836, but had been removed by 1851. Deep shaft features associated with the dwelling may be located within the APE.

- Documentation of Disturbance/Identification of Potential Undisturbed Resources

For the 96th-99th Street APE, no potential archaeological resources were identified and consequently documentation of disturbance is unnecessary. Between 105th and 111th Streets, activities associated with urbanization, grading, construction of the streetbed, construction and demolition of the Second Avenue elevated train, and installation of the numerous utilities would certainly have destroyed the fragile remains of Native American planting fields that may once have been located there. ✓

For the East 124th and East 125th Street APes, early nineteenth century historical period resources may have been deposited within East 124th Street. The disturbance record for this area did not suggest that extensive excavations were completed for the creation of the street, and there were minimal utility lines buried beneath it. There may be pockets of undisturbed soil within the street bed which may possess early nineteenth century home lot resources which have remained undisturbed. ✓ y

#### POTENTIAL CONSTRUCTION STAGING SITE

- Potential Resources

*Prehistoric Period.* Like the adjacent area along Second Avenue (the 96th-99th Street APE), the potential construction staging site (on the east side of Second Avenue between 96th and 97th Streets) was wetland before historical development. Therefore, it is not sensitive for prehistoric resources. ✓

*Historical Period.* After Second Avenue was opened in the 1860's, this block was filled some time during the next decade. Because of the late date of this fill and lack of associative value, the material used to fill the marshlands would not be archaeologically significant. By 1879, a brick structure containing the Second Avenue Railroad Depot had been constructed on the site. The depot most likely served as a service and storage area for vehicles used on the elevated railroad on Second Avenue, which was completed at the same time. The structure covered the entire block until at least 1927. By 1943, the structure had been demolished and replaced on the eastern part of the block with the high school building that is still there today.

- **Documentation of Disturbance/Identification of Potential Undisturbed Resources**

Although construction of the park and playground on the site may have disturbed some portions of the site, most of the APE remains undisturbed since its previous use. However, the nature of the structure that once stood there was such that it probably lacks archaeological visibility and potential importance. As part of the archaeological study conducted for the Route 9A Reconstruction Project, a similar site was researched for its potential sensitivity. The study concluded that the archaeological evidence associated with structures such as car depots, which had as their primary purpose storing and servicing railroad cars, would most likely include only the building footprints and tracks. These lack the potential to address meaningful research issues. Therefore, the construction staging site is not considered archaeologically sensitive. ✓

## **C. FUTURE CONDITIONS COMMON TO ALL ALTERNATIVES**

Without the proposed project, any archaeological resources buried in the APEs of the MESA alternatives will most likely remain in place. Repair work to utilities and other in-street work could have some additional effect on those resources, but otherwise there is no reason to expect them to be disturbed.

## **D. PROBABLE IMPACTS OF THE PROJECT ALTERNATIVES**

### **NO BUILD AND TSM ALTERNATIVES**

As described earlier, the No Build Alternative and TSM Alternative do not have the potential to affect archaeological resources.

### **BUILD ALTERNATIVE 1**

As described above under "Existing Conditions," potential archaeologically sensitive areas were identified in none of the APEs in the Upper East Side, and only

one of the APEs in East Harlem at East 124th Street. Therefore, the construction of the new subway tunnel in this area may have the potential to result in significant adverse impacts to archaeological resources.

Although the possible archaeological resources are presumed to be present and significant at this time, further research into subsurface conditions is required to better understand whether the resources may actually be present. Therefore, should this alternative be selected as the locally preferred alternative, additional research in the form of a full Stage 1A archaeological investigation will be conducted for the final alignment designed at that time. The research will be focused on seeking further cartographic and subsurface disturbance data, such as soil boring logs, utility maps, and profiles. In conjunction with this research, it is recommended that a series of soil borings be performed and analyzed to archaeological specifications. This research will provide additional information about disturbance that may have affected locations identified above as possibly archaeologically sensitive.

In addition to the new tunnel, the subway line would require ventilation shafts and fan chambers along its entire alignment. The ventilation shafts would be placed approximately every 400 feet within the sidewalk along Second Avenue, and the fan chambers would be approximately midway between the new stations. These features would require small areas of cut and cover construction in the sidewalks along Second Avenue. The specific location of these features will not be determined until a later phase of the project, should an alternative with the subway component be selected as the locally preferred alternative. At that time, to avoid significant impacts on archaeological resources, further research into the potential for archaeological resources in the selected locations will be conducted. If possible archaeological resources are identified, mitigation will be developed and implemented (see the discussion below under E, "Mitigation Measures").

## **BUILD ALTERNATIVE 2**

The potential for impacts related to construction of a new subway are discussed above under Build Alternative 1, and would be the same for the subway included in Build Alternative 2.

As detailed above under "Existing Conditions," numerous areas in the APEs in the Lower Manhattan and Lower East Side zones are considered potentially sensitive for archaeological resources. These include the following:

- Water Street from Broad to Fulton Street. All of this area except the intersections with William and Broad Streets may contain archaeological resources from the historical period (specifically, the 17th through 19th centuries).
- Pearl Street from Fulton to Frankfort Street. North of Fulton Street, Pearl Street may contain archaeological resources from the prehistoric period. In addition, all

of Pearl Street in the APE may contain archaeological resources from the historical period (specifically, commercial and residential remains from the 17th through 19th centuries, including structures and associated shaft features; a 17th century structure that stood in Pearl Street; a 17th century market; and the fill materials used to create dry land here).

- Frankfort Street from Pearl Street to near Centre Street. This APE may contain archaeological resources from both the prehistoric and historical periods, although it is possible that later bridge construction activities have disturbed any resources.
- Canal Street from Christie Street to East Broadway. This APE also may contain prehistoric and historical-period archaeological resources. These include the possible remains of a Native American village site, and possible mid-18th to 19th century residences and businesses.
- East Broadway (east of Strauss Square) and Grand Street. This APE is also sensitive for prehistoric and historical-period archaeological resources. Potential archaeological resources include a Native American village site, a Revolutionary fort, and late 18th and early 19th century businesses and residences, including a house that once stood in the path of East Broadway approximately 150 feet west of Grand Street.
- Kazan/Columbia Street. This APE is potentially sensitive for prehistoric resources from Grand to Delancey Street. It may also contain historical-period archaeological resources from Grand to East Houston Street. These include possible remains related to a Revolutionary War fort, landfilling (which may have been associated with the fort), and early 19th century residences and businesses.
- LRT Storage and Maintenance Yard. This APE may contain prehistoric and/or historical-period archaeological remains, including evidence of a Revolutionary War fort and residences and businesses from the late 18th century.

In all of these locations, the construction of Build Alternative 2 could result in adverse impacts to archaeological resources, if they are present. Buried remains from previous uses on a site are considered valuable if they may meet the criteria for eligibility for the State or National Registers of Historic Places. These criteria include association with significant historical (or prehistoric) events or activities, or potential to yield information important in prehistory or history. To be conservative, it is assumed that any sites identified above as having the potential to contain archaeological resources are potentially significant, until further research is conducted. Therefore, the research to date indicates that Build Alternative 2 could result in significant adverse impacts to archaeological resources along its right-of-way.

Although the possible archaeological resources are presumed to be present and significant at this time, further research into subsurface conditions is required in many locations to better understand whether the resources may actually be present. Therefore, should the LRT component of Build Alternative 2 be selected as the locally

preferred alternative, additional research in the form of a full Stage 1A archaeological investigation will be conducted for the final alignment designed at that time. The research will be focused on seeking further cartographic and subsurface disturbance data, such as soil boring logs, utility maps, and profiles. In conjunction with this research, it is recommended that a series of soil borings be performed and analyzed to archaeological specifications. This research will provide additional information about disturbance that may have affected locations identified above as possibly archaeologically sensitive.

In addition to the right-of-way and maintenance and storage yard, the LRT would require six new below-grade electric substations that would also disturb the ground and therefore could affect archaeological resources. As demonstrated by the research conducted for the project to date, much of Lower Manhattan and the Lower East Side has the potential to contain archaeological resources, and therefore the sites selected for the substations could be archaeologically sensitive as well. If so, the substations could result in significant adverse impacts to archaeological resources. Therefore, should the LRT be selected as the locally preferred alternative, the Stage 1A archaeological research will also focus on the specific sites chosen for these substations to determine their sensitivity and to develop appropriate mitigation measures.

## **E. MITIGATION MEASURES**

For the alternative selected as locally preferred, further archaeological research in the form of a full Stage 1A investigation will be undertaken for all areas considered potentially sensitive for archaeological resources. In addition, for the selected alternative, areas of potential disturbance that have not yet been specifically located (such as areas to be affected by ventilation shafts for the new subway or by electrical substations for the LRT) will be defined. Archaeological research in the form of a Stage 1A report will then be performed for those areas to determine their potential sensitivity as well as potential significance. The Stage 1A research will identify the potential significance of any archaeologically sensitive areas and, for any significant locations, will develop appropriate mitigation measures (such as archaeological testing or excavation) so that no significant adverse impact would occur.

## TABLE OF CONTENTS

I.	INTRODUCTION .....	1
II.	RESEARCH METHODS AND GOALS .....	2
	DEFINITION OF APES .....	3
	METHODOLOGY .....	6
III.	GEOLOGICAL HISTORY .....	7
IV.	CONTEXTUAL FRAMEWORK .....	8
	PREHISTORIC OVERVIEW .....	8
	Prehistoric Background .....	8
	Previously Identified Prehistoric Sites in the Project Area .....	12
	HISTORICAL OVERVIEW .....	14
	Historical Background .....	14
	Previously Identified Historical Site Types .....	32
V.	EXISTING CONDITIONS .....	40
	RESEARCH ISSUES .....	40
	PRESENTATION ORGANIZATION .....	42
	EXISTING CONDITIONS .....	42
VI.	CONCLUSIONS AND RECOMMENDATIONS .....	120
	BIBLIOGRAPHY	
	FIGURES	

## FIGURES

1. Project Limits, U.S.G.S. Quadrangle
2. Approximate Areas of Potential Effect (APEs)
3. Project Boundaries, East 69th to East 72nd Street APE
4. Project Boundaries, East 83rd to East 86th Street APE
5. Project Boundaries, East 92nd to East 99th Street APE
6. Project Boundaries, East 105th to East 111th Street APE
- 6a. Project Boundaries, East 125th and East 126th Street APE
7. Project Boundaries of Block 1668, East 96th Street and Second Avenue APE
8. Interior Photograph of Car Depot
9. Project Boundaries, Frankfort Street from Center Street to Pearl Street APE
10. Project Boundaries, Frankfort Street from Center Street to Pearl Street and Pearl Street from Frankfort Street to Peck Street APE
11. Project Boundaries, Canal Street from East Bowery to Ludlow Street APE
12. Project Boundaries, Canal Street from East Bowery to East Broadway APE
13. Project Boundaries, Water Street from Broad Street to Old Slip APE
14. Project Boundaries, Water Street from Old Slip to John Street APE
15. Project Boundaries, Water Street from John Street to Fulton Street, Fulton Street at Pearl Street, and Pearl Street from Fulton Street to Peck Street APE
16. Project Boundaries, East Broadway from Canal Street to Pitt Street APE
17. Project Boundaries, East Broadway from Pitt Street to Grand Street, and Grand Street from East Broadway to Columbia Street APE
18. Project Boundaries, Columbia Street from Grand Street to south of Delancey Street APE

19. Project Boundaries, Columbia Street from south of Delancey Street to East Houston Street APE
20. Project Boundaries, Avenue D from East Houston Street to East 7th Street APE
21. Project Boundaries, Avenue D from East 7th Street to Szold Street APE
22. Project Boundaries, Avenue D from Szold Street to East 14th Street and East 14th Street from Avenue D to Avenue C APE
23. Project Boundaries, East 14th Street from Avenue C to Avenue B APE
24. Project Boundaries, East 14th Street from Avenue B to Avenue A APE
25. Project Boundaries, East 14th Street from Avenue A to Second Avenue APE
26. Project Boundaries, East 14th Street from Second Avenue to Union Square APE
27. Project Boundaries, Light Rail Storage Yard and Shop Site, Essex Street, Attorney Street, South Delancey Street and Broome Street APE

**ARCHAEOLOGICAL SENSITIVITY MAPS:**

28. Archaeological Sensitivity, Frankfort Street from Centre Street to Pearl Street APE
29. Archaeological Sensitivity, Frankfort Street from Centre Street to Pearl Street, and Pearl Street from Frankfort Street to Peck Street APE
30. Archaeological Sensitivity, Canal Street from East Bowery to Allen Street APE
31. Archaeological Sensitivity, Canal Street from Allen Street to East Broadway APE
32. Archaeological Sensitivity, Water Street from Broad Street to Old Slip APE
33. Archaeological Sensitivity, Water Street from Old Slip to John Street APE
34. Archaeological Sensitivity, Water Street from John Street to Fulton Street, Fulton Street at Pearl Street, and Pearl Street from Fulton Street to Peck Street APE

35. Archaeological Sensitivity, East Broadway from Canal Street to Pitt Street APE
36. Archaeological Sensitivity, East Broadway from Pitt Street to Grand Street, and Grand Street from East Broadway to Columbia Street APE
37. Archaeological Sensitivity, Columbia Street from Grand Street to south of Delancey Street APE
38. Archaeological Sensitivity, Columbia Street from south of Delancey Street to East Houston Street APE
39. Archaeological Sensitivity, Light Rail Storage Yard and Shop Site, Essex Street, Attorney Street, South Delancey Street and Broome Street APE

## I. INTRODUCTION

MTA New York City Transit (NYCT) is considering improving transportation on the East Side of Manhattan. Four alternatives are being studied: The No Action Alternative, the Transportation Systems Management (TSM) Alternative, Build Alternative 1 (a new Second Avenue subway with a 125th Street/Pelham connection and routing along Broadway south of 63rd Street), and Build Alternative 2 (the new Second Avenue subway with a 125th Street/Pelham connection and routing along Broadway, as well as a new Light Rail Transit [LRT] on the Lower East Side and in Lower Manhattan; See Figures 1, 2).

For this archaeological assessment any activity which will cause even minor subsurface impacts is considered to have a potential effect on archaeological resources. This conservative approach was taken since it has been demonstrated in Manhattan that some types of resources may actually exist within the extant roadbeds, or directly beneath the surface at shallow levels.

The project area was divided into five subareas of study. From south to north these are: Lower Manhattan (from Battery Park north to Dover Street near City Hall Park); Lower East Side (from Dover Street north to East 14th Street); East Midtown (from East 14th Street to East 59th Street); Upper East Side (from East 59th Street north to East 96th Street); and Harlem (from East 96th north to East 125th Street). The actual boundaries of impact, or Areas of Potential Effect (APEs) are defined in the Research Goals and Methods chapter which follows (see Figures 3 through 27). As described there, the APEs are located in Lower Manhattan, the Lower East Side, Upper East Side, and East Harlem. In terms of organization, this report is divided into the Northern Subway section that encompasses the APES included in the Upper East Side and Harlem areas, and the Light Rail alternative that encompasses the APEs included in the Lower Manhattan and Lower East Side areas.

This study was conducted to determine what potential archaeological resources may exist, undisturbed, within the APEs. In some areas of Manhattan - that may be rich in potential archaeological resources - no extensive disturbance can be documented, so these areas were determined to have a high sensitivity rating. This rating indicates that they need more in-depth study at a later date. There are other areas that appear to have little or no potential to contain significant archaeological deposits and thus require no further research.

## II. RESEARCH GOALS AND METHODS

As part of the Draft Environmental Impact Statement (DEIS) being prepared for the Manhattan East Side Transit Alternatives Study, the project alternatives' effects on archaeological resources must be considered. This section of the report defines the Areas of Potential Effect (APEs) for archaeological resources and outlines the methodology of study for these areas.

The No Action Alternative would have no effect on archaeological resources and, therefore, there is no APE. According to Peter Shaver of the Historical Preservation Field Services Bureau of the New York State Office of Parks, Recreation, and Historical Preservation (NYSOPRHP, also known as the State Historical Preservation Office, or SHPO), the TSM Alternative would not be considered an "undertaking" and therefore would not require analysis or definition of an APE. Consequently, this report considers the impacts of Build Alternatives 1 and 2 on potential archaeological resources.

Each alternative entails design plans that would cause different levels of subsurface disturbance to specific areas. Proposed construction ranges from the creation of new subway tunnels using either deep tunnel boring or the cut-and-cover method, to the creation of an at-grade light rail system in lower Manhattan. Because of the degree of variation in the types and extent of impacts within the proposed alternatives, the study approach for each area must be appropriately designed. The NYSOPRHP has reviewed this methodology prior to the commencement of archaeological research. As an interested expert agency, the New York City Landmarks Preservation Commission (LPC) was also consulted.

The goal of the archaeological assessment in the DEIS is to identify potential archaeological deposits within the APEs and to assess the two alternatives' possible impacts on those resources. To complete this, a Contextual Framework for the project corridors was compiled and, as described below, an Existing Conditions report was completed for each APE in order to determine the archaeological potential of each area. Areas with little or no archaeological potential were also identified. Then, the alternatives' impacts on potential resources were assessed. For areas which were considered potentially sensitive and which may be impacted, additional work is recommended (e.g. Stage 1A reports). That work is not proposed as part of this study; it will be completed for the Final Environmental Impact Statement (FEIS) if this project proceeds. The discussion below focuses first on the APEs that were analyzed and then on the methodology used for the analysis.

## DEFINITION OF APEs

### NORTHERN SUBWAY - BUILD ALTERNATIVES 1 & 2

Both Build Alternatives would involve construction of a new subway beneath Second Avenue, with a deep below-grade connection at the north and south ends to existing East Side subways. At the north end, the connection would be to the Lexington Avenue subway at 125th Street; at the south end the connection would be to the existing 63rd Street tunnel at Third Avenue. The tunnel and new stations would be constructed by either deep bore tunneling through rock or cut and cover construction. In locations where tunnel sections already exist under Second Avenue, those sections would be used. The APEs for the subway are as follows.

#### Tunnel Construction - Hard Rock Tunnel Sections

There is no Area of Potential Effect (APE) for areas where hard rock tunneling/mining will be used since the tunnels will be drilled through bedrock and are at a depth below where it is possible for archaeological resources to exist. Therefore, there will be no impact to potential archaeological resources in these areas.

#### New Station Construction - Hard Rock Tunnel/Mining Section

Between approximately 124th Street and 127th Street, a new subway station is proposed east of Lexington Avenue beneath existing City blocks. Construction of the station between East 126th and East 127th Streets would involve hard rock tunneling or subsurface mining, and would be approximately 70 feet below grade. There is no APE for this section of the new station construction since drilling will be through bedrock or at a depth below where it is possible for archaeological resources to exist. However, some underpinning of buildings will be needed as the tunnel or new station may be close to building foundations. This will most likely only cause disturbance to areas that were previously disturbed by foundation/basement construction. Therefore, there will be no impact to potential archaeological resources.

#### Tunnel Construction - Existing Sections

There would be no effect from using existing, but currently unused, tunnel sections and therefore there is no APE.

#### Tunnel and New Station Construction - Cut and Cover Sections

The APE is where cut and cover tunnel construction would entail excavating tunnels from the ground surface down to a depth of about 50'. This would occur in the following places:

East 69th Street to East 72nd Street in 2nd Ave.  
East 83rd Street to East 86th Street in 2nd Ave.  
East 92nd Street to East 99th Street in 2nd Ave.  
East 105th to East 111th Street in 2nd Ave.  
East 124th and East 125th Streets

#### Tunnel Boring Machine Access Shaft

An access shaft will be required to allow the tunnel boring machine and other construction equipment to reach the below-grade tunnel construction area. This shaft will be approximately 60 feet in diameter, and will be sited on property adjacent to Second Avenue. The site of the access shaft is on Block 1668, north of East 96th Street and east of Second Avenue. The entire area to be impacted, the western half of Block 1668, is the APE.

#### Ventilation Shafts, Fan Chambers, and Other Equipment

The new subway line will require ventilation shafts, fan chambers, and other equipment throughout its alignment. Ventilation shafts will be placed approximately every 400 feet within the sidewalk along Second Avenue, and fan chambers will be placed midway between new stations. These facilities will require cut and cover construction for the connection between the surface and the tunnel below. However, the precise location of these facilities will not be designed at this stage in the MESA study, making an assessment of archaeological resources inappropriate. As described later in this report, these facilities have the potential to disturb archaeological resources, and further study (such as Stage 1A reports) is required for the FEIS.

#### LIGHT RAIL TRANSIT (LRT) SHUTTLE - BUILD ALTERNATIVE 2

Light rail transit would run between Union Square and Broad Street in Lower Manhattan. The LRT route would run east along 14th Street from Union Square, then south on Avenue D, then turning west again on East Broadway. From East Broadway it would turn onto Canal Street then south down Centre Street, then east on Frankfort Street alongside the Brooklyn Bridge, and then south down Water Street. The LRT would be at-grade, except for one segment that would be below-grade in a tunnel. A large part of the below grade route already exists as a tunnel beneath Centre Street from Walker Street to Frankfort Street. Cut and cover construction would be required to allow connection between the existing tunnel and the at-grade portions of the LRT. The APEs for the LRT are as follows.

#### Existing Tunnel Portions

Between Walker Street and Frankfort Street, the LRT would travel in the existing tunnel beneath Centre Street. No new excavation is proposed here. Therefore, the

proposed project would have no impact on archaeological resources within these areas and there would be no APE. Specifically, there would be no impact to the African Burial Ground National Historic Site.

#### Below Grade Tunnel Construction - Cut and Cover Method

The APE is where new excavations would be required to bring the LRT to the surface. The APE for this section is:

Frankfort Street from Centre Street to near Pearl Street.  
Canal Street just east of the Bowery to Ludlow Street.

#### Surface Track Construction - Rails in Street Bed and Utility Poles

The APE is where rails and/or utility poles supporting power lines will be placed in the street beds and nearby sidewalks in the following places:

Water Street from Broad Street to Fulton Street.  
Pearl Street from Water Street at Fulton Street to Frankfort Street.  
Frankfort Street from Pearl Street to just west of Pearl Street.  
Canal Street from Ludlow Street to East Broadway.  
East Broadway from Canal Street to Grand Street  
Grand Street from East Broadway to Columbia Street  
Columbia Street from Grand Street to East Houston Street  
Avenue D from East Houston Street to East 14th Street  
East 14th Street from Avenue D to Union Square

The depth of impacts by rails in the street beds will not extend further than 3' below the surface.

Where necessary, utility poles supporting power lines will be constructed in the area of the current sidewalks, adjacent to the surface rails in the roadbed. Foundations for these poles are estimated to extend from approximately six to eight feet below the current surface, with additional subsurface disturbance necessitated by excavation and construction. Furthermore, the full dimensions of this area subsurface impact are not yet known, and neither the number of poles nor their specific locations has been chosen, making an assessment of potential archaeological resources impossible. As discussed later in this report, the construction of these utility poles has the potential to disturb archaeological resources, and further study, such as a Stage 1A archaeological assessment, is required for the FEIS.

## Below-grade Substations

The new LRT line will require six new below-grade electric substations, each about 20 to 25 feet deep. While hypothetical locations are shown on project plans for feasibility purposes, the specific locations for these facilities have not been selected, making an assessment of archaeological resources inappropriate. As discussed later in this report, these facilities have the potential to disturb archaeological resources, and further study (such as a Stage 1A report) is required for the FEIS.

## Light Rail Storage Yard and Shop Site

The LRT will require a large parcel for use as a vehicle storage and maintenance facility. This yard is proposed for the south side of Delancey Street South on the two-and-a-half vacant blocks between Essex Street and a line 120 feet east of Clinton Street. This yard would be created using cut-and-cover construction on Delancey Street South. Therefore, the APE includes the entire area covered by the proposed yard. In addition, an access tunnel would be created using cut-and-cover construction on the south side of Delancey Street between Columbia Street and the yard site.

## METHODOLOGY

For areas where no potential for impact would occur, no further work is required.

For the APEs defined above, an Existing Conditions report was completed and included the following work tasks:

- Listing potential archaeological resources identified through documentary and cartographic research at repositories such as the New York Public Library (NYPL), the NYSOPRHP, the New York State Museum site files (NYSM), and the NYCLPC files and archives (e.g. predictive models, neighborhood studies, planning documents, and site inventory forms).
- Documenting known prior disturbance through a review of utility maps, and historical and topographic maps available at various repositories.
- Identifying potential resources which may not have been previously disturbed.
- Assessing impacts of proposed construction to potential resources.
- Recommending further investigation required, if any.

### III. GEOLOGICAL HISTORY

The prehistory and history of Manhattan was in part shaped by the topography, ecology, and economic conditions that prevailed at various times. During the Pleistocene period, ice advanced in North America four times. In the last 50,000 years, the Wisconsinian period, ice was 1,000 feet thick over Manhattan. Gravel and boulders deposited at the ice sheet's melting margin formed Long Island about 15,000 years ago (Kieran 1982:26). Briefly, Manhattan was largely covered by Glacial Lake Flushing which occupied broad, low-lying areas after deglaciation produced vast volumes of meltwater. Higher elevations of Manhattan may have been marginal to this lake (Church and Rutsch 1984:6). By 12,000 years ago the lake drained and sea levels have gradually risen as glaciers retreated.

The project area 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 1968:11). The Manhattan ridge generally rises in elevation towards the north, and sinks towards the south. South of 30th Street, the bedrock dips down several feet beneath the earth surface, and south of Washington Park it plunges down below 100 feet forming a valley. Near Chambers Street the bedrock rises to less than 100' below the current surface (Barlow 1971:18).

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 tide and filled with drift and alluvium. The southern section of Manhattan is a flat tongue-shaped projection. This area is characterized by drift with underlying crystalline rocks including stratified gneiss, mica schist, hornblende gneiss and hornblende schist with some feldspar and quartz (Gratacap 1909:27). Beneath most of the project area 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 1909:5). Soil within Manhattan is mostly glacial till, clay, sand, gravel, mud, and assorted debris (Kieran 1982:24). The groundwater level fluctuates with tidal variations in the river.

## **IV. CONTEXTUAL FRAMEWORK**

### **PREHISTORIC OVERVIEW**

#### **PREHISTORIC BACKGROUND**

Archaeologists have divided North American prehistory into three periods, the Paleo-Indian, Archaic, and Woodland, followed by the historical, or Contact period. Both the Archaic and Woodland periods are generally divided into subperiods using the appellations Early, Middle, and Late. Changes in the prehistoric environment, the characteristics of prehistoric peoples, and the cultural artifacts that were left behind enable archaeologists to present a chronological framework for the prehistory of North America. What follows is a brief overview of these periods with emphasis on the characteristics of, and archaeological evidence for, each period in the New York City area.

#### **Paleo-Indian Period (10,000 - 7,000 B.C.)**

Near the end of the Wisconsin glacial age the first humans crossed into the New World via a narrow land bridge in the vicinity of the Bering Strait. These nomadic hunters, known as the Paleo-Indians, are identified by their utilization of a distinctive artifact, the fluted point. Archaeological evidence suggests that although Paleo-Indians were limited in number and traveled in small groups, they soon spread across the pristine environment of North America. Perhaps they were following the migration patterns of the game animals they depended upon for subsistence. Numerous Paleo-Indian "kill sites" have been discovered in the western and southwestern United States. In contrast, none have been recovered in the Northeast. Several camp sites have been excavated in the Northeast, however, leading scholars to suggest that seasonal patterning or perhaps territorialism commenced during the latter part of this period (Ritchie 1965: 3,9).

The environment during the Paleo-Indian period was dominated by the retreating glaciers and the change toward the deciduous woodland setting prominent in the Archaic Period. The warmer climate and the new open river valleys provided ample hunting grounds. As a result, the favored location for Paleo-Indian sites, and all prehistoric sites, were well-elevated large fertile valleys close to a fresh water source. Along with the fluted point, scrapers and borers were part of the nomadic hunter's "tool kit." These tools were used to hunt and butcher mastodon, elk, caribou, bison, and other smaller mammals. A variety of these animals, dated to this time period, have been excavated in New York State, particularly in the vicinity of former glacial lakes and moraines (Ritchie 1965: 9-16).

Although Paleo-Indians were dispersed across the North American continent no human skeletal material, or artifacts such as animal hides or wood objects have been recovered. Perhaps due to the transitory nature of these people little remains of their culture but lithic material. In New York State a few camp sites have been examined (For a detailed discussion on Paleo-Indian, Archaic, and Woodland sites in New York see Ritchie 1980). The closest recorded Paleo-Indian site to the project area is Port Mobil, a small camp site, recovered in Staten Island (Ritchie 1980: 1,3,7).

#### Archaic Period (7,000 - 1,000 B.C.)

The transition from the Paleo-Indian period to the Archaic was marked by the availability of a larger variety of plants and small-game as the post-glacial Archaic peoples exploited the now dominant deciduous woodland environment. The decreased population of big-game animals led to the hunting of smaller game including the white-tailed deer, moose, wild turkey, and rabbit. In addition, Archaic peoples began to exploit the marine environment. Although not as mobile as the Paleo-Indians, archaeological evidence indicates that early Archaic peoples continued to travel seasonally. Their group movements, however, were within well-defined territorial boundaries and the camp sites that have been recovered indicate that they were repeatedly occupied over time.

River valleys and around other sources of fresh water were locales that could support the game animals exploited by Archaic hunters. The tool kit of the Archaic Period was expanded to include the grooved axe, beveled adze, and narrow bladed projectile point. In addition, the mortar and pestle, grinders, and various implements used for fishing, are evidence of the Archaic peoples' expanded diet (fishing and increased gathering).

An increase in the number and size of archaeological sites recovered from the Archaic period suggests that the human population had expanded and that Archaic peoples were becoming more settled and therefore having a greater impact on the landscape. A result of becoming more settled, and the establishment of specific territories, was the emergence of different cultural phases. A phase has been defined "as a recurring complex of distinctive archaeological traits" representing an individual cultural group (Ritchie 1965: xvi). The Lamoka, Vosburg, and Brewerton phases are among those identified in New York State by Ritchie (1980).

A number of small multicomponent sites have been recovered in coastal New York. Like the inland sites, they are usually located near fresh water ponds, tidal inlets, coves, and bays. These locales provided abundant resources including small game, fish, shellfish, and a large variety of plants and tuberous grasses. Sites discovered in coastal areas around New York City indicate that by the Late Archaic there was a distinct reliance upon shellfish, particularly oysters and clams. No large camp site or

settlement has been found within the boundaries of the five boroughs and the few Archaic period artifacts encountered within the city are isolated finds.

#### Woodland Period (1,000 B.C. - c.1600 A.D.)

The Woodland period is characterized by the introduction of pottery and horticultural activity, as well as the establishment of clearly defined trade networks. During the Woodland Period primary habitation sites, or villages, had increased in size and were permanent (year-round) settlements. As in the Archaic Period these sites were located near a large fresh water source (e.g., pond, lake, tributary, or river). Secondary sites, where specific activities took place (e.g., shellfish gathering and/or processing, tool making), were usually situated near the location of the resource.

The first significant and identifiable use of pottery in New York State can be traced to the Early Woodland Period, around 1,000 B.C. By the Middle Woodland Period a wide variety of stamped, impressed and cord-decorated pottery types were developed. Smoking pipes, another Woodland innovation, reflected different cultural styles which archaeologists have been able to link to specific groups. The tool kit of the Woodland peoples expanded to include a larger variety of knives, drills, hammerstones, etc. Although some Archaic human burials have been recovered, those discovered dating from the Woodland Period suggest that more complex ceremonial burials commenced during the later period. Furthermore, this widespread mortuary ceremonialism (mound building) peaked during the beginning of the Middle Woodland and was essentially nonexistent by the close of the Period.

Although the use of cultigens was evident in many areas of North America during the Early Woodland, it was not until near the end of the Middle Woodland stage (c.800-1000 A.D.) that agriculture may have played a part in the economy of New York State culture groups. By the Late Woodland, cultigens had become an essential element in daily life. The introduction of agriculture brought about a major change in settlement patterns as larger villages, some fortified or palisaded, were established. One such site was noted by the early Dutch explorer Adriaen Block, who described seeing "large wigwams of the tribe on Castle Hill" in the Bronx (Skinner 1919: 76). With the creation of more permanent sites came the development of extensive trade networks for the exchange of goods between the coastal and inland areas.

Late Woodland Stage sites of the East River Tradition in Manhattan and other parts of southern New York have been noted on the "second rise of ground above high water level on tidal inlets," and situated on "tidal streams or coves" and "well-drained sites" (Ritchie 1980:269). Carlyle S. Smith, who studied and analyzed the distribution of prehistoric ceramics in coastal New York, stated that "village sites" are found on the margins of bays and tidal streams" (Smith 1950:130). Early twentieth century archaeologist Reginald P. Bolton writes that "the indispensable elements in the selection of native dwelling places," were an accessible spring, and shelter from

prevailing winter winds, which on Manhattan Island was found on "the eastern side of hills, or a southern exposure" (Bolton 1922:46,62,64).

#### Contact Period (A.D. 1600-A.D. 1800)

Much of what is known about the Contact Period has been acquired from the documentary record. Using legal documents and early ethnohistorical accounts, archaeologists have been able to learn much about the Native groups that were present upon contact with Europeans. One example is the journal of Robert Juet who traveled with Henry Hudson on his 1609 voyage. Juet provided a description of the native population encountered and the exchange of "Indian Wheate" (maize) and tobacco for beads and knives (Van Zandt 1981: 10-11).

In *Native American Place Names in New York City* (1981), Robert Steven Grumet categorized data from historical documents and the work of previous scholars in an attempt to synthesize and verify known information on Native American sites, pathways and culture groups. Grumet notes that the 1610 Velasco map used the name *Manahata* as the designation for the native inhabitants of both banks of the lower Hudson River (1981: 24). The Manhattan Indians were identified on Dutch seventeenth-century maps but not on many other documents. In addition, no individual Manhattan Indian was referred to by name in the documentary record.

Isaak de Rasieres reported c.1628, that the island was "inhabited by the old Manhatesen; they are about 200 to 300 strong, women and men, under different chiefs." The Wiechquaesgeck have been identified as the denizens of northern Manhattan, as well as parts of the Bronx and Westchester County. However, there is little data available to identify the "Manhatesen" who dwelt to the south, in lower Manhattan. Tradition, rather than firm evidence, has identified them as Canarsee Indians, while another, also discredited line of reasoning, suggested that they were Rechgawawancks. However, there is no seventeenth century documentary evidence to support this, nor even the idea that Manhattan was divided north/south between different maximal groups. It is likely that the Manhattan Indians were a sub-group of the Wiechquaesgeck, with whom they eventually combined (Grumet 1981:24-26; Bolton 1972:127).

The Manhattan and their Wiechquaesgeck relatives had few furs to trade with the Dutch. As a result, there was little motivation on either side for good relations, and New Amsterdammers probably considered the local Indians an annoyance. In addition, the sometimes cruel and often dishonest practices of European traders led to Wiechquaesgeck retaliation, which took the form of several murders between 1640 and 1642, leading to various raids and counter raids between Dutch and Indians (Grumet 1981:60-61; Kammen 1975:45-46).

The Dutch practice of trading firearms to the upriver Mahican and Mohawk, while denying guns to the Indians of the lower Hudson, left them vulnerable to attack. When a large force of Mahican or Mohawk attacked the Wiechquaesgeck and Tappan in 1643, the surviving Indians fled to the Dutch in New Jersey and Corlaer's Hook on Manhattan for protection. Governor Kieft and his advisors seized this chance to revenge themselves, and sent a force to attack the refugee camp at Pavonia (now Jersey City), massacring 80 Tappan, while another force killed another 40 Wiechquaesgeck on Manhattan. Eventually every lower Hudson native group joined in war against the Dutch, with disastrous results for European settlers. "Governor Kieft's War" ended when the Manhattan and Wiechquaesgeck sued for peace in 1644, after a series of surprise attacks on Indian villages ended in brutal massacres. Nevertheless, friction with the Dutch continued, as the Wiechquaesgeck participated in the "Peach War" (1655-1657) and the "Esopus War" (1659-1664) (Grumet 1981:60-62; Brodhead 1853:349-353; Bolton 1975:79).

These hostilities, coupled with the introduction of European diseases against which Native American populations had no natural protection, decimated Indian populations in the New York City area, and forced many groups to merge in order to maintain viable communities. The last of the Manhattans apparently left the island sometime after 1628, joining the mainland Wiechquaesgeck, where they were noted in 1680 as the *former* inhabitants of Manhattan Island (Grumet 1981:24,25).

## PREVIOUSLY IDENTIFIED PREHISTORIC SITES IN THE PROJECT AREA

### Lower Manhattan

According to Grumet the very southern tip of Manhattan was called Kapsee (Grumet 1981:68). This was described as a ledge of rocks at the southernmost point of Manhattan Island, probably in the vicinity of what is now Battery Park (Grumet 1981:17). To the north, Ashibic was probably a narrow ridge or ancient cliff north of Beekman Street in lower Manhattan, which was bounded by marsh to the south (Ibid.:3).

### Lower East Side

A map of Native place names and trails that have been identified for Manhattan Island shows a large path leading to the area called "Nechtanc," translated as "sandy point," near the East River at Houston Street (1981: 39). Grumet's research indicates that this place was also known as "Corlaers Hook" (Ibid.). A previous site file search for another report (Kearns and Kirkorian 1995: Appendix) reported one prehistoric site in this area. This is NYSM #4060, which Parker identifies as a village site (Parker 1920:627), and Grumet places more precisely near the East River, on the line of Canal Street. Parker reported "traces of occupation" there (Parker 1920:582). This "village" may be the site of Nechtanc which has yet to be verified archaeologically. Grumet

identifies the area called Nechtanc as being "contiguous to Jacob van Curler's plantation." It is somewhere in the vicinity of Corlaer's Hook (Grumet 1981:68).

Historical documents attest to the fact that the land at Corlaers Hook was the location of a terrible massacre during the Governor Kieft War (Grumet 1981: 39, 61; Stokes 1917 I: 22-23). This event prolonged the war for another two years until August 30, 1645 (Stokes 1922 IV: 98).

Information gathered from several sources indicate that the coastal area, southwest of Corlaers Hook, possesses some of the attributes that may have attracted prehistoric peoples. The Native pathway reported by Grumet that terminated in the vicinity of the Corlear's Hook may indicate that at one time there was a village, camp site, lookout, or processing station in the general area (Grumet 1981:68).

To the north and west, in the vicinity of East 14th Street, few Indian sites have been uncovered, in large part due to the intensive development there during the nineteenth and twentieth centuries. Bolton identified the section of Fourth Avenue near 14th Street as part of the "Wickquasgeck Road," which lead from the southern tip of Manhattan to Albany, with branches leading to settlements along the East and Hudson Rivers. Bowery Lane (of which the Bowery/Fourth Avenue is now a part), the main north/south route on Manhattan during the colonial period, followed the earlier Indian trail. The nearest settlement to this part of the project site is identified by the place name Schepmoes, which Bolton reports as referring to "the area of Second Avenue in the vicinity of 14th Street. Here a pond of fresh water existed in the vicinity of a knoll, thus affording to some extent shelter and water supply" (Bolton 1972:133; 1922:57,64). Bolton refers to Schepmoes as a "plantation," a "group of lodges" and a "place of Indian occupation," and suggests that Schepmoes means "little brook" (Ibid.). Robert Grumet's later research indicates that this toponym was not a Native word, but the name of a Dutch settler, Jan Jansen Schepmoes, who was a prominent seventeenth century Manhattan landowner. Grumet places the settlement somewhat farther south closer to Second Avenue and East 10th Street (Grumet 1981:51, 68).

#### Upper East Side

The only Native American feature reported by Grumet in this area is the Wickquasgeck Road - a Native trail which ran from the southern tip of Manhattan to the northern tip of Manhattan. The road ran west of the project site through the Upper East Side and then turned into Central Park to head northeast. The road was well traveled, and connected settlements at the southern part of the island with those on the north.

#### East Harlem

This area is near former flatlands called Muscoota by Native Americans, which lies between the Harlem River and Morningside Heights northwest of what was once

Although early Dutch trading expeditions had already been visiting the Hudson River for many years, the first settlement in New Netherland was not undertaken until 1624, under the authority of the Dutch West India Company, a private trading company founded in 1621. The purpose of this expedition was to strengthen Dutch ownership claims by occupying strategic points in the territory. Surprisingly, Manhattan was ignored in favor of Governors Island, where eight men were left to build a fort to protect the mouth of the Hudson. The main group of colonists traveled north and established Fort Orange, now part of Albany, in an area advantageously situated for participation in the lucrative fur trade (Brodhead 1853:150-151).

Eventually, the Dutch traders recognized Manhattan as the strategic heart of the region. Colonization began in earnest in 1625, when an expedition of Company farmers with livestock, tools and provisions arrived on the Hudson River, establishing itself at the southern tip of Manhattan Island, with the purpose of building a fort and laying out nine Company farms, or *bouwerijen* (bow-wer-RAY-en). These *bouwerijen* were intended to supply Company personnel with agricultural provisions, so that the Manhattan post would be self-sufficient (Bachman 1969:82-87). In addition, farm land, including a small tract north of what became Prince Street, was also designated for the "Company's Negroes" (Stokes 1926 VI: 70-72).

#### Lower Manhattan and Lower East Side

- Colonial History

The West India Company was generally scrupulous about acquiring title to the lands it occupied, and upon his arrival on Manhattan Island in 1626, Governor General Peter Minuit opened negotiations with the local Indians, and purchased the approximately 22,000 acres of the island for about 60 guilders worth of goods. The erection of Fort Amsterdam was begun near the foot of present Broadway, commanding the upper bay and the entrances to the Hudson and East Rivers (Brodhead 1853:164). The settlement which grew up around the fort, eventually called New Amsterdam, grew slowly, and at the time of the English conquest in 1664, extended only as far north as the palisades built along present Wall Street. Many of these settlers were merchants and fur traders who needed access to the shipping routes. As a result, much of the land granted was located along the rivers surrounding the island.

Although the central section of Manhattan was considered too rocky for agriculture, and areas were heavily forested, as early as c.1628 at least six Company *bouwerijen*, four of which were near the East River shore, had been laid out and leased to tenants. The farms embraced a total area of 120 acres. Unfortunately, Manhattan was not terribly fertile, and only two of the farms were considered good, the others better-suited for growing rye or buckwheat (Brodhead 1853:167; Bachman 1969:91; Jenkins 1913:69-70).

Harlem Creek and its surrounding swampy area (Rubinson 1989:3). Rechgawanes is reported by Grumet as a point of land along the western shore of the confluence of the East and Harlem Rivers, and a long obliterated stream that ran along the route of East 125th Street (1981:46).

In this section of the project area, the Wickquasgeck trail ran to the west through what is now Central Park. An Indian Path veered off this trail at East 110th Street near Fifth Avenue, and headed northeast towards a habitation site on the Harlem River near East 124th Street. This Amerindian Trail was incorporated into the first road system of the village of Harlem. Passing through the meadows of Muscoota to the area called Conykeekst, it crossed First Avenue at 124th Street and Second Avenue at 121st Street (Bolton 1922:72,74-76). Arrowheads and flakes were found in East Harlem in 1855 during the excavation of a cellar on Avenue A between 120th and 121st Streets (Riker 1904:123). Bolton concluded that the site was intermittently used as a place of landing or trade, or perhaps a fishing place (Bolton 1922:72F.,pl.IV as reported in Rubinson 1989:7).

Planting areas and old fields are shown along much of this area, especially in the vicinity of First and Second Avenues. In addition, in the vicinity of East 97th to East 101st Streets was "Konaande Kongh," defined by Grumet as a major Indian settlement. (1981:20). Bolton reported that this was a village located approximately between Lexington Avenue and Madison Avenue and East 98th to East 100th Streets, west of Second Avenue (Ibid.).

## **HISTORICAL OVERVIEW**

Much of the following historical overview is derived from previously performed historical research completed for a number of sites throughout Manhattan (See Kearns and Kirkorian 1986, 1987, 1993, 1995a, 1995b; Kearns, Kirkorian, and Mascia 1995; and Kearns, Kirkorian, and Schaefer 1992). In addition, other cultural resource reports were reviewed at the NYCLPC, as were predictive models.

## **HISTORICAL BACKGROUND**

New York City, with Manhattan Island as its commercial and locational center, has developed at a rapid pace over the past three centuries. An important factor has been the flourishing commercial waterfront and the surrounding mercantile and later industrial ventures. The expansion and development of the waterfront along the East River began in the early seventeenth century. Although parts of the current project area along Water Street were submerged at that time, landfilling along the East River began before the end of the seventeenth century and continues today. Early historical maps indicate that the waterfront near Water Street hosted small piers. These areas were eventually filled in and the newly created blocks were commercially developed.

The bounds of Bouwery No. 1 began on the east side of present Fourth Avenue/Bowery, between Houston and 18th Streets. It is described on the 1639 "Manatus" Map as "Company Farm with an excellent house." In addition to the Company farms, by 1635 about 150 colonists inhabited a number of private farms north of the town (Rink 1986:128).

Most of Manhattan's farmsteads suffered greatly during the Indian troubles of 1642-43, and by the end of hostilities, the bouwerijen needed so many improvements that the West India Company decided to sell them rather than invest the money. No. 1 was purchased by Director-General Peter Stuyvesant and became known as "Stuyvesant's Great Bouwery." The Bowery Road, the only road from New Amsterdam (now The Bowery and Fourth Avenue) was improved as far as his property [about present Stuyvesant Street] Jenkins 1913:70,73,94).

In 1660, when farmers were ordered to gather into settlements for common defense, those directly north of the city asked to be allowed to remain in their homes, but requested that others be permitted to establish a village in the vicinity. The site selected was on Stuyvesant's Bouwery, and became known as the Bowery Village, an area generally between Bleecker and 10th Streets, Broadway and Second Avenue. In support of the new community, the Director-General had a chapel erected on his property, at the northwest corner of present Second Avenue and East 10th Street. Residents of the city attended Sunday evening services there, as did Stuyvesant's household and about 40 free Africans who lived in the neighborhood (Jenkins 1913:73; Brodhead 1853:681). Only two miles from the city, the "three or four houses" and a tavern, early became a popular recreational spot, a "stopping place, and the pleasure-ground of the Manhattans" (Brodhead 1853:681; Valentine 1853:69).

Following the 1664 conquest of New Netherland by the English, most private property was confirmed in its pre-conquest ownership. Stuyvesant chose to remain in New York, and retired to his Great Bouwery, where he remained influential until his death in 1678. In 1671, when Governor Lovelace set out to improve the road to Harlem, of which the Bowery Road was a part, the widening of the section between present Chatham Square and the Bowery Village was carried out under Stuyvesant's direction. This roadwork was part of Lovelace's projected New York to Boston postal service, the first rider of which galloped past the project site in January of 1673 (Jenkins 1913:1-2,73).

Officially, New York City was the entire island of Manhattan, with the "Out Ward" created by Governor Dongan in 1683. The Out Ward extended from approximately present Canal Street to the Spuyten Duyvil (Valentine 1853:182,184). The line of city fortifications which protected "the compact part of the city" had begun its slow march northward, as a palisade on Wall Street was demolished in 1699, and a new line erected in 1745 slightly north of present Chambers Street.

The inland area of Lower Manhattan, including a section of land just north of what is now City Hall Park, was originally set off by the Dutch colonial government as the Commons. Through time the watercourses and swamps in the Commons were filled in and the area eventually became the hub of communal, public, and civic endeavors. In the mid 1660s the area was used as a communal pasture, but by 1720 it had become the site of governmental activities such as executions (Harris et al 1993:3). This area was considered remote enough from the city proper to allow more "marginal" uses. For example, an almshouse was built in the Commons in 1735, and a burial ground for negroes (now the African Burial Ground) was established here in the early 1720s, and remained in use until about 1795. The African population also used this area to celebrate holidays, and in the 1740s it was the site of a palisade with blockhouses across what is now the northern end of City Hall Park (Ibid.).

During the pre-Revolutionary period, the Commons was the site of mass meetings and demonstrations, but by the end of the century, it was altered drastically. Chambers Street was laid out (1796), city blocks were devised and lotted, and City Hall construction began in 1803 (Ibid.). Elevated terrain was leveled the low lying ground around the Collect Pond was filled. The area gradually acquired a more landscaped, park-like character, and former features were buried beneath new structures and roadbeds<sup>1</sup>.

- Waterfront Growth

Since the Dutch first established the settlement of New Amsterdam, the growth of the waterfront has played a vital role in the history of Manhattan Island. The first public dock on the East River was constructed in 1647 near the area of Pearl and Broad Streets which were then at the shoreline (Buttenwieser 1987: 26). Ships would anchor in the river and passengers and cargo would be transported via a small boat to the narrow wooden dock. Less than twenty years later, the British, now ruling the colony renamed New York, transferred ownership of vacant (unpatented) and public (wharves, streets, and highways) land to the City of New York. In an effort to bolster trade, City leaders concentrated on developing the waterfront (e.g., the construction of the Great Dock in 1675).

The Dongan Charter of 1686 granted all unencumbered lands to the City of New York. In addition, this allowed the city to expand eastward 200 feet, to the low water mark in the East River. While the population of Manhattan was increasing, soil removed from sections where new homes were built was deposited along the lower East River bank, horizontally extending the shoreline one block to the east (from Water to Front Street) by 1700.

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<sup>1</sup>For a more detailed discussion of this archaeologically sensitive area, see Harris et al, 1993, Howson and Harris, 1991, and Ingle et al 1990.

It was during the eighteenth century that the urbanization of Manhattan Island began in earnest. For the first two decades of the eighteenth century houses and stores sat on the banks of the East River in Lower Manhattan adjacent to the stone bulkheads, and in some cases were supported by wooden stilts extending out over the water (Buttenwieser 1987: 32). Most of the landfilling that took place from 1700-1776 was conducted by private citizens (Ibid.:13.). Within the Lower East Side waterfront area, however, landfilling activity did not extend the shoreline significantly until the end of the eighteenth century (Buttenwieser 1987: 26, 27, 28, 31).

Wharves were built along the East River throughout the colonial period, the most common type of wharf constructed was made of timber. The two types of timber wharves are "crib" and "cobb." Crib wharves are made out of rough timbers that are placed in alternating rows of "headers" (running lengthwise) and "stretchers" (spanning the width). In most cases a floor is built at the base to support the fill placed within. The cobb wharf is an openwork variant of the crib wharf. Its name comes from the cobblestone fill used to fill and sink the wharf. The least common wharf is that made out of wrecked or burned ships. After securing the ship in the desired place, the framework of the hull is filled in much the same manner as the cobb wharf. While the primary function of these wharves was to provide docking space, in some cases they were later used as bulkheads for the continuing landfill along the East River. Most of the bulkheads constructed were of stone, although in some cases timber bulkheads were driven into the river bottom.

The need for more waterfront land promoted the Montgomerie Charter of 1730, which extended the boundary for development around the island to 400 feet out from the shoreline, 200 feet beyond the 1686 Dongon Charter line (Ibid.:28). Waterfront construction escalated and numerous shipyards were created along the shores of the East River. As a result, the number of ships owned in Manhattan increased dramatically from approximately 60 at the turn of the seventeenth century to 447 by 1760, and nearly doubled to 709 by 1770 (Ibid.: 35-36). The shortage of waterfront dock space was critical. Along with the lack of dock space, Manhattan merchants had the additional problem of having their shipping curtailed by British taxation. In the few years before the Revolutionary War, waterfront expansion was reduced by the lack of freedom in colonial trading.

- Revolutionary War

The Revolutionary War saw a seven-year British occupation of New York City, which followed Washington's evacuation of Manhattan Island in 1776. During the War the occupation of the Harbor by the British further prevented waterfront construction and in most cases even the maintenance of the existing facilities. New military works, known as "The Barrier" were begun by the Americans in 1776, but completed by the British occupation forces. The Barrier crossed Bowery Lane near present Grand Street (Jenkins 1913:59,84; Frances 1848:18).

Many of the residences in the city's outskirts suffered greatly during the occupation. Due to the British force's enormous demand for firewood for heating and cooking, large sections of Manhattan and its environs were completely denuded of trees. Soldiers also cut down long-established orchards and razed and stripped buildings. Livestock was officially confiscated or simply stolen. Within the city proper, disastrous fires in 1776 and 1778 left Broadway from Trinity Church (Wall Street) to the Battery in ruins. Trinity and the nearby Lutheran Church on Rector Street had been consumed in the conflagration, and not rebuilt. The British used the buildings of the Dutch, Presbyterian and other "dissenting" denominations as a riding school, stables, prison and hospital (Smith 1972:5,50; Marks 1827:108,110).

When the war was over and American troops reentered the city, they marched from Harlem to the Bowery Lane on November 25, 1783, "Evacuation Day." A group of citizens on horseback then rode up the Bowery Lane and met General Washington at the site of present Union Square, immediately west of the project area. From there, Washington led assorted officers, dignitaries and their "suites," as well as citizens on foot and horseback in a triumphal parade into the city, which concluded with a banquet at Fraunces Tavern, and fireworks on Bowling Green (Marks 1827:106).

- Late Eighteenth and Nineteenth Centuries

Following the war the recovery of the city was swift, and the need to improve waterfront conditions was apparent. Central to this revitalization was the establishment of new trade routes to China which gave "fresh impulse and energy to American industry" (McKay 1969: 5). The China trade and open markets encouraged buying, filling, repairing, and building along the banks of the East River. The accumulation of refuse and natural sedimentation between wharves contributed to the problems plaguing the shipping lanes on the East River. In addition, the build-up of sewage and garbage adjacent to the shoreline was also a major problem for both sanitary and economic reasons. The piers and jettys that lined the crowded waterfront were preventing the removal of debris by the River's natural tidal fluctuations. Although dredging was conducted along the East River beginning in 1785, most of the activity took place in the vicinity of slips and wharves, leaving the channel to fill with debris (Historical Perspectives 1987: 23-24). By the end of the eighteenth century, dredging alone could not keep up with the accumulation of refuse.

In order to address the problem of the lack of dock space, the East River waterfront was filled, expanding the boundaries of lower Manhattan to South Street. The newly created land along the waterfront in the Lower East Side became the center of the economic life of the city, while the streets further inland were lined with overcrowded tenements. The majority of the commercial activity between Cherry and South streets was directly tied to the fluctuating shipping industry. Along with the many boat builders and lumber yards, iron foundries dotted the many blocks along the shore

of the East River. These industrial enterprises were needed for constant ship repairs, as well as boiler and engine work.

During the early nineteenth century the continued growth of maritime trade made New York the most important port in the United States. Historical documents are full of requests for more docking space including an 1803 letter from Comptroller Strong to the Common Council where he states there is:

"a great want of accommodations for market boats and coasting vessels . . . there being no public slips between Catherine & Rutgers slips the distance of near half a mile"  
(Stokes 1918 III: 1403).

The Randall Plan, or Commissioner's Map of 1811, established new roads for Manhattan's unoccupied and newly filled areas along the waterfront. The creation of these roads required extensive filling and grading of the natural topography. The natural topographic barriers around the Collect Pond (e.g., Bayard's Hill, Smith's Hill and Lispenard's Meadow) were leveled by the end of the eighteenth century as city expansion pushed north. These hills were cut down and the material deposited along the shoreline and in low lying areas. In addition, the construction of streets and new buildings, especially those with cellars, provided soil, sand, rocks, and other debris for fill along the shoreline. Another source of fill was the immense amount of garbage generated by the inhabitants of the island.

Many coastal landowners built narrow private piers at the ends of the newly laid out streets. The area directly adjacent to the waterfront became the location for supplementary shipping activities (e.g., machine works, sail makers, ship's carpenter tool makers, iron and brass foundries and lumber yards). Between 1800 and 1820 a shipbuilding community was located along the East River from Catherine Street to Corlears Hook (McKay 1969: 69). By the mid-nineteenth century most of eastern Manhattan had been filled to South Street, including most of the project area which was previously land under water (Kardas & Larrabee 1977:62).

The nineteenth century also marked the decline of the Lower East Side of New York which was often described as a community of immigrants, tenement slums, and sweatshops. The War of 1812 brought to a halt the rapid expansion of Manhattan. Boycotts of European trade goods hurt the port industry. By 1815 the city limits had reached 14th Street on the West side and 6th Street on the East side. Greenwich and Bowery Villages were incorporated into the city proper. By 1820 the city in its urban form was established. Neighborhoods were of specific nationalities, and class, with residences and shops sprinkled on every street, in backyards and alleys (NYCLPC 1983:27).

Several events occurred toward the middle of the century that had a profound effect upon the character of the Lower East Side. The first was the change in the types of ships that came to New York Harbor. Second was the influx of waves of new immigrants from European countries.

The shift from sail to steam power changed the construction of the large cargo ships. Longer, faster boats were now being used to ship goods in and out of New York. The immense investment in the new shipping was noted by diarist Philip Hone who, in 1850, wrote:

I witnessed this morning, at nine o'clock, a novel, exciting, and glorious exhibition. Three steam vessels, of the aggregate cost of more than \$1,000,000 were launched in succession from the shipyard of William H. Brown, at the foot of Twelfth Street, East River (1927: 882).

However, these new ships could not move easily on the East River and many of the narrow piers became obsolete. Increased shipping traffic also amplified the difficulty of docking along the East River. The new longer, and, in many cases wider, ships began to use the western side of Manhattan, on the much wider, deeper Hudson River, for berth space.

By 1870, New York, with over ten thousand vessels moored in the harbor, had been established as one of the world's preeminent seaports (Buttenwieser 1987: 56). Shipwrights, riggers, sailmakers, merchants, and blacksmiths, as well as lumber yards, and iron foundries were among the many commercial establishments crowding the riverfront. Many of the piers on the East River were once again in terrible condition and insufficient for most ships. City officials grew increasingly concerned with the overcrowding along the East River waterfront. "Made land" was used for new waterfront construction and landowners built long thin piers to allow deep water wharfage to ships. In many areas land was generated at the expense of harbor space.

- Public Housing

In 1833, one of the earliest multifamily tenements was constructed near Corlears Hook (WPA 1939 1982: 108). Following that date, a great many of these large structures were built all over the Lower East Side. It was to this small district that many of the over two million Irish immigrants came between 1846 and 1860. Poor and working class families were pushed into the waterfronts or into low-lying or otherwise noxious areas (Rubinson 1993:12). Not all of the structures built for this class were as slum-like and notorious as the infamous Five-Points, located at the intersection of Mulberry, Worth, Park, Baxter, and Little Water Streets, but the entire area was overcrowded and extremely poor. Most of the new male immigrants found work along the waterside as carpenters, joiners and calkers, some commuted to further

workplaces. Female immigrants often worked as domestic servants or out of their home on a piecework basis. This flood of new residents caused the population of Manhattan to double between 1840 and 1860. Many of the older residents of the area moved northward in Manhattan, leaving the Lower East Side to the immigrants and the market activities of the busy port.

One of the more descriptive passages from Philip Hone's diary relates both problems with new technology and the urban poor. Hone writes:

Wed. February 18, 1850

When we read the accounts of the loss of human life by steam and its machinery, boilers bursting, flues collapsing, running into each other at sea, and running off the track on land, besides the dreadful shipwrecks, the accounts of which occupy the principle column of every newspaper, there would seem to be some reason to apprehend a diminution of the human family. But in a walk up the Bowery, in the slums of Corlears Hook, or through the classic region of the Five-Points, the swarms of ragged, bare-footed, unbreeched little tatterdemalions, free-born Americans (free enough, in all conscience), will afford abundant proof that suitable means are taken to keep up the supply (1927: 884).

The crowded residential areas of the Lower East Side was home to most of the city's labor force during the mid-nineteenth century. Like the decaying waterfront, the crumbling residential area just a few blocks inland was the source of much concern to many New Yorkers.

After the wave of Irish immigrants, thousands of Germans began to settle in this area. Unlike their predecessors, many were skilled workers who supported the trade union movement. The German Jews created a tight-knit community and were known as furriers, jewelers, traders and clothing manufacturers. Throughout the rest of the century, the flood of immigrants continued from Russia, Greece, Turkey, Poland, Romania, and Italy. At the end of the nineteenth century, the Lower East Side was recognized as the largest Jewish community in the world. As many of the 1,562,000 Jewish immigrants who arrived in New York between 1881 and 1910 settled there (WPA 1939:109). The Tenement Museum on the Lower East Side is a testament to this influx of immigrants.

- Twentieth Century

The wave of foreign arrivals continued until the 1920s when new federal immigration quotas were put into effect. The early twentieth-century creation of a subway system in Manhattan and the outer boroughs enabled many of these residents

to live in less expensive areas and travel to work in the city. These factors caused the number of residents in the Lower East Side to drop from over 500,000 to under 250,000 in less than twenty years. In addition, increased vehicular traffic after the turn of the century prompted the removal of many of the decaying tenements in order to widen roads and create access ramps to the Williamsburg (1901) and Manhattan (1909) bridges over the East River.

The character and view of the Lower East Side did not change much during the first quarter of the twentieth century. However, by the late 1920s many New Yorkers focused on the renewal of this once active waterfront. In January 1929, while the construction of the West Side highway was proceeding, a plan was presented to the Board of Estimate for the construction of a similar road along the East River (Buttenwieser 1987: 165). The road was to be built to ease traffic and to create a more aesthetic appearance for the riverside. Many of the proponents of the new road believed that an attractively landscaped East River Drive would encourage slum removal and rebuilding in the adjacent area.

Several plans were submitted for the new road including ones that incorporated housing changes. One plan, designated the "Rutgers Town" plan, called for low-moderate income housing to be built on eighteen blocks of former slum property below Corlears Hook (Buttenwieser 1987: 177). At this time many of the older slums were being torn down or boarded up. The population of the Lower East Side dropped as immigration quotas went into effect and many residents moved on to other neighborhoods within the city or to the suburbs. Although none of the above plans were used, a pattern of community involvement in the renovation of the Lower East Side had started. In 1935 the Mayor of New York applied to the Public Works Authority for funds to construct the East Side Drive (Ibid.: 180). Instead of an aesthetic showpiece, plans were drawn up to build a road for continuous fast traffic. Construction began within a few months and the East Side Drive/FDR was completed in sections over the next few years.

The Lower East Side, however, was still in a state of physical deterioration. During the 1930s the neighborhood around Corlears Hook was the location of some of the most decayed real estate in New York City. The area was replete with disintegrating commercial buildings, boarded-up warehouses, and out of date tenements. The East River was bordered with dumps, lumber and coal yards, decaying piers, and the remains of a once prosperous shipbuilding industry (Buttenwieser 1987: 165).

Toward the middle of the twentieth century a new phase of rebuilding commenced that continues today. The first public housing in the country was built in this area in the 1930s, as the community sought quality of life improvements and affordable residences. The Lower East Side waterfront, once the most flourishing in the world, has only a few docks still in place.

## Upper East Side

This region of Manhattan has historically maintained a diversity of neighborhoods, industries and institutions. During the seventeenth and early eighteenth centuries, this region was only woodlands with sparsely situated farms. The first significant development within this district was the establishment of the Boston Post Road which ran through the Upper East Side of Manhattan Island near the present route of Third Avenue (Church and Rutsch 1984:13). This section of the route was known as the Eastern Post Road, built between 1669 and 1671. This important road was the vital link to the colonial village on the island's southern tip. Early settlements in this area tended to cluster along this road, and the East River shorefront. As a result of this thoroughfare, the last decades of the seventeenth century witnessed a growth of farmsteads.

In two transactions dated to 1677, the colonial Governor, Sir Edmund Andros, deeded 60 acres north of East 70th Street to John Bassett and an adjoining 60 acres to the southeast to Cornelius Mattysen (Stokes 1928 VI:108). By 1742 David Provoost had taken ownership of the Bassett land and the northern 30 acres of the Mattysen tract (Church and Rutsch 1984:10). This Provoost tract, otherwise known as Jones' Wood, became the Louvre Farm and was more intensively settled than the surrounding properties. An important facility in the area was the Dove Tavern, an early eighteenth century tavern formerly located at the intersection of East 67th Street and Third Avenue.

A Quaker by the name of Robert Murray owned almost all of what became Murray Hill prior to the American Revolution. In 1776 the fleeing Continentals charged north through this area after the British invaded Manhattan. British frigates were stationed near Kip's Bay to the south (23<sup>rd</sup> to 34<sup>rd</sup> Streets between Second Avenue and the East River) for the duration of the war. The British occupation of Manhattan raged havoc on much of this area. Woodlands were decimated and orchards pillaged and raided for wood.

After the Revolutionary War, the Common Council voted to have the Murray Hill region surveyed and divided into lots for sale. As a result, families established a hamlet called Yorkville, in the vicinity of the Post Road. This community extended north between East 83rd and East 89th Streets near Third Avenue, and was the site of a number of summer houses and estates. This settlement had good access to Newtown across the river, via the Horn's Hook - or Hell Gate - ferry across the East River. This ferry stopped at the foot of what is now East 86th Street at the East River. Yorkville eventually became a crowded section of tenements and brownstones populated by immigrants from Middle Europe (WPA 1982:184).

In 1815 the Common Council authorized the construction of Third Avenue which was to be 60 feet wide. In the 1820s this road was macadamized making this an

popular thoroughfare to travel (Rubinson et al 1984:15). As a result, by the first half of the nineteenth century this area grew into a domesticated landscape containing some estates bordering the East River shore, some mixed but scattered development along or near the Post Road, and the single hamlet of Yorkville. As early as the 1820s sections of the Upper East Side were home to many small houses and shanties, particularly in the area south of 104th Street (Hunter 1990:5-12).

The construction of the New York and Harlem Railroad, which was operating by 1832, further opened up this area to more settlement and vastly impacted this area as smokey trains cut through the community of Yorkville (Church and Rutsch 1984:14). Nineteenth-century maps show the transformation of this district from rural to suburban and then urban. The fast growing climate resulted in an oddly mixed land use - for example in some places small run down shanties were situated next to large opulent estates.

The mid-nineteenth century also marked the true appearance of class segregated neighborhoods. The industrial working class was just beginning to emerge in the 1820s-1830s. There was an influx of European immigrants at that time, and in downtown the poor inherited the abandoned homes of the uptown-moving rich, who ended up in the Midtown and Upper East Side areas. There was increasing differentiation between neighborhoods and the steady move uptown spread. The city proper tapered off about 14th Street in 1825 - but by 1853 it extended much further north (NYCLPC 1983:25).

In the 1850s and 60s, "Manhattan north of Forty-second Street was not pleasant countryside; it was garbage dumps, shanty towns, and decrepit taverns, all punctuated by outcroppings of rock" (Lockwood 1976:236). One census counted over 10,000 squatters in this area (ibid.), while the *New York Times* conservatively estimated the Manhattan squatters' population at 20,000 in 1864 (Plunz 1990:53-54). Although squatting in the area slated for Central Park became more widespread after 1853, when the City began acquiring private land for the Park, one of Frederick Law Olmsted's first acts as Park Commissioner in 1857 was to remove 300 shacks from the area. The construction of Central Park had an important effect on the East Side of Manhattan. The Park made Fifth Avenue, which formed its eastern border, New York's new fashionable neighborhood. As a result, real estate prices and development increased there and on adjacent streets.

Following the Civil War, prosperity brought growth to this area. Further impacts to the Upper East side neighborhood occurred with the construction of the Third Avenue Elevated (El) train in 1878-1881 which brought additional people and businesses to the region. Squatters, who may have paid "rent" to land speculators, were evicted from the properties as the residential building boom moved north, and one- and two-family houses and tenements were erected. (Plunz 1990:54).

The densely settled areas of lower Manhattan (below 30th Street ) were ringed with factories, shipyards, and wharves, while the central business district remained below Chambers Street. Working class housing tended to be located on the city's East Side while the elite lived in the city's northern sections (Ibid.). The Upper East Side region was never entirely residential, but continuously had a mix of small industries and services as well. Some of the examples of the types of non-residential uses in this region include Mt. Sinai Hospital, which was built between 1872-1904, the Normal College for Girls (now Hunter College) built in 1873, and the Seventh Regiment Armory erected in 1880.

Between 1867 and 1880 four elevated train lines were built in Manhattan, one on Second Avenue (Parsons Brinckerhoff Quade & Douglas, Inc., et al 1991:II-3). Steam powered trains chugged up through Manhattan leaving soot and smoke in their trails. While the EIs were relatively inexpensive and quick to build, they were noisy, interfered with street traffic, and blocked light and air from abutting properties (Ibid.). Many of the residents adjacent to these lines considered them a blight. But the EI mobilized the city population and forever changed the city's character. The introduction of the subway in 1904 and the subsequent dismantling of the EI tracks did much to improve this area. The construction of East River Drive in the 1940s further changed the nature of the East Side by attempting to beautify the waterfront.

#### East Harlem

New Amsterdam had been settled for 13 years before the first attempt was made to settle at Harlem. Early attempts by families in 1637 were not successful because of lack of manpower, poor health, political conflict and Indian attacks. By 1658 a village was developed in New Harlem, laid out by an order for the Director-General and Council of New Netherland. The village had house lots and garden lots with related farming land. Its boundaries are almost entirely outside of the project area, and are approximately as follows: starting at a point on the East River at 125th Street the village boundary headed southwest to the intersection of Second Avenue and East 122nd Street. It then turned south on Second Avenue to East 118th Street. Heading west on East 118th Street it then veered north on Park Avenue to East 122nd Street. At East 122nd Street the boundary veered east one block to Lexington Avenue, and then headed north to East 125th Street, where it then veered east again for one block. The boundary then turned north up Third Avenue, east at East 128th Street, then roughly followed the shoreline back down to East 125th Street. This tract is now commonly known as Spanish Harlem (Rubinson 1989:10).

Isaac De Forest was the first documented owner of what became the village of Harlem. In 1630s he was granted about 100 acres in a narrow strip from the Harlem Creek to the Harlem River. This tract went to William Beeckman and then Claesen Swits. Swits' farm was destroyed in an Indian attack (Rubinson 1989:11). Swits' abandoned land became the first documented settlement of the village of New Harlem.

Much of the area south of Harlem Village was part of the common land used by area residents as pasture land (Kearns and Kirkorian 1986: Neighborhood 2).

After New Haarlem was established, Danes, Swedes, Hollanders, French Huguenots, and Germans developed rich farms there. It was originally connected with the little town of New Amsterdam by the widening of the previously-discussed Indian trail "by the Dutch West India Company's negroes" (WPA 1939:254). Interestingly, the British permitted it to retain the name of New Harlem after their capture of the city in 1664 (Ibid.:256).

It wasn't until the early nineteenth century that this area truly began to grow. East of Fifth Avenue, between East 110th and East 125th Streets, a tract was purchased by James Roosevelt, great-grandfather of Franklin Delano Roosevelt. He cultivated this land and eventually sold the property in the 1820s. The 1832 construction of the Railroad to Harlem from the southern tip of Manhattan forged the way for this region to change from a charming rural area to a "suburb" of the growing city.

Because of the growth and overcrowding in lower Manhattan, there was an increased need for low-cost housing as wage-earners desired to move their homes apart from their work place and other industrial centers. The city had changed again, internally, and organizationally. At its edges were still factories and shipyards, while other sections had small shops, factories, and residences. Residential patterns changed, and residential streets of varying wealth and character were both clustered and scattered throughout the city proper (NYCLPC 1983:25). Factories and warehouses often moved to more remote areas. When the railroad was built from Chambers Street to Harlem in the 1830s, it enabled large numbers of people to move to the northern part of the island, and Harlem's population grew.

The nineteenth century also marked the introduction of the elevated railroad up Second and Third Avenues in the 1870s. The flatlands of the upper 90s served the transportation industry with the Manhattan Railway Company's yard at East 99th Street, and a trolley barn at East 100th Street and Lexington Avenue. In the early nineteenth century, the majority of Manhattan north of 125th Street was listed as a mix of residential, agricultural, and industrial use, while the late nineteenth century it was shown as residential, commercial, and unimproved land. Presumably agriculture had largely been abandoned in this area by that time (NYCLPC Neighborhood Maps 1815-1829, 1855-1879). After 125th Street was opened and regulated, it became an import cross-island thoroughfare.

The Polo-Grounds in northern Manhattan were visited by New York's society, and the acclaimed Harlem Opera House was opened on West 125th Street in 1889. Following this period an influx of immigrants, largely Jews and Italians, changed the community character again. By the early twentieth century, African Americans, Puerto

Ricans, and other Latin-American groups moved to the area. Subsequently, housing developments which once were stretched along the Lower East Side, took hold in this section of the city. Harlem has a wealth of rich cultural resources chronicling the communities various transformations.

## History of New York's Transportation Systems

### Trolley Lines

Following the creation of a formal street system within the city in the early nineteenth century, public transportation efforts were escalated. The great network of mass-transit that exists in Manhattan today got its small beginning in 1832 when the first streetcar, drawn by a team of horses, passed along the streets of New York City. While surface railways were operating in Manhattan in the 1840s and 1850s, these were typically at-grade steam engines which proved hazardous to pedestrian and vehicular traffic, and volatile to human health in general. Horse-drawn streetcars were slow to take hold, but by the 1860s were networked throughout the city. Their popularity was due, in part, to their less officious and more accessible nature. The earliest horse-drawn lines were no more than tracks in the streetbeds which guided horse-drawn cars, and were slowly replaced by a series of other streetcars; first cable-run cars, and later electrically powered cars. However, some horse-drawn lines remained in use in Manhattan through the 1920's - particularly those that served the city's ferries.

In 1868 the first ploughed cable-cars were introduced, powered by long cables of iron and hemp that rested on pulleys which pulled them through the streets at about nine-miles per hour. A plough protruded below the car, passing through a slot between the rails which gripped the continuously-moving cable. These were expensive to operate and only lasted for a very brief period (Jackson 1995: 174).

Early electric railway experiments failed because they depended on wet-cell batteries, but by the 1870s efficient direct-current generators were available, and engineers quickly adopted them for streetcar systems. In 1874 Stephen Dudley Field successfully ran an electric streetcar in New York City with power from a stationary generator. At first power was transferred to the cars by an overhead trolley wire. These types of electrified trolleys were instituted in the 1880s, but following the blizzard of 1888 were abandoned and replaced by electrified tracks (personal communication, Tom Harrington, Curator, New York City Transit Museum, December 15, 1997). The new cars connected to an electrified track laid in a slot between the two main trolley tracks directly in the street bed (Cudahy 1982:11). Only New York City and Washington, D.C. required that trolleys be powered this way.

The earliest horse-drawn cars ran along tracks laid directly in the city streets, the rails of which were capable of holding 35 pounds per yard - a relatively low weight.

These tracks were commonly ripped out and replaced since they were not capable of supporting the weight of later cable and electrified cars. The later ploughed cable-cars required rails capable of supporting 65 pounds per yard, and the subsequent electrified cars were even heavier which forced earlier tracks to be ripped up and replaced with even heavier weight tracks (personal communication, William Wood, Connecticut Trolley Museum, December 4, 1997). Huge cast iron saddles, typically three to four feet high and yoked shaped, were installed in the streetbeds to support both the trackage of the cable cars and later the electrified cars. Many of these were later modified or modernized; cast-cement models sometimes replaced them. The older trolley saddles within the street beds of Manhattan were either ripped up and replaced, or abandoned *in situ* and paved over.

This popular form of electric street railways spread rapidly until the early 20th century. With the advent of buses, the costs of street-railway maintenance seemed prohibitively high, and hundreds of railway systems in New York City were abandoned during the period from 1920 to 1960 as the age of the automobile took off.

### Elevated Trains

Other efforts to improve transportation in Manhattan sought to avoid the already congested streets which were crowded with pedestrian and vehicular traffic. Elevated trains were proposed to remove speeding trains from the dangerous street level, and provide "rapid transit" between the northern and southern sections of the city. The first elevated train in Manhattan, the Ninth Avenue El, was actually an overhead cable-powered railway. These elevated cable-cars were replaced by steam locomotives in 1871 (Jackson 1995: 174).

The Third Avenue El was opened in the 1870s, and in 1879 the Second Avenue El was opened as far north as East Harlem, connecting this neighborhood with lower Manhattan and the outer boroughs. These two lines were built by the Metropolitan Elevated Company and the New York Elevated Railroad respectively, which merged in 1879 to form the Manhattan Railway (Stelter 1995:9). While real estate directly along their smoke-filled and noisy routes was typically reserved for the impoverished, surrounding neighborhoods became more fashionable (WPA 1939:256).

In 1902 the Manhattan Railway company electrified their lines, improving air quality along El routes. By 1920 the ridership on the El systems reached its peak, subsequently declining with competition brought on by the newly burgeoning subway system. The late 1920s saw closure to some of the El lines. In 1940 the Second Avenue line north of 59th Street was officially closed, and was demolished the following year. The remainder of the Second Avenue line was razed in 1942 as riding subways and public buses became customary (Stelter 1995: 9).

### Subway Lines

Following the passage of the state Rapid Transit Act of 1894, New York's first subway line opened in 1904. And while the ensuing years of development and refining this transportation system opened the doors to what is now New York's rapid transit system, it was not without a bumpy ride. When subways were introduced, they eventually replaced existing elevated train lines and the even more outmoded street trolleys which serviced the city. Traveling around the city was greatly enhanced.

Subways were constructed in one of two ways: by deep-boring tunnels or by shallow excavation more commonly known as the "cut and cover" method (Cudahy 1988:23). Subsurface conditions had a direct bearing on the method employed. In some cases one method was used on one side of a street, and another method was used on the other because of the underlying geology. While the cut and cover method proved unsafe in several instances - more than one accident occurred when temporary covers over open tunnels collapsed allowing pedestrian and vehicular traffic to fall in - it also caused any pre-existing archaeological deposits en route to be destroyed. Because deep boring tunnels usually ran far below the surface and often through bedrock, any pre-existing archaeological deposits located closer to the surface would have remained potentially undisturbed.

The opening of the subway in 1904 had profound influence on the sparsely populated areas in northern Manhattan. According to one report,

The Progressives, social reformers very public and vocal at the time, wanted single family houses to be erected in these new areas, but the actions of land and building speculators brought about the construction of tenement type buildings (Parsons Brinckerhoff Quade & Douglas, Inc., et al 1991:III-5).

Plans to relieve urban slums in lower Manhattan relied heavily on the ease of movement provided by the new subways. With the opening of the IRT New York's demographics changed, and populations were dispersed and shifted. In fact, the subway system is said to have one of the greatest impacts on the City's twentieth century settlement patterns(Ibid.:IV-1).<sup>2</sup>

In 1940 the City of New York purchased the IRT and the Second Avenue El was abandoned and dismantled with the promise of a new Second Avenue Subway (Cudahy 1988:118; Stelter 1995: 9). Only the Third Avenue El remained in operation on the east side. The intent was for the Third Avenue El to stay in operation until the planned Second Avenue subway was completed (Cudahy 1988:119). In 1955 all of the Third Avenue El in Manhattan was abandoned - a six mile stretch in the Bronx

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<sup>2</sup>For a more complete discussion of New York's subway system see Parsons Brinckerhoff Quade & Douglas, Inc., 1991, and Cudahy 1979.

remained active until 1973 (Ibid.:126). Demolition included yanking the pillars from their foundations (Stelter 1995:109).

In October of 1972 ground was broken at East 102nd Street for the newly approved Second Avenue Subway (Cudahy 1988:150). However, New York City's financial troubles in the 1970s brought a quick halt to construction and excavated tunnels were sealed up and left for future use. At that time the MTA chose to invest in refurbishing and updating older lines and future services for Queens.

## PREVIOUSLY IDENTIFIED HISTORICAL SITE TYPES

The NYCLPC has worked towards developing an outline for studying Manhattan's historical archaeological resources. As part of their efforts, potential resources within Manhattan were divided into distinct time periods, and specific resource types. These efforts have resulted in the delineation of six different time periods (NYCLPC 1983) and 16 different categories of potential resources. The NYCLPC's Draft Predictive Model for Manhattan's archaeological resources examined changing land use patterns, focusing on specific industrial, commercial, and public areas that may be archaeologically visible, and provided recommendations for future research (NYCLPC 1982:4).

The categories developed by the NYCLPC were adopted for this study and are presented below. Although each site type is discussed, some resource types are not found within any of the APEs. In the following Existing Conditions chapter, the sensitivity of each individual APE for these types of resources is addressed.

### Agricultural Land

Most of the tracts of agricultural land observed on maps were in the Lower East Side's northern section, and north to Harlem. It is doubtful that this type of resource would have a high degree of archaeological visibility. There have been cases where buried prehistoric agricultural fields and where historical plow scars and agricultural features do indeed survive beneath fill in rural settings. But these instances are very rare, especially in an urban environment.

## Commercial

Many areas of commercial activity occurred throughout Manhattan, but earlier ventures were concentrated in Lower Manhattan and the Lower East Side. The waterfront was the hub of most early commercial activities, as evidenced by archaeological research in these areas.

Archaeological research at Block 31, bounded by Pearl, Wall, and Water Streets and by the south lot line of Lot 11, revealed that the site possessed landfill associated with a series of water lot grants dating to 1694-95, and some of the earliest commercial activities associated with the waterfront in that area. By the middle of the eighteenth century and the early nineteenth century, the block was mixed residential, with a cluster of chemist/druggists, artists and small scale merchants (Louis Berger & Associates 1987:11). The block was eventually used as brokerages and for warehousing; by the 1820s it was all commercial.

Stage I testing performed at the site exposed extensive yard deposits, middens, privies, wells, cisterns, and house and outbuilding foundations. The rear yard areas were concentrated within the center of the block. Deposits along the street fronts were destroyed by late nineteenth and twentieth century construction. Most of the deposits dated between 1780-1820. Home lot and commercial activities were reflected in the archaeological deposits (Ibid.:4).

One of the resources of particular interest in this category are markets. According to some studies of market placement in Manhattan, the location of markets is determined by expected consumer rationality and competition between sellers. Most of the markets were located along the edges of Manhattan (Rothschild 1990:56). By 1728 there were five markets in Manhattan, all located along the East River at the ends of major streets. It was probably the farmers' need for easy transport of goods into the city that was responsible for the waterside location of markets. In the project area there were markets near Water Street at Old Slip and Coenties Slip (Ibid.:57).

Much of the project traverses areas of early commercial use, especially in Lower Manhattan. Specifically, where the route of the light rail transit crosses former city blocks which were razed and paved, there is a high sensitivity for this type of resource.

## Residential

Archaeological research in Manhattan has shown that residential neighborhoods have the potential to yield important information on former occupants. Although several nineteenth century sites have been archaeologically studied in lower Manhattan such as 64 Pearl Street, 175 Water Street, 209 Water Street, and Old Slip, these do not address the borough's general settlement patterns or land use (NYCLPC 1983:14). The expansion of city services to developing areas and the differences in availability to

rich and poor or commercial and residential neighborhoods is poorly understood. Therefore, residential yards and features throughout Manhattan are considered a potentially important historical resource towards understanding the issue of community development and expansion.

Early residences were scattered throughout the island in a number of communities, and frontages were not oriented toward the current street grid. Therefore, remnants of these structures and associated features may be present within the road beds in a number of places. In addition, after the grid plan was implemented (1811), and city blocks were created, some blocks were developed and then razed for street rerouting. These areas are also sensitive for dwellings, most likely dating to the nineteenth and twentieth centuries.

#### Governmental (including town halls, court houses, civic centers)

Historically, a number of civic institutions were present throughout Manhattan, but not within any APEs. No specific structures of this type which will be potentially impacted were identified in this preliminary stage of research.

#### Military

The military related structures and features identified for this report largely date to the Revolutionary War period. Public parks and squares were used as parade grounds then and during subsequent periods of military upheaval. Garrisons and forts were scattered throughout the southern section of the project area and were extensive in nature. The wall that once ran along what is now Wall Street, was itself a military feature - designed to keep intruders out of the city proper. Fortifications were reported in the following places near the project area: At Wall Street near Pearl Street (Fly Block House 1689-), Pearl and Wall Street (Guard house near the Water Gate 1653), Pearl Street west of Old Slip (Half-Moon at Burger's Path 1679-1695), South side of Pearl Street east of Coenties Alley (Half Moon before the Stadt Huys 1661-), north and south of the line of Chambers Street across the length of the island (Palisades of 1746); across the island along the north line of Wall Street (The Wall 1653-1699), Whitehall Street (Whitehall Battery 1694) (NYCLPC 1982:94-95).

A magazine or powder house stood in what is now City Hall Park between 1747 and 1789, and upper barracks were sited there from 1757 through 1790 (NYCLPC 1982:88). Between 1811 and 1812 additional fortifications, mostly earth and timber works, were quickly mounted. These extremely important features are depicted on the Historical Sensitivity Maps. Battlefields and sites of skirmishes, e.g. McGown's Pass north of 99<sup>th</sup> Street, have a lower degree of archaeological visibility.

## Industrial

Only a few industrial complexes and structures were observed on historical maps within the project APEs. There were a number of early potteries in lower Manhattan, but these are either outside of the project site, or their exact whereabouts unknown. The exception to this is a cluster of potters somewhere in the vicinity of the current location of the Alfred E. Smith houses near Dover Street, and another "just west or east of Broadway, contiguous and adjacent to the Negroes burial ground" (NYCLPC 1982:108-109). The majority of the other industries and industrial complexes, e.g., two eighteenth century ropewalks, were observed outside of impact boundaries.

## Institutional Complexes (e.g. colleges, hospitals, mental institutions)

A number of areas with large institutional complexes, or where a number of smaller institutions were clustered over a few city blocks were observed on historical maps and atlases. In the northeast corner of City Hall Park, New York's first Dispensary stood between 1811 and 1828 (NYCLPC Appendix L). The city's first alms house (1736-1797), which also stood in City Hall Park, was professionally excavated in the late 1980s (NYCLPC 1990:1).

A number of these institutions were also located on the Upper East Side near First and Second Avenues and 64th Street.

## Parks and Recreation

The establishment of parks and recreation sites has been integral to the history of Manhattan. As part of the 1811 Commissioners Plan, the entire island of Manhattan was gridded, and designated park land was established. However, not all designated parks were actually built. Established parks provided residents with much needed breaks in the urban landscape, and allowed city dwellers the opportunity to seek tranquility amidst the clutter. No potential archaeological features related to parks exist within any of the APEs.

## Cemeteries

Several cemeteries were identified within the vicinity of project site, although none actually fall within the APEs. Furthermore, the NYCLPC study listed no potential cemeteries within the APEs (1982:89). However, there is a possibility that undocumented small family graveyards and church-associated cemeteries exist in the area.

The African Burial Ground is located near Chambers Street, however, there are no APEs within or directly adjacent to its boundaries (See Methodology Section). The National Historical Site includes Blocks 153, 154, and 155, and is bounded by Duane

Street on the north, Chambers Street on the south, Centre Street and Lafayette Street on the east and Broadway on the west. Since the African Burial Ground is thought to be preserved beyond the bounds of this designated tract, the NYCLPC expanded upon the National Historical Site boundaries when they designated the site as a city landmark. Boundaries were increased to encompass Block 122 to the south, where City Hall is now located, and Blocks 155 and 158 to the north, between Lafayette Street, Pearl Street, and Park Street to include the Commons Historical District (Howson, et al 1991; Harris et al 1993).

### Docks and Wharves

There is the potential for docks, wharves, and other waterfront features including bulkheads, to exist where the project site traverses landfill. Sections of Water Street, parts of Avenues C and D, and First Avenue cross over land which was once either submerged or shown as wetland/marsh on the 1859 Viele Topographic Map. Historical filling created the roadbeds for these thoroughfares which were once along the shorefront. It is possible that historical waterfront features are buried in this landfill.

Previous archaeological studies on the wharves and piers of Manhattan have focused primarily on resources dating to the eighteenth and very early nineteenth centuries. The mid-nineteenth century transition to the pile driven wharves has not been documented up to this point, leaving a real gap in our knowledge of the history of wharf construction. Piers and wharves which may be located in the project site should be assessed for significance with regards to the type of joinery techniques employed and the whether they bear evidence of the effects of utilizing steam driven piles.

The South Street Seaport District is listed on the National Register. The district encompasses the blocks bounded by Burling (John Street) and Peck Slips, and Water and South Streets directly adjacent to and within the project corridor on Water Street.

### Fishing

No specific fishing related features are expected in the project area.

### Transportation

This category contains two specific types of historical structures which may have archaeological components, and may fall within the impact corridors. These include trolley lines and elevated trains (a.k.a. els).

- Trolley Lines

Trolley lines may be present in the street beds of the APEs. The earliest horse-drawn lines were no more than tracks in the streetbeds which were commonly ripped

out and replaced with electrified tracks in the 1890s. Trolleys powered by overhead wires were instituted in the 1880s, but following the blizzard of 1888 were abandoned and replaced by electrified tracks. By 1899 Second Avenue had an electrified line, while most of the Lower East Side and Lower Manhattan were still serviced by horse-drawn lines (Landers 1997: map #4).

Most of the earlier horse-drawn tracks were removed or abandoned. However, in some places, such as Fifth Avenue, these early horse-drawn tracks were never removed, remaining in operation until buses replaced them. The remains of the later electrified tracks - which consisted of two outside tracks and a third central electrified track - are commonly found throughout Manhattan. Other features, such as saddles (yokes), switching boxes, or electrical duct feeder vaults, may be associated with them. Since many of these lines ran through the 1940s, the earliest systems were often modified and updated with more modern equipment. Subsurface remains of these late-running systems bear evidence of these later modernizations, and little - if no - evidence of their original components.

The archaeological research potential of trolley features is currently under consideration. Some trolley features are considered more likely to address meaningful research issues than others. According to Tom Harrington, curator at the New York City Transit Museum, the presence of former trolley lines alone is not reason to designate their former routes as archaeologically sensitive (personal communication December 15, 1997). Extensive documentation already exists regarding the routes, technology, and construction of Manhattan's trolleys. Thus tracks found in the streetbeds are not typically considered potentially significant. However, encountering a feature such as a cast-iron saddle - a support structure for the earliest electrified trolleys - may warrant consideration.

- **Elevated Trains**

EIs which once ran above some of the APEs date to the late 1870s. When the EIs were dismantled, all of their structural supports were removed and recycled throughout the city. The brick and/or cement footings for structural framework were most likely removed entirely, but at the least were removed above street level. Footings from these piers, which may exist within the APEs, are common throughout Manhattan given that these lines covered miles of terrain. Furthermore, as a potential resource footings can provide only limited information about the structures they supported. Thus while this resource may require further consideration, its research potential is considered minimal.

### **Reservoir and City Water Systems**

No reservoirs were noted within any of the APEs. However, evidence of early water distribution systems undoubtedly exists throughout Lower Manhattan. Until 1842

when the gravity-fed Croton Aqueduct brought fresh water into Manhattan, city residents relied on well water and centralized pump stations. The introduction of a reliable water source was met with enthusiasm and piped delivery to sections of the city began in earnest. Early piping systems for water delivery, some being hollowed tree trunks, have been recovered within city streets. These early infrastructure systems, underlying many of the city's earliest streets in Lower Manhattan and the Lower East side constitute a historical resource. However, they are typically buried beneath the anticipated depths of project impacts.

Concurrent with the need to bring water into the city proper, was the need to dispose of vast quantities of sewage. In response to this need elaborate and massive brick sewer lines were installed in street beds throughout Manhattan during the nineteenth century.

#### Landfill

Archaeological research in lower Manhattan, and particularly on Water Street, has shown that landfill can be a potentially important resource. In their 1981 study of the 175 Water Street Block, Soil Systems, Inc., (1981), map research showed that this block was filled between 1730 and 1766-67. The study area to the west was filled between 1660 and 1730. In the seventeenth century this tract was owned by Laurens Cornelissen vander Wel. The early riverside structures in the area were known as Smith's Fly, and were subsequently named Queen's Street and finally Pearl Street. The Dongan charter of 1686 permitted filling to the low water mark, and after this, city ordinances regulated the granting and filling of water lots (Soil Systems 1981:3). The Montgomery Charter of 1731 extended the landfill 400 feet below the low water mark, which required the creation of a bulkhead or dock and backfilling. Boats and other items were used for fill.

In another study of a parcel directly west of Water Street, field investigations at Block 71 between John, Front, Fletcher, and Water Streets recovered a Merchant ship in the landfill. In 1736 water lots were granted to merchants, and they were filled by 1773. The ship dated to the late seventeenth or early eighteenth century, and was discovered outside of the backyard area. This block is reclaimed land located on the fringe of the South Street Seaport Historical District, which is on the National Rester of Historical Places (Soil Systems 1982:2). Preliminary documentary research verified the block's commercial history, tying it to the mid-to-late eighteenth century development of New York City. Background research chronicled the backyard sections of the lots and determined that this was a predominantly mercantile area with china and glass shops as well as warehouses (Ibid.:5).

For about the past ten years archaeologists have focused on research documenting changes in urban landfill and the growth and development of the urban waterfront. These two issues have important implications for our understanding of the

process of urbanization. The majority of the research on these types of sites has been conducted within the boundaries of New York City, with Manhattan receiving most of the attention because of the intensive development currently occurring on the island. Beyond increasing our knowledge of Manhattan's development, archaeologists must also be interested in the possibility that information from these archaeological resources might cast light on the process of urbanization in general. This might be done through comparison of data from sites located in different cities and associated with different time periods.

Because so much work has already been done by professional archaeologists towards documenting the general filling process in Manhattan, many research issues appear to have been adequately addressed. More so, the various archaeological sites researched all demonstrated similar characteristics in terms of the technical aspects of land creation and the types of fills used in the process.

Therefore, unless a filling deposition can be tied to a specific episode by a group or individual, such as a manufacturer discarding waste materials from the production process, landfill in and of itself has little to contribute to the historical record. If specifically documented resources are in situ, precise information can be gathered regarding a manufacturing process or an individual's lifeways. If deposition is simply the collection of trash from an undesignated area, together with materials excavated elsewhere and debris from a variety of sources, then the landfill lacks associative value.

Additionally, occasionally ships were sunk as landfill between slips and along the shoreline. In some cases the hulls were intentionally raised from the river bottom, while in other cases they were left as fill. Ships and their associated artifacts found in this context are often well preserved and can provide information of significant historical value.

Other (unimproved or wooded areas, marsh)

While these areas were identified by the NYCLPC, the question of archaeological visibility must be considered. As a resource, they should be considered only moderately important, and only minimally visible.

Churches

This category was not on the NYCLPC list but was added for this research as a possible indicator of pre-1850 cemetery lots. After the city's cholera and yellow fever epidemics of the early 1800s, in conjunction with the rapid spread of the population and the introduction of the "cemetery as a park" concept, cemeteries were concentrated in the outer boroughs. Prior to this shift, interments were often on family estates, in potters fields in various sections of the city, and within the confines of the church yard.

There were numerous churches throughout Manhattan, serving the diverse neighborhoods and populations. Early eighteenth century churches tended to be situated inland, in the center of Manhattan, rather than on the shoreline (Rothschild 1990:47). This pattern continued through the late eighteenth century, but as the city grew their placements became more spread out. Although there are churches near the project site, none were directly noted within any of the APEs.

## V. EXISTING CONDITIONS AND PROBABLE IMPACTS TO AREAS OF POTENTIAL EFFECT (APE)

### RESEARCH ISSUES

This chapter documents the existing conditions of each APE derived through the completion of several tasks. First, known and potential archaeological resources were identified through documentary and cartographic research at repositories such as the New York Public Library (NYPL), the NYSOPRHP, the New York State Museum site files (NYSM), and the NYCLPC files and archives (predictive models, neighborhood studies, planning documents, and site inventory forms). Next, recorded prior subsurface disturbances were documented through a review of utility maps, and historical and topographic maps. Following this task, a discussion of potential resources which may not have been previously disturbed was compiled, and an assessment of proposed construction impacts to potential resources was made. Finally, recommendations for further investigations, if any, were presented.

Documenting prior disturbances to potential archaeological resources requires an understanding of each resource's initial deposition. Due to differences in technology, land use, and lifeways, the depths of archaeological resources from the prehistoric and historical periods generally vary relative to the ground surface at the time of their deposition. As a result, subsequent activities such as construction or grading impact these buried resources differently.

Prehistoric resources in much of Manhattan are typically found in shallow deposits; that is, they are not deeply buried below the original surface largely because of the lack of soil build-up. Buried prehistoric archaeological remains are normally found within 3 to 4 feet of the pre-development land surface, and as a result, are extremely susceptible to destruction from subsequent grading and construction. Therefore, disturbance to the prehistoric topography generally constitutes disturbance to the prehistoric resources.

In order for a potentially prehistorically sensitive area to retain that evaluation, it must be demonstrated that the original prehistoric - and pre-colonial - land surface has somehow been protected from historical manipulation. To address potential site integrity, or lack thereof, research must be aimed at demonstrating either that pristine soils have been protected beneath fill prior to modern development, or that these soils have not been protected and were disturbed by historical processes (e.g. the regulating of streets and installation of utilities).

Historical archaeological resources relating to dwellings, workplaces and schools are often more deeply buried since they are sometimes preserved in privies, cisterns or wells, which in the days before the construction of municipal services -

namely sewers and a public water supply - were an inevitable part of daily life. These shafts became convenient receptacles for all sorts of trash, providing a valuable time capsule of stratified deposits for the modern archaeologist. They frequently provide the best domestic remains recovered on urban sites. Truncated portions of these shaft features are often encountered on homelots because their deeper (to approximately 8 feet) and therefore earlier layers remain undisturbed by subsequent construction. In fact, construction often preserves the lower sections of the features by sealing them beneath structures and fill layers.

Other commonly occurring, but much more shallow buried historical remains include foundations and builder's trenches, which extend only a few feet below the pre-development land surface if a structure did not have a basement. More fragile backyard remains such as fence lines, paths, traces of landscaping and sheet midden scatter rarely survive in the urban context.

The creation of the streets and avenues themselves may have caused a degree of disturbance to the original landscape, and perhaps the prehistoric and/or historical archaeological resources which may have been previously deposited along their routes. However, in some cases street regulating did not impact subsurface deposits, especially where grading was not required. For example, in lower Manhattan a stratified series of historical deposits were found in the street bed lying between Broad Street and Coenties Alley, within the top four feet below grade (NYAC Action Committee Resolution 1997: 7). Below this were seventeenth century Dutch artifacts, which were underlain by earlier Native American artifacts at seven feet below grade. Neither the creation of the street nor the installation of utilities - which were clustered in the center of the street - impacted these potentially significant deposits.

Given that it has been demonstrated that potentially significant archaeological deposits can retain their integrity beneath the street surfaces within Manhattan, it is necessary to detail and document disturbance episodes and the horizontal and vertical extent and types of land manipulation that would have been required for the creation of the existing streets and the burying of utility lines. Therefore, a discussion of the types of disturbances experienced by the creation of each street and the urban infrastructure is presented for each APE.

Not every resource type presented in the previous chapter is discussed individually within each APE. Specifically, most transportation related resource types identified in the APEs are ubiquitous in Manhattan. Almost every APE that historically served as a transportation artery is potentially sensitive for these types of resources, which include trolley features such as cast-iron saddles, switching boxes, and electrical duct feeder vaults, as well as pier foundations from el's. Second Avenue hosted both surface trolley cars and an el in the late nineteenth century, and many of the Lower Manhattan streets had horse-drawn trolleys on them at one time or another. Because of both the density and wide spread occurrence of these resource types, their potential

presence within all of the APEs is noted herein. Therefore, each following APE discussion does not restate the potential for these resources to exist; it is simply a given. The potential presence of these resources alone would probably not justify mitigation procedures due to their minimal research potential. However, for the APEs which may require further mitigation for other resources, these resources should be addressed in more detail as part of that process.

## **PRESENTATION ORGANIZATION**

This chapter is subdivided by Build Alternatives, with the Northern Subway section presented first, and the southern Light Rail Transit section presented second.

Within the Northern Subway alternative, APEs are discussed according to the types of impacts which are anticipated (e.g. cut-and-cover versus boring). First, a discussion pertaining to the Tunnel and New Station Construction is presented running from south to north. This is followed by a discussion of the Tunnel Boring Machine Access Shaft APE, and finally the Vent Shafts, Fan Chambers, and Other Equipment APEs are discussed.

The southern Light Rail Transit section is also divided according to the type of anticipated impacts (e.g. cut-and-cover tunnel construction versus surface track construction). Within each impact section, APEs are presented from south to north according to the divisions discussed in the Research Goals and Methods Chapter. First, the Below Grade Tunnel Construction APEs are presented. This is followed by the Surface Track Construction APEs, the Below-grade Substation APEs, and finally the Light Rail Storage Yard APE.

## **EXISTING CONDITIONS**

### **NORTHERN SUBWAY - BUILD ALTERNATIVES 1 & 2 TUNNEL AND NEW STATION CONSTRUCTION - AREAS OF POTENTIAL EFFECT**

East 69th to East 72nd Street - Second Avenue and Sidewalks (Figure 3)  
(UPPER EAST SIDE)

- Identification of Potential Resources

#### **Prehistoric Resources**

No potential prehistoric sites were previously identified for this section of the project site. The NYCLPC did not identify this area as potentially sensitive (New York City Landmarks Preservation Commission 1982), however early topographic maps show that this section of Second Avenue was once at the top of a hill two blocks south

of a fresh water stream (Viele 1859, 1874). This type of landform is considered potentially sensitive since it has been demonstrated that prehistoric sites have often been found on knolls near fresh water sources. Therefore, this section of the APE is considered moderately sensitive for prehistoric cultural deposits.

### Historical Resources

None of the maps and atlases consulted depicted any historical activity in this area (Bridges 1811; Colton 1836; Dripps 1852; Dripps 1867; Bromley 1879; Bromley 1902). Stokes reports that the route of Second Avenue was opened between East 28th and East 86th Streets, and from East 109th to East 123rd Street in 1835.

- Documentation of Disturbance

Currently there are a number of utility lines beneath the route of Second Avenue and the bordering sidewalks which would have caused impacts to potential archaeological resources. Excavations for each of these utilities would have probably extended between one and two feet beyond the size of the pipe, both horizontally and vertically. Plans and profiles of the current project indicate that these lines run to a depth of between ten and fifteen feet below grade (Vollmer Associates 1997a: Drawing NS-03). The 1958 Sewer Plan map shows that at that time there were two sewer pipes in Second Avenue, each 4' in diameter (City of New York 1958). The current sewer map also shows a sewer line beneath the street measuring 4' in diameter. There are also sewer lines traversing the avenue at cross streets. For example, at East 70th Street there is a sewer crossing Second Avenue measuring 4" x 2'4" (Vollmer Associates 1997b). There is also a 48" water main running beneath Second Avenue (Ibid.).

In addition, there are clusters of ECS (telecommunication) ducts in Second Avenue over and under existing sewers, but the majority of these run beneath the sidewalks on the western side of the road. Typically, these are clusters of 4" and 5" ducts, measuring a total of about 2' in diameter (Empire City Subway Co. 1979). In addition to these are gas lines and regulators, steam lines, and abandoned utility lines (e.g. postal & telegraph lines; old phone lines; old sewer and water lines) which do not show up on current maps, but all probably fall within fifteen feet below current grade. For example, the City of New York 1958 Plan of Sewers shows abandoned lines by that time, as do the Works Progress Administration 1937 Subsurface Conditions Maps.

No documents could be found providing the exact pre-development (ca. 1835) elevations of land between East 69th and East 72nd Streets along the route of Second Avenue although some topographic maps do show this area was once on top of a hill (Viele 1874). Typically, elevations were recorded on maps and atlases after the roads and avenues were created; thus any filling or grading had already been done.

Between East 69th Street and East 72nd Street the grade elevations currently lie roughly between 51' and 58' above Mean Sea Level, sloping downward to the north, and coincide exactly with the 1902 surface elevations (Sanborn 1997; Bromley 1902). Thus any filling and grading for the creation of Second Avenue was clearly already done by 1902, and the grade level of the street bed has remained unchanged over at least the last ninety years.

In this area the bedrock lies close to the surface, and in some places is no more than five feet below grade (Vollmer Associates 1997a: Drawing NS-03). Because of this, throughout this APE many of the utility lines are buried within the bedrock (Ibid.) The installation of utility lines must have required drilling and blasting bedrock to accommodate them.

Early Rock Data Maps do not have any boring data for this section of the project area (Rock Data Maps 1969-1973). However, soil borings performed in 1970 indicate that fill extends down from the streetbed to depths varying between two to ten feet (Raymond International Inc. 1970: Boring Logs 2-50 through 2-52). Heading from south to north, borings taken from beneath the sidewalks on either side of Second Avenue revealed the following (Note: All depths are feet below grade):

Stratigraphic Description	69th Street	70th Street	71st Street
Sand, Cinders & Gravel Fill	0-10'	0-2'	0-5'
Bedrock	10'	2'	5'

All of the soil borings show that fill levels range between two and eight feet in depth, and that these levels extend from grade down to bedrock (Raymond International. 1970: Borings #2-50-2-53). Most likely the leveling of the hill observed on early topographic maps for the creation of Second Avenue produced the observed subsurface stratigraphy. No water table data was given with any of these borings.

The installation of utility lines, which run as deep as fifteen feet below grade, has impacted the fill levels above the bedrock (Vollmer Associates 1997a). No natural stratigraphic levels appear to have remained above the bedrock. Again, the process of blasting to permit utility lines to run through bedrock has generated extensive subsurface disturbance, as did the act of grading and filling to create the street.

- Potential Undisturbed Resources

Although the APE may have once possessed prehistoric archaeological deposits, the cartographic and documentary research has concluded that there is no

longer any of the prehistoric landscape intact beneath the surface of Second Avenue within the APE. The shallow bedrock, grading, introduction of landfill, and installation of extensive utility lines has completely obliterated the prehistoric surface. Therefore, there are no potentially undisturbed prehistoric resources within this APE.

- **Assessment of Proposed Construction Impacts**

The proposed creation of a tunnel and station beneath Second Avenue between East 69th and East 72nd Streets will entail cut and cover excavation from the current grade down through bedrock to about forty feet below the surface. These activities will have no impact on any potential prehistoric archaeological resources since none would have survived prior disturbances.

- **Recommendations**

Because research has concluded that there is very low potential for significant archaeological resources to exist, no additional archaeological research or work is warranted for this APE. ✓

#### East 83rd to East 86th Street - Second Avenue and Sidewalks (Figure 4) (UPPER EAST SIDE)

- **Identification of Potential Resources**

An evaluation of the documentary sources has identified several potentially sensitive areas within the East 83rd to East 86th Street corridor.

##### Prehistoric Resources

The NYCLPC identified the land surrounding a small creek in the vicinity of Second Avenue and East 86th Street as potentially sensitive for prehistoric archaeological resources. The upland areas just south of the creek near East 86th Street presumably would have been suitable for prehistoric habitation.

##### Residential Dwellings

Historically this area was on the western boundary of Yorkville - a once rural village centered around East 84th Street and Third Avenue. In the 1850s Yorkville was predominantly occupied by Germans (Jackson 1995:1285).

Historical maps revealed that two structures belonging to H. Hopper once stood just south of East 84th Street in the vicinity of Second Avenue. The southern one of these stood in the planned Second Avenue road bed directly south of East 84th Street, while the northern building was directly south of East 84th Street, but within the

planned city block (Bridges 1811). Although the two structures appeared standing in 1836, they were both shown as being west of the Second Avenue street bed, well within the city block (Colton 1836). These were probably moved off the planned road bed in anticipation of its opening. The structures were also clearly off the road bed in 1852 and 1867 (Dripps 1852; Dripps 1867). By 1852 an additional building had been built within the Second Avenue street bed directly north of East 84th Street. By 1867 this had been removed (Dripps 1852; Dripps 1867).

In the vicinity of East 86th Street and Second Avenue two structures also appeared on the 1811 maps, one which fell into the Second Avenue street bed at East 86th Street, and a second to the north largely within the block (Bridges 1811). These were both labeled W. Waldron, and a system of drives led to them. Both of these structures had been moved off of the street bed and were within the block by 1836, again probably in anticipation of the street opening (Colton 1836). Both buildings had been removed altogether by 1852 (Dripps 1852).

- Documentation of Disturbance

Currently there are a number of utility lines beneath the route of Second Avenue and the bordering sidewalks which would have caused impacts to potential archaeological resources. Excavations for each of these utilities would have probably extended between one and two feet beyond the size of the pipe, both horizontally and vertically. Plans and profiles of the current project indicate that these lines run to a depth of between ten and fifteen feet below grade (Vollmer Associates 1997a: Drawing NS-06). The 1958 Sewer Plan map shows that at that time there were two sewer pipes in Second Avenue, each 4' in diameter (City of New York 1958). The current sewer maps show a sewer line beneath the street measuring 4' x 2'8" south of East 86th Street, a 12" sewer between East 86th and East 87th Street, a 15" sewer just north of East 87th Street, and a 30" sewer at East 88th Street. There are also sewer lines traversing the avenue at cross streets. For example, at East 85th Street there is a sewer crossing Second Avenue measuring 4' x 2'4" (Vollmer Associates 1997b). There is also a 48" water main running beneath Second Avenue (Ibid.).

In addition, there are clusters of ECS (telecommunication) ducts in Second Avenue over and under existing sewers, but the majority of these run beneath the sidewalks on the western side of the road. Typically, these are clusters of 4" and 5" ducts, measuring a total of about 2' in diameter (Empire City Subway Co. 1979). In addition to these are gas lines and regulators, steam lines, and abandoned utility lines (e.g. "postal" & "telegraph" lines; old phone lines; old sewer and water lines) which do not show up on current maps, but all probably fall within fifteen feet below current grade. For example, the City of New York 1958 Plan of Sewers shows abandoned lines by that time, as do the Works Progress Administration 1937 Subsurface Conditions Maps.

No documents could be found providing the precise pre-development (ca.1851) elevations of land between East 83rd and East 88th Streets along the route of Second Avenue. Typically, elevations were recorded on maps and atlases after the roads and avenues were created; thus any filling or grading had already been done.

Between East 83rd Street and East 86th Street the grade elevations currently lie roughly between 47' and 62' above Mean Sea Level, and coincide exactly with the 1902 surface elevations (Sanborn 1997; Bromley 1902). Thus any filling and grading for the creation of Second Avenue was clearly already done by 1902, and the grade level of the street bed has remained unchanged over at least the last ninety years. The surface elevations gradually slope upward as one progresses north from East 83rd Street and then start to dip down at East 86th Street.

In this area the bedrock lies close to the surface, and in some places is no more than five feet below grade (Vollmer Associates 1997a: Drawing NS-04). Because of this, throughout this APE many of the utility lines are buried within the bedrock (Ibid.) The installation of utility lines must have required drilling and blasting bedrock to accommodate them.

Early Rock Data Maps do not have any boring data for this section of the project area (Rock Data Maps 1969-1973). However, soil borings performed in 1970 indicate that fill extends down from the streetbed to depths varying between two to ten feet (Raymond International Inc. 1970: Boring Logs 2-67 through 2-73). Heading from south to north, borings taken from beneath the sidewalks on either side of Second Avenue revealed the following (Note: All depths are feet below grade):

<u>Stratigraphic Description</u>	<u>82nd-83rd Street</u>	<u>83rd-84th Street</u>	<u>84th-85th Street</u>	<u>85th-86th Street</u>	<u>86th-87th Street</u>	<u>87th Street</u>	<u>88th Street</u>
Sand & Gravel Fill	0-2'6"	0-5'	0-2'	0-2'	Refusal	0-8'	0-2'
Brown Sand/ Silt & Gravel	2'6"-8'6"						
Fine Brown Sandy Silt				2'-7'			2'-10'
Brown Clay & Sand				7'-11'			
Bedrock	8'6"	5'	2'	11'		8'	10'

Most of the borings encountered bedrock between five and ten feet below grade, while between East 84th and East 86th Streets it was much closer to the surface (Borings #2-85, #2-86). No water table data was given with any of these borings.

The soil borings show that fill levels range between two and eight feet in depth, and in most places actually extends from grade down to bedrock (Raymond International. 1970: Borings #2-67-2-73). Only between East 82nd and East 83rd Streets, at East 86th Street, and just north of East 88th Street are non-fill levels observed between the fill and bedrock (see the table above).

The installation of utility lines, which run to fifteen feet below grade, has not only impacted fill levels, but has also impacted the natural strata below it, where it exists (Vollmer Associates 1997a). Again, the process of blasting to permit utility lines to run through bedrock has generated extensive subsurface disturbance.

The Second Avenue roadbed between East 83rd and East 84th Streets may have once hosted the Hopper house which stood from at least 1811 and was removed sometime before 1836 (Bridges 1811; Colton 1836). However, the boring logs show that between East 83rd and East 85th Street only fill levels exist above the bedrock, which is fairly shallow (Boring Log 2-68). Bedrock was encountered between two and five feet below grade, and sewer lines were actually placed within the bedrock.

The subsurface conditions observed here suggests that potential historical resources in this area (e.g. wells, privies, and cisterns), which may have been associated with the Hopper structures, no longer exists. This is the case for one of two reasons. First, if there were once natural soil levels over bedrock which could have accommodated subsurface shaft features, they have either been removed or so disturbed that they now appear as fill levels (as evidenced by the borings presented above). Second, it is also possible that the shallow bedrock in this area actually prohibited the creation of these types of subsurface features, and thus they were sited elsewhere where there deep soil deposits permitted shafts. In either scenario, there is no potential to encounter historical deposits associated with these structures within this APE.

There were also two residential structures belonging to W. Waldron which once stood near East 86th Street and Second Avenue. Again, the buildings stood from at least 1811, but were removed by 1836 (Bridges 1811; Colton 1836). This area was also flagged by the NYCLPC as potentially sensitive for prehistoric archaeological resources.

Much like the scenario at East 84th Street, the bedrock was so shallow at East 86th Street that a soil boring could not be completed, and was simply recorded as a "Refusal" (Boring #2-85). To the north at East 87th Street, a boring revealed that eight feet of fill existed over the bedrock (Boring #2-86). No non-fill or natural stratigraphic

levels were observed in this area. The lack of natural stratigraphy and the shallow depth of bedrock negates both the historical and prehistoric sensitivity of the street bed in this area. Only fill levels remain. Any potential resources which may have once been deposited here were removed or disturbed with the regulating and opening of Second Avenue and the subsequent installation of utility lines.

- **Potential Undisturbed Resources**

Documentary research initially identified two areas which were considered potentially sensitive for nineteenth century historical remains within this APE: Second Avenue near East 84th Street and Second Avenue near East 86th Street. The area surrounding East 86th Street was also judged to be sensitive for prehistoric archaeological resources (NYCLPC 1982). Upon further examination of the subsurface conditions in these areas, it became clear that in each of these loci identified as potentially sensitive the bedrock is shallow (between two and eight feet below grade), and only fill levels exist above the bedrock. In addition, extensive utility lines have been installed beneath the Second Avenue street bed which, in some cases, were actually drilled into the bedrock due to its shallow depth.

The disturbance record clearly shows that there is no longer any possibility for historical resources associated with either the Hopper or Waldron houses to exist. Nor is there the possibility that shallow prehistoric deposits, if they did in fact once exist, have survived the effects of urbanization. In addition to the disturbance caused by the installation of utility lines, the actual regulating and opening of Second Avenue in and of itself would have caused impacts to these areas. The minimal depth of bedrock suggests that any resources pre-dating the creation of the road would have been shallowly deposited, and thus would have been easily obliterated by the creation of the road itself. Therefore, there is no longer any sensitivity for any prehistoric or historical archaeological resources.

- **Assessment of Proposed Construction Impacts**

The proposed creation of a tunnel and station beneath Second Avenue between East 83rd and East 89th Streets will entail cut and cover excavation from the current grade down through bedrock to about forty feet below the surface. These activities will have no impact on archaeological resources, since none were identified.

- **Recommendations**

Because research has concluded that there is very low potential for significant archaeological resources to exist, no additional archaeological research or work is warranted for this APE. ✓

East 92nd to East 99th Street - Second Avenue and Sidewalks (Figure 5)

## (EAST HARLEM & UPPER EAST SIDE)

- Identification of Potential Resources

### Prehistoric Resources

There is no potential for prehistoric cultural resources to exist within this APE since this entire APE was inundated with a series of streams prehistorically (Viele 1859; 1874). Furthermore, the NYCLPC predictive model of site locations failed to identify any potentially sensitive areas in this vicinity. The early topography of the site suggests it was not habitable prehistorically.

### Historical Resources

An evaluation of potential resources has identified only one potential archaeological resource within the East 92nd Street to East 99th Street Second Avenue corridor.

The current Sanborn map (Figure 5), shows that a series of streams crossed the route of Second Avenue prior to opening and regulation in the mid-nineteenth century. What the current Sanborn maps do not show is the extent of marsh land which surrounded this series of streams. The 1811 Commissioners Map, the 1819 Rikers Map and the 1836 Colton Map all show vast marsh land surrounding these water courses, essentially throughout this entire corridor.

The presence of marsh land and streams prohibited the historical development of this area, and thus none of the historical maps and atlases reviewed depicted any activity in this area (Colton 1836; Dripps 1851; Dripps 1867; Bromley 1879; Bromley 1902). Therefore, the only historical features within this APE are mid-to-late nineteenth century landfill which was required for the creation of Second Avenue and the Second Avenue El.

### Landfill

Although the 1811-1811 Commissioners Plan called for the creation of a gridded street system throughout Manhattan, the actual completion of streets and avenues did not occur, in some cases, until years later. In fact, much of Second Avenue was not opened until the 1830s. Some cross streets were not opened until much later. Historical fill used to create these streets is a potential archaeological resource, depending upon its date and whether it can be attributed to a specific depositional episode.

A stream and surrounding marsh land crossed Second Avenue between East 92nd and East 99th Streets. This was undoubtedly drained and filled to allow the

creation of the street system, probably sometime after 1867 since the wetlands were still depicted on maps at that time (Dripps 1851; Dripps 1867). By 1879 the road was complete at this location (Bromley 1879). Stokes reports that the route of Second Avenue was opened between East 28th and East 86th Streets, and from East 109th to East 123rd Street in 1835. However, the date of the avenue's opening between East 86th and East 106th Streets was not reported (Stokes 1929). Research suggests that the fill beneath Second Avenue which covered the marsh and stream between East 92nd and East 99th Streets definitely post-dates 1835, and most likely post-dates 1867.

The late period of the fill, which dates to the late nineteenth century, does not indicate archaeological sensitivity. Furthermore, there were no references in any of the historical literature consulted suggesting that these wetlands were filled with material from a single industrial, commercial, or residential source (Stokes 1929; Riker 1904). Maps and atlases revealed that there was almost no historical development through much of the nineteenth century in this area, thus there would be no industrial or domestic refuse from directly nearby that could have been used as fill (Colton 1836; Dripps 1852; Dripps 1867). Rather, the fill is most likely the collection of trash from an unknown source, together with materials excavated elsewhere. It is also possible that surrounding upland was leveled and graded to create the fill over this wet area. Therefore, the landfill in this APE lacks associative value and archaeological significance.

- **Documentation of Disturbance**

An extensive documentation of prior disturbances to this APE is not necessary due to the lack of archaeological potential.

- **Potential Undisturbed Resources**

The cartographic and documentary research has concluded that there were no potentially important archaeological resources within this APE.

- **Assessment of Proposed Construction Impacts**

The proposed creation of a tunnel and station beneath Second Avenue between East 92nd and East 99th Streets will entail cut and cover excavation from the current grade down to about forty feet below the surface. This will have no impact on potential archaeological resources, since none were identified.

- Recommendations

Because research has concluded that there is very low potential for significant archaeological resources to exist, no additional archaeological research or work is warranted for this APE.

#### East 105th to East 111th Street - Second Avenue and Sidewalks (Figure 6) (EAST HARLEM)

- Identification of Potential Resources

An evaluation of the documentary sources has identified several potentially sensitive areas within the East 105th to East 111th Street corridor.

#### Prehistoric Resources

No previously identified prehistoric sites were reported within this corridor. Furthermore, the NYCLPC failed to find this area sensitive for prehistoric resources in their 1982 assessment of the overall sensitivity of Manhattan. However, Grumet did identify land north and south of Harlem Creek as the site of Native American planting areas and old fields (Grumet 1981:68). This type of resource is extremely fragile due to its shallow and tenuous nature, and is rarely found undisturbed in the archaeological record. It is highly unlikely that any evidence or remains of these fields survived the process of urbanization.

#### Historical Resources

##### Landfill

Although the 1807-1811 Commissioners Plan called for the creation of a gridded street system throughout Manhattan, the actual completion of streets and avenues did not occur, in some cases, until years later. In fact, much of Second Avenue was not opened until the 1830s. Some cross streets were not opened until much later, such as East 111th Street which opened in 1869 (Bradley 1881: np). Historical fill used to create these streets is a potential archaeological resource, depending upon its date and whether it can be attributed to a specific depositional episode.

The route of Harlem Creek and its surrounding marsh land crossed Second Avenue between East 106th and East 109th Street. This was undoubtedly drained and filled to allow the creation of the street system, probably sometime after 1836 since the creek is still depicted on maps at that time (Colton 1836). As discussed above, Second Avenue was opened between East 109th to East 123rd Street in 1835 (Stokes 1929). In 1837 it was opened between East 106th and East 109th Streets. However, the date of the avenue's opening between East 86th and East 106th Streets was not reported.

Therefore, the fill beneath Second Avenue which covered the marsh and stream between East 106th and East 109th Streets probably dates to between 1835 and 1837 when the avenue was opened. Fill between East 105th and East 106th Streets post-dates 1837.

As discussed in the previous section, the late period of the fill, which dates to ca. 1835 and later, does not indicate archaeological sensitivity. Therefore, the landfill in this APE lacks associative value and archaeological importance.

### Residential Dwellings

Historical maps and atlases indicate that Margaret McGown (a.k.a. Widow McGown whose tavern and home were situated in Central Park - and for whom McGown's Pass, where the Colonial Army retreated in September, 1776, was named) sold this tract to Edward Sanford sometime in the late-eighteenth century. An early nineteenth-century homestead or estate called the "Red House," which was actually two structures, was sited directly east of Second Avenue between East 105th Street and East 106th Street by 1811 and stood through at least 1851 (Bridges 1811; Colton 1836; Dripps 1851). In 1851 the structures were labeled as the Red House Hotel complex (Dripps 1851). The St. Georges Cricket Club maintained another structure and a large green also east of Second Avenue between these two crossroads, just to the east of the Red House Hotel complex (Dripps 1851). Neither the Red House Hotel complex nor the Cricket Club fell within the path of the project corridor, as they were at least one-third of a block east of Second Avenue.

The only features associated with these structures which fell within the project corridor were an elaborate system of roads and drives which crossed Second Avenue (Colton 1836; Dripps 1851). These are not considered archaeologically visible due to their superficial nature. It is highly unlikely that other historical features associated with the Red House complex, such as wells, privies, or cisterns, were anywhere near the project corridor. These types of features, necessary to utilize on a daily basis, would have been situated closer to the main buildings, out of the project site.

Two additional residential structures were observed near the intersection of East 111th Street and Second Avenue. The 1807-1811 Commissioners Map showed two structures within the Second Avenue Street bed, but both fell north of East 111th Street closer to East 112th Street and outside of the APE. The southernmost of these structures was clearly shown at least half a block north of East 111th Street on an 1825 survey map when it was labeled as the "Brandish Home" (Spielmann & Brush 1881). The 1836 Colton Map also placed the dwelling north of East 111th Street, partially within the road bed and partially within the designated city block. As discussed in the previous section, any potentially sensitive historical features associated with this dwelling were probably situated directly around the main house which stood half a block north of East 111th Street, and thus north of this APE.

## Industrial Sites

Although early maps and atlases show some nineteenth century development on the surrounding blocks, the actual APE which follows Second Avenue did not experience any other recorded historical land use. It should be noted that the Harlem Gas Works was operating on the east side of Second Avenue between East 110th and East 111th Streets by the 1850s, and operated through at least 1879 (NYCLPC Neighborhood Maps; Bromley 1879). Although this facility did not extend into the APE, undoubtedly there would have been an extensive system of underground inter-connecting pipes and possibly conveyor tunnels between coal sheds, gas tanks, and furnaces. Some of these may have extended into Second Avenue, just north of this APE. Although the piping systems are not considered a potential archaeological resource, their presence in the streetbeds would have caused impacts to any other potential resources.

- *Documentation of Disturbance*

Currently there are a number of utility lines beneath the route of Second Avenue and the bordering sidewalks which would have caused impacts to potential archaeological resources. Excavations for each of these utilities would have probably extended between one and two feet beyond the size of the pipe, both horizontally and vertically. Plans and profiles of the current project indicate that these lines run to a depth of between ten and fifteen feet below grade (Vollmer Associates 1997a: Drawing NS-06). The 1958 Sewer Plan map shows that at that time there were two sewer pipes in Second Avenue, each 4' in diameter, which ran from East 107th Street north to East 120th Street (City of New York 1958). The current sewer maps show two sewer lines beneath the street, each measuring 3'6" x 2'4", with larger sewers traversing the avenue at cross streets. For example, at East 110th Street there are several sewers crossing Second Avenue; a 7'10"x 11' line, an 8' x 12' line, and a 7'6"x 8'6" line (Vollmer Associates 1997b). There is also a 60" water main running beneath Second Avenue (Ibid.).

As discussed in the previous section, there are other utility lines as well including ECS (telecommunication) ducts in Second Avenue over and under existing sewers; gas lines and regulators; steam lines; and abandoned lines (e.g. "postal" & "telegraph" lines; old phone lines; old sewer and water lines) which do not show up on current maps. Most probably fall within fifteen feet below current grade as is the case with those that appear on the City of New York 1958 Plan of Sewers map and the Works Progress Administration 1937 Subsurface Conditions Maps.

Between East 105th Street and East 111th Street the grade elevations currently lie roughly between 7-11' above Mean Sea Level, and coincide exactly with the 1902 surface elevations (Sanborn 1997; Bromley 1902). The surface elevations gradually slope upward as one progresses north from East 108th Street and south from East

106th Street. Between these two cross streets, elevations are at their lowest. In this area the bedrock lies between about 40-45' below grade, roughly following the same topography observed on the surface (Vollmer Associates 1997a: Drawing NS-06). Thus there are at least 40-45' of soil and fill levels between the street surface and the buried bedrock.

No documents could be found providing the precise pre-development (ca.1837) elevations of land between East 108th and East 111th Streets along the route of Second Avenue. Typically, elevations were recorded on maps and atlases after the roads and avenues were created; thus any filling or grading had already been done.

Early Rock Data Maps do not have any boring data for this section of the project area, but do show that Harlem Creek and surrounding marshland extended on Second Avenue from the north side of East 106th Street to the north side of East 108th Street (Rock Data Maps 1969-1973). This would account for the dip observed in current elevations between these two cross streets.

Soil borings performed in 1970 indicate that fill extends down from the streetbed to depths varying between three and 18 feet (Raymond International Inc. 1970: Boring Logs 2-94 through 2-99). Heading from south to north, borings taken from beneath the sidewalks on either side of Second Avenue revealed the following (Note: No borings were taken near 109th Street. All depths are feet below grade):

<u>Stratigraphy Description</u>	<u>105th Street</u>	<u>106th Street</u>	<u>107th Street</u>	<u>108th Street</u>	<u>110th Street</u>	<u>111th Street</u>
Brown sand/ Gravel Fill	0-17'	0-2'6	0-8'	0-7'	0-18'	0-13'
Brown Sand/ Silt & Gravel	17-31'	2'6-28'	8-16'	7-37'	18-44'	13-29'
Varied Clay, Silt/Sand Lens		28-37'	16-18'			29-64'
Brown or Reddish Brown Fine Sand & Silt		37-46'	18-56'	37-46'	44-46'	64-69'
Varied Clay Lenses			56-101'			

Only one boring reported reaching bedrock which was encountered at a depth of 70' below the surface (Boring #2-99 taken near East 111th Street). This is inconsistent with the current bedrock elevations which reportedly range between 40 and 45' below the current grade elevation (Vollmer Associates 1997a: Drawing NS-06). However, since all of the borings, with the exception of Boring #2-96 at East 107th Street, stop at

about 46 below the surface, it can be assumed that this is where bedrock was encountered but the recording procedures failed to mention it. The boring taken near East 107th Street failed to encounter bedrock, even at 101' below the surface. This location coincides with the route of the stream observed on early topographic maps.

Although no water table data was given with any of these borings, just south of East 105th Street water was encountered at about 12' below surface (Raymond International Inc. 1970: Boring #2-93).

The soil borings show that fill levels range between three and 18' in depth (Raymond International. 1970: Borings #2-94-2-99). That means that in some places the existing and abandoned utility lines, which were placed within 15' of the surface (Vollmer Associates 1997a), actually extend into non-fill or pre-development soil. Since the area between East 108th and East 111th Street was judged to be potentially sensitive for prehistoric archaeological resources (NYCLPC 1982), the depth of fill observed in this area may have protected the prehistoric landscape in some places.

At East 108th Street, fill levels only extended to seven feet below the surface. That means that not only were these top seven feet of fill disturbed by the installation of utilities, but that the top eight feet of the pre-development surface below the fill were disturbed as well since utilities run to 15' in depth. Although the entire street bed was not subjected to excavations for utilities, a large portion of it was. Therefore, most of the prehistoric landscape in this area was disturbed to a depth of about 8'.

Contrary to the situation at East 108th Street, at East 110th Street fill levels extend to a depth of 18'. In addition to the utility lines here discussed above, there were probably also additional pipes for the adjacent Harlem Gas Works (ca.1850-ca.1879) which would have caused a degree of subsurface disturbance. However, the depth of fill (18') lies below the depth of anticipated utility lines (15'). At least three feet of fill lies over the original ground surface.

At East 111th Street the fill extends to a depth of 13'. That means that the top two feet of the prehistoric land surface was probably disturbed by the utilities which were installed to a depth of 15'. It is highly unlikely that shallow prehistoric deposits would have escaped disturbance in this area.

- Potential Undisturbed Resources

The only potential archaeological resources identified for this APE between East 105th and East 111th Streets, were the Native American planting fields identified by Grumet north of East 108th Street. South of East 108th Street the project site was formerly a stream and marsh which were probably utilized for resource procurement by prehistoric groups, but which probably bear no evidence of habitation. The land north of East 108th Street which was well-drained land in proximity to fresh water, would

have served well as planting fields. However, this type of resource rarely survives in the archaeological record, and has never been found to survive the process of urbanization.

Clearly at East 108th and East 111th Streets modern utilities have disturbed the prehistoric landscape. The fill at East 110th Street may have been deep enough to have protected the prehistoric landscape from utility disturbance. However, the process of historical filling itself most likely caused some disturbance to potential landscape features, which would be extremely shallow and fragile. These resources are so fragile that they are usually obliterated by the normal weathering process. It is highly unlikely that archaeological evidence of planting fields has remained undisturbed and retained integrity beneath the fill. The very nature of landfilling and road regulation at the very least would have superficially impacted the landscape and disturbed these resources. Therefore, there is no sensitivity for any prehistoric and/or historical Native American resources in this area.

- Assessment of Proposed Construction Impacts

The proposed creation of a tunnel and station beneath Second Avenue between East 105th and East 111th Streets will entail cut and cover excavation from the current grade down to bedrock at about forty feet below the surface. This will have no impact on potential archaeological resources, since none were identified.

#### Recommendations

Because research has concluded that there is very low potential for significant archaeological resources to exist, no additional archaeological research or work is warranted for this APE. ✓

#### East 124th and East 125th Streets (Figure 6a) (EAST HARLEM)

#### Prehistoric Resources

No previously identified prehistoric sites were reported within this immediate area. Furthermore, the NYCLPC failed to find this area sensitive for prehistoric resources in their 1982 assessment of the overall sensitivity of Manhattan. However, Grumet did identify land north and south of Harlem Creek as the site of Native American planting areas and old fields (Grumet 1981:68). This type of resource is extremely fragile due to its shallow and tenuous nature, and is rarely found undisturbed in the archaeological record. It is highly unlikely that any evidence or remains of these fields survived the process of urbanization.

## Historical Resources

This area was once characterized as part of Harlem Flats, with the original village of Harlem settled directly to the east. Early maps depict both East 124th and 125th Streets as farmland with a large hill directly to the south (British Headquarters Map 1783). It is doubtful if evidence of the agricultural land exists beneath the urban landscape.

By 1811 there were three buildings, probably dwellings, mid-way between Third and Fourth Avenues, approximately where Lexington Avenue was later cut through. One of these was clearly in the path of the proposed 124th Street roadbed, another was half in the road and half in the block to the north, and the third was clearly within the block to the north (Bridges 1811). These were all owned by Raib(sic). The planned route of East 125th Street was vacant. An 1823 map showed no buildings anywhere on it, but did indicate that the East 124th Street parcel was owned by J.H. Raub (Ewen 1823).

In 1836 there was only one building in East 124th Street, situated about 700' east of Fourth Avenue and 175' west of Third Avenue, west of the Old Post Road (portrayed as a dashed set of lines on Figure 6a), and possibly within this APE (Colton 1836). The other two dwellings were clearly shown within the city block to the north of East 124th Street. East 125th Street was still vacant.

By 1851 the building in East 124th Street had been removed (Dripps 1851). However, at that time a building appeared in the middle of East 125th Street. The building was just west of the Old Post Road, possibly within this APE, but probably just to the east of it. A coal yard was depicted crossing East 125th Street in this vicinity, so the structure may have been a temporary building associated with the yard.

The temporary nature of the East 125th Street structure, which did not appear on maps until 1851 and was removed for road regulation within the next decade, suggests it is not archaeologically visible. Furthermore, cartographic sources depict it somewhat east of the APE. The structure most likely served as a temporary shed or storage facility as part of the coal yard. Given its association with the coal yard, its site probably lacked the types of deeply buried shaft features typically found at historical sites within an urban context. Its position outside of the APE, its minimal archaeological research potential, and the likelihood that it did not leave a footprint on the landscape which would have survived road regulation negate this potential features sensitivity.

- Documentation of Disturbance

Currently there are a number of utility lines beneath both East 124th and East 125th Streets and their bordering sidewalks which would have caused impacts to

potential archaeological resources. Excavations for each of these utilities would have probably extended between one and two feet beyond the size of the pipe, both horizontally and vertically. Two sewer lines run beneath the 125th Street roadbed, each 3'6" x 2'4", with their inverts at fifteen feet below the surface. Between them runs a water main of unknown size. At East 124th Street there is a 4'6" x 3' sewer line, with its invert at 12.5' below the surface.

As discussed in the previous section, there are most likely other utility lines as well in these cross streets, over and under existing sewers; gas lines and regulators; steam lines; and abandoned lines (e.g. "postal" & "telegraph" lines; old phone lines; old sewer and water lines) which do not show up on current maps. Most probably fall within fifteen feet below current grade as is the case with those that appear on the City of New York 1958 Plan of Sewers map and the Works Progress Administration 1937 Subsurface Conditions Maps.

Although pre-road construction elevations are unavailable, early maps depict this area as level farmland. In all likelihood, little grading would have been required in this area to accommodate the creation of cross streets. Existing elevations are about 13' above sea level at Third Avenue, rising to 18' above sea level at Lexington Avenue.

Soil borings were not taken in this area, however, soil borings were available for the intersection of these two cross streets at Second Avenue, two blocks to the east of the APEs. A series of three borings show that fill and soil levels extend down to at least 50' below the surface before bedrock is encountered (Raymond International, 1970: Borings #2-112 - 2-114). The soil profiles created for the NYCT show that the "probably top of bedrock" is within five feet of the surface at both East 124th and East 125th Streets near Lexington Avenue. Without soil boring data to confirm the exact depth of bedrock within the APEs, it is difficult to determine the subsurface conditions and degree of prior disturbance.

- **Potential Undisturbed Resources**

Potential archaeological resources identified for this APE include Native American planting fields identified by Grumet. However, this type of resource rarely survives in the archaeological record, and has never been found to survive the process of urbanization.

Clearly modern utilities have disturbed the prehistoric landscape. These resources are so fragile that they are usually obliterated by the normal weathering process. It is highly unlikely that archaeological evidence of planting fields has remained undisturbed and retained integrity beneath the fill. The very nature of landfilling and road regulation at the very least would have superficially impacted the landscape and obliterated these resources. Therefore, there is no sensitivity for any prehistoric resources in this area.

The East 124th Street roadbed may be sensitive for historical period deposits associated with the Raub house which stood from at least 1811 through the 1830s (Bridges 1811; Colton 1836). Although utility lines run through this cross street, there may be undisturbed areas which bear evidence of deeply buried home-lot features such as wells, cisterns, and privies. If indeed the bedrock is within five feet of the surface in this area, then there is the likelihood that soils above it were disturbed with utilities and street regulation. However, if the bedrock is deeper and pockets of undisturbed soil may exist, then they must be considered - at this stage of research - archaeologically sensitive for nineteenth century domestic refuse.

- **Recommendations**

Since the East 124th Street APE is considered sensitive for potential historical period cultural resources, further research in the form of a full Stage 1A archaeological assessment is recommended. Research should be aimed at seeking further cartographic and subsurface disturbance data (i.e., soil boring logs, utility maps and profiles) and in conjunction with documentary research, it is recommended that a series of soil borings in the potentially sensitive sections of the project site be performed and analyzed to archaeological specifications. This data would better define the areas of potential sensitivity.

#### **TUNNEL BORING MACHINE ACCESS SHAFTS - AREA OF POTENTIAL EFFECT**

West half of Block 1668, East 96th Street and Second Avenue (EAST HARLEM).

- **Identification of Potential Resources**

An evaluation of the documentary sources has identified only two potential archaeological site types within this block (Figure 7).

##### **Prehistoric Resources**

The NYCLPC did not identify any potential prehistoric sites in this area, nor were any prehistoric sites reported nearby (New York City Landmarks Preservation Commission 1982). Early topographic maps show this area as being inundated or covered with marshland. While this area might have provided resources suitable for Native American exploitation, they prohibit the types of activities which are archaeologically visible, mainly extended habitation.

##### **Landfill**

Prior to historical development Block 1668, which is situated between East 96th and East 97th Streets and First and Second Avenues, was depicted on maps as low-

lying swamp or marsh (Bridges 1811; Colton 1836; Dripps 1852; Dripps 1867). A series of streams ran through this area, which were surrounded by nothing but wetlands. This condition prevented early historical development in the area. It was not until after 1867, after Second Avenue was regulated and opened and the wetlands were filled, that this block experienced any development. The fill which was used to create this block was deposited sometime between 1867 and 1879 (Dripps 1867; Bromley 1879).

The late period of the fill, which post-dates 1867, does not indicate archaeological sensitivity. Furthermore, there were no references in any of the historical literature consulted suggesting that this area was filled with material from a single industrial, commercial, or residential source (Stokes 1929). Rather, the fill is most likely the collection of trash from an unknown source, together with materials excavated elsewhere. It is also possible that surrounding upland was leveled and graded to create the fill over this wet area. Therefore, the landfill in this APE lacks associative value and archaeological importance.

### Transportation

By 1879 Block 1668 (then Block 212) had been covered by a brick structure which functioned as the Second Avenue Railroad Depot and was connected to the Second Avenue El by an assortment of tracks (Bromley 1879). The depot was probably built in conjunction with the creation of the el which was completed in 1879, and operated to service and store inactive locomotives. The structure covered the entire lot through at least 1927 (Robinson 1890-1893; Bromley 1902; Bromley 1927). By 1943 the building had been removed, and the eastern half of the block was covered by the Machine and Metal Trades High School - an extant structure. The western half of the block was left vacant for many years (Bromley 1943).

- Documentation of Disturbance

Following the demolition of the Second Avenue Railroad Depot sometime between 1927 and 1943, the western half of Block 1668 remained vacant through much of the twentieth century. Current Sanborn maps show that a city park and playground was created over the western half of the block, which includes a fountain/wading pool and nearby comfort station near the East 96th Street and Second Avenue intersection (Figure 7). Certainly the creation of these and the underground piping to service them has impacted part of this APE.

- Potential Undisturbed Resources

The cartographic and documentary research concluded that the only potential resource which was present on this block was the Second Avenue Railroad Depot which stood between ca.1879 and ca.1940. The structure was removed by 1943.

Documented disturbance to the former site of this structure includes the installation of a fountain/wading pool and the construction of a comfort station. Landscaping for the park itself would have also caused a degree of disturbance, the depths of which are unknown. Much of the APE has remained undisturbed. However, the archaeological visibility and potential significance of this resource type is questionable regardless of its potentially undisturbed status.

As part of the Route 9A Archaeological Study, which was completed in the early 1990s for the west side of Manhattan, the site of a former railroad car depot was identified near West 42nd Street as potentially archaeologically sensitive. An intensive study of the research potential of this resource type concluded that certain archaeological deposits from railroad complexes can provide information about changes in round house architecture, and changes in railroad technology, craftsmanship, and locomotive maintenance operations, to name a few (Louis Berger & Associates 1992:19). The archaeological visibility at railroad complexes potentially encompasses architectural features, machines, refuse deposits, and other such features. However, the archaeological evidence associated with structures such as car depots, whose primary purpose was to store and service the el cars, would most likely only possess the footprints of buildings and tracks (Ibid.:20; Figure 8). Therefore, they were judged to lack the potential to address meaningful research issues.

The nature of the structure at East 96th Street was such that it probably lacks archaeological visibility and potential importance. When facilities such as these were dismantled, machinery and mechanisms were removed for sale, recycling, or disposal. Once this building was emptied it would have been demolished, with any architectural refuse most likely left on site and buried. Therefore, any remains of this structure are likely architectural in nature, and do not have the potential to address any meaningful research issues. Pertinent research issues would be better addressed through the documentary record.

- **Assessment of Proposed Construction Impacts**

The proposed creation of a tunnel boring access shaft in the western half of Block 1668 will entail excavating a large shaft, roughly 60' in diameter, from grade through bedrock down to roughly 45' below grade. The remainder of the lot will be used for equipment storage including trailers, trucks, and a truck elevator or conveyor to remove rock and dirt being excavated from the tunnel. This will have no impact on potential archaeological resources, since none were identified.

- **Recommendations**

Because research concluded that there is very low potential for significant archaeological resources to exist, no additional archaeological research or work is warranted for this APE.

## VENTILATION SHAFTS, FAN CHAMBERS, AND OTHER EQUIPMENT

The new subway line will require ventilation shafts, fan chambers, and other equipment throughout its alignment. Ventilation shafts will be placed approximately every 400 feet within the sidewalk along Second Avenue, and fan chambers will be placed midway between new stations. These facilities will require cut and cover construction for the connection between the surface and the tunnel below. However, the precise location of these facilities has not yet been designed at this stage in the MESA study, making an assessment of archaeological resources infeasible. When the sites for these structures are chosen, they may have the potential to disturb archaeological resources. When the Areas of Potential Effect are refined they will require further study (such as Stage 1A reports) for the FEIS.

## LIGHT RAIL TRANSIT (LRT) SHUTTLE - BUILD ALTERNATIVE 2

### BELOW GRADE TUNNEL CONSTRUCTION - CUT AND COVER METHOD

In this APE, new excavations would be required to bring the LRT to the surface. These access tunnels would be at Frankfort Street from Centre Street to near Pearl Street and at Canal Street from just east of the Bowery to Ludlow Street.

#### Frankfort Street from Centre Street to near Pearl Street (Figures 9, 10) (LOWER MANHATTAN)

- Identification of Potential Resources

##### Prehistoric Resources

No prehistorically sensitive areas or prehistoric sites were identified in the vicinity of this section of the APE (NYCLPC 1982; Site File Search). Early topographic maps show that this area was near the East River shoreline at the time of European Contact (Viele 1859; 1874). It is possible that prehistoric encampments are located along this section of the Contact Period shoreline. Therefore, this area has a moderate sensitivity for prehistoric cultural resources.

##### Commercial and Residential

This APE was formerly part of the Jacob Leisler farm, and Frankfort Street was named for his place of birth in Germany (Stokes 1922 IV:514). Frankfort Street had already been laid out from Centre Street (then Kip Street) as far east as present Gold Street by 1728. East of Gold Street was Beekman's Swamp, which extended further east along the future route of Frankfort Street approximately to midway between Gold and Pearl Streets (Lyne 1728). Frankfort Street was extended to Cliff Street (then

Skinner) by 1755, when the Holland Map records structures on both sides of the street west of Gold Street. By the time of the 1767 Ratzler map, all the blocks adjacent to Frankfort Street were shaded in, indicating that they were developed (Holland 1755; Ratzler 1767). Frankfort Street was finally completed east of Cliff/Skinner Street before 1797 (Taylor-Roberts 1797), probably by 1789, when it was recorded to be 32'6" wide (Stokes 1926 V:1251).

A number of notable buildings were standing on Frankfort Street in 1811, including Tammany Hall ("Great Wigwam") on the south side of Frankfort Street at Centre Street, and St. John's Hall, midblock on the north side of Frankfort Street between Centre and William Streets (Bridges 1811).

As originally built, Frankfort Street ran further north than the current Frankfort Street, terminating on the northern end of Franklin Square at Pearl Street. Dover Street, running eastward from Pearl Street, formed the southern boundary of the square. With the construction of the Brooklyn Bridge approaches in the 1880s, Frankfort Street was diverted southward just east of the current Gold Street intersection. The new route ran through the building lots on the existing block (now Block 94) which had lined the southern side of Frankfort Street. This change in route is particularly visible just east of this APE, where Frankfort and Dover Streets now meet at Pearl Street, when formerly Frankfort Street was approximately 120 feet north of Dover (Robinson 1884; Dripps 1852; Bridges 1811).

West of Gold Street, Frankfort Street is barely recognizable as the 32.5-foot-wide street it once was. With the excavation of the Brooklyn Bridge footings and those of its approaches, all the buildings on the north side of the street were removed in 1878 (Stokes 1926 V:1967). The street has an irregular width at present, which ranges from 24 to 50 wider than before the bridge was built. As a result, part of the former building lots along the old north side of the street are within current Frankfort Street's boundaries, but given the irregularity of the current street and adjacent blocks it is difficult to calculate the area precisely (Sanborn 1997).

#### Industrial Sites

Between Gold Street and Pearl Street, in a low-lying, swampy area known as Beekmans Swamp, were the "Old Anthony tan-yards," established earlier than 1755. Figure 10 indicates the eastern edge of the meadows with a broken wavy line crossing Frankfort Street approximately 160 feet west of Pearl Street. The 1755 map shows the tannery to be both north and south of Frankfort Street (Holland 1755; Stokes 1926 V:1967), and before the street was cut through the meadows the tannery appears to have occupied Frankfort Street in the APE as well (Augustyn and Cohen 1997:58, 61). These "meadows" were filled in after an order of the Common Council in 1792, so the tannery presumably ceased operation by that time (Stokes 1926 V:1287). NYCLPC

has identified the entire area of this APE as potentially sensitive for archaeological resources relating to the tannery, for the period 1665 to 1815 (NYCLPC 1982).

### Churches/Cemeteries

The "New" Lutheran Church stood on the northeast corner of Frankfort and William Streets. The building was erected prior to 1767, when it appears on the Ratzer Map, and was still shown on the Commissioners Plan in 1811, and Dripps' 1852 map. Although the maps show no churchyard/cemetery associated with the building, which apparently occupied all but a narrow sliver of the lot extending northward from Frankfort Street (Dripps 1852), it is not improbable that interments took place beneath the floor of the sanctuary itself. The NYCLPC also notes the presence of the church here during the general period 1721 to 1865 (NYCLPC 1982).

- Documentation of Disturbance

The construction of the approaches for the Brooklyn Bridge necessitated the razing of the structures on the northern side of Frankfort Street in 1878. West of Gold Street, from 20 to 50 feet of the old building lots on the north side of Frankfort Street lie south of the bridge ramps and abutments. Some or all of this area has surely been impacted by bridge construction, unfortunately, due to lack of subsurface disturbance data, the areal extent of this disturbance is unclear.

Subway tunnel construction along Centre Street utilized the cut and cover method, and would certainly have eliminated potential remains to the current eastern line of Nassau Street, but without further subsurface data, extrapolation of the disturbance east of this point is also uncertain.

At present there are a number of utility lines running beneath the project site section of Frankfort Street which would have adversely impacted potential buried archaeological resources. Excavations for the installation of these utilities would most probably have extended from one to two feet beyond the diameter of the utility pipe or conduit, both horizontally and vertically. Utility plans and profiles indicate that beneath Frankfort Street these lines run to a depth of approximately two to 10 feet below current grade.

The utilities are as follows: a 12" High Pressure water line and a 12" water main run from Centre Street to Pearl Street; a sewer line and a 6" water main runs from Centre Street to Cliff Street; and a 20" water main runs from Centre Street to the former path of William Street. There is also a 4' by 2'4" and a 4' circular sewer in the center of the street (Office Record Plan of Sewers 1958). There are also two 6" gas lines and telephone and electric ducts (WPA 1937). Additional utilities crossed Frankfort Street at the current and former intersections with William, Rose, Gold, Jacob/Vandewater and Cliff/Hague Streets (Sanborn 1922; Robinson 1884).

No elevations of this section of the APE are available from before the construction of the Brooklyn Bridge - the major subsurface disturbance in this area. Available elevations from 1884, 1922 and 1997 seem to show little change in the grade levels. Predevelopment contours which appear on early topographic maps are still visible. West of Pearl Street (22'-23' elevation), Frankfort Street slopes downward until Gold Street (12'-13' elevation), the site of the former swamp and tan yards depicted on 18th-century maps. Elevations increase gradually toward Centre Street (MESA Task 6 Engineering Report 1997: SLRT-02; Ratzer 1767; Sanborn 1997).

No borings in the Frankfort Street APE were available from the City Bureau of Subsurface Exploration.

- Potential Undisturbed Resources

Although there are a large number of buried utilities beneath the Frankfort Street roadbed, they tend to be clustered at the center of the street, leaving sections of the current and former sidewalks untouched. Utility profiles were not available for this APE. Pipes and mains from the cross streets would not have affected most of the potential historical remains, since in most cases, with the exception of the tan yards, these streets were laid out at the same time as, or prior to, the construction of buildings on Frankfort Street.

Disturbance caused by the construction of the Brooklyn Bridge and its approaches has probably eliminated all the sensitive areas which fall within this APE, but the lack of documentation of this disturbance makes a dismissal of potential archaeological sensitivity impossible.

Commercial/residential remains were noted in two sections, both with occupation dates beginning with the period 1728 to 1755. The first is the site of the former lots along the northern side of Frankfort Street, between the eastern line of Nassau Street and Gold Street. This includes not only potential foundations, but also shaft features relating to the buildings' occupants. Also in this area was the location of the "New Lutheran Church" whose presence NYCLPC notes during the period 1721 to 1865.

The second is current Frankfort Street (including current sidewalks), beginning at the midpoint between Gold and Pearl Streets, and continuing east to the eastern edge of this APE. This is the part of Frankfort Street which was diverted through the neighboring building lots to the south at the time of the erection of the Brooklyn Bridge. The Frankfort Street roadbed includes not only the locations of the foundations of these buildings, but also of the rear lots which are potentially sensitive for shaft features relating to the structures and their occupants.

In addition, the APE was also noted as being potentially sensitive for Industrial resources, namely the "Anthony" tannery which operated in the vicinity of the APE and

in the adjacent swampy section to the west of the APE, from before 1755 to approximately 1792. NYCLPC brackets its years of operation in the period 1665-1815. Since this area was filled in 1792, remains from the tannery would most likely have received additional protection from subsequent construction by the presence of this fill overmantle.

The deposition of the very same historical resources for which this section of the APE is potentially sensitive may have impacted any earlier prehistoric potential, although some areas may have been left undisturbed. Without soil borings for this area it is difficult to assess current subsurface conditions. There may be areas on former individual lots (now within the streetbed) which are sensitive for prehistoric resources and may have been left undisturbed by historical development.

- **Assessment of Proposed Construction Impacts**

In this APE, new excavation would be required to bring the LRT to the surface. This excavation would be carried out by the cut and cover method. The maximum depth of excavation is approximately 40 feet below the current surface. Although disturbance caused by utility installation and the construction of the Brooklyn Bridge and its approaches certainly extends to greater than four feet below the present surface in much of the street, and probably has eliminated all of the sensitive areas which fall within the proposed action's subsurface impact zone, the lack of documentation of this disturbance -- both in depth and width -- makes a dismissal of potential archaeological sensitivity impossible. Therefore, potentially sensitive soils on Frankfort Street from Centre Street to west of Pearl Street will be impacted by the proposed action.

- **Recommendations**

Since sections of the Frankfort Street roadbed are considered sensitive for potential prehistoric cultural resources, and buried historical cultural resources (Figures 28, 29), further research in the form of a full Stage 1A archaeological assessment is recommended. Research should be aimed at seeking further cartographic and subsurface disturbance data (i.e., soil boring logs, utility maps and profiles) and in conjunction with documentary research, it is recommended that a series of soil borings in the potentially sensitive sections of the project site be performed and analyzed to archaeological specifications. This data would better define the areas of potential sensitivity.

Canal Street from just east of the Bowery to Ludlow Street (Figures 11, 12)  
(LOWER EAST SIDE)

- Identification of Potential Resources

Prehistoric Resources

No prehistoric resources were reported by the NYCLPC within this section of the APE (1982). A site file search identified one prehistoric site in this area, NYSM #4060, which Parker identifies as a village site (Parker 1920:627), and Grumet places more precisely near the East River, on the line of Canal Street. Parker reported "traces of occupation" there (Parker 1920:582). The precise location and horizontal extent of the reported village is speculative, therefore it is possible that it extends into this section of the APE.

Early topographic maps show this area directly west of a series of hills (Viele 1859; 1874). While this section of the APE maintained no distinctive topographic features which would suggest prehistoric sensitivity, especially since it is located at least seven blocks from the nearest mapped fresh water source, it still maintains limited sensitivity based on Parker's notation of a nearby village site.

Commercial and Residential

Canal Street (first called Pump Street, and later Walker Street), from east of current Bowery to Ludlow Street was laid out between 1757 and 1767, and structures appear in an unbroken line along the northern side of Canal Street from Bowery Street through the future location of Ludlow Street. Fewer structures stood along the south side of the street, confined to the blocks between Bowery and Forsyth Street (Holland 1757; Ratzler 1767). By 1797 structures had been built along the south side of Canal Street between Forsyth Street (then Second Street) and Allen Street (then Fourth Street) (Taylor-Roberts 1797).

Between 1797 and 1811 Ludlow Street was laid out, and shading on the 1811 map indicates that the lots on both sides of Canal Street in this section of the APE were completely built up (Taylor-Roberts 1797; Bridges 1811).

Canal Street is presently 75 feet wide in this section of the project site (Sanborn 1997). William Bridges' notes on the Commissioners Map suggest that Canal Street (then Walker Street) was 60 or fewer feet wide in 1811 (Bridges 1811:32), and when it was extended westward from Lafayette to Church Streets in 1806, it was only 50 feet wide (Stokes 1926 V:1462). The Longworth map of 1817 shows this 50-foot-wide section of Canal Street as the same breadth as the section of the street within the APE (Longworth 1827).

This is given more credence by the fact that in 1855, Canal Street, still called Walker Street, was widened to 75 feet, and a report on the progress noted that "nearly all of the houses beyond the line have been cut or removed back, and many new buildings are being erected" (Stokes 1926 V:1682,1861). It appears that the extra 25 feet came from the block on the north side of the street, since a small triangular block on the south side of this section of the APE (surrounded by Orchard, Canal and Division Streets) survived the widening intact (Colton 1836; Sanborn 1997).

According to the 1852 map, a number of rear and side yards along the north side of Canal Street had Canal Street frontage, and thus now fall within the APE. These areas, which would have been more extensive in the years before 1852, are potentially sensitive for shaft features, i.e., privies, cisterns and wells, relating to the buildings and their occupants which stood on these lots.

Many fragmentary foundations from the demolished buildings would also be encountered in this narrow area (Dripps 1852). These architectural remains are not considered a potential archaeological resource due to their limited research potential.

- Documentation of Disturbance

At present there are a number of utility lines running beneath this APE's section of Canal Street, which would have adversely impacted potential buried archaeological resources. Excavations for the installation of these utilities would most probably have extended from one to two feet beyond the diameter of the utility pipe or conduit, both horizontally and vertically. Unfortunately, the following description is complicated by the fact that these utilities are coming from six different streets.

On Canal Street from Bowery to Ludlow Street are two sewer lines, one 5'6" and the other 4'0" by 2'8", a 16" High Pressure water main, and a 12" water main. Only spanning between Bowery and Orchard Streets is another 20" water line. Additional water lines cross Canal Street at intersections: a 12" High Pressure water main crosses at Forsyth Street; 6" and 12" water lines cross at Eldridge Street; a 12" water main and a 16" High Pressure water main cross at Allen Street; and 36" and 6" water mains cross at Orchard Street (Sanborn 1922; High Pressure Fire System Map; Water Distribution Map). The original canal ditch and Canal Street sewer, built ca.1819 and for which Canal Street received its name, is west of Centre Street, far out of this APE.

A major subsurface disturbance was the construction of the Manhattan Bridge approaches between Chrystie Street and Bowery (completed 1909), and four subsequent subway tunnels, also on or crossing Canal Street between Bowery and Chrystie Street (Sanborn 1997; MESA Task 6 Engineering Report 1997: SLRT-04). Bridge construction as well as the cut and cover construction required for the tunnels at this location would have eliminated any surviving archaeological resources in that part of the APE.

Current elevations from Canal Street between Bowery and Ludlow Street are little changed from the earlier available elevations, with Canal Street still sloping gradually downward toward Ludlow Street (Robinson 1884; Sanborn 1997).

No earlier, pre-development elevations were available. No borings in the Canal Street section of this APE were available from the City Bureau of Subsurface Exploration.

- **Potential Undisturbed Resources**

The northern 25 feet of present Canal Street (including the sidewalks there) were noted as having potential for commercial/residential remains dating from the period 1755 to 1767 through 1855. These were the building lots truncated when Canal Street was widened from 50 to 75 feet in 1855. This area includes not only the foundations of these buildings, but also parts of rear and side lots which are potentially sensitive for shaft features relating to the structures and their occupants.

Although there are a number of utility lines on Canal Street, their placement in the roadbed is not documented, and since utilities are generally beneath the roadbed and not under or adjacent to the sidewalks, the 25-foot-wide section along the northern side of Canal Street should be relatively free of these pipes and mains. However, the building of the subway tunnels beneath this part of Canal Street and Manhattan Bridge approach construction would have adversely impacted any potential archaeological sensitivity in the section of the APE from Chrystie Street west to Bowery Street.

Those areas which are considered potentially sensitive for historical period cultural resources may also be sensitive for prehistoric cultural resources. There may be areas on former lots which were left undeveloped, and have retained their prehistoric sensitivity.

- **Assessment of Proposed Construction Impacts**

In this APE, new excavation would be required to bring the LRT to the surface. This excavation would be carried out by the cut and cover method. The maximum depth of excavation is approximately 60 feet below the current surface. Although disturbance caused by utility installation may have impacted potential subsurface remains in a few places of the roadbed, for the remaining areas the lack of subsurface data makes a dismissal of potential archaeological sensitivity impossible. Therefore, potentially sensitive soils within the APE on Canal Street from Bowery to Ludlow Street will be impacted by the proposed action.

- Recommendations

Since the northern 25 feet of Canal Street from Chrystie Street east to Ludlow Street are considered sensitive for potential prehistoric cultural resources, and buried historical cultural resources (Figures 30, 31), further research in the form of a full Stage 1A archaeological assessment is recommended. Research should be aimed at seeking further cartographic and subsurface disturbance data (i.e., soil boring logs, utility maps and profiles), and in conjunction with documentary research it is recommended that a series of soil borings in the potentially sensitive sections of the project site be performed and analyzed to archaeological specifications. This data would better define the areas of potential sensitivity.

## SURFACE TRACK CONSTRUCTION - AREAS OF POTENTIAL EFFECT

### Water Street to Frankfort Street (LOWER MANHATTAN)

This APE begins on Water Street at Broad Street and runs north to Fulton Street. At Fulton Street it runs to Pearl Street and then on Pearl it runs north to Frankfort Street.

Because of the size of this APE and the variety of terrain, potential resources and disturbance, this APE has been divided into four smaller sections for the remainder of this discussion:

- Water Street from Broad Street to Fulton Street
- Fulton Street from Water Street to Pearl Street
- Pearl Street from Fulton Street to Frankfort Street
- Frankfort Street from Pearl Street to west of Pearl Street

### Water Street from Broad Street to Fulton Street (Figures 13, 14, 15)

- Identification of Potential Resources

#### Prehistoric Resources

Although all of this APE was land under water when the first Europeans landed on Manhattan, land which lay beneath the East River at the time of European Contact may have been exposed and habitable prehistorically. These areas are now covered by layers and layers of historical fill, introduced by the 18th century to allow for the creation of Water Street. The now-buried East River floor which may be sensitive for prehistoric cultural resources lays far below the anticipated depths of impact for this project - and therefore these potentially sensitive areas are not part of this APE.

## Historical Resources

Potential archaeological resources are tightly clustered in Lower Manhattan, particularly in this section of the APE. Also, the purposes of many of the pre-19th-century buildings in the project site are not precisely known, since through the 19th-century, commercial, industrial, residential activities, etc., often took place in a single building. Therefore, the heading "Historical Resources" will comprise a general category of undifferentiated potential resources. Since in a normal sequence of events, landfill generally precedes the construction of buildings, this discussion will begin with "Landfill ."

### Landfill

The Water Street section of this APE is located entirely on an area of landfill. The Castello Plan, depicting the year 1660, clearly shows the East River shoreline of Manhattan, with Pearl Street as the easternmost dry land (Castello 1670). Landfill operations had already begun to create building lots on the east side of Pearl Street, and during the last decade of the 17th century, landowners at different locations along the eastern side of Pearl Street were required to "build a wharf" 30 feet wide behind their properties for use as a public street, which later became Water Street (Stokes 1922 IV: 366, 382, 395-396). Grants of water lots on the east side of Water Street between Fletcher and John Streets required the grantees to extend Water Street from 30 feet to 45 feet at their own expense (Friedlander et al. 1981:4). This appears to have been the case throughout this part of the APE, as historical atlases from the mid-19th century on show Water Street as 40 to 50 feet wide.

Currently, Water Street is approximately 90 to 100 feet wide from Broad Street to John Street, and 70 feet wide from John to Fulton Streets. Although the street widening c.1960, facilitated by a general replacement of 19th-century structures, appears to have taken this additional land from lots on the eastern or shore side of Water Street (e.g. Friedlander 1981:17), fill episodes from both east and west of colonial Water Street will be discussed in the following paragraphs.

Water Street appears to be complete to Beekmans Slip (Fulton Street) in the c.1717 Burgess View, although as can be seen there and in the 1728 Lyne Map, slips interrupt the street every few blocks, at Coenties Slip, William Street/Old Slip, Wall Street, Maiden Lane, and John Street/Burling Slip (Burgis c.1719-21; Lyne 1728).

Also by 1728, fill was beginning to extend the "wharf" (Water Street) beyond its early 30-foot width, as docks and "keys" were constructed on what became the east side of Water Street. These are: the East and West Dock, at the foot of Broad Street; docks adjacent to Coenties Slip; Hunters Key, a large area of made land between William Street/Old Slip and the slip at Wall Street; and Burnets Key, an even larger area of filled land between the north side of the slip at Wall Street, and the slip at

Maiden Lane (then Crown Street). Burnets Key even hosted four buildings, which fall within this APE (Lyne 1728).

Subsequent maps show the gradual filling of the east side of Water Street. By 1755, this had been done from Coenties Slip to William Street/Old Slip, Wall Street to John Street, and John Street to Beekman Slip. Slips still interrupted the path of Water Street at Coenties Slip and Burling Slip at John Street (Holland 1755; Ratzler 1767).

Hunters Key was filled in by 1776, as was Burling Slip (John Street) and Beekmans Slip (Holland 1776). By 1797, fill in the APE was complete except for Coenties Slip which still abutted Water Street. Coenties Slip was not filled in this part of the APE until between 1836 and 1852 (Colton 1836; Dripps 1852), it was only completely filled by 1905.

#### Other Historical Resources

The earliest buildings in the APE were those along the western side of the early 30-foot wide Water Street wharf. During the 1690s the residents of the buildings which faced Pearl Street were charged with completing Water Street behind their properties (Stokes 1922 IV: 366, 382, 395-396). By 1717, this had been completed, and the buildings are visible from Broad Street to below Fulton Street (Burgis c.1719-21). This is also shown on the 1728 map (Lyne 1728)

The remainder of the project site was built up in various stages between 1717 and 1797. On the eastern side of old Water Street, three structures were erected between 1717 and 1728 on Burnets Key, between Wall Street and Pine Street (Burgis c.1719-21; Lyne 1728). Between 1728 and 1755 the first buildings were constructed from Coenties Slip to William Street/Old Slip, the rest of Burnets Key from Pine Street to Maiden Lane was occupied, and structures were built from the north side of Maiden Lane to Fulton Street (Holland 1755). Hunters Key from William Street/Old Slip to Wall was built up by 1776 (Holland 1776), while the section from Broad Street to Coenties Slip first hosted buildings between 1776 and 1797 (Taylor-Roberts).

The list of potential archaeological resource locations noted by the NYCLPC in the Water Street section of this APE is too long to itemize. Dates range from 1609 to 1865 and beyond (NYCLPC 1982). Also, the files of the New York State Office of Parks, Recreation and Historical Preservation list at least eight inventoried archaeological sites within or abutting the Water Street APE. These include most of the major archaeological excavations on Manhattan Island which have recovered artifacts and other data from the city's colonial past. Sites include: the Telco Block, at Fulton and Water Streets; the Barclays Bank Site near Wall Street; and 175 Water Street. To these can be added Hanover Square and Old Slip (55 Water Street), sites on opposite sides of Water Street south of Old Slip (for a brief overview of these

excavations see Rothschild and Wall 1985). All parts of this section of the APE must be considered highly sensitive for potential historical period archaeological resources.

- Documentation of Disturbance

At present there are a number of utility lines running beneath the project site section of Water Street which would have adversely impacted potential buried archaeological resources. Excavations for the installation of these utilities would most probably have extended from one to two feet beyond the diameter of the utility pipe or conduit, both horizontally and vertically. Utility plans and profiles indicate that these lines run to a depths of approximately two feet to as much as seven feet below the current grade.

For example, on Water Street between Fulton and John Streets, utilities include a 3'7¼" by 2'4¾" sewer main, 24", 4" and 12" gas lines, two sets of electrical ducts, telephone cables, and a 12" water pipe. From block to block, different lines begin and end or are added from cross streets. The above mentioned sewer line joins a larger main at John Street, and from John to Fletcher Street, there is a different, 4'0" sewer line. This line leaves the APE on Fletcher Street, and the next sewer does not appear until south of Maiden Lane. Additional lines cross Water Street at each intersection (WPA 1937). A later utility map shows a 4' by 4' sewer line from 1961 running the length of the Water Street APE (Office Record Plan of Sewers 1958). A 12" High Pressure water line runs from Broad Street to Fulton Street, as does a 20" water main. This latter main appears to be in the current eastern side of Water Street (High Pressure Fire System Map; Water Distribution Map).

Except for the 20" main, these utilities tend to be clustered in a 25-foot band in the old center of Water Street, in what was the old street bed before it was widened by approximately 30 to 50 feet beginning in the 1960s. That episode brought the old sidewalks and former building lots on the eastern side of Water Street into the APE (Sanborn 1997). Also, detailed maps of utility placement were only available from Fulton Street to south of Maiden Lane. The presence of areas of little or no utility disturbance within the old Water Street roadbed south of Maiden Lane could not be determined.

An important source of subsurface disturbance at two intersections are subway tunnels, constructed using the cut and cover method. These are 1) the IRT tunnel which crosses Water Street at Hanover Square/William Street and Old Slip, completed in 1919 and, 2) the BRT tunnel beneath Broad Street, opened in 1920 (Hall 1945:7). These two disturbances would have eliminated any archaeological sensitivity in these two sections of this APE.

With one exception, intersection elevations along Water Street have changed four inches or less since 1884. Elevations on Water Street still vary between five and

nine feet above mean sea level. The elevation at the intersection of Maiden Lane and Water Street has risen from 4.5 feet to six feet at present (Sanborn 1997; Robinson 1884). No earlier, pre-development elevations were available.

A soil boring was performed in this APE in 1982, on the east side of Water Street at the western edge of the sidewalk, 19 feet south of Old Slip. The log was made available by the City Bureau of Subsurface Exploration (City of New York Department of General Services 1982:1396).

Boring #2	
Surface elevation 6.0'	Depth Below Grade
Concrete and gravel	0' to -0.6'
Fill: brown sand, silt, trace gravel, cinders and brick	-0.6' to -7.0'
Brown sand, trace silt	-7.0' to -26.5'
Water	-11.5'

Considering the proximity of this location to the subway tunnel in Old Slip, and the deep excavation which took place for the adjacent 55 Water Street building, it is difficult to draw conclusions from this soil boring. Whether the fill is 20th-century or earlier is also difficult to discern. It is interesting to note that New York State OPRHP Archaeologist Paul Huey's excavation at 55 Water Street (Old Slip) uncovered 17th- and 18th-century fill strata beneath a brown sand and fill layer like the one identified in this log. However, these similarities can be carried only so far, since unlike the 55 Water Street excavation site, which was actually in the water of Old Slip when the slip was functioning, the boring location was on dry land near the Old Slip shoreline (Huey 1984:18-23).

- Potential Undisturbed Resources

There are a large number of buried utilities beneath the Water Street roadbed, and in locations in which depth of disturbance could be quantified, this utility disturbance extends to at least three feet below the current surface.

On the other hand, the mains, pipes and conduits tend to be clustered in a 25-foot-wide band under the old streetbed, leaving the outer sections of the roadbed and the sidewalks undisturbed. Street widening operations have absorbed into the current roadbed from 30 to 50 feet of the former sidewalks and building lots on the eastern side of Water Street, all of which appear to have undergone little or no disturbance from utility installation. Furthermore, detailed utility diagrams were unavailable south of Maiden Lane, so it cannot be determined whether large, undisturbed areas exist in the old roadbed south of that street.

This entire section of the APE, on Water Street from Broad Street to Fulton Street, was noted as having potential sensitivity for a wide variety of historical remains

related to the structures erected, and activities carried out there during the broad period from 1609 to 1865 (NYCLPC 1982). Remains include not only the locations of the foundations of structures, but also rear and side yards, which are potentially sensitive for shaft features relating to the lots and their occupants. The area is also potentially sensitive for historical fill, the vast majority of which was deposited between the 1690s and the end of the 18th century.

- **Assessment of Proposed Construction Impacts**

In this APE, surface track construction is proposed, with rails within the streetbed. Construction would impact to no more than three feet below the present streetbed's surface. Although disturbance caused by utility installation certainly extends to greater than four feet below the present surface in many places of the roadbed, and may have eliminated some of the sensitive areas which fall within the proposed action's subsurface impact zone, for the remaining areas of Water Street the lack of subsurface disturbance, or the lack of documentation of subsurface disturbance makes a dismissal of potential archaeological sensitivity impossible. Therefore, potentially sensitive soils on sections of Water Street from Broad to Fulton Street will be impacted by the proposed action.

- **Recommendations**

Since the sections of the Water Street roadbed from Broad Street to Fulton Street are considered sensitive for buried historical cultural resources (Figures 32, 33, 34), further research in the form of a full Stage 1A archaeological assessment is recommended. Research should be focused on seeking further cartographic and subsurface disturbance data (i.e., soil boring logs, utility maps and profiles) and in conjunction with documentary research, it is recommended that a series of soil borings be performed and analyzed to archaeological specifications. This data would better define the areas of potential sensitivity. ✓

It should also be noted that due to subsurface disturbance caused by utility installation, some sections of this APE are not considered potentially sensitive in the LRT impact zone (no more than three feet below the current surface). Nevertheless, in these same areas there is a high potential sensitivity for undisturbed archaeological deposits below this depth. This is particularly true in areas of 17th- to 18th-century fill such as those noted within this APE.

#### Fulton Street from Water Street to Pearl Street (Figure 15)

- **Identification of Potential Resources**

- Prehistoric Resources**

Most of this APE was land under water at the time of European Contact. Those sections of Fulton Street which were exposed for habitation at that time are considered potentially sensitive for prehistoric cultural resources. These are described below. However, there may have been areas which were beneath the East River at the time of European Contact which may have been exposed and habitable prehistorically. These areas are now buried beneath layers and layers of historical fill, introduced in the 18th century to allow for the creation of Pearl and Fulton Streets.

Since the original width of Pearl Street at Fulton Street is estimated to have been approximately 30 feet wide (see the discussion in the next section of this APE: "Pearl Street from Fulton Street to Frankfort Street"), only the westernmost 30 feet of the Fulton Street intersection with Pearl Street (outside the APE) was fast land at the time of Contact, while the remaining c.175 feet to the east, which includes this section of the APE, rests on fill. Although this now-buried East River floor may be sensitive for prehistoric cultural resources, the potential resources lie far below the anticipated depths of impact for this project - and are therefore outside this APE.

#### Landfill

All parts of this section of the project site were created by landfilling. Most of the land had been created by 1728, when the street appears on the Lyne Map. Only a small sliver of the old Beekmans Slip, the northern 40 feet of the intersection of Fulton and Water Streets, was not filled until between 1767 and 1776 (Ratzer 1767; Holland 1776).

#### Historical Resources

Because potential archaeological resources are so tightly clustered in Lower Manhattan, due to the fact that the nature of many of the pre-19th-century buildings in the project site are not precisely known, and that through the 19th-century, commercial, industrial, residential activities, etc., often took place in a single building, the heading "Historical Resources" comprises a general category of undifferentiated potential resources in addition to the landfill discussed above.

Pearl Street ran along the East River shore of Manhattan as it existed when the first European settlers and explorers arrived on the island. It was officially opened in 1707 (NYCLPC 1982; WPA 1937). The original Pearl Street is estimated to have been approximately 30 feet wide (see the discussion in the next section of this APE: "Pearl Street from Fulton Street to Frankfort Street"), and this 30-foot-wide streetbed corresponds to the westernmost 30 feet of the Fulton Street/Pearl Street intersection. The remaining c.175 feet to the east, of which the easternmost 50 feet represents this section of the APE, lies on land created by the deposition of fill in East River.

By 1728 fill had been added south of Pearl Street, creating Beekmans Slip, in the path of future Fulton Street. Buildings had already been erected along the north side of the slip (Lyne 1728). By 1755, Water Street had been laid out as far as the south shore of the slip, and buildings stood on all sides of the slip west of Water Street (Holland 1755). The 1767 Ratzler map shows a clear picture of Beekmans Slip. The narrowest part of the slip, small finger of water, extends westward into the APE. Except for the water side, the adjacent blocks are all shaded to indicate that the lots contain structures (Ratzler 1767).

Between 1767 and 1776, the filling of this section of Fulton Street was completed. The "small finger of water" mentioned in the previous paragraph, was shaded in 1776 to indicate that it contained structures (Ratzler 1767; Holland 1776). By 1797 it had been cleared and made part of Water Street (Taylor-Roberts 1797).

A comparison of historical maps indicates that from before 1857 to post-1922, Fulton Street was approximately 45 feet wide in this APE (Perris 1857; Robinson 1884; Sanborn 1922). When another part of Fulton Street (then called Partition Street) was laid out on the west side of Manhattan in 1785, its width was set at 40 feet (Stokes 1926 V:1202). For the sake of this discussion, 40 feet will be used as the former width of Fulton, although it may have been as narrow as 30 feet, as was Water Street, when it was originally planned (Stokes 1922 IV:491).

Currently, as described above, the APE section of Fulton Street corresponds roughly to the easternmost 50 feet of the extremely irregular three-way intersection of Pearl, Water and Fulton Streets. It runs approximately 100 feet from north to south. The intersection was created by the post-1937 widening of Pearl Street from its original c.30 feet. In this widening the block at the northeastern corner of Fulton and Pearl Streets (now the eastern half of Block 95) was truncated, and some of these old building lots are presently part of the Fulton Street APE. This former part of Block 95 is 50 feet wide (east/west) and runs for 40 feet (north/south) along the east side of Pearl Street, adjacent to current Lot 101 of Block 95. The first buildings were erected here by 1728 (Lyne 1728; WPA 1937).

To the south, the remainder of the Fulton Street section this APE, Fulton Street is currently approximately 60 feet wide. The northern 40 feet of this intersection corresponds to a filled-in section of Beekmans Slip, part of which is depicted with structures in 1776, which was made part of Water Street by 1797 (Holland 1776; Taylor-Roberts 1797).

- Documentation of Disturbance

At present there are a number of utility lines running beneath the project site section of Fulton Street which would have adversely impacted potential buried archaeological resources. Excavations for the installation of these utilities would most

probably have extended from one to two feet beyond the diameter of the utility pipe or conduit, both horizontally and vertically. Utility plans and profiles indicate that beneath Pearl Street these lines run to a depths of approximately three to as much as 15 feet below the current grade.

Utilities running along Fulton Street include: a 12" water pipe and a 12" High Pressure water main; a 4'0" by 4'0" sewer line; a 12" gas pipe; and telephone and electrical ducts. From Water Street, utilities turn eastward on Fulton, and leave the APE to go northward on Water Street. These include a 24" gas line, a 12" water main, four electrical ducts which crisscross the area, and a 12" gas main which links up with the line going west on Fulton Street. From Pearl Street comes a 4'0" circular sewer, 12" and 16" water lines, a 16" High Pressure water main, 8" and 10" gas lines, one telephone line and two electric ducts. (WPA 1937).

Although there are a vast number of utility lines in this area, they tend to be tightly clustered in an approximately 20-foot-wide band in the old roadbeds of Water and Fulton Streets. The band of disturbance divides this section of the APE into northern and southern sections. (Figure 34) In no locations do the utility lines appear to extend beneath the old c.1937 sidewalks. Moreover, as discussed earlier, following the creation of the WPA utility maps and profiles, Pearl Street was widened toward the east, bringing the old sidewalks and former building lots of Block 95 into the APE (Sanborn 1997).

Another potential disturbance to this APE was the construction of the IND subway tunnel beneath Fulton Street, which was completed in 1933 (Hall 1945:8). However, this tunnel, actually a pair of tunnels, round in cross section, was not constructed by the cut and cover method, and would not have affected the archaeological resources in this section of the APE.

The intersection elevations along Fulton Street have changed no more than an inch since 1884. The elevation at Pearl Street is now 5.4 feet where it was formerly 5.3 feet. At Water Street the elevation is still 8 feet (Sanborn 1997; Robinson 1884).

No earlier, pre-development elevations were available. No soil borings in the Pearl Street section of this APE were available from the City Bureau of Subsurface Exploration.

- Potential Undisturbed Resources

Although there are a large number of buried utilities beneath the Fulton Street roadbed, they tend to be clustered in a 20-foot-wide band under the old streetbeds, leaving the outer sections of the roadbed and the sidewalks untouched. Street widening operations have more than doubled the width of Pearl Street, absorbing into the current roadbed as much as 50 feet of the former sidewalks and building lots at the

northern end of the project site, all of which appear to be undisturbed by utility installation. This section of Fulton Street in the current Pearl Street intersection, west of Block 95, was noted as having potential sensitivity for prehistoric resources as well as a variety of historical remains, most notably commercial and residential usage related to the buildings erected here before 1728 (including the structures that once stood on the north side of Beekmans Slip). This location includes not only the locations of the foundations of these structures, but also parts of the rear and side lots, which are potentially sensitive for shaft features relating to the structures and their occupants. The area is also potentially sensitive for historical fill which was deposited prior to 1728.

A second area of potential historical sensitivity lies on the southern side of Fulton Street at the head of Water Street, in which there are large undisturbed areas between the widely-spaced electrical ducts. The area is also potentially sensitive for historical fill which was deposited by 1728.

- Assessment of Proposed Construction Impacts

In this APE, surface track construction is proposed, with rails within the streetbed. Construction would impact to no more than three feet below the present streetbed's surface. Although disturbance caused by utility installation certainly extends to greater than four feet below the present surface in many places of the roadbed, and may have eliminated some of the sensitive areas which fall within the proposed action's subsurface impact zone, for the remaining areas of Fulton Street the lack of subsurface disturbance, or the lack of documentation of subsurface disturbance makes a dismissal of potential archaeological sensitivity impossible. Therefore, potentially sensitive soils on Fulton Street from Water Street to Pearl Street will be impacted by the proposed action.

- Recommendations

Since sections of the Fulton Street roadbed between Water and Pearl Streets are considered sensitive for buried historical cultural resources (Figure 34), further research in the form of a full Stage 1A archaeological assessment is recommended. Research should be focused on seeking further cartographic and subsurface disturbance data (i.e., soil boring logs, utility maps and profiles) and in conjunction with documentary research, it is recommended that a series of soil borings be performed and analyzed to archaeological specifications. This data would better define the areas of potential sensitivity.

It should also be noted that due to subsurface disturbance caused by utility installation, some sections of this APE are not considered potentially sensitive in the LRT impact zone (no more than three feet below the current surface). Nevertheless, in these same areas there is a high potential sensitivity for undisturbed archaeological

deposits below this depth. This is particularly true in areas of 18th-century fill such as those noted within this APE.

#### Pearl Street from Fulton Street to Frankfort Street (Figures 10, 15)

- Identification of Potential Resources

#### Prehistoric Resources

No prehistorically sensitive areas or prehistoric sites were identified in the vicinity of this section of the APE (NYCLPC 1982; Site File Search). Early topographic maps show that this area was directly on the East River shoreline at the time of European Contact (Viele 1859; 1874). It is possible that prehistoric encampments are located along this section of the Contact Period shoreline. Therefore, this area has a moderate sensitivity for prehistoric cultural resources.

#### Historical Resources

Because potential archaeological resources are so tightly clustered in Lower Manhattan, due to the fact that the nature of many of the pre-19th-century buildings in the project site are not precisely known, and that through the 19th century, commercial, industrial, residential activities, etc., often took place in a single building, the heading "Historical Resources" comprises a general category of undifferentiated potential resources.

Within this APE, Pearl Street was officially laid out in 1707 (WPA 1937). At the time of the Lyne Plan, in 1728, Pearl (then Queen Street) was already lined with numerous structures within the project site, on both sides of the street. More than half the street frontage was occupied by buildings (Lyne 1728). The number of buildings increased until the maker of the 1767 map simply shaded in the blocks on each side of the street to indicate that they were built up (Holland 1755; Ratzer 1767).

Currently, Pearl Street between Fulton and Frankfort Streets varies enormously in breadth. At the north side of Fulton Street, where Pearl also meets Water Street, Pearl is approximately 206 feet wide (Note: the APE only includes the easternmost c.50 feet of Pearl Street south of Beekman Street). Pearl Street narrows as one proceeds northward from Fulton Street, to a width of approximately 130 feet on the south side of the Beekman Street intersection, to 106 feet north of Beekman Street to Peck Slip, and 101 feet near Frankfort Street. Pearl Street's original width was substantially smaller than at present. No references were found which provide the exact original width, but extrapolations from data on adjacent streets, other sections of Pearl Street, and street widths calculated from 19th-century atlases provide a clearer picture of the colonial street.

Adjacent Water Street, which was created on landfill beginning at the end of the 17th century, was planned to be 30 feet wide (Stokes 1922 IV:395-396,491), although sections northeast of this part of the APE were described as 45 feet wide in 1792 (Stokes 1926 V:1287). In 1814 the Common Council ordered Pearl Street enlarged to 50 feet and straightened from Chatham to Augustus Streets (now Park Row to Cardinal Hayes Place) (Stokes 1926 V:1570). Straightening was necessary since the original route of the street followed pre-development topography and shoreline. The combination of these two operations caused many older buildings to become public nuisances. Prior to an 1826 widening and straightening of Pearl Street at Coenties Slip (south of this section of the APE), what was presumably a 17th-century building, "the ancient Knickerbocker edifice which has for nearly a century and a half obtruded itself far too much into the street" was torn down (Stokes 1926 V:1658). This reference also suggests that street widening operations had been carried out continuously since the 17th century.

Calculations from measurements in the 1857 Perris Atlas provide street widths ranging from 41 to 48 feet (Perris 1857:5), while in 1884 the measurements are between 40 and 44 feet (Robinson 1884:4), and in 1923 the range is from 38 to 41 feet, suggesting that during the 18th century Pearl was even narrower, probably about 30 feet or less. If 30 feet is taken as the maximum width during the 18th century, and 15 feet as an average sidewalk width, then at least 40 to 140 feet of the building lots from the 18th century and earlier are currently part of the Pearl Street roadbed, and thus this section of the APE.

NYCLPC sensitivity maps indicate that the current eastern side of Pearl Street in the APE, from approximately Fulton to Beekman Streets, was part of the original shoreline of Manhattan. It also identifies a number of structures within or abutting this section of the APE. In addition to the resources described above, the NYCLPC also notes the presence of a structure in Pearl Street at the Peck Slip intersection, dating from the period 1609 to 1664 (NYCLPC 1982).

#### Commercial

Peck's Market appears on the 1767 map immediately east of Pearl Street at Pecks Slip (Ratzer 1767). NYCLPC gives its period of activity as approximately 1721 to 1815 (NYCLPC 1982). Subsequent widenings of Pearl Street would have brought large sections of the market location into this portion of the APE.

- Documentation of Disturbance

At present there are a number of utility lines running beneath the project site section of Pearl Street which would have adversely impacted potential buried archaeological resources. Excavations for the installation of these utilities would most probably have extended from one to two feet beyond the diameter of the utility pipe or

conduit, both horizontally and vertically. Utility plans and profiles indicate that beneath Pearl Street these lines run to a depths of approximately 2½ to as much as fifteen feet below the current grade.

For example, on Pearl Street from Peck Slip to Beekman Street there are telephone ducts, two sets of electrical ducts, 8" and 10" gas lines, a 12" sewer, 16" and 12" water mains, and a 16" high pressure water main. South of Beekman Street and north of Peck Slip there is also a 4" by 2'8" circular sewer at the center of the roadbed. Additional buried utilities cross Pearl Street at the intersections (Fulton, Beekman, Peck Slip and Frankfort), creating the largest concentrations of utilities and utility disturbance in this part of the APE.

The utility disturbance is tightly clustered in the roadbed. In no locations does it extend beneath the c.1937 sidewalks. Moreover, following the creation of these utility maps and profiles, Pearl Street was widened throughout this APE, bringing the sidewalks and additional utility-free areas into the APE. This change in street width is the most noticeable at Fulton Street, where the Pearl Street utilities are clustered in an area approximately 20 feet wide, outside the APE. Presently, the Pearl Street roadbed there is about 180 feet wide, and the area which makes up that part of the APE appears to have come completely from the lots of Block 95 on the eastern side of the street (Sanborn 1997). A similar situation exists at Beekman Street, where the roadbed and APE are about 104 feet wide, with utility lines packed into a 20-foot section of the APE.

On Pearl near Frankfort Street the streetbed had already reached its modern width by the 1930s (at present Franklin Square), with utilities distributed over an area about 57 feet wide. As a result, the utilities are more spread out in this area, leaving an undisturbed zone 240 feet long and about 16 feet wide, running southward from just below the Frankfort Street intersection. Also, the current streetbed width is now 70 feet, indicating that undisturbed areas also exist along the edges of the roadway (WPA 1937; Sanborn 1997).

The intersection elevations along Pearl Street appear to be changed two inches or less from 1884 to the present. This section of the APE still slopes downward from Frankfort Street to Fulton Street, except for a slight rise at Beekman Street. Frankfort Street was shown as the crest of a hill on early maps (Ratzer 1767; Robinson 1884; Sanborn 1997).

No earlier, pre-development elevations were available. No soil borings in the Pearl Street section of this APE were available from the City Bureau of Subsurface Exploration.

- Potential Undisturbed Resources

Although there are a large number of buried utilities beneath the Pearl Street roadbed, they tend to be clustered in a 20- to 57-foot-wide band at the center of the street, leaving the outer sections of the roadbed untouched. Street widening operations have drastically altered the width of Pearl Street, absorbing into the current roadbed as much as 140 feet of the former sidewalks and building lots, all of which appear to be undisturbed by utility installation. There is also an area at the center of the old streetbed, immediately south of Frankfort Street, which apparently did not have any utility lines, although it is surrounded by them.

This section of Pearl Street was noted as having potential for a variety of historical remains, one NYCLPC-noted structure dating to as early as the period 1609-1664 (Pearl Street at Peck Slip), and the majority of buildings postdating the opening of this part of Pearl Street in 1707. The Pearl Street roadbed not only includes the locations of the foundations of these structures, but also parts of the rear and side lots, which are potentially sensitive for shaft features relating to the structures and their occupants.

In addition, this APE was also noted as being potentially sensitive for commercial resources, relating to Peck's Market, which operated at Pecks Slip from c.1721-c.1815. Although not originally in the Pearl Street roadbed, the widening of the street has incorporated parts of the market location into the APE.

The very same historical resources which this section of the APE is potentially sensitive for may have disturbed any earlier prehistoric potential. Without any soil borings for this area it is difficult to assess current subsurface conditions. There may be areas on individual lots (now within the streetbed) which are sensitive for prehistoric resources and may have been left undisturbed by historical development.

- Assessment of Proposed Construction Impacts

In this APE, surface track construction is proposed, with rails within the streetbed. Construction would impact to no more than three feet below the present streetbed's surface. Although disturbance caused by utility installation certainly extends to greater than four feet below the present surface in many places of the roadbed, and may have eliminated some of the sensitive areas which fall within the proposed action's subsurface impact zone, for the remaining areas of Pearl Street the lack of subsurface disturbance, or the lack of documentation of subsurface disturbance makes a dismissal of potential archaeological sensitivity impossible. Therefore, potentially sensitive soils on Pearl Street from Fulton Street to Frankfort Street will be impacted by the proposed action.

- Recommendations

Since the Pearl Street roadbed from Fulton Street to Frankfort Street is considered sensitive for potential prehistoric resources and buried historical cultural resources (Figures 29, 34), further research in the form of a full Stage 1A archaeological assessment is recommended. Research should be focussed on seeking further cartographic and subsurface disturbance data (i.e., soil boring logs, utility maps and profiles) and in conjunction with documentary research, it is recommended that a series of soil borings be performed and analyzed to archaeological specifications. This data would better define the areas of potential sensitivity.

#### Frankfort Street from Pearl Street to West of Pearl Street (Figure 10)

- Identification of Potential Resources

##### Prehistoric Resources

No prehistorically sensitive areas or prehistoric sites were identified in the vicinity of this section of the APE (NYCLPC 1982; Site File Search). Early topographic maps show that this area was directly on the East River shoreline at the time of European Contact (Viele 1859; 1874). It is possible that prehistoric encampments are located along this section of the Contact Period shoreline. Therefore, this area has a moderate sensitivity for prehistoric cultural resources.

##### Commercial and Residential

Frankfort Street was not cut through the city block from Cliff Street east to Pearl Street until 1792 (WPA 1937; Taylor Roberts 1797). However, the original street was not in the same location as the current route of Frankfort Street. Since the construction of the Brooklyn Bridge approaches in the 1880s, the new Frankfort Street was rerouted to cross the same blocks further to the south, where it cut through a number of building and yard locations. The change in route is particularly visible in this APE. Frankfort and Dover Streets now meet at Pearl Street, where formerly Frankfort was approximately 120 feet to the north of Dover (Robinson 1884; Dripps 1852; Bridges 1811).

This APE was formerly part of the Jacob Leisler farm, and Frankfort Street was named for his place of birth in Germany (Stokes 1922 IV:514). The Lyne Plan of 1728 shows the APE as an empty space with no roads or structures in the area between Cliff Street (which formerly intersected Frankfort Street west of this APE) and Pearl Street (then Queen Street). The map does not depict blocks laid out in the area (Lyne 1728), but these appear by 1755, when there were two buildings along the west side of Pearl Street in the path of the current Frankfort Street roadbed. Most of the APE is part of

the block's interior, an apparently open area of undisclosed use. By 1767, the entire block containing the APE was shaded to indicate that its lots were occupied (Ratzer 1767).

### Industrial Sites

Between Gold Street and Pearl Street, in a low-lying, swampy area known as Beekmans Swamp, were the "Old Anthony tan-yards," established earlier than 1755. Figure 10 indicates the eastern edge of the meadows with a broken wavy line crossing Frankfort Street approximately 160 feet west of Pearl Street. The 1755 map shows the tannery to be both north and south of Frankfort Street (Holland 1755; Stokes 1926 V:1967), and before the street was cut through the meadows the tannery appears to have occupied Frankfort Street in the APE as well (Augustyn and Cohen 1997:58, 61). These "meadows" were filled in after an order of the Common Council in 1792, so the tannery presumably ceased operation by that time (Stokes 1926 V:1287). NYCLPC has identified the entire area of this APE as potentially sensitive for archaeological resources relating to the tannery, for the period 1665 to 1815 (NYCLPC 1982).

- Documentation of Disturbance

At present there are a number of utility lines running beneath the project site section of Frankfort Street which would have adversely impacted potential buried archaeological resources. Excavations for the installation of these utilities would most probably have extended from one to two feet beyond the diameter of the utility pipe or conduit, both horizontally and vertically. Utility plans and profiles indicate that beneath Frankfort Street these lines run to a depth of approximately two to six feet below current grade.

The utilities are as follows: a 12" High Pressure water pipe, a 12" water main, two 6" gas lines and telephone and electric ducts (WPA 1937). There is also a 4' by 2'4" and a 4' circular sewer at the center of the street (Office Record Plan of Sewers 1958).

The elevation at the intersection of Pearl and Frankfort Streets was 24.3 feet in 1884 and is presently between 23 and 24 feet. Unfortunately, both elevations were recorded *after* the Brooklyn Bridge was completed, so there is little evidence of regrading since that major construction episode. Some predevelopment contours are still visible. Frankfort Street at Pearl is still the top of a hill or ridge, as it appears on 18th-century maps (Ratzer 1767), and slopes downward toward the west, the location of an earlier swamp (Robinson 1884; MESA Task 6 Engineering Report 1997: SLRT-02).

No earlier, pre-development elevations were available. No borings in the Frankfort Street APE were available from the City Bureau of Subsurface Exploration.

- **Potential Undisturbed Resources**

Although there are a large number of buried utilities beneath the Frankfort Street roadbed, they tend to be clustered at the center of the street, leaving sections of the roadbed near the sidewalks untouched. This is particularly evident on the south side of Frankfort near Pearl Street, where an area approximately 115 feet long and eight feet wide appears to have no buried utilities. A similar area exists on the northern side of Frankfort Street, also near Pearl Street. These areas form a continuous area of potential sensitivity with the adjacent sidewalks (although the sidewalks themselves are not within the APE).

This section of present Frankfort Street was noted as having potential for commercial/residential remains dating as early as the period 1726 to 1755. These dates represent the earliest appearance of structures on the lots across which Frankfort Street was diverted at the time of the erection of the Brooklyn Bridge. The Frankfort Street roadbed includes not only the locations of the foundations of these buildings, but also of the rear lots which are potentially sensitive for shaft features relating to the structures and their occupants.

In addition, the APE was also noted as being potentially sensitive for Industrial resources, namely the "Anthony" tannery which operated in the vicinity of the APE and in the adjacent swampy section to the west of the APE, from before 1755 to approximately 1792.

The deposition of the very same historical resources for which this section of the APE is potentially sensitive may have disturbed any earlier prehistoric potential. Without any soil borings for this area it is difficult to assess current subsurface conditions. There may be areas on individual lots (now within the streetbed) which are sensitive for prehistoric resources and may have been left undisturbed by historical development.

- **Assessment of Proposed Construction Impacts**

In this APE, surface track construction is proposed, with rails within the streetbed. Construction would impact to no more than three feet below the present streetbed surface. Although disturbance caused by utility installation certainly extends to greater than four feet below the present surface in many places of the roadbed, and may have eliminated some of the sensitive areas which fall within the proposed action's subsurface impact zone, for the remaining areas of Frankfort Street the lack of subsurface disturbance, or documentation of subsurface disturbance makes a dismissal of potential archaeological sensitivity impossible at this stage of research. Therefore, potentially sensitive soils on Frankfort Street from Pearl Street to west of Pearl Street will be impacted by the proposed action.

- Recommendations

Since the Frankfort Street roadbed from Pearl Street to west of Pearl Street is considered sensitive for potential prehistoric resources and buried historical cultural resources (Figure 29), further research in the form of a full Stage 1A archaeological assessment is recommended. Research should be aimed at seeking further cartographic and subsurface disturbance data (i.e., soil boring logs, utility maps and profiles) and in conjunction with documentary research, it is recommended that a series of soil borings in the potentially sensitive sections of the project site be performed and analyzed to archaeological specifications. This data would better define the areas of potential sensitivity.

#### Canal Street to Union Square (LOWER EAST SIDE)

This APE begins on Canal Street at Ludlow Street, and runs eastward to East Broadway. It continues along East Broadway from Canal Street to Grand Street, and from there to Columbia Street. The APE runs on Columbia Street north to East Houston Street, and then runs along Avenue D as far as 14th Street. It continues along 14th Street as far west as Broadway at Union Square.

Because of the size of this APE and the variety of terrain, potential resources and disturbance, this APE will be split into six smaller sections for the remainder of this discussion.

- Canal Street from Ludlow Street to East Broadway
- East Broadway from Canal Street to Grand Street
- Grand Street from East Broadway to Columbia Street
- Columbia Street from Grand Street to East Houston Street
- Avenue D from East Houston Street to East 14th Street
- East 14th Street from Avenue D to Union Square

#### Canal Street from Ludlow Street to East Broadway (Figure 12)

- Identification of Potential Resources

##### Prehistoric Resources

No prehistoric resources were reported by the NYCLPC within this section of the APE (1982). A site file search identified one prehistoric site in this area, NYSM #4060, which Parker identifies as a village site (Parker 1920:627), and Grumet places more precisely near the East River, on the line of Canal Street. Parker reported "traces of occupation" there (Parker 1920:582). The precise location and horizontal extent of the

reported village is speculative, therefore it is possible that it extends into this section of the APE.

Early topographic maps show this area at the base of a hill which rises to the north (Viele 1859; 1874). While this section of the APE maintained no distinctive topographic features which would suggest prehistoric sensitivity, especially since it is located at least seven blocks from the nearest mapped fresh water source, it still maintains limited sensitivity based on Parker's notation of a nearby village site.

#### Commercial and Residential

Canal Street (first called Pump Street, and later Walker Street), from current Ludlow Street to Division Street was laid out between 1757 and 1767. Structures first appear on maps in an unbroken line along the northern side of Canal Street as far as Division Street at that time (Holland 1757; Ratzer 1767).

Between 1783 and 1797 East Broadway (Harman Street) was laid out, yet Canal Street was not yet extended past Division Street. Rutgers Street, running perpendicular to both East Broadway and Division Street, formed an intersection with Division Street slightly east of the intersection of Canal and Division Streets. Shading on the 1797 map indicates that the lots on either side of Rutgers Street between Division Street and East Broadway were completely built up, while the lots on the south side of Canal Street from Ludlow (then Fourth) Street to Division Street remained empty (British Head Quarters 1783; Taylor-Roberts 1797). However, by 1811 all the abutting blocks were occupied by structures (Bridges 1811).

Canal Street was not extended and cut through the blocks between Division Street and East Broadway until 1855, when the northeast corner of current Block 283 (eliminating or truncating approximately four lots with buildings) and a larger southwest corner of current Block 311 (eliminating and truncating about 8 lots with buildings) were cut through, linking Canal Street directly to East Broadway, and creating what is now called Straus Square. (Dripps 1852; Stokes 1926 V:1861; Sanborn 1997). The eliminated lots first hosted buildings between the years 1783 and 1797 (British Head Quarters 1783; Taylor-Roberts 1797).

Canal Street is presently 75 feet wide in this section of the project site (Sanborn 1997). William Bridges notes on the Commissioners Map suggest that Canal Street (then Walker Street) was 60 or fewer feet wide in 1811 (Bridges 1811:32), and when it was extended westward from Lafayette to Church Streets in 1806, it was only 50 feet wide (Stokes 1926 V:1462). The Longworth map of 1817 shows this 50-foot-wide section of Canal Street as the same breadth as the section of the street within the APE (Longworth 1827).

This is given more credence by the fact that in 1855 Canal Street, still called Walker Street, was widened to 75 feet. A report on the progress noted that "nearly all of the houses beyond the line have been cut or removed back, and many new buildings are being erected" (Stokes 1926 V:1682,1861).

It appears that the extra 25 feet came from the north side of the street, since a small triangular block on the south side (surrounded by Orchard, Canal and Division Streets) survived the widening (Colton 1836; Sanborn 1997). The current Sanborn map indicates that the sidewalks along Canal Street are presently about 17 feet wide, and since only the roadbed is part of the APE, this would reduce the maximum possible impact to only eight feet on the old building lots on the north side of Canal Street.

According to the 1852 map, only fragmentary foundations from the demolished buildings would be encountered in this narrow area (Dripps 1852), and these remains are not considered a potential archaeological resource due to their limited research potential.

- Documentation of Disturbance

At present there are a number of utility lines running beneath this APE's section of Canal Street, which would have adversely impacted potential buried archaeological resources. Excavations for the installation of these utilities would most probably have extended from one to two feet beyond the diameter of the utility pipe or conduit, both horizontally and vertically. Unfortunately, the following description is complicated by the fact that these utilities are coming from six different streets.

On Canal Street from Ludlow Street to East Broadway there is a 20" water main. On Canal from Ludlow Street to Division Street is a sewer line and a 16" high pressure water line. The HP water line turns southeast at Division Street and goes down Rutgers Street. Crossing Canal Street at Ludlow Street are two 12" and two 6" water mains, at Essex Street a sewer line crosses Canal Street, linking with a sewer pipe from Division Street to continue down Rutgers Street. Another sewer pipe crosses Canal Street at Division Street. A water distribution map also shows a number of 12" water mains mostly on the south side of Canal Street. It is not clear whether they are some of the same mains described above (Robinson 1884; Sanborn 1920; High Pressure Fire System Map; Water Distribution Map).

A major subsurface disturbance was the construction of the East Broadway Station of the IND Subway's 8th Avenue line which crosses Canal Street between East Broadway and Essex Street. It was completed in 1933 (Sanborn 1997; Hall 1945:8). Construction of station vents and entrances would have eliminated any surviving archaeological resources in that part of intersection. The completion of the subway station also necessitated the removal of a decorative fountain that operated in this intersection (Sanborn 1922:51).

Current elevations from Canal Street between Ludlow Street and East Broadway are little changed from the earliest available elevations from 1884, with Canal Street still sloping gradually downward toward East Broadway. One exception is the elevation at Essex Street, which has increased from 35 feet to 35'10" (Robinson 1884:9; Sanborn 1997). It is not clear why this has occurred, especially since it was not in the route of subway construction.

No earlier, pre-development elevations were available. No borings in the Canal Street section of this APE were available from the City Bureau of Subsurface Exploration.

- **Potential Undisturbed Resources**

In addition to this area being potentially sensitive for prehistoric cultural resources, two sections of present Canal Street were noted as having potential for commercial/residential remains dating from the period 1783 to 1797. These were the approximately 12 building lots truncated or eliminated when Canal Street was cut through from Division Street to East Broadway in 1855, creating what is now called Straus Square. This area includes not only the foundations of these buildings, but also the rear lots which are potentially sensitive for shaft features relating to the structures and their occupants.

Although there are many utility lines on Canal Street, few seem to cross east of Division Street and impact these two areas. The subway station does impact the western section of the lots which formerly fronted on East Broadway, so that this area of potential sensitivity is somewhat reduced.

- **Assessment of Proposed Construction Impacts**

In this APE, surface track construction is proposed, with rails within the streetbed. Construction would impact to no more than three feet below the present roadbed surface. Although disturbance caused by utility installation certainly extends to greater than four feet below the present surface in some places of the roadbed, and may have eliminated some of the sensitive areas which fall within the proposed APEs subsurface impact zone, for the remaining areas the lack of subsurface data makes a dismissal of potential archaeological sensitivity impossible. Therefore, potentially sensitive soils on Canal Street from Ludlow Street to East Broadway will be impacted by the proposed action.

- **Recommendations**

Since two sections of the Canal Street roadbed from Ludlow Street to East Broadway are considered sensitive for buried historical cultural resources, as well as a limited potential prehistoric sensitivity (Figure 31), further research in the form of a full

Stage 1A archaeological assessment is recommended. Research should be aimed at seeking further cartographic and subsurface disturbance data (i.e., soil boring logs, utility maps and profiles), and in conjunction with documentary research it is recommended that a series of soil borings in the potentially sensitive sections of the project site be performed and analyzed to archaeological specifications. This data would better define the areas of potential sensitivity.

East Broadway from Canal Street to Grand Street and Grand Street from East Broadway to Columbia Street (Figures 12, 16, 17)

- Identification of Potential Resources

Prehistoric Resources

Although the NYCLPC did not identify this area as potentially sensitive, at least one prehistoric village site was reported in the vicinity of Corlears Hook which may extend into the project site. As previously discussed, NYSM Site #4060, which Parker identifies as a village site with traces of occupation (Parker 1920:627, 582) and Grumet places near the East River on the line of Canal Street, may extend into this section of the APE. Since the precise location and horizontal extent of the reported village is speculative, it is possible that it extends into this section of the APE.

Agricultural

According to the 1767 Ratzer map, the route of present East Broadway appears to cross through what were then cultivated fields which lay between current Montgomery and Grand Streets. The fields appear to have belonged to three separate properties which extended south from the south side of Grand Street to the shores of the East River, where a residence and other buildings stood.

Commercial and Residential

These two categories must be combined for this area of undifferentiated buildings, since during this period it is not possible to separate residences from shops and other small businesses.

Attempts to lay out Grand Street as far east as East Broadway and to the East River began by 1767, when the street is tentatively drawn as a pair of dotted lines (Ratzer 1767). This proposed urban development was interrupted by the American Revolution and the construction of fortifications on the site roughly centered on Grand Street (and discussed below under "Military"). By 1797, with the fort gone, Grand Street had been completed and East Broadway (then Harman Street) was laid out from Canal Street (then Pump Street) to Montgomery Street. It was not yet cut through from Montgomery to Grand Street, and in 1797 a single building stood in the APE in the

roadbed of East Broadway on the south side of Grand Street. It was gone by 1811, when East Broadway appears to have been completed to Grand Street (Taylor Roberts 1797; Bridges 1811).

In 1797, the current city blocks along East Broadway between Rutgers and Clinton Streets were also shaded to indicate that they too had houses or other structures on them (Taylor Roberts 1797). By 1811, all the blocks between Canal/Rutgers Street and Grand Street were built up. A more detailed view of the buildings appears on the 1852 Dripps map, which shows numerous small buildings on lots with 25 to 50-foot frontages on both sides of East Broadway, as well as the APE section of Grand Street between Columbia Street and East Broadway.

The current street widths of Grand Street and East Broadway in this section of the APE are 70 and 80 feet respectively (Sanborn 1997). This agrees with measurements from the 1920 atlas (Sanborn 1920), although the 1884 atlas seems to present measurements between 70 and 78 feet on East Broadway (Robinson 1884). The 1852 and 1836 maps show Grand Street as wider than the neighboring streets, and wider than Avenue D, which was officially 60 feet wide. East Broadway was even wider than Grand Street. (Colton 1836; Stokes 1926 V:1632). According to the Commissioners Map, Grand Street was officially planned as 100 feet wide (Bridges 1811), but was apparently reduced in size subsequently. East Broadway is drawn as approximately 70 feet wide in 1811, slightly wider than the neighboring streets (Ibid.), but 10 feet narrower than at present.

Since the East Broadway sections of this APE consist only of the street roadbeds, and since the sidewalks on all sides of these streets are approximately 15 feet wide, none of the building lots encroached upon by an hypothesized street widening of up to 10 feet fall within the APE.

### Military

A fortified line later known as "The Barrier," extended eastward from the Post Road (Bowery), roughly centered on the path of present Grand Street. It was part of a system of fortifications hastily built by Washington's troops in 1775-76 to defend New York City from British attack. The eastern terminus of this line was a large fort built on Grand Street between Norfolk and Columbia Streets, and including the East Broadway section of this APE from Grand Street to south of Clinton Street. These defenses were maintained, manned and strengthened by the British during the occupation of New York City (1776-1783), and appear on the British Head Quarters Map of 1783. The Hills Map of 1782 shows at least four buildings within the confines of the walls (British Head Quarters 1783; Hills 1782). However, by 1797 they and the fort no longer appear, and a number of streets had already been laid out through this area (Taylor-Roberts 1797).

### Industrial

The 1767 map shows a ropewalk which was once located along the east side of Little Division Street (now Montgomery Street). This structure appears to lie adjacent to, but not in, the East Broadway section of the APE. It was no longer present in 1797 (Ratzer 1767; Taylor Roberts 1797).

Further west near the intersection of East Broadway and Rutgers Street, a small road and dammed pond of the Rutgers estate were near, but not within the APE (Ratzer 1767). The 1757 Holland map shows a building adjacent to the pond and labels it a "Brew House". These constructions appear to be abutting, but not part of the APE (Holland 1757).

- Documentation of Disturbance

At present there are a number of utility lines running beneath the project site section of East Broadway and Grand Street, which would have adversely impacted potential buried archaeological resources. Excavations for the installation of these utilities would most probably have extended from one to two feet beyond the diameter of the utility pipe or conduit, both horizontally and vertically.

From Canal/Rutgers Street to Clinton Street on East Broadway, these utilities include a sewer line, a 24" high pressure fire system water main, and 12" and 20" water lines. From Clinton to Grand Street there are 12" and 16" water lines and a sewer main. On Grand Street there is a sewer line, and 12" and 16" water mains (Robinson 1884; High Pressure Fire System Map). At the intersections of Rutgers/Canal, Jefferson, Clinton and Montgomery Streets a sewer pipe and 6" water line cross East Broadway. In addition, the Jefferson Street intersection has a 12" high pressure water line, and the Clinton Street intersection has both a 16" high pressure line and a regular 12" water line (Sanborn 1922:51).

Major subsurface disturbance was caused by the construction of the East Broadway Station of the IND subway's 6th Avenue Line at the intersection of East Broadway and Rutgers Street, completed in 1933 (Sanborn 1997; Hall 1945:8). Construction of station vents and entrances would have eliminated any surviving archaeological resources in that intersection. The completion of the subway station also necessitated the removal of a decorative fountain that operated in this intersection (Sanborn 1922:51).

Grade elevations at East Broadway and Grand Street intersections have changed no more than five to seven inches since the earliest elevations available, dating to 1884 (Robinson 1884). The predevelopment hill near Grand Street seems to peak at 35.5 feet at Montgomery Street, before sloping gradually downward toward Canal/Rutgers Street (28.1 feet) to the west. That the hill on which Revolutionary fortifications stood is still evident, suggests that little recontouring or regrading has

been done on the site prior to, and since the opening of East Broadway and Grand Streets (Sanborn 1997).

No earlier, pre-development elevations were available. No borings in the East Broadway/Grand Street section of the project site were available from the City Bureau of Subsurface Exploration.

- **Potential Undisturbed Resources**

This section of the APE is considered potentially sensitive for prehistoric cultural resources, given its proximity to a documented village site. Since the depth of fill in this section of the APE is unknown, there is the possibility that undisturbed sections of the prehistoric landscape which may be archaeologically sensitive exist beneath the road bed and may be impacted by the proposed construction. Where subway construction has caused extensive impacts, there is no longer any prehistoric sensitivity. ✓

Archaeological visibility of the cultivated fields lying between Montgomery and Grand Streets, observed on the 1767 Ratzler map, is considered too ephemeral to have survived the construction of fortifications on the entire site during the period 1775 to 1783.

The potential military resources, a fortification built, strengthened and maintained by the Americans and British from 1775 to 1783, were constructed on the high ground of this section of the APE on Grand Street from Columbia Street to East Broadway, and along East Broadway from Grand Street to between Clinton and Jefferson Streets. Remains from this fortification, and the campsites and shaft features created by the people who manned them, would have been found in a broad area around the position, including the APE as far as but excluding the subway station at Rutgers Street.

Also, a single building (presumably residential), appeared on the 1797 map in the roadbed of East Broadway facing Grand Street. Foundations and shaft features (privies, cisterns and wells) relating to this homestead would be expected in the first 150' of the roadbed of East Broadway west of Grand Street.

- **Assessment of Proposed Construction Impacts**

In this APE, surface track construction is proposed, with rails within the streetbed. Construction would impact to no more than three feet below the present streetbed surface. Although disturbance caused by utility installation certainly extends to greater than four feet below the present surface in many places of the roadbed, and may have eliminated some of the sensitive areas which fall within the proposed action's subsurface impact zone (particularly in the intersections), for the remaining areas the lack of subsurface data makes a dismissal of potential archaeological sensitivity

impossible at this stage of research. Therefore, potentially sensitive soils on Grand Street from Columbia Street to East Broadway and on East Broadway from Grand Street to Rutgers Street will be impacted by the proposed action.

- Recommendations

Since the East Broadway roadbed from Canal Street to Grand Street, and the Grand Street roadbed from East Broadway to Columbia Street are considered sensitive for buried prehistoric and historical cultural resources (Figures 31, 35, 36), further research in the form of a full Stage 1A archaeological assessment is recommended. Research should be aimed at seeking further cartographic and subsurface disturbance data (i.e., soil boring logs, utility maps and profiles) and in conjunction with documentary research, it is recommended that a series of soil borings in the potentially sensitive sections of the project site be performed and analyzed to archaeological specifications. This data would better define the areas of potential sensitivity. ✓

Abraham E. Kazan Street / Columbia Street from Grand Street to East Houston Street (Figures 18, 19)

- Identification of Potential Resources

Prehistoric Resources

No areas of potential prehistoric sensitivity were identified through either the NYCLPC or the site file search. Most of Columbia Street was land under water at the time of European Contact, and would have been uninhabitable. Prior to that time when water tables were lower and the East River shoreline was further east, some of the shoreline may have been exposed as dry land suitable for prehistoric use. These prehistoric landforms may be deeply buried under the historical landfill which created Columbia Street, far below the 3' depth of anticipated impacts, and are therefore out of this APE.

The only section of Columbia Street that was not inundated four hundred years ago was situated between Grand and Delancey Streets. Viele (1859) shows a series of knolls here directly south of an inlet. This type of topographic setting is typically considered potentially sensitive based on regionally established models of prehistoric site locations. Therefore these two blocks along Columbia Street are considered potentially sensitive for prehistoric resources.

Landfill

Two large areas of marsh land have been noted in the Columbia Street section of this APE. Firstly, the swampy area which lay roughly at current Delancey Street. This marsh appears on the 1767 map, but was apparently partially filled when the

Revolutionary War fortifications were constructed during the period 1775-1783, although what seems to be drainage channels are depicted on the 1782 Hills map (Hills 1782). By 1797, however, all trace of this marsh had been removed (Taylor-Roberts 1797). The fill in this area may be related to the construction of these late 18th century fortifications and the soldiers who manned them, and since it is related to a specific episode and group whose identity can be determined, it has archaeological potential.

The northernmost blocks of Columbia Street, from Stanton Street to East Houston Street, although partially built-up by 1811, were also part of the extensive salt meadow which extended northward along the East River shore. The 1836 map shows this section completely developed (Colton 1836), so this fill dates to the period between 1811 and 1836. Although this later fill episode is poorly documented, the source of the fill is believed to have been local glacial till from nearby hills (Cozzens 1843:18-19,24,35). As such, although the fill has the potential to contain archaeological materials, it is not considered a potential archaeological resource because of its disturbed nature, and the fact that the fill cannot be attributed to a specific source or depositional episode.

#### Agricultural

Although part of the [James] "DeLancey Farm" (Sanborn 1997), an estate confiscated from that prominent Loyalist family at the close of the Revolution, there appear to be no cultivated fields on the site of current Columbia Street in the mid-18th century. In 1767, the project site appears to be two large hills or ridges, with intervening marshy lowlands, one crossing the APE at approximately current Delancey Street, and the other north of Stanton Street (Ratzer 1767; Bridges 1811). By 1797 Columbia Street had been laid out and opened for urban development (Taylor-Roberts 1797).

#### Commercial and Residential

These two categories must be combined for this area of undifferentiated buildings, since during this period it is not possible to separate residences from shops and other small businesses.

According to WPA utilities survey maps, Columbia Street was legally opened in 1795 (WPA 1937). However, although the 1797 map shows the street, there is only one structure present, a large residence on the block west of Columbia Street between Grand and Bullock Streets (now Broome Street). This building lies outside the APE. By 1811, both sides of Columbia Street are shaded as developed from Grand Street to the northern side of Stanton Street (Taylor-Roberts 1797; Bridges 1811).

The northernmost block of Columbia Street, from Stanton Street to East Houston Street, although partially built-up by 1811, was still part of a larger salt meadow which

extended northward along the East River shore. The 1836 map shows this section completely developed (Colton 1836).

The earliest detailed map of individual lots, from 1852, depicts numerous small lots with small buildings, generally with 25- to 50-foot frontages on Columbia Street. At the block corners, lots are laid out with their frontages oriented toward the cross streets (Grand, Broome, Delancey, Rivington and Stanton), and their open rear yards along Columbia Street.

A pioneer co-operative apartment complex, the Amalgamated Dwellings (northwest corner of Columbia and Grand Streets, between Grand and Broome Streets, completed 1930), replaced the earlier small structures there, and was followed by Hillman Housing on the opposite corner of Columbia Street in 1951 (Willensky and White 1988:88). With the construction of these large complexes in the 1950s, Columbia Street was broadened from 50 feet to its current 80-foot width. The additional 30 feet of street was gained from land subtracted from blocks on the east side of the street, facilitated by the demolition of all the earlier buildings there (Sanborn 1997; Sanborn 1920; WPA 1937:116).

Cartographic evidence indicates that this was the only widening that Columbia Street has experienced. The street was 50 feet wide in 1884 (Robinson 1884), and measurements calculated from the 1857 Perris atlas show a similar street width (Perris 1857:31). Although the Commissioners Plan postdates Columbia Street's opening by about twelve years, the slightly greater 60-foot width of the later grid system streets (Bridges 1811:32) seems to be a continuation of the urban design trends already expressed in Columbia Street and its contemporaries. Fifty feet also falls within the street width guidelines laid down by the Legislature in 1787, authorizing the Common Council to lay out streets between 33 and 66 feet (two to four rods) wide (Smith 1972:8).

The 30 feet added to Columbia Street came from the lots facing the eastern side of the street, although only approximately 15 feet of this, along the east side of Columbia, is part of the APE since only the roadbed and not the current 15 feet of sidewalks there is part of the project site. In at least two areas (Stanton to Houston; Grand to Delancey) this strip may be from 20 to 30 feet wide because of variation in the widths of current sidewalks. In many of the lots in this strip only foundations from the fronts of demolished buildings would be encountered, and these remains are not considered a potential archaeological resource due to their limited research potential.

Nevertheless, numerous side yards and backyards fronted on this section of Columbia Street in 1852, and these open areas may have been more extensive in previous decades. This strip along the eastern side of the Columbia Street roadbed is potentially sensitive for shaft features relating to residential and commercial buildings occupied beginning c.1800.

## Military

A fortified line later known as "The Barrier," extended eastward from the Post Road (Bowery), roughly centered on the path of present Grand Street. It was part of a system of fortifications hastily built by Washington's troops in 1775-76 to defend New York City from British attack. To protect the eastern end of the Barrier from an amphibious attack, a second line of forts and redoubts ran along the hills near the East River shore, southward from the edge of the swamps that began north of current Stanton Street, and roughly including Columbia Street from Stanton through Delancey Streets. These defenses were maintained, manned and strengthened by the British during the occupation of New York City (1776-1783), and appear on the British Head Quarters Map (1783; Hills 1782). However, by 1797 they had been removed, and streets had already been laid out through this area (Taylor-Roberts 1797).

- Documentation of Disturbance

At present there are a number of utility lines running beneath the project site section of Columbia Street, which would have adversely impacted potential buried archaeological resources. Excavations for the installation of these utilities would most probably have extended from one to two feet beyond the diameter of the utility pipe or conduit, both horizontally and vertically. Utility plans and profiles indicate that beneath Columbia Street these lines run to a depth of between four and approximately 13 feet below the current grade.

These utilities include a 4'0" by 2'8" sewer line, a 20" high pressure water main, a 12" water main, a 16" gas pipe and two electrical ducts. In addition, there is a more shallowly buried 8" gas pipe and telephone ducts (WPA 1937; City of New York 1958). However, except for the street intersections where additional mains cross Columbia Street, large sections of the center of Columbia Street have no recorded utilities. In addition, the mains are clustered beneath the older, western side of the street, and not beneath the additional 30 feet added to Columbia Street during the 20th century.

Grade elevations at Columbia Street intersections have changed two inches or fewer since the earliest elevations available, from 1884 (Robinson 1884; Sanborn 1997). The predevelopment hill at Grand Street is still evident, and suggests that little recontouring or grading has been done in elevated areas prior to, and since Columbia Street's opening. The street slopes up a foot per block going from north to south, until at Delancey Street the grade becomes steeper, rising from 11.9 to 16.1 feet at Broome Street, and a block further south at Grand Street and East Broadway the elevation jumps to between 32 and 35 feet (Robinson 1884; Sanborn 1997). No earlier, pre-development elevations were available.

The only available boring came from the northeast side of East Houston Street, an area of former marsh, evidence of which (silt and vegetation) is buried beneath more than 12 feet of fill. The boring confirms the presence of a filled-in marsh (which maps

indicate present in 1811, eliminated 1836) north of Stanton Street, although this thickness of fill cannot be extrapolated to the non-marshy areas of Columbia Street. The following boring was taken at East Houston Street where the surface elevation was 8.9' above sea level (City of New York, Department of Public Works, Subsurface Exploration Section 1961:174A-1).

<u>Depth below grade</u>	<u>Strata Description</u>
0-12.3'	Misc. fill: Sand, gravel, brick, bone and wood.
12.3'-13.6'	Organic silt, trace vegetation
13.6'-20.0'	Gray sand, trace silt, trace gravel
20.0'-25.0'	Brown-gray sand, trace silt, trace gravel
25.0'-30.0'	Brown and gray sand in layers, trace silt, trace organic silt
30.0'-35.0'	Brown sand, trace silt, trace vegetation
35.0'-41.3	Brown sand, little silt
41.3'-49.0'	Brown silt, little brown sand, thin layers of gray clay.

- Potential Undisturbed Resources

Between Grand and Delancey Streets, Columbia Street is considered potentially sensitive for prehistoric resources where utility lines have not caused previous disturbance. The current topography suggests that the pre-development hill is still partially intact. The extent of historical grading is unknown at this stage of research since pre-development maps fail to report grade elevations. ✓

To the north of this area Columbia Street is considered potentially sensitive for deeply-buried prehistoric resources which may have existed on the once-exposed and now buried prehistoric shoreline. These topographic features would have been far below the depth of anticipated project site impacts (3'), as the only soil boring available confirms that the Contact Period shoreline comprised of marsh is now buried beneath at least 12' of fill. They are therefore outside the project's APE. This is presumably the case for most of Columbia Street.

Four types of historical resources (Commercial, Residential, Military, and Landfill) have been noted as having potential sensitivity in the Columbia Street section of this APE. Most of the potentially sensitive sections of the roadbed were added to the project site at the time of the 20th-century street widening, which added approximately 30 feet to the eastern side of Columbia Street. In general, this consists of approximately 15 feet of the old building lots, as well as approximately 12.5 feet of old sidewalk (WPA 1937), which were free of buried utilities.

The commercial/residential buildings' rear and side yards which were located along the eastern side of Columbia Street, and are included in this c.15-foot-wide strip, are considered sensitive for shaft features (privies, cisterns and wells) relating to these buildings and their inhabitants. The earliest sections were built upon between 1797 and 1811, while the marshy area between Stanton and East Houston Streets was built up between 1811 and 1836. These rear and side lots along Columbia Street are scattered throughout the blocks, and may have been more extensive before 1852, the

date of the earliest detailed map researched (Dripps 1852). No evidence of new utilities or other construction disturbance in this area was uncovered.

The potential Military resources, documented fortifications built, strengthened and maintained by the Americans and British from 1775 to 1783, were constructed south of the swampy area above Stanton Street, extending southward to beyond Grand Street. Remains from these fortifications, and the campsites and shaft features of the people who manned them, would have been found in a broad area around and including the Columbia Street section of this APE. Landfill in the marshy area near present Delancey Street appears to have been deposited at the time of the construction of these fortifications, and should also be considered sensitive.

Utility installation, which extends from three to 13 feet deep in many places of the roadbed, as well as building construction, may have eliminated some of the sensitive areas which fall within the proposed actions subsurface impact zone, but this is not certain, due to the lack of subsurface data. In addition, sections of the pre-widening roadbed appear to be free of utility lines (e.g., much of the central section of Columbia Street between Rivington and Delancey Streets -- WPA 1937), as is the old pre-widening, eastern sidewalk, approximately 12.5 feet wide, now in the roadbed.

- Assessment of Proposed Construction Impacts

In this APE, surface track construction is proposed, with rails within the streetbed. Construction would impact to no more than three feet below the present streetbed surface. Although some areas of the roadbed have been disturbed to a depth of 3 feet or more below the present surface by utility installation, available subsurface and disturbance data from other areas, particularly the eastern side of the roadbed, is insufficient to dismiss potential sensitivity. Furthermore, according to the current engineering report, it is this section of the roadbed which will receive the proposed track and be impacted by the construction (MESA Task 6 Engineering Report 1997:SLRT-05, -06).

Land potentially sensitive for historical period cultural resources on Columbia Street from Grand Street to East Houston Street will be impacted by the proposed action. With regard to prehistoric sensitivity, potentially sensitive land between Grand Street and Delancey Street may be impacted by the proposed construction. North of Delancey Street any potential prehistoric resources are - beneath land fill, far below the depth of anticipated construction impacts (3'). Therefore, there is no anticipated impact to potential prehistoric resources north of Delancey Street.

- Recommendations

Since the Columbia Street roadbed from Grand Street to Delancey Street is considered sensitive for buried prehistoric resources, and from Grand Street to East

Houston Street is sensitive for buried historical cultural resources (Figures 37, 38), further research in the form of a full Stage 1A archaeological assessment is recommended. Research should be aimed at seeking further cartographic and subsurface disturbance data (i.e., building records, additional soil boring logs, dates of utility installation) and in conjunction with documentary research, it is recommended that a series of soil borings in the potentially sensitive sections of the project site be performed and analyzed to archaeological specifications. This data would better define the areas of potential sensitivity. ✓

Avenue D from East Houston Street to East 14th Street (Figures 19 through 22)

- Identification of Potential Resources

Prehistoric Resources

No potentially sensitive areas were identified within this section of the APE (NYCLPC 1982). Early topographical maps show that Avenue D was either land under water or marsh at the time of European Contact, which would have been inaccessible to Native American populations (Viele 1859). Earlier landforms which may have been exposed prehistorically when water levels were lower would have later been inundated and then buried under deep levels of fill. ✓

Landfill

Avenue D was originally planned as a 100-foot-wide thoroughfare (Bridges 1811), yet in 1823 the Common Council decided to reduce its width to 60 feet (Stokes 1915 V:1632). Urban development apparently had not yet reached as far north as Avenue D, since in the first decade of the 19th century it is depicted as swamp and unfilled river bottom (Bridges 1811).

As the grid system was imposed on the landscape of the Lower East Side in the early decades of the 19th century, the Avenue D section of the APE, which was salt meadow as far north as far as East 11th Street, was filled by 1836 (Ratzer 1767; Colton 1836). The 1811 map already shows a drainage canal running through the meadow, crossing Avenue D near current East 9th Street. This may have been a preliminary step before landfill (Bridges 1811). Therefore fill for Avenue D south of East 11th Street was deposited during the period between 1811 and 1836.

More substantial filling was required to extend the East River shoreline from East 11th Street to East 14th Street. This was accomplished as far north as East 13th Street between 1811 and 1836, while the section between East 13th Street and East 14th Street was filled between 1836 and 1852 (Bridges 1811; Colton 1836; Dripps 1852).

Although these fill episodes are poorly documented, the source of the fill is believed to have been local glacial till from nearby hills (Cozzens 1843:18-19,24,35). As such, although the fill has the potential to contain archaeological materials, this fill is not considered a potential archaeological resource because of its disturbed nature, and the fact that the fill cannot be attributed to a specific source or depositional episode.

No references were found regarding the specific provenience or date of this fill. As a result, the historical landfill in the Avenue D section of this APE, between East Houston Street and East 14th Street, is not considered sensitive, because of its late date and lack of associative value.

### Commercial and Residential

These two categories must be combined for this area of undifferentiated buildings, since many historical cartographic sources did not separate residences from shops and other small businesses. The first buildings along Avenue D were constructed between 1811 and 1836 (Bridges 1811; Colton 1836); and probably postdate 1823, when the Common Council set the street width of the street at 60 feet (Stokes 1915 V:1632). It remained 60-feet wide until c.1960, when Avenue D was widened to 80 feet; the additional 20 feet coming from the east side of the street. This was accomplished by razing earlier buildings which were constructed there for a housing project in the 1960s (Sanborn 1920; 1997; Willensky and White 1988:164).

The present 80-foot-wide Avenue D includes part of the former building lots along the east side of the street. In 1836, this built-up area extended north from East Houston Street to south of East 10th Street (Colton 1836). The 1852 map shows the area in greater detail; there were a series of small lots with 25- to 30-foot frontages on Avenue D, extending back (eastward) from the street between 80 and 100 feet (Dripps 1852). The residential/commercial section, which would have contained small shops and light industry, extends as far north as East 9th Street, beyond which large-scale manufacturing concerns dominate the blocks.

The shaft features associated with the commercial and residential occupations of these buildings, i.e., privies, wells and cisterns, which provide archaeologists with their most valuable sources of archaeological data, would have been located at the rear of the Avenue D lots. These areas would have fallen outside of this section of the APE. Since the APE in this area is only the Avenue D roadbed, a comparison of the pre- and post-widening sidewalk locations indicates that 15' of the added 20' is made up of former sidewalks (Sanborn 1997), which would not have had any building remains beneath them. On the remaining 5' wide narrow strip along the east side of Avenue D, only fragmentary foundations from the demolished buildings could be encountered, and these remains are not considered a potential archaeological resource due to their limited research potential.

One lot, as it appears in 1852, was oriented toward East Houston Street, with its rear yard along the Avenue D frontage (the northeast corner of Avenue D and East Houston). Although the sections of this lot which are potentially sensitive for shaft features were along the eastern side of Avenue D, only a narrow, five-foot-wide strip of this section falls within the APE. Additional rear and side lots may also be sensitive for shaft features, yet they also would consist of an extremely limited area along Avenue D (Dripps 1852).

It should be mentioned that the Union Market, which occupied a irregularly-shaped block between East Houston Street and Second Avenue, stood on the western side of Avenue D, adjacent to, but not in the APE.

### Industrial Sites

In addition to the small workshops and factories that would have been in, and interspersed with 19th-century residences, 19th-century atlases also identify a number of industrial concerns near the East River shoreline, particularly from East 8th Street north to East 14th Street.

The Novelty Iron Works, located between Avenue C and the East River, from East 12th to East 13th Streets was established there before 1852. At that time, Avenue D had not been cut through the blocks north of 10th Street, so the iron works occupied the entire Avenue D roadbed between East 12th and East 13th Streets. In 1857 it had expanded, occupying both sides of Avenue D from East 11th to East 14th Streets. A carpentry shop stood in the street between East 12th and East 13th Streets, and a coal yard was located in the area from East 13th to East 14th Streets (Perris 1857:38). The concern was no longer present on the site in 1884, by which time it had been replaced by the New York Mutual Gas Light Company (Robinson 1884).

A second ironworks, the Morgan Ironworks complex, occupied the east side of Avenue D between East 9th and East 10th Streets by 1852 and was still present in 1884. The sites of two buildings occupied the entire east side of that block along Avenue D (Dripps 1852; Robinson 1884). Since only 5 feet of this frontage strip is within the current roadbed, and would contain only building foundations, it is not considered to have archaeological potential.

William H. Brown's shipyard appearing by 1852, and the "Dry Dock," before 1836, occupied the lots adjacent to Avenue D, and included the Avenue D roadbed from East 10th to East 12th Streets. Avenue D was not cut through these blocks until the 1880s. Since the lots also included East River frontage, it is possible that "Dry Dock" is simply that, a dry dock attached to the Brown shipyard (Dripps 1852). The Dry Dock is associated with these lots by 1836, when the Goodrich map shows what appear to be small sections of track crossing the Avenue D roadbed connecting the shipyard buildings (Stokes 1918 III:pl.99), and Dry Dock Street (now Szold Place)

which connected East 10th and East 12th Streets west of Avenue D (Colton 1836). The 1857 atlas depicts a "Ship plank and timber yard" on the future Avenue D roadbed (Perris 1857). By 1884, Avenue D had been cut through the property, and the area north of East 11th Street was part of the New York Mutual Gas Light Company, while the section between East 10th and East 11th Streets was occupied by a tobacco factory. These businesses extended onto the eastern 20 feet of the APE segment along Avenue D (Robinson 1884).

- Documentation of Disturbance

At present there are a number of utility lines running beneath the project site section of Avenue D, which would have adversely impacted potential buried archaeological resources. Excavations for the installation of these utilities would most probably have extended from one to two feet beyond the diameter of the utility pipe or conduit, both horizontally and vertically. Utility plans and profiles indicate that beneath Avenue D these lines run to a depth of approximately 13 feet below current grade.

The 1958 sewer plan records a 4'x2'8" and a 2'3" sewer, and a 108" (9') interceptor sewer as well as an abandoned 3'6" pipe, all running beneath Avenue D from East Houston to East 14th Streets (City of New York 1958). Water lines beneath Avenue D include a 12" line and a 24" High-Pressure Fire System main running from East 1st to East 8th Streets, with a 12" water main in all other areas. Additional water lines intersect Avenue D from each cross street (Sanborn 1920; Robinson 1884; Water Distribution and High Pressure Fire System Maps). A second interceptor sewer was installed during the 1960s, for the Newtown Creek Pollution Control Plant in Greenpoint.

Because the street was widened 20 feet to the east by the 1960s, the older utility lines tend to lie toward the western side of the street. However, the borings from the logs for the installation of the more recent interceptor investigated the area along the curb on the eastern side of the street from East Houston Street to East 14th Street. This was the only section of the Avenue D roadbed which could have accepted another large interceptor sewer (e.g., the pre-1958 interceptor has a diameter of nine feet), because as a newly-added streetbed, it was free of other utilities (City of New York, Department of Public Works, Subsurface Exploration Section 1961:174A-1).

Soil borings performed in 1961 agree with the scenario of a filled low-lying meadow and riverbed. Of 14 borings taken along Avenue D between East Houston and East 13th Street, fill layers extended from the surface to depths of between five and 24 feet. The greatest amount of fill was in the sections of Avenue D from East 9th Street to East 13th Street, areas which had been part of the riverbed, and would have required more fill than the meadowlands. A number of locations (A-23, -24, -26 and -29) exhibited lenses of peat or meadow mat beneath the fill layer, indicating that the pre-fill (and pre-development) surface has been protected by the fill overmantle (City of

New York, Department of Public Works, Subsurface Exploration Section 1961:174A-1).  
The following borings were taken within the Avenue D road bed in the early 1960s  
(Note: the first numeric depths provided for each boring reflects the grade elevations  
above sea level. All other elevations are also given in relation to sea level, not in  
relation to the grade):

## AVENUE D BORING LOGS

Loc.	E. Houston Street	3rd Street	4th Street	5th Street	6th Street	7th Street	8th Street
<u>Bor#</u>	<u>(A-21)</u>	<u>(A-22)</u>	<u>(A-23)</u>	<u>(A-24)</u>	<u>(A-25)</u>	<u>(A-26)</u>	<u>(A-27)</u>
Elev. Lev.1	9.5' to -2.5' 3" asphalt & 11" concrete at surface Misc. fill, Brown sand, gravel	9.8' to 0.2' 2" asphalt 10" concrete at surface Misc. fill, sand	9.5' to -1.5' pavement Misc. fill, sand, gravel brick, silt	8.8' to -1.2' asphalt & concrete at surface Misc. fill, brown sand, little silt, gravel brick	8.3' to 3.3' pavement 18" thick Misc. fill, sand, brick, gravel	8.3' to -2.7' .8' pavement, Brick? Misc. fill, sand, gravel, brick & plaster	8.4' to 1.4 1'pavement, Misc. fill, brown sand, little gravel, brick
Elev. Lev.2	-2.5' to -10.5' Gray sand, some gray silt	-6.2' to -7.2' Gray sand, some silt	-1.5' to -9.5' Gray sand, tr. vegetation tr. silt, gravel	-1.2' to -5.2' Brown and gray sand, peat	3.3' to -10.7' Gray sand, little silt	-2.7' to -13.7' 1' meadow mat at -2.7' green-gray sand, little gravel, silt trace clay	1.4' to -5.6' Brown sand, some gravel, trace silt trace clay
Elev. Lev.3		-7.2' to -15.2' Brown sand, some silt, gravel	-9.5' to -13.5' Gray sand, trace silt	-5.2' to -14.2' Gray sand, some silt, trace vegetation	-10.7' to -23.7' Gray sand, trace silt, gravel	-13.7' to -23.7' Gray sand, trace gravel, silt	-5.6' to -15.6' Gravel, little peat, trace brown sand
<hr/>							
Loc.	9th Street	10th Street	11th Street	12th Street	12th-13th Streets	12th-13th Streets	13th Street
<u>Bor#</u>	<u>(A-28)</u>	<u>(A-29)</u>	<u>(A-30)</u>	<u>(A-31)</u>	<u>(A-32)</u>	<u>(A-33)</u>	<u>(A-34)</u>
Elev. Lev.1	7.8' to -11.2' .7' pavement Misc. fill, brown sand, gravel, wood brick, cinders	6.9' to -5.1' pavement Misc. fill, sand, gravel brick, silt vegetation	6.6' to -4.4' 1' pavement Misc. fill, Gray & brown sand, gravel, cinders, brick, wood	7.8' to -10.2' 1.5' pavement Misc. fill, Brown sand, gravel, brick, cinders	6.8' to -5.2' 1' pavement Misc. fill, Sand, brick, pebbles, cinders	6.2' to -7.8' .9' pavement Misc. fill, Cinders, brick, sand	5.1' to 0.1' 1' pavement Misc. fill, Sand, tar concrete, brick, cinders pebbles
Elev. Lev.2	-11.2' to -20.2' Gray sand, some wood little silt	-5.1' to -12.1' 1' meadow mat at -5.1' organic & gray sand, trace vegetation	-4.4' to -8.4' Gray sand, little gravel, trace silt & wood	-10.2' to -17.2' Gray-brown sand, little silt	-5.2' to -12.2' Possible fill, sand, silt, little pebbles	-7.8' to -14.8' Possible fill, gray sand, gravel, little silt	0.1' to -14.9' Spaced timber ranging to 6", 8", 10"
Elev. Lev.3		-12.1' to -17.1 Grayish-brown sand, little silt gray sand	-8.4' to -23.4' Gray & gray-brown sand, little silt		-12.2' to -20.2' Brown sand, little silt, trace clay	-14.8' to -21.8' Brown sand, some silt, trace gravel, litt. clay, possible fill	-14.9' to -18.9 Black-brown sand, mixed with fill, wood, gravel

Boring A-34 is particularly notable, since beneath five feet of miscellaneous fill are 15 feet of "spaced timbers," indicating some remnants of the industrial concerns that existed in the area during the 19th century, possibly an undocumented dock or dry dock. Additional fill lies below the timbers.

Street intersection elevations have varied little from 1884 to the present, generally two inches or less. The only exception is the intersection of Avenue D and East 3rd Street, which has dropped from 11.6 feet (above mean sea level) in 1884 to 10.4 feet at present (Sanborn 1997; Robinson 1884). Boring A-22 shows this area to have 9.6' of fill. No earlier, pre-development elevations are available.

- Potential Undisturbed Resources

Although no prehistoric sites were reported in this area, there may have been landforms along the prehistoric shoreline which would have been exposed during periods when water table levels were lowered and were ideally suited for settlement by Native Americans. However, the boring logs clearly show that at least a five foot level of fill exists beneath this roadbed over the original surface. Any prehistoric landforms which are considered potentially sensitive exist beneath the fill, at least five feet below grade, and in some places it is even more deeply buried.

Only two areas were noted which may be potentially sensitive for buried resources from the historical period. The first is the five-foot-wide strip along the east side of the Avenue D roadbed, which represents the easternmost part of the 19th-century lots which lined Avenue D prior to its widening. It is highly unlikely that the remains of shaft features from residences and commercial buildings would have survived in this narrow section of the old back and side yards, given that later construction along the street front required builders trenches which would have impacted this narrow 5' strip. Secondly, the 1961 boring log indicates that this was the location of an interceptor sewer which was installed subsequent to that date, which would have destroyed any resources to a depth substantially greater than four feet below the current surface.

The second area exhibiting historical archaeological potential is the area of the 19th-century industrial concerns, namely the Novelty Ironworks (East 12th to East 13th Streets) and William H. Brown's Shipyard and the Dry Dock (East 10th to East 12th Streets). Since these businesses were present before Avenue D was cut through the area above East 10th Street, they occupied the entire roadbed. The borings performed prior to the laying of an interceptor sewer indicate (especially A-34 with the numerous timbers) that buried evidence of these complexes still exists beneath the present surface, but under at least five feet of fill.

Although the eastern side of the street was relatively free of utility lines until the 1960s, like the older, western side of Avenue D, it would have been disturbed to a

depth greater than four feet below the present surface when the second interceptor sewer was installed. Since the second interceptor (with an estimated diameter of at least nine feet) would have been placed along the eastern side of the street, the greatest disturbance impact would have occurred there, in precisely the location of the proposed light rail construction (MESA Task 6 Engineering Report Drawing SLRT-07).

- **Assessment of Proposed Construction Impacts**

In this APE, surface track construction is proposed, with rails within the streetbed. Construction would impact to no more than three feet below the present streetbed surface. Prehistorically sensitive areas now exist far below the anticipated 3' of impacts from this proposed project. Therefore, proposed construction will have no impact to any anticipated prehistoric cultural resources within this section of the APE.

Since the Avenue D roadbed has been disturbed to a depth of 3 feet or more below the surface by extensive utility installation, and more specifically by the installation of two interceptor sewers, any potential archaeological sensitivity for historical period cultural resources in the proposed zone of construction would have been eliminated.

If the proposed depth of construction disturbance is revised and will cause impacts more than three feet below the current surface, or if the impact area is widened beyond the Avenue D roadbed, then additional historical and archaeological research, study and evaluation of the industrial complexes between 10th and 13th Streets will be necessary. Furthermore, if impacts were to occur to a depth of greater than five feet, research on the potential impact to - prehistoric landforms which may be archaeologically sensitive would be required.

- **Recommendations**

Keeping the warning in the previous paragraph in mind, because research has concluded that there is a very low potential for the existence of significant archaeological resources in the proposed zone of disturbance, no additional archaeological research or work is warranted for the Avenue D section of this APE.

East 14th Street from Avenue D to Broadway at Union Square  
(Figures 22 through 26)

- Identification of Potential Resources

Prehistoric Resources

According to the NYCLPC (1982) there is an unexcavated Contact Period site somewhere near the intersection of East 13th Street and Avenue C. The site, which is depicted along the contact period shoreline, probably did not extend into the 14th Street APE which appeared to be land under water at that time. The East River shoreline ran east-west along East 13th Street between Avenue D and B at the time of European Contact, south of this APE. To the west of Avenue B where East 14th Street is now located, this APE was covered with a series of streams and surrounding marshland. However, an 1859 topographic map depicted a large knoll between these small watercourses in the vicinity of East 14th Street and Avenue A. This landform may have been suitable for prehistoric occupation and is considered potentially sensitive.

The NYCLPC also demarcated tracts at East 14th Street and Second Avenue, and at East 14th Street on the west side of Union Square (at Broadway) as potentially sensitive (1982). These areas were determined to be potentially sensitive based on their proximity to fresh water, and their pre-contact period topography (Viele 1859).

Agricultural Land

The route of current 14th Street (from Broadway to Avenue A) passed through a number of fields relating to the estates of the Stuyvesant family, which cartographic evidence depicts under cultivation by the mid-18th century (Ratzer 1767). As part of the Dutch West India Company's Bowery No. 1, established before 1639 and purchased by Peter Stuyvesant c.1649 (Manatus Map, 1639; Jenkins 1913:70,73,94; Brodhead 1853:504; Stokes 1928 VI: pl.84B-b), it is possible that sections of the present East 14th Street project site were cultivated during the seventeenth century.

Residential

This majority of the APE on East 14th Street was once part of Bowery No. 1, established by the West India Company before 1639. The Bowery included the project site from Fourth Avenue to Avenue A, although the locations of the house and farm buildings within Bowery No.1 are not known. By 1649 it had become the property of the Stuyvesant family, purchased by Peter Stuyvesant when he was still Director-General of New Netherland (Stokes 1928 VI: PL.84B-b). Stuyvesant's house and buildings lay outside the project site, at 10th Street and Stuyvesant Place. The estate was divided among his descendants, and during the second half of the 18th century the area was still owned by members of the Stuyvesant family. Most of 14th Street

appears to have been part of the estate of Peter G. Stuyvesant, although none of the structures relating to this residence (between First Avenue and Avenue A, and 14th and 16th Streets) were in, or abutting the East 14th Street roadbed (Ratzer 1767; Bridges 1811-11). An access road, connecting these buildings to Bowery Lane (now Fourth Avenue/Bowery), crosses 14th Street at the intersection of Avenue A, however, it is not considered archaeologically visible due to its superficial nature.

It is unlikely that any associated historical features, such as wells, privies or cisterns, which would have been situated close to these main buildings, would have been situated within the project site.

Between Fourth Avenue and Broadway, sections of the 14th Street APE were part of the Jacob Boshart Farm (pre-1767 to 1784), a property subsequently purchased by Joseph Mott, a butcher (1784 to post-1815) (Holmes 1882:10; Sackersdorff 1868). A single building from the farmstead stood in 14th Street near Fourth Avenue by 1767, and it appears on subsequent maps through the first decades of the 19th century, when it was removed for the completion of 14th Street (Ratzer 1767; Hills 1782; British Head Quarters 1783; Bridges 1811-11). The foundations of this structure and potentially sensitive historical features relating to this farmstead may have been situated within the project area, the East 14th Street roadbed, between Fourth Avenue and Broadway.

A later residence, a single building identified by the name Taylor, was constructed between 1782 and 1811 in the current 14th Street roadbed, west of present Irving Place (Hills 1782; Bridges 1811). By 1836, the structure had been removed, and 14th Street opened (Colton 1836). The foundations and potentially sensitive historical features relating to this residence would have been situated within the project area, the East 14th Street roadbed, between Irving Place and Fourth Avenue.

#### Industrial Sites

Nineteenth-century atlases indicate the presence of a number of industrial concerns near the East River shoreline, which were operating prior to the extension of East 14th Street beyond Avenue A.

The Novelty Iron Works, established before 1857 on either side of Avenue D from 11th to 14th Streets maintained a coal yard in the roadbed of Avenue D from 13th through 14th Streets, as well as on the surrounding blocks (Perris 1857:38). Although it may have archaeological visibility, a coal yard is not considered a potentially sensitive archaeological resource due to its limited research potential.

## Landfill

A series of orders issued by the Common Council indicate that East 14th Street was opened from Union Square West to the East River in 1829, the year of the last recorded resolution to remove all buildings in the roadbed and open the street by October 1. The street was ordered paved from Union Square to the East River in 1836 (Stokes 1926 V: 1685, 1740). As per the street grid of Commissioners Plan, and the current atlas, 14th Street was originally planned to be 100 feet wide, and was laid out as such (Bridges 1811; Sanborn 1997).

As the grid system was imposed on the landscape of the Lower East Side in the early decades of the 19th century, the area underwent substantial recontouring, as hills were truncated and valleys and marshes filled in to provide level sites for buildings and streets. Although the exact locations and breadth of this activity are poorly documented, the source of the fill is believed to have been local glacial till from the surrounding hills (Cozzens 1843:18-19,24,35). As such, although it has the potential to contain archaeological materials, this fill is not considered a potential archaeological resource because of its disturbed condition, and the fact that the fill cannot be attributed to a specific source or depositional episode.

Unlike this leveling of the interior blocks, which would require detailed topographic maps to chart, historical maps clearly show the East River retreating eastward as the salt marshes, creeks and shore were filled in stages. In 1811, the dry, elevated land of the East 14th Street project site extended only as far east as the lower slopes of a hill lying between present Avenues A and B. Beyond this was salt marsh, with the intersection of Avenue B and 14th Street still submerged in the East River (Bridges 1811). Landfilling continued through 1836, when the shore was pushed to Avenue C (Colton 1836), and by 1852, East 14th Street had been extended to its intersection with Avenue D (Dripps 1852).

Therefore, fill deposited between Avenues A and C dates from the period from 1811 to 1836, while the filling between Avenues C and D was part of a later episode, deposited sometime between 1836 and 1852.

No references were found regarding the specific provenience or date of this fill. As a result, the historical landfill in this APE, along East 14th Street between Avenues A and D, is not considered sensitive, because of its late date and lack of associative value.

- Documentation of Disturbance

At present there are a number of utility lines running beneath the project site section of East 14th Street, including the bordering sidewalks, which would have adversely impacted potential buried archaeological resources. Excavations for the

installation of these utilities would most probably have extended from one to two feet beyond the diameter of the utility pipe or conduit, both horizontally and vertically. The Utility plans and profiles indicate that beneath East 14th Street these lines run to a depth of between 10 and 15 feet below current grade.

For example, between Second and Third Avenues the WPA 1937 Subsurface Conditions Maps show five gas lines (10", 8", 6", 6" and 6"), three water lines (36", 12", 12"), a telephone duct, two electric ducts, and two 15" sewer lines. The sewer lines, at a depth of greater than 14 feet, rest on or adjacent to the roof of the L (originally the BRT 14th Street) subway line, which runs beneath 14th Street, at a depth of approximately 14.5 feet. Additional utility lines running north/south along the avenues cross 14th Street at each intersection. At Second Avenue fourteen different ducts and lines cross 14th Street, the largest of which is a 5'6" circular sewer. At a depth of approximately 14.5 feet, the base of this sewer must also rest on the roof of the subway tunnel beneath it. The utility lines are generally clustered beneath the roadbed, and not beneath the sidewalks, except at intersections, where the areas of interconnections between utilities from the streets and avenues cover a more extensive area (WPA 1937).

Additional sewer lines recorded in the City of New York's 1958 Plan of Sewers include a 4'6" circular sewer which runs under 14th Street, westward from Avenue B to Union Square, where it divides into two lines -- 3'6" and 2'4" in diameter. West of First Avenue the sewer line reduces in size to 18".

As mentioned above, the tunnel of the 14th Street subway runs beneath the 14th Street roadbed at an approximate depth of 14.5 feet below the road surface. This subway may have been constructed by the cut-and-cover method, requiring the complete disturbance of the 14th Street APE. Even if this construction method were not used, subsurface disturbance would have been extensive. Subway tunnel vents connect the tunnel to the surface through adjacent sidewalks (WPA 1937). Stations at Broadway, Fourth, Third and First Avenues increase the zone of disturbance from just under the roadbed to the beneath the sidewalks, as the tunnel is necessarily wider to allow passenger platforms and additional vents and stairways which communicate between the platform and street level.

Disturbance is more extensive in the vicinity of Broadway and Fourth Avenue, which is the location of not just one subway station, but an underground concourse between two subway lines -- a pair of stations, one atop the other (Sanborn 1997). As an example of the extensive disturbance caused by concourse construction (c.1935), adjacent Union Square park was literally raised more than three feet above street level (WPA 1939:202). According to one report, when construction was undertaken for this concourse, engineers found rock from street level on down on the west side of Fourth Avenue, and soft sand for the first fifteen feet on the east side of Fourth Avenue (Cudahy 1988:23). Clearly their method of construction for the station entailed cut-and-

cover excavation. In fact, most of the subway tunnels in Manhattan were created using this method (Ibid.).

No documents were found which provide pre-development elevations of the project site section of East 14th Street. Unfortunately, such elevations were usually recorded at street intersections *after* the land was recontoured.

Between Union Square (Fourth Avenue) and Avenue D, current grade elevations decline from west to east (i.e., slope downward toward the East River), from approximately 40 feet at Broadway and Union Square to 4.10 feet at the intersection of 14th Street and Avenue D (Sanborn 1997). These elevations coincide almost exactly with those from 1884, which preceded the construction of the tunnels and stations for the subway lines beneath 14th Street and Fourth Avenue. Differences were generally an increase of no greater than two inches, a change which could be due to repaving. However, the Avenue D intersection is presently seven inches lower than in 1884, dropping from 4.8 to 4.1 feet. Following the construction of the 14th Street subway line in 1924, the intersection of Fourth Avenue and 14th Street also changed approximately one foot from the 1884 elevation, dropping from 41.1¼ to 40.3 feet (Hall 1945; Robinson 1884; Sanborn 1997). If one takes the 1920 atlas as a benchmark, the decline was even greater, dropping from 42 feet to 40.3 (Sanborn 1920). The construction of the subway most likely accounted for this drop in elevation.

No borings in the 14th Street section of the project site were available from the City Bureau of Subsurface Exploration. However, in his 1909 *Geology of the City of New York*, geologist Louis Pope Gratacap published a chart showing a cross section of Manhattan's geological strata along the path of Broadway, which intersects 14th Street slightly west of Fourth Avenue. In the 14th Street roadbed beneath 11 feet of fill and 2.25 feet of coarse sand, there is a dramatic rise (20 feet, within the 14th Street roadbed) in the elevation of the underlying rock. It rises steeply to only 13.25 feet below street level. The rise continues more gradually toward the north (Gratacap 1909:Map I). This suggests that a thick fill overmantle of approximately 11 feet was laid over the thin natural glacial till layer in the western section of the 14th Street project site. However, because of the extensive disturbance associated with the construction of the 14th Street (L) and Broadway subway lines, it is highly unlikely that any archaeological resources have escaped disturbance in the roadbed.

#### • Potential Undisturbed Resources

Three areas of potential prehistoric sensitivity were identified within this APE. Areas considered sensitive were the prehistoric landforms that once existed near the intersections of East 14th Street and Broadway, Second Avenue, and Avenue A. The disturbance record detailed above clearly showed that the 14th Street roadbed contains utility lines which extend across the entire width of the street, from the surface down to the top of the subway tunnel which sits at 14.5' below grade. The prehistoric

topography in this area was clearly restructured and disturbed when knolls were graded, wetlands were filled, and 14th Street was regulated and opened. Further disturbance was effected first when utility lines were initially installed, and again when the subway was constructed and utility lines were rerouted above and around the tunnel. Prehistoric resources which would have been shallowly deposited (within the upper three feet of the prehistoric land surface) would have been greatly disturbed by these activities. Therefore, there is no longer sensitivity for this type of resource in any part of this APE.

Three potential historical archaeological resources were identified for this APE. Firstly, a house belonging to the Taylor family, which was sited in the current roadbed of 14th Street between Fourth Avenue and Irving Place, and secondly, the Boshart/Mott farmstead building and related features identified as having been located in the 14th Street roadbed between Broadway and Fourth Avenue. However, given the projected 11 feet of fill and a depth of bedrock of only 13.25 feet in this area, any pre-fill historical deposits would necessarily have been shallow, i.e., within three feet of the surface. Furthermore, utility disturbance in the vicinity has penetrated to approximately 14.5 feet below the surface, meeting the roof of the subway station/tunnel which extends from west of Broadway to Irving Place.

The third potential historical resource was agricultural land relating to Bowery No. 1 and the Stuyvesant family Bowery, possibly dating to as early as the 1630s. However, utility disturbance and subway tunnel construction directly beneath the zone of utility disturbance in the roadbed would have effectively destroyed any of the cultural evidence relating to agricultural practice.

- **Assessment of Proposed Construction Impacts**

In this APE, surface track construction is proposed, with rails within the streetbed. Construction would impact to no more than three feet below the present streetbed surface. Since the East 14th Street roadbed has been disturbed to a depth of 3 feet below the surface or greater, potential archaeological sensitivity in the proposed zone of construction would have been eliminated.

- **Recommendations**

Because research has concluded that there is very low potential for significant archaeological resources to exist, no additional archaeological research or work is warranted for the 14th Street section of this APE. ✓

## BELOW-GRADE SUBSTATIONS

The new LRT line will require six new below-grade electric substations, each about 20 to 25 feet deep. While hypothetical locations are shown on project plans for feasibility purposes, the specific locations for these facilities have not been selected, making an assessment of archaeological resources inappropriate. These facilities have the potential to disturb archaeological resources. When the Areas of Potential Effect are refined, they will require further study (such as a Stage 1A report) for the FEIS.

## LIGHT RAIL STORAGE YARD (Figure 27)

The LRT will require a large parcel for use as a vehicle storage and maintenance facility, with surface track linkage from the facility to Columbia Street.

Delancey Street South from Clinton Street to Abraham E. Kazan/Columbia Street and the Blocks bounded by Delancey Street South, Broome, Essex Streets and a line 120 feet east of Clinton Street

(Note: since the completion of the Williamsburg Bridge in 1903, Delancey Street in this APE has been split into two lanes, separated by a central island with the bridge approach. The present route of Delancey Street South is the previous site of the building lots on the northern ends of the blocks between Broome and old Delancey Streets.)

- Identification of Potential Resources

### Prehistoric Resources

No prehistorically sensitive areas or prehistoric sites were identified in the vicinity of this section of the APE (NYCLPC 1982; Site File Search). Early topographic maps show that this area was once comprised of level land near a series of knolls about three blocks south of a stream which drained into the East River (Viele 1859; 1874). It is possible that prehistoric encampments were once situated on the prehistoric landforms in this area. Therefore, this area has a moderate sensitivity for prehistoric cultural resources.

### Commercial/Residential

The first structures in this APE were three buildings which were erected facing Broome Street, two on the block (Block 346) between Suffolk and Clinton Streets, and one at the northeast corner of Clinton and Broome Streets (Block 347). They first appear on the site between 1783 and 1797 (Taylor Roberts 1797; British Head

Quarters 1783). Block 352, of which only Lot 71 at the northeast corner of Clinton and Broome Streets is part of the APE, was empty during this period.

By 1811, all the lots on these blocks had been built up. The 1836 map indicates a building of note in the APE, on Block 346, at the northeast corner of Norfolk and Broome Streets (Colton 1836), although this structure is never identified there nor on subsequent maps. The 1852 map shows numerous buildings with small frontages on Broome and the side streets, and large open rear yards within the APE (Dripps 1852). The 1884 atlas distinguishes between brick and frame buildings, and identifies the Apollo Hall, a meeting or concert hall, on the east side of Clinton Street and a furniture factory at the northwest corner of Suffolk and Broome Streets (Robinson 1884).

By the 1920s many of the earlier structures had been replaced by brick tenements, and the buildings which stood in the APE sections of present Delancey Street South had been eliminated for the new street necessitated by the construction of the Williamsburg Bridge approach. A number of open rear yards remain on the truncated blocks from Norfolk through Clinton Streets (Sanborn 1920; 1922).

#### Military

A fortified line later known as "The Barrier," extended eastward from the Post Road (Bowery), roughly centered on the path of present Grand Street. It was part of a system of fortifications hastily built by Washington's troops in 1775-76 to defend New York City from British attack. The eastern terminus of this line was a large fort built on Grand Street between Norfolk and Columbia Streets, and its site included parts of this APE from Bialystoker Place to Clinton Street. These defenses were maintained, manned and strengthened by the British during the occupation of New York City (1776-1783), and appear on the British Head Quarters Map of 1783. The Hills Map of 1782 shows at least four buildings within the confines of the walls (British Head Quarters 1783; Hills 1782). However, by 1797 they and the fort no longer appear, and a number of streets had already been laid out through this location (Taylor-Roberts 1797).

- Documentation of Disturbance

At present there are a number of utility lines running beneath the project site section of Delancey Street (south side), which would have adversely impacted potential buried archaeological resources. Excavations for the installation of these utilities would most probably have extended from one to two feet beyond the diameter of the utility pipe or conduit, both horizontally and vertically.

Recorded utilities include a 12" high pressure water main on the south side of Delancey Street (most of the utility lines tend to be on the north side of the street), and two additional water mains and a sewer main crossing the APE section of Delancey

Street at the intersections of Clinton, Ridge and Pitt Streets, Bialystoker Place (formerly Willett), and the former Sheriff and Attorney Street intersections from Columbia to Clinton Streets (Robinson 1884; Sanborn 1920; 1922).

The construction of the Williamsburg Bridge, completed in 1903, had a major impact on this APE, causing the removal of all the buildings in the project site from Columbia Street to Clinton Street. The bridge approach ramps abut the north side of Delancey Street South, and there are breaks between the ramps for the north/south streets to pass beneath the bridge. (Sanborn 1922).

The Broadway (Brooklyn) subway line, the BRT, which runs along Delancey Street was completed in 1908, after the Williamsburg Bridge (Hall 1945:6), and crosses the East River on the bridge, becoming a true subway on the Manhattan side of the river. Both the Delancey/Essex Street station, and any subsurface sections of the subway tunnel as it leaves the bridge appear to either abut or lie outside the APE (Sanborn 1920; 1997).

A comparison of street intersection elevations is necessarily crude because Delancey Street South was not created until 1903, after the subsurface disturbance caused by the building of the Williamsburg Bridge. However, the old Delancey Street elevations from 1884 and those of present Delancey Street North differ by no more than two inches. When elevations are provided, it is apparent that like the northern section of the street, Delancey Street South (about a foot higher) slopes gradually upward from Columbia Street (c. 12 feet) to Ridge Street (c.20 feet) (Robinson 1884; Sanborn 1920; Sanborn 1997). No earlier, pre-development elevations were available.

Soil borings available from the City Bureau of Subsurface Exploration in this APE were performed in 1992 along the retaining wall/approach ramps of the Williamsburg Bridge, and are not able to provide subsurface data relating to the potentially undisturbed areas to the south of the ramps (City of New York, Department of Transportation 1991: 2222).

- **Potential Undisturbed Resources**

There is the potential for prehistoric cultural resources to exist where historical development has not impacted the buried prehistoric landscape. Although utility installation and subway construction has impacted much of the Delancey Street roadbed, the depth of impacts in relation to fill levels and the original ground surface is unknown. On the site of the proposed maintenance and storage yard, the four blocks south of Delancey Street South, the construction of various structures would have severely impacted the potential prehistoric remains. However, some places where undeveloped yards existed may still have prehistoric potential. ✓

The potential military resources, a fortification built, strengthened and maintained by the Americans and British from 1775 to 1783, were constructed in this section of the APE on Delancey Street from Bialystoker Place (formerly Willett Street) to Suffolk Street. Remains from this fortification, and the campsites and shaft features of the people who manned them, would have been found in a broad area around the position, including the entire APE.

Although there are a number of utility lines on and crossing Delancey Street South, there is insufficient evidence of subsurface disturbance from utilities on Delancey Street or the cross streets to eliminate potential archaeological sensitivity in these areas. However, it is certain that the construction of the Williamsburg Bridge approach ramps would have destroyed some of the archaeological potential on the Delancey Street South sections of the APE. However, as with the utility information, there is insufficient subsurface data to determine the areal extent of this disturbance.

On the site of the proposed maintenance and storage yard, the four blocks south of Delancey Street South, the construction of various structures would have severely impacted the potential Revolutionary War remains, but without additional disturbance data, and with the existence of open, unbuilt rear yards, it is difficult to assess the full impact of this later construction.

Excluding the locations of the present and former cross streets (from east to west: Essex, Norfolk, Suffolk, Clinton, Attorney, Ridge, Pitt, Bialystoker and Sheriff), all areas of this APE were noted as having potential for mixed commercial/ residential remains, of which the earliest date from the period 1783 to 1797. This part of the APE includes not only the foundations of these buildings, but also the rear lots which are potentially sensitive for shaft features relating to the structures and their occupants.

- **Assessment of Proposed Construction Impacts**

In this APE, the proposed maintenance and storage yard will be built underground, which along with a portion of the spur west of Columbia Street, will involve cut and cover construction. Although disturbance caused by utility installation certainly extends to greater than four feet below the present surface in a few places of the roadbed, and may have eliminated some of the sensitive areas which fall within the proposed action's subsurface impact zone (particularly in the intersections), for the remaining areas of Delancey Street South, as well as the portions of the APE on Blocks 346, 347 and 352, the lack of soil borings and other subsurface data make a dismissal of potential archaeological sensitivity impossible. Therefore, potentially sensitive soils in the Light Rail Storage Yard and Shop APE will be impacted by the proposed action.

- **Recommendations**

Since much of this APE is considered potentially sensitive for prehistoric period cultural resources, and the entire APE is considered potentially sensitive for buried historical cultural resources (Figure 39), further research in the form of a full Stage 1A archaeological assessment is recommended. Research should be aimed at seeking further subsurface disturbance and cartographic data (i.e., soil boring logs, utility maps and profiles, as well as hookup dates), and in conjunction with documentary research, it is recommended that a series of soil borings in the potentially sensitive sections of the project site be performed and analyzed to archaeological specifications. This data would better define the areas of potential sensitivity. ✓

## VI. CONCLUSIONS AND RECOMMENDATIONS

The first task of the archaeological assessment for the Manhattan East Side Transit Alternatives study was to distinguish those areas within each of the proposed alternatives that would experience construction episodes likely to have any impact to potential subsurface resources. After these Areas of Potential Effect (APEs) were established, research was undertaken to identify those locations within APEs that might have potentially important archaeological deposits, and to assess the likelihood that any such resources could have survived documented disturbance episodes. This was accomplished by reviewing a collection of seventeenth through twentieth century maps and atlases, utility maps, and soil borings, as well as pertinent documentary sources. The locations of potential resources were generalized - precise "footprints" of deposits were not created. Rather, generalized site types and locations were identified and then compared to known disturbances.

Some locations within some of the APEs have the potential for a variety of site types representing many time periods. No extensive disturbance, which would negate their sensitivity, could be documented at this stage. These areas were given a high sensitivity rating and further research, in the form of a Stage 1A investigation, was recommended (see Figures 6a, and 28-39). On the other hand, some APEs were found to have little or no potential to contain significant archaeological resources, either through lack of deposition or because of extensive prior disturbance. Therefore, proposed project alternatives would have no impact on archaeological resources in these areas, and thus no further research is recommended.

It should be noted that trolley lines existed throughout most of the APEs. Specific trolley features, such as cast-iron saddles, may be considered archaeologically important however, tracks, in and of themselves, are so common that, while they might be worth noting if encountered during construction, there is no specific reason to document each incidence or attempt to save them. Early tracks were often ripped up or replaced, and subsurface features were commonly replaced by more modern mechanisms. Therefore, rather than identify each potential trolley line within each APE, it would be more efficient to note any features which are encountered at the time construction. In the event that these features are encountered, curators at the New York City Transit Museum should be contacted for their input. This is also the case for the ubiquitous and technologically indistinct el pier foundations which may exist truncated beneath street beds.

This archaeological assessment concluded that in the Northern Subway section, Build Alternatives 1 and 2, there may be an impact to potentially important archaeological deposits only at East 124th Street. The remainder of the APEs will not impact potential archaeological resources through either the creation of tunnels, subway stations, or tunnel boring machine access shafts as per the current plans

(December 15, 1997). Research has concluded that each of these APEs either 1) lacked any potential deposits due to their pre-development topography and/or their lack of historical use, or 2) that potentially sensitive sections of Second Avenue were extensively disturbed by historical land manipulation. These assessments were documented through the cartographic record and through a review of boring logs compiled for the original 1972 Second Avenue subway plan. Therefore, for the Northern Subway section, further archaeological research is recommended for only the East 124th Street APE.

For the Light Rail Transit, Build Alternative 2, potential prehistoric and historical archaeological deposits were identified in most of the APEs. The prehistoric use and extensive early historical development of Lower Manhattan and the Lower East Side has been comprehensively documented by cartographers, early amateur archaeologists, historians, and contemporary researchers. In many of the APEs, early street beds were widened or rerouted over former city blocks which were lotted and once possessed residential and commercial dwellings - and probably associated features. These areas are considered particularly sensitive, although in many places the roadbeds themselves are equally sensitive even where they did not traverse developed lots due to the potential for either prehistoric resources or early landfill.

Despite the extensive network of utilities laid within the Lower Manhattan street beds of most of the APEs, where utility maps were found for specific areas, conduits were often shown clustered together - probably to save excavation costs at the time of initial installation. Furthermore, when many of the early streets were widened, the routes of utilities had already been installed in the original street beds, leaving the widened path relatively undisturbed. Where subway lines within the APEs were found to be constructed using the cut-and-cover method, which was typical for most of Lower Manhattan, all identified sensitive areas in its route were considered to be completely disturbed.

Research concluded that in two of the Light Rail Transit APEs, East 14th Street and Avenue D, no archaeological potential exists where proposed project impacts will occur. These two APEs either lacked potential resources or had experienced documented subsurface disturbance so great that all archaeological potential could be readily dismissed. Therefore, no further archaeological research is recommended for either the East 14th Street or Avenue D APE.

All of the remaining APEs within the Lower Manhattan and Lower East Side sections of the proposed project were found to have archaeological potential, and limited prior impacts. Therefore, these areas require more comprehensive Stage 1A investigations in order to refine the archaeological potential of each APE. Research should be aimed at documenting, in detail, the horizontal and vertical footprint of each potential resource, and assessing the extent of prior impacts (i.e., soil boring logs, utility maps and profiles, as well as hookup dates). In conjunction with documentary

research, it is recommended that a series of soil borings in the potentially sensitive sections of the project site be performed and analyzed to archaeological specifications. This data would better define or possibly eliminate the areas of potential sensitivity.

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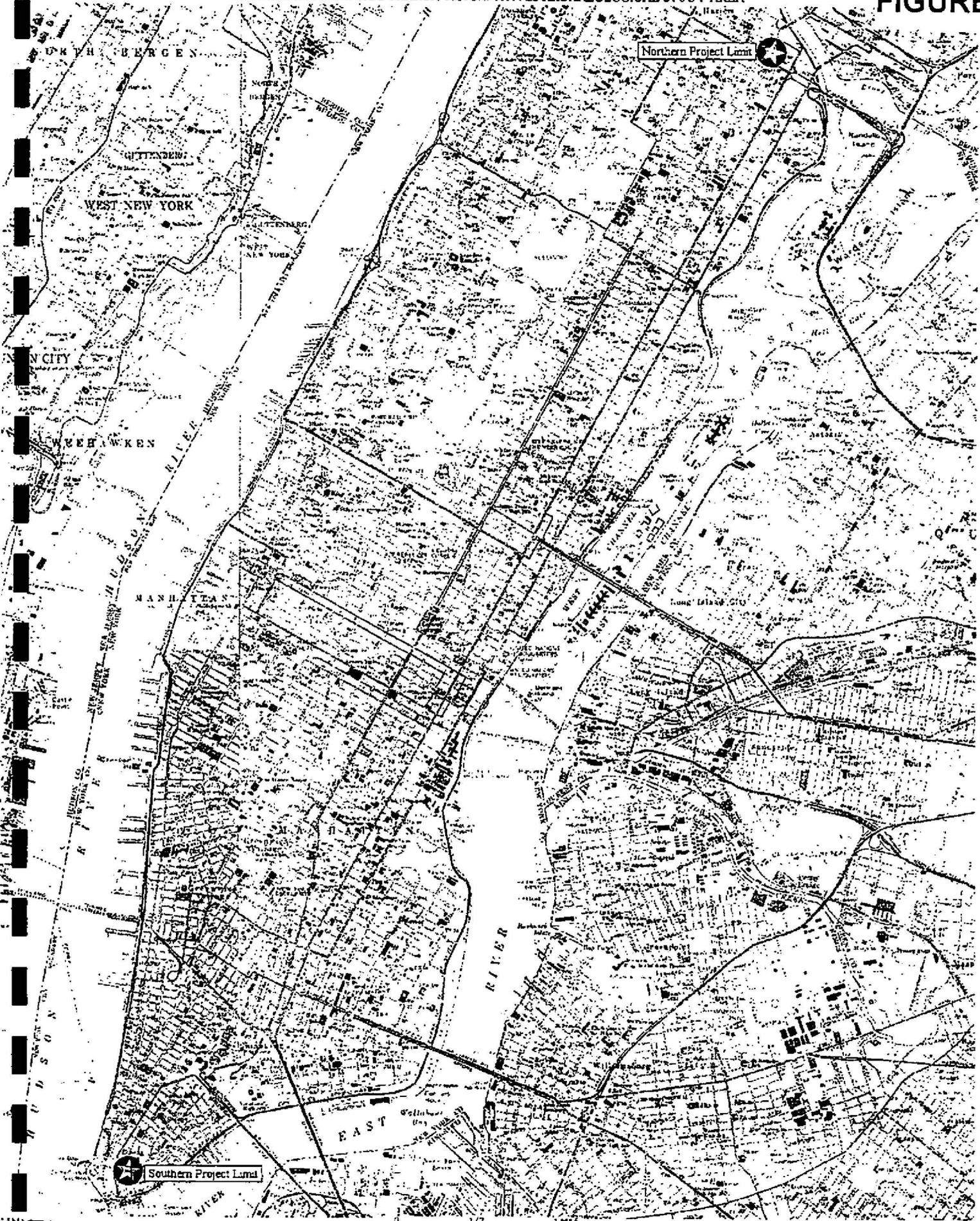
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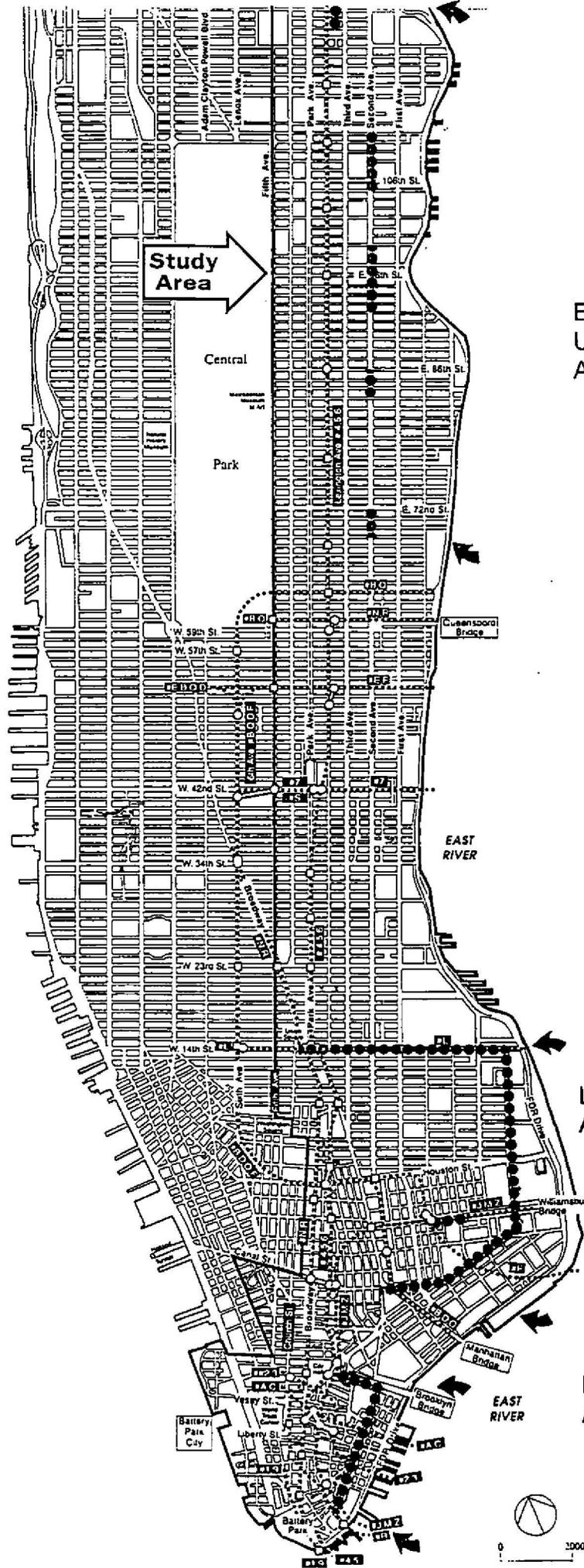
Subsurface Conditions: Lower East Side, Manhattan, Department of  
Water Supply, Gas and Electric. Works Progress Administration, New  
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MN 39°

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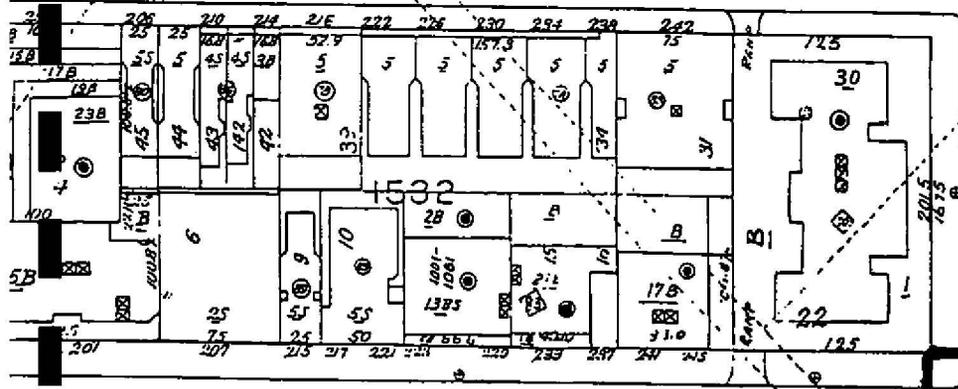
**FIGURE 2**  
MESA AREAS OF  
POTENTIAL  
EFFECT (APEs) ●●●●●





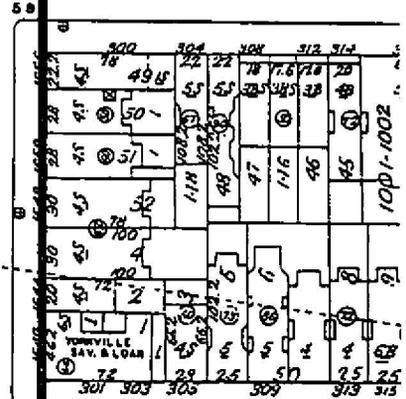
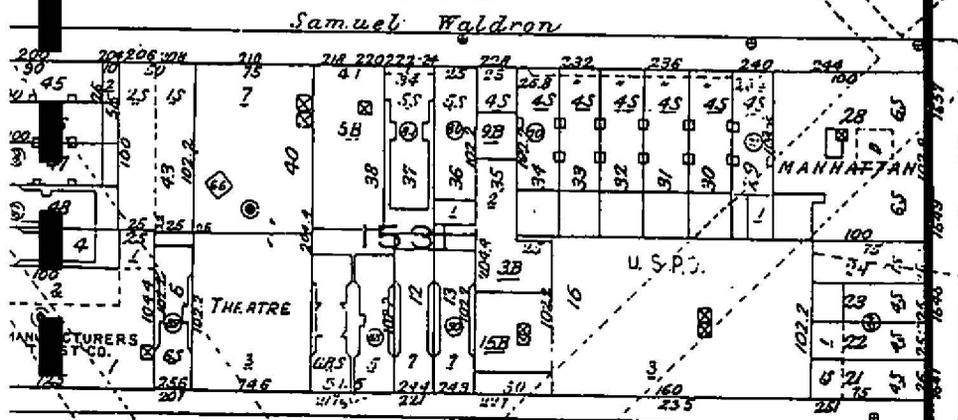
Brown  
329 P. 502

E. 87 TH

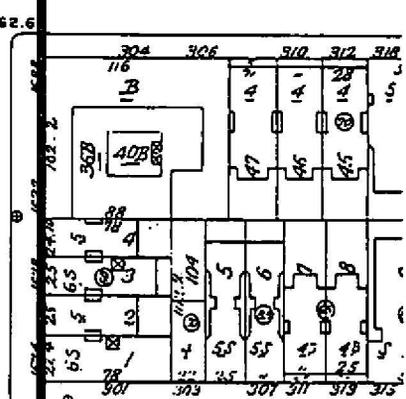
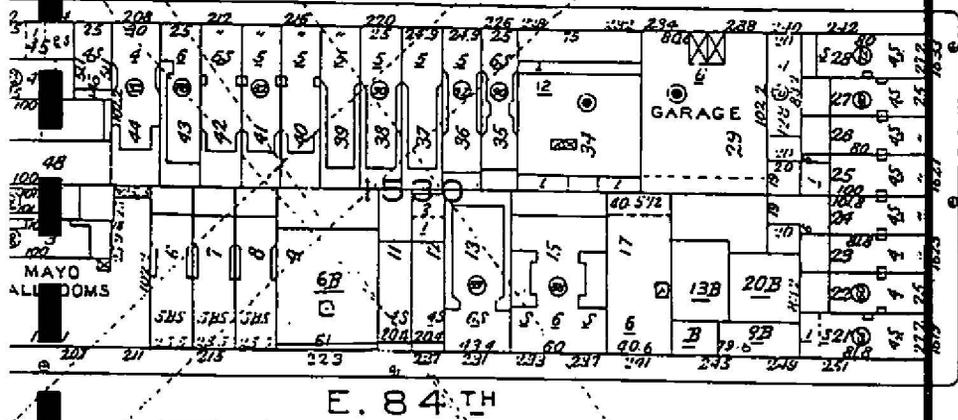


**FIGURE 4**  
PROJECT  
BOUNDARIES  
EAST 83RD STREET  
TO EAST 86TH  
STREET APE

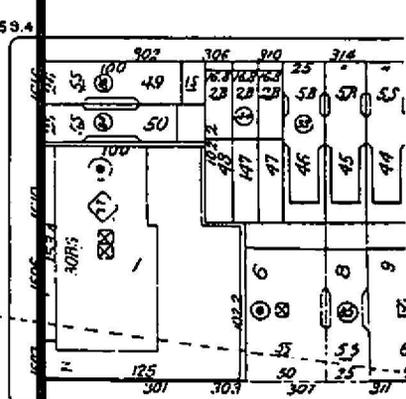
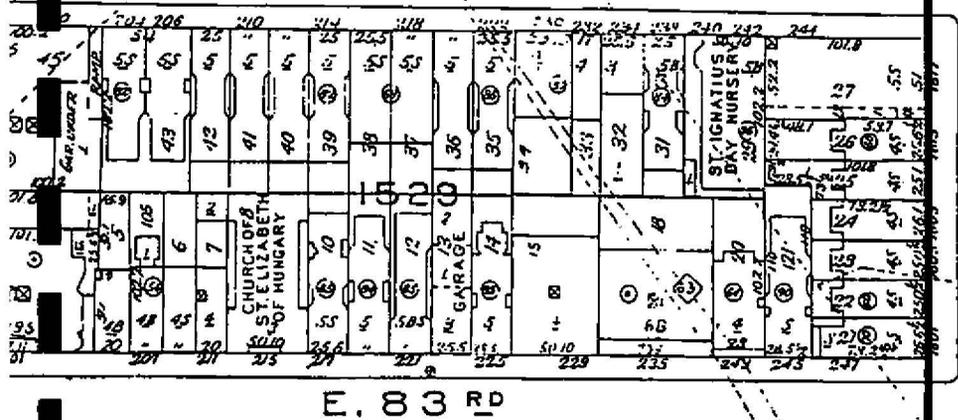
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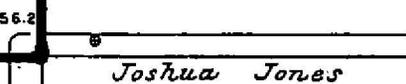
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E. 84 TH

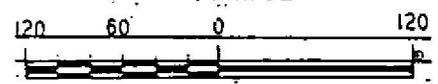


E. 83 RD

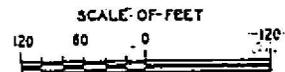
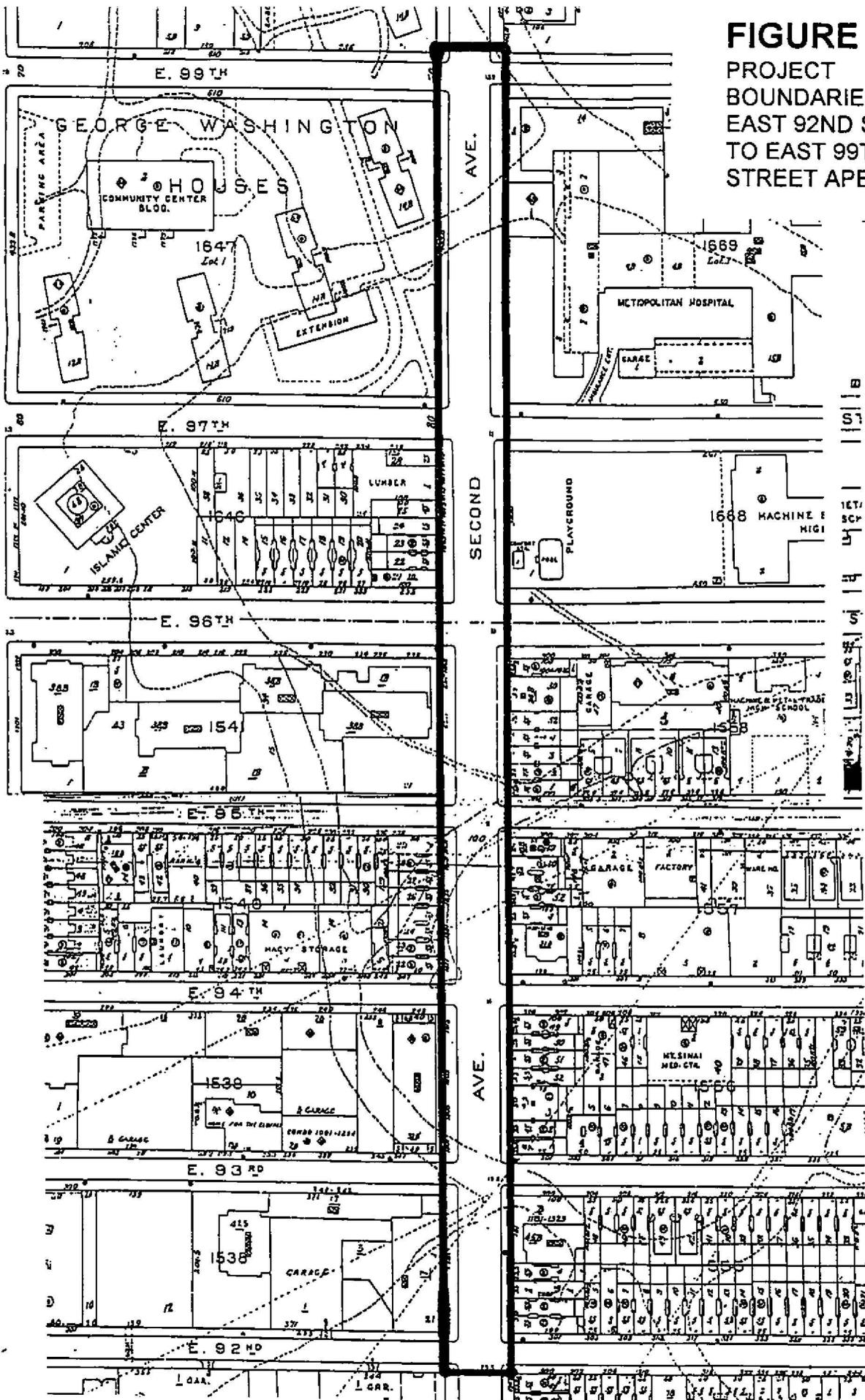


SECOND

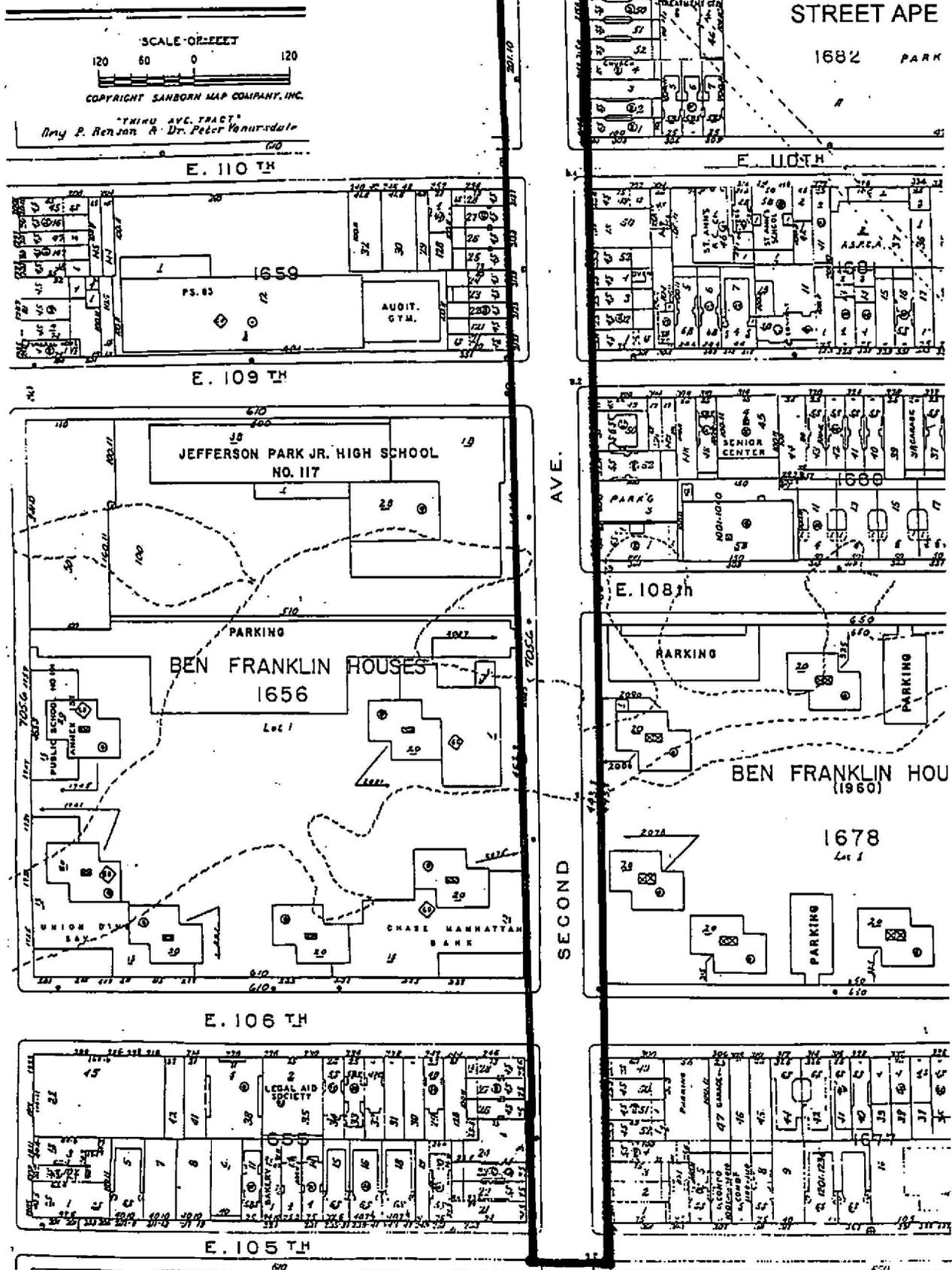
SCALE OF FEET



**FIGURE 5**  
 PROJECT  
 BOUNDARIES  
 EAST 92ND STREET  
 TO EAST 99TH  
 STREET APE



**FIGURE 6**  
 PROJECT  
 BOUNDARIES  
 EAST 105TH STREET  
 TO EAST 111TH  
 STREET APE



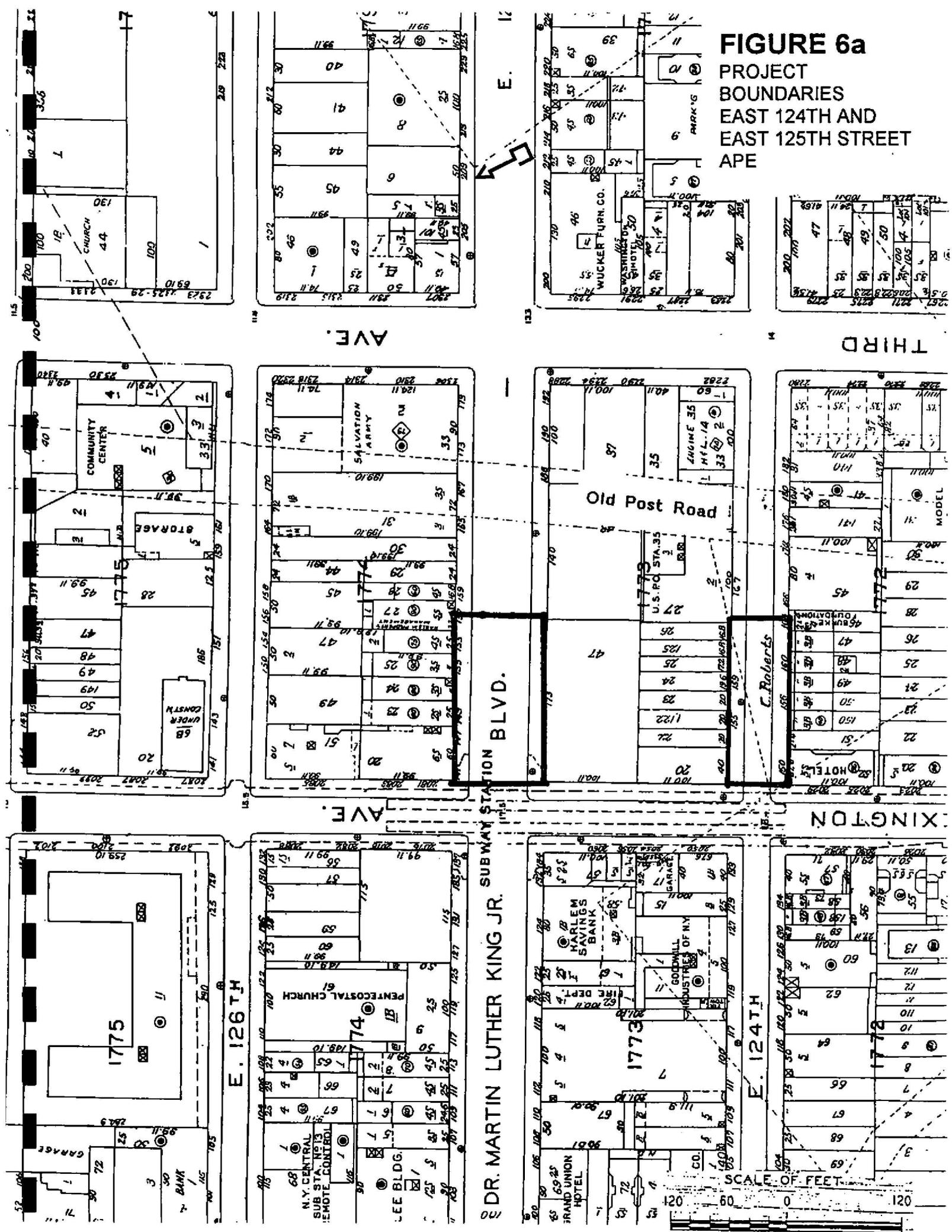
1682 PARK

AVE.

SECOND

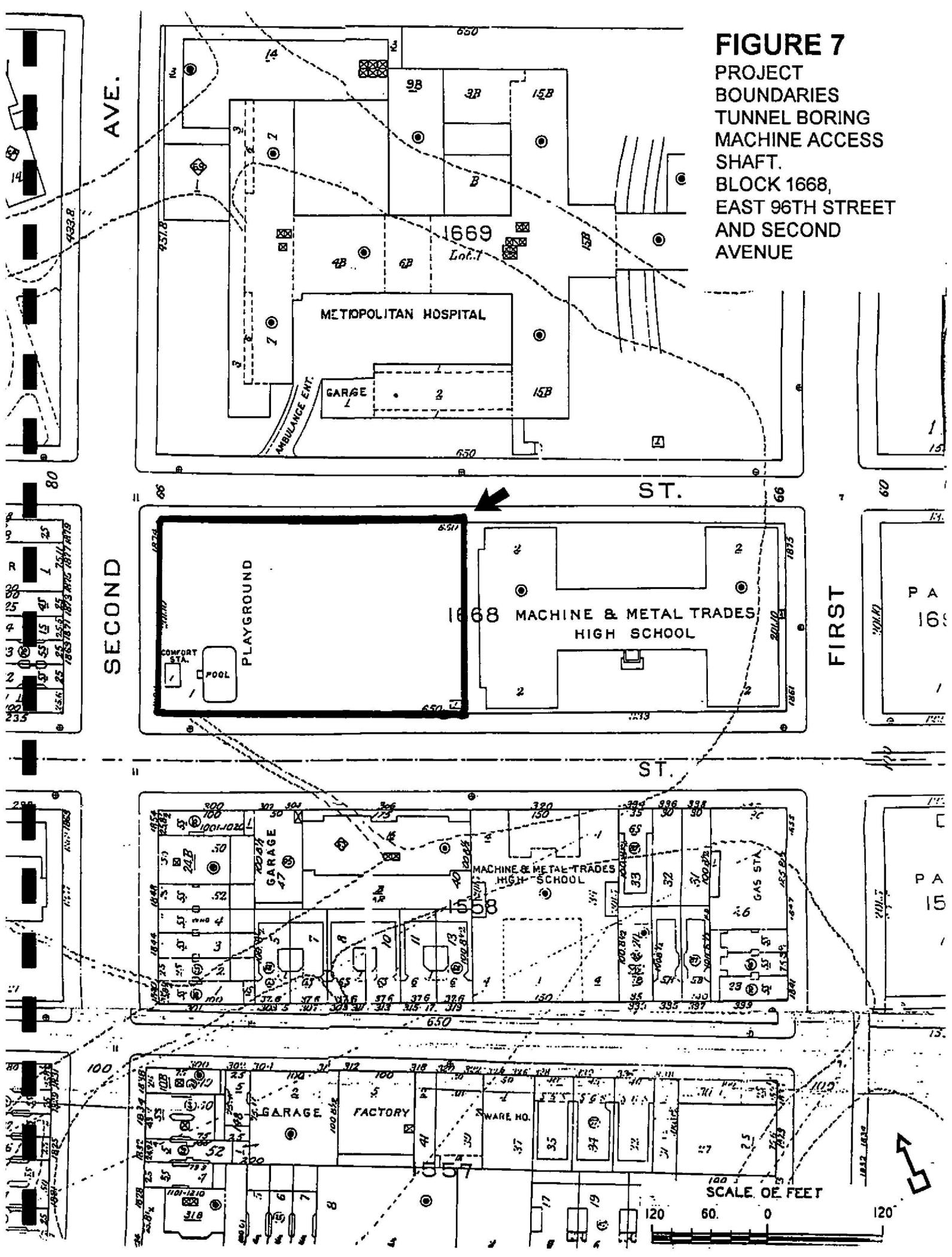


**FIGURE 6a**  
**PROJECT**  
**BOUNDARIES**  
**EAST 124TH AND**  
**EAST 125TH STREET**  
**APE**

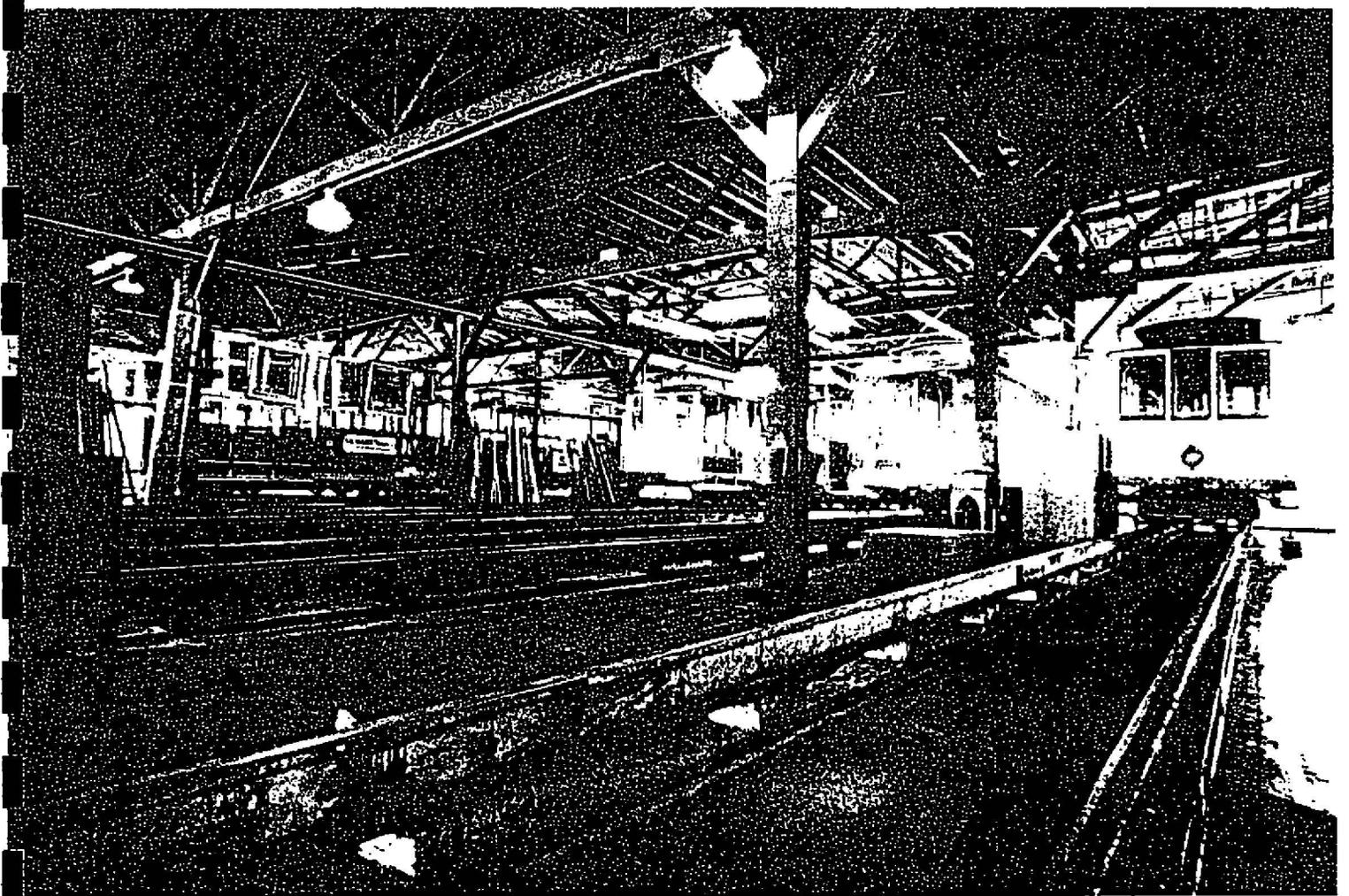


# FIGURE 7

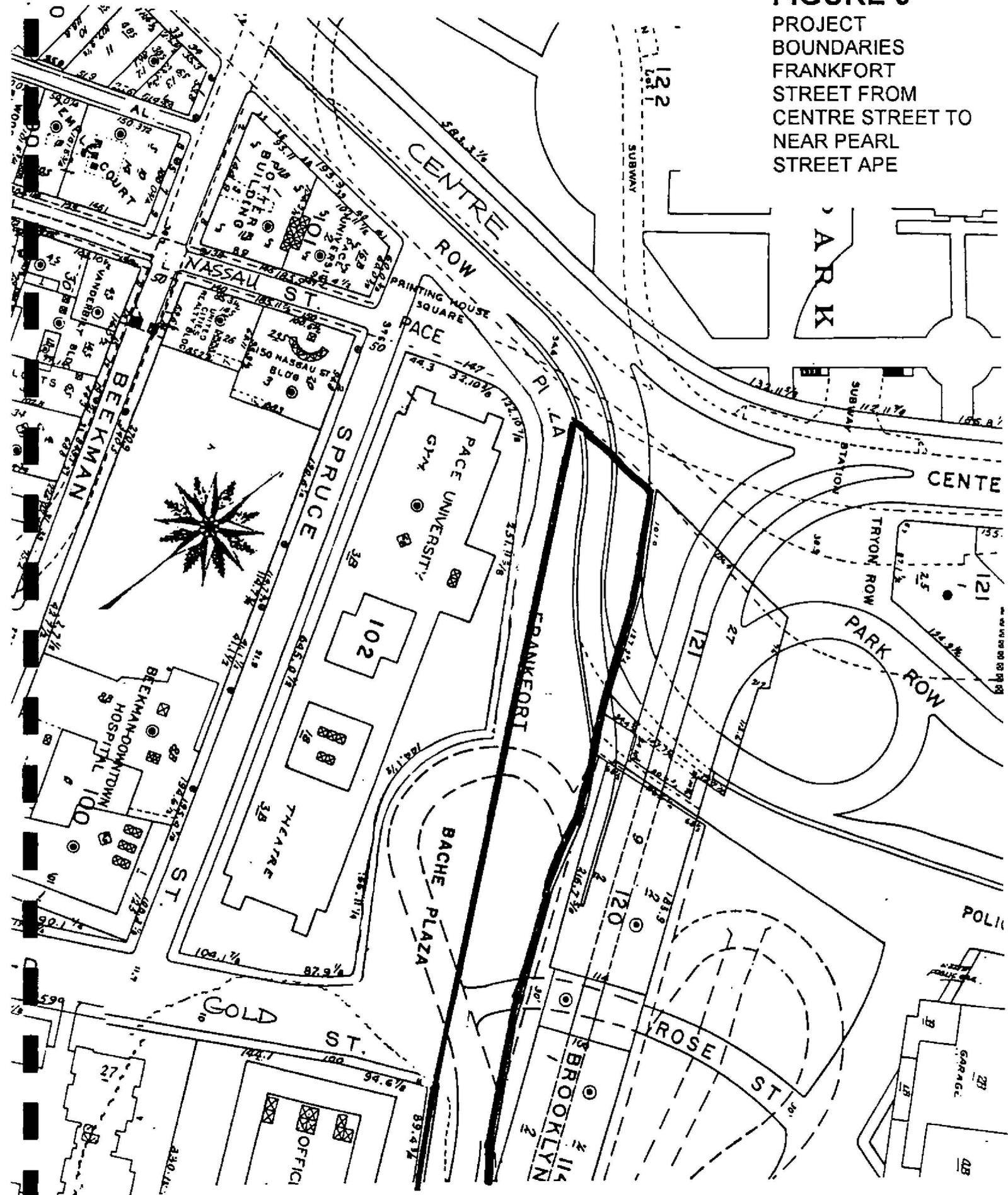
PROJECT  
BOUNDARIES  
TUNNEL BORING  
MACHINE ACCESS  
SHAFT.  
BLOCK 1668,  
EAST 96TH STREET  
AND SECOND  
AVENUE



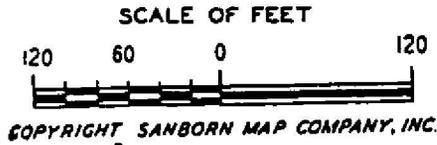
**FIGURE 8**  
INTERIOR OF  
TYPICAL CAR  
BARN/DEPOT,  
SAN FRANCISCO.  
WILLIAM GUEDET,  
1993.



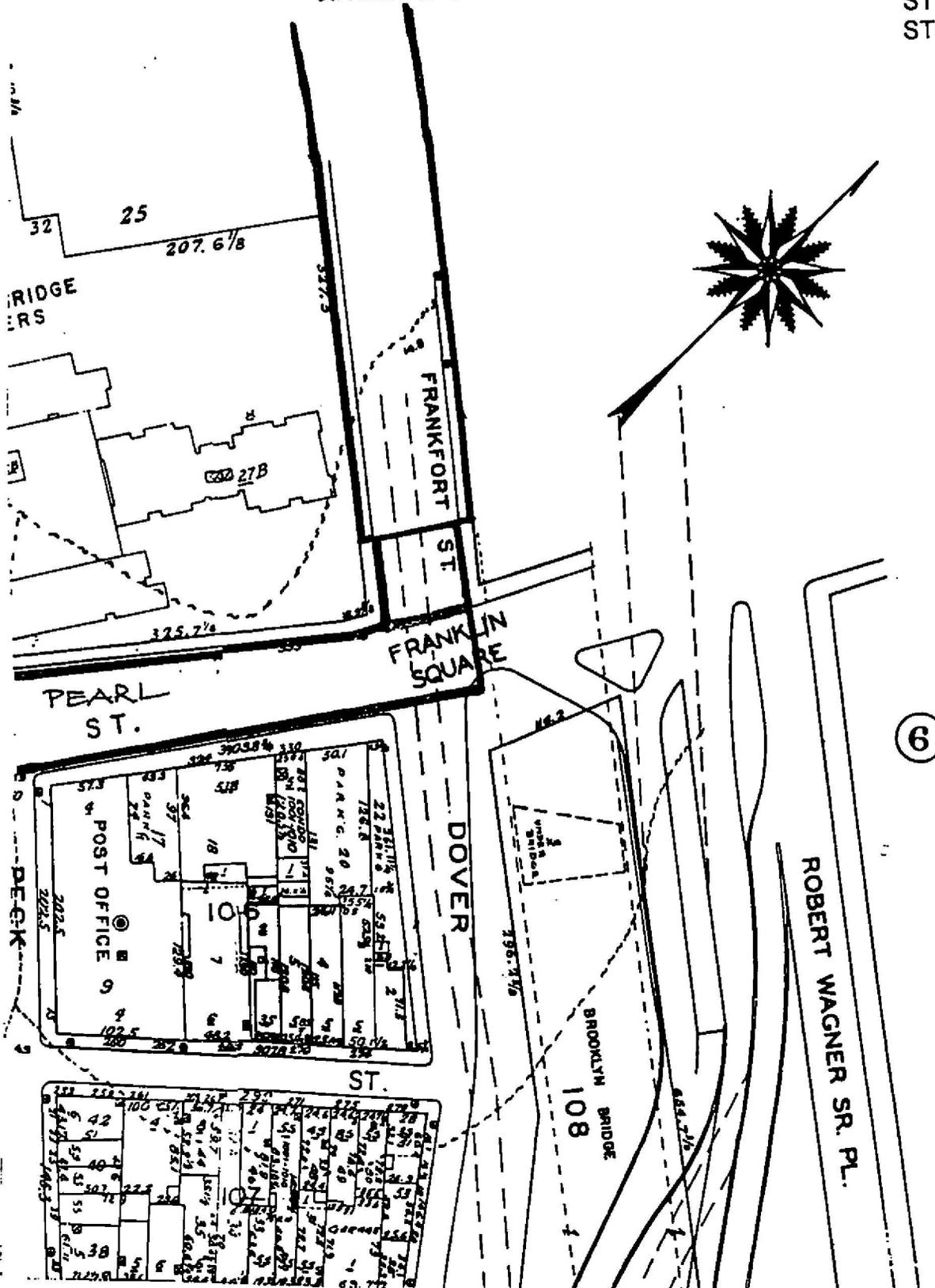
**FIGURE 9**  
PROJECT  
BOUNDARIES  
FRANKFORT  
STREET FROM  
CENTRE STREET TO  
NEAR PEARL  
STREET APE



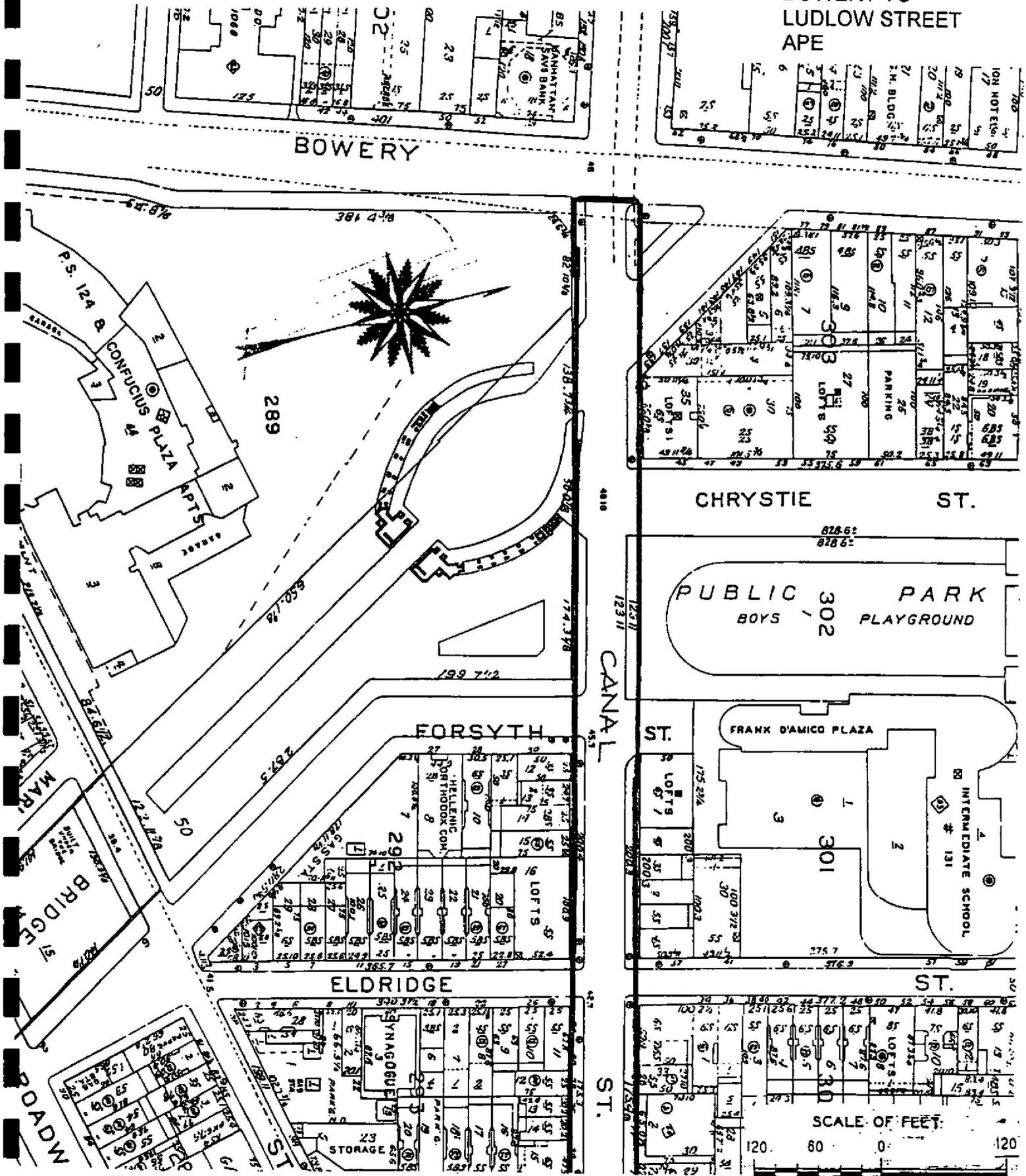
# PART OF SECTION 1



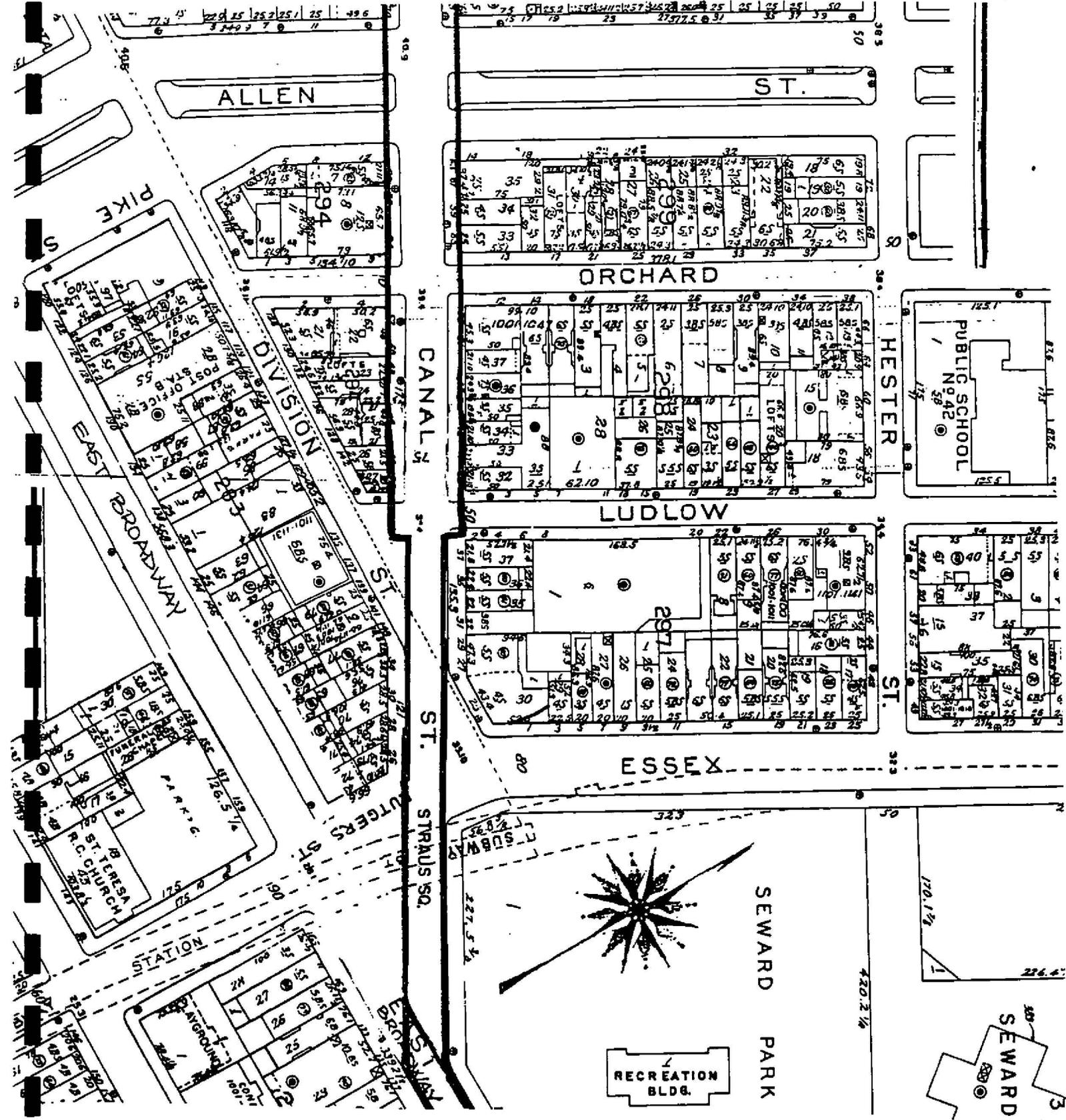
**FIGURE 10**  
PROJECT  
BOUNDARIES  
FRANKFORT  
STREET FROM  
CENTRE STREET TO  
PEARL STREET APE  
AND PEARL STREET  
FROM FRANKFORT  
STREET TO PECK  
STREET APE



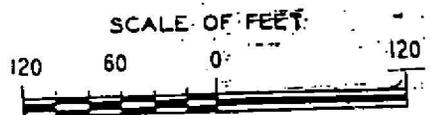
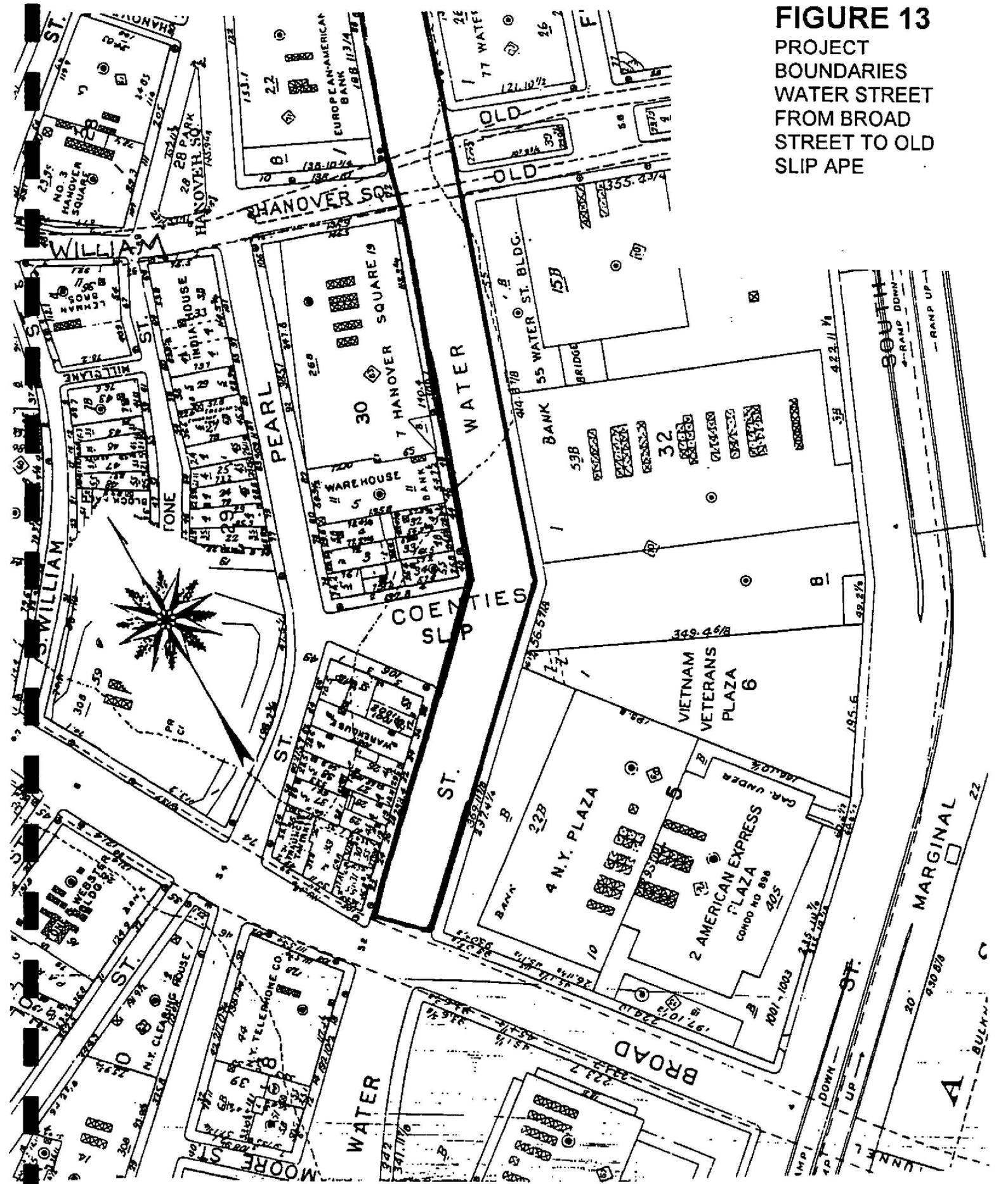
**FIGURE 11**  
 PROJECT  
 BOUNDARIES  
 CANAL STREET  
 FROM EAST  
 BOWERY TO  
 LUDLOW STREET  
 APE



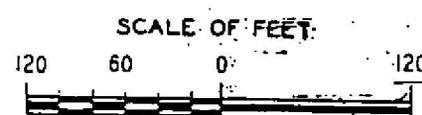
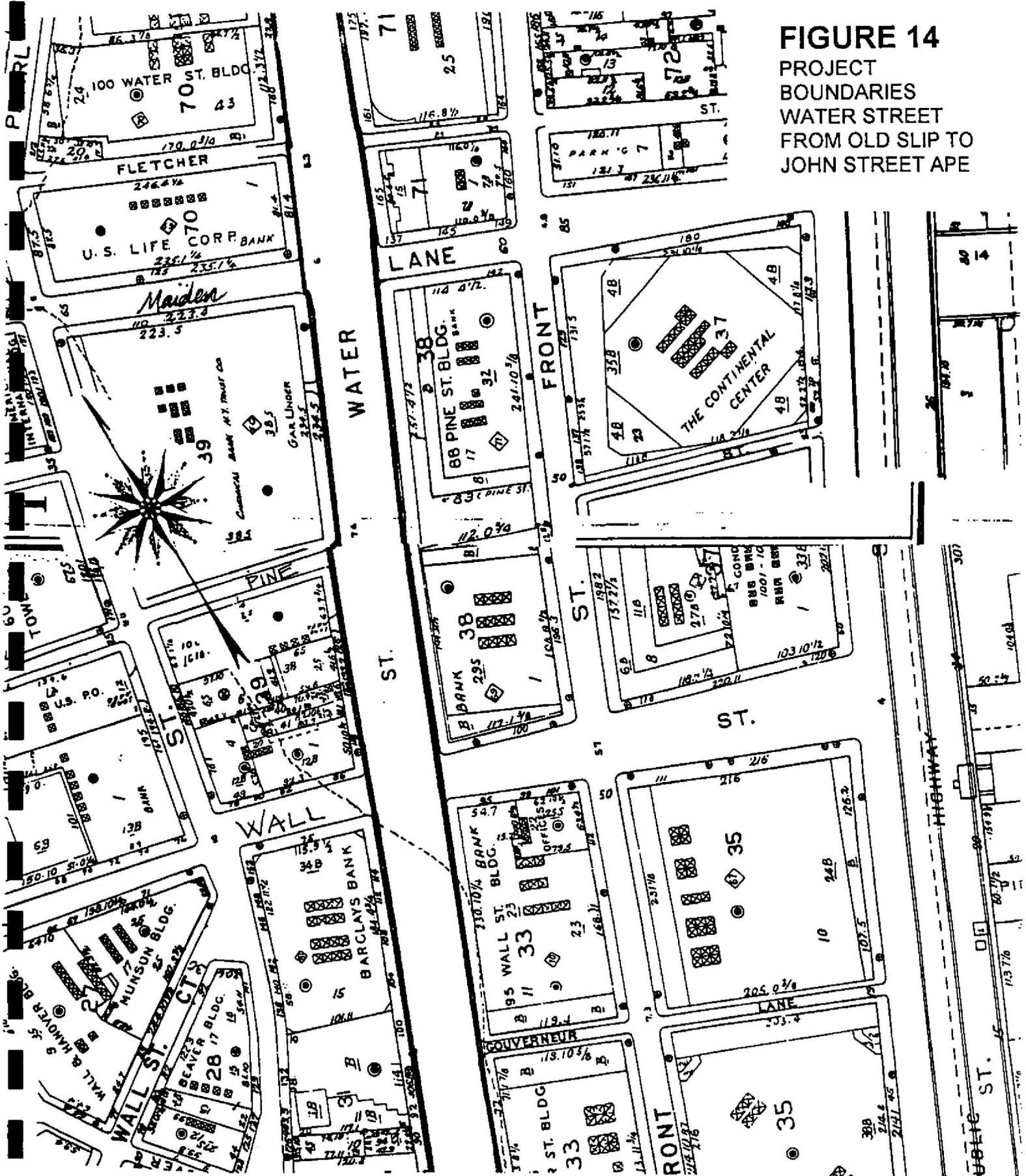
**FIGURE 12**  
 CANAL STREET  
 FROM EAST  
 BOWERY TO EAST  
 BROADWAY APE



**FIGURE 13**  
 PROJECT  
 BOUNDARIES  
 WATER STREET  
 FROM BROAD  
 STREET TO OLD  
 SLIP APE

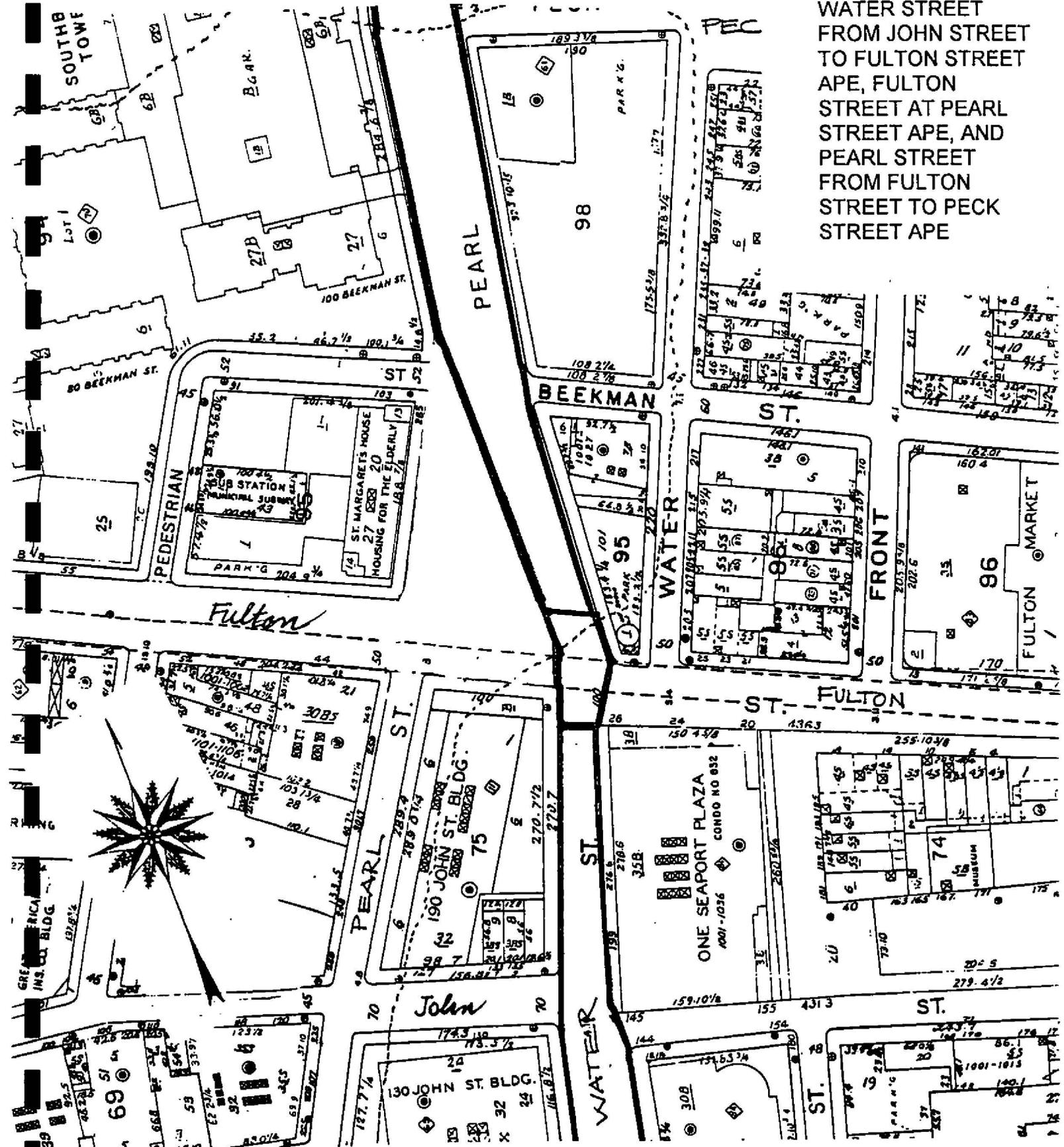


**FIGURE 14**  
 PROJECT  
 BOUNDARIES  
 WATER STREET  
 FROM OLD SLIP TO  
 JOHN STREET APE

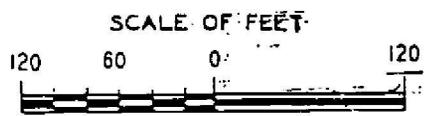
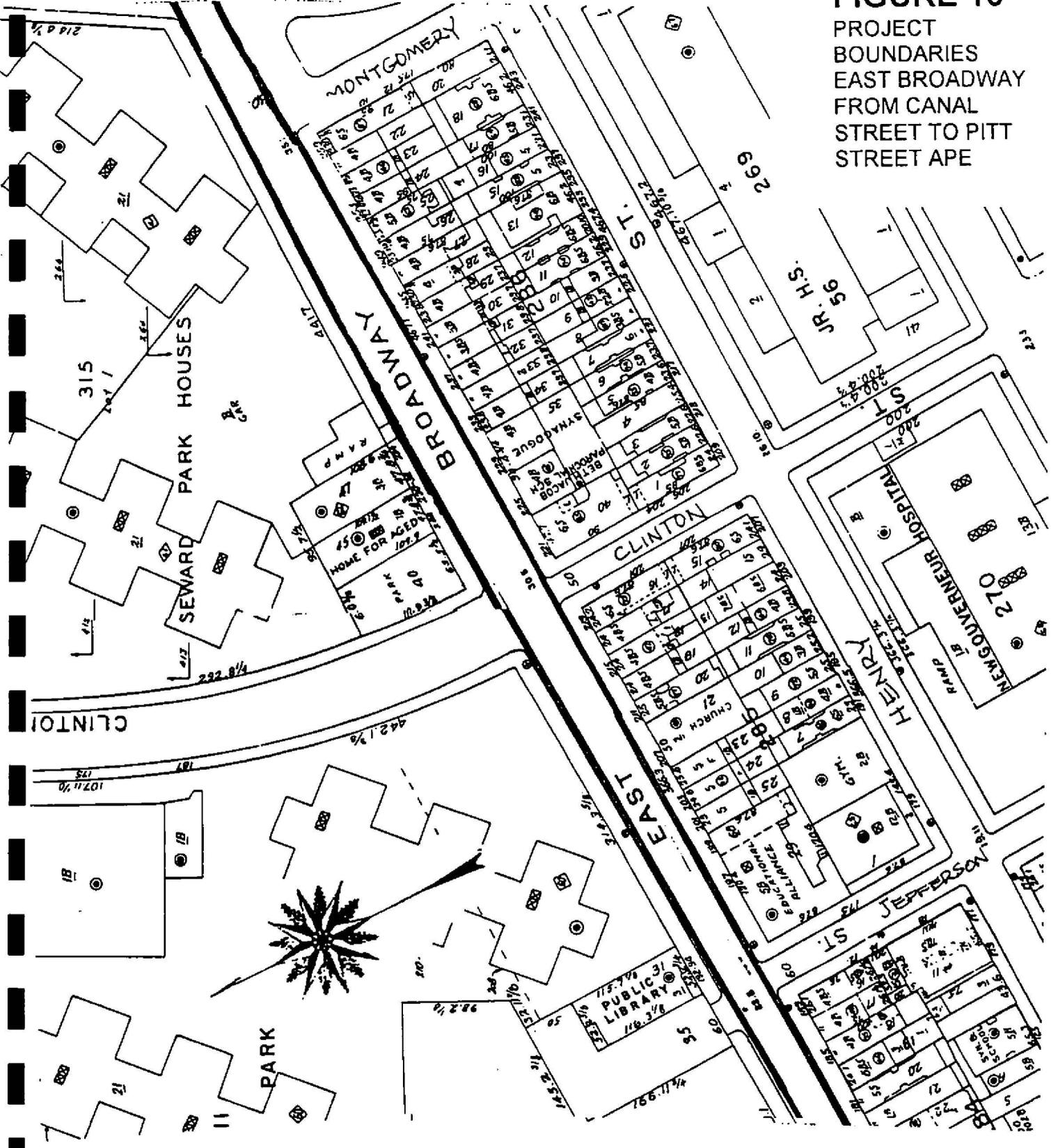


# FIGURE 15

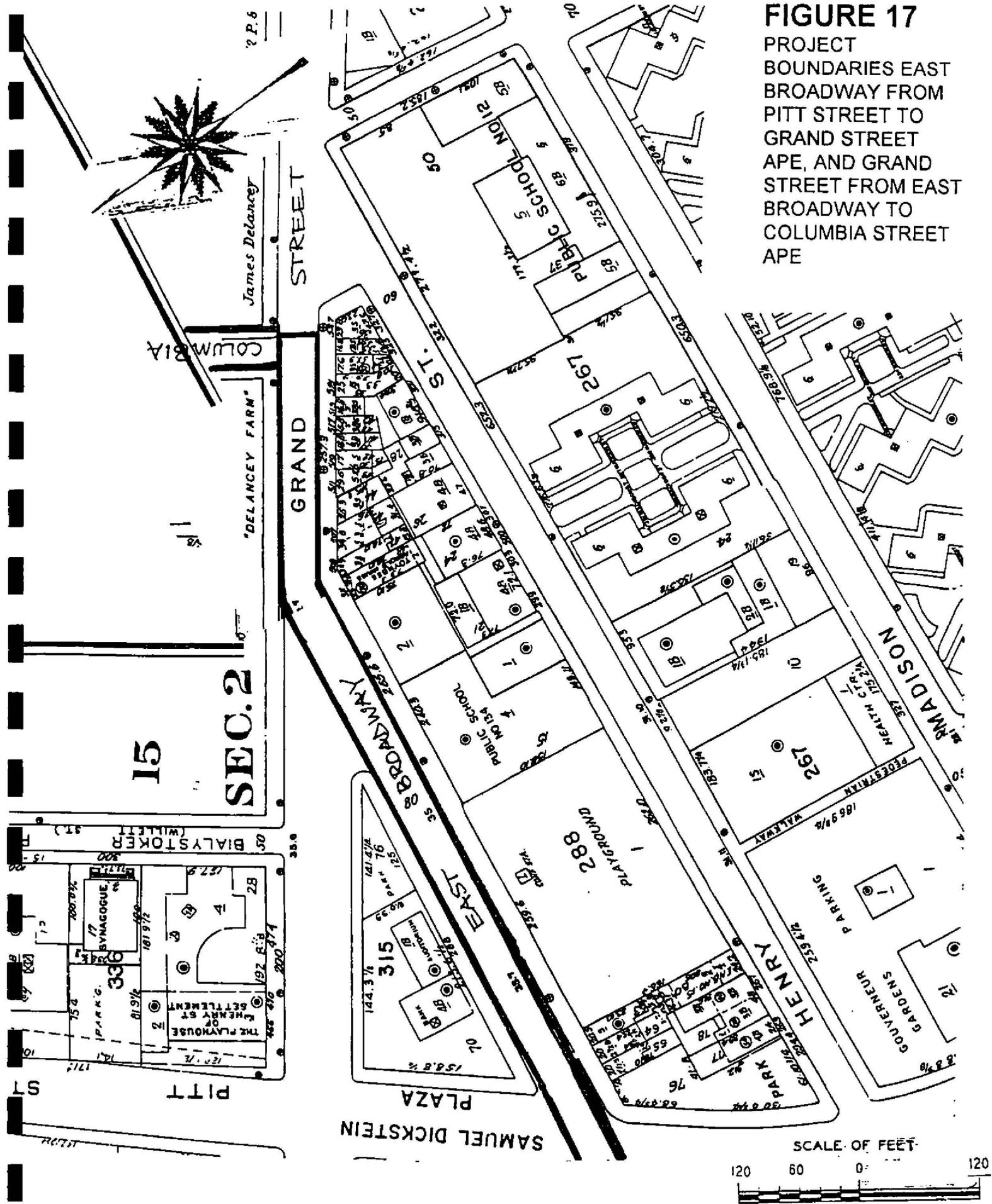
PROJECT  
BOUNDARIES  
WATER STREET  
FROM JOHN STREET  
TO FULTON STREET  
APE, FULTON  
STREET AT PEARL  
STREET APE, AND  
PEARL STREET  
FROM FULTON  
STREET TO PECK  
STREET APE



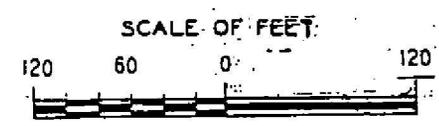
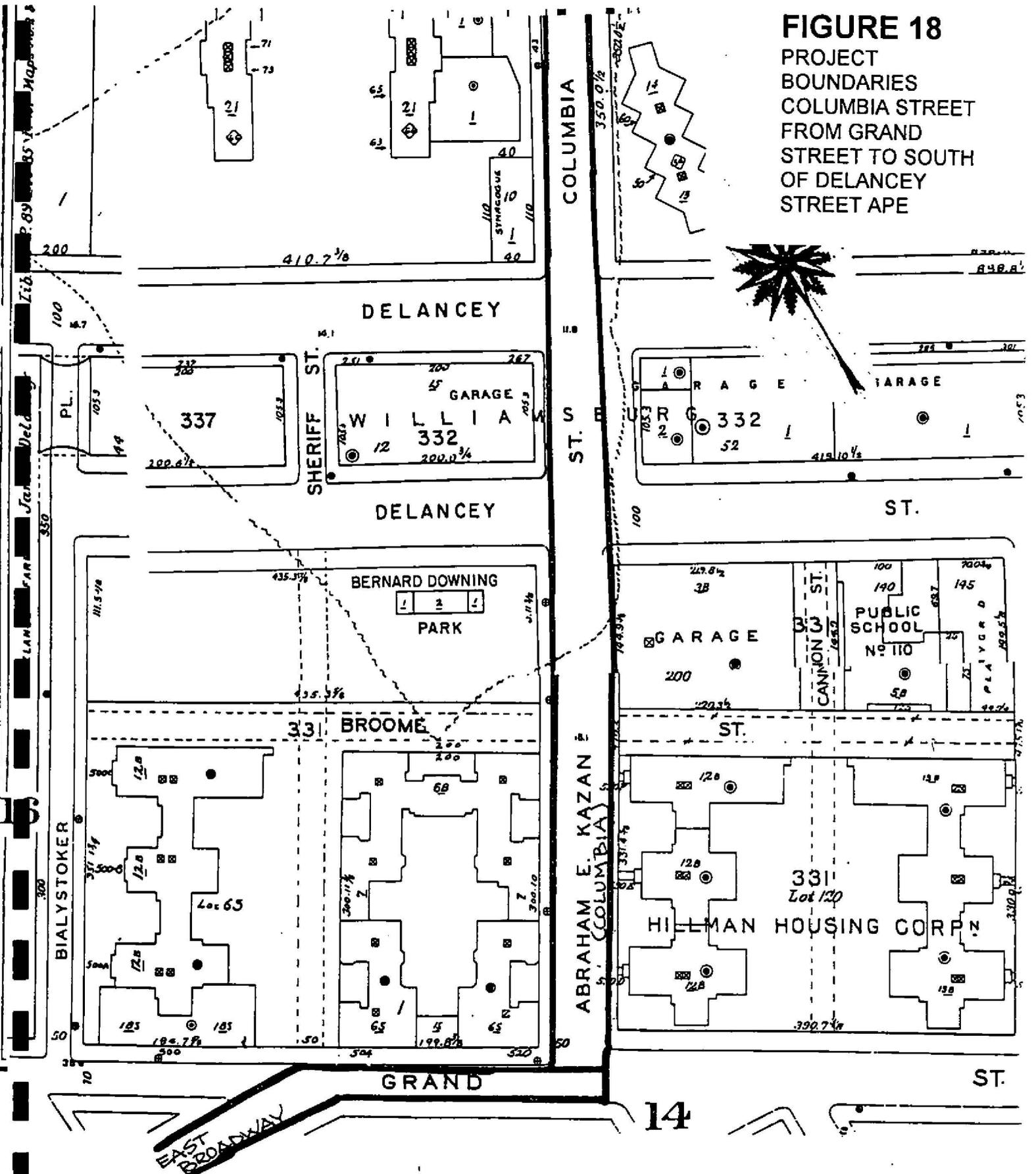
**FIGURE 10**  
 PROJECT  
 BOUNDARIES  
 EAST BROADWAY  
 FROM CANAL  
 STREET TO PITT  
 STREET APE



**FIGURE 17**  
 PROJECT  
 BOUNDARIES EAST  
 BROADWAY FROM  
 PITT STREET TO  
 GRAND STREET  
 APE, AND GRAND  
 STREET FROM EAST  
 BROADWAY TO  
 COLUMBIA STREET  
 APE

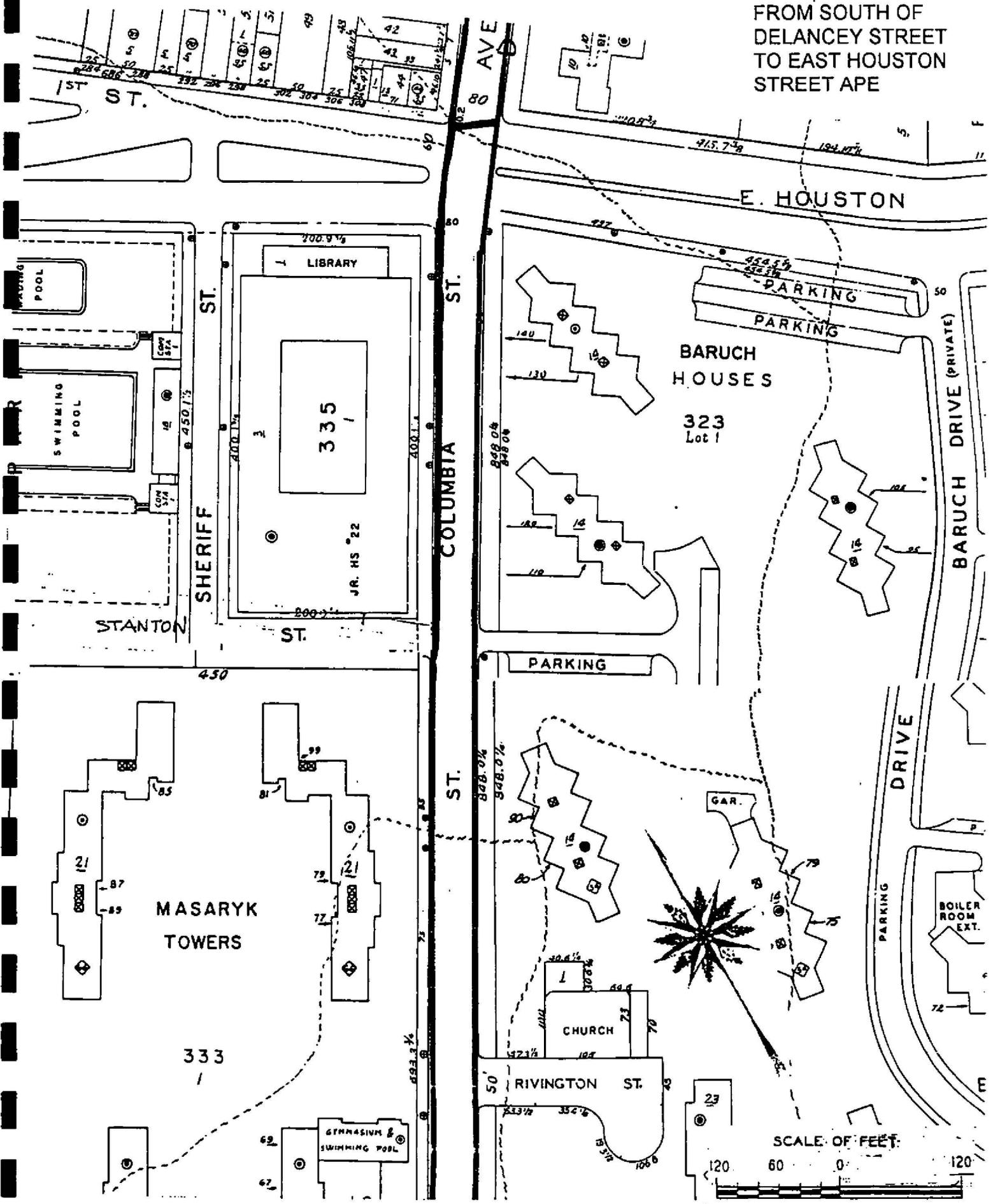


**FIGURE 18**  
 PROJECT  
 BOUNDARIES  
 COLUMBIA STREET  
 FROM GRAND  
 STREET TO SOUTH  
 OF DELANCEY  
 STREET APE

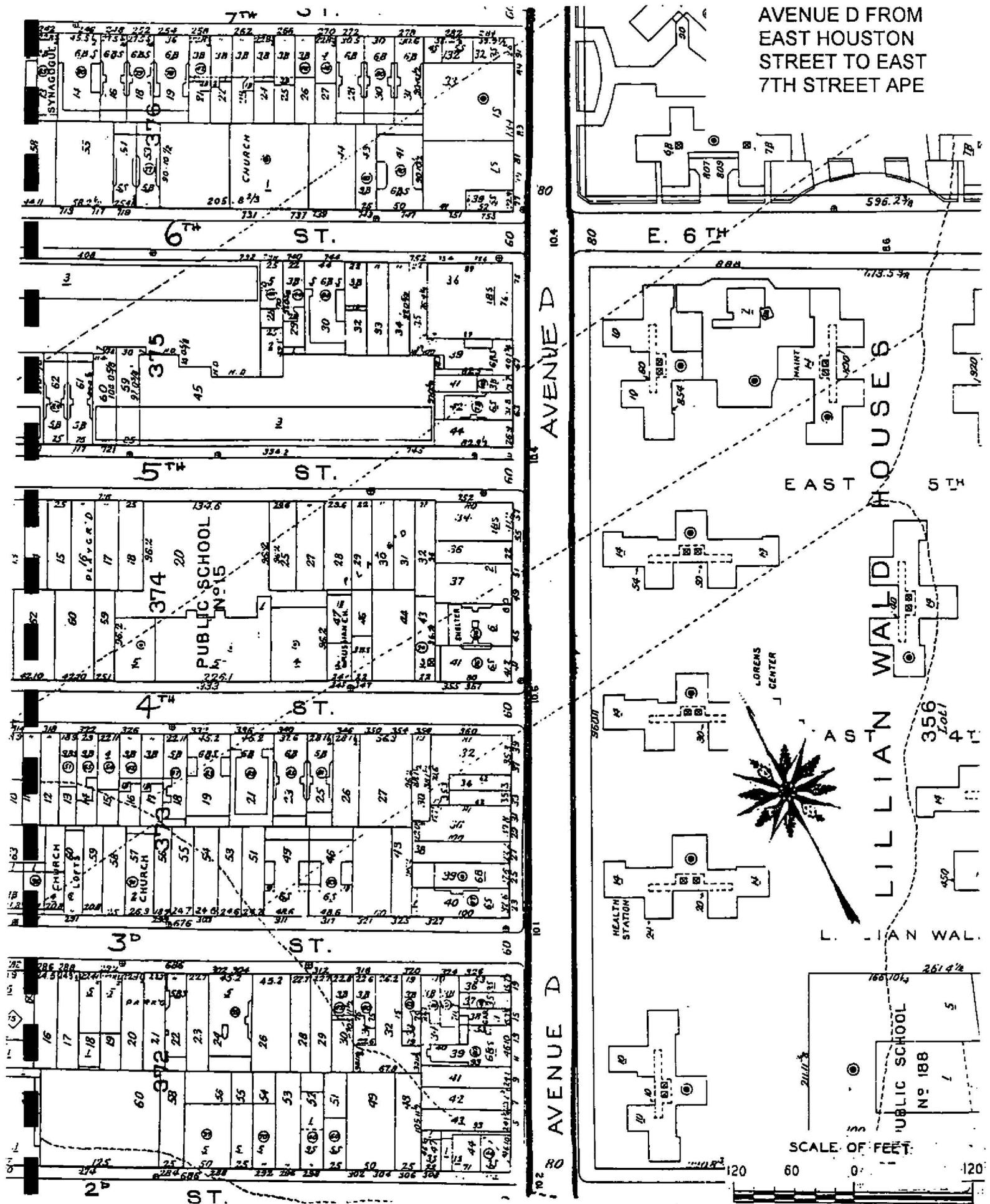


# FIGURE 19

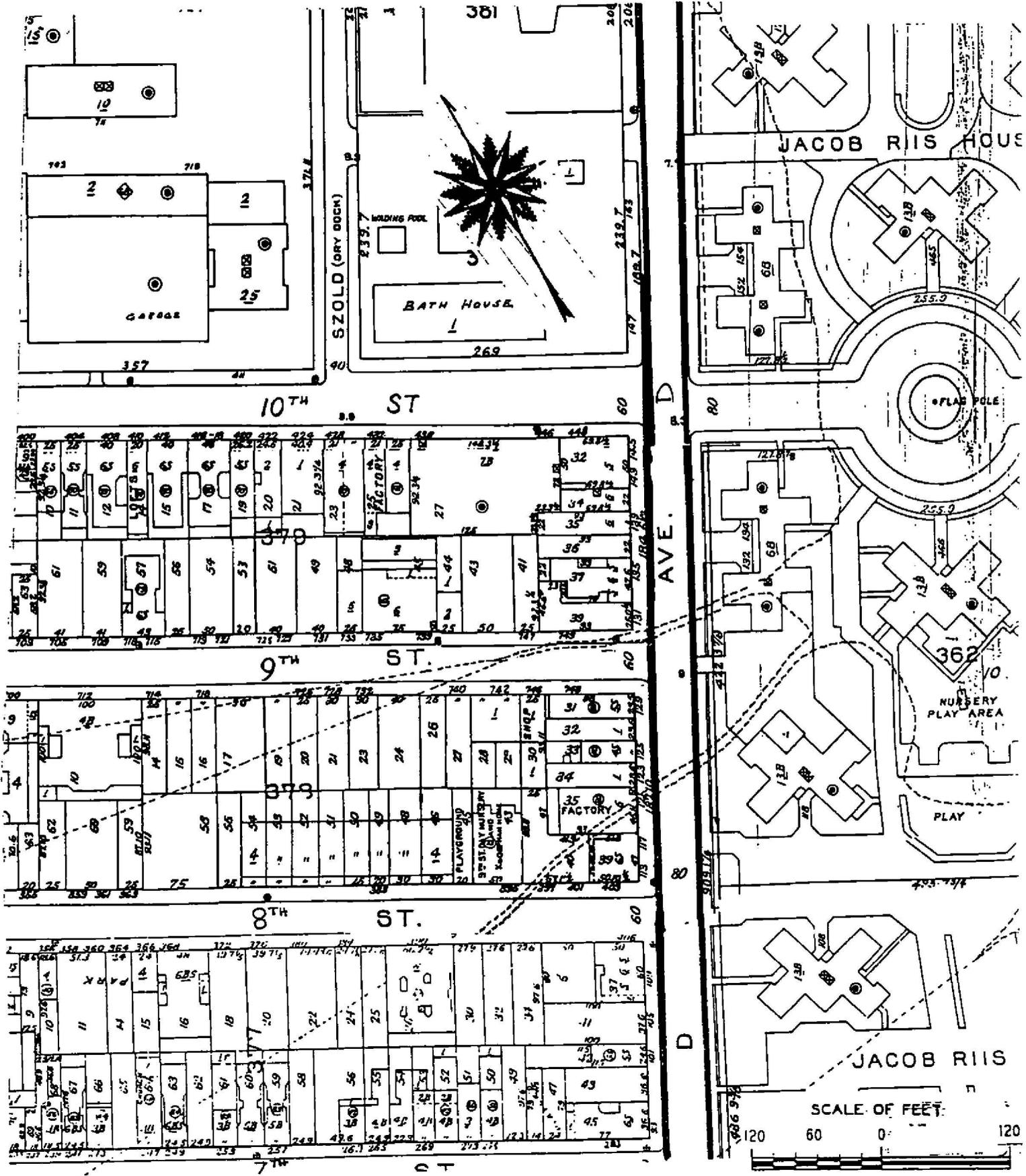
PROJECT  
BOUNDARIES  
COLUMBIA STREET  
FROM SOUTH OF  
DELANCEY STREET  
TO EAST HOUSTON  
STREET APE



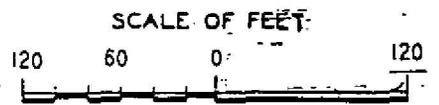
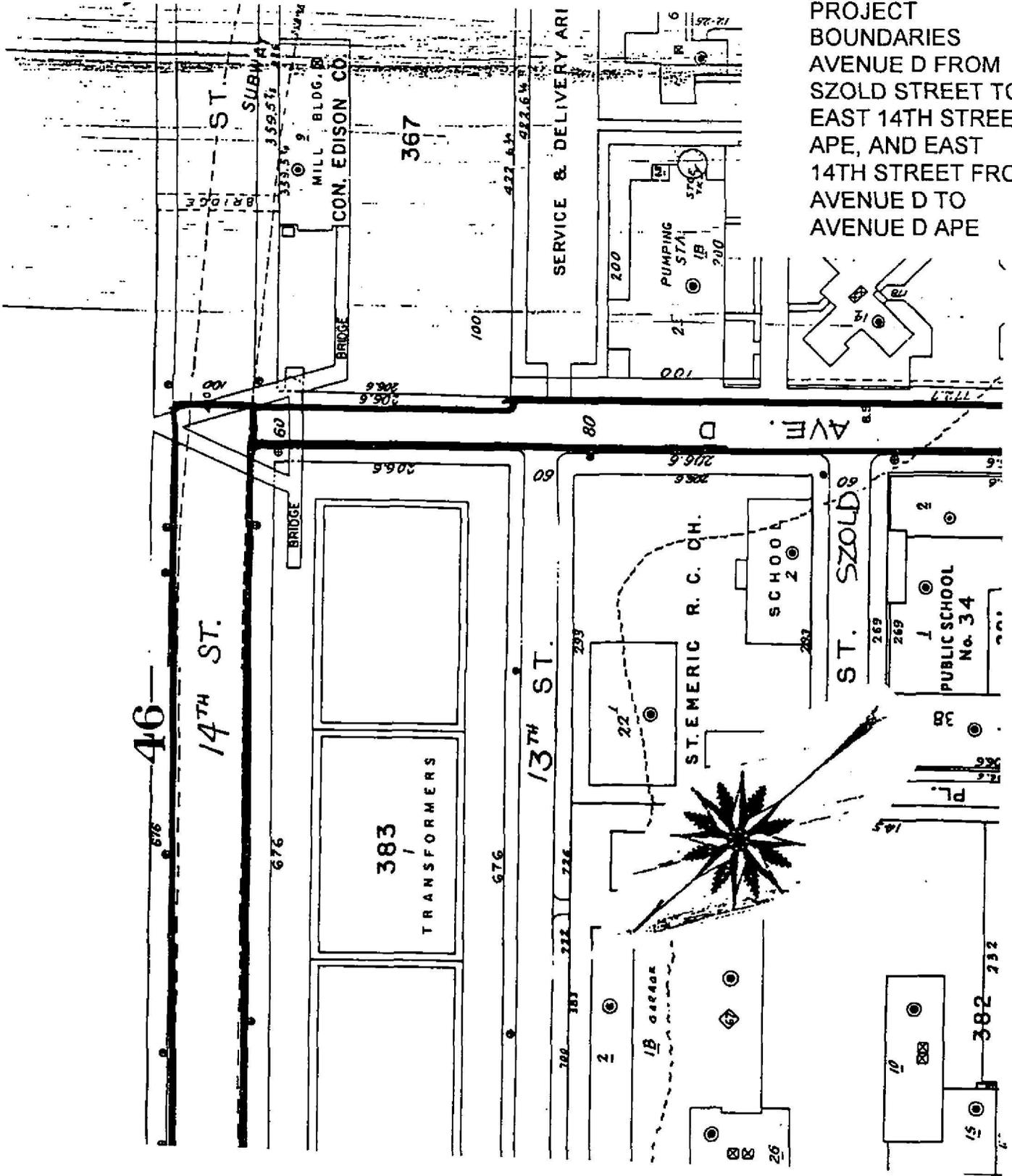
**FIGURE 20**  
 PROJECT  
 BOUNDARIES  
 AVENUE D FROM  
 EAST HOUSTON  
 STREET TO EAST  
 7TH STREET APE



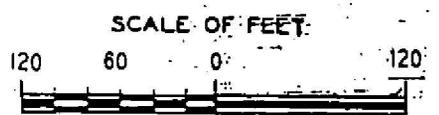
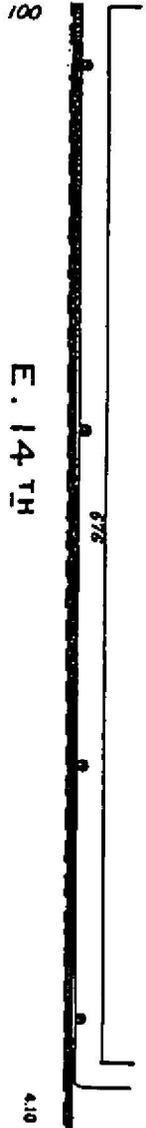
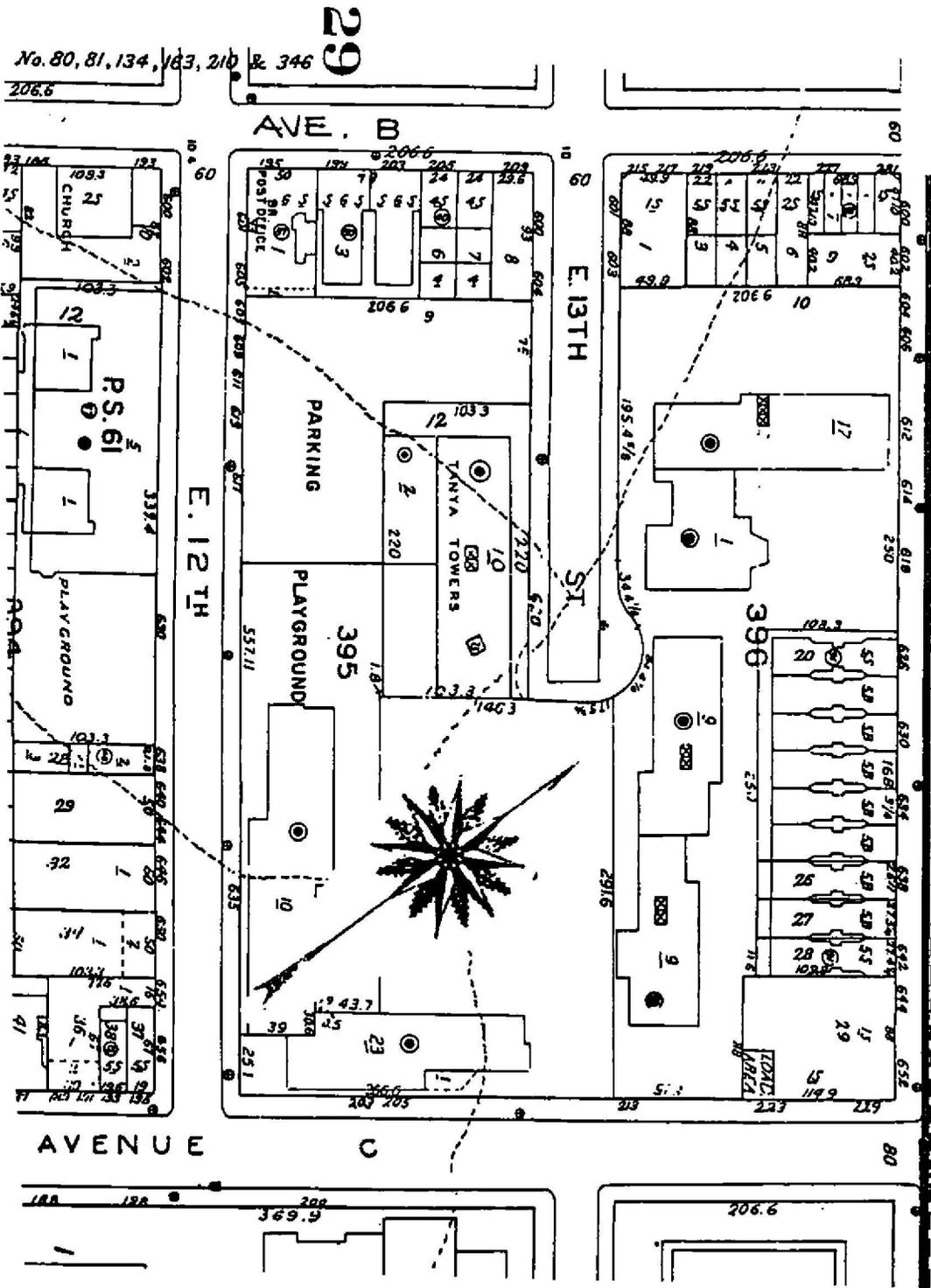
**FIGURE 21**  
 PROJECT  
 BOUNDARIES  
 AVENUE D FROM  
 EAST 7TH STREET  
 TO SZOLD STREET  
 APE



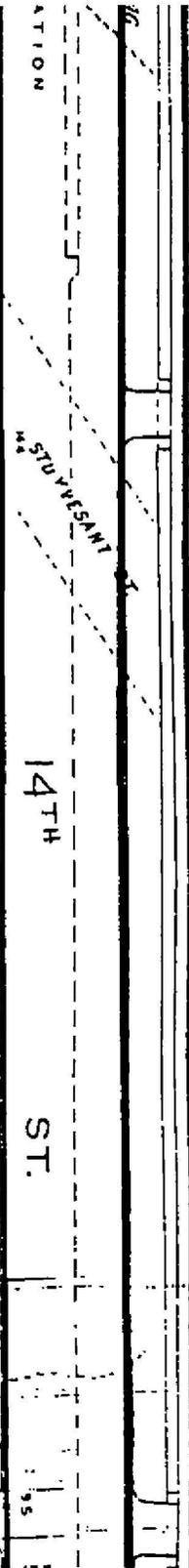
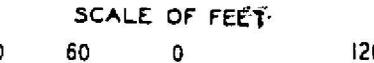
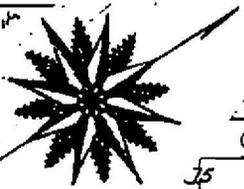
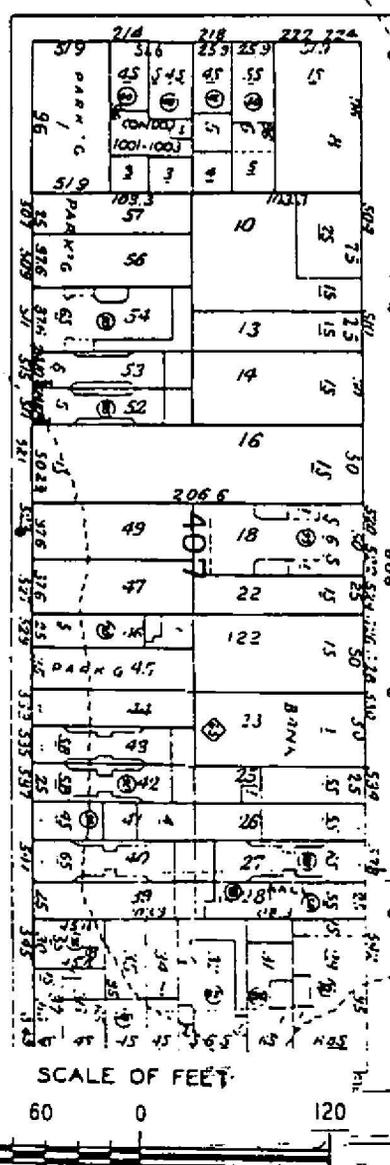
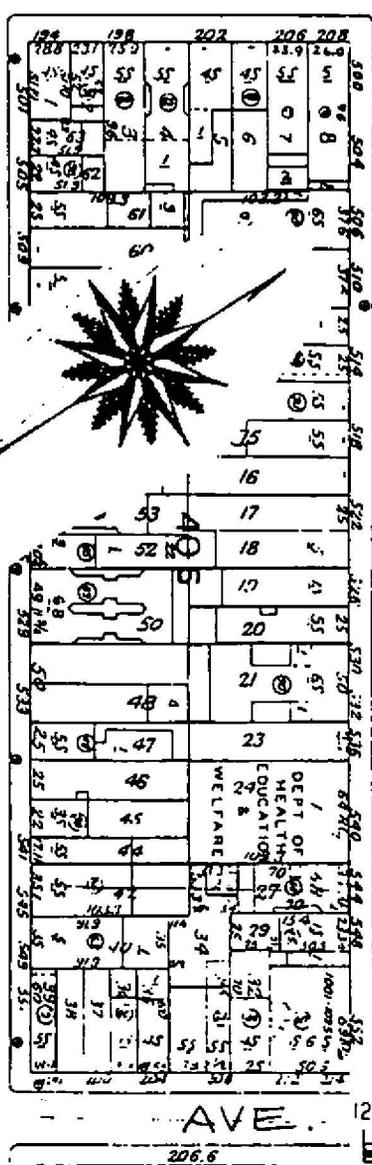
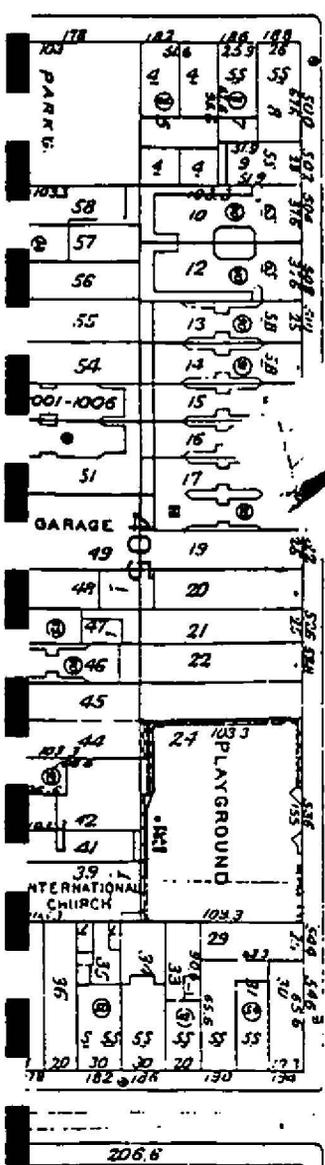
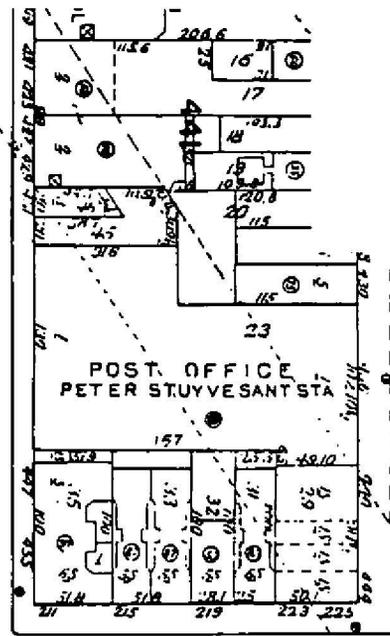
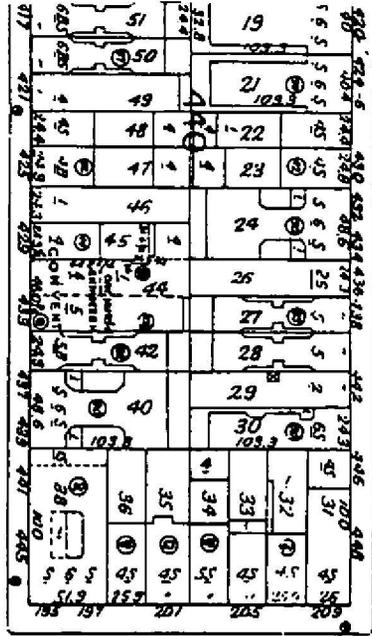
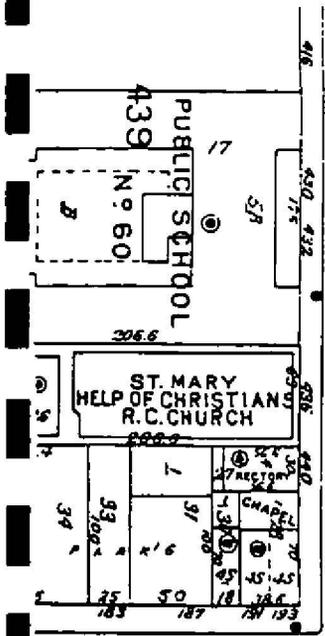
**FIGURE 22**  
 PROJECT  
 BOUNDARIES  
 AVENUE D FROM  
 SZOLD STREET TO  
 EAST 14TH STREET  
 APE, AND EAST  
 14TH STREET FROM  
 AVENUE D TO  
 AVENUE D APE



**FIGURE 23**  
 PROJECT  
 BOUNDARIES  
 EAST 14TH STREET  
 FROM AVENUE C TO  
 AVENUE B APE



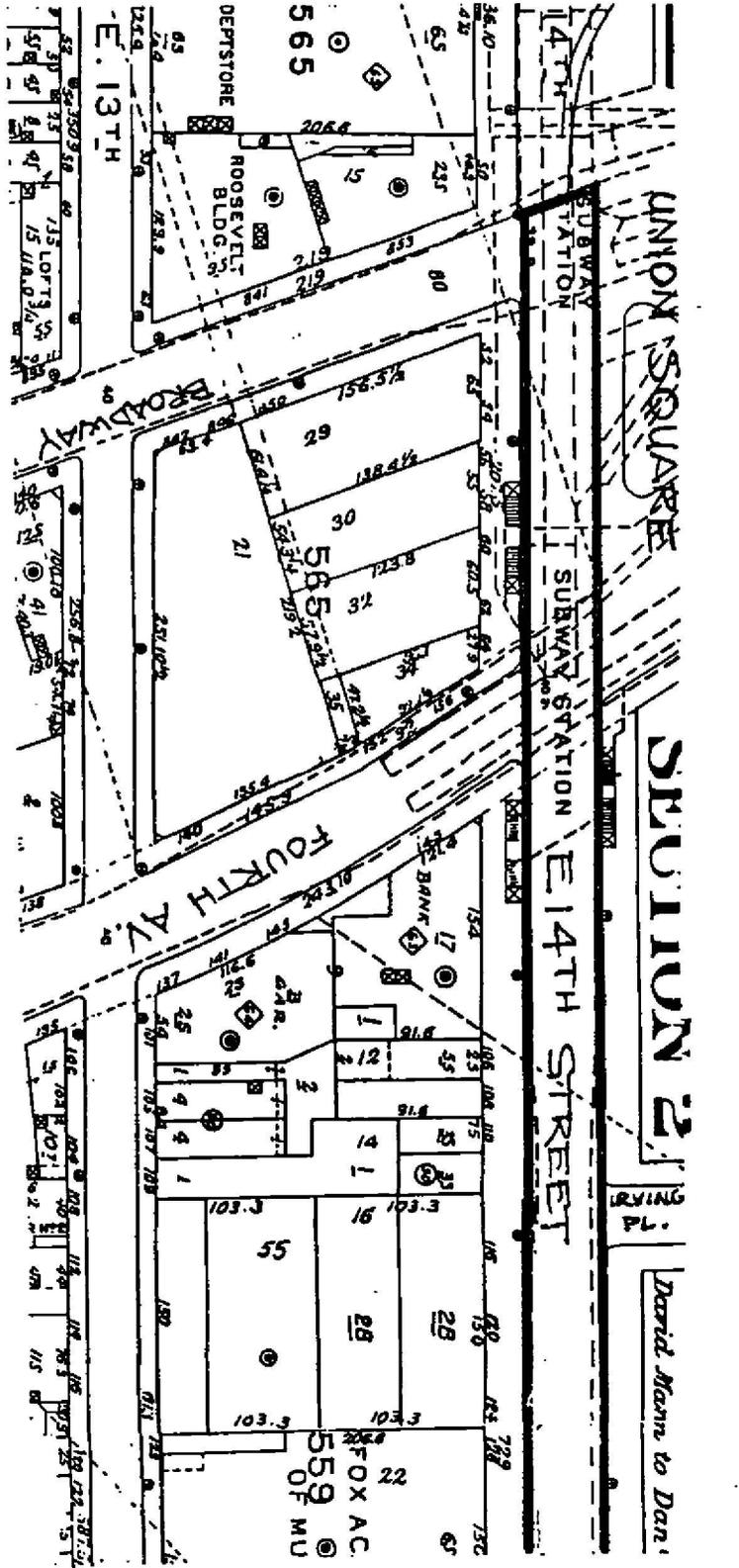
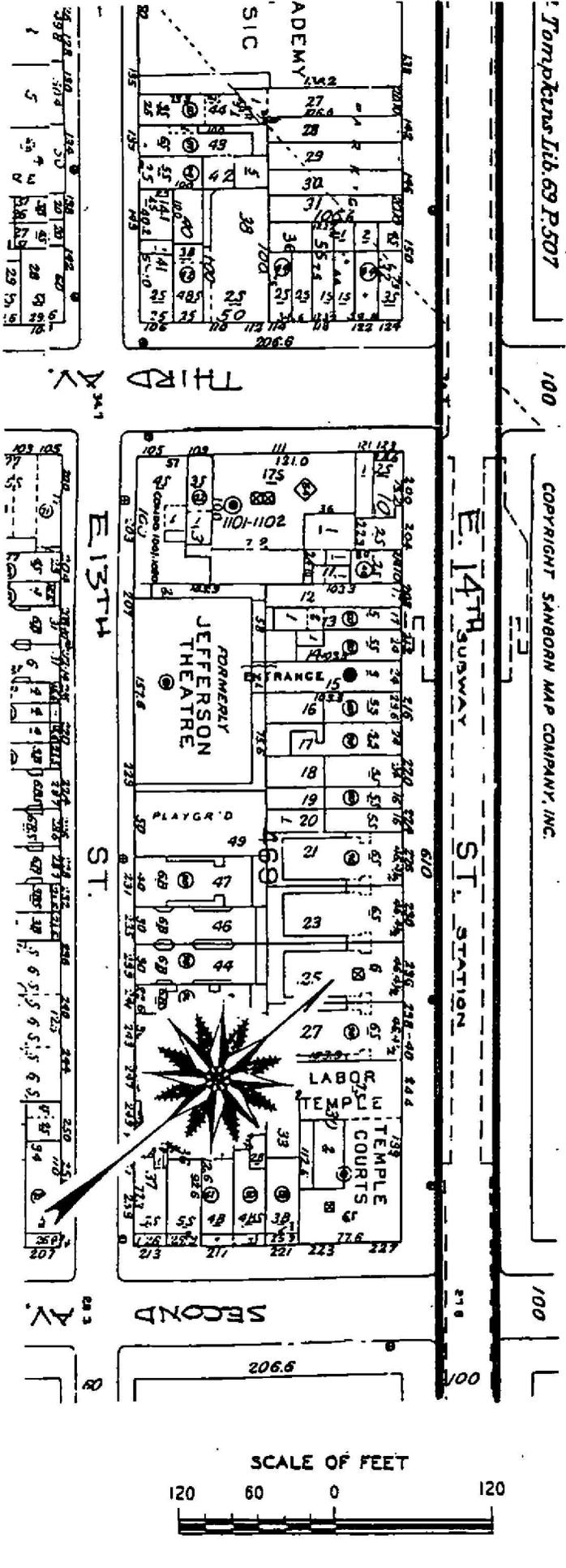
**FIGURE 24**  
 PROJECT  
 BOUNDARIES  
 EAST 14TH STREET  
 FROM AVENUE B TO  
 AVENUE A APE



**PLATTE**

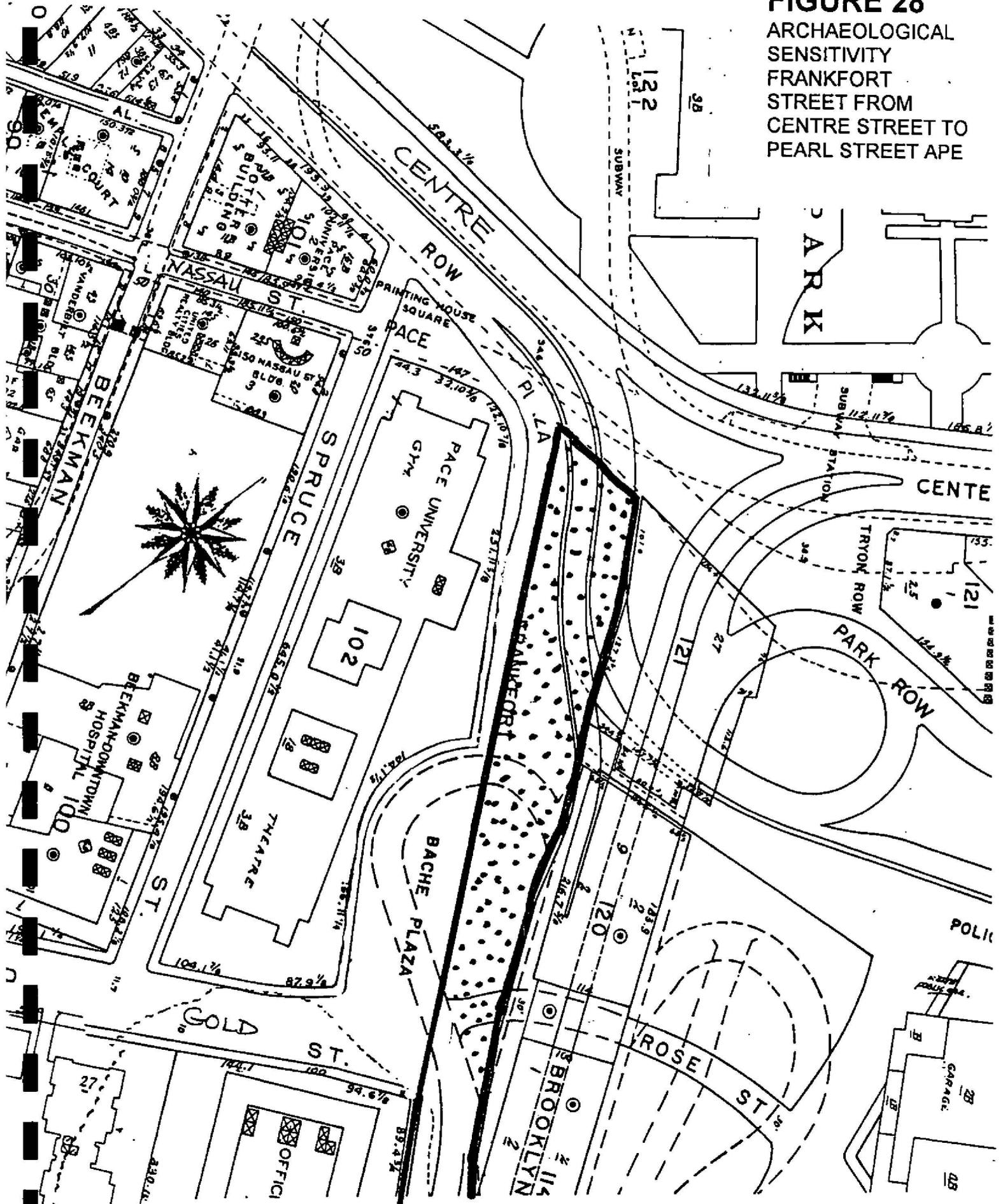


**FIGURE 26**  
 PROJECT  
 BOUNDARIES  
 EAST 14TH STREET  
 FROM SECOND  
 AVENUE TO UNION  
 SQUARE APE





**FIGURE 28**  
ARCHAEOLOGICAL  
SENSITIVITY  
FRANKFORT  
STREET FROM  
CENTRE STREET TO  
PEARL STREET APE



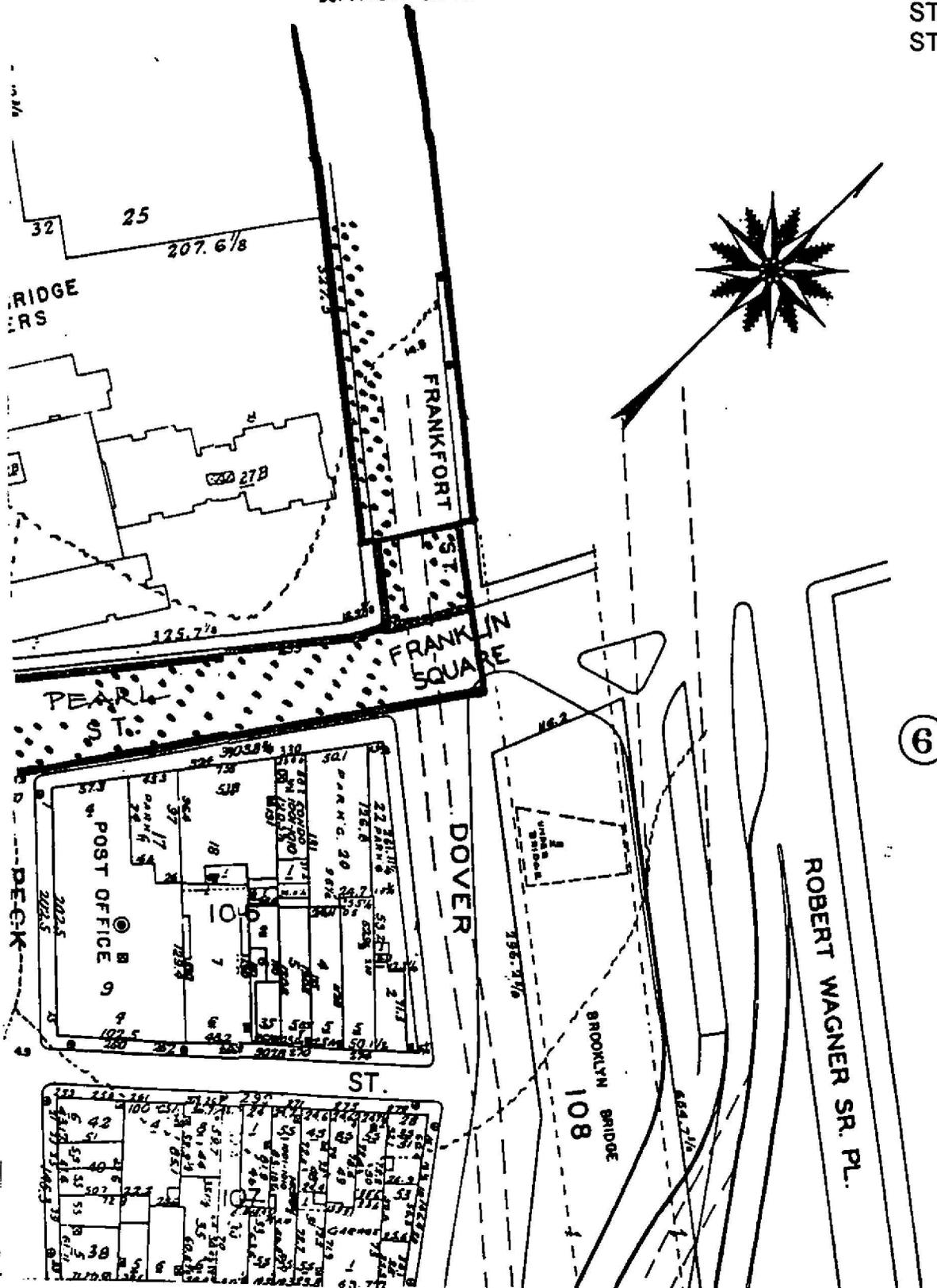
# PART OF SECTION I

SCALE OF FEET

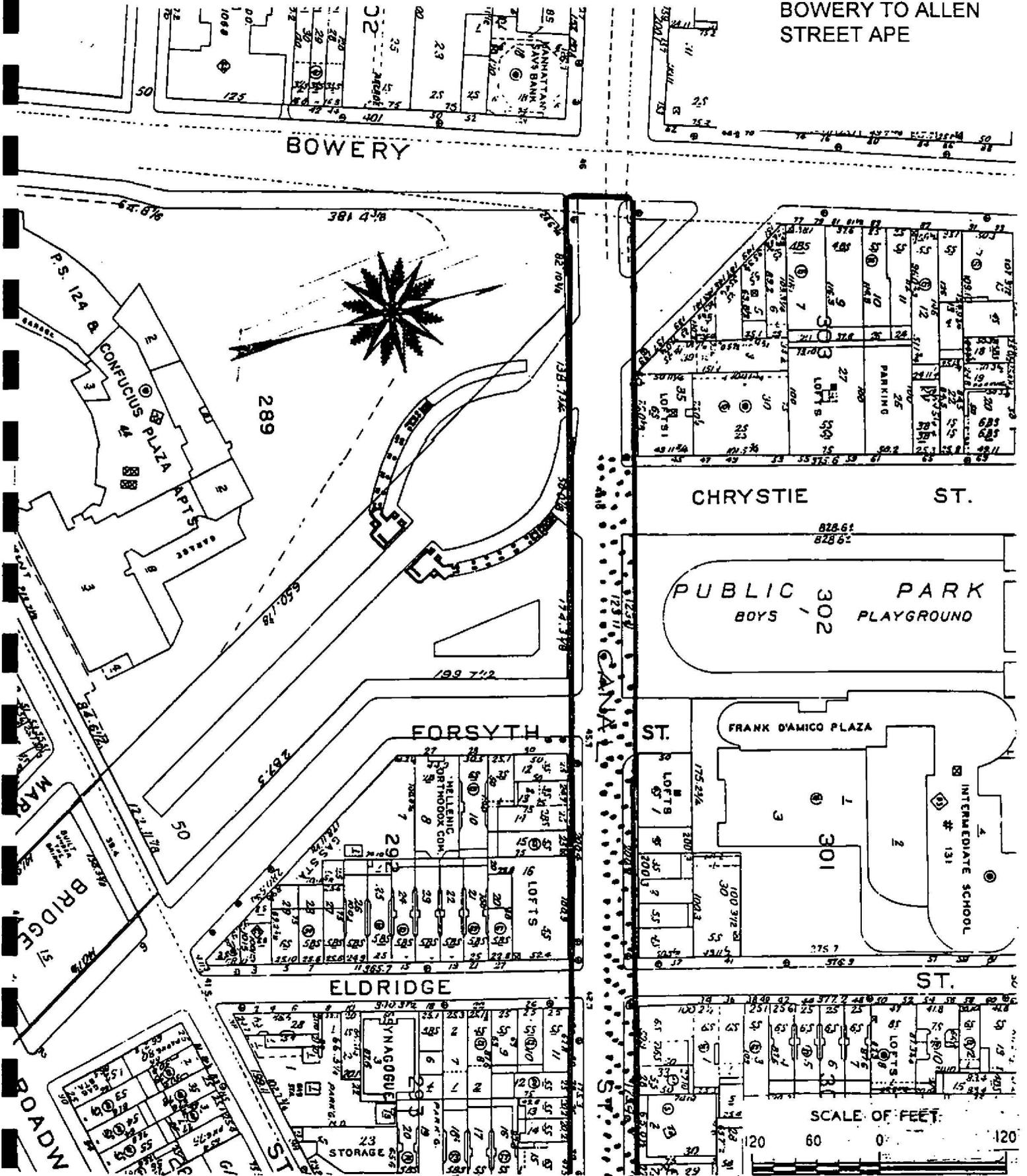


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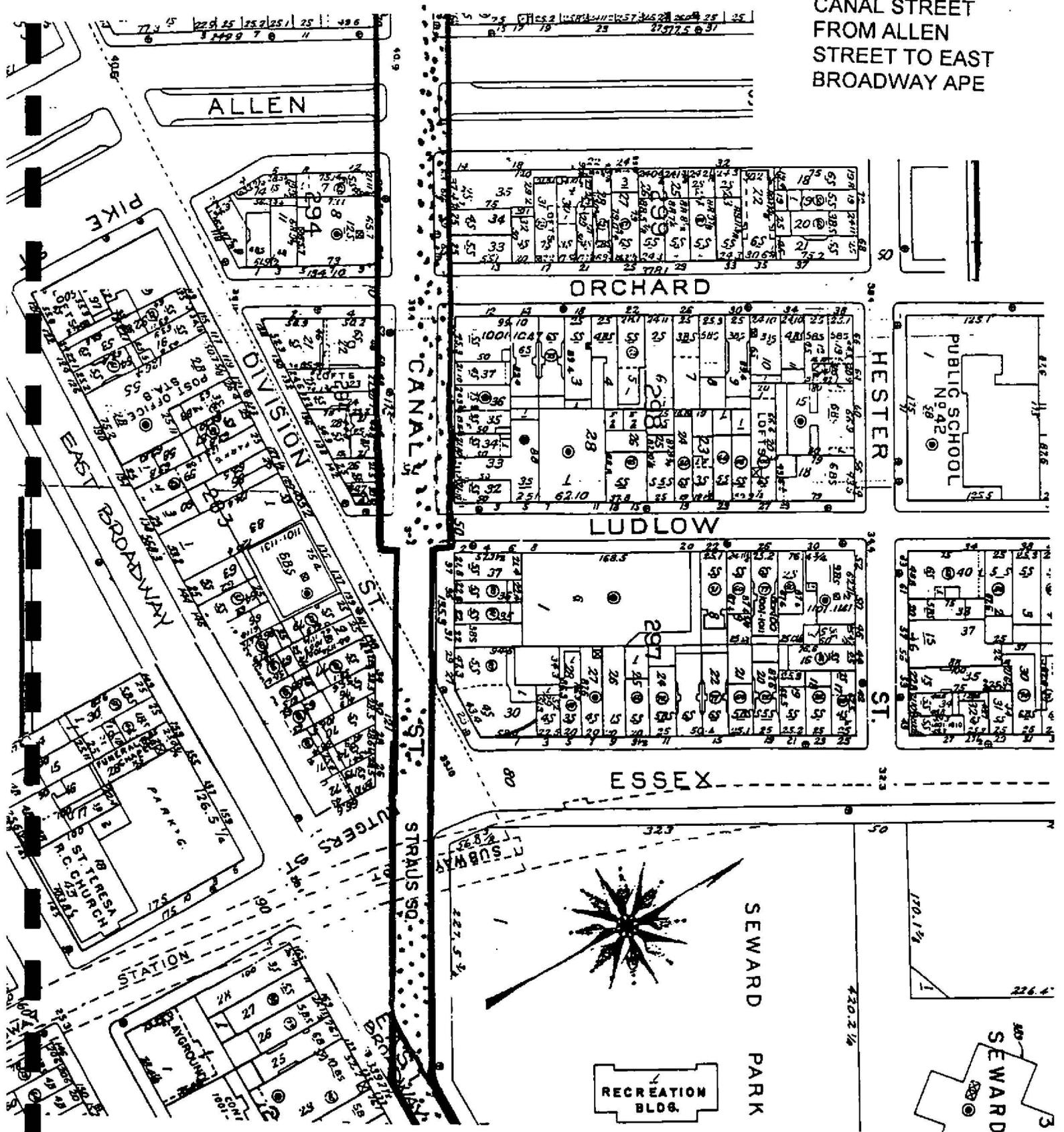
**FIGURE 29**  
ARCHAEOLOGICAL SENSITIVITY  
FRANKFORT STREET FROM CENTRE STREET TO PEARL STREET APE, AND PEARL STREET FROM FRANKFORT STREET TO PECK STREET APE



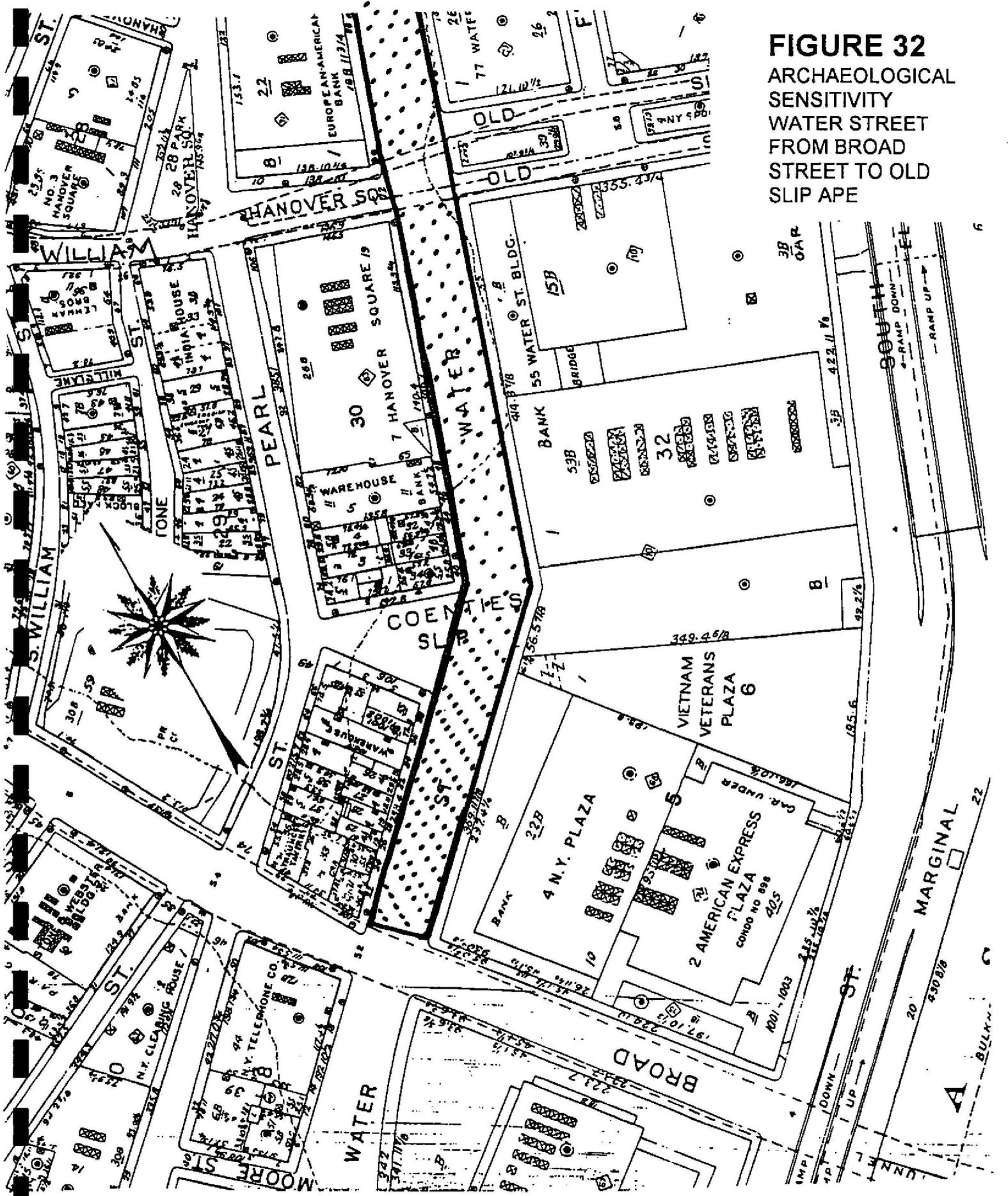
**FIGURE 30**  
 ARCHAEOLOGICAL  
 SENSITIVITY  
 CANAL STREET  
 FROM EAST  
 BOWERY TO ALLEN  
 STREET APE



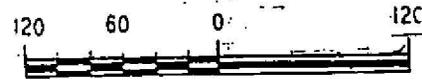
**FIGURE 31**  
 ARCHAEOLOGICAL  
 SENSITIVITY  
 CANAL STREET  
 FROM ALLEN  
 STREET TO EAST  
 BROADWAY APE



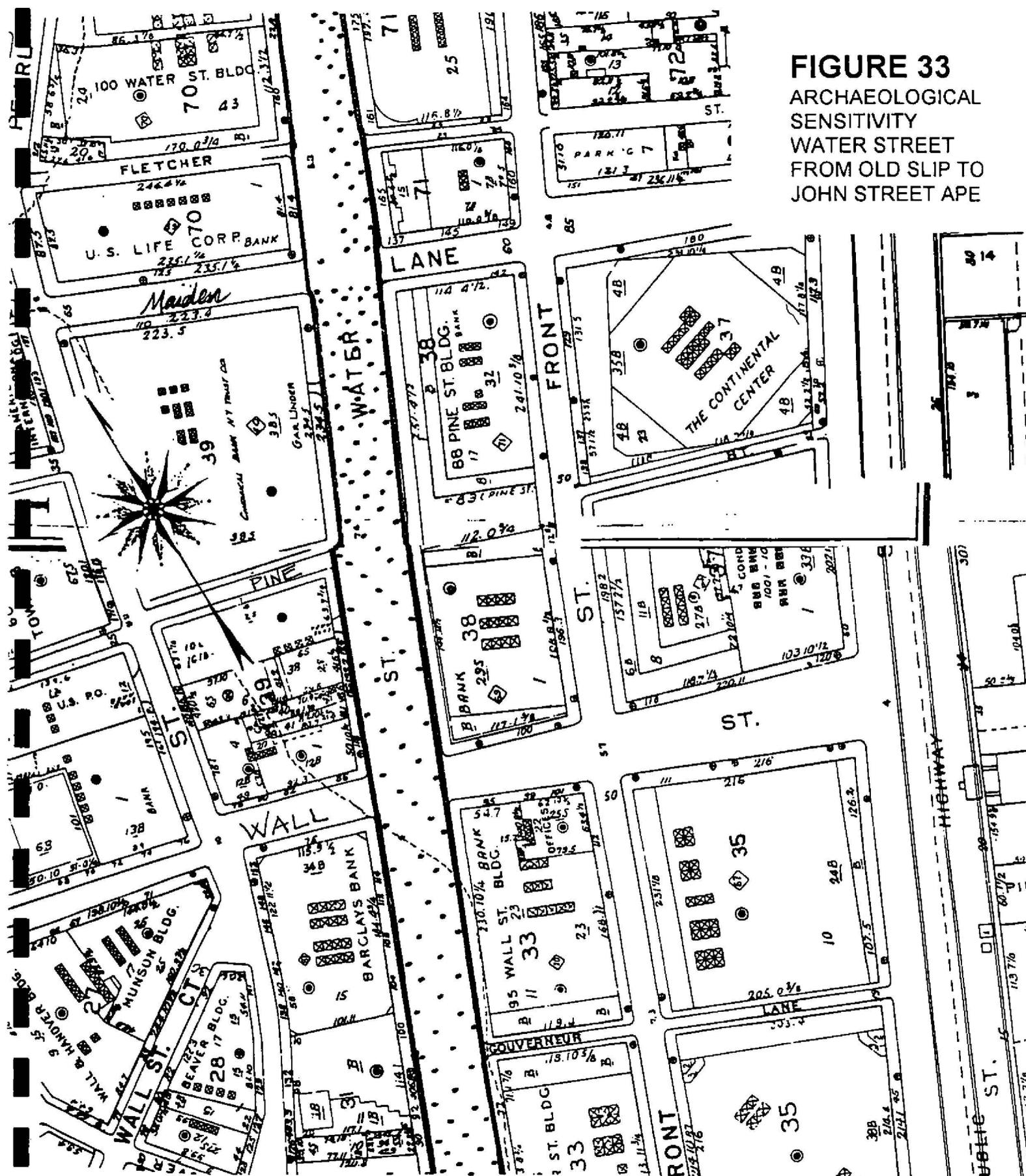
**FIGURE 32**  
 ARCHAEOLOGICAL  
 SENSITIVITY  
 WATER STREET  
 FROM BROAD  
 STREET TO OLD  
 SLIP APE



SCALE OF FEET:



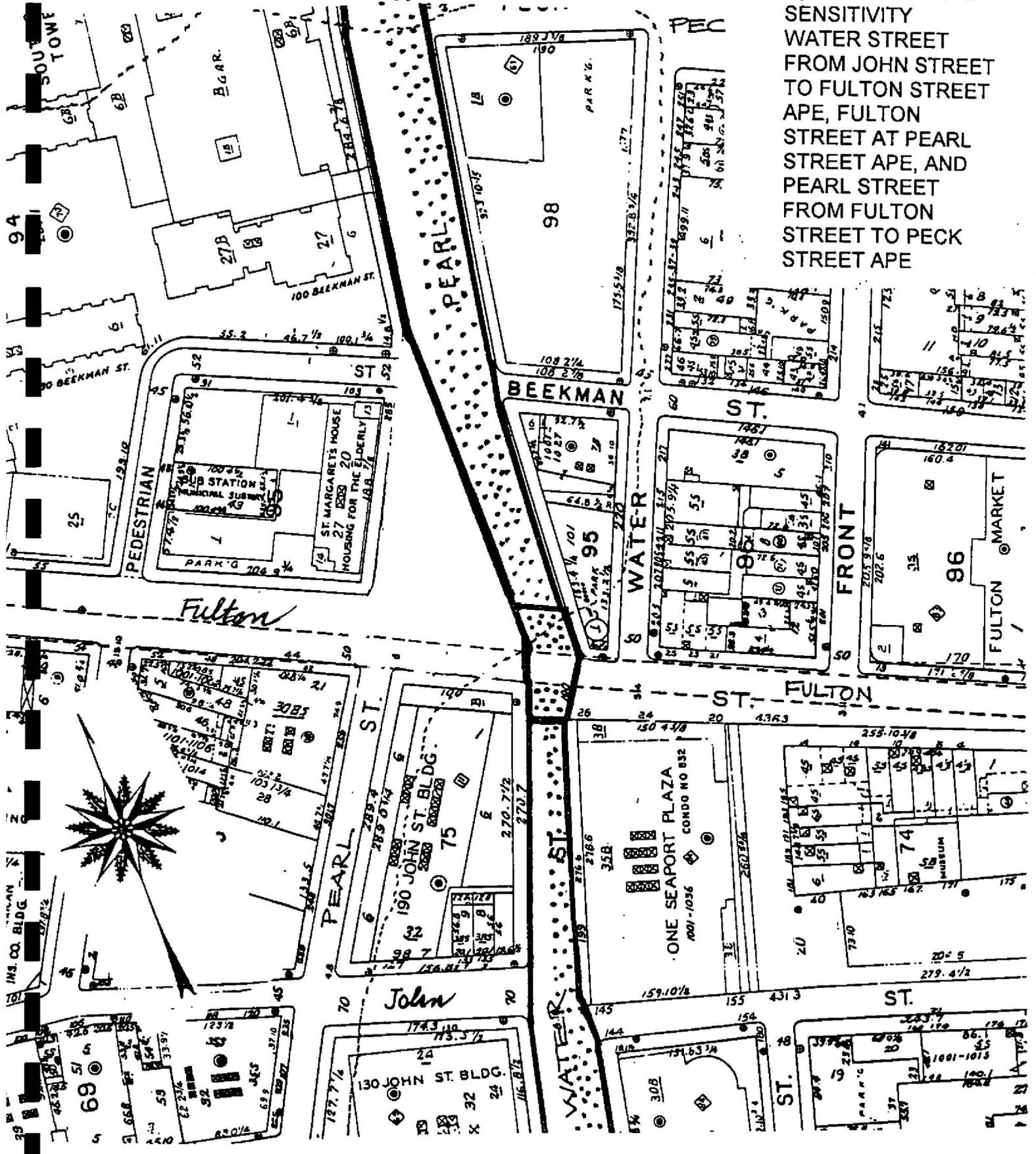
**FIGURE 33**  
 ARCHAEOLOGICAL  
 SENSITIVITY  
 WATER STREET  
 FROM OLD SLIP TO  
 JOHN STREET APE



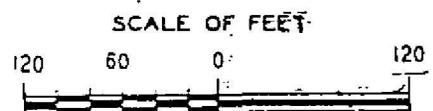
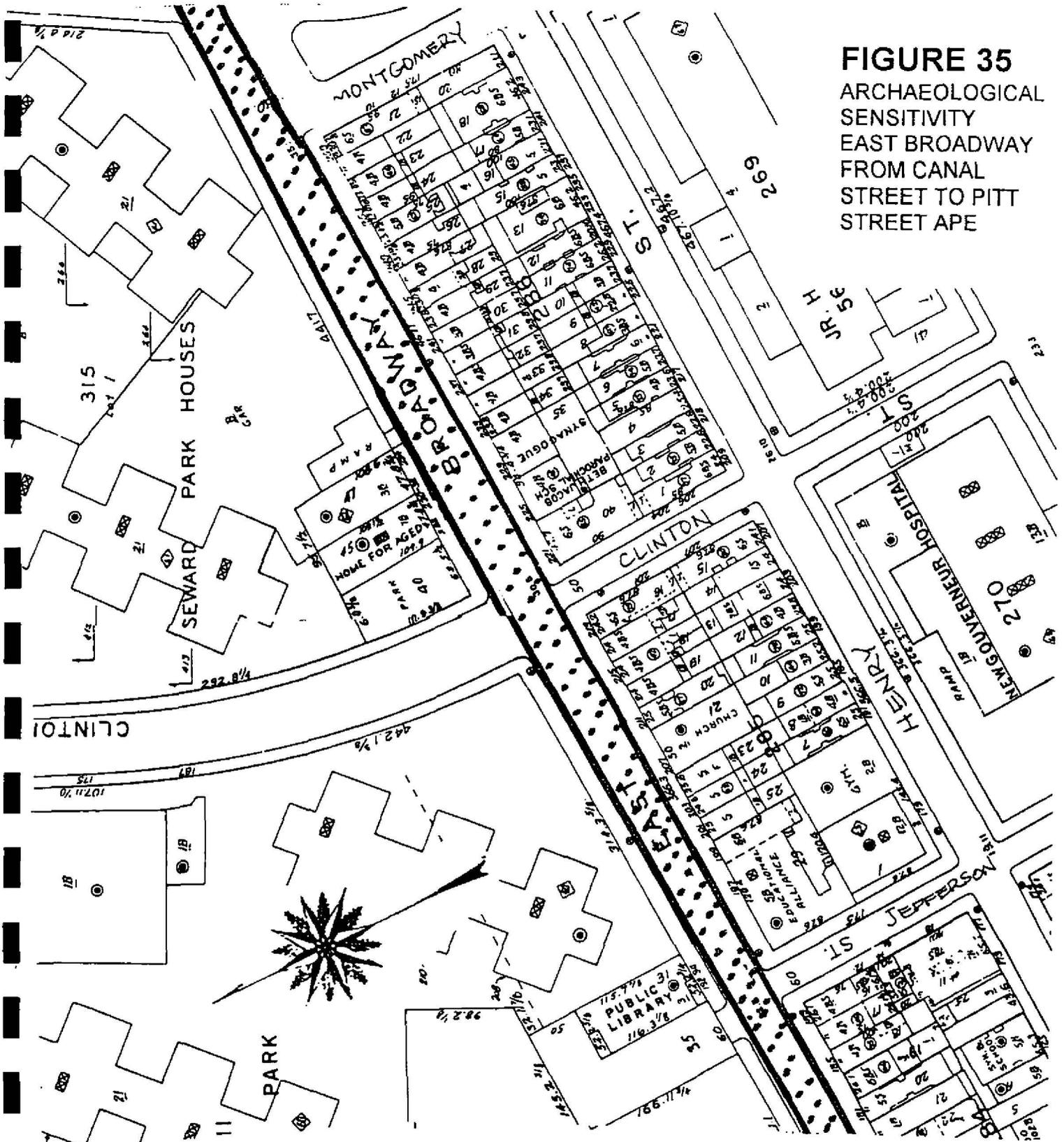
SCALE OF FEET



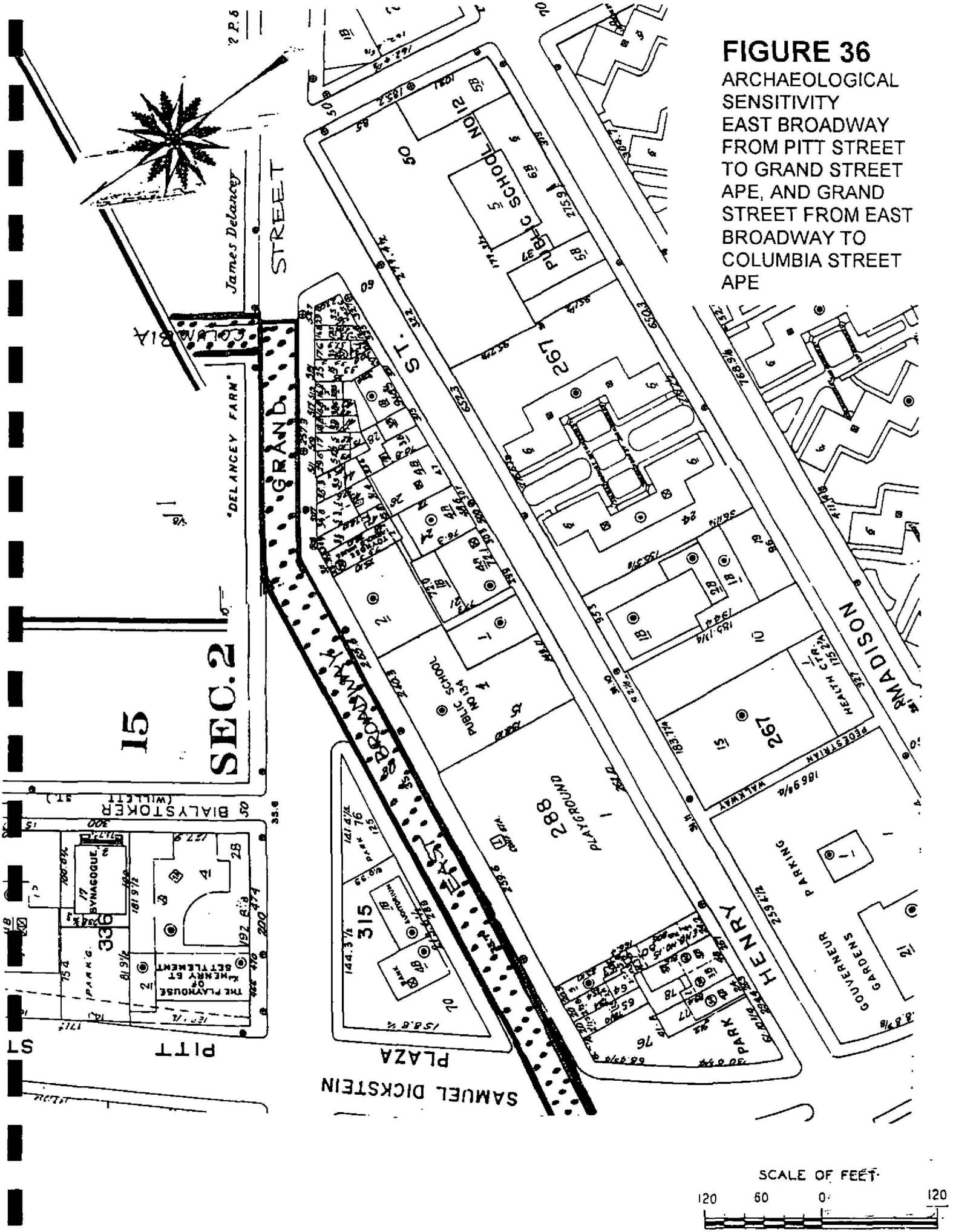
**FIGURE 34**  
 ARCHAEOLOGICAL  
 SENSITIVITY  
 WATER STREET  
 FROM JOHN STREET  
 TO FULTON STREET  
 APE, FULTON  
 STREET AT PEARL  
 STREET APE, AND  
 PEARL STREET  
 FROM FULTON  
 STREET TO PECK  
 STREET APE



**FIGURE 35**  
 ARCHAEOLOGICAL  
 SENSITIVITY  
 EAST BROADWAY  
 FROM CANAL  
 STREET TO PITT  
 STREET APE



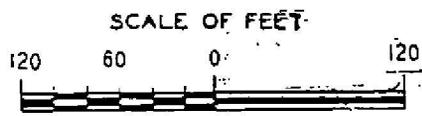
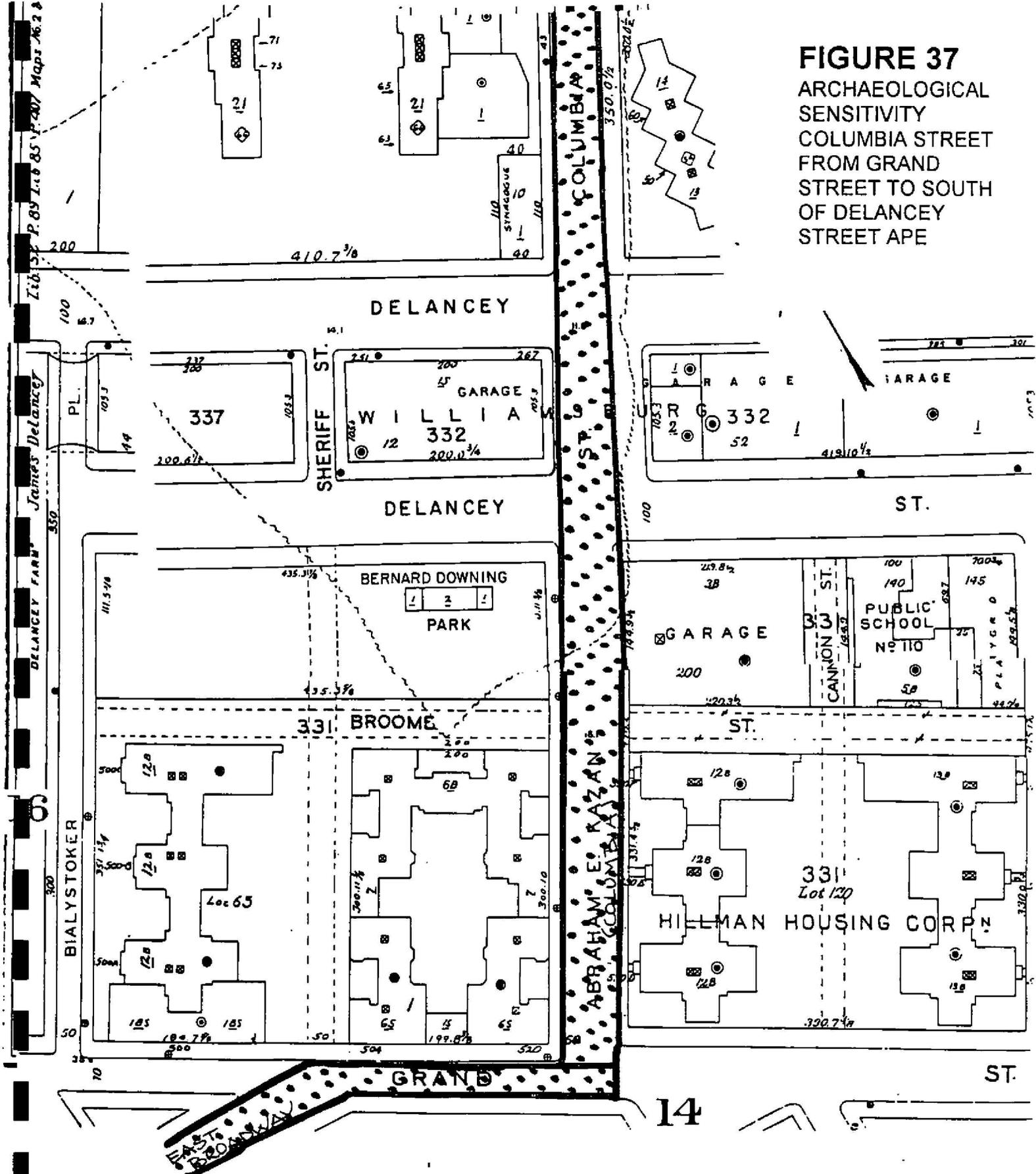
**FIGURE 36**  
 ARCHAEOLOGICAL SENSITIVITY  
 EAST BROADWAY FROM PITT STREET  
 TO GRAND STREET APE, AND GRAND  
 STREET FROM EAST BROADWAY TO  
 COLUMBIA STREET APE



SCALE OF FEET

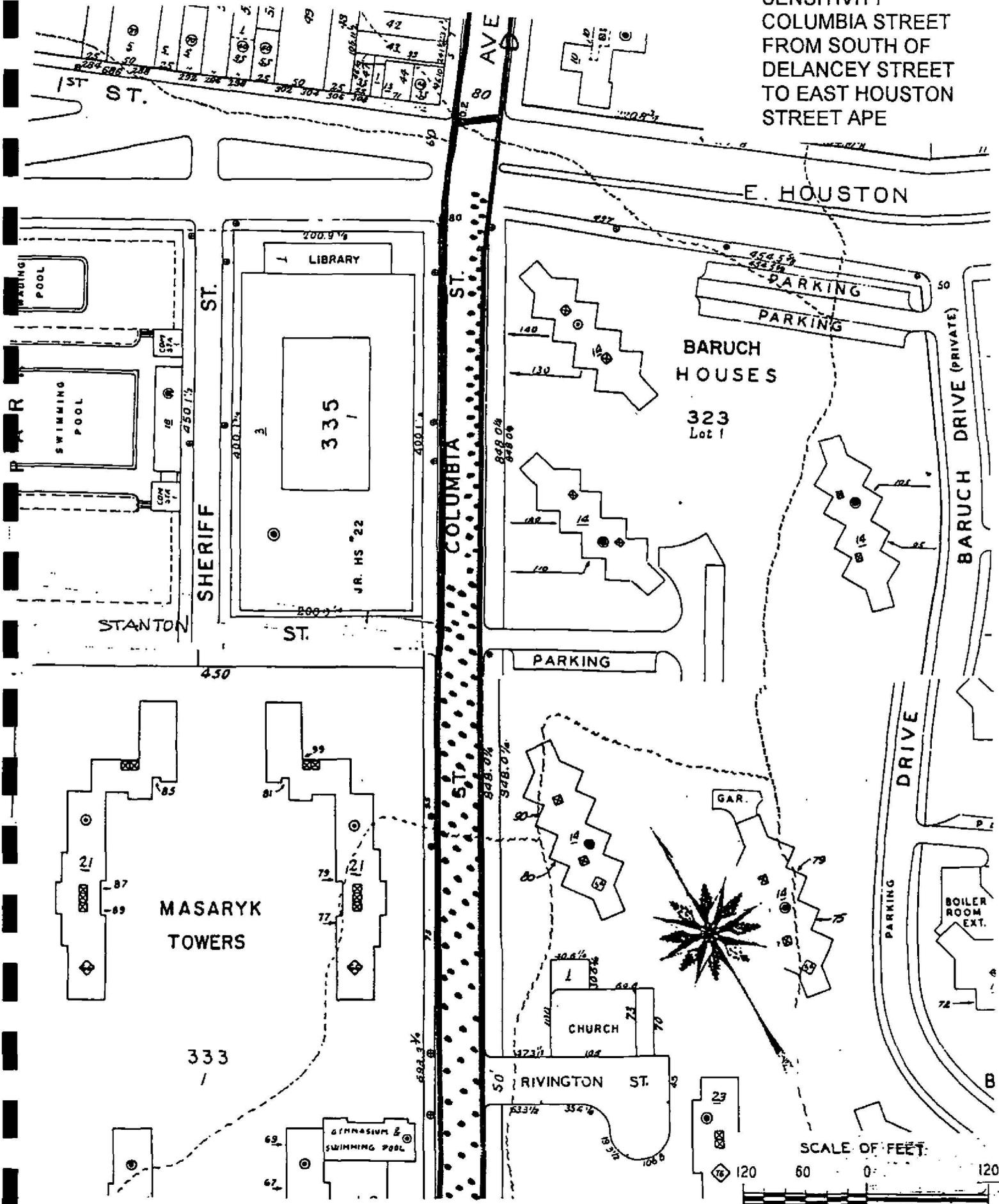


**FIGURE 37**  
 ARCHAEOLOGICAL SENSITIVITY  
 COLUMBIA STREET  
 FROM GRAND STREET TO SOUTH  
 OF DELANCEY STREET APE



# FIGURE 38

ARCHAEOLOGICAL  
SENSITIVITY  
COLUMBIA STREET  
FROM SOUTH OF  
DELANCEY STREET  
TO EAST HOUSTON  
STREET APE



**FIGURE 39**  
 ARCHAEOLOGICAL SENSITIVITY  
 LIGHT RAIL STORAGE YARD AND SHOP APE.  
 ESSEX STREET, ATTORNEY STREET,  
 SOUTH DELANCEY STREET, AND  
 BROOME STREET

