

**EVALUATION OF PRIOR DISTURBANCE AND ARCHEOLOGICAL  
SENSITIVITY OF THE AREA OF POTENTIAL EFFECT ASSOCIATED  
WITH THE MANHATTAN PORTION OF THE  
M-29 TRANSMISSION LINE PROJECT  
NEW YORK COUNTY, NEW YORK**

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PREPARED FOR

**TRC**

AND

**CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.**

BY

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## **MANAGEMENT SUMMARY**

John Milner Associates, Inc. (JMA) has completed an evaluation prior ground disturbance within the Area of Potential Effect (APE) associated with construction of the Manhattan portion of the M29 transmission line project.

For purposes of analysis the archeological APE is defined as the area that will be physically disturbed by construction. In practice this constitutes the trench within which the cable will be installed, and areas of ground disturbance associated with the construction of appurtenances such as manholes, and the locations of upland ground disturbing activities associated with the Harlem River crossing.

In the opinion of JMA, the entire APE has been subjected to extensive prior ground-disturbance associated with street and utility construction.

Based upon a review of original source material, JMA concludes that none of the previously recorded archeological sites listed in the NYSM/OPRHP inventories, and noted in the phase IA survey as being in the vicinity of the project, are within the APE. However, one previously recorded site that is not listed in the NYSM/OPRHP inventories is located in close proximity to the APE. This site is located along either side of Broadway, immediately north of Isham Street. The remains of truncated archeological pit features may exist in this area, and archeological monitoring of construction through this area is recommended.



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## **1.0 INTRODUCTION**

### **1.1 PURPOSE AND GOALS OF THE ANALYSIS**

The goal of this analysis is to evaluate the potential for presence of significant archeological resources within the Area of Potential Effect (APE) associated with the construction of Consolidated Edison Company of New York, Inc.'s (Con Edison) M29 transmission line project (the Project) in Manhattan. This report deals only with the portion of the Project in Manhattan. Separate analyses are being prepared for portions of the Project in the Bronx and the City of Yonkers. There are two components to the analysis. The first component is an evaluation of the degree to which the ground disturbance associated with street and road construction has eliminated or severely compromised the likelihood of intact soil horizons being present within the APE. The second component is the identification of the location of any remaining areas of archeological sensitivity within the APE.

### **1.2 PROJECT LOCATION AND DESCRIPTION**

Figure 1 shows the location of the Manhattan portion of the Project route. The Project route originates at Con Edison's Academy Substation at West 201<sup>st</sup> and Academy Streets. It then proceeds west on 201<sup>st</sup> Street to Tenth Avenue, and continues north on Tenth Avenue to 204<sup>th</sup> Street. From 204<sup>th</sup> Street the route proceeds west to Broadway and then north on Broadway to 219<sup>th</sup> Street. From 219<sup>th</sup> Street the route goes east to Ninth Avenue and then north on Ninth Avenue to a point just north of 220<sup>th</sup> Street, where it will enter a sub-riverbed tunnel for the Harlem River crossing.

The Project's transmission line will incorporate a 345 kV high-pressure fluid filled (HPFF pipe-type) underground transmission feeder comprised of three 2,500 kcmil paper-insulated copper conductors for the land based section, and 3,000 kcmil paper-insulated copper conductors for the Harlem River crossing. The transmission line will be installed primarily underground within existing Con Edison property and public roadway rights-of-way, with the exception of four bridge crossings where the transmission line will be mounted to the underside of bridges or installed within the bridge roadway. None of the four bridge crossings is in Manhattan.

Along most of the proposed route, the transmission line will be installed within an open-cut trench. Where the feeder crosses the Harlem River into Manhattan, the pipe-type cable will be installed via a new tunnel. Along most of the proposed transmission line route, the general sequence of construction activities will include:

- Utility survey and mark-out;
- Pavement saw cutting;
- Trench excavation and spoil removal;
- Pipe installation and welding;
- Non-destructive testing of welds;
- Pipe coating testing;
- Backfill with select (thermal) material;
- Pavement restoration; and
- Pressure testing of installed facilities after backfill



In general, the trench would be excavated to a depth sufficient to provide a minimum of three feet of cover over the cable pipe. When less than two feet of cover over the cable pipe or fluid-circulating pipe is authorized because of special conditions, suitable guards such as one-inch thick steel plates would be placed over the pipes prior to backfilling. A greater depth of cover may be required for installations within roadways under New York State Department of Transportation ("NYSDOT") jurisdiction. Typical trench width will be approximately three feet, however, this could be increased depending upon the configuration of pipes within the trench and whether other utilities must be crossed. Typical trench cross-sections are shown in Figure 2.

For purposes of analysis the archeological Area of Potential Effect is defined as the area that will be physically disturbed by construction. In practice this constitutes the trench, within which the cable will be installed, and areas of ground disturbance associated with the construction of appurtenances such as manholes, and the locations of activities associated with the Harlem River crossing.



## **2.0 PRIOR GROUND DISTURBANCE WITHIN THE APE**

### **2.1 SOIL SURVEY INFORMATION**

The New York City Reconnaissance Soil Survey (NRCS 2005) indicates that all of the Manhattan portion of the Project will be in soil mapping Units 1, 2, 4 and 206. These are described, as follows:

Unit 1 - pavement and buildings, postglacial substratum (dunes and dune sands), 0-5% slopes;

Unit 2 - pavement and buildings, glacial till substratum, 0-5% slopes;

Unit 4 - pavement and buildings, wet substratum (filled swamp, tidal marsh, or water), 0-5% slopes; and

Unit 206 – pavement and buildings, Chatfield-Greenbelt complex, 15-50% slopes (moderately steep to very steep urbanized areas of bedrock controlled hills and ridges modified by glacial action, that have been substantially cut and filled, mostly for residential use

The portions of the APE within Academy Street, 201<sup>st</sup> Street, and Tenth Avenue are within Unit 1. The portions of the APE within Unit 2 include 204<sup>th</sup> Street from Vermilyea Avenue to Broadway, and Broadway from 204<sup>th</sup> Street to approximately 212<sup>th</sup> Street. Portions of the APE within Unit 4 include 204<sup>th</sup> Street from Nagle Avenue to Vermilyea Avenue, and all areas within 219<sup>th</sup> Street and Ninth Avenue. The portions of the APE within Broadway, from 212<sup>th</sup> Street to 219<sup>th</sup> Street fall within Unit 206.

At this relatively gross level of analysis which is limited by the precision of the mapping, this would suggest that little in the way of Holocene soils can be expected within the portions of the APE within Unit 2, as existing paving directly overlies Pleistocene subsoil. Likewise, portions of the APE within Unit 206, are likely to have been significantly altered by cutting and filling, and should, in any event be considered to have a lower archeological sensitivity because of the steep slopes present. Portions of the APE within Unit 4 are likely to contain material associated with the filling of underlying swamps and marshes. Such areas are generally held to have a low archeological sensitivity, although immediately adjacent areas, and small elevated areas within the limits of larger marshes, are considered desirable locations for prehistoric settlement.

### **2.2 HISTORIC CARTOGRAPHY**

Historic cartography was reviewed and evaluated as part of the Phase 1A cultural resources survey for the Project (Pasquariello and Loorya 2006). It was re-evaluated for this study to determine if it could be used to derive information pertaining to changes in topography over time that could have destroyed or buried older ground surfaces, and potentially, archeological remains. Of the maps cited only a few contain information on topography and land forms at a sufficient level of detail to be of possible use.

Dripps (1851) (Figure 3) shows the locations of marsh/swamp areas and prominent hills in relation to a superimposed street grid. (The only existing road shown is present-day Broadway, labeled “Kings Bridge Road”). Care must be used in interpreting the relationship between the features shown and present-day locations as the superimposed grid does not, in fact, correspond to the present day grid (Cohen and Augustyn 1997:126). It does, however, suggest that marshy areas were present in the area that will be crossed by the extreme southern and



northern ends of the Project APE in Manhattan. This is generally, but not precisely, consistent with the soil survey data discussed in section 2.1.

Viele's (1865) *Sanitary & Topographical Map of the City and Island of New York* (Figure 4) notes original watercourse, streams, meadows, marshes, ponds, and ditches, canals, and the shoreline prior to landfilling. An inset map shows northern Manhattan. Features shown conform closely, but not precisely, to those shown on the earlier Dripps map.

A version of the Randall Farm Maps (Sackersdorff 1867)(Figures 5a and 5b), which are based on 1819-1820 surveys, although not cited in the original IA survey report, were reviewed. These also show marsh/swamp areas at the extreme northern and southern ends of the Project APE in Manhattan. Maps include a superimposed hypothetical street grid that differs significantly from the present-day grid. Demonstrating the problem with attempting to superimpose the M29 cable route on all the early historic maps is the fact that the Randall map, believed to be one of the most accurate, shows the location of the "Jacobus Duyckman" [Dyckman] house on the west side of Broadway, at 208<sup>th</sup> Street. The house is, in fact, located four blocks south at 204<sup>th</sup> Street. Numbered streets are shown intersecting Broadway at an acute angle. They actually intersect Broadway at a right angle.

Colton's (1836) *Topographical Map of the City and Country of New York, and the Adjacent Country* (Figure 6) shows still another, generally consistent, depiction of the locations of topographic features such as hills, and the locations of marshy/swampy areas. This map is significant because it was used by Bolton (1922) as a base for his map depicting archeological site locations (see Section 3).

## 2.3 EXISTING UNDERGROUND UTILITIES

All of the streets within which the Project APE is located presently contain an extensive complex of underground utilities. These include water and sewer pipes and associated catch basins and manholes, as well as gas lines, electric distribution lines, and telephone and cable lines. To determine the degree to which construction of these underground utilities has disturbed soils within the APE, JMA archeologists reviewed detailed plan and profile drawings for the Project<sup>1</sup> (Appendix A). That review indicates that *all* of the streets in Manhattan within which the Project will be constructed have existing underground utilities that parallel the entire length of the Project. In many cases the Project APE is situated parallel to, and *between*, existing underground utilities.

To determine the extent of the disturbance associated with the construction of existing utilities several lines of inquiry were pursued. First, the records of the New York City Department of Environmental Protection (DEP), Bureau of Sewer and Water Operations (BSWO), Manhattan Borough Office were consulted. No construction or as-built drawings, or original construction specifications, exist for the water and sewer lines within the Project APE. The DEP-BSWO files do, however, contain a plat book (NYCDEP n.d.) that notes the dates of construction, and size, of larger water and sewer lines installed in upper Manhattan streets in the early part of the twentieth century. Most of the streets within which the APE is located are identified as having water and sewer lines with installation

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<sup>1</sup> A full-size set of the identical plan and profile drawings at a scale of 1 inch = 20 feet were supplied to the NYS Office of Parks, Recreation and Historic preservation. On September 7, 2007, OPRHP responded to TRC: "We acknowledge there are utilities at various locations within the streets; however these are localized disturbances" (Blakemore 2007).



dates of 1900 to 1910. The only area where existing underground utilities are not shown on the plat map is a section of Broadway between Isham Street and 214<sup>th</sup> Street. (Plan and profile maps profile maps in Appendix A *do* show underground utilities in this area, suggesting they were installed some time after 1929—the latest installation date shown on the plat maps for any street in northern Manhattan).

In the absence of site-specific data quantifying the extent to which underground utilities may have caused subsurface disturbance within the APE, JMA consulted water and sewer construction manuals and textbooks dating from the period roughly contemporary with the original installation of utilities along the project route (Latham 1878, Adams 1880, Ogden 1908, Metcalf and Eddy 1915). These sources (especially the latter) provided detailed descriptions of water and sewer construction techniques in use in New York City and other large urban areas. In reviewing this material, special attention was given to descriptions of trenching methods, and the relationship between utility types and size, and trench width and depth.

In referring to the construction of sewers, Adams states that trench centerlines should be “marked out for a width in the clear of two feet greater than the outside of the finished work” and “if the cut be deep, some additional width be allowed for the side slopes” (1880:103)

Ogden provides the most detailed description of the relationship between sewer size and construction trench width.

“method of computing the excavation depends on the specifications, but the most reasonable method is for the specifications to prescribe the width of the trench that will be paid for, in terms of the diameter of the pipe and the depth of the pipe invert. There should be room on the outside of the bell for the workman’s hands, with a small margin for alignment of the pipe, a width of twelve inches more than the outside diameter of the bells being a reasonable amount. The outside diameter of a bell for a twelve inch pipe is 17 inches, so that the trench width for a twelve inch pipe should be 29 inches, the width to be used in estimating. A 6-inch pipe would in the same way be estimated at 21¼ inches and a 24-inch pipe as 43 inches. *These are minimum widths and would probably be narrower than the trench would actually be dug*” (1908:242).

Ogden goes on to note that for trenches less than ten feet deep, “two feet should be added [to the trench width] where sheeting is employed, and one foot where the trench is stable without it.” In cases where trenches exceed ten feet in depth, three feet should be added to the trench width. Ogden also states that “Some contractors, in order to minimize the danger of banks caving, open a trench about 4 feet wide on top” (1908:242, 245).

Standard sewer construction specifications of the American Society of Municipal Improvements are reproduced in Metcalf and Eddy (1915). Metcalf and Eddy state that these specifications “are believed to be representative of the general opinion of sewerage specialists in 1914, so far as can be learned (1915:467). Article 1 of the specifications deal with excavation and state, in part:

“The ‘lines of excavation’ of trenches in earth and rock for pipe sewers . . . not over 18 in. in diameter, shall be such as to give a clearance of at least 6 inches on either side of the barrel of the pipe, and a clearance of at least 8 in. on each side of the barrel of the pipe when the latter has a diameter exceeding 18 in. All trenches shall have a clear width between ‘lines of excavation’ equal to the maximum widths of the cradles of the sewers laid in them when such cradles are wider than the widths stated in the last preceding sentence. The ‘lines of excavation’ of trenches in



earth and rock for sewers other than pipe sewers shall be separated by a distance equal to the greatest external width of the structures to be built in them, including the necessary forms” (Metcalf and Eddy 1915:467).

There is no reason to assume that the practices, standards, and specifications described above would not have been applied to construction of sewers in the Manhattan streets in which the APE is located.

Major existing underground utilities which parallel the Project APE are identified in Table 1. Table 1 is not a comprehensive list of in-street utilities. In addition to the ground disturbance associated with the utilities called out in Table 1, additional disturbance can be assumed to have been associated with underground cable and telephone lines, smaller water and sewer house connections (which are generally at right angles to main lines paralleling the larger utilities, and therefore cross the APE), manholes, and catch basins.

## 2.4 STREET CONSTRUCTION

The M29 cable and its archeological APE are located entirely within paved urban streets. One of these—Broadway—is also a designated highway (US Route 9). Construction of these streets would have been associated with extensive ground disturbance, including grading, cutting and filling, removal of unsuitable soils, and foundation preparation. In order to assess (and possibly quantify) the degree to which these activities would have affected the APE an attempt was made to locate original construction and grading plans. The Manhattan Topographical Bureau of the Manhattan Borough President’s office (the Borough Engineer’s office) was contacted. No as-built drawings or original construction specifications relating to street construction along the cable route in northern Manhattan have been identified. The Topographic Bureau does maintain maps noting existing and legal grades (actually top of curb elevations above an arbitrary datum), but these are not helpful in the absence of original elevation data with which to compare them.<sup>2</sup>

No original construction contracts or specifications for streets in the Project area could be located at the Topographic Bureau. However, even if copies of original specifications existed and could be located, it is unlikely that they would include information relating to site-specific grading requirements or depth of foundation materials, as this is generally determined in the field by the construction contractor (see below).

In the absence of location-specific data quantifying the extent to which street construction may have caused subsurface disturbance within the APE, JMA consulted street and road construction manuals and textbooks dating from the period roughly contemporary with the original construction of the streets within which the M29 cable will be installed (Tillson 1912<sup>3</sup>, Blanchard and Drowne 1914, Byrne 1917, Harger and Bonney 1919, Wood 1920)

All of these references note the importance of proper grading as an initial step in road construction (e.g. Tillson 1912:454). This is necessary to provide both proper traction and proper drainage. In speaking of grade limitations

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<sup>2</sup> Topographic Bureau staff advised JMA that maps possibly showing older grade conditions did exist, but their fragile physical state prohibited their removal from storage and examination.

<sup>3</sup> Tillson was a New York City municipal engineer, Consulting Engineer to the Brooklyn Borough President, and member of the Association for Standardizing Paving Specifications.



Table 1. Major Underground Utilities Parallel to the M29 Cable Route in Manhattan

<i>Street/Avenue</i>	<i>Utility Type</i>	<i>Size</i>	<i>Dwg. No.</i>	<i>Construction Date</i>
Academy Street	Water	12"	348681	
	Sewer	Two 6' x 7' egg" sewers	348681	1900
201 <sup>st</sup> Street	Water	12"	348681	
	Sewer	Two 6' x 7' "egg" sewers	348681	1900
Tenth Ave. (201 <sup>st</sup> St. – 202 <sup>nd</sup> St.)	Gas	12"	348681	
	Water	12"	348681	
	Sewer	3'-6" x 2'-4" "egg" sewer	348681	1902
Tenth Ave. (202 <sup>nd</sup> St. – 204 <sup>th</sup> St.)	Gas	12"	348682	
	Water	12"	348682	
	Sewer	3'-6" x 2'-4" "egg" sewer	348682	1902
204 <sup>th</sup> St. (Nagle Ave. – Sherman Ave.)	Gas	6"	348683	
	Sewer	15" vitrified	348683	1900, 1902
	Water	8"	348683	
204 <sup>th</sup> St. (Sherman Ave. – Broadway)	Gas	6"	348684	
	Sewer	15" vitrified	348684	1900, 1908
	Water	8"	348684	
Broadway (204 <sup>th</sup> St. – 207 <sup>th</sup> St.)	Gas	6"	348685	
	Gas	12"	348685	
	Water	20"	348685	
	Water	12"	348685	
	Sewer	15" vitrified	348685	
Broadway (207 <sup>th</sup> St. – 212 <sup>th</sup> St.)	Water	Two 12"	348686	
	Gas	12"	348686	
	Sewer	15"	348686	1909 (207 <sup>th</sup> -211 <sup>th</sup> St)
Broadway (212 <sup>th</sup> St. – 215 <sup>th</sup> St.)	Water	Two 12"	348687	
	Gas	12"	348687	
	Sewer	15" (214 <sup>th</sup> – 215 <sup>th</sup> Sts.)	348687	1909
Broadway (215 <sup>th</sup> St. – 218 <sup>th</sup> St.)	Water	Two 12"	348688	
	Gas	12"	348688	
	Sewer	3'-6" x 2'-4" "egg" sewer	348688	1900
	Sewer	15" (216 <sup>th</sup> -218 <sup>th</sup> Sts.)	348688	
Broadway (218 <sup>th</sup> St. – 219 <sup>th</sup> St.)	Gas	12"	348689	
	Sewer	15" vitrified	348689	1909
	Sewer	3'-6" x 2'-4" vitrified	348689	1909
219 <sup>th</sup> St. (Broadway – Ninth Ave.)	Gas	6"	348689	
	Water	8"	348689	
	Sewer	15" vitrified	348689	1925
Ninth Avenue	Gas	6"	348690	
	Water	12"	348690	
	sewer	3'-6" x 2'-4" vitrified	348690	1909



of pavements in the Bronx, Blanchard and Drowne cite engineer S.C. Thompson who noted that “the grade of sheet asphalt is usually limited to 3 percent” (1914:85).

Early twentieth-century highway and road construction manuals and textbooks routinely contain sections that consistently describe the need for the construction of a proper foundation to support the final road-surfacing material, whether it be macadam or concrete. The foundation itself is defined as the structure “interposed between the wearing surface and the *subsoil* . . .” (Wood 1920:94, emphasis added).

All of the references consulted discuss the need to remove topsoil containing organic material, citing as a reason the need to minimize the amount of moisture in the material underlying the street or road foundation. Byrne, for example, states simply that “It is no use to lay good material on a bad substratum” (1920:121). Blanchard and Drowne state that “All loads must ultimately be carried by the subsoil. The subsoil, without the construction of some artificial foundation in addition, will not be sufficient under most conditions. All forms of block pavements and sheet asphalt, for instance, cannot be built and maintained successfully on a subsoil foundation alone” (1914:126). Tillson includes as part of a standard specification that for asphalt roadways the consolidated foundation should be finished to a depth of nine inches below final grade (1914:455). Harger and Bonney note that it “is recognized by most designers and estimators that it is impossible from even a careful preliminary examination of the soil to specify exactly the amounts of and depths of foundation stone” (1919:667). Wood reports that “it has been suggested that the depth [of the road foundation] should be 2 to 3 feet” (1920:95).

The relevance and applicability of this general information on the construction of street foundations, to the streets within which the Project APE is located, is supported by data (Table 2) from test pits excavated along the M29 cable route in Manhattan.

Table 2. Test Pit Data from the M29 Cable Route

<b><i>Test Pit ID</i></b>	<b><i>Location</i></b>	<b><i>Results</i></b>
TP-M04	204 <sup>th</sup> and 10 <sup>th</sup> Ave	12 inches of asphalt over 6 inch concrete base
TP-M06	204 <sup>th</sup> w/o Post Ave	7 inches of asphalt over 8 inches of concrete
TP-M07	204 <sup>th</sup> e/o Broadway	10 inches of asphalt over 8 inches of concrete
TP-M010	Broadway n/o 204th	8 inches of asphalt over 8 inches of granite block

This data is consistent in showing 15-18 inches of asphalt, and concrete or granite block overlying the underlying subsoil. This information is also consistent with the descriptions of typical street and road construction procedures detailed in the construction manuals and texts cited above.

## 2.5 EXISTING CONDITIONS

JMA personnel conducted a reconnaissance of the Project area on January 28, 2008. Special attention was given to locations along the M29 cable route believed to be in close proximity to the locations of previously recorded archeological sites. The highly developed urban nature of the entire APE is documented in photographs included in Appendix 2.



### 3.0 PREVIOUSLY RECORDED ARCHEOLOGICAL SITES

The Phase 1A study (Pasquariello and Loorya 2006) noted that a total of 13 archeological sites are recorded in the files of OPRHP and the New York State Museum as being potentially located within 1000 feet of the Project APE. Table 3 reproduces the data from the Phase IA report and adds the Parker (1922) designations where known. The distance from the APE was derived from USGS quadrangle maps maintained by OPRHP and annotated to show archeological site locations.

Table 3. Previously reported archeological sites within 1000 feet of the Project APE in Manhattan, as reported in Pasquariello and Loorya (2006).

Site Designation	Site Name	Time Period	Site Type	Location	Approximate Distance from APE
NYSM 4052 Parker NY-2	-		Shell midden	220 <sup>th</sup> Street and Kingsbridge Road	750 feet
NYSM 4054 Parker NY-4	Seaman's Garden	Historic	Village	Seaman Avenue and Isham Street	1000 feet
NYSM 4055 Parker NY-5A	-	Late Woodland	Stray find	214 <sup>th</sup> Street and Tenth Avenue	1000 feet
NYSM 4056 Parker NY-6A	-		Indian trail		0 feet
NYSM 4057 Parker NY-7			Shell midden	East of Fieldston Rd. and north of W. 247 <sup>th</sup> Street	1000 feet
NYSM 4069 Parker-NY?			"Traces of occupation"	Manhattan	0-1500 feet
NYSM 8369 Parker NY-?	-		Shell midden	Manhattan	0 feet
NYSM 8371 Parker-NY?	-		Camp	Manhattan	<0.25 miles
A061.01.00532		Late Archaic	Shell midden		0
A061.01.00534	Dongan Place		Shell midden		1000 feet
A061.01.00537	Isham's Garden	Early Woodland	Village, possible	Manhattan	1000 feet
A061.01.00119	Brook Crossing	Burial			750 feet
A061.01.00114	Seaman Avenue	Shell heaps/ dog burial		Manhattan	1000 feet

A review of the original OPRHP site file data from which this information was derived reveals numerous inaccuracies and inconsistencies. Most of the information on the site forms maintained by OPRHP (and the associated mapping on the USGS quadrangle maps maintained by OPRHP) was derived from early twentieth century sources, some of which (notably Parker 1922), were themselves secondary reports. The result has been several cases of the same site being recorded several times (and assigned several site numbers) and mapped in



several different locations. It has also resulted in vague and general locations being afforded an unwarranted level of precision and sites being mapped as occupying a much larger area than they most probably did. To address these problems, and more precisely define the locations of these sites in relation to the Project APE, the original early twentieth sources were consulted, where available.

One of the sites in Table 3 can be immediately excluded from further consideration because it is clearly some distance from the APE. NYSM 4057 is described being located east of Fieldston Rd. and north of W. 247<sup>th</sup> Street. This location would place it more than a mile from the APE, rather than the 1000 feet reported in the Phase IA survey report. Several of the sites listed were apparently misidentified because of inconsistencies in site file data. NYSM Sites 4069, 8369, and 8371 are all identified as sites listed in Parker (1922). These may be associated with site locations marked on Parker's map of New York County. The scale of that map precludes the assignment of precise locations to these sites, and they most likely are meant to represent some of the same sites described in the following section.

### **3.1 PREVIOUSLY RECORDED SITES IN THE NYSM/OPRHP INVENTORIES**

#### ***A061-01-0532 (The Shora Kapkok/Cold Spring Site)***

The OPRHP archeological site inventory form for the "Shora Kapkok/Cold Spring Site" gives its location as "vicinity of 207<sup>th</sup> Street and Broadway." This would place it in very close proximity to the Project APE which follows Broadway from 204<sup>th</sup> Street to 219<sup>th</sup> Street. The earliest published reference to the site appears in Bolton (1909):

"Another and perhaps more important path, led to that secluded and still undisturbed dell below the east side of the end of Inwood Hill, which is now know locally, as 'Cold Spring Hollow,' where, among overhanging masses of rocks detached from the lofty cliff, a secure refuge was afforded from winter's storms and from hostile observation, a spot known to the Red Man as, Shora-kap-kok, or 'the sitting down place.' This has been rendered, "a portage," and may well have been so since it was in direct line between the Harlem and the Hudson River"(1909:77).

The OPRHP site form notes that testing of the site was carried out in 1895 by A. Chenoweth. This information appears to have its source in Bolton (1909) who writes that "The opening, by Mr. Alexander Chenoweth, of the interior of the cave at Cold Spring, disclosed a large number of objects, showing the extended occupation by the Red man. These objects are now in the Museum<sup>4</sup>, where they form an interesting collection" (1909:88).

Skinner (1915) reports that "the only Indian remains left on the Island, so far as known to the writer, are situated at the extreme northern end at Inwood and Cold Spring. They consist of the so-called shell-heaps or refuse piles from Indian camps, and three rock-shelters at Cold Spring" (1915:51). Bolton (1920) lists "Shorakapkok" as Station 16. His entire description is as follows: "Shorakapkok ('the sitting-down place'). A station in the present Cold Spring hollow, under Inwood hill, in which is situated a cave explored by Alexander Chenoweth in 1895, and a large shell

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<sup>4</sup> The OPRHP site form indicates that the present repository of materials from the site is the "Heye Foundation ?" It is possible that the "Museum" referred to is the American Museum of Natural History, as Bolton (1909) was published by the latter institution.



and kitchenmidden deposit explored by Alanson Skinner in 1918-19. See this series, vol. II, no.6” (1920:307). Bolton (1922) states that “The sheltered side of Inwood Hill was a most desirable place for native residence, and extensive debris discovered on all favorable sites testifies to their long-continued occupancy. The mouth of Spuyten Duyvil creek bounds the hill on the north and partly on the east, and this portion of the waterway was included in the name applied by the natives to the locality, Shorakapkok, which Mr. Harrington suggests may be from *shaphakeyeu-aki*, referring to “wet-ground place” (1922:83). Bolton (1922) also contains a photograph labeled “An Indian path, the trail through Shorakapkok, the Inwood Village, Manhattan (Station 16, Map V). The photo shows an unpaved track passing through an area of dense brush and what appears to be secondary growth forest. A second photo, labeled “Rockshelters at Shorakapkok. (Station 16, Map V), shows a steep bedrock outcrop and what appears to be the entrance to a cave or rock-overhang. A third photo shows an exposed flexed burial and is labeled “Indian woman and child in a grave at Shorakapkok (Station 16, Map V), an arrowpoint was found in one of the woman’s ribs, indicating a violent death, Photograph by W.L. Calver, 1908.”

Bolton’s summary description of his Station 16 in his 1922 publication is different form, but not inconsistent with the description he provided in 1920”

“16. SHORAKAPKOK (Maps I, V). A name, fortunately preserved, applied to the locality under Inwood hill and to the western part of Spuyten Duyvil creek, on the bank of which, in the glen now called Cold Spring hollow, large deposits of debris, food-pits, and rock-shelters attest the long continued native residence. The well known cave is one of the features of Shorakapkok” (1920:225).

Skinner’s 1920 publication (referred to in his 1915 publication) does not mention Shorakapkok by name. However, he does include an extensive description of archeological excavations, by various individuals over several years, at what he terms “the most famous Indian village-site in tidewater New York.” He also includes a detailed map showing the locations of caves, rock shelters, shellpits and find spots in relation to Spuyten Duyvil Creek and “a path to 207<sup>th</sup> Street”. The map is difficult to orient (it does not have a north arrow) but it is apparent that the mapped location corresponds to an archeological site location on Bolton’s (1922) Map I and Map V (Figures 7a and 7b) more than a quarter-mile west of the Project APE. However, considerable confusion appears to have resulted from the fact that Skinner names, what is clearly part of Bolton’s Station 16, Skorakapok, the “Inwood Village Site” (see Section 3.2).

#### ***A061.01.00119 (Muscoota/Inwood Site)(Seaman Ave. Indian Burial Ground)<sup>5</sup>***

There is considerable confusion concerning the location of the site designated A061.01.00119 in OPRHP files. The OPRHP computerized SPHINX inventory identifies it as the “Seaman Ave. Indian Burial Ground, and describes its location as “northern Manhattan; between 204<sup>th</sup> and 207<sup>th</sup> St.; W. of Broadway.” However, OPRHP archeological files contain several different site inventory forms. The first, dated June 1, 1997, describes the location as “196-219<sup>th</sup> Streets, between Seaman-Academy<sup>6</sup>.” The same form cites as historical documentation of the site, Bolton (1922:224-225). That citation refers to Bolton’s description of his Station 15:

<sup>5</sup> Pasquariello and Loorya (2006) identify A061.01.00119 as ‘Brook Crossing’ (Table 3). No reference to “Brook Crossing” was found in any of the records or sources consulted as part of this study.

<sup>6</sup> Seaman Avenue and Academy Street intersect.



“MUSCOOTA (Map V). The modern Dyckman tract, comprising all the lowlands draining into Sherman basin, and the marsh meadows along the shore of Harlem river, which was referred to as “the Kil Muscoota.” These lands extend as far north as Marble hill. The name indicates a meadow or place where rushes grow. Around the tract evidence of native occupancy were found at 209<sup>th</sup> streets, 213<sup>th</sup> street, and at 219<sup>th</sup> street. In the interior of the area a ceremonial site at 212<sup>th</sup> street and sundry places marked by food pits have been discovered” (Bolton 1922:224-225).

It is clear from this description that Bolton was applying the name Muscoota to a *group* of individual archeological loci within a large general area (see Bolton’s Map V, reproduced here as Figures 7a and 7b). An examination of Bolton’s Map V indicates that the loci at 209<sup>th</sup> Street and 213<sup>th</sup> Street are located east of Ninth Avenue, near the Harlem River shoreline. The location of the 219<sup>th</sup> Street locus is less clear, but is probably the location shown on Map V, north of 218<sup>th</sup> Street and west of Broadway. Bolton (1909) refers to sites at 219<sup>th</sup> Street and 213<sup>th</sup> Street as being “along the west bank of the Harlem” (1909:79).

The 212<sup>th</sup> Street locus is mapped at a location between just west of Tenth Avenue. This is almost certainly the same site described by Bolton in his earlier 1909 publication. He reports there that “at 211-213 Streets, just west of Tenth Avenue, pits containing oyster shells, packed over and around the remains of a dog, and accompanied by broken pottery” were found (1909:79).

The second archeological site inventory form for A061.01.00119, dated October 26, 1976, gives the name of the site as the “Seaman Ave. Indian Burial Ground.” It gives as a location “Seaman Avenue., Cooper St., Academy St., Inwood Section, Northern Manhattan betw [sic] 204 & 207<sup>th</sup> St. W of Broadway. The form notes that there is no visible evidence of the site that the location is occupied by apartment house. The form cites Bolton (1909) as historical documentation. Bolton reproduces a detailed map of the site showing the locations of individual archeological features including shell pits, fire pits, human burials, and dog burials. The map indicates that the site is generally bounded by Seaman Avenue, Hawthorne Street (present-day 204<sup>th</sup> Street), Academy Street, and Cooper Street. This location is clearly marked as a major locus of aboriginal occupation on Bolton’s Map V.

It is apparent that the two versions of the inventory form for site A061.01.00119 are referring to different locations. However, all of the loci described above on both versions of the inventory form, are well distant from the Project APE.

#### ***A061-01-0534 / NYSM 4054 (Isham’s Garden)<sup>7</sup>***

New York State Museum files identify NYSM Site 4054 as corresponding with Parker’s (1922) New York County Site 4. The OPRHP SPHINX inventory lists it as “Seaman Avenue, Isham’s Garden (Parker #4) at Isham Street.” The complete citation from Parker is as follows “Village site in Seaman’s Garden on the line of Seaman avenue and Isham street. This seems to have been occupied for some time and a considerable variety of relics have been found” (1922:630).

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<sup>7</sup> Pasquariello and Loorya (2006) identify A061.01.0034 as the “Dongan Place” site, and the Isham’s Garden Site as A061.01.00537. JMA could find no record of an archeological site with the latter number in the SPHINX inventory, which associates the number with a standing structure in lower Manhattan. The Dongan Place Site is located in Ft. Tryon Park, west of the intersection of Dongan Place and Broadway. It has been assigned OPRHP site designation A061.01.0123. It is more than 0.25 miles southwest of the Project APE.



This seems to be the same location being referred to by Bolton who reports that “In the field, still farmed upon the estate of Mr. William B. Isham, at Seaman and Isham Avenues, a planting ground was evidently cultivated, the native tools therein found, the rich soil and favored location combining to indicate use” (1919:79). Bolton’s Map V shows a cultivated area at this location immediately adjacent to area where archeological remains were recovered. The location is well west of the project APE.

***A061-01-0114 (Harlem River Shellheaps)<sup>8</sup>***

The OPRHP archeological site inventory form for this site refers to it as the “Harlem River Shellheaps (dog burials).” Its location is described as “209-211 street east of 10<sup>th</sup> Ave nr. Harlem River.” This location places it well east of the Project APE.

***NYSM 4052***

NYSM 4052 is Parker’s (1922) New York County Site 2. The complete citation from Parker is as follows: Shell heap at 220<sup>th</sup> street and Kingsbridge road [Broadway] destroyed when the canal was dug. The shells were in a compact mass. Parker apparently based this report on an earlier report by Finch (1909) who refers to the location at the Harlem Ship Canal site.:

“Formerly at 220<sup>th</sup> Street and Kingsbridge Road was a large deposit of shells on the westerly side of the road. This was destroyed when the ship canal was put through. As with the Inwood Station site, no systematic examination of this place was ever made. Mr. John Neafie found some potsherds here. Mr. Calver says that this was a large deposit, and that the peculiar thing about it was that the shells were so wedged and packed together that a pick would hardly penetrate them. They lay on the bare rock surface in cracks in the rock” (Finch 1909:70).

The described location, in addition to having almost certainly been completely destroyed, is located well to the northwest of the Project APE.

***NYSM 4055***

NYSM 4055 is one of two loci that comprise Parker’s (1922) New York County Site 5. The complete citation from Parker is as follows: “A large complete pottery vessel of the Iroquoian type was found at 214<sup>th</sup> street and Tenth avenue. It was discovered during the course of municipal grading and had just barely escaped the spades of the workmen. It lay upon one side 18 inches below the sod line” (1922:630). Parker apparently based this report on an earlier report by Bolton:

“These finds [at Seaman Avenue] culminated in the discovery, by Mr. W.L. Calver, at 214<sup>th</sup> Street, about 100 feet east of 10<sup>th</sup> Avenue, of a fine jar of Iroquois pattern, about 13 inches in diameter and height. This interesting object protruded from the surface of a newly graded bank and had

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<sup>8</sup> Pasquariello and Loorya (2006) identify A061.01.00114 as the “Seaman Ave” site (Table 3). As noted above, the Seaman Avenue site is, in fact, site A061.01.00119. The confusion most likely stems from the fact that, as noted, two different forms for A061.01.00119 exist in OPRHP files.



been missed by the laborers by no more than an inch . . . .It lay upon its side, about eighteen inches below the sods and was quite intact” (1909:88-89).

The precise location places it well east of the Project APE.

### ***NYSM 4056***

NYSM 4056 is Parker’s (1922) New York County Site 6. The complete citation from Parker is as follows: “A trail ran around the rocks at the northern end of the island form [sic] the Dyckman village site to the mouth of Spuyten Duyvil creek. It was examined by the writer in 1904. The path was worn for more than an inch in the rock. There are rock shelters along the high banks west of the Dyckman tract site. This description clearly places the trail west of the Project APE, and not at a distance of “0 feet” as noted in Table 3 (above).

## **3.2. BOLTON’S MAP V**

Bolton (1922) is perhaps the most detailed compendium of archeological site data for New York City. As can be seen from the information in the previous section, much of the information about the previously recorded archeological sites discussed in the previous section is derived from Bolton. Bolton was intimately familiar with the work of Skinner, Calver, and Chenoweth and had first-hand knowledge of many of the archeological sites in northern Manhattan. For these reasons, his Map V, “Upper Manhattan, comprising the Inwood valley, the Dyckman tract, and Marble Hill” (Figures 7a and 7b) which accompanies his 1922 publication is believed to be exceptionally accurate.

Bolton does not identify his source for the topographic information on Map V. However, he does state that he used an 1837 J.H. Colton map in preparing maps for his 1920 publication. He may have used the 1836 Colter map (Figure 6) as the topographic base for Map V. The topographic features shown on Map V are all consistent with those shown on the Dripps, Viele, Randall and Colter maps (Figures 3-6). The Dripps and Randall maps include overlays of a hypothetical street grid which differs significantly from that which exists today. Bolton, however, has superimposed a street grid on Map V which matches in most particulars the present-day grid, and identifies most of the street locations used by Bolton and Skinner to identify the locations of archeological sites.

Some of the confusion with the designation of site names and locations described in the previous section is explained by Map V. Bolton’s Stations 15 (Muscoota) and 16 (Shorakapkok) are labeled as extremely large undefined areas including essentially all of, respectively, the northeast and northwest portions of Manhattan. It is clear that these same names, as assigned to specific sites with site numbers, and discussed in the Section 3.1, are referring to specific loci within these much larger areas. These individual loci are clearly marked as such on Map V. Of note is the fact that none of the locations on Map V showing where archeological remains were found is located *in* an area identified as swamp or marsh. However, many of the same locations are located immediately adjacent to such areas.

The Project APE can be plotted with some precision on Map V. Map V suggests that the southern end of the APE east of Tenth Avenue is located on made land. Map V shows that archeological materials were known by Bolton to have been found on both sides of Broadway, immediately north of Isham Street. No NYSM or OPRHP archeological site number appears to have been assigned to these loci. An extensive description of the site appears



in Skinner (1920):

“On March 7, 1919, two Indian kitchen-refuse deposits, situated on a vacant lot at the northeast corner of Broadway and Isham Street, were opened and examined.

The first shellbed proved to be a small thin kitchenmidden, ten or twelve feet square and two or three inches thick. Tests located nothing more than charcoal and small oyster-shells. The second deposit was a pit in the angle of Broadway and Isham Street, on the slope of a knoll. It was barrel-shaped, with a diameter of two and a half feet, by four feet deep. The contents were oyster-, hard-clam, soft-clam, and mussel-shells, a few deer- and fish-bones, and fragments of tortoise-shell. At a depth of six inches a bit of the stem of a white clay trade pipe was discovered, and at the depth of eight inches, the skeleton of a puppy was found standing erect heading west. Six inches deeper the entire pit was paved with the dorsal plates of a large sturgeon, carefully arranged with the rough surface down. This, however, was far from being the bottom of the pit. Four feet from the surface the charcoal and oyster-shells, sparser below the sturgeon scales, ended at a stone hearth, among the boulders of which lay a partially grooved stone clubhead or weight. A worked conch columella or wampum blank was also found.

Across the street in the northwest angle of Isham street and Broadway, a small shellheap was located. This was about fifteen feet across and twenty-five feet long by about a foot deep. Deer-bones, fish-bones, charcoal and burnt stones, flint chips and potsherds, were common. Rim fragments of five different jars of Algonkian [sic] and sub-Iroquois types were found.

A small pit two and a half feet across by two and a half feet deep was uncovered at the northeastern edge of the shellheap, but it held only oyster shells. Arrowheads, chips, a good grooved stone club, and potsherds were found on the surface nearby” (Skinner 1920:137-139).

The Project APE follows Broadway and crosses Isham Street. It therefore runs between, and in close proximity to the areas on either side of Broadway where remains were reported by Skinner.



## **4.0 CONCLUSIONS AND RECOMMENDATIONS**

### **4.1 SUMMARY AND CONCLUSIONS**

All of the Project's APE is located within paved streets, all of which contain extensive underground utilities that parallel the M29 cable route within the same streets. Original construction plans and specifications documenting the installation of utilities, and the grading and filling, and foundation construction associated with street construction could not be located and most likely do not exist. However, a review of standardized construction techniques for both streets and sewers, in use during the period contemporaneous with the construction of streets and sewers along the M29 cable route, strongly supports the position that extensive grading and excavation has effectively destroyed all original upper soil strata within this area, to a minimum depth of 18 inches to two feet, and to considerably greater depths where trenches for utility installation were excavated..

While it is possible that some areas of filling would have been required in the small areas at both ends of the Manhattan portion of the cable route where the Project APE crosses swampy/marshy land, these areas would also have been subjected to considerable disturbance in connection with the filling required for preparation of street foundations. These areas are also believed to be the areas of lowest archeological sensitivity along the entire portion of M29 cable route in Manhattan.

A review of the original documentation used to generate the information contained in the OPRHP/NYSM archeological site inventories, permitted considerable refinement of the locations of previously recorded archeological sites in the inventories. That review indicated that none of the archeological sites identified in the Phase IA survey report for the Project (Pasquariello and Loorya 2006) is located within or in close proximity to the Project APE. However, that review also indicated that archeological remains have been previously reported at a location which is not included in the NYSM/OPRHP archeological inventories.

Bolton's Map V shows that archeological remains were found on either side of Broadway, immediately north of Isham Street. Extensive midden deposits, including a dog burial, and pit features extending as much as four feet below the original ground surface, were recorded in this area by Skinner (1920). Given the depth of these features it is possible, although unlikely, that the remains of truncated pit features could be present beneath Broadway in this area.

### **4.2 RECOMMENDATIONS**

No Phase IB survey of any portion of the Project APE is recommended. However, given the proximity of the APE to previously reported archeological remains at one location, monitoring of construction as it proceeds through this area is recommended. This location is the area immediately north of the intersection of Broadway and Isham Street (Sta. 49+50 – 52+50). Monitoring should be carried out under the supervision of a Registered Professional Archeologist with a stop-work authority covering the area of any discovery and the immediately adjacent areas. In the event that the RPA determines that potentially significant archeological remains have been discovered, OPRHP should be immediately notified to determine a course of action. In the event that human remains are encountered, the Office of the Chief Medical Examiner should be contacted as well.



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## FIGURES



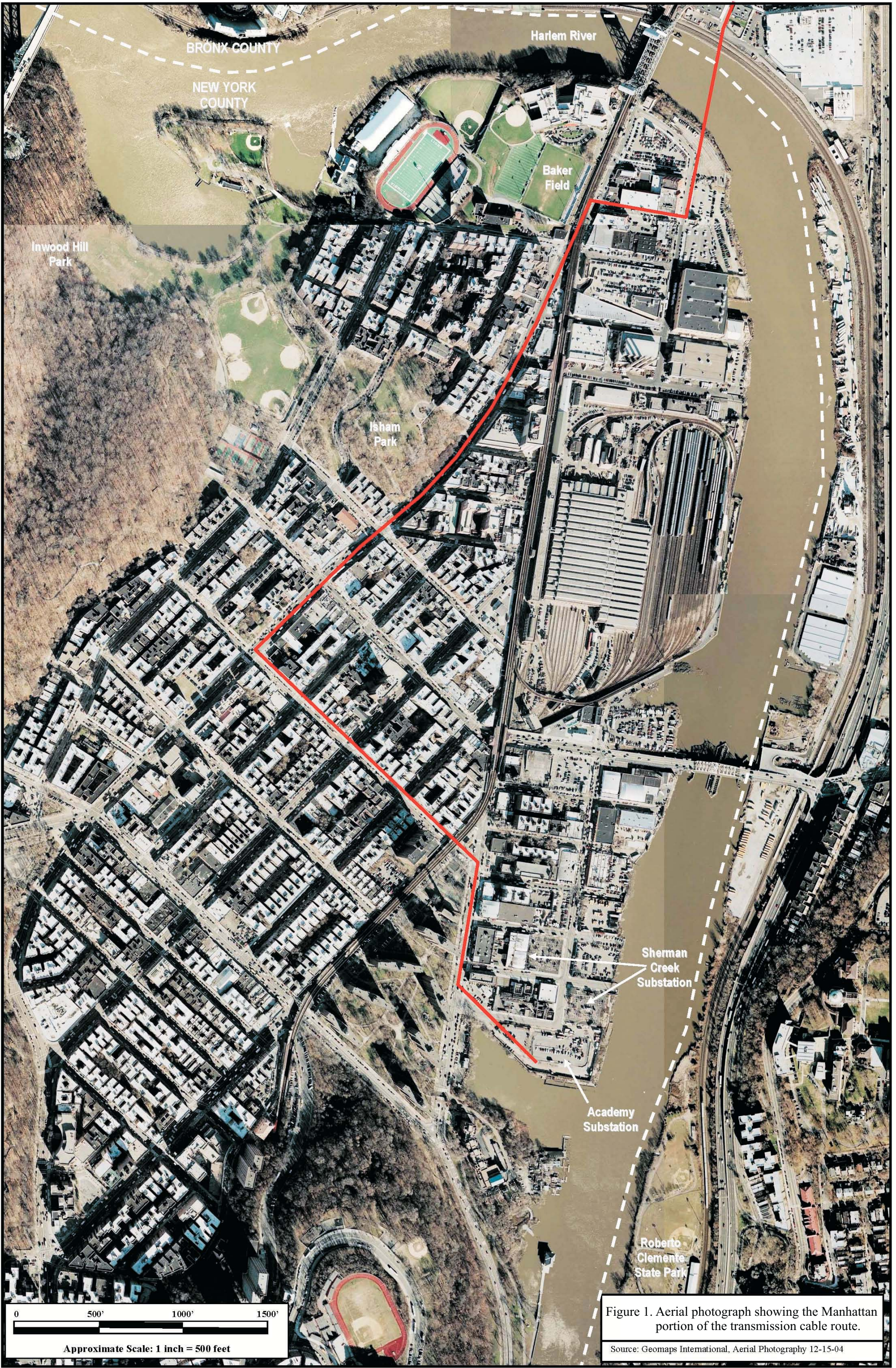


Figure 1. Aerial photograph showing the Manhattan portion of the transmission cable route.

Source: Geomaps International, Aerial Photography 12-15-04



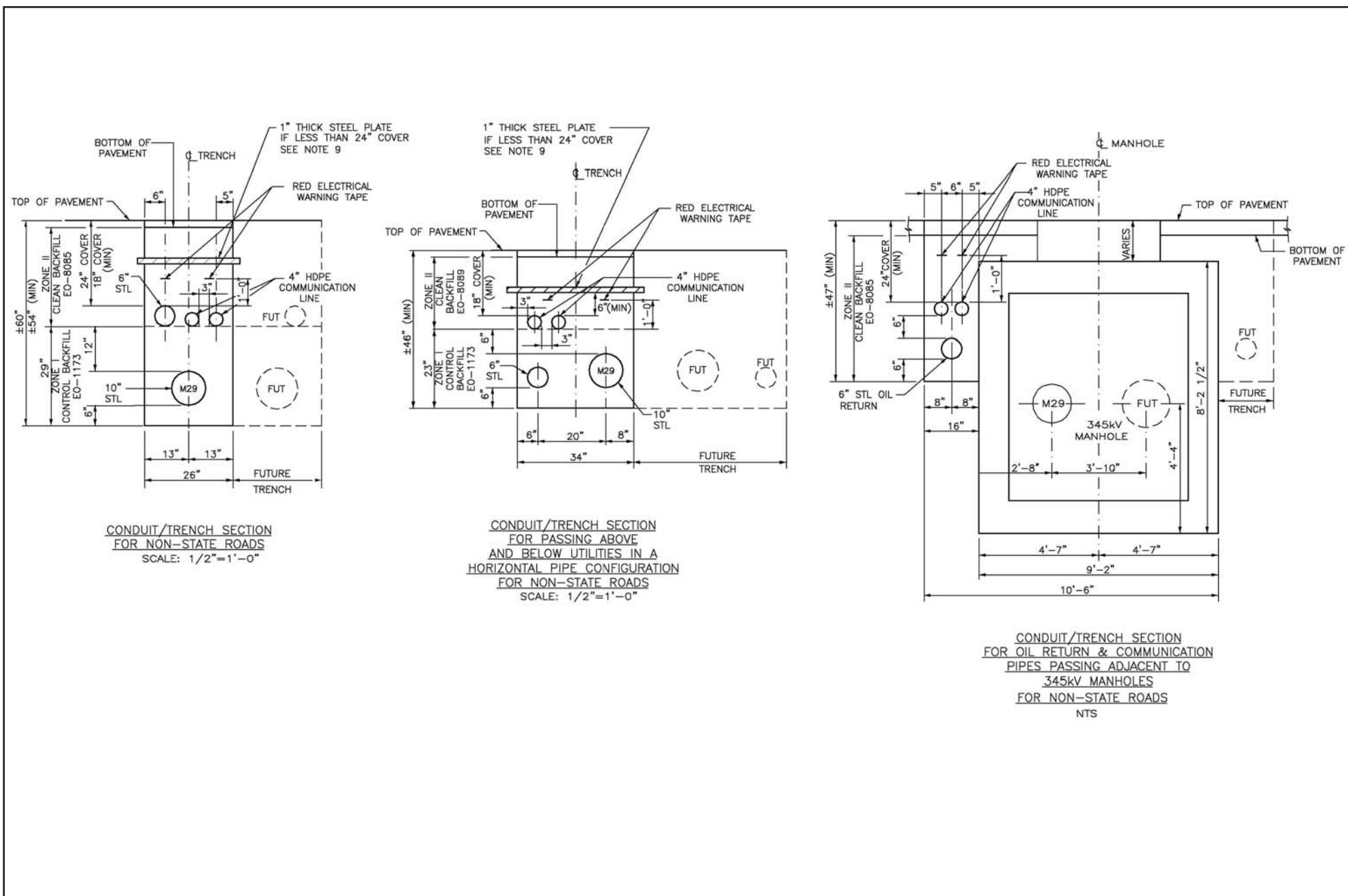


Figure 2. Cross-section: typical pipe-type trench dimensions for the M29 Cable in the City of New York.





Figure 3. A portion of the 1851 Dripps map showing northern Manhattan.





Figure 4. Inset from the 1865 Viele map showing northern Manhattan.





Figure 5a. Plate 25 from the 1867 edition of the 1815 Randall Farm Map.

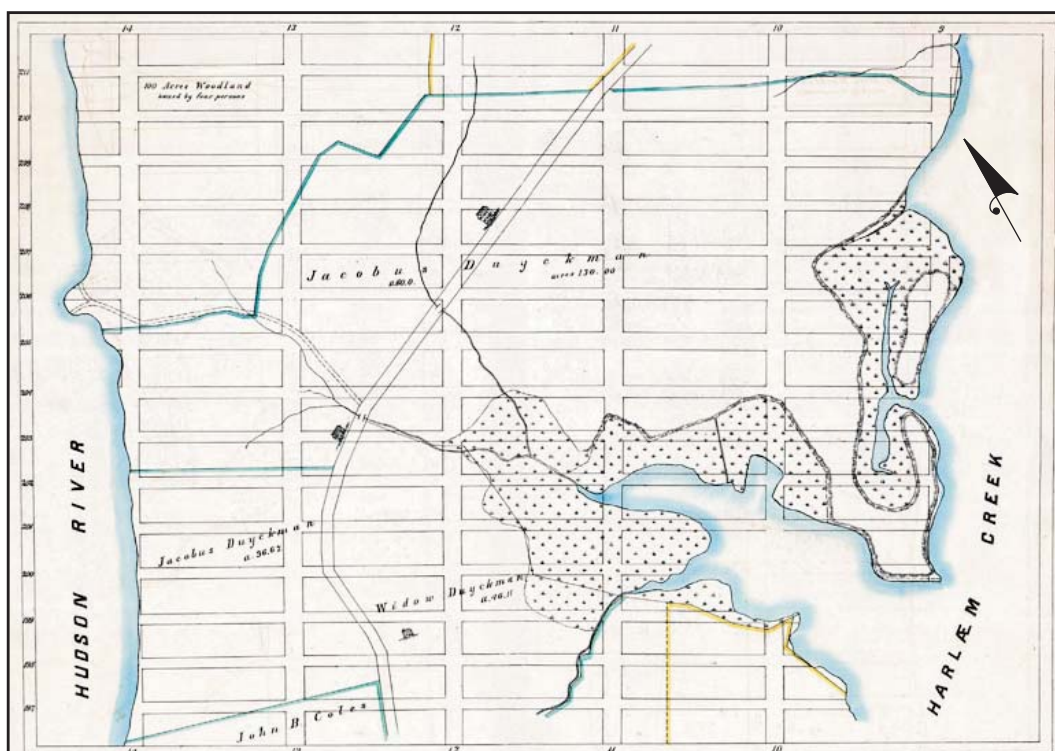


Figure 5b. Plate 26 from the 1867 edition of the 1815 Randall Farm Map.



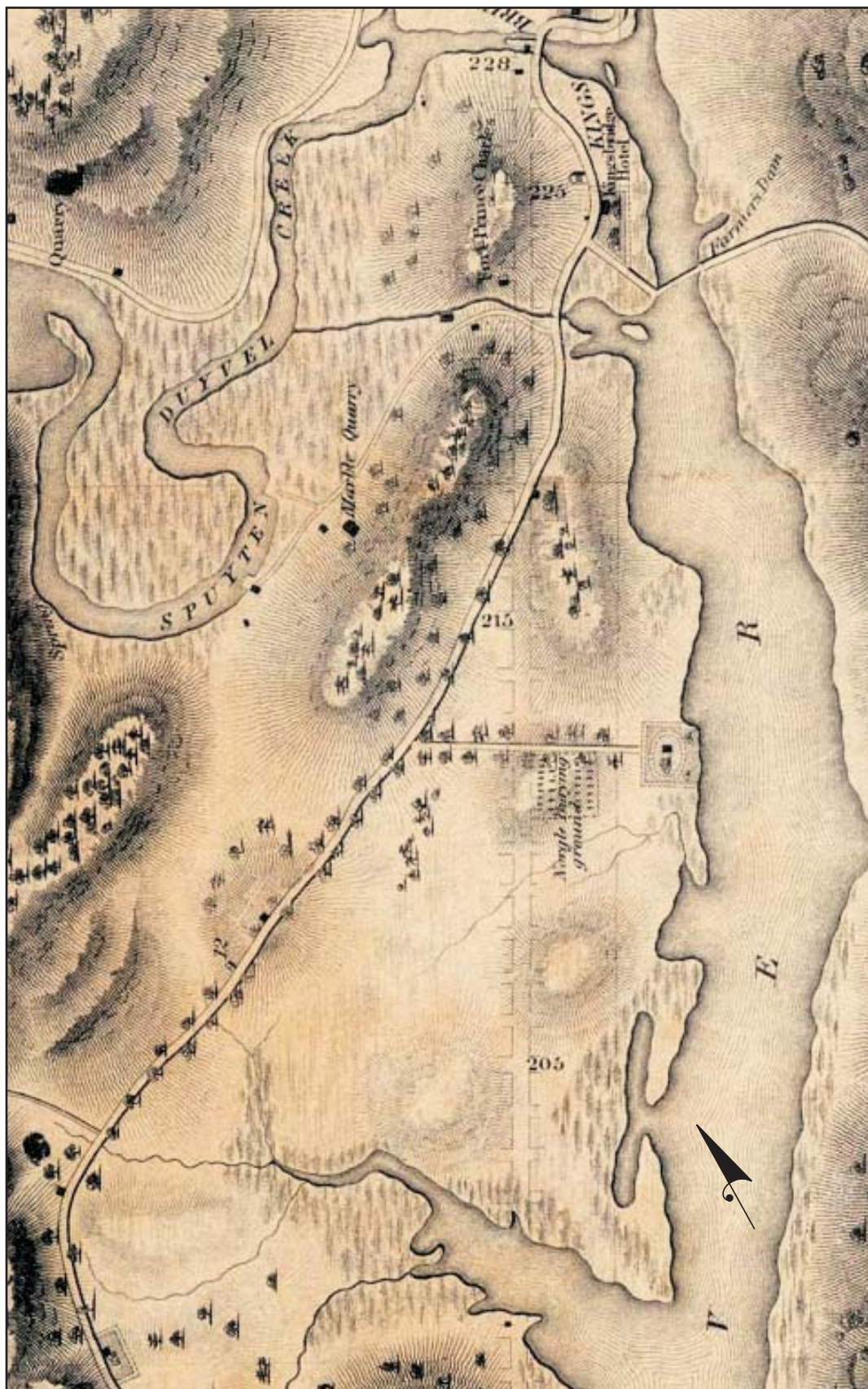


Figure 6. A portion of the 1836 Colter map showing northern Manhattan.

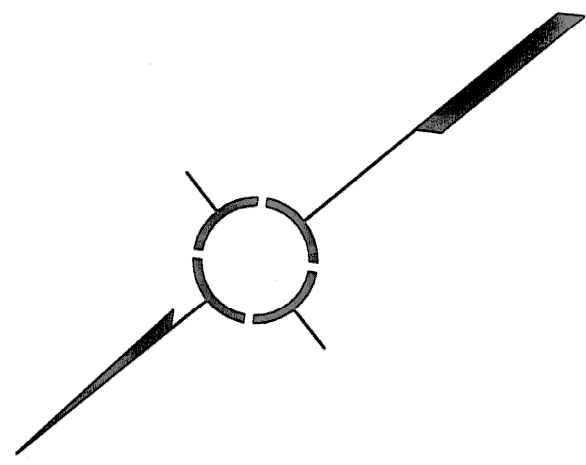






# APPENDIX I





CONDUIT TABLE M2  
(M-40078 - M-24150) 5'-3" T.C. (RET.)  
(M-40078 - M-24150) 4'-3" T.C. (RET.)  
(M-40078 - M-24150) 3'-3" T.C. (RET.)  
(M-40078 - M-24150) 2'-3" T.C. (RET.)  
(M-40078 - M-24150) 1'-3" T.C. (RET.)  
(M-40078 - M-24150) 0'-3" T.C. (RET.)  
(M-40078 - M-24150) 5'-3" T.C. (RET.)  
(M-40078 - M-24150) 4'-3" T.C. (RET.)  
(M-40078 - M-24150) 3'-3" T.C. (RET.)  
(M-40078 - M-24150) 2'-3" T.C. (RET.)  
(M-40078 - M-24150) 1'-3" T.C. (RET.)  
(M-40078 - M-24150) 0'-3" T.C. (RET.)

CONDUIT TABLE M1  
(M-43415 - M-40020) 5'-3" T.C. (RET.)  
(M-43415 - M-40020) 4'-3" T.C. (RET.)  
(M-43415 - M-40020) 3'-3" T.C. (RET.)  
(M-43415 - M-40020) 2'-3" T.C. (RET.)  
(M-43415 - M-40020) 1'-3" T.C. (RET.)  
(M-43415 - M-40020) 0'-3" T.C. (RET.)  
(M-43415 - M-40020) 5'-3" T.C. (RET.)  
(M-43415 - M-40020) 4'-3" T.C. (RET.)  
(M-43415 - M-40020) 3'-3" T.C. (RET.)  
(M-43415 - M-40020) 2'-3" T.C. (RET.)  
(M-43415 - M-40020) 1'-3" T.C. (RET.)  
(M-43415 - M-40020) 0'-3" T.C. (RET.)

CONDUIT TABLE M3  
(M-40078 - M-40020) 5'-3" T.C. (RET.)  
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(M-40078 - M-40020) 3'-3" T.C. (RET.)  
(M-40078 - M-40020) 2'-3" T.C. (RET.)  
(M-40078 - M-40020) 1'-3" T.C. (RET.)  
(M-40078 - M-40020) 0'-3" T.C. (RET.)  
(M-40078 - M-40020) 5'-3" T.C. (RET.)  
(M-40078 - M-40020) 4'-3" T.C. (RET.)  
(M-40078 - M-40020) 3'-3" T.C. (RET.)  
(M-40078 - M-40020) 2'-3" T.C. (RET.)  
(M-40078 - M-40020) 1'-3" T.C. (RET.)  
(M-40078 - M-40020) 0'-3" T.C. (RET.)

CONDUIT TABLE M4  
(M-40078 - M-40020) 5'-3" T.C. (RET.)  
(M-40078 - M-40020) 4'-3" T.C. (RET.)  
(M-40078 - M-40020) 3'-3" T.C. (RET.)  
(M-40078 - M-40020) 2'-3" T.C. (RET.)  
(M-40078 - M-40020) 1'-3" T.C. (RET.)  
(M-40078 - M-40020) 0'-3" T.C. (RET.)  
(M-40078 - M-40020) 5'-3" T.C. (RET.)  
(M-40078 - M-40020) 4'-3" T.C. (RET.)  
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(M-40078 - M-40020) 1'-3" T.C. (RET.)  
(M-40078 - M-40020) 0'-3" T.C. (RET.)

CONDUIT TABLE M5  
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(M-40078 - M-40020) 2'-3" T.C. (RET.)  
(M-40078 - M-40020) 1'-3" T.C. (RET.)  
(M-40078 - M-40020) 0'-3" T.C. (RET.)  
(M-40078 - M-40020) 5'-3" T.C. (RET.)  
(M-40078 - M-40020) 4'-3" T.C. (RET.)  
(M-40078 - M-40020) 3'-3" T.C. (RET.)  
(M-40078 - M-40020) 2'-3" T.C. (RET.)  
(M-40078 - M-40020) 1'-3" T.C. (RET.)  
(M-40078 - M-40020) 0'-3" T.C. (RET.)

CONDUIT TABLE M6  
(M-40078 - M-40020) 5'-3" T.C. (RET.)  
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(M-40078 - M-40020) 3'-3" T.C. (RET.)  
(M-40078 - M-40020) 2'-3" T.C. (RET.)  
(M-40078 - M-40020) 1'-3" T.C. (RET.)  
(M-40078 - M-40020) 0'-3" T.C. (RET.)  
(M-40078 - M-40020) 5'-3" T.C. (RET.)  
(M-40078 - M-40020) 4'-3" T.C. (RET.)  
(M-40078 - M-40020) 3'-3" T.C. (RET.)  
(M-40078 - M-40020) 2'-3" T.C. (RET.)  
(M-40078 - M-40020) 1'-3" T.C. (RET.)  
(M-40078 - M-40020) 0'-3" T.C. (RET.)

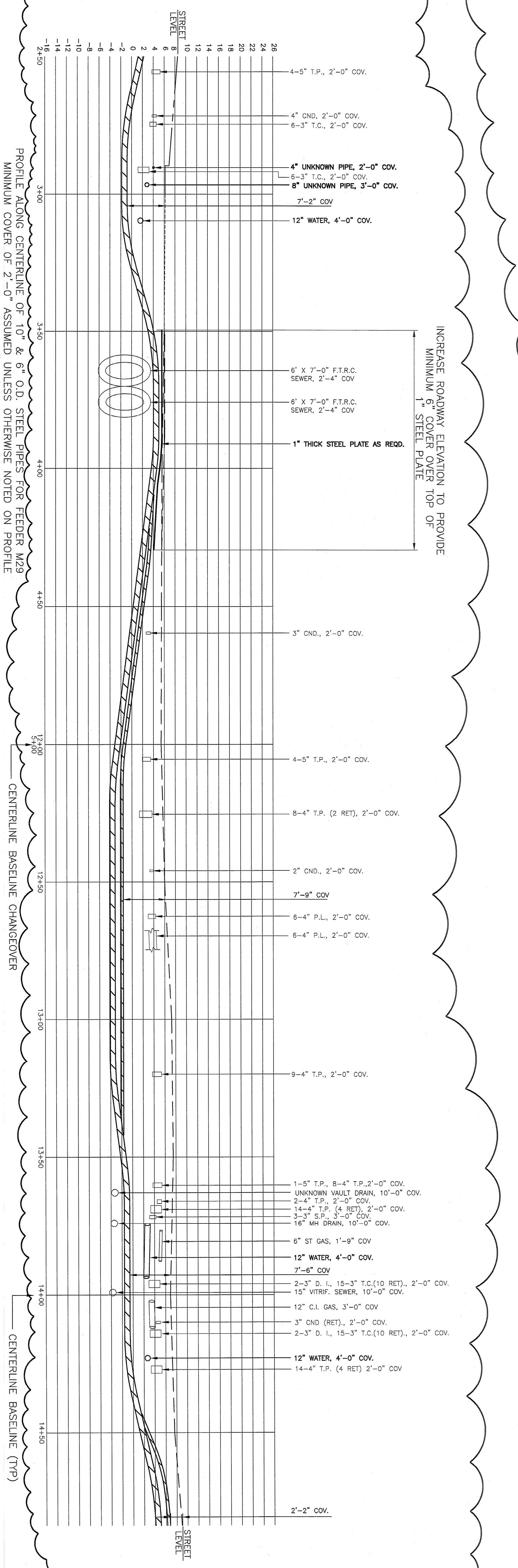
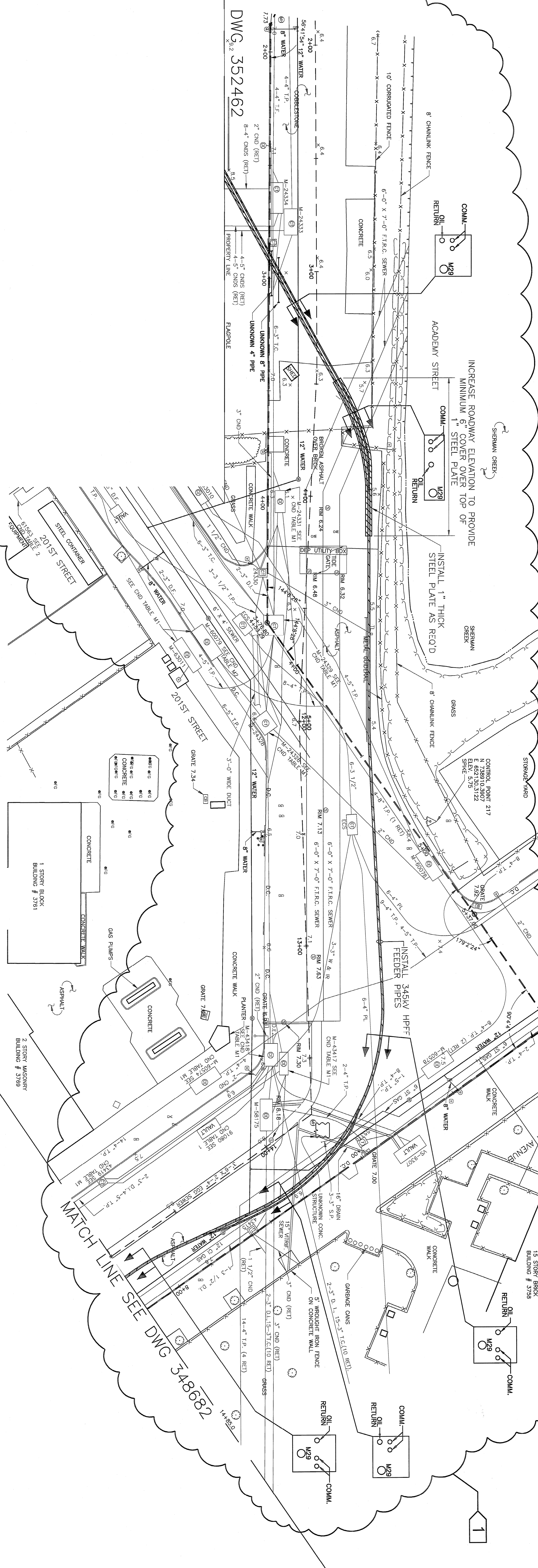
CONDUIT TABLE M7  
(M-40078 - M-40020) 5'-3" T.C. (RET.)  
(M-40078 - M-40020) 4'-3" T.C. (RET.)  
(M-40078 - M-40020) 3'-3" T.C. (RET.)  
(M-40078 - M-40020) 2'-3" T.C. (RET.)  
(M-40078 - M-40020) 1'-3" T.C. (RET.)  
(M-40078 - M-40020) 0'-3" T.C. (RET.)  
(M-40078 - M-40020) 5'-3" T.C. (RET.)  
(M-40078 - M-40020) 4'-3" T.C. (RET.)  
(M-40078 - M-40020) 3'-3" T.C. (RET.)  
(M-40078 - M-40020) 2'-3" T.C. (RET.)  
(M-40078 - M-40020) 1'-3" T.C. (RET.)  
(M-40078 - M-40020) 0'-3" T.C. (RET.)

CONDUIT TABLE M8  
(M-40078 - M-40020) 5'-3" T.C. (RET.)  
(M-40078 - M-40020) 4'-3" T.C. (RET.)  
(M-40078 - M-40020) 3'-3" T.C. (RET.)  
(M-40078 - M-40020) 2'-3" T.C. (RET.)  
(M-40078 - M-40020) 1'-3" T.C. (RET.)  
(M-40078 - M-40020) 0'-3" T.C. (RET.)  
(M-40078 - M-40020) 5'-3" T.C. (RET.)  
(M-40078 - M-40020) 4'-3" T.C. (RET.)  
(M-40078 - M-40020) 3'-3" T.C. (RET.)  
(M-40078 - M-40020) 2'-3" T.C. (RET.)  
(M-40078 - M-40020) 1'-3" T.C. (RET.)  
(M-40078 - M-40020) 0'-3" T.C. (RET.)

CONDUIT TABLE M9  
(M-40078 - M-40020) 5'-3" T.C. (RET.)  
(M-40078 - M-40020) 4'-3" T.C. (RET.)  
(M-40078 - M-40020) 3'-3" T.C. (RET.)  
(M-40078 - M-40020) 2'-3" T.C. (RET.)  
(M-40078 - M-40020) 1'-3" T.C. (RET.)  
(M-40078 - M-40020) 0'-3" T.C. (RET.)  
(M-40078 - M-40020) 5'-3" T.C. (RET.)  
(M-40078 - M-40020) 4'-3" T.C. (RET.)  
(M-40078 - M-40020) 3'-3" T.C. (RET.)  
(M-40078 - M-40020) 2'-3" T.C. (RET.)  
(M-40078 - M-40020) 1'-3" T.C. (RET.)  
(M-40078 - M-40020) 0'-3" T.C. (RET.)

MATCH LINE SEE DWG. 352462

MATCH LINE SEE DWG 348682



## PLAN LEGEND:

- RIGHT OF WAY LINE
- EDGE OF WALK/ CONCRETE
- FENCE LINE
- CONSTRUCTION BASELINE
- CONCRETE BASELINE
- CABLELINE
- OPENED WIRE
- PAINTED TRAFFIC LINE
- TREE LINE
- BRUSH LINE
- COLLUM
- SPOT ELEVATION
- PAV. PAVING
- CROSSWALK SIGNAL POLE

- MANHOLE OF UNKNOWN TYPE
- WATER MANHOLE
- CON. DESIGN MANHOLE
- SEWER MANHOLE
- C.I. & E.S. MANHOLE
- PRE MANHOLE
- E.C.S. MANHOLE
- D.P.M. MANHOLE
- SUBWAY MANHOLE
- STANDARD / SPRINKLER
- ENVIRONMENTAL WORKING POINT
- TRAFFIC TUBES
- UNKNOWN TUBES
- CABLE TELEVISION
- WELL COOR
- ELECTRIC PULBOX
- TREE PT
- REINFORCED CONCRETE SEWER PIPE
- WIRING SEWER PIPE

## PROFILE LEGEND:

- PROFILE CENTERLINE BASELINE
- PROFILE RIGHT OF WAY
- PROFILE LEFT OF WAY

## STATIONING LEGEND:

- STA. = STATIONING
- CONSTRUCTION BASELINE
- PI = POINT OF INTERSECTION
- PC = POINT OF CURVATURE
- PT = POINT OF TANGENCY
- PI = POINT OF INTERSECTION
- ANG. = ANGLE IN DEGREES
- L = DISTANCE FROM PI TO POINTS (R)

## STATIONING NOTES:

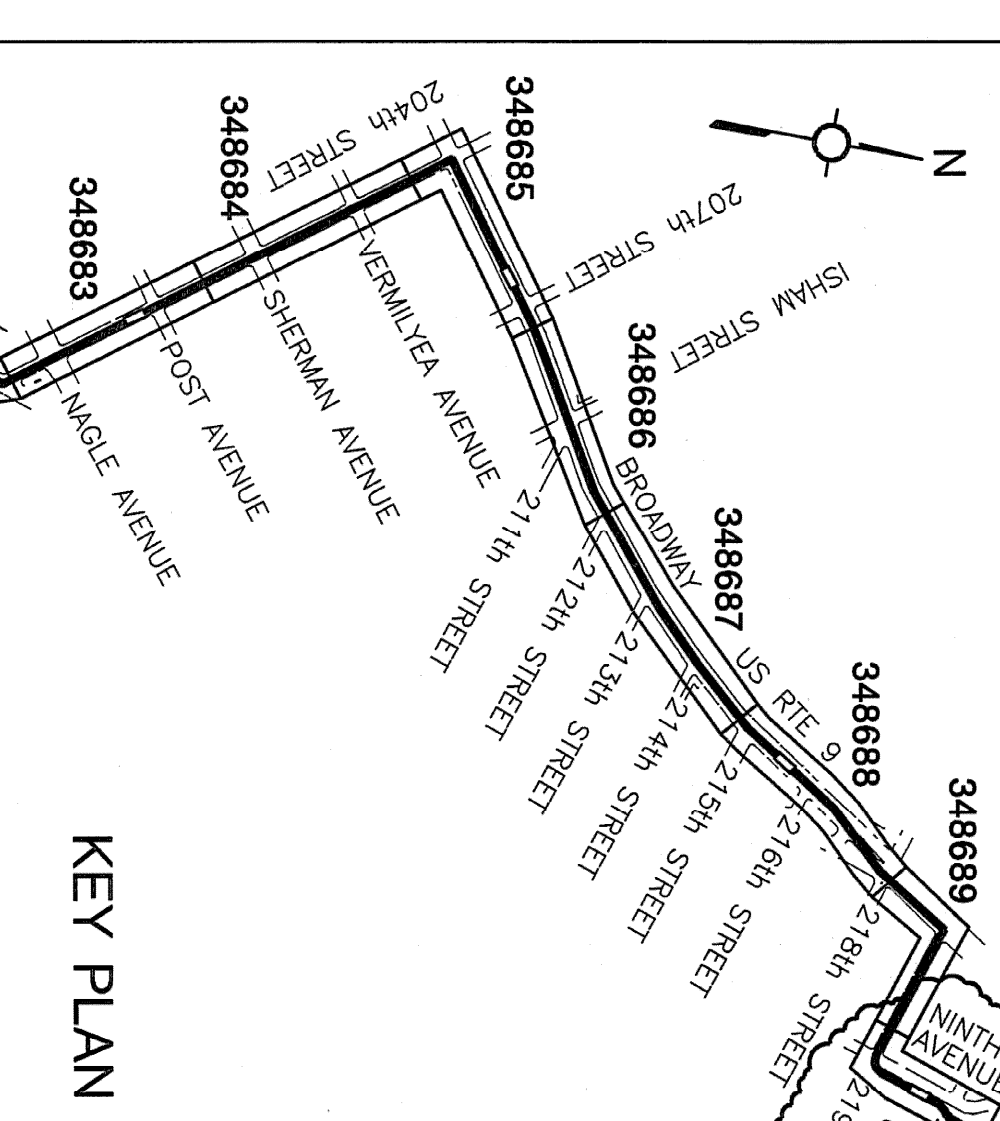
- STATIONS INDICATED ALONG THE BOTTOM OF THE DRAWING CORRESPOND TO THE STATIONS SHOWN ON THE PLANS.
- THE STATIONING OF THE PIPE/TRENCH ROUTE SHOWN ON THE PLANS ARE DERIVED FROM THE CONSTRUCTION BASELINE.
- ELEVATIONS REFER TO THE LEGS NORTH AMERICAN VERTICAL OF DATUM 1988 WHICH IS APPROXIMATELY 1.034 FT BELOW CONSOLIDATED YORK STATE PLANE EAST ZONE (NAD 83).
- COORDINATES AND BEARINGS REFER TO NEW YORK STATE PLANE EAST ZONE (NAD 83).

## SURVEY NOTES:

- ELEVATIONS REFER TO THE LEGS NORTH AMERICAN VERTICAL OF DATUM 1988 WHICH IS APPROXIMATELY 1.034 FT BELOW CONSOLIDATED YORK STATE PLANE EAST ZONE (NAD 83).
- COORDINATES AND BEARINGS REFER TO NEW YORK STATE PLANE EAST ZONE (NAD 83).

## NOTES:

- CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFICATION, PRIOR TO CONSTRUCTION, OF THE EXACT LOCATION OF ALL BURIED FACILITIES IN THE VICINITY OF CONSTRUCTION INDICATED ON THESE DRAWINGS. CONTRACTOR SHALL OBTAIN A SEARCH OF THE AVAILABLE RECORDS, ADDITIONAL UNDERGROUND UTILITIES, AND SURVEY DATA FROM THE RESPONSIBLE AGENCY TO OBTAIN THE EXACT LOCATION OF TROTTLE.
- SEWER AND WATER CONNECTIONS TO BUILDING EXIST IN STREETS, BUT SPECIFIC LOCATIONS ARE NOT KNOWN FOR THE PURPOSES OF THIS DRAWING. CONTRACTOR SHALL OBTAIN THE EXACT LOCATION OF TROTTLE.
- CATCH BASIN PIPE LOCATION AND DEPTH ARE APPROXIMATE AND ASSUMED. ACTUAL FIELD INSTALLATION OF TRENCHES SHALL BE DETERMINED BY THE CONTRACTOR.
- FOR PIPE SIZES, TYPES, TRENCH CONFIGURATION, AND TRENCH DETAILS SEE DRAWING 348682 & 348680.
- TROTTLE RAIS MAY EXIST BELOW ROAD SURFACE ON THE DRAWINGS. AS WITH ALL UNDERGROUND FACILITIES, CONTRACTOR SHALL OBTAIN THE RESPONSIBLE AGENCY TO OBTAIN THE EXACT LOCATION OF TROTTLE.
- FOR LEGEND SEE DRAWING 348682 & 348680.
- THE MINIMUM BENDING RADIUS OF ALL STEEL AND HDPE PIPES SHALL BE 40 FEET.
- ALL TRENCHES SHALL BE 40 FEET WIDE.
- WHERE 1-INCH THICK PLATES ARE REQUIRED TO BE INSTALLED, CONTRACTOR SHALL INSTALL SQUARE-TYPE TRENCHES. THE PLATES SHALL BE 18 INCHES LONG AND 18 INCHES WIDE. THE PLATES SHALL BE LOCATED AT THE BOTTOM OF THE TRENCH ON FIRM UNDISTURBED SOIL.



## KEY PLAN

COMPUTER GENERATED DRAWING NOT TO BE HAND REVISED

SCALE: 1" = 20'

DESIGNER: M. LAZAR / D. FERRIOLA

DESIGNER: WASHINGTON GROUP INT.

SCALE: 1" = 20'

DESIGNER: M. LAZAR / D. FERRIOLA

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SCALE: 1" = 20'

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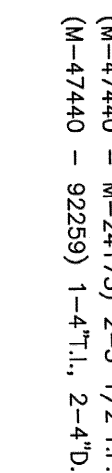












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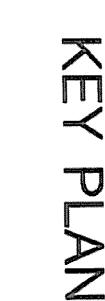
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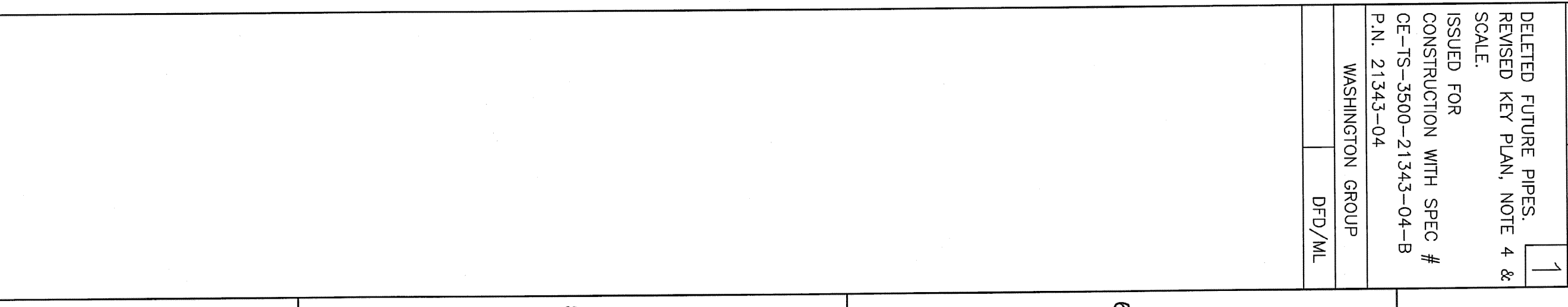
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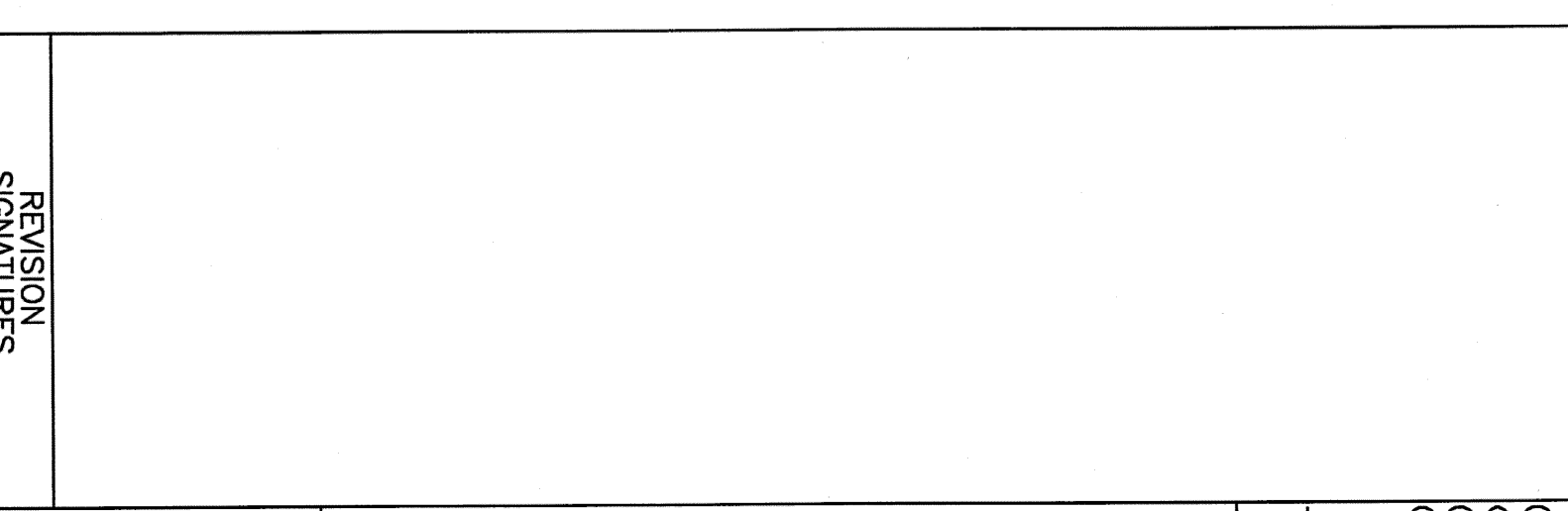


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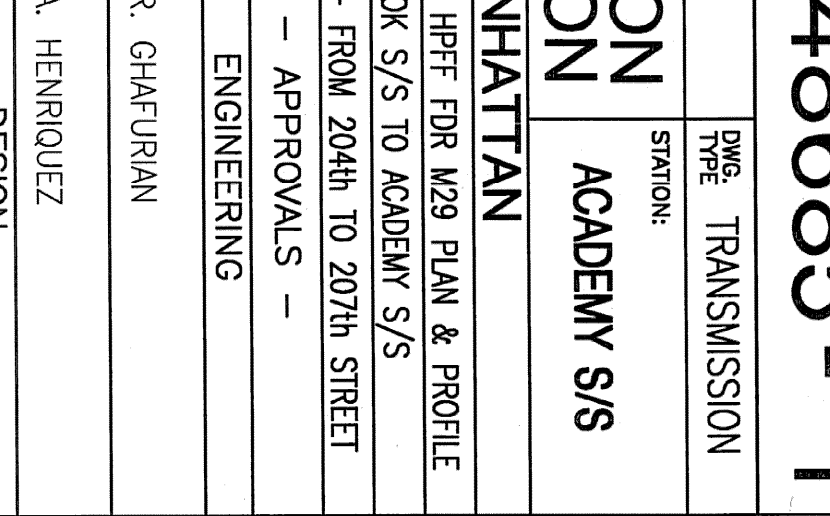
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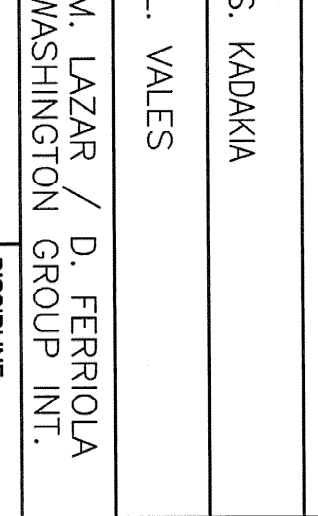
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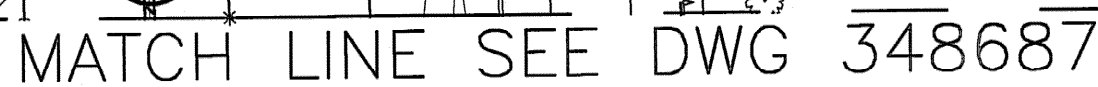
APPROVALS -
ENGINEERING
R. GHAFURIAN
A. HENRIQUEZ
DESIGN



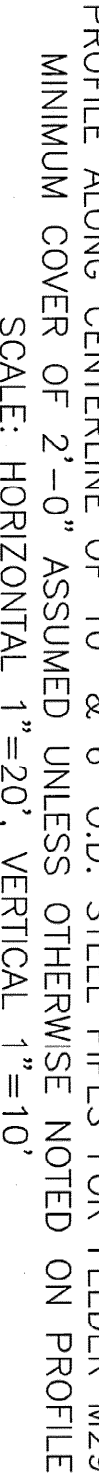
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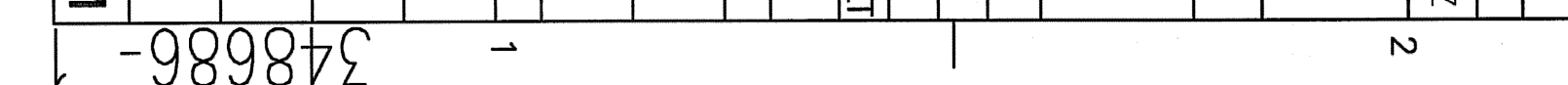
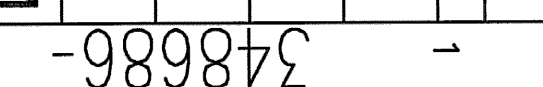
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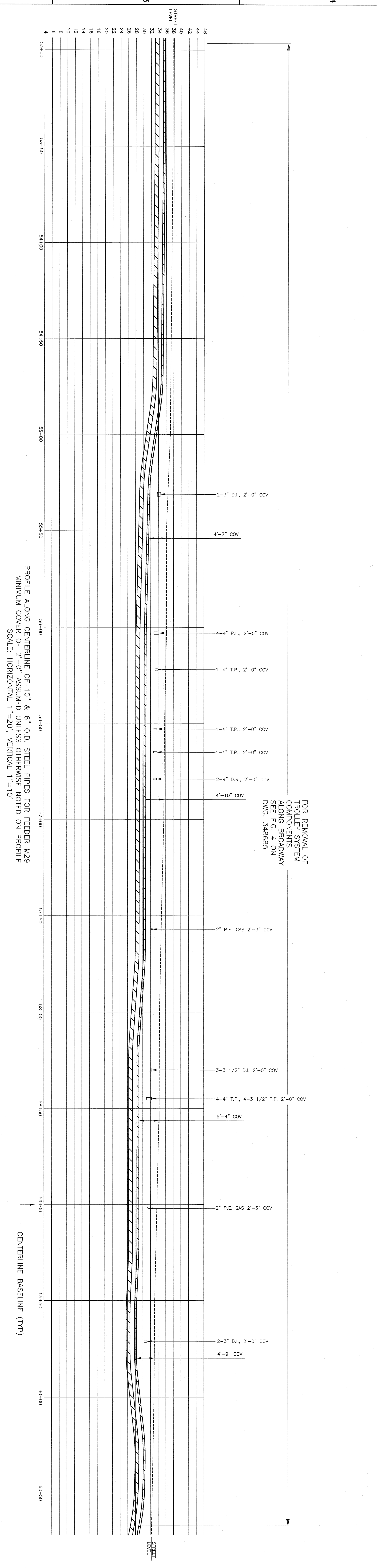
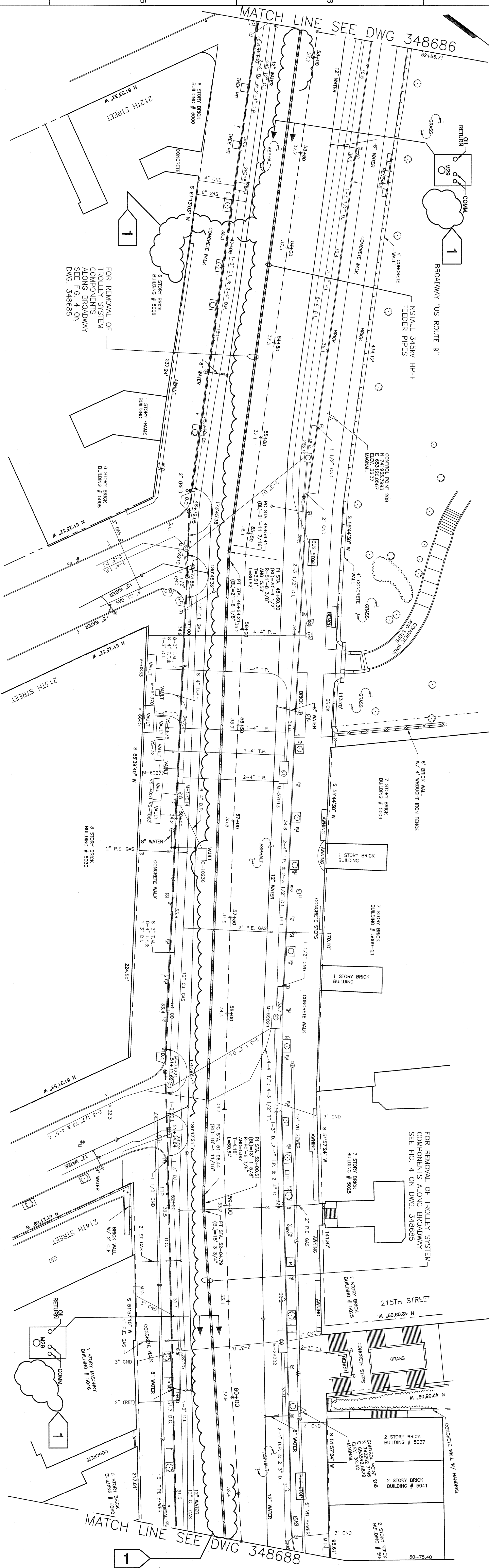


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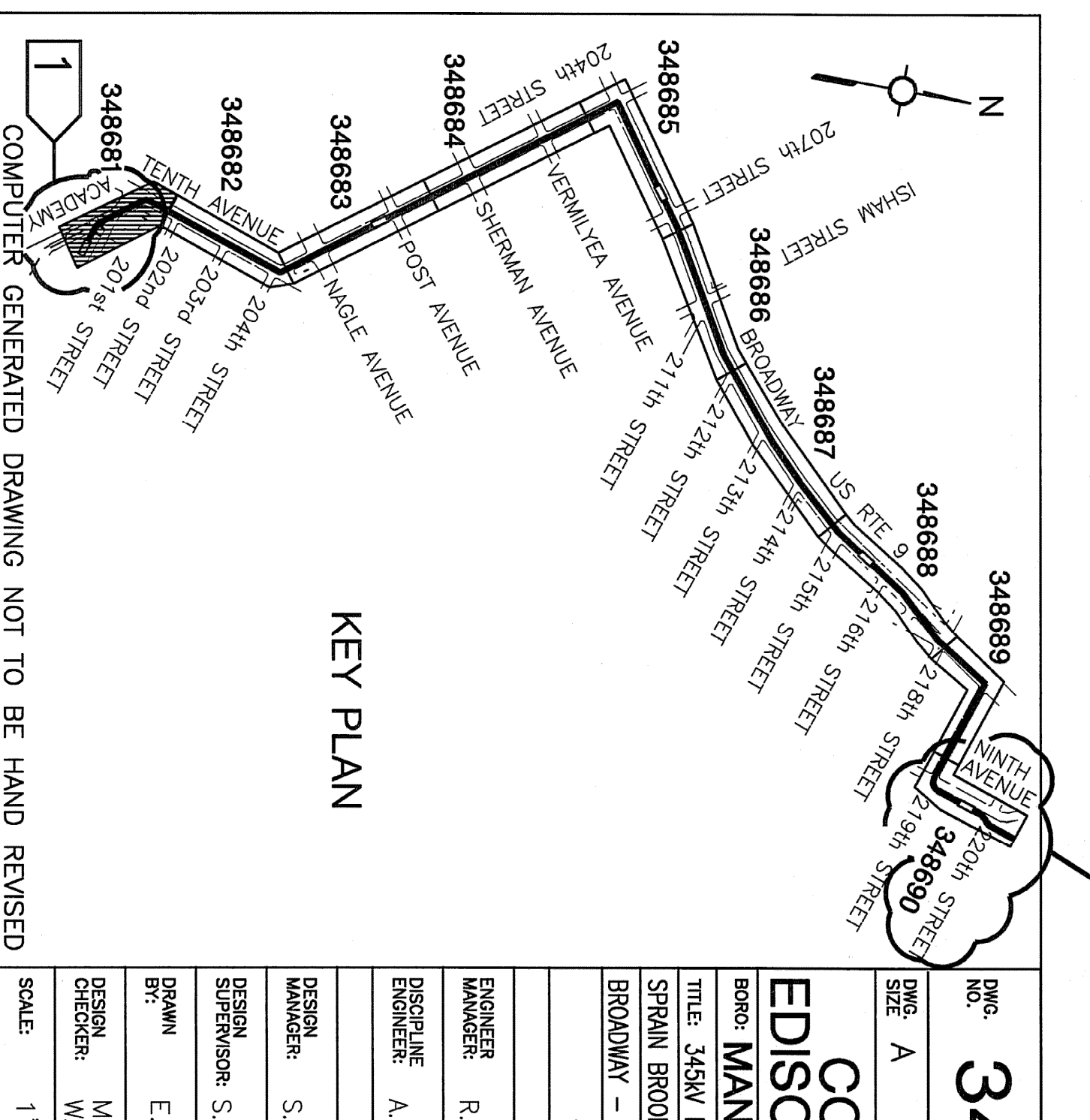
REV	DESCRIPTION	DATE
0	ISSUED FOR CONSTRUCTION WITH SPEC # CE-15-3500-21343-04-8	02/02/08
1	DELETED FUTURE PIPES, REVISED KEY PLAN, NOTE 4 & SCALE	02/02/08
2	CONSTRUCTION WITH SPEC # CE-15-3500-21343-04-8	02/02/08
3	WASHINGTON GROUP	02/02/08



- STATIONING LEGEND:**
- STA = STATIONING
  - (BL) = DISTANCE FROM THE BEGINNING OF THE PROJECT
  - PT = POINT OF INTERSECTION
  - PC = POINT OF CURVATURE
  - PI = POINT OF INTERSECTION
  - ANG = ANGLE IN DEGREES
  - T = DISTANCE FROM PT TO PI
  - L = DISTANCE FROM PI TO PVI
- STATIONING NOTES:**
- STATIONS INDICATED ALONG THE BOTTOM OF THE PROFILE CORRESPOND TO THE STATIONS SHOWN ON THE PLAN.
  - THE STATIONING OF THE PRE/FRENCH ROUTE SHOWN ON THE PLANS ARE DERIVED FROM THE CONSTRUCTION BASELINE.

- NOTES:**
- CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFICATION, CORRECTION, AND REVISION OF THE PLANS. THE LOCATION OF THE BURIED FACILITIES, INCLUDING THE LOCATION OF THE BURIED FACILITIES, SHALL BE VERIFIED BY THE CONTRACTOR. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE LOCATION OF THE BURIED FACILITIES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE LOCATION OF THE BURIED FACILITIES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE LOCATION OF THE BURIED FACILITIES.
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KEY PLAN

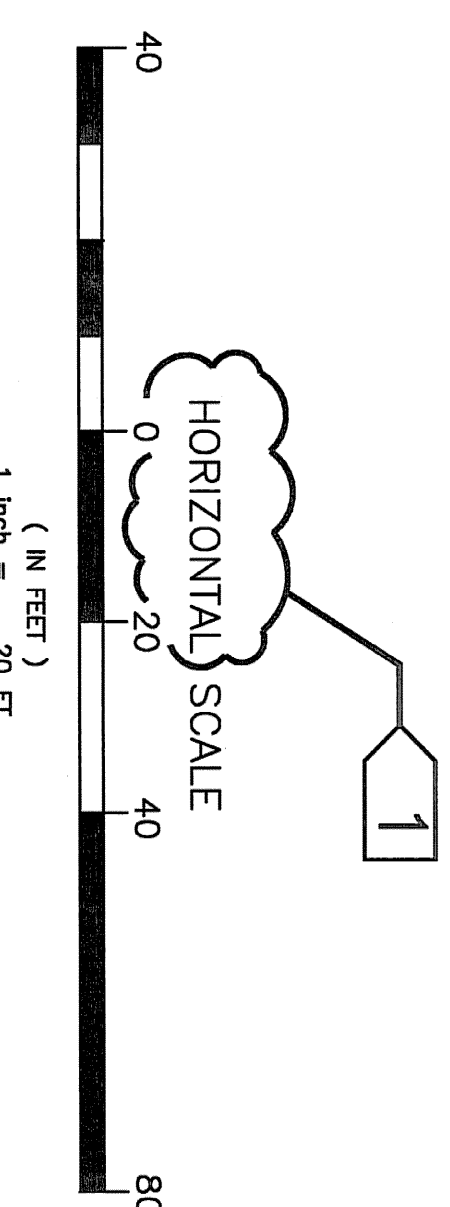
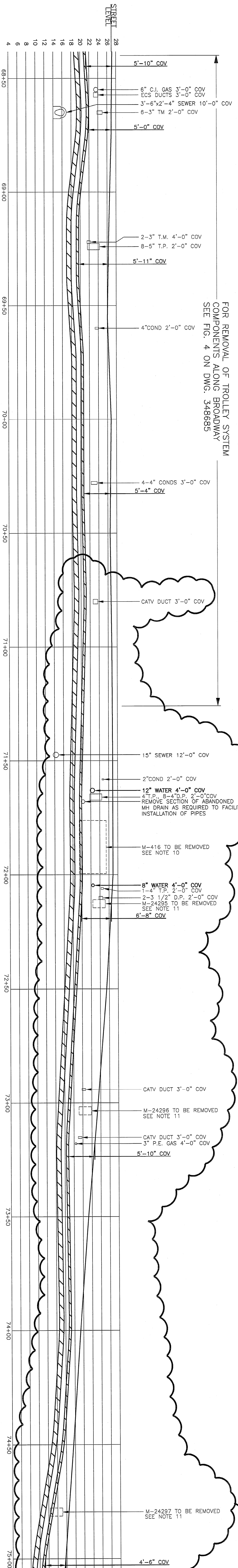
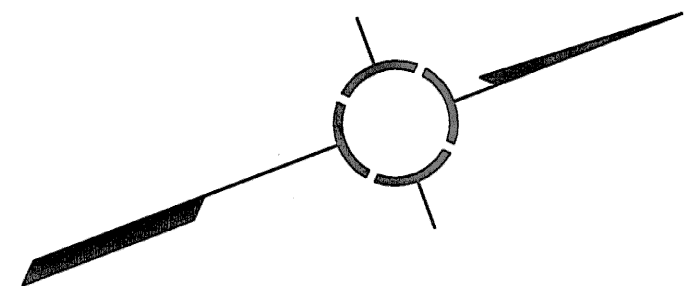


REV	DESCRIPTION	DATE
1	ISSUED FOR CONSTRUCTION WITH SPEC # CE-15-3500-21343-04-8	02/02/08
2	DELETED FUTURE PIPES, REVISED KEY PLAN, NOTE 4 & SCALE	02/02/08
3	CONSTRUCTION WITH SPEC # CE-15-3500-21343-04-8	02/02/08
4	WASHINGTON GROUP	02/02/08









STATIONING LEGEND:

STA. = STATIONING ALONG & OF THE  
(BU) = DISTANCE FROM THE CONSTRUCTION  
PT = POINT OF TANGENCY  
PC = POINT OF CURVATURE  
R = RADIUS OF CIRCLE  
ANG. = ANGLE IN DEGREES PT TO PT  
L = DISTANCE FROM PT TO POINTS (R)

NOTES (CONT'D):

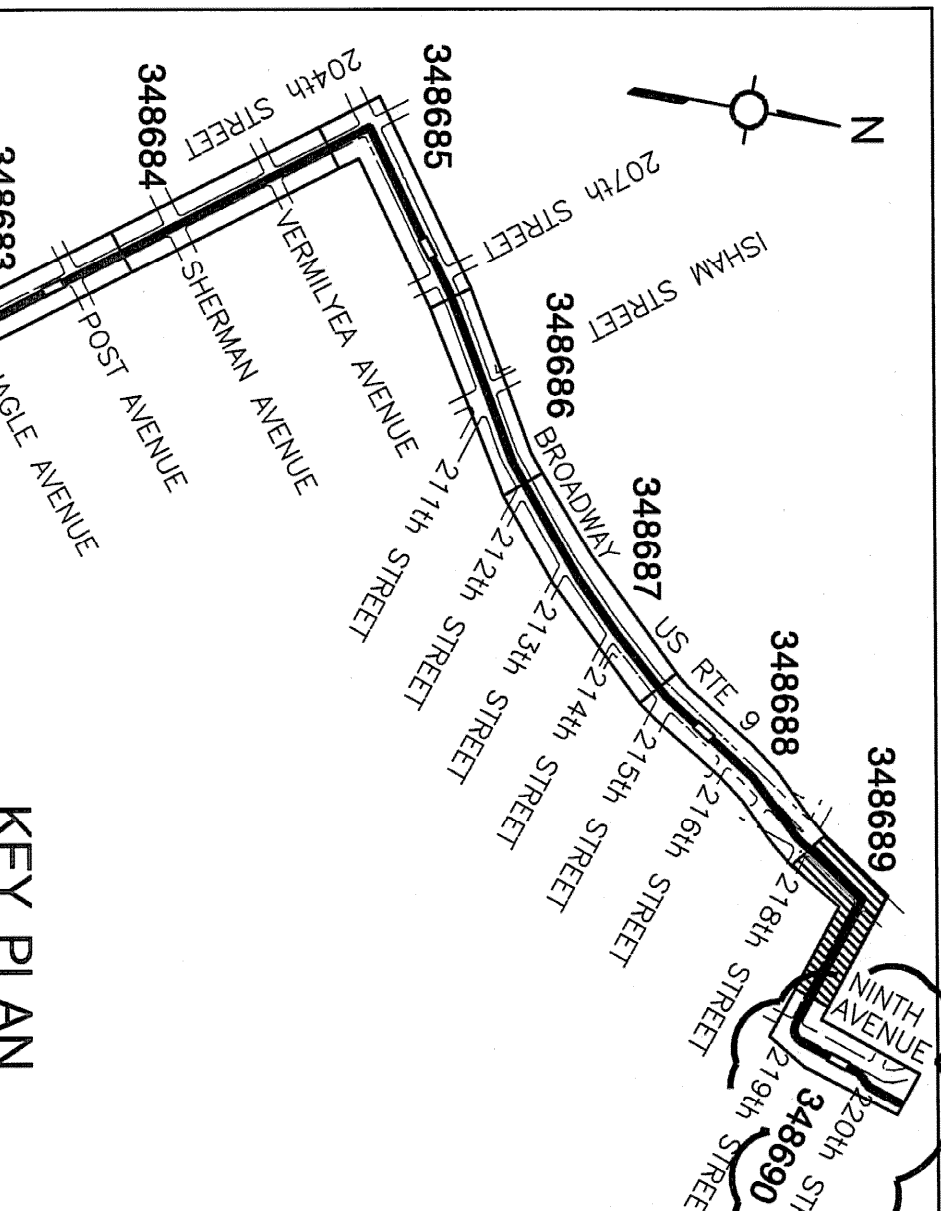
1. STATIONS INDICATED ALONG THE BOTTOM  
2. THE STATIONING OF THE PIPE/TRENCH ROUTE  
SHOWN ON THE PLANS IS DERIVED FROM THE  
CENTERLINE BASELINE.

1. CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFICATION,  
PRIOR TO CONSTRUCTION, OF THE EXIST. LOCATION OF  
ALL UTILITIES. LOCATIONS OF UTILITIES NOT SHOWN ON  
THESE PLANS SHALL BE OBTAINED BY A SEARCH  
ON THE GROUND. THE LOCATIONS OF THE UTILITIES  
OBTAINED BY SEARCH SHALL BE SHOWN ON THESE PLANS.  
2. SINKS AND WATER CONNECTIONS TO BUILDING EXIST IN  
STREETS. CONTRACTOR SHALL VERIFY LOCATION AND DEPTH  
AND TRENCH DETAILS SEE DRAWING 348687 AND 348689.  
3. CATCH BASIN PIPE LOCATION AND DEPTH ARE  
NOT SHOWN ON THESE PLANS. CONTRACTOR SHALL  
VERIFY LOCATION AND DEPTH AND TRENCH DETAILS  
SEE DRAWING 348687 AND 348689.  
4. FOR PIPE SIZES, TYPES, TRENCH CONFIGURATION  
AND TRENCH DETAILS SEE DRAWING 348687 AND 348689.  
5. TRENCH PILES MAY EXIST BELOW ROAD SURFACE  
ON THESE PLANS. CONTRACTOR SHALL VERIFY LOCATION  
AND DEPTH AND TRENCH DETAILS SEE DRAWING 348687  
AND 348689.  
6. THE MINIMUM BEARING RADIUS OF ALL STEEL AND  
IRON SHALL BE 100 FEET.  
7. THE MINIMUM BEARING RADIUS OF ALL STEEL AND  
IRON SHALL BE 100 FEET.  
8. WHERE 1-INCH THICK PLATES ARE REQUIRED TO BE  
INSTALLED, CONTRACTOR SHALL INSTALL SQUARE-TYPE  
PLATES TO SUPPORT THE PLATES. THE BOTTOM OF THE PLATES  
SHALL BE LOCATED AT THE BOTTOM OF THE TRENCH ON FIRM  
UNDISTURBED SOIL.

NOTES:

1. CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFICATION,  
PRIOR TO CONSTRUCTION, OF THE EXIST. LOCATION OF  
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THESE PLANS SHALL BE OBTAINED BY A SEARCH  
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INSTALLED, CONTRACTOR SHALL INSTALL SQUARE-TYPE  
PLATES TO SUPPORT THE PLATES. THE BOTTOM OF THE PLATES  
SHALL BE LOCATED AT THE BOTTOM OF THE TRENCH ON FIRM  
UNDISTURBED SOIL.

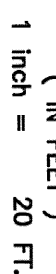
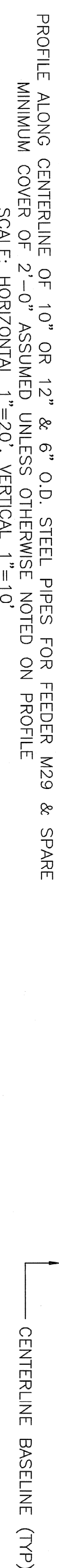
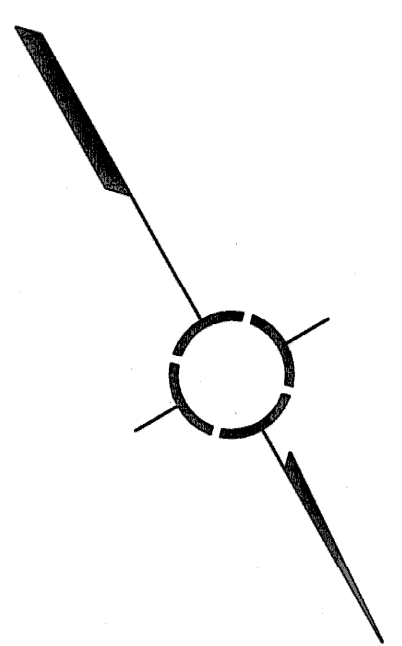
KEY PLAN



REVISION		DATE	BY	CHK
1	ISSUED FOR CONSTRUCTION WITH SPEC # CE-TS-3500-21343-04-B	02/03/06	ML/DF	
2	REROUTED M29 PILES TO SOUTH SIDE OF 219TH STREET AND 21ST STREET AND 11. & REVISED KEY PLAN DELTED FUTURE PILES.	02/03/06	ML/DF	
3	CE-TS-3500-21343-04-B	02/03/06	ML/DF	
4	WASHINGTON GROUP	02/03/06	ML/DF	

DESIGNED BY: R. CHARTMAN	DESIGNED BY: R. CHARTMAN
ENGINEER: A. HENRIQUEZ	ENGINEER: A. HENRIQUEZ
DESIGNED BY: S. RAZZOUL	DESIGNED BY: S. RAZZOUL
DESIGNED BY: S. KADAMA	DESIGNED BY: S. KADAMA
DESIGNED BY: A. RUSU	DESIGNED BY: A. RUSU
DESIGNED BY: M. LAZAR / D. TERRILL	DESIGNED BY: M. LAZAR / D. TERRILL
DESIGNED BY: WASHINGTON GROUP INT.	DESIGNED BY: WASHINGTON GROUP INT.
SCALE: 1" = 20'	SCALE: 1" = 20'





6. FOR LEGEND SEE DRAWING 348691.
7. THE MINIMUM BENDING RADIUS OF ALL STEEL AND HOPE PIPES SHALL BE 40 FEET.
8. THE FEEDER PIPE AND OIL RETURN PIPE SHOWN AS FUTURE ARE NOT TO BE INSTALLED AS PART OF THE M29 PROJECT.
9. WHERE 1-INCH THICK PLATES ARE REQUIRED TO BE INSTALLED, CONTRACTOR SHALL INSTALL COMBINATION-PIPE SUPPORTS TO SUPPORT BOTH SIDES OF THE TENSION MEMBER.

WASHINGTON GROUP INT.



## APPENDIX II





West 201<sup>st</sup> and Academy streets, view to the north.



West 201<sup>st</sup> and Academy streets, view to the north



West 201<sup>st</sup> and Academy streets, view to the north. Note Tenth Avenue in background.





Junction of Academy Street and Tenth Avenue, view to the east/northeast.



Tenth Avenue and West 202<sup>nd</sup> Street, view to the east/northeast/



Tenth Avenue and West 202<sup>nd</sup> Street, view to the east/northeast.





Tenth Avenue and West 204<sup>th</sup> Street, view to the east/northeast.



West 204<sup>th</sup> Street and Nagle Avenue intersection, view to the north/northwest.



West 204<sup>th</sup> Street and Nagle Avenue intersection, view to the north/northeast.





West 204<sup>th</sup> Street between Nagle Avenue and Post Avenue, view to the northwest.



West 204<sup>th</sup> Street and Post Avenue intersection, view to the northwest.



West 204<sup>th</sup> Street and Sherman Avenue intersection, view to the south.





West 204<sup>th</sup> Street and Sherman Avenue, view to the north. Note Vermilyea Avenue in background.



West 204<sup>th</sup> Street and Vermilyea Avenue, view to the north.



Intersection of West 204<sup>th</sup> Street and Vermilyea Avenue, view to the north. Note Broadway (Rt 9) in background at top of hill.





Broadway (Rt 9) at West 204<sup>th</sup> Street Intersection, view to the east.



Broadway (Rt 9) at West 207<sup>th</sup> Street, view to the northeast.



Broadway (Rt 9) and Isham Street, view to the west.





Broadway (Rt 9) and West 212<sup>th</sup> Street,  
view to the east/northeast.



Broadway (Rt 9) and West 212<sup>th</sup> Street (Joe  
English Way), view to the east/northeast.



Broadway (Rt 9) and West 213<sup>th</sup> Street,  
view to the east.





Broadway (Rt 9) and West 214<sup>th</sup> Street,  
view to the north/northeast.



Broadway (Rt 9) and West 214<sup>th</sup> Street,  
view to the east.



Broadway (Rt 9) and West 215<sup>th</sup> Street,  
view to the north/northeast.





Broadway (Rt 9) and West 215<sup>th</sup> Street,  
view to the southeast.



Broadway (Rt 9) and West 218<sup>th</sup> Street,  
view to the north/northeast



Broadway (Rt 9) and West 219<sup>th</sup> Street,  
view to the south.





West 219<sup>th</sup> Street, view to the east.



West 219<sup>th</sup> Street, view to the east.



West 219<sup>th</sup> Street and Ninth Avenue, view to the east.





West 219<sup>th</sup> Street and Ninth Avenue, view to the northeast.



Ninth Avenue at West 220<sup>th</sup> Street, view to the south.



Ninth Avenue and West 220<sup>th</sup> Street, view to the north. Note Broadway (Rt 9) in background.