

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

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 of prior ground disturbance within the Area of Potential Effect (APE) associated with construction of the Bronx 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 archeological remains have been noted at two locations (probably associated with a single New York State Museum archeological site number) through which the Project APE passes. The first location is believed to be within what is now West 230th Street and just west of Broadway. The second location, which is believed to be covered by deep fill deposits, is located within Broadway and south of West 230th Street. Although it is unlikely that intact archeological remains exist at either location, the possibility can not be ruled out. Archeological monitoring of construction through these areas 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 the Bronx. This report deals only with the portion of the Project in the Bronx. A separate analysis has been prepared for the Manhattan portion of the Project (Klein and Baldwin 2008) and one is being prepared for the portion in 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 with the APE.

1.2 PROJECT LOCATION AND DESCRIPTION

Figures 1a, 1b, and 1c show the location of the Bronx portion of the Project route. The Bronx portion originates at the point near the north shore of the Harlem River near 225th Street where the cable will exit from a sub-riverbed tunnel through which the cable will cross the Harlem River. It will then proceed west on 225th Street to Broadway, north on Broadway to 230th Street, west on 230th Street to Riverdale Avenue, and north on Riverdale Avenue (crossing the Henry Hudson Parkway) to the NYC-Yonkers border.

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. Only one of the four bridge crossings, 252nd Street Bridge over the Henry Hudson Parkway, is located in the Bronx.

Along most of the proposed route, the transmission line will be installed within an open-cut trench. Where the feeder crosses the Harlem River between the Bronx and 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 Bronx portion of the Project will be in soil mapping Units 101, 212, 219, and 223. These are described, as follows:

Unit 101 - Pavement and buildings, wet substratum-LaGuardia-Ebbets complex, 0-8% slopes. postglacial substratum (dunes and dune sands), 0-5% slopes; . . . urbanized areas filled with a mixture of natural soil materials and construction debris over swamp, tidal marsh, or water; a mixture of anthropogenic soils which vary in coarse fragment content, with 50 to 80 percent of the surface covered by impervious buildings and pavement.

Unit 212 - Pavement and buildings, Chatfield-Greenbelt complex, 0-8% slopes; nearly level to gently sloping urbanized areas of bedrock controlled hills and ridges modified by glacial action that have been partially cut and filled with natural soil materials, mostly for residential use; a mixture of moderately deep and deep gneissic till soils and anthropogenic soils, with 50 to 80 percent of the surface covered by impervious pavement and buildings.

Unit 219 - Chatfield-Greenbelt-Pavement and buildings complex, 0-8% slopes. Nearly level to gently sloping areas of bedrock controlled hills and ridges modified by glacial action that have been partially cut and filled, mostly for parks and low density residential use; a mixture of moderately deep gneissic till soils and anthropogenic soils, with 15 to 49 percent of the surface covered by impervious pavement and buildings.

Unit 223 - Chatfield-Greenbelt-Pavement and buildings complex, 15-50% slopes. Moderately steep to very steep areas of bedrock controlled hills and ridges modified by glacial action that have been partially cut and filled, mostly for parks and low density residential use; a mixture of moderately deep gneissic till soils and anthropogenic soils, with 15 to 49 percent of the surface covered by impervious pavement and buildings.

The portions of the APE east of Riverdale Avenue at the south end of Bronx portion of the Project are within Unit 101. The portions of the APE within Unit 223 include Riverdale Avenue from 230th Street to 235th Street, from 238th Street to Manhattan College Parkway and from 246th Street to 256th Street. Portions of the APE within Unit 219 include Riverdale Avenue from Manhattan College Parkway to 246th Street. The portions of the APE within Riverdale Avenue, from 235th Street to 238th Street, and north of 256th Street fall within Unit 212.

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 intact soils can be expected within any portions of the APE. With the exception of Unit 101 soils all of the soils within the APE are characterized as having been “partially cut and filled.” Additionally, areas within Unit 223 can be considered to have a lower archeological sensitivity because of the steep slopes present. Portions of the APE within Unit 101 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 two, the Bien (1893) atlas map and the 1891 USGS Harlem quadrangle depict topographic information. In both cases the scales of the maps preclude their being used to evaluate grade changes along the streets in the project APE. Details topographic information from the late 19th century was located at the Bronx Topographical Bureau of the Bronx Borough President's office (the Borough Engineer's office) and is discussed in Section 2.4.

Several sets of late nineteenth-early twentieth century insurance atlases were also reviewed. Although these atlases do not provide topographic information, they do in many cases indicate the existence of in-street water lines. (Sewer lines are generally not shown on these maps because they do not relate to fire protection). This information is discussed in Section 2.3.

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 Project¹ (Appendix A). That review indicates that *all* of the streets in the Bronx 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) 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 for the Bronx do not contain plat books noting the dates of construction, and size, of larger water and sewer lines, comparable to those for Manhattan which were used in analyzing portions of the Project APE in 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.

¹ A full-size set of the identical plan and profile drawings at a scale of 1inch = 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).

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 21½ 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 Bronx 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 electric, 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.

2.0 PRIOR GROUND DISTURBANCE WITHIN THE APE

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

Street/Avenue	Utility Type	Size	Dwg. No.²	Construction Date
Unnamed (tunnel exit to 225 th Street)	Water	8"	348717	
225 th Street	Water	12"	348717	
	Gas	12"	348717	
Broadway (225th St – 228th St.)	Gas	12"	348718	
	Sewer	3'-6" x 2'-4" concrete sewer"	348718	1901-1904
	Water	12"	SM-1913-v12-p81 SB-1914-v13-p12	Pre-1913
Broadway (228 th – 230 th Street)	Sewer	3'-6" x 2'-4" concrete sewer"	348719	
	Water	12"	348719 SM-1913-v12-p81 SB-1914-v13-p12	Pre-1913
230 th St. (Broadway to Kingsbridge Rd.)	Gas	12"	348720	
	Sewer	34" x 46" RCP	348720	1901-1904
	Water	12"	348720 SB-1914-v13-p12	Pre-1914
230 th St. (Kingsbridge to Riverdale Ave.)	Gas	12"	348721	
	Sewer	24" RCP	348721	
	Water	12"	348721 SB-1914-v13-p11	Pre-1914
Riverdale Ave. (230 th St. – 231 st St.)	Gas	6"	348722	
	Water	12"	348822 SB-1914-v13-p10	Pre-1914
	Water	24"	348822	
	Sewer	48" RCP	348822	
	Sewer	68"	348722	
Riverdale Ave. (231 st St. – 234 th St.)	Water	8"	348723	
	Water	12"	348723 SB-1914-v13-p10	Pre-1914
	Sewer	48" reinforced concrete	348723	
Riverdale Ave. (234 th St. – 235 th St.)	Water	12"	348724	
	Gas	6" (2)	348724	
	Sewer	48" reinforced concrete	348724	
Riverdale Ave. (235 th St. – 238 th St.)	Water	12"	348725	
	Gas	6"	348725	
	Sewer	48" reinforced concrete	348725	

2.0 PRIOR GROUND DISTURBANCE WITHIN THE APE

Table 1. Major Underground Utilities Parallel to the M29 Cable Route in the Bronx (continued)

Street/Avenue	Utility Type	Size	Dwg. No.²	Construction Date
Riverdale Ave. (238 th St. – Johnson Ave.)	Gas	12"	348726	
	Water	20"	348726 SB-1914-v13-p33	Pre-1914
Riverdale Ave. (Johnson Ave. - Man. C. Pkwy.)	Sewer	12"	348727	
Riverdale Ave. (Man. C. Pkwy. – 246 th St.)	Water	8"	348728	
	Sewer	18" vitrified	348728	
Riverdale Ave. (246 th St. – 250 th St.)	Gas	12"	348729, 348730	
	Water	8"	348729, 348730	
	Sewer	15" vitrified	348729, 348730	
Riverdale Ave. (250 th St. – 252 nd St.)	Water	8"	348731	
Riverdale Ave. (252 nd St. – 254 th St.)	Water	20"	348732 SB-1914-v13-p64	Pre-1914
	Gas	6"	348732	
Riverdale Ave. (254 th St. – 259 th St.)	Sewer	15" vitrified	348732	
	Water	20'	348733 - 348735	
Riverdale Ave. (254 th St. – 259 th St.)	Water	12"	348733 - 348735	
	Gas	12"	348733 - 348735	
	Sewer	12"/15" vitrified	348733 - 348735	
Riverdale Ave. (259 th St. – NYC line)	Water	20"	348736 - 348738 SB-1914-v13-p83	Pre-1914
	Water	12"	348736 - 348738	
	Sewer	12"	348736 - 348738	

² Six-digit numbers refer to plan and profile drawings in Appendix I. Drawings with an “SM” or “SB” prefix refer to Sanborn insurance atlas maps. Date, volume and plate number are provided (eg. SM-1913-v12-p81, refers to Plate 81 in volume 12 of the 1913 Manhattan atlas. An “SB” prefix refers to Bronx atlases. Six digit drawing numbers refer to plan and profile drawings in Appendix I.

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). Portions of Riverdale Avenue also serve as a service road for the Henry Hudson Parkway. 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 collections of the New York Public Library contain a partial set of drawings entitled *Maps or Plans and Profiles Showing the Location, Width, Grades and Class of Streets, Roads and Avenues, Public Squares and Places located and bid out by the Commissioner of Street Improvements of the 23rd and 24th Wards of the City of New York* (New York Topographic Bureau 1892). These maps were prepared at a scale of 1 inch equals 150 feet and employ a ten foot contour interval. Although the contour interval is rather coarse, the maps also contain a large number of spot elevations, including multiple elevations at every intersection that are given to the tenth of a foot. Plates 21, 23, and 25 include the portion of Riverdale Avenue extending from West 230th Street north to the New York City-Yonkers boundary. Portions of these plates are reproduced in Appendix III. They clearly show the grading that has taken place along the entire stretch of Riverdale Avenue within which the Project APE is located.

The holdings of the Bronx Topographical Bureau of the Bronx Borough President's office (the Borough Engineer's office) were reviewed. No original construction specifications relating to street construction along the cable route in the Bronx were found. However, the Topographic Bureau files did contain a number of maps, plans, and drawings noting changes in street grade and elevation over time. Some of these pertain to the Project APE and provide a good indication of the nature of typical grade changes along the route of the M29 cable in the Bronx.

A 1918 plan and profile drawing for a portion of Riverdale Avenue (Bronx Topographical Bureau 1918) shows that a significant portion of a large hill was removed to arrive at an acceptable grade for the portion of Riverdale Avenue between West 231st Street and West 236th Street. Along this stretch of street the existing grade was lowered by as much as 30 feet. The evidence of this massive change in grade is still visible in the form of a large retaining wall on the west side of Riverdale Avenue in this area (see Appendix II). The same drawing also shows that the finished street grade in 1917 for the portions of Riverdale Avenue between 230th and 231st Street, and between 236th Street and what is now 239th Street had been reduced an average of one to two feet. A 1907 map notes that the elevation of the intersection of West 230th Street and Riverdale Avenue (labeled Spuyten Duyvil Road) has been reduced from 25.5 feet to 17 feet (Bronx Topographical Bureau 1907).

In the absence of location-specific data quantifying the extent to which street construction may have caused subsurface disturbance within the entire 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 1912³, Blanchard and Drowne 1914, Byrne 1917, Harger and Bonney 1919, Wood 1920).

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

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 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).

2.5 EXISTING CONDITIONS

JMA personnel conducted a reconnaissance of the Project area on February 12, 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 four prehistoric 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 prehistoric archeological sites within 1000 feet of the Project APE in the Bronx, as reported in Pasquariello and Loorya (2006).

Site Designation	Site Name	Time Period	Site Type	Location	Approximate Distance from APE
NYSM 2218	-		Stray Find	Bronx ⁴	<100 feet
NYSM 4057 Parker NY-7	-		Shell midden	East of Fieldston Rd. and north of W. 247 th Street	1000 feet
NYSM 5320 Parker-BX?	-		“Traces of occupation”	Bronx	0-1/2 mile
NYSM 5321 Parker-BX?	-		“Traces of occupation”	Bronx	0-1/2 mile

According to the New York State Museum (NYSM) site files, Site 2218 consists of a single flake of green (possibly Coxsackie) chert, recovered in a shovel test during a cultural resources survey associated with a NYS DOT project (PIN 8114.01). The associated location shown on OPRHP site file maps places it just west of Riverdale Avenue, between Morris and Post Streets in the City of Yonkers, not the Bronx.

The NYSM site file notes that there are discrepancies about the location of site NYSM 4057. This may be referring to the fact that Parker includes his mention of the site in his discussion of New York County (Manhattan) rather than Bronx County. The location as given by Parker (1922:630), “east of Feildston [sic] Road and north of West 247th Street,” would place the site well to the east of the Project APE.

The assignment of NYSM site numbers 5320 and 531 appears to be based on Parker’s large scale (1 inch equals approximately 2 miles) map of Bronx County which labels two areas east of Tibbet Brook with a “traces of occupation” symbol. No further information is provided. USGS quadrangle maps maintained by OPRHP and showing archeological site locations identify two large areas as corresponding with these two site numbers. The first of these (NYSM 5320) is placed on the north side of Spuyten Duyvil Creek, just east of the Henry Hudson Parkway. This would place it well west of the Project APE.

NYSM 5321 is shown on OPRHP maps as covering an area roughly bounded by Gun Hill Road on the north, West 230th Street on the south, Broadway on the east, and Irwin Avenue on the west. The Project APE crosses through

⁴ This site is actually located in Yonkers, not the Bronx.

the extreme southern edge of this area. However, it should be noted that, given the near total lack of information about the site, and the extremely imprecise location source data, the OPRHP mapped size, boundaries, and location of NYSM 5321 should be treated with utmost skepticism.

Bolton (1922) is perhaps the most detailed compendium of archeological site data for New York City, and Parker derived much of his information about new York City sites from Bolton. Bolton refers to aboriginal occupations at much more precisely defined points within the large area mapped as NYSM 5321. Bolton was intimately familiar with the work of early researchers such as Skinner, Calver, and Chenoweth and had first-hand knowledge of many of the archeological sites in northern Manhattan and the Bronx. For these reasons, his Map VI, "The Wading Place and the Meeting of the Paths" (Figure 3) which accompanies his 1922 publication is believed to be relatively accurate. Map VI places one locus of Bolton's Station 18⁵ astride what is now West 231st Street and just west of Broadway. He also notes the presence of "shells," just northwest of the intersection of Broadway and West 230th Street. The latter is in close proximity to the Project APE.

Bolton also notes the presence of aboriginal occupation on an island in what was formerly the channel of the Harlem River, within what is now Broadway at a point south of West 230th Street. This would place it along the M29 cable route. Bolton labels this location "Wading Place." "The Wading place is described as having been a short distance east of the original Kingsbridge, which in turn was more east of the more recent bridge, now buried under Kingsbridge Avenue (see Map VI).

Steven Jenkins, in his Story of the Bronx, places the situation of the Wading place, with much probability of accuracy, under our present Broadway, at the disused bridge which in recent years spanned the little creek. Here the water was shoal, and at low tide the bottom was exposed in the middle of the tideway, forming a little island (pl. VI) . . . The exact line of the Wading place was under the western part of the bridge, nearer the high ground on each shore" (1922:87-88).

Jenkins refers to the "wading place" several times, and describes it as "a natural ford through Spuyten Duyvil Creek about where the bridge carries Broadway across the stream (1912:181). He goes on to note that "During the three years from 1901 to 1904, contractors were engaged in laying a great trunk sewer on the line of Broadway. . ." (1912:182).

⁵ Bolton describes Station 18 as follows: "Paparinemin or Papirinem. Applied both to the island which became the site of the village of Kingsbridge, and to that part of Spuyten Duyvil creek contiguous thereto. A favorite resort of the Reckgawawanc, one of whose stations was on the line of 231st street overlooking the crossing of the main path to the north and east countries" (1922:225-226).

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. A review of late-19th and early-20th century plan and profile drawings prepared by the City of New York note that extensive grading has occurred along the entire length of Riverdale Avenue from 230th Street to the New York City-Yonkers boundary. The majority of the Bronx portion of the M29 cable route is located in this stretch of Riverdale Avenue. Comparable data is not available for the portions of the Project APE south and east of 230th Street and Riverdale Avenue. 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 the south end of the Bronx portion of the cable route where the Project APE crosses swampy/marshy land, and which corresponds to an area of Unit 101 soils (see Section 2.1), these areas would also have been subjected to considerable disturbance in connection with the filling required for preparation of street foundations. With the exception of the small area of what was once slightly higher ground (the “wading place”)(see Section 3.3), this area is believed to be an area of low archeological sensitivity.

Information on known archeological sites in the Project vicinity compiled as part of the Phase 1A survey for the Project (Pasquariello and Loorya 2006) was reviewed. A review of the source data for this information indicates that one of the previously reported sites, NYSM 5321, is relatively close to the Project APE. Although OPRHP maps show NYSM 5321 as covering a relatively large area (based on the presence of a symbol for “traces of occupation” on Parker’s 1922 map showing archeological site locations in the Bronx), it seems probable that Parker was referring collectively to several loci reported by Bolton (1922). The loci include “shells,” just northwest of the intersection of Broadway and West 230th Street, and the “wading place,” located within the line of Broadway south of 230th Street. The Project APE crosses both of these locations.

4.2 RECOMMENDATIONS

No Phase IB survey of any portion of the Project APE is recommended. Although intact archeological remains are unlikely to be present, given the proximity of the APE to two previously reported archeological site locations, monitoring of construction as it proceeds through these two areas is recommended. The first location is the portion of the Project route along West 230th Street between Broadway and a point east of Kingsbridge Road (Sta. 121+50 – 126+00). The second is a portion of the Project route along Broadway, south of West 230th Street (Sta. 104+00 – 110+00). (It should be noted that large sewers are located within both of these areas, reducing the likelihood of intact remains being present). 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

4.0 CONCLUSIONS AND RECOMMENDATIONS

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



■ Required Easements

Figure 1a
Aerial Photographs

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



Figure 1b
Aerial Photographs



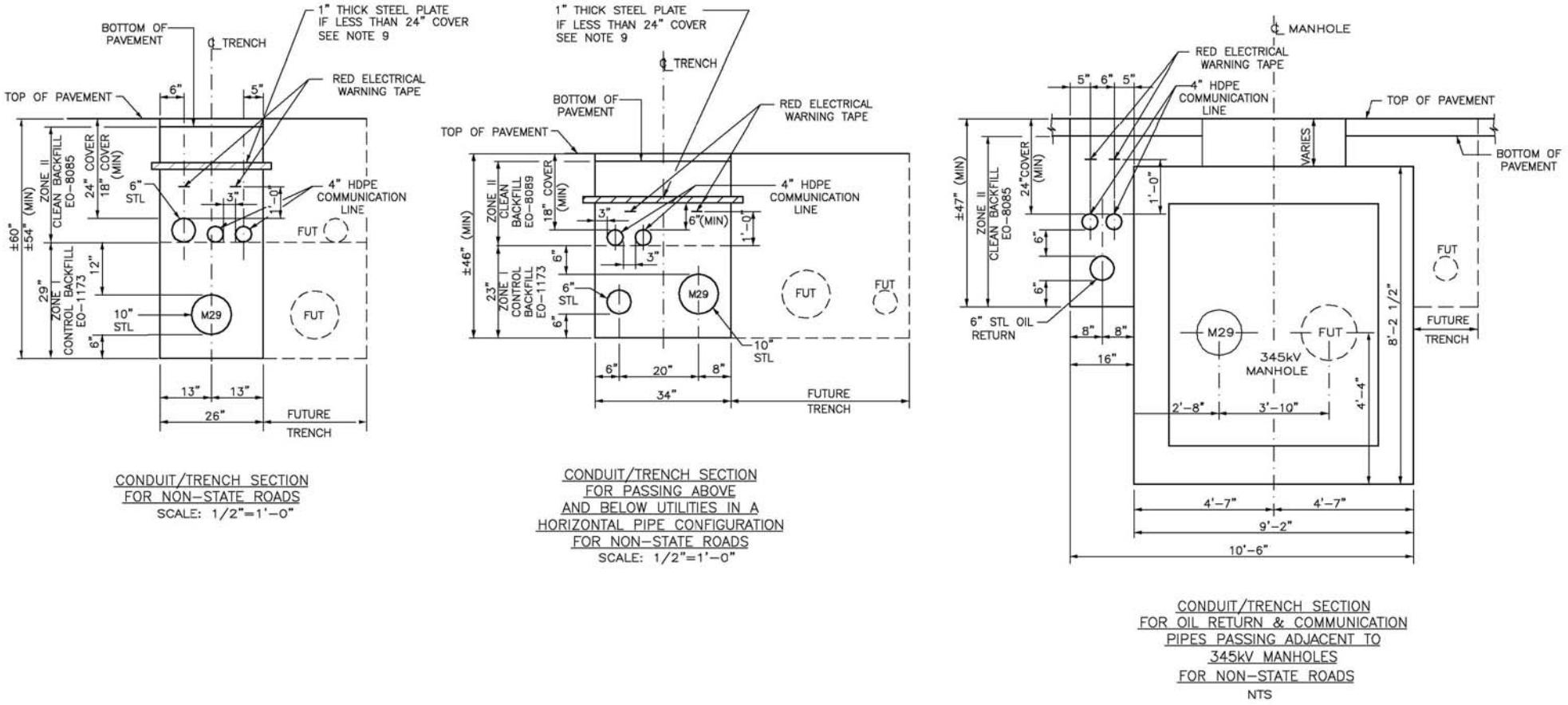
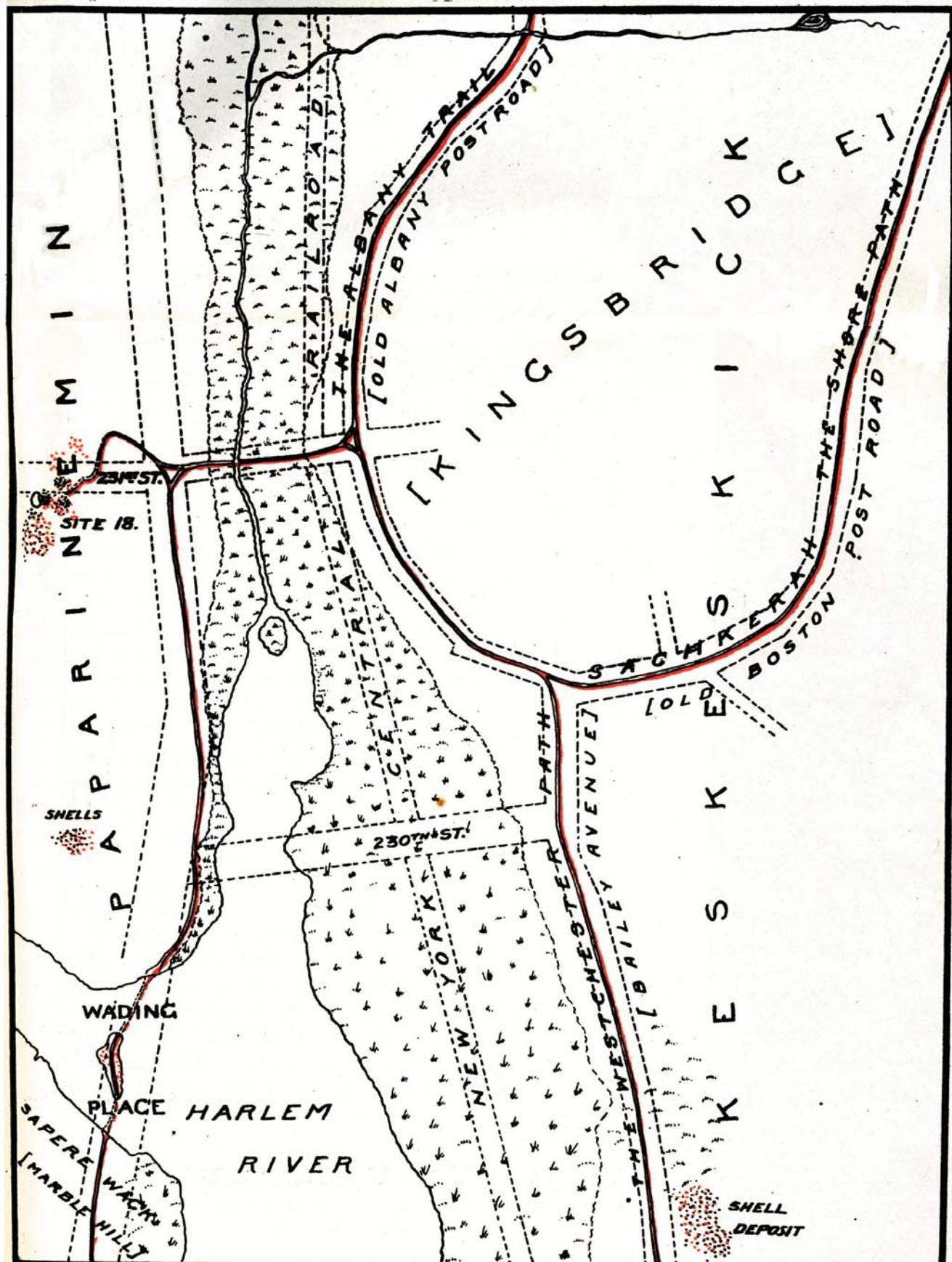



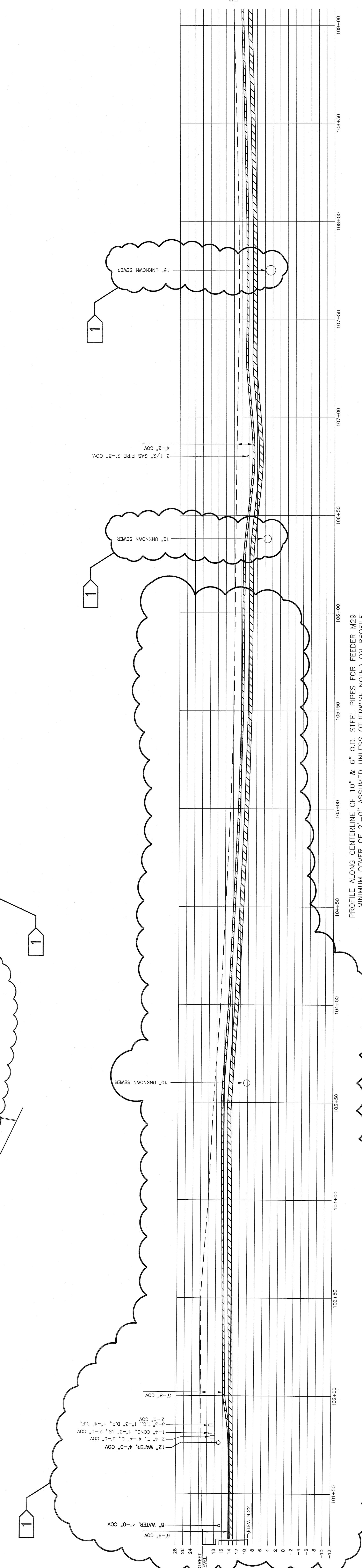
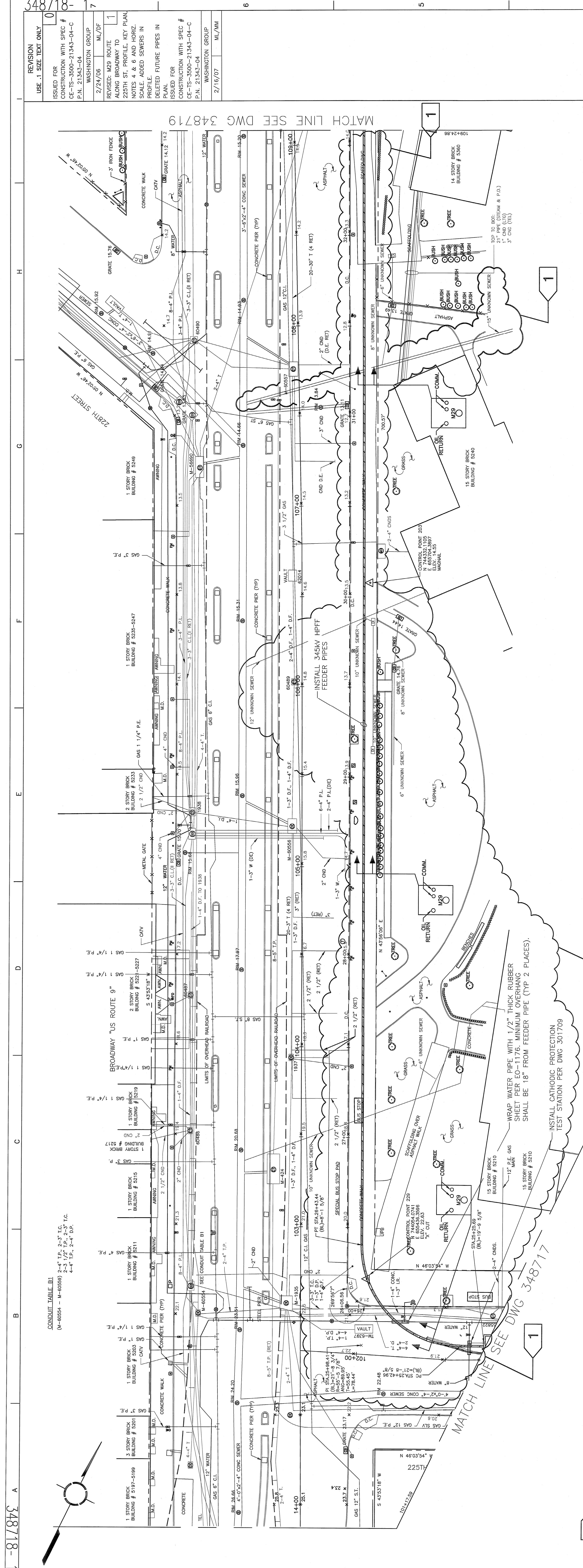
Figure 2. Cross-section: typical pipe-type trench dimensions for the M29 Cable in the City of New York.



THE WADING PLACE AND THE MEETING OF THE PATHS.

APPENDIX I





NOTES.

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DWG TYPE TRANSMISSION

STATION: N

ACADEMY S/S

NX

MPFF FDR M29 PLAN & PROFILE

FROM 225th ST TO 228th ST
S/S 10 ACADEMY S/S

— APPROVALS —

ENGINEERING

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卷之三

HENRIQUEZ DESIGN

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
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KADAKIA

TANASESCU

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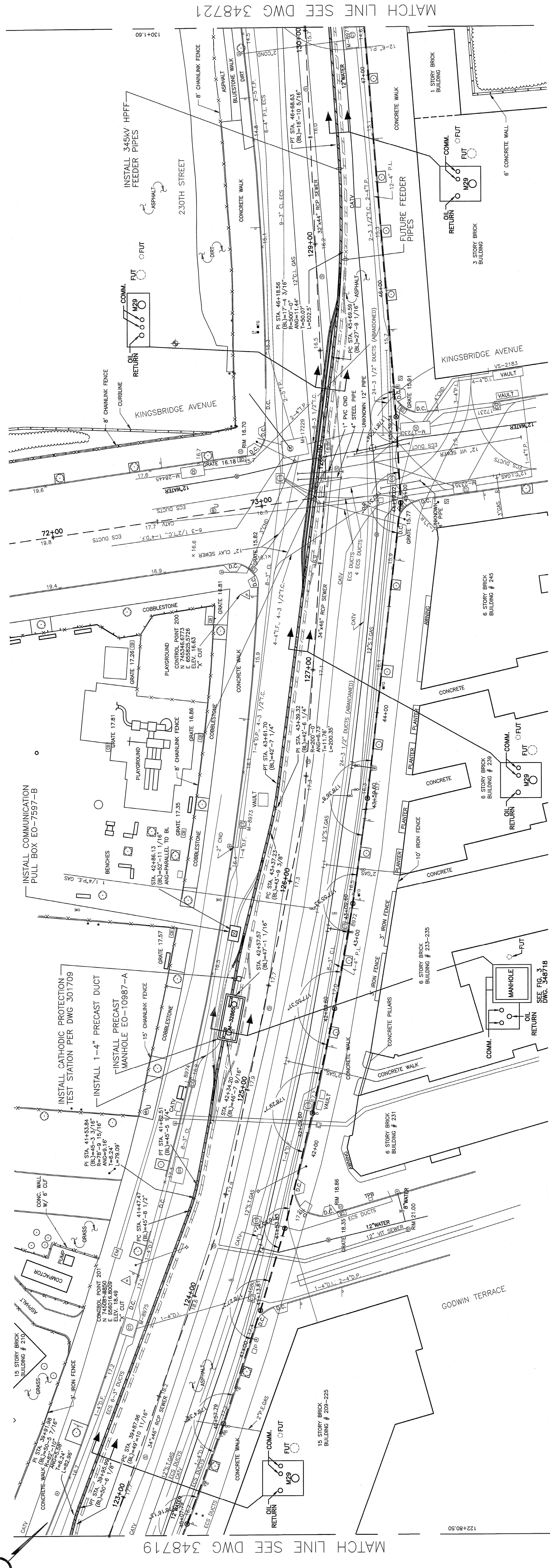
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2/24/06	ML/DF	
REVISED KEY PLAN AND NOTES. ISSUED FOR CONSTRUCTION WITH SPEC # CE-TS-3500-21343-04-C P.N. 21343-04	1	
WASHINGTON GROUP		
8/04/06	ML/MM	

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348720- 1



11-9" COV

CENTERLINE BASELINE (YP)

PROFILE ALONG CENTERLINE OF 6" & 10" O.D. STEEL PIPES FOR FEEDER M29
MINIMUM COVER OF 5'-0" ASSUMED UNLESS OTHERWISE NOTED ON PROFILE

KEY PLAN

Legend:

- STA. = STATIONING ALONG C OF THE CONSTRUCTION BASELINE
- (BL) = DISTANCE FROM THE CONSTRUCTION BASELINE
- PT = POINT OF TANGENCY
- PC = POINT OF CURVATURE
- PI = POINT OF INTERSECTION
- R = RADIUS OF CIRCLE
- ANG. = ANGLE IN DEGREES
- T = DISTANCE FROM PC OR PT TO RADIUS (R)
- L = DISTANCE FROM PI TO RADIUS (R)

NOTES:

- CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFICATION, PRIOR TO CONSTRUCTION OF THE EXACT LOCATION OF ALL BURIED FACILITIES IN THE VICINITY OF CONSTRUCTION ON THE PLANS. THE LOCATIONS OF THE BURIED FACILITIES INDICATED ON THESE DRAWINGS WERE OBTAINED BY A SEARCH OF THE AVAILABLE RECORDS. ADDITIONAL UNDERGROUND FACILITIES MAY EXIST OR THE LOCATIONS OF THE FACILITIES MAY DIFFER FROM THE LOCATIONS SHOWN ON THESE PLANS.
- SEWER AND WATER CONNECTIONS TO BUILDING EXIST IN STREETS, BUT SPECIFIC LOCATIONS ARE NOT KNOWN OR IDENTIFIED. CONTRACTOR SHALL LOCATE AND PROCEED PER REQUIREMENTS OF SPECIFICATIONS.
- CATCH BASIN PIPE LOCATION AND DEPTH ARE APPROXIMATE AND ASSUMED. ACTUAL FIELD INSTALLATION IS NOT DOCUMENTED. CONTRACTOR SHALL LOCATE.
- FOR PIPE SIZES, TYPES, TRENCH CONFIGURATION, AND TRENCH DETAILS SEE DRAWING 348717.
- TROLLEY RAILS MAY EXIST BELOW ROAD SURFACE ON PORTIONS OF THE ROUTE. THESE RAILS ARE NOT DEPICTED ON THE DRAWINGS. AS WITH ALL UNDERGROUND FACILITIES, CONTRACTOR SHALL CONTACT THE RESPONSIBLE AGENCY TO IDENTIFY AND MARK-OUT THE EXACT LOCATION OF TROLLEY RAILS ALONG THE ROUTE.
- FOR LEGEND SEE DRAWING 348717.
- THE MINIMUM BENDING RADIUS OF ALL STEEL AND HDPE PIPES SHALL BE 40 FEET.
- THE FEEDER PIPE AND OIL RETURN PIPE SHOWN AS FUTURE ARE NOT TO BE INSTALLED AS PART OF THE M29 PROJECT.
- WHERE 1-INCH THICK PLATES ARE REQUIRED TO BE INSTALLED, CONTRACTOR SHALL INSTALL SONATUBE-TYPE PIERS EVERY 4 FT ALONG BOTH SIDES OF THE TRENCH TO SUPPORT THE PLATES. THE BOTTOM OF THE PIERS SHALL BE LOCATED AT THE BOTTOM OF THE TRENCH ON FIRM UNDISTURBED SOIL.
- 1 inch = 20 FT.

STATIONING NOTES:

- STATIONS INDICATED ALONG THE BOTTOM OF THE PROFILE CORRESPOND TO THE CENTERLINE BASELINE.
- THE STATIONING OF THE PIPE/TRENCH ROUTE SHOWN ON THE PLANS ARE DERIVED FROM THE CONSTRUCTION BASELINE.

STATIONING LEGEND:

STA. = STATIONING ALONG C OF THE CONSTRUCTION BASELINE
(BL) = DISTANCE FROM THE CONSTRUCTION BASELINE
PT = POINT OF TANGENCY
PC = POINT OF CURVATURE
PI = POINT OF INTERSECTION
R = RADIUS OF CIRCLE
ANG. = ANGLE IN DEGREES
T = DISTANCE FROM PC OR PT TO RADIUS (R)
L = DISTANCE FROM PI TO RADIUS (R)


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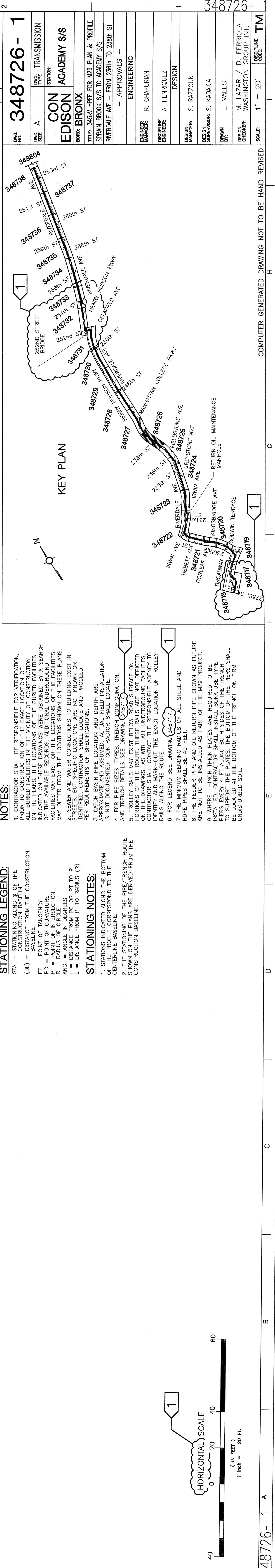
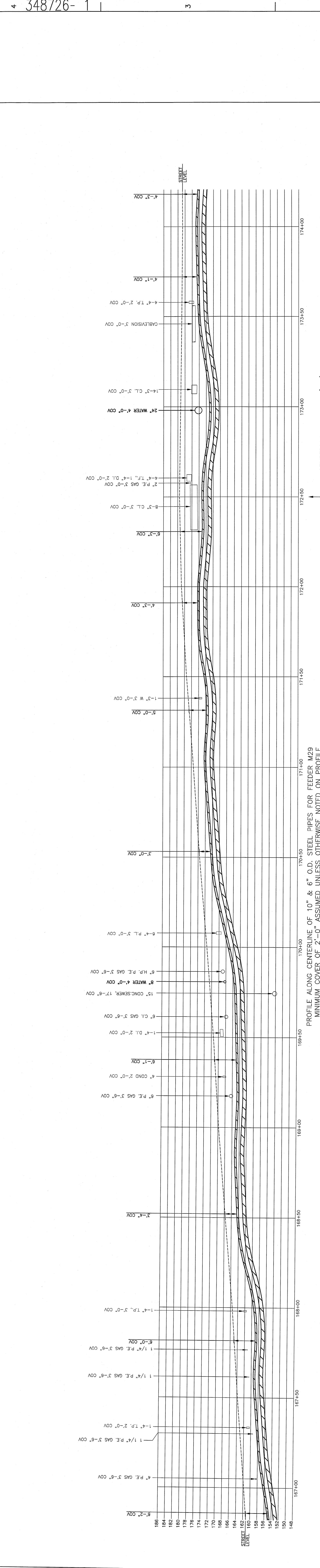
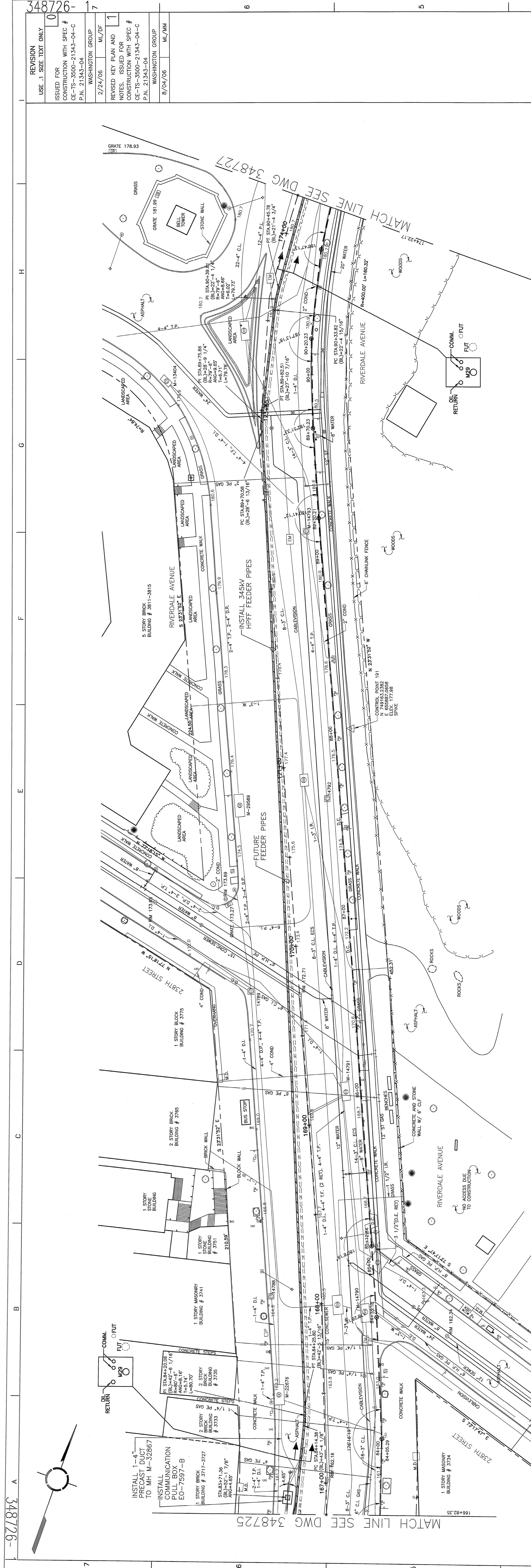
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(IN FEET)

1 inch = 20 FT.

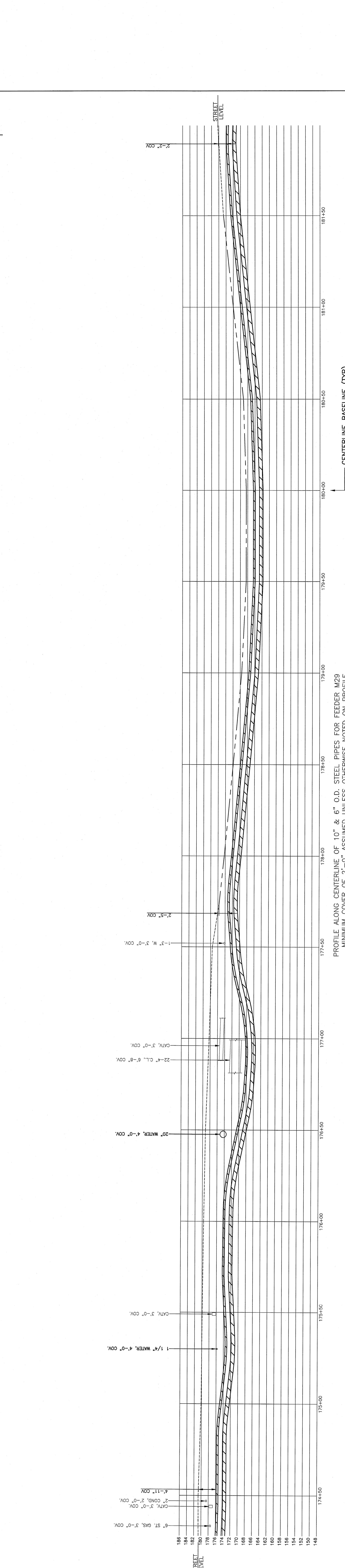
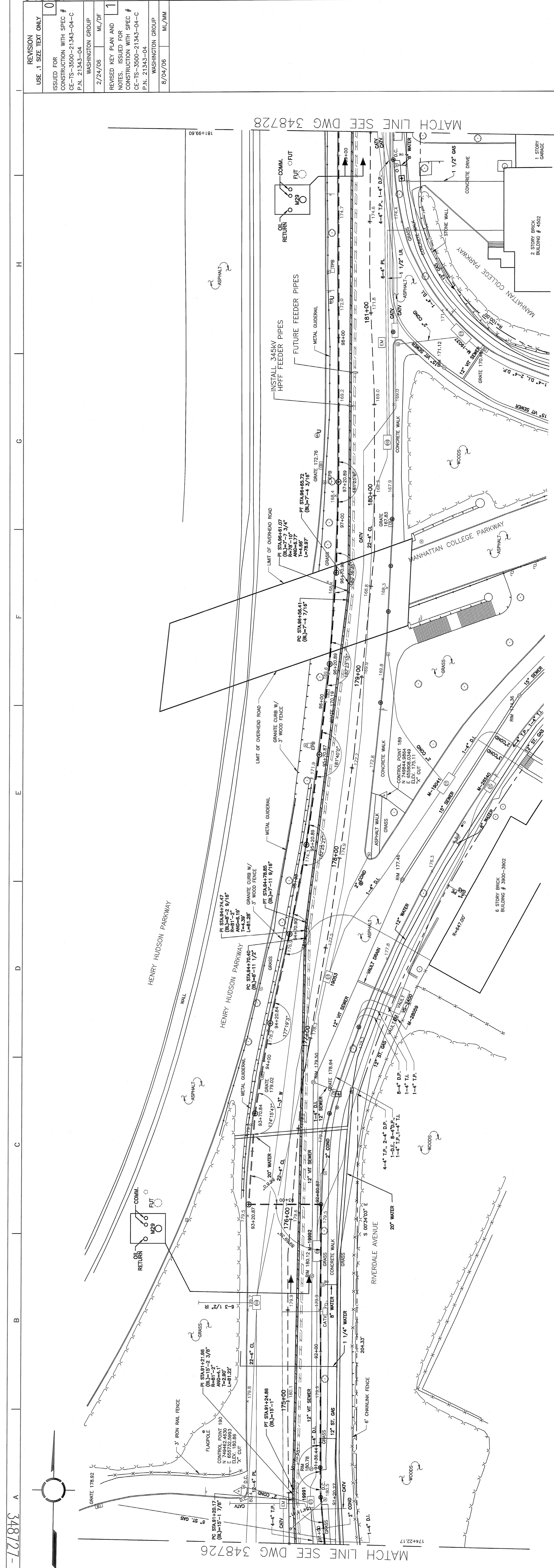
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— APPROVALS —
ENGINEERING
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A. HENRIQUEZ
DESIGN

DESIGN
S. RAZZOUK
S. KADAKIA
C. RAUTI
M. LAZAR / D. FERRIOLA
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1" = 20' DISCIPLINE CODE: TM

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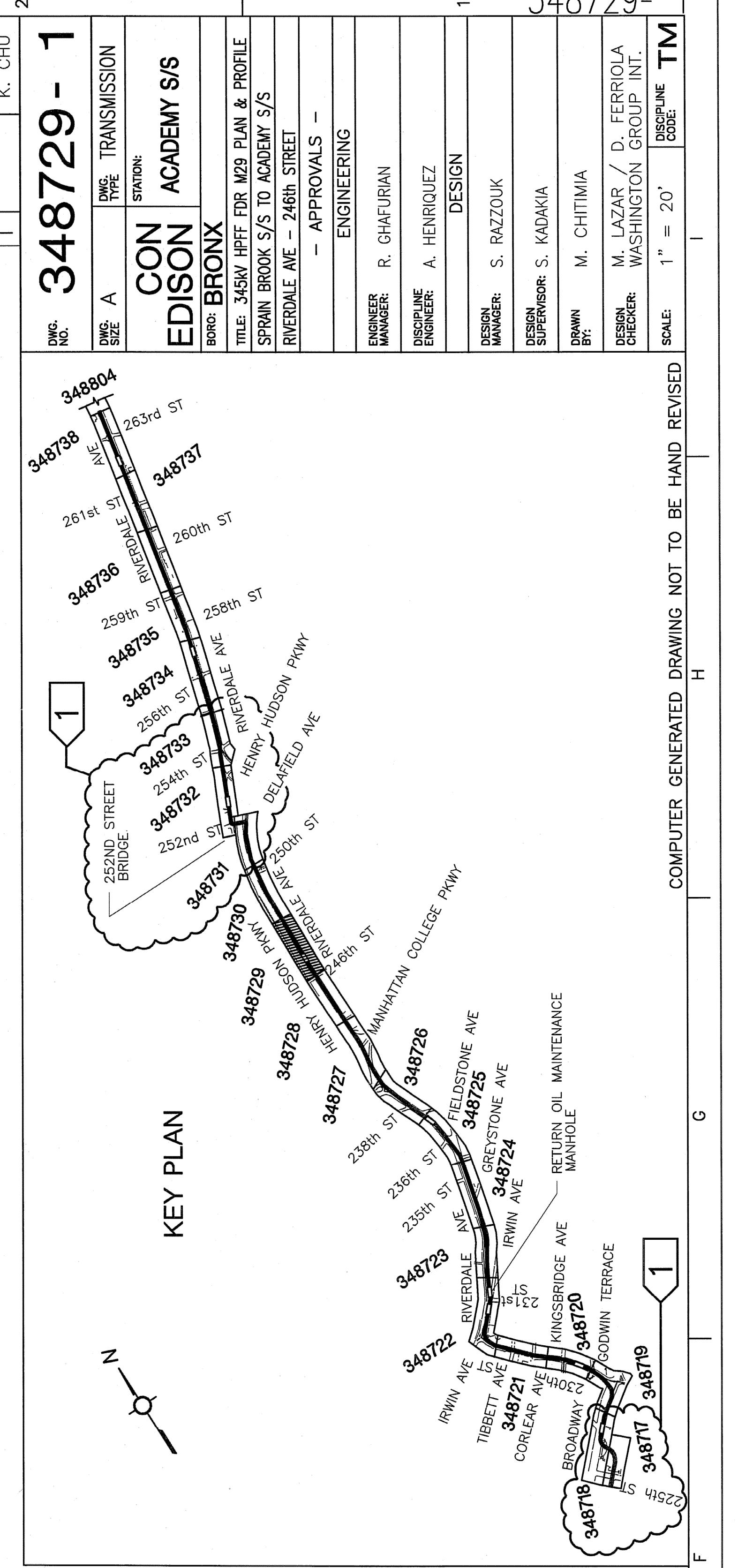
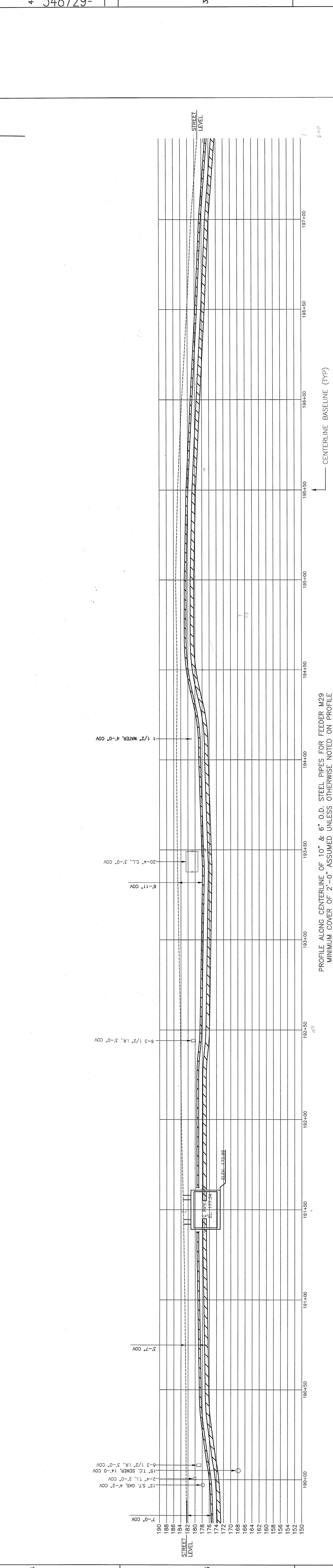
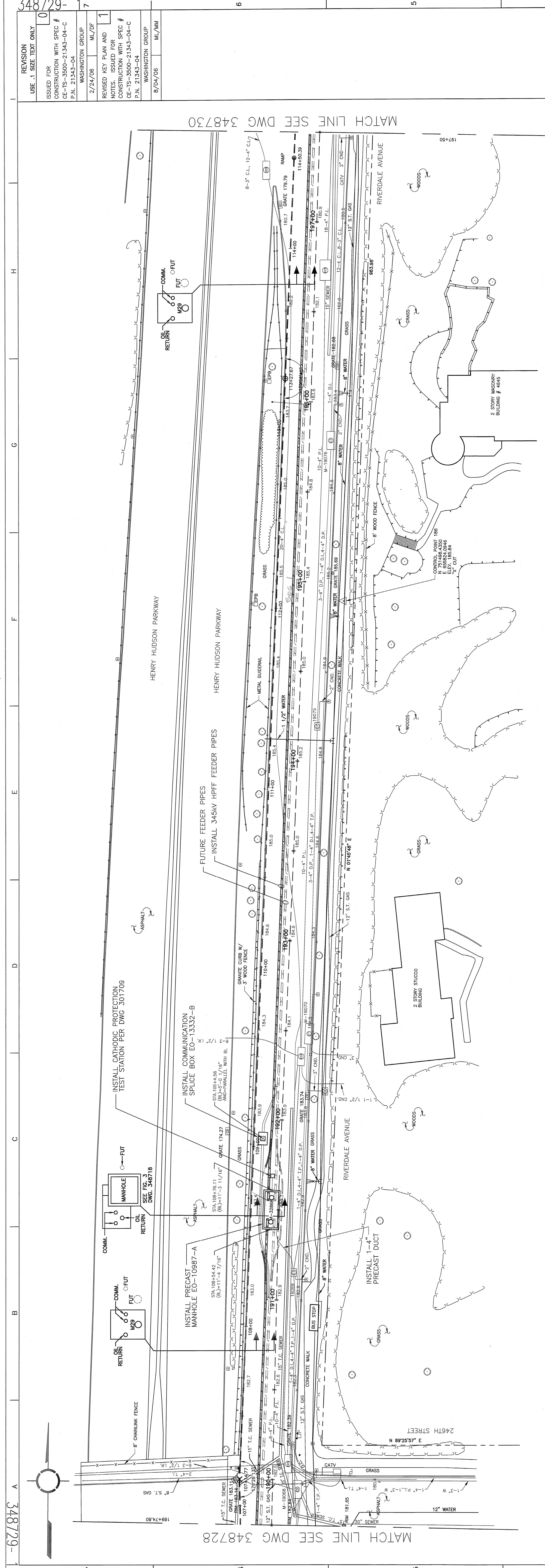
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MANAGER:**

DISCIPLINE

DISCERNING
ENGINEER: /

SCALE:



NOTES:

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PRIOR TO CONSTRUCTION OF THE EXACT LOCATION OF ALL BURIED FACILITIES IN THE VICINITY OF CONSTRUCTION

ON THE PLANS. THE LOCATIONS OF THE BURIED FACILITIES INDICATED ON THESE DRAWINGS WERE OBTAINED BY A SEAFARER

POINT OF CURVATURE
POINT OF INTERSECTION
OF THE AVAILABLE RECORDS. ADDITIONAL UNDERGROUND
FACILITIES MAY EXIST OR THE LOCATIONS OF THE FACILITIES

MAY DIFFER FROM THE LOCATIONS SHOWN ON THESE PLANS
2. SEWER AND WATER CONNECTIONS TO BUILDING EXIST IN
RADII OF CIRCLE = ANGLE IN DEGREES

2: SWLWNR AND WLNK CONNCTIONS TO BUILDING LAIS IN STREETS, BUT SPECIFIC LOCATIONS ARE NOT KNOWN OR IDENTIFIED. CONTRACTOR SHAL LOCATE AND PROCEEDED

NOTING NOTES:

7. CATCH BAGS, RIDE LOCATION, AND SEATING ARE PER REQUIREMENTS OF SPECIFICATIONS.

3. CAJCH BASIN PIPE LOCATION AND DEPTH ARE APPROXIMATE AND ASSUMED. ACTUAL FIELD INSTALLATION IS NOT DOCUMENTED. CONTRACTOR SHALL LOCATE INDICATIONS INDICATED ALONG THE BOTTOM

IS NOT DOCUMENTED. CONTRACTOR SHALL LOCATE.

4. FOR PIPE SIZES, TYPES, TRENCH CONFIGURATION,

STATIONING OF THE PIPE/TRENCH ROUTE
ON THE PLANS ARE DERIVED FROM THE
AND TRENCH DETAILS SEE DRAWING 348717

PORTIONS OF THE ROUTE. THESE RAILS ARE NOT DEPICTED ON THE DRAWINGS. AS WITH ALL UNDERGROUND FACILITIES, CONSTRUCTION BASELINE.

CONTRACTOR SHALL CONTACT THE RESPONSIBLE AGENCY TO IDENTIFY AND MARK-OUT THE EXACT LOCATION OF TROLLEY

RAILS ALONG THE ROUTE.
6. FOR LEGEND SEE DRAWING 348717

**7. THE MINIMUM BENDING RADIUS OF ALL STEEL AND
WIRE SHOULD BE 12 FEET**

8. THE FEEDER PIPE AND OIL RETURN PIPE SHOWN AS FU
HDPE PIPES SHALL BE 40 FEET.

ARE NOT TO BE INSTALLED AS PART OF THE M29 PROJECT
2 WHERE 1 INCH THICK PLATES ARE REQUIRED TO BE

3. WHERE 1-INCH THICK PLATES ARE REQUIRED TO BLINSTALLED, CONTRACTOR SHALL INSTALL SONATUBE-TYPE PIERS EVERY 4 FT ALONG BOTH SIDES OF THE TRENCH

THIS ELEVATION SHOWS THE PIER SUPPORTS TO SUPPORT THE PLATES. THE BOTTOM OF THE TRENCH ON FIRM BE LOCATED AT THE BOTTOM OF THE TRENCH ON FIRM

UNDISTURBED SOIL.

E

252nd STREET BRIDGE (BIN No. 2-22950-0)

STATIONING LEGEND:

- STA. = STATIONING ALONG C. OF THE CONSTRUCTION BASELINE
- (BL) = DISTANCE FROM THE CONSTRUCTION BASELINE
- PT = POINT OF TANGENCY
- P = POINT OF BEND
- R = RADIUS OF CURVE
- ANS. = ANGLE IN DEGREES
- T = DISTANCE FROM PT OR P TO BL
- L = DISTANCE FROM PT TO RADUS (R)

STATIONING NOTES:

- STATIONS INDICATED ALONG THE BOTTOM CENTER LINE CORRESPOND TO THE CONSTRUCTION BASELINE.
- THE STATIONING SLOWS ARE DERIVED FROM THE CONSTRUCTION BASELINE.
- INST. OF ELEC. AND GAS FLOOR HUNTER PARK PLATE AND NOTES

REFERENCE DRAWING:

321377-01

NOTES:

- CONTRACTOR SHALL BE RESPONSIBLE FOR IDENTIFICATION, PROTECTION, CONSTRUCTION, LOCATION OF THE EXISTING LOCATIONS OF ALL BURIED FACILITIES IN THE VICINITY OF CONSTRUCTION ON THE PLANS. THE LOCATIONS OF THE BURIED FACILITIES IDENTIFIED ON THE DRAWINGS SHALL NOT BE SEARCHED FOR DURING CONSTRUCTION. CONTRACTOR SHALL BE RESPONSIBLE FOR IDENTIFYING THE LOCATIONS OF THESE FACILITIES AND FOR EXCAVATING THE LOCATIONS SHOWN ON THESE PLANS.
- SEWER AND WATER CONNECTIONS TO BUILDING EXIST IN STREETS, BUT SPECIFIC LOCATIONS ARE NOT KNOWN OR IDENTIFIED. CONTRACTOR SHALL LOCATE AND PROTECT THESE CONNECTIONS.
- CATCH BASIN PIPE LOCATION AND DEPTH ARE DOCUMENTED ON THE PLANS. CONTRACTOR SHALL LOCATE AND PROTECT THESE CONNECTIONS.
- FOR PIPE STRESSES, TRENCH CONSIDERATION, AND TRENCH DETAILS SEE DRAWING 348730.
- TROLLEY RAILS MAY EXIST BELOW ROAD SURFACE ON STREETS. THESE RAILS ARE NOT DEPICTED ON THE DRAWINGS. AS SUCH, ALL UNDERGROUND FACILITIES ON THESE STREETS ARE NOT SHOWN. CONTRACTOR SHALL LOCATE AND PROTECT THESE CONNECTIONS.
- WHERE 1-INCH THICK PLATES ARE REQUIRED TO BE INSTALLED, CONTRACTOR SHALL INSTALL SODA-LIFE-TYPE PLATES OVER 4 FT ALONG BOTH SIDES OF THE FENCE. CONTRACTOR SHALL SUPPORT THE PLATES ON THE SIDE OF THE TRENCH ON THE INSURDED SOIL.
- THE MINIMUM BINDING SPAN IS 6 FT. AND PIPE PIPES SHALL BE 6 FT.
- THE FEEDER PIPE AND RETURN PIPE SHOWN AS FUTURE ARE TO BE INSTALLED AS PART OF THE 252 PROJECT.
- WHERE 1-INCH THICK PLATES ARE REQUIRED TO BE INSTALLED, CONTRACTOR SHALL INSTALL SODA-LIFE-TYPE PLATES OVER 4 FT ALONG BOTH SIDES OF THE FENCE. CONTRACTOR SHALL SUPPORT THE PLATES ON THE SIDE OF THE TRENCH ON THE INSURDED SOIL.

KEY PLAN

348731-1

CONSTRUCTION DRAWINGS

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
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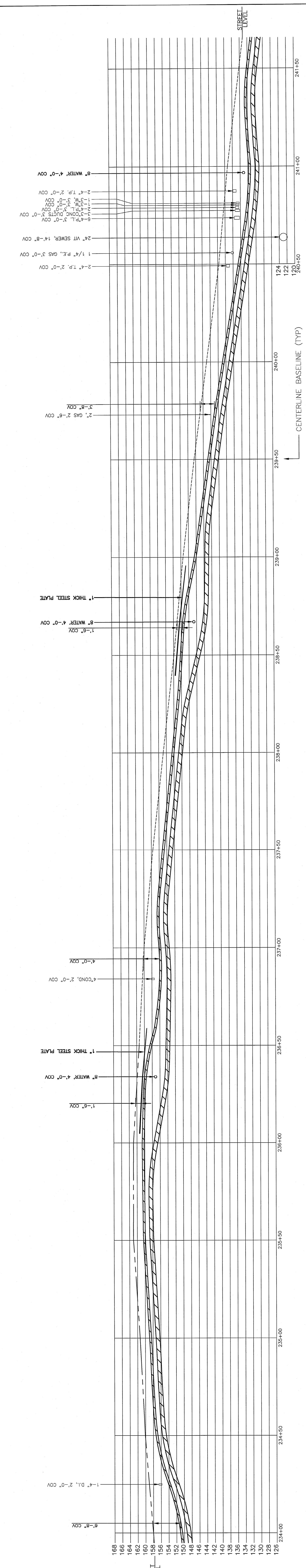
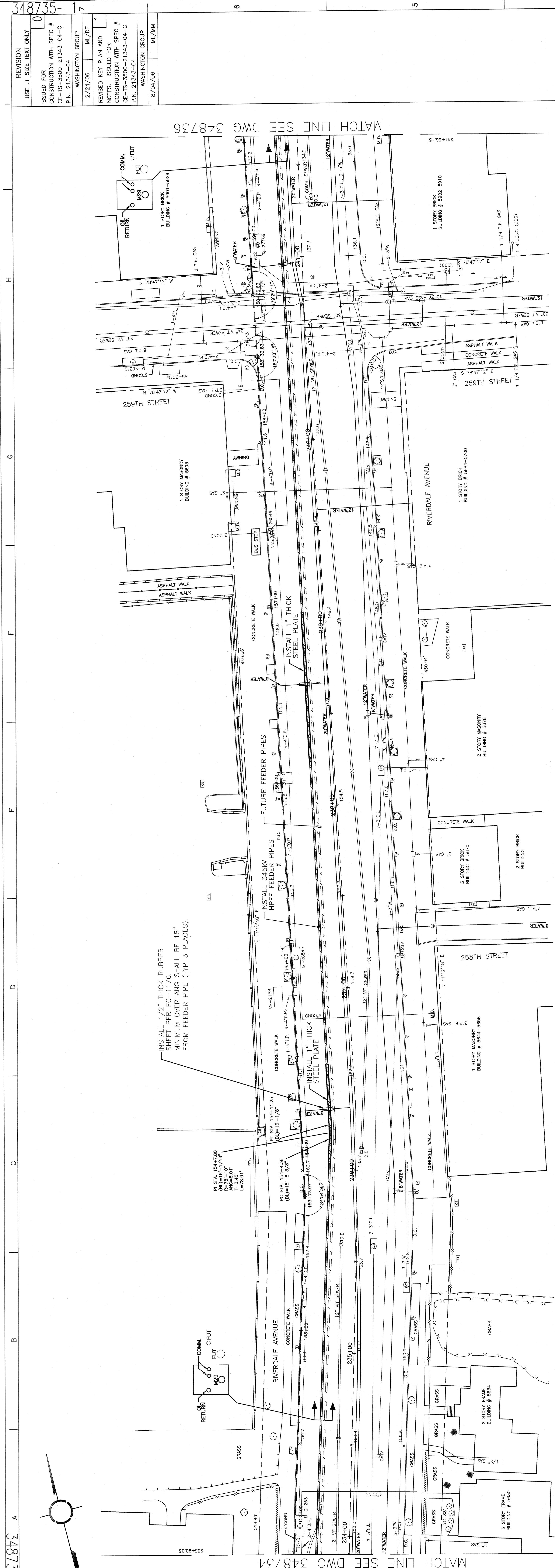
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STATIONING | EGEND: NOTES:

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DWG. NO.	348804	-	DWG.

348804
348738
261st S
Ave

2



ST
348729 PKWY N 25th AVE 348728 PKWY N 25th AVE
HENRY RIVER DELAFIELD HUDSON PKWY
SPRAIN BROOK S/S TO ACADEMY S/S
RIVERDALE AVE - FROM 256th TO 259th ST

348727 HENRY F. RIVERDALE ST AVE 246th S.
238

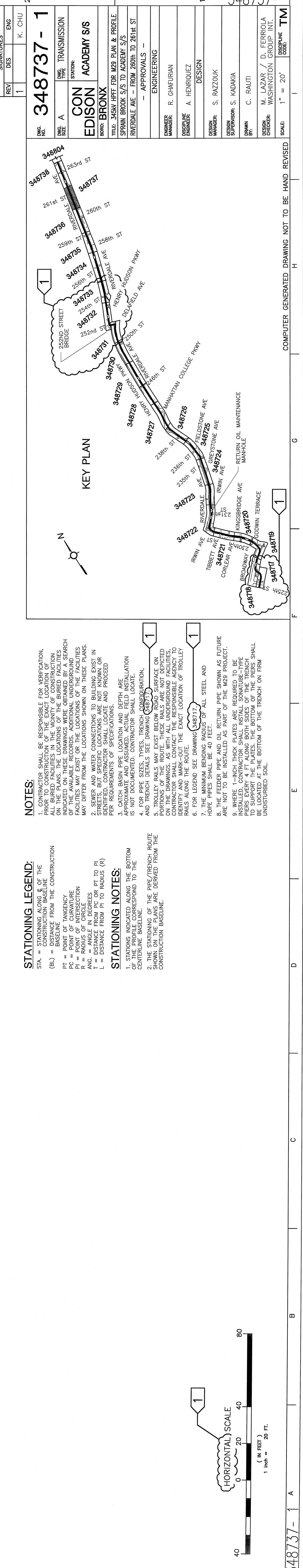
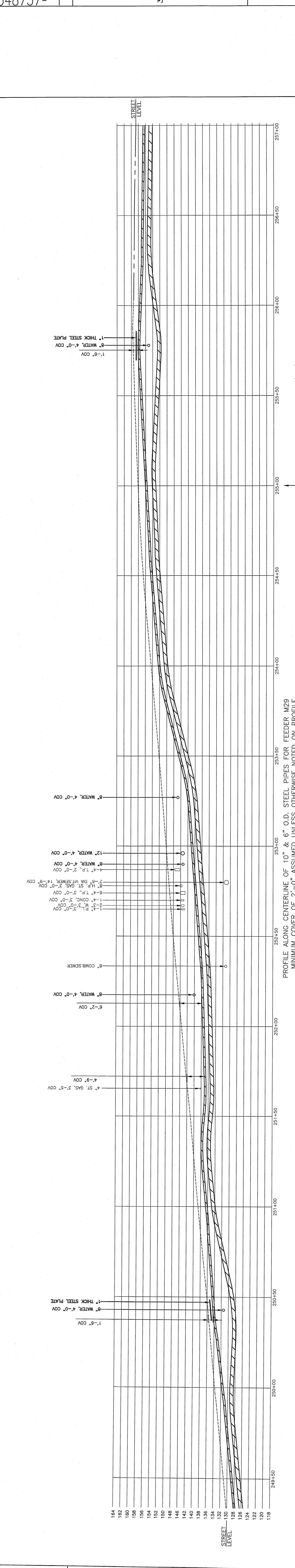
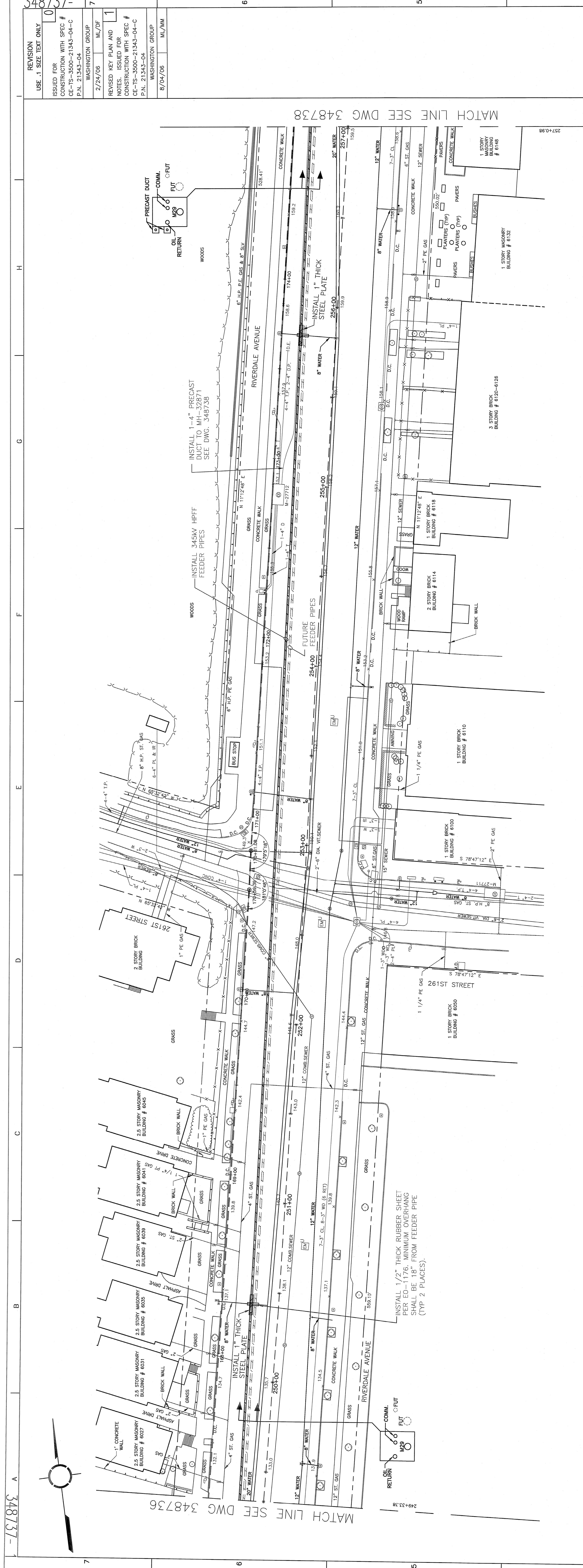
MANHATTAN COLLEGE
348726
3487
R. GHAFURIAN
A. HENRIQUEZ

DESIGN
MANAGER: S. RAZZOOG
FIELDSTONE AVE
348725
GREYSTONE
TIBBETTS ST
RIVERDALE AVE
IRWIN AVE
23
1722
-GE PKWY

348721 CORLEAR AVE
348724 IRWIN AVE
231st ST
KINGSBIDGE AVE
RETURN ON MAINTENANCE
S. KADAKIA
DESIGN SUPERVISOR: S.

DRAWN BY:	A. RUSU
DESIGN BY:	M. LAZAR / D. FERRIOLA

COMPUTER GENERATED DRAWING NOT TO BE HAND REVISED			
CHECKER:	WASHINGTON GROUP INT.	SCALE:	1" = 20'
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<p>348717 348719 225th 1 TM</p>			



APPENDIX II



West 225th Street at the Harlem River, view to the southeast.



West 225th Street looking towards Broadway, view to the west.



Intersection of W225th Street and Broadway, view to the northwest.



Broadway and West 228th Street, view to the northeast.



Intersection of Broadway and West 230th Street, view to the northwest.



Intersection of West 230th Street and Godwin Terrace, view to the northwest.



Intersection of West 230th Street and Kingsbridge Avenue, view to the northeast.



Intersection of West 230th Street and Corlear Avenue, view to the southeast.



Intersection of West 230th Street and Tibbet Avenue, view to the northeast.



Intersection of W230th Street and Riverdale Avenue, view to the northeast.



Riverdale Avenue, West 231st Street and Irwin Avenue intersection, view to the north.



Riverdale Avenue north of Irwin Street, view to the north.



Intersection of Riverdale Avenue and Grayston Avenue, view to the north.



Intersection of Riverdale Avenue and West 236th Street, view to the north.



Intersection of Riverdale Avenue and West 238th Street, view to the north.



Riverdale Avenue north of West 238th Street, view to the north.



Intersection of Riverdale Avenue and the Henry Hudson Parkway, view to the north.



Riverdale Avenue at Manhattan College, view to the north.



Intersection of Riverdale Avenue and West 246th Street, view to the north.



Intersection of Riverdale Avenue and West 250th Street, view to the north.



Intersection of Riverdale Avenue and West 252nd Street, view to the north



Intersection of Riverdale Avenue and West 252nd Street, view to the north.



Intersection of Riverdale Avenue and West 254th Street, view to the north.



Riverdale Avenue north of West 254th Street, view to the north.



Riverdale Avenue between West 254th and West 255th Streets, view to the north.



Intersection of Riverdale Avenue and West 256th Street, view to the north.



Intersection of Riverdale Avenue and West 258th Street, view to the north.



Intersection of Riverdale Avenue and West 259th Street, view to the north.



Riverdale Avenue between West 259th and West 261st Street, view to the north.



Intersection of Riverdale Avenue and West 263rd Street, view to the north.

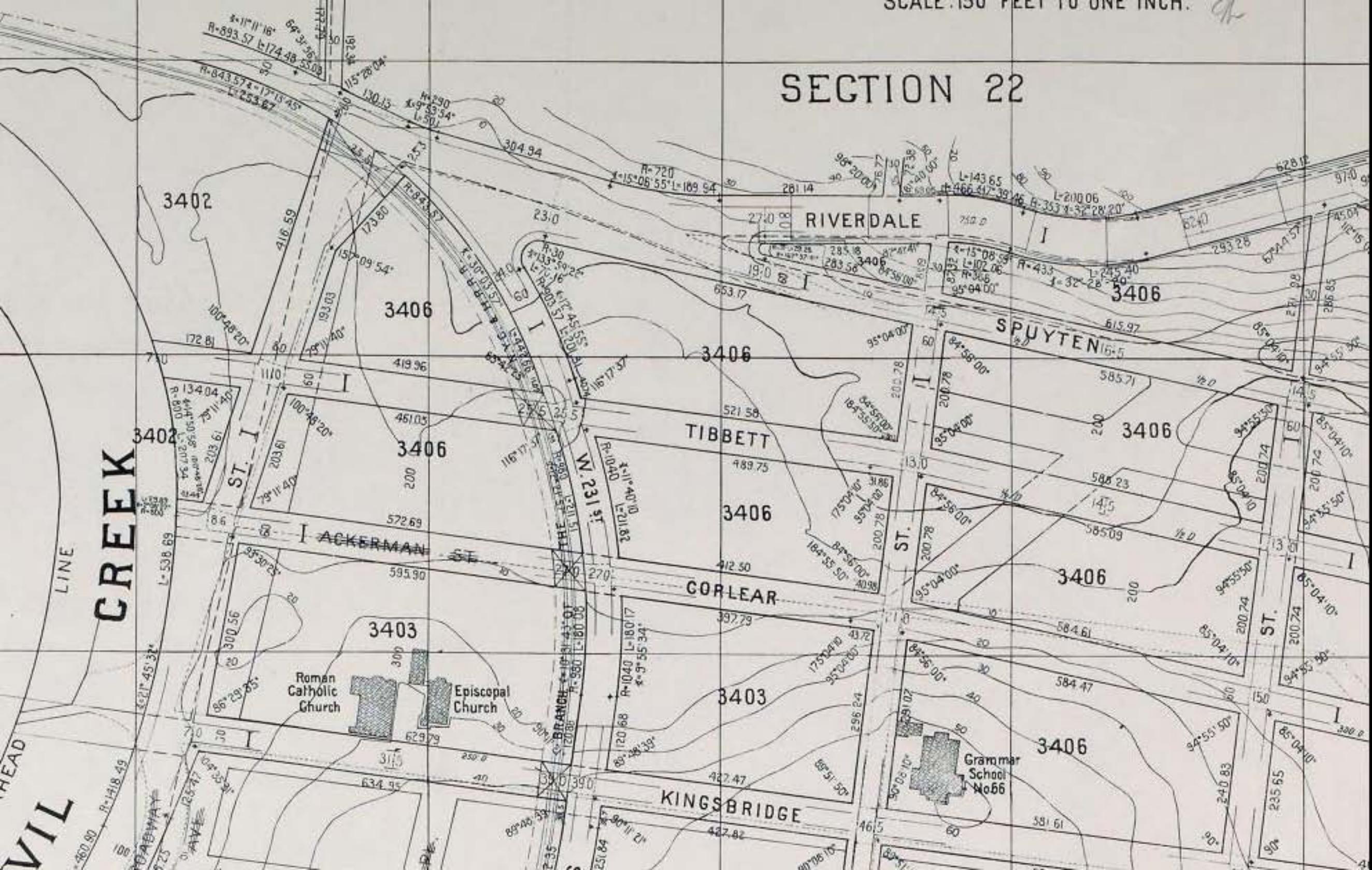


Riverdale Avenue at Westchester County line,
view to the north.

APPENDIX III

SCALE, 150 FEET TO ONE INCH.

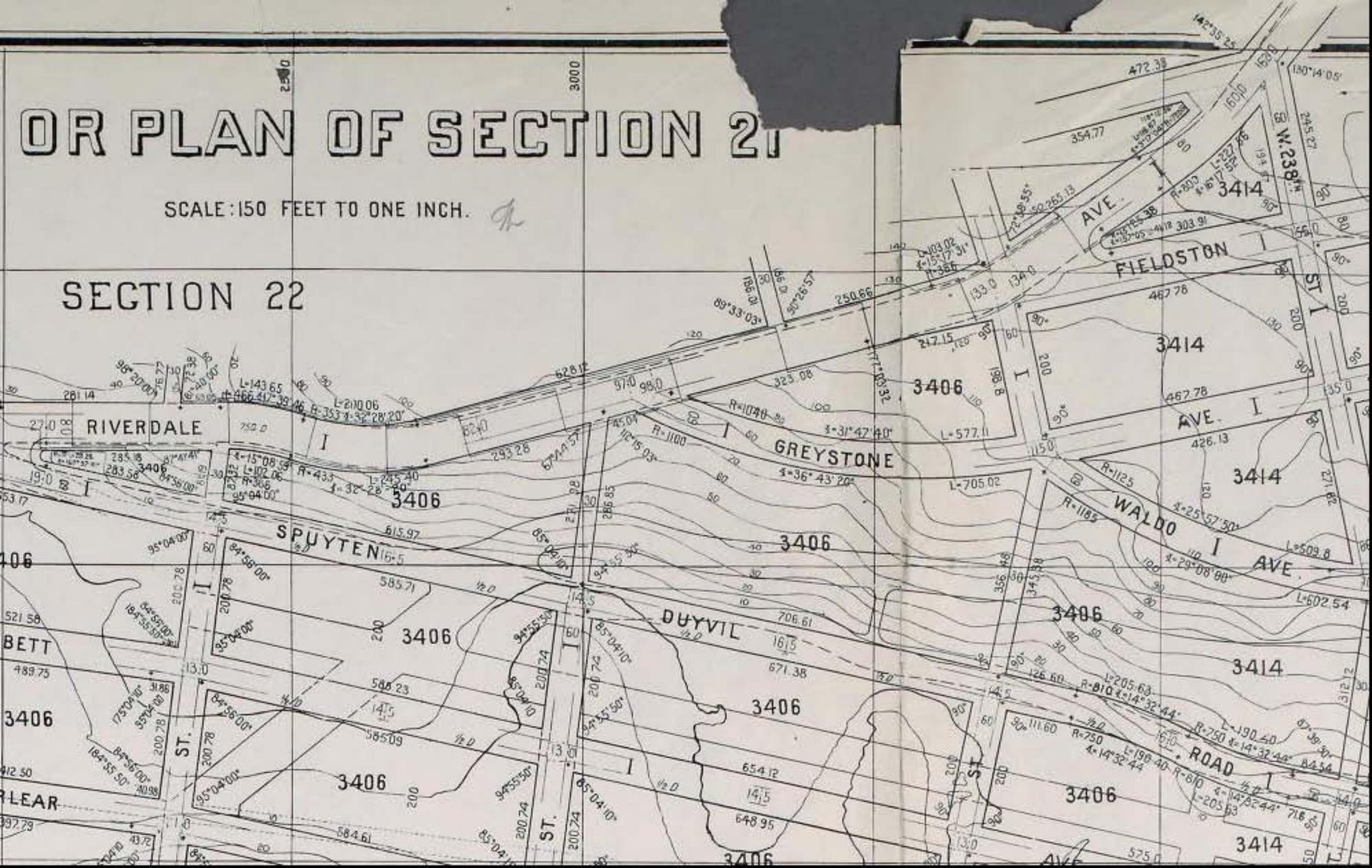
SECTION 22

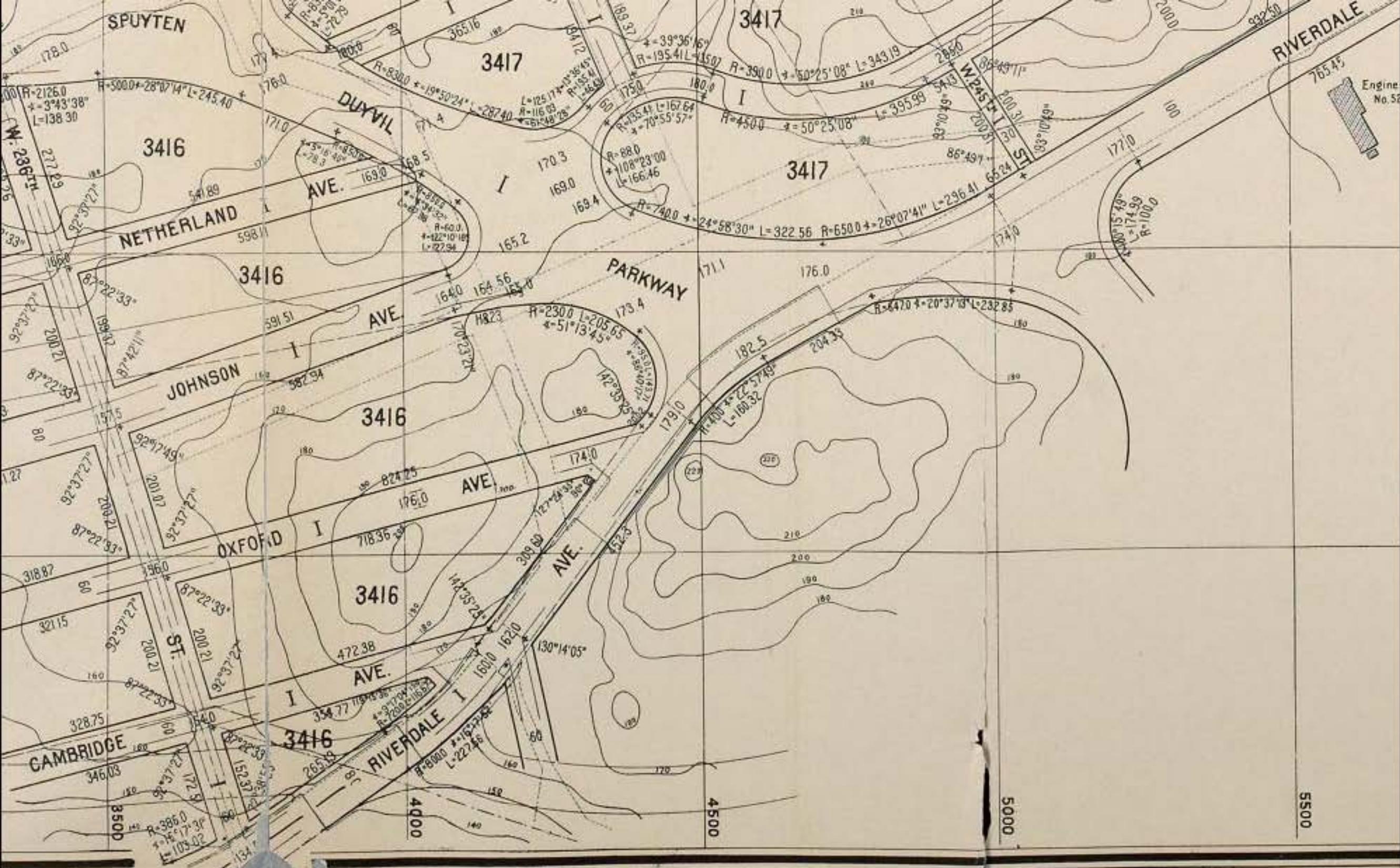


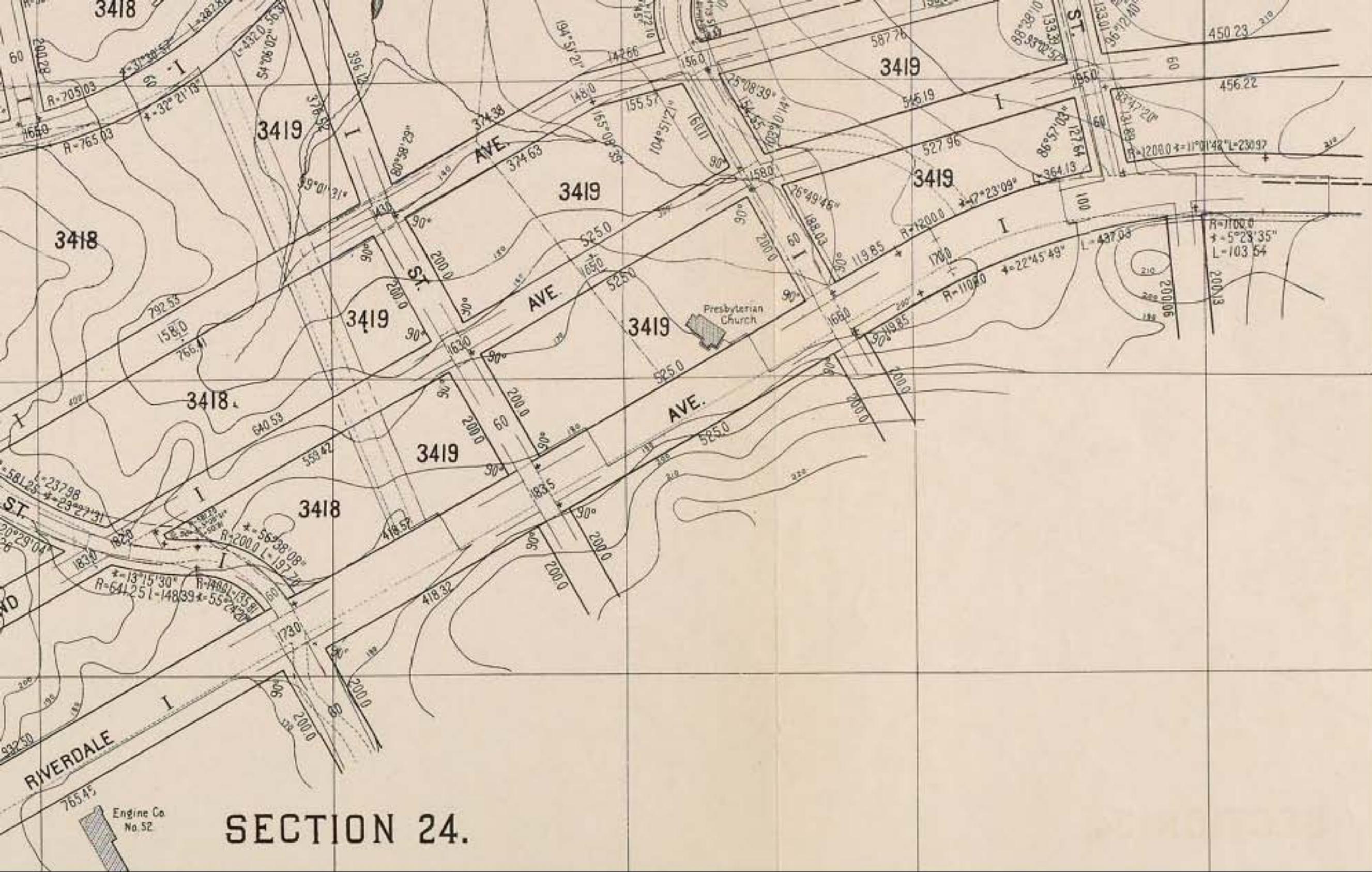
OR PLAN OF SECTION 21

SCALE: 150 FEET TO ONE INCH.

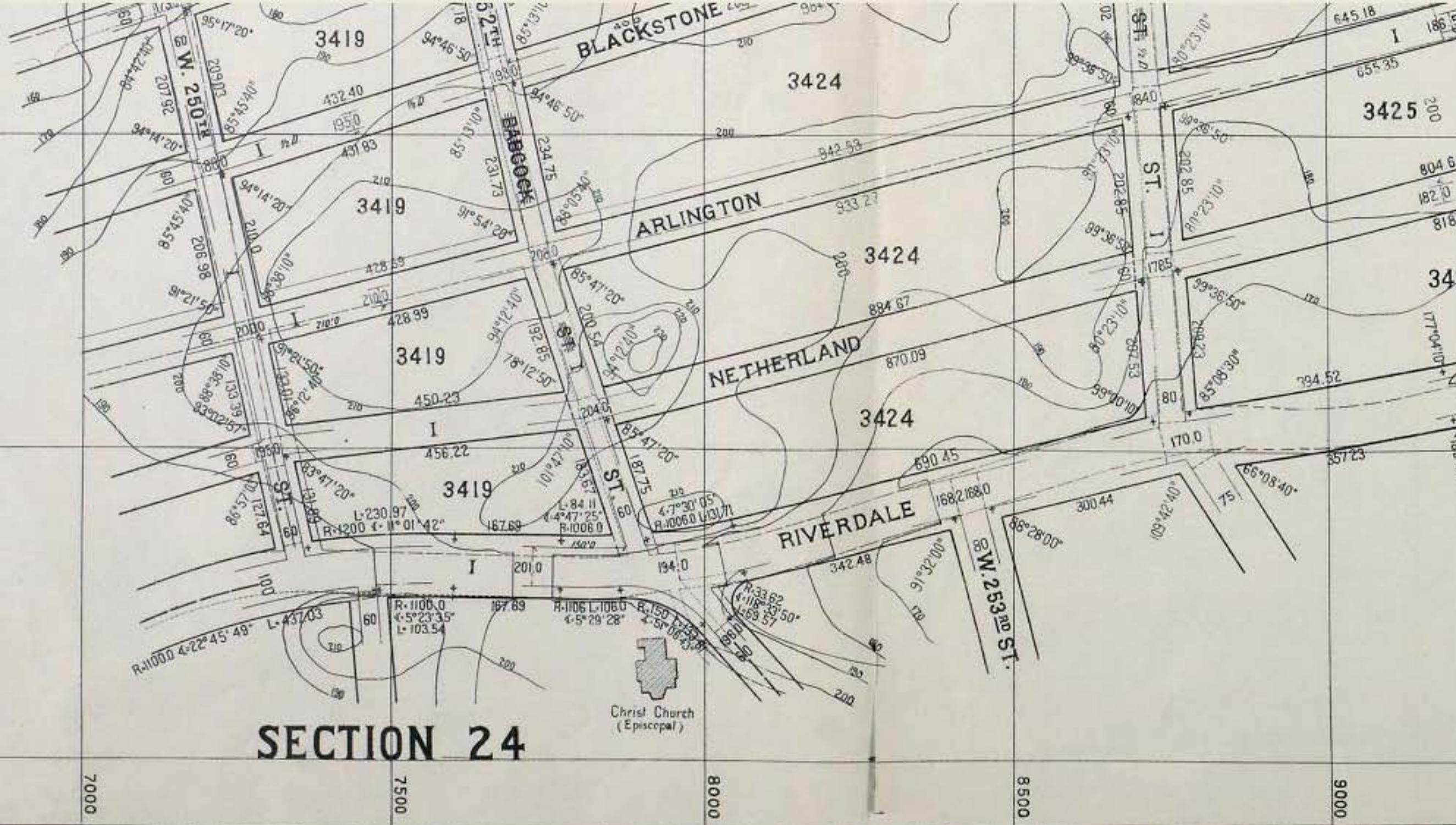
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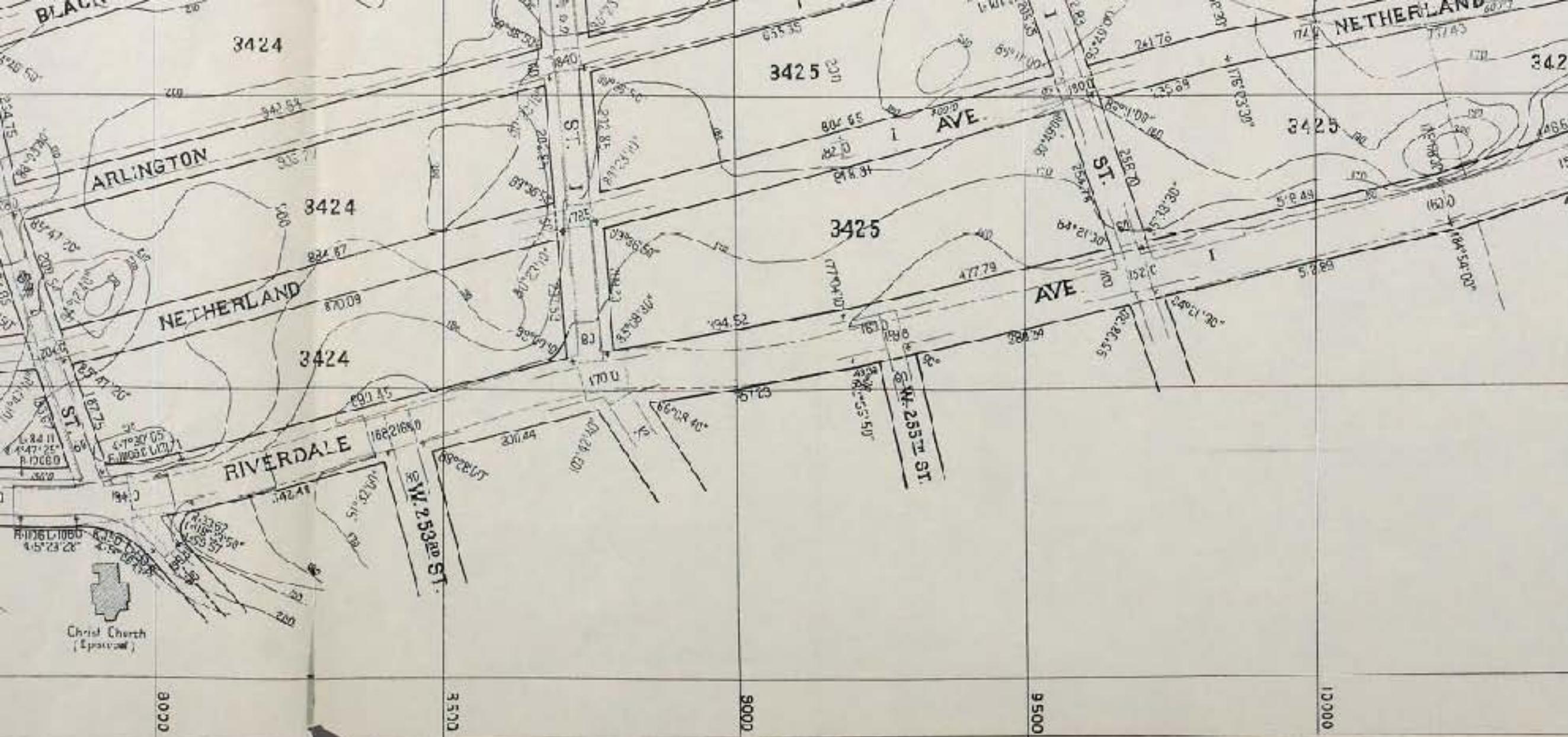


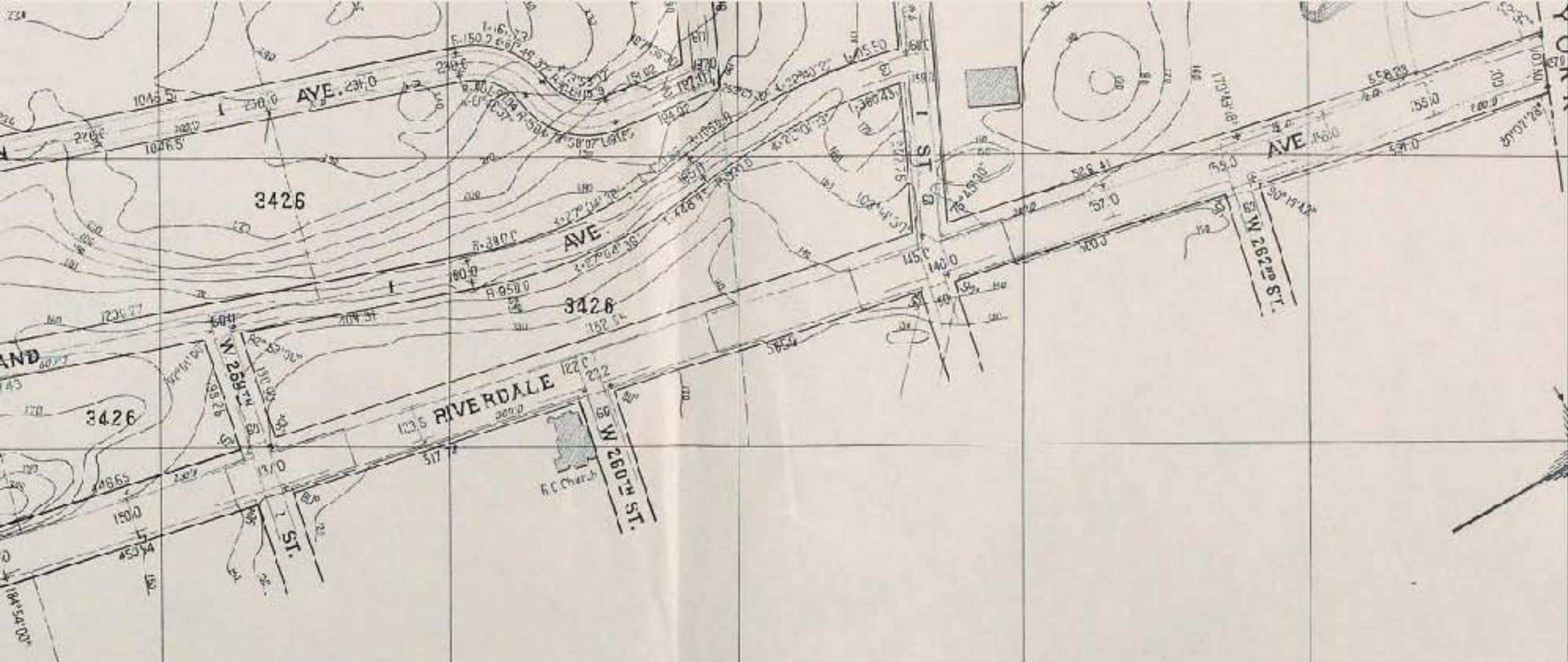


SECTION 24.



SECTION 24





SECTION 25

Section 26 of Final Maps and Profiles of the 23rd & 24th

prepared under authority of chapter 545 of the Laws of 1899 and amendatory acts.

NEW YORK, JUNE 17th 1899.
TOPOGRAPHICAL BUREAU.

LOUIS A. RISSE.

Chief Engg.