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NCEGR

STAGE I
ARCHAEOLOGICAL SURVEY

FULTON STREET
(Cadman Plaza West)
Furman Street to east of Front Street

ATLANTIC AVENUE, FURMAN STREET AND JORALEMON STREET
West of Columbia Street

MAIN AND PLYMOUTH STREETS
Howard Alley to Pearl Street

Contract 1A
RED HOOK WATER POLLUTION CONTROL PROJECT
BROOKLYN, NEW YORK

for

Mason & Hanger-Silas Mason Co., Inc.
under their contract No. 213085

with

Department of Water Resources
City of New York

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by

Ralph S. Solecki, Phd.
597 Piermont Road
Demarest, New Jersey 97627

268

March 23, 1977

597 Piermont Road
Demarest, New Jersey 07627
March 22, 1977

Mr. August Matzdorf, P.E., Area Manager
Mason & Hanger-Silas Mason Co., Inc.
437 Madison Avenue
New York, New York 10022

Dear Mr. Matzdorf,

I am submitting herewith the full report of the Stage I Archaeological Survey, Contract 1A, Red Hook Water Pollution Control Project. In my earlier transmittal to you dated February 1, 1977, I sent to you the first phase of the investigations, which concerned only the tunnel sections.

As per your request, I have included the first phase of the report (i.e. the tunnel sections) in the final report. I have taken the liberty to add certain additional and pertinent information to the history and background of the first phase report. I have tried to answer your specific questions concerning land fill to the best of my knowledge from my researches.

This present report includes illustrations and the results of the additional core boring studies, which were completed following the submission of the first phase report.

I appreciate having the opportunity to participate in this Archaeological Study, since it is important to me professionally as well as of genuine interest as an old Brooklyn boy (Williamsburg).

This report was produced through the efforts of two employees on your staff. To Mrs. Doris Ferrante, who typed and retyped the manuscript, and to Mr. Vincent Mangiere, who drew the plans and sections and assembled the illustrations, I am heavily obliged.

Sincerely yours,


Ralph S. Solecki, Ph.D.

INTRODUCTION

The areas studied in this Stage I Archaeological Survey of Contract 1A, Red Hook Water Pollution Control Project, PW 152, are in the opinion of the author among the most interesting areas of investigation in Brooklyn, if not the most important areas. These areas - the Fulton Ferry District, the Atlantic Avenue-Furman Street-Joralemon Street section, and the blocks adjacent to the Main and Plymouth Streets intersection - date from the very beginning of the settlement of this part of New York City, and the author felt genuinely privileged to have the opportunity to do the work on this project.

It is recommended that a Stage II monitoring of part of the sewer project by a qualified archaeologist be done when the work of excavation begins, as outlined in the Conclusions and Recommendations.

The author made fifteen separate visits to the sites areas in the course of his field investigations. These areas are respectively: (a.) the distorted-U-shaped configuration made up of Atlantic Avenue, west of Columbia Street, Furman Street, between Atlantic Avenue and Joralemon Street, and Joralemon Street, west of Furman Street; (b.) Fulton Street (Cadman Plaza West) from Furman Street to just east of Front Street; and (c) the L-shaped configuration formed by Main Street, between Howard Alley and Plymouth Street, and Plymouth Street between Main and Pearl Streets. All of these areas of course bear absolutely no

resemblance today to what they had been originally, since they have suffered numerous changes. Of the three areas, The Fulton Ferry district still retains a semblance of certain charm under its weather-beaten and battered exterior. The latter district has been placed in the National Historic Register, and there is a move to include certain of the buildings in the rolls of the Landmarks Preservation Commission.

Actually documentation research on the project was begun on January 5, 1977. Study of the geological core sample data revealed some hints as to possible aboriginal occupation (from burned shell debris) on the old river shore at the East River end of Fulton Street. Examination of the core samples indicated that only partial physical samples of the cores were saved, and it appeared advisable to obtain more complete representative core samples for a better assessment of the archaeological potential of the study areas.

A meeting of the principals involved in the archaeological investigations at Federal Plaza in Manhattan on January 11, 1977 included Prof. Bert Salwen, of New York University and Consultant to the Environmental Protection Agency, Mr. Richard Walka, Scientist of the Environmental Protection Agency, Mr. Sudhir Parekh, of the Department of Water Resources of New York City, Mr. August Matzdorf, P.E., Area Manager of Mason & Hanger-Silas Mason Company, Inc. and the author, to discuss the strategy to be followed in the archaeological survey, at which the specific problem of additional borings in the study area was brought up. It was recommended that this be done in all three areas.

The nature of the sewer construction in the three areas influenced the recommendations for further researches. Thus,

the proposed projects will involve open excavation cuts on Atlantic Avenue and Joralemon Street, while the section between these two streets on Furman Street will be a tunnel. The Fulton Street sewer project will involve an open cut. The Main and Plymouth Street sewers will be mined in a tunnel.

The field work involved a walk-over of the study areas with the maps of the districts, a study of the buildings and structures with an emphasis upon the historic buildings and spots, and a photographic record of the latter. A comparison of the Jeremiah Lott (1816) map of the Fulton Ferry district was made with the present situation, and the location of a number of historic places was pin-pointed. Included among these was the original site of the old "Corporation House", the first city owned property (so far as was ascertained) on the Brooklyn side and in an adjacent location the place from which Francis Guy made his "Snow Scenes" on Front Street in 1820. The building of the old Franklin House Hotel on the corner of Water and Fulton Streets still serves meals in the contemporary first floor Waterfront Restaurant, - meals which only a hearty and very hungry truck driver could stomach. It can be imagined that a hundred years ago lower Fulton Street was probably no easier to traverse with the horse drawn street cars, teams of horses pulling heavy loads, etc. than it is against motorized traffic today, excepting that speed has increased several fold.

A team of drillers with a City geologist and a Columbia University graduate student archaeologist in attendance made ten core borings on Fulton Street and Joralemon Street. Also present was an employee of the utility company who monitored the placement of the borings to be sure that the utility lines would not

be affected. The author visited the on-site borings during the course of the work, familiarizing himself with the methods used as well as to check on the results of the explorations.

While lower Fulton Street presents some interesting vignettes of Old Brooklyn for examination, not much can be said for the other two areas. The situation of Main and Plymouth Streets, in the shadow of the bridges, presents little for study with the exception of a couple buildings on the end of Water Street, west of its intersection with Main Street. The water front at the end of Plymouth Street in front of the Empire Storage Warehouse presents a kind of tranquil view formed by the Brooklyn Bridge. The Atlantic Street-Joralemon Street-Furman Street areas, aside from the docks, takes a lot of imagination to recapture the past.

Retrieval of data in the documentary researches has found to be a kind of a near frustrating quest. One of the historians notes that the British had destroyed official papers during their occupation of Brooklyn, and the records of later periods did not suffer better fate. Judd (1959, iii) observes that in his researches in the period between 1834 to 1855 it is believed that the official documents of the early periods were destroyed in a series of fires, while other official documents were "systematically destroyed in order to provide space for more recent records". (ibid.). It is indeed fortunate that the daily newspapers of the time thought the minutes of the meetings important enough to print. The problem of course is to wade through reels of microfilmed newspapers for the nuggets of information sought. Parenthetically, it may be said that contemporary records also have a short shelf life. One hears of old men who knew everything

in their departments, and when retired, their hard-won knowledge went with them. The younger replacements in general are too busy with problems of the moment to concern themselves with ancient history and tribal lore.

The most useful summaries of early Brooklyn history can be counted on the fingers of one hand. These include Henry Stiles' "History of County of Kings and the City of Brooklyn, New York from 1683 to 1884", which appeared separately in one volume (almost as thick as two telephone books, a sizeable mean coffee table weight), a two volume and a three volume edition. This is of course confusing for documentation. This work was edited by him, with his own contributions interspersed in the work. He had written an earlier study on Brooklyn in three volumes, published in 1867. The others are Eugene Armbruster's "The Ferry Road on Long Island (1919); Gabriel Furman's "Notes Geographical and Historical Relating to the town of Brooklyn in Kings County of Long Island" (1824); Furman's "Antiquities of Long Island" (1874), and for the more recent period, Richard Rosan's (et al) "Fulton Ferry" (1972). It was found that the writings and observations of Armbruster, Furman and Stiles have been absorbed and regurgitated in many subsequent published papers and books written on the subject of Brooklyn, and the fine hand of these three gentlemen can be distinguished everywhere - this presentation being no exception.

In his researches, the author made extensive use of the facilities of the Long Island Historical Society, and is obliged to its Director, James Hurley for his library assistance. Similarly, he is obliged heavily to Prof. Arthur Konop of the James A. Kelly Institute at St. Francis College. The author

also used the Collections of the Columbia University Library, as well as his own professional books and papers. He also conferred with the New York City geologists, Mr. Irving Ostrofsky and Mr. Peter Kuuk of the Department of Public Works, and on other geological problems related to the work with Drs. Herbert Hills of the Nassau Point Museum, Long Island, and Walter Newman of Queens College. The author also conferred with the Engineers of the Department of Highways at 40 Worth Street, New York.

Mr. Thomas McGovern, a graduate student archaeologist at Columbia University, survived the rigors of Arctic climate on the riverfront in recovery of the supplementary core borings. His Arctic experience (Greenland) made him especially well qualified.

Without the help of two members of the Mason & Hanger-Silas Mason Co., Inc. staff, this report would certainly not have achieved its perfected state in record time. Mrs. Doris Ferrante typed and helped in the assembly of the manuscript, while Mr. Vincent Mangiere did the draughting work as well as the preparation of the illustrations.

Ralph S. Solecki, Ph.d.
March 21, 1977

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The following sheets from the Contract 1A plans are transmitted with this report:

<u>Sheet No.</u>	<u>Description</u>
22 of 77	Plan & Profile - Atlantic Avenue, West of Columbia Street
23 of 77	Plan & Profile - Joralemon Street, West of Furman Street
25 of 77	Plan & Profile - Fulton Street, Furman Street to Everitt Street
26 of 77	Plan & Profile - Fulton Street, Elizabeth Place to Hicks Street

Note: The following sheets from the Contract 1A plans were transmitted with the first phase report

<u>Sheet No.</u>	<u>Description</u>
3 of 77	Plan & Profile - Atlantic Avenue, Columbia Street to Furman Street
4 of 77	Plan & Profile - Furman Street, Atlantic Avenue to Joralemon Street
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13 of 77	Plan & Profile - Main Street, Front Street to Plymouth Street
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HISTORY OF THE FULTON STREET FERRY & ENVIRONS

The literature indicates that Fulton Street, or the lower part of it at the East River (that part now called Cadman Plaza West) was part of an old Indian trail through Brooklyn and out to Long Island (Figs. 1, 2). The same crossing which the early settlers who wished to cross to the island of Manhattan used was originally used by the Indians (Bolton, 1922, p. 131; Furman, 1875, p. 135). The native village of Mareyckawick, which belonged to the Canarsie tribe, reportedly stood in the vicinity of Lawrence and Jay Streets about half a mile from Fulton Ferry. It is said that the first white settlement in Brooklyn was made upon this site (Furman, 1875, p. 135). Unfortunately, there is no record of any kind of exploration, much less careful excavation, of this and other Indian village sites in this part of Brooklyn, although there had been extensive street grading and building operations (Bolton, 1922, p. 132).

The Name "Brooklyn" comes down to us over three hundred years of time with changes. Originally known as "Bruikjkleen Colonie", it was established through the purchases of Director-General William Kieft, who wanting landed property, was evidently obliged to buy land on Long Island because everything available on Manhattan Island was already taken (Armbruster, 1918, p.7). He acquired the land through purchase from the local Brooklyn Indians, the Canarsies. According to another source (Bolton, 1920, p.271) the sachems of the Mareykawick family sold their rights to fishing and oystering up the East River to Blackwells Islands to Director Van Tweiller. Indeed, the record of sales

of rights and land by the Indians to the Dutch appears to be clouded with a number of questions. In any case, the word "Bruijkleen" is a Dutch appellation to the area, a word still being used in the Netherlands (Armbruster, 1918, p.9). It means "free loan", and as applied to land negotiations, and in our equivalent it is a "homestead". Farmers in the Dutch colonial days were given plots of land to use provided that they put it under cultivation (Armbruster, 1918, p.9).

One of the earliest residents of the Old Ferry area appears to be a Claes Cornelissen (Mentelaer) Van Schouw, who received a patent for land from Governor Kieft on the water front extending from the ferry. At the ferry point itself, a number of grants for houses and building lots were made subsequently, to various individuals.

The seal for the "Bruijkleen Colonie" was created in 1654, formally fixing the name to the area. The village of "Breukelen" was founded in 1645 upon the Indian village site of Maerckkaakwick (Mareyckawick) noted above (Armbruster, 1918, p.11). The name of the village was changed from "Bruekelen" to "Brookland", when the English took possession in 1664. It became also known as Clover Hill, and Brooklyn Heights. The name was again changed to Brooklyn in 1807, and Brooklyn village was organized in 1816 (Langstaff, 1933; Brooklyn Daily Eagle, 75th Anniv.).

The Old Ferry was established about 1642 by Cornelius Dirckson (Hooglant) who was called the Ferry Man (Fig. 3) (Stiles, 1884, p.92; Booth, 1859, p.684). Dirckson sold his property and his ferry rights to a William Thomassen (or alias William Jansen) in 1643 (Stiles, 1884, Vol. 1, p.85). Thomassen (or Jansen) appears to have enjoyed the rights for a few years.

A complicated set of charges against cargo and persons was declared for ferriage by Governor Stuyvesant in 1654 (Stiles, 1884, Vol. 1, pp. 425-6). Two or more people in a party were given cut rates (half price each one). The first ferry house or tavern on the Brooklyn side appears to have been established by an Egbert Van Borsum, who in 1655 leased the ferry from Governor Stuyvesant. He had the ferry rights to as late as 1663, the year before the English took over New York. From the time the English assumed control until 1695, there was much confusion regarding ferry rights. The people of Brooklyn wanted to control their own ferry, which by this time was quite a lucrative enterprise (Stiles, *ibid*, pp. 426-7).

Upon cession of the city to the English, the new rulers assumed control over the waters, and made the ferry pay toll to the city government. The people insisted on their right to ferry themselves however (Booth, 1859, p.685).

The Old Ferry Street had various names recorded from 1646, when it was called the "Highway". It was also named "The Wagon Road", the "Kings Highway", and the "Queens Road" etc. Within the later Brooklyn village limits, the road was best known as Ferry Road until a branch road had been established along the present line of Main Street in 1795; then there was an Old Ferry Road and a New Ferry Road. In 1817 the Old Ferry Road was re-named Fulton Street, in honor of Robert Fulton (who died in 1815). Outside these limits the road became Fulton Avenue when Brooklyn City came into existence (Armbruster, 1919, p.10) (Table 1).

There are suggestions from early maps that there had been a number of changes in the position of the ferry landing. The Old Ferry Landing was originally much farther inland and somewhat

to the southward of lower ferry slip (Stiles, 1869, Vol. II, p. 36). In fact, according to Furman (1824, p.29), and indicated on an early map (Fig. 1), the original or first ferry point in Brooklyn was near the foot of Joralemon Street during the early years of the colony. Furman (ibid.) adds that at the time of his writing it was difficult to ascertain the exact point in time when the ferry at the foot of Fulton Street was established.

No property records earlier than the close of the 17th century for the land (Block Nos. 200, 201, 202, 35) (Fig. 4) at the foot of Fulton Street in the vicinity of the ferry were located. The record for the north side of the street between present Water Street and Front Street, which nearly follows the original line of the road so far as could be determined from all published maps, illustrations and records, indicated that the first land transaction in the area began in 1694 with the names John Coe and John Aerson (Liber 2, p.287, August 13, 1694). The same year the Corporation of the City of New York bought the William Morris House, barn and premises on the same side of the road opposite Little Street (present Elizabeth Street) about a hundred feet from the then shore of the East River (Furman, 1824, p. 23, 102-3). The Corporation built the services for the ferry, including a pier, ferry stairs (to accomodate the rise and fall of approximately five feet of tide)and a cattle yard (Armbruster, 1874, p.278). The house was later replaced in 1699-1700 with a brick and stone ferry house and tavern which is depicted in a number of well-known scenes (Figs. 5, 6, 7, 8). It had a stepped roof front in the Dutch Style. John Aerson, a property owner at the ferry landing mentioned above, was ferry master in 1697 (Furman, 1824, p.29).

A frontage of some 450 feet was acquired along the river by the Corporation, from the south side of Fulton Street to the north side of the present Brooklyn Bridge tower, for which foresight later proved valuable toward the construction of the bridge (Brooklyn Daily Eagle, 1890, p.8; Armbruster, 1919, p.9; Rosebrock et al., 1975, p.5; Furman, 1824, p. 23, 110-115). Armbruster (ibid.p.9) mentions the tavern as well as a new ferry house and the landing bridge, were all built at a cost of about 435 pounds, which small as it seems now, was of some consequence then. The tavern was burned down in either 1747 or 1748. According to Mary Booth (1859, p.684) the Sepoys of Long Island were supposed to have been responsible for the burning in order to inflict damage upon the Corporation for infringing on their rights. But probably more correctly it was burned down by outraged Brooklynites, who were embroiled in a continuous litigation over the lucrative ferry rights (Stiles, 1884, Vol. I, p.95).

A new two story tavern, 60 feet square, was built on the spot in 1748, which became known in the records as the "Corporation House". It stood until 1812, when a widespread fire, literally a "fire storm" of the type which destroyed German cities during WW II, consumed a number of buildings in the area and destroyed it. The remains were leveled five years later (Armbruster, 1919, p.9; Stiles, 1869, Vol. II, p.2). The site of the Corporation House is partially occupied today by Nos. 19, 21 and 23 on Fulton Street, (Fig. 2) just west of the old "The Banker's Corner" (The Fulton Ferry Bank) at 25-27 Fulton Street. Today, No. 19 Fulton Street is occupied by a single story commercial building, the Waxman building. Next door to the east, the Fulton Street frontage is gap toothed with an empty lot occupying Nos. 21 and

23, belonging to a Ms. Mary Winconia, its leveled area shut off from the street by a high iron chain link fence. With the exception of a rusting derelict truck, no apparent use is being made of the property today, and would seem that a golden opportunity presents itself for a deep sondage to be made to lay bare the foundations of the "Corporation House".

About the road to the ferry and the ferry itself, there are some illuminating contemporary records. Dankers and Sluyter, (1867, p.119) two travellers to the New World, give a description of the ferry ride to "Brookland" in 1679. The fare was three "stuivers" in wampum (zeewan) each person, or the equivalent of less than half a cent in 1867 when the book was reprinted.

"Zeewan", the Indian name for wampum, is the descriptive given to Long Island (Seewanhacky) in the early colonial records for the good wampum produced there.

In 1704, a decision of moment decided the course of the ferry road at lower Fulton Street for over a hundred years, until new changes were made. The Main Road, or Fulton Street, was laid out by the Commissioners for the Colony of New York in March of that year, when it was ordered that a public highway the King's Highway be laid out beginning from the low water mark at the ferry running four rods wide (64 feet) between the house and lands of John Aerson, John Coe and George Jacobs to "Broockland" town (Furman, 1874, p.319; Flint, 1896; Armbruster, 1919; Stiles, 1884, Vol. I, p. 92).

The butcher business was evidently a very profitable enterprise during the early history of the colony and Brooklyn opposite the Manhattan shore. Names like Patchen, Stryker, Doughty, Hicks, Horsfield, Carpenter, Everit were butchers who were prominent

figures and whose names are found on the streets of downtown Brooklyn today (Stiles, 1869, Vol. II, p.67, 38-9, 52, 119, 122, 125; Furman, 1824, p. 40). It was more convenient to ship sides of beef to Manhattan rather than the whole animal, and slaughter houses sprang up around the Fulton ferry. Indeed, some of the butchers evidently had their own ferry landing, with one at the foot of Doughty Street just to the south of the Fulton Ferry, and one to the north of Fulton Ferry at the foot of Dock Street, near a slaughter house, which stood about where Fire Engine No. 4 later stood (Furman, 1824, p.40).

The "Fly Market" in the center of the street, which dates from the late 17th Century (1676) was the virtual monopoly of the butcher trade (Furman, 1824, p.85) A second market was established along the river to the north in the next century at the foot of Main Street near the newly established ferry (ibid.).

There appears to have been a steady landfilling of the area of the Fulton Ferry from earliest times. Much of this land fill probably came from the reduction of nearby hills, but it is more likely later on that the most convenient fill was destroyed buildings, or the result of the widenings of Fulton Street. Originally, there had been a small cove at the bottom of a gently sloping hill just north of the present Brooklyn Heights area. The indications from early land deeds are that the East River cut about the present line of Everitt Street, and there was a bluff fronting on the river just about where Front Street is today.

The ten foot contour follows the old 18th Century shore line (Fig. 9). The original ferry house, shown in the painting by Burgis shows it to have been just to the river or westward of the bluffs (Fig. 5).

The earliest land transaction found in the records of the ferry area (Sect. 1, Block 200, from April 7, 1685, Liber 1, p. 40,

also Liber 4, p. 111, March 26, 1716) between Hans Bergen and Johannes Sebering, concerns land south of the ferry point. The East River appears to have come up to a little west of present Everitt Street, which was crossed diagonally by the water. The same people figured in another land transaction (Liber 4, p. 113, March 26, 1717); in which it is shown that the river still crossed the Old Ferry Road or present Fulton Street about the line of present Everitt Street (Blocks 200, 201). A diagram in which the grantee is Hans Bergen, Sect. 1, Block 201, Liber 4, p. 142, April 16, 1717, shows that there is no change.

The 1717 Burgis view (Kouwenhoven, 1972, pp. 52-53) (Fig. 5) shows interesting additional details. Next to the cattle yard on the south side of Fulton Street appears to be a barn about where Middagh and Elizabeth Streets are today. On the north side of the street, the only buildings evident apparently are part of the Corporation complex - a smaller two story building flanking the Corporation House on the east with a gabled roof, a hip roofed single story structure leaning against the Corporation House on the immediate west, and then another single story shed with a gable roof adjoining to the west of the latter structure. Just visible to the north on Front Street (originally Mill Road) appears to be another two story structure, which is presumably the John Rapalye house, two stories high and built of Holland brick. It somehow survived the fire-storm ravages in the earlier part of the century. Between the Corporation House and the Rapalye house was later built the first fire engine house about the end of the 18th century. It was built upon the "gore" lot made by the two buildings above.

On the "gore" lot today is the present bare hull of the

Fulton Ferry Bank building (Fig. 10) originally built as the Long Island Safe Deposit Company in 1868 (Stiles, 1884, Vol. I, p.632). This unique iron clad structure, on the corner of Fulton and Front Streets (Nos. 25-27 Fulton Street) is presently vacant. The owner would like to make a restaurant out of it. I visited the building and viewed the interior on March 14, 1977, in company with two gentlemen who were inspecting the structure. It is difficult to capture the spirit of smartly suited men and women of a bygone era today in this stark, decrepit interior, which needs much to refurbish it. The illustration in Stiles (ibid.) shows next door, to the west of this building, a simple four story brick building, the lower part of which appears to be a store front. This building (since demolished) stood on the site of the old Corporation House. To the right of the bank building is a three story brick structure (Nos. 5-7 Front Street) which is functioning today as a restaurant on its first floor.

Across from Front Street stood a very old frame building which functioned as the first post office in Brooklyn in 1818 (Armbruster, 1919, pp. 23-24). In the same Burgis 1717 view, the Brooklyn Heights, of Ihpetonga, does not appear to be especially heavily wooded, with a copse of trees at the northern end overlooking the ferry, and another grove of trees toward the west end in the illustration.

Study of the view of the Fulton Ferry in 1746 (Fig. 7, 8) (Stiles, 1869, Vol. II, p. 39) does not show very much change from the 1717 view of Burgis. The cattle yard is still there, and the Corporation House still stands with its outbuildings and neighboring buildings on the north side of the Old Ferry. There was a sandy bluff just to the south of the building adjoining the

Corporation House, which ran northward in line with present Front Street, and to the left side. Significantly, there appears to have been a small cove just behind the Corporation House, and there are ships docked just to the west of the small building adjoining the Corporation House to the west, which probably stood about where No. 17 Fulton Street stands now. The beach appears to have begun to the west of this building, and the dock extended possibly about a hundred feet out into the river. The end of the dock comes to about the present Water Street, if our estimates are correct. The dock appears to have been a quay made up of a long rectangular framework of timbers approximately ten feet by forty feet long, divided up by cross beams at ten foot intervals. In it appears to have been placed some kind of fill, which from the illustrations looks like gravel or cobbles. This rectangular grillwork evidently was the forerunner of the Fulton Street Ferry slip. This quay side, in effect, bounds a grassy sward to the south, on which a lady and several gentlemen are promenading. Two other gentlemen are taking their ease sitting in a pirogue on this dry land for some unaccountable purpose. On the left side of the illustration is the cattle yard, standing about where the present Eagle Storage and Warehouse Company is today. The street was quite wide in this view, and the narrowness complained about in the 1816 maps is not indicated in these early views.

The same is indicated in Liber 6, p. 59, 60 for Sect. 1, Block 201, in which in a land transaction on May 28, 1756 to grantee John Carpenter, the East River cut across Fulton Street (Old Ferry Road) about the line of present Everitt Street, hence there was no change. There was a further note that the East River was 105 feet west of Little Street (present Elizabeth

Street). Until Furman Street was opened up, Elizabeth Street was the only means of access to the Fulton Ferry from the beach road to the south which became Furman Street (Stiles, 1869, Vol. II, p. 118).

In 1741, Brooklyn Ferry was made a relay station for the mail coach connecting His British Majesty's Colonies of New England and Virginia. A stage coach route was established from Brooklyn Ferry to Sag Harbor, which ran once a week, and then came the Flushing coach (in 1801 to 1854) (Armbruster, 1919, pp. 10-11).

Lt. Ratzer's map of 1766 (Fig. 11) shows that there was by this time a considerable settlement at the foot of the Old Ferry Road. It figured heavily in the military strategy at the time of the Revolutionary War, and was the embarkation point of Washington's first major retreat from Long Island on August 27, 1776, in which some 9,000 American troops were evacuated in a kind of Dunkirk operation under the superintendence of a General McDougall. All available boats were commissioned for the operation, which was successfully completed by August 30th. It is not unlikely that Washington and his staff at least visited the Corporation House during this tense period of the new country's history (Fig. 12, 13).

Furman (1824, p.52) says that Captain Hale, reconnoitering for information for Washington, was taken by the English and hung as a spy somewhere along the Brooklyn shore to the southwest of the Old Ferry. Most of the records of early Brooklyn were destroyed by the English after they won the Battle of Long Island and took possession of Brooklyn.

As might be expected, the "Corporation House" figured heavily in the occupation by the English victors. It was otherwise known as the "Ferry Tavern", a large and gloomy stone build-

ing. It had also been called "The Coffin House", because of some evidently troublesome incident when a coffin had been hauled up on the flagstaff of the building (Stiles, 1884, Vol. 1, p.95). This tavern was famed for thirty years before the American Revolution, when it was simultaneously managed with the ferry by a Captain Adolph Waldron, who had allied himself with the American rebels. Forced to leave because of his position, his place was taken by a couple of loyalists who renamed the tavern "The King's Head" they declared bankruptcy at the war's end in 1782. Subsequently this tavern was called the "Brooklyn Hall", until its burning in 1812 (Stiles, 1884, Vol. 1, p. 96). The first newspaper in Brooklyn was published by the landlords of the "King's Head Tavern" in 1782 (Stiles, *ibid.* p. 99).

At the close of the Revolutionary War there were about 56 buildings within the boundary of Brooklyn (Armbruster, 1919, p. 16) (Fig. 12, 13). In the early 1800's there was an increased tempo in the number of street and building improvements in the ferry area, as the village prospered. At the beginning of that century, the landing was a cluster of taverns, livery stables and stores. It became the shopping center for the majority of Long Islanders, and stage coaches leaving for any point of the island had their terminus at the landing. A gravel sidewalk was laid about 1818 to accommodate the foot traffic, and curbstones were set up to separate the walk from the street, which must have been very untidy with the droppings of cattle and horses, as well as the unpaved street, which was undoubtedly muddy in bad weather, and dusty in fine weather. There is record that there was some balking at making sidewalk improvements about this time. A local figure named Mr. Patchen was ordered in 1816 to replace his cobble-

stone sidewalk for a gravel walk with curbstones in front of his premises on Fulton Street (Stiles, 1869, Vol. II, p. 70-71).

In the days of the Revolutionary War, the waters of the East River were still close to their original line, since the river came up close to the point now called Front Street, and it was about this time that the space between the ferry gate and the Corporation house was filled in and built upon (Armbruster, 1919, p.23).

Mention is made that in the latter part of the 18th century the land on the southern side of the ferry had such high hills that "considerable exertion" was required to remove them, indicating that the leveling of the higher hills was contemplated, if not undertaken at this early date (Stiles, Vol. 1, 1884, p.103). The most convenient dumping spot would be at the ferry landing. It is assumed that the Indian Hill at Jay and York Streets must have followed the same end in the East River. Streets were laid out and forced through in the Brooklyn Heights area in the 1820's (Stiles, Vol. I, 1884, pp. 129-130, 132), which undoubtedly accounted for a considerable amount of land-fill, some of which too must have found itself used to build up the East River shoreline.

By 1796 the B. Taylor map (published in 1797) (Kouwenhoven, 1972, pp. 194-5) (Fig. 14) indicated that the Old Ferry Road, Water Street, Front Street, Dock Street and Main Street were already well established, with two piers at the Old Ferry, one between Old Ferry and Dock Street, one at Dock Street, and one at Main Street, with another structure between the two latter extending into the river. The little cove at the end of the Old Ferry Road had been filled in, and the Ferry was moved to the west of its original position. On the south side of the street, Elizabeth Street (formerly Little Street) is shown but not named,

and the river appears to come about even with the line of present Everitt Street. There is an angle to Water Street as it meets present Fulton Street. No indication of a market is shown in the Street between Water Street and present Everitt Street in the middle of Old Ferry Road, although it reportedly stood until 1814.

The boundary of the river was still shown at Everitt Street in 1804. However, that same year, for Block 200, Liber 8, p. 129, and Liber 9, p. 556, dated May 25, 1804, there is an indication that there was land filling beyond Everitt Street to Furman's property. On September 8, 1804, there is a record of a land transaction in which William Furman was a grantee (Sec. 1, Block 200, Liber 8, p. 153). He figured in land from a Mr. Cooper along the south side of the ferry wharf, on the southwest side of the Old Ferry Street. Six years later, according to another record (Sect. 1, Block 200, Liber 9, p. 642) in a conveyance to Mr. Birdsall, the land appears to extend beyond Everitt Street to the river. About 1814, there appears to have been a number of changes, and land filling appears to have quickened in intensity. According to a record in which Thomas Everitt figures as grantee (Section 1, Block 201, Liber 11, p. 39), the East River is shown a little west of Everitt Street. But the same year, June 12, 1814 (Sect. 1, Block 201, Liber 11, p. 41), Thomas Everitt acquired land practically to the east side of Furman Street, and the East River is shown at Furman Street. (Also, Sect. 1, Blocks 200, 201, April 14, 1914, Liber 11, p. 41 and Liber 8, p.155) which shows Thomas Everitt's land up to about the present line of Furman Street. Furman Street at the Old Ferry Road appears to have still been part of the East River at this date. The land fill must have been continued westward, because on April 1, 1826

(Sect. 1, Block 201, Liber 19, p. 232) a conveyance of land to a Mr. Henry Onderdonk mentions the property of William Furman on the present line of Furman Street on the River. Specifically, in 1846 (Sect. 1, Block 200, Liber 157, p. 255) there is record of a conveyance of land to Garbiel Furman (William Furman's son), residing at the corner of Furman and Fulton Streets, in which it appears that there is dry land going westward beyond Furman Street to the East River. Ten years later, there is a record on November 1, 1856, that the executors of the estate of Gabriel Furman conveyed the Furman property to the Brooklyn City Rail Road Company (Sect. 1, Block 200, Liber 435, p. 537). This was now part of the 1st Ward of Brooklyn. The entry for September 14, 1894 (Sect. 1, Block 201, Liber 2258, p. 160) shows that the Brooklyn City Rail Road Company occupied the land on the south side of Fulton Street and the old Furman estate) between Everitt and Elizabeth Streets, evidently expanding themselves to the east.

After Lt. Ratzer and Taylor's maps, the next map of any real detail is W. Jermiah Lott's map of 1816 (Fig. 15) and Lott's Fulton Street map of 1821 in the St. Francis College, James Kelly Institute, which shows the width and direction of the Old Ferry Road. Several streets were already established by this time. The Ferry Road (Main Street at the Brooklyn Ferry) was straightened out to its approximate present lines. The narrowest point of the road was 35 feet wide at a point 124.4 feet from present Water Street going up the hill. The total distance from Water Street to Front Street was about 221 feet. A point on the southwest corner of Front Street across to the other side of the Old Ferry Road was 41 feet 3 inches. The only street shown in Lott's 1821 map between the ferry end of the map (unfortunately torn away

and missing) and Hicks Street is Little Street (present Elizabeth Street), which was 19 feet wide. The market is shown in the square, shown as an oblong measuring about 35 feet north and south and about 22 feet east and west. The width of the square from the corner of Water and Fulton building line to the south side of Fulton Street was about 102 feet. The Lott map in the St. Francis College Library apparently has no provenience history, but it was probably one of the base maps, which may have added information to the finished map of the Village of Brooklyn in 1816 (Fig. 16, 17). It was this year that the Village of Brooklyn became incorporated, and an act of legislature gave the power to the trustees of the new village to make and regulate alleys, highways, to drain, level and fill up land, to pave and improve the streets and highways, and to keep them in order. Mention is also made of the regulation of slaughter houses and houses of ill-fame etc., (all in one sentence, which gives an insight into the troubles the town elders faced)(Furman, 1824, p. 70). Jeremiah Lott's report of the street levels of Brooklyn was accepted on April 30, 1821 (Stiles, 1869, Vol. II, p.199). There was a great flurry of land speculation and improvement about this time on Brooklyn Heights, which became a very desirable place to live. Lott's map became obsolete the very next year(1817)when the trustees of the village had altered the name of Old Ferry Road to Fulton Street in honor of Robert Fulton and a sign board was put up reinforcing the action two years later in 1819 (Furman, 1822, pp. 195-6). By this time, the village, which must have been like a frontier town with all of its bustling activity, had growing pains. An editorial in the Star dated April 19, 1820 complained that the street near the water (Water Street, pre-

sumably) between Catherine Street Ferry and the Old Ferry needed raising, and that Furman Street, which was newly opened should be widened and regulated. The neglect of the streets, and the danger of fires because of the tinder-box nature and proximity of the wooden buildings was a cause of some concern. This latter was amply justified with the fire storms which leveled parts of the city. It was authorized to raise Front Street and be leveled at its junction with Dock and James Streets, near where Francis Guy made his memorable street scenes (Furman, 1822, pp. 185-7, 199) (Figs. 18, 19). Stiles (1869, Vol. II, p.99) says that the views were taken from the second floor of the artist's residence which stood at 11 Front Street. Today there is a low two story municipal building on the spot.

Furman (1822, p.122) spoke of the tide rising to a height of 17 inches in his basement at the corner of Fulton and Furman in 1823. About this time, the city fathers saw to it that there were improvements. The streets had been unpaved, unregulated, without sidewalks, and unlighted but by 1824, new avenues and streets were cut through, nearly all of which had been regulated and paved as if by magic. Lamps were hung out to light the way of nocturnal citizens, and carefully constructed side gutters replaced the poorly managed watercourses which ran down the middle of the streets (Furman notes, 1822, pp. 208, 210).

The houses were numbered in 1822 with the limits of Fulton Street and a stone walk was made from the ferry gate to Water Street in 1825 (Armbruster, 1919, p.16). Street lamps were proposed to be erected in 1828 at an estimated cost of \$14.31 per lamp per annum (ibid.). A major change occurred on Fulton Street in 1834-5, when the buildings on the north side of the street

were demolished from Water Street to Front Street (the democratic side as opposed to the aristocratic side of the south side of the street) (Armbruster, 1919, p.16; Stiles, 1869, Vol. II, p.254). The street was additionally widened in 1839 (Stiles, 1884, Vol. I, p.93). There was violent opposition to this. It is presumed that the resultant debris was used as land fill on the water front. This increased vigor may be attributable to the fact that Brooklyn had been incorporated as a city in 1834 (Furman, 1822, p.211). The northern (or northeastern) side of Fulton Street was really created between 1836 and 1839, with the construction of the line of buildings occupying the front line of Fulton Street (with the exception of the buildings closest to Front Street (Rosebrock, et al, 1975, p.4). All of these first block Fulton Street buildings were built in a kind of Greek revival type although this is hard to tell today for the grime and delapidation of the buildings. Nos. 5-7 is an 1834 building.

Next to importance to the Corporation House, which had the most notable history, was perhaps the corner of Fulton and Water Streets, with the location of the several hotels and public places, functioning to this day at the spot. Originally dating from about the early 1800's was situated the tavern of a Captain King. It was afterwards owned about 1819 by a Mr. Barnum ("Barnum's House"), and followed by the "Steamboat Hotel", owned first by a Mr. Young and then by a Gerard Langdon (proprietor from 1816 to 1822). Following this was the Franklin House (Armbruster, 1919, p.23; Stiles, 1869, Vol. II, pp. 49-51; Fig.16-19) which was built on the same spot in 1839. On February 13, 1865 a conveyance to Robert Hutchinson, shows the Fulton Street ferry slip and the Franklin House at the corner of Water Street and Fulton Street in

Liber 630, p.39. This hotel was still in existence in 1900. Comparing the 1857 illustration (Fig. 20) of Fulton Street looking eastward from the corner of Fulton Street and Furman Street, the building of Franklin House is shown. The name appears just above the second story windows on both corners of Water Street and Fulton Street, with the legend "Brooklyn Hotel" above the windows of the third story. Comparing a recent photograph taken from the same corner looking toward the corner of Water and Fulton Streets shows that there is a family resemblance between the 1857 illustration and the 1977 photograph. There were renovations of the hotel in the 1860's, in which window pediments were added to smarten up the window lines. One of the pediments (illustration Rosebrock et al, 1975, p.8) is missing, revealing the block letters of either "NU" or "NO" in the space where the pediment had been (Rosebrock, *ibid.*). Could this have been part of the name "Barnum's"(*?*).

The new century of the 1800's, when the Revolutionary War was fresher in the minds of the people than World War I is today, the new surge of budding Industrial Age effects began to be felt in the New World. The Brooklyn, Jamaica and Flatbush Turnpike Company was incorporated in 1809, a landmark in transportation, since emphasis began to be placed on year-round passage of the roads. As late as 1840 all public highways were nothing more than dirt tracks with the exception of the Jamaica and Brooklyn Plank Road, which serviced only a small portion of the Brooklyn limits. The turnpike company abandoned that portion of its road which lay within the village limits, below Red Hook Lane, which was actually part of the village system. There were two branches, one leading to the New Ferry at Main Street and the second to the

Old Ferry (Armbruster, 1919, p.13). Awareness of importance and civic pride manifested itself in 1813 with the ordering of the construction of gravel sidewalks held from the roadway by curb-stones in the Old Ferry and New Ferry districts, and the placement of street signboards, no doubt for the convenience of visitors and passers-through.

When the Old Ferry lease expired in 1813, Robert Fulton and his partner William Cutting successfully petitioned for and obtained a franchise to operate a ferry to run from Old Ferry to the Fly Market, and Burling Slips in New York (Armbruster, 1919). The first steam boat, the "Nassau" to begin the run on May 10, 1814, carried as many as 550 passengers, besides a few wagons, etc. on one trip. The name of the Old Ferry Road was changed in Fulton's honor to Fulton Street, and similarly the landing in New York was named Fulton Street (Langstaff, 1933, p.21). The name change carried to Red Hook Lane in Brooklyn (Armbruster, 1919, p.25).

The road and ferry improvement must have acted like a tonic on the village, which by 1816 was about 140 years old. The junction of the two most important streets (Old Ferry Road, or Fulton Street and New Ferry Road, or Main Street) was well lined with buildings of various types, including Yankee wood frames houses and "humpbacked" Dutch houses built either of stone or of small imported bricks (Stiles, 1869, Vol. II, p.34).

The village suffered a set-back in 1822, when it was plagued with outbreaks of ship-borne Yellow Fever. New York was hard hit, and the business activities were transferred south to Greenwich Village, compelling the ferryboat "Nassau" to make the longer run between Old Ferry in Brooklyn and Greenwich (Armbruster, 1919).

The floating bridge introduced in 1822, made transfer from the shore to the ferry less of a hazard. The bridge, which rose and fell with the changing tide, was aided by counterbalancing weights on the shore and spring piles. The former was the invention of Robert Fulton, while the latter was the addition of R. L. Stevens. The critical embarkation and debarkation moments were helped by this invention which soon found acceptance on the ferries (Booth, 1859, p. 687). The Fulton Street ferry changed hands a number of times until its last run in 1924 (Rosebrock et al, 1975, p.6). Between the introduction of the "Nassau" and the year 1871, there were 38 named ferry boats which docked at Fulton Street (Armbruster, 1919) (Fig. 21, 22, 23). In its later years, the ferry underwent incorporation, with the New York and Union Ferry Company from 1839 to 1844; Brooklyn Ferry Company operating between 1844 and 1851; the Union Ferry Company from 1851 to 1854, and the Union Ferry of Brooklyn incorporating in 1854 (Stiles, Vol. II, p.303).

From its early position close to Front Street, the ferry house was changed to the ferry landing area after the Old Corporation house was burned in 1812. The Fulton Ferry house, which stood about opposite the old Franklin Hotel on Water Street, was improved in 1865 (Fig. 24). This ferry house was replaced by a classic Victorian age structure in 1871 (Fig. 25) which reportedly cost \$138,000 (Armbruster, 1919). When this ferry, the queen of New York City ferries was retired in 1924, it brought to an end nearly three centuries of service.

When Brooklyn was made a city in 1834, the real city was the Brooklyn Ferry, while the rest of the larger former town was still a kind of suburbia or farming district. The ferry area was

the central shopping area for the majority of Long Islanders, and it was serviced by livery stables, hotels, stores and taverns. Fifty feet from the ferry gate was the Liberty Pole, which was erected on July 4, 1822. Where the old cattle enclosure had been at the southwest end of Fulton Street toward the river, was a group of buildings including a stage house and grocery with livery stables (Armbruster, 1919, p. 22, 23; Stiles, 1869, Vol. II, p.41). About 50 or 60 feet east of the flagstaff in the middle of Fulton Street stood the old Fly Market. By this time it was a long and shabby wooden structure, its foot about 35 feet up the street from the corner of Fulton and Furman, and its head about five feet from the corner of Elizabeth Street (Fig.16, 17). It was considered a nuisance, and evidently in some disrepair, and as with old, neglected buildings, it was demolished one night by a group of young men and boys in 1814 (Stiles, 1869, Vol. II, p. 38, 40). William Furman occupied a large double frame house located at point No. 1 (Figs. 16, 17), which is now No. 8 Fulton Street. After Furman came the Brooklyn City Railroad Company, which built the present fine structure. The significance of this is that the building line on the south side of Fulton Street evidently held firm from at least 1814, in contrast to the opposite side of the street which saw a number of refacings. Furman kept an oyster house in the basement nearest the water. Since he was only steps away from the ferry, in fact in front of the ferry stairs, he commanded a ready clientele. For the moderate charge of twelve and a half cents, a person could eat as many of the fine roasted oysters he could manage at one sitting (Stiles, 1869, Vol. II, p.40). The East River oysters were renown for their excellence, and there is a report that they attained foot long

lengths. On the western side of the Furman house was competition to Furman's oyster house, in the form of another Furman, unrelated to William Furman, who kept a fish and oyster house in a small shanty. There was still a third oyster "saloon" (No. 4, Fig. 16) which had occupied the area of the "ladies sitting room" of the ferry house of Stiles' day (Stiles, 1869, Vol. II, p.49) opposite the old Franklin Hotel. A Mr. Daniel Wright, the proprietor of this 1816 oyster house used to keep his product conveniently fresh by storing them in the water which flowed beneath his house. Of incidental note, this gentleman's establishment stood just a couple yards north of the outlet for the sewer which was pushed through in the second half of the same century. Undoubtedly this marked the demise of the oyster business, at least locally obtained oysters.

As the ferry service was improved with the introduction of steam powered engines and improved equipment for carrying and landing passengers and other loads, so the land transport improved. The Flushing Stage coach ran until 1854, when the iron horse, the Flushing and North Shore Rail Road put an end to this mode of transport as a welcome relief (Armbruster, 1919, p.11). The same year, the street cars of the Brooklyn City Rail Road Company, which made its headquarters at 8 Fulton Street on the former home site of William Furman, made their first trips on Fulton Street and other routes (Armbruster, 1919, p.26; Stiles, 1869, Vol. II, p. 302). The Coney Island Rail Road ran from Fulton Ferry to Coney Island in 1869, adding to the congestion of horse drawn traffic in the ferry district (Stiles, 1869, Vol. II, p.446) (Figs. 22, 23). About the middle of the 19th century, all of the important business transactions took place

in the area of the Fulton Ferry. Banks, insurance companies and newspaper offices (principally the Brooklyn Daily Eagle) were clustered in the first block of Fulton Street. The lawyers habitually congregated seeking business about the corner of Fulton and Front Streets at the "Lawyer's Corner". The business portion of the city was transferred to the area around City Hall when this building was erected, aided unquestionably by the later construction of the Brooklyn Bridge which by-passed the Fulton Ferry district (Figs. 24, 25). The population of the city grew by leaps and bounds. It was 40,000 about 1845 and just a few years later after the Civil War in 1869, the population of Brooklyn stood at nearly 300,000 (Stiles, 1969, Vol. II, p.496-7).

After the streets had assumed stabilization, or at least had been laid down in some kind of permanent semblance, the city fathers of Brooklyn began to think seriously about the disposal of sewage, lighting and other services which necessitated cutting into the streets. The Brooklyn Gas Light Co. was interested in lighting the streets in 1824, but this proposal did not materialize. Another proposition to light Fulton Street was made four years later (Stiles, 1869, Vol. II, pp. 221, 228). Gas was finally introduced to Brooklyn for the first time in 1848 (*ibid.*, p. 279). They must have dug pipe into the ground like beavers, because only five years later, there were 22 miles of street mains laid by the Brooklyn Gas Company. This period must have been a trying one for Brooklyn residents, since a full and permanent water supply was brought in by 1851 (*ibid.*, pp.295-6), and the streets must have been torn up everywhere. The building of the water works created a new problem, since water now became easily obtainable and once used, it had to be disposed of, and waste water had

to be carried off. So long as well water had been used, the small quantities obtained in this manner made no problem for disposal. Before 1857, the time when a comprehensive report for the drainage of Brooklyn was drawn up, some five and a half miles of sewers had been built in the city. Most of these were large enough for men to enter and to clean out any waste accumulations causing stoppages (Stiles, 1884, Vol. I, p.592). These sewers were really storm sewers, built for the purpose of draining ponds which had become filled up with rain after storms. They were not hooked up with houses, which depended upon cesspools for their waste water disposal. The fallacy of the large sewers was discovered by the engineers about the 1850's, and the smaller diameter sewers were advocated as being more efficient. The plan of 1858, as drawn up by a Col. Adams, advised that the main sewers in all cases discharge into tide water (ibid., pp. 592-30). There was to be one main sewer discharging into the river, with its greatest diameter at the outlet, and gradually diminishing in size with distance from the outlet. The smallest diameter used was 12-inch pipe sewers, which comprised the greatest length of pipe. The effect of raw sewage dumping into the river was recognized, with the eventual serious consequences for the character of New York Harbor. Stiles (ibid. p.593) made the prophetic remark that "The time will probably come when it will be found necessary to build intercepting sewers, as has been done with a few years for the city of London, and discharge the sewage into the waters of the ocean". Of course, the later solution was no solution at all. The elevation of the bottom of the sewers was established at one foot above the low water level, and with an average tide of about five feet, it meant

that there was some back up of sewers which had to be occasionally cleaned out manually.

The Fulton Street view (Fig. 26) which shows the Brooklyn Bridge (finished 1884) and the Brooklyn Daily Eagle still existing (the Eagle Storage Co. was built on the ground of this newspaper when it moved in 1899) indicates some of the busy aspect of the street. There are horse drawn cars, with four sets of tracks (actually there are 9 rails in the view) terminating at the ferry. The ferry building in the "shadow" of the bridge, (Fig. 27) dominates the end of the street just the other side of Water Street.

The elevated trains brought rapid transit to Brooklyn, with the construction of the Kings County Elevated Railway, which had a terminus at the Fulton Ferry. The elevated was taken down in 1941, and it is said that great quantities of iron from the structure had been earlier sold as scrap to Japan. The concrete supports for the elevated are still lined up below street level, and the Consolidated Edison Co. learned a lesson at least on one occasion when they tried unsuccessfully to push through one of these piers. In the King's View of Brooklyn, (Anonymous, 1904, p.39), there is a view of the Fulton Street district, with the Brooklyn Bridge dominating the scene. According to the caption of the photograph, the area was changing from a residential to a zone of manufacturing and warehousing interests, which has perpetuated to the present. The shops and the activity of the shoppers, etc. depicted in the earlier views (Fig. 26) are gone.

Presently the aspect of the Fulton Street district is a short-cut thoroughfare for motorized traffic along Furman Street to Atlantic Avenue, and to the bridge and the Brooklyn Queens

Expressway in the vicinity of Fulton Street. When ships dock at Pier No. 1, off the end of Fulton Street, large trucks stand in line like elephants waiting to be charged with cargo, or waiting to discharge their loads, compounding the traffic congestion and raising the noise decible to an uncomfortable level.

TABLE 1*

OLD FERRY STREET

(Fulton Street)

<u>SECTION</u>	<u>30 BLOCKS - 9/10 MILE</u>					
1	35	45	58	74	84	93
	102	112	113	126	138	139
	144	149	150	153	200	201
	202	207	212	217	222	227
	232	238	239	244	256	266
			<u>RECORDED</u>	<u>LIBER</u>		<u>PAGE</u>
"Highway"			---1646	Bergens Genealogy		46
"The Wagon Road			Stiles Vol. 1 12/3/1652	-		-
"Kings Highway"			4/26/1701	2		205
"Queens Road"			1/21/1725-6	3		203
"Common Highway			5/3/1708	3		241
"High Road or Street lead- ing to the Ferry"			4/20/1740	5		129
"Brooklyn Road			3/19/1800	15		92
"Main Street, leading from the Ferry to Brooklyn"			5/9/1800	7		203
"Old Ferry Street or Highway"			8/2/1804	8		127
"Street leading from the Ferry to Brooklyn Church"			1/20/1807	23		181
"Old Ferry Street" changed to "Fulton Street"			10/6/1817	Village By-laws		-

*Courtesy James Kelly Institute, St. Francis College

SEWER CUT AND THE GEOLOGICAL PROFILE:

The Red Hook Branch Intercepting Sewer will be a 30-inch diameter line extending up Fulton Street from a regulator (Reg. R-17) about 15 feet from the southwest corner of the old Marine Fire Department building, (constructed the year the Fulton Ferry ceased to operate in 1924). The proposed sewer (an open cut all the way) will extend in the construction planned some 900 feet along Fulton Street to a point opposite Hicks Street, where it will join a 108-inch diameter intercepting sewer. Fulton Street is its narrowest between buildings from the corner of Fulton and Front Streets to the south side of Fulton Street, measuring about 90 feet. From curb to curb is about 50 feet. It is recalled that the width of the street was a mere 35 feet about 160 years ago, when the old "Corporation House" stood at Nos. 19, 21 and 23 Fulton Street, marked today by the "Waxman Building" (No. 19), and an earthen parking lot (Nos. 21, 23). It is recalled that there was some widening of the street on the south side of the street in the early 1800's when the distillery owner Pierrepont volunteered to cut back on his property in the Hicks Street area. On a line just to the south or at the present curbside of the suspected site of the Corporation House foundations, there are two abandoned elevated railroad piers spaced about 50 feet apart. They are about where the foundations should come to (at either end of the building, east and west, below the sidewalk). Further examination of the plan indicates that the combined widths of the Waxman Building plus the parking lot equals 60 feet, or the exact documented width of the Corporation House. This appears to be more than just coincidence. In any proposed excavation,

this area, particularly, should be examined by a trained investigator for possible architectural and otherwise remains.

At its eastern end near Hicks Street, the bottom of the sewer or invert elevation is -7.44 (below 0 datum, which is about ground water elevation). At its western end, close to the Marine Fire House, the sewer or invert elevation is -5.84 feet below 0 elevation. At its eastern end, the invert line of the sewer is about 28 feet below the existing street surface, and at the western end, it is about 13 feet below the ground level. There is an added depth for the regulator (down to about fifteen feet below ground level) at the west end, and an added depth for the intercepting sewer at the east (Hicks Street) end, down to a depth of 39 feet below ground level. To lay the sewer, there will be an open cut measuring about 7 feet wide and about 25 feet deep (with the exception of the two ends, where the depths of the excavations will be correspondingly deeper).

Thirteen borings to determine the subsurface geology of lower Fulton Street were made by the City geologists as part of the study. These borings (Nos. 41, 42A, 43C, 44, 45, 46, 47, 48, 49, 50, 51, S30A and 31) were made for the most part on the southern side of the street and only two borings (Nos. 50 and 51) were made in the near proximity of the proposed present sewer construction. Unfortunately while the geological borings do give us very valuable information as to the subsurface conditions, they do not give us the kind of information needed for a precise archaeological assessment. For instance, we do not obtain the fine layering as can be visually obtained in an exposed excavation, and thus miss the finer details. These details, were they obtainable might be keyed to historical street changes (leveling of

buildings, resurfacing of streets in a vertical perspective). Considering plan views, to obtain detail in depth in plan perspective is a difficult matter even in the usual archaeological excavation. Available to us are contemporary street maps, plus old maps of the area. It is recognized that to effect such an assessment in Fulton Street is rendered easier by comparison of building lines, etc. as drawn up in deeds, wills, and mortgages as well as maps such as Lott's map of 1816 (Fig. 15). It is assumed that given the nature of the sewer excavation (with pilings, the use of heavy machinery etc.), plus the narrowness of the proposed cut, it is unlikely that a high precision of horizontal planning of the street can be done archaeologically.

Given all of these qualifying conditions, we can only approximate the nature of the subsurface conditions from the borings in the zone of the sewer cut, which is presumably a fair approximation, since the original street roughly followed the same lines as at present. The exception is that the north side of the street (called in the early 19th Century the "Democratic Side") had been moved back and straightened out somewhat to its present line in the 1830's.

The existing 6-foot sewer, which empties in the East River, follows the center of Fulton Street from the river. Its construction certainly must have made a great gouge in the street. No mention has been found in the literature of what the cut had turned up in the nature of archaeological or historical remains. In all likelihood there was no trained investigator on the spot (as usual). This old sewer cut is particularly intriguing, since it would have to cut through the place where the "Fly Market" of the Fulton Ferry had stood extending between Furman and

Elizabeth Street. But it is extremely doubtful that there would be any traces left of this structure, since it had been described as a rickety wooden building in very dilapidated condition when it was demolished early in the 1800's.

Flanking both sides of the street are the gas, water and electricity lines, which have also made their own respective street excavations. A number of these are indicated as "retired" or "disused", indeed, relics. Spaced the length of Fulton Street about 50-60 feet apart are a number of abandoned concrete piers of the former Fulton Street elevated, which was torn down in 1941. These piers straddled the old sewer, and the new sewer, following a path just to the north of the old sewer, similarly threads its way through the piers. To unravel the sequence of street subsurface cuttings for the laying down of the service lines, sewers, as well as surface disruptions resulting from street pavings, and repavings, street car lines and the elevated, is a complicated history in itself in this bit of ancient Brooklyn. Indeed, all it lacks is an underground subway to make it the most intensely torn up street in Brooklyn.

The geological samples from the Fulton Street borings were examined by Dr. R. Solecki in company with Mr. Irving Ostrofsky and Mr. Peter Kuuk, Department of Public Works geologists, at storage points in a Coney Island sewage treatment plant and in the basement of the Manhattan Municipal Courthouse. The borings were made to a maximum depth of about 60 feet, but with a more general and average depth of about 50 feet from the surface. Five geological soil horizons are evident in the geological profile, which may be identified as soil Layers a, b, c, d, e, and f, from top to bottom. The top Layer a is a blanket of fill which is

thicker at its western end, and thinner toward the eastern end of the section. It reaches to about 30 feet in line with the western side of Furman Street, thins going eastward, reaching a minimum depth of about five feet about Front Street, and then thickens to about 15 feet at the line of Hicks Street. This profile of the bottom of the fill line appears to follow quite faithfully our information as derived from the early 18th century illustrations of lower Fulton Street (Old Ferry Road), and from the written descriptions and land conveyances.

According to Stiles (Vol. 1, 1884, p.111), there was a hill between Poplar, Hicks, Furman and Orange Streets, which was used during the Revolutionary War as a burying-ground for British soldiers and sailors. The hill, graves and all, appears to have been levelled at the close of the war. No mention is made of what became of the soil, but the East River could have been a convenient dumping spot, and it appears very likely that with the presence of the Fulton Street landing nearby, the land fill found its way to that point. The torn down buildings on Fulton Street would have provided additional fill, accounting for the brick fragments etc. which have been encountered in the borings. One of the problems is that we do not know the sequence of fill historically from the borings. This kind of information can be derived from an examination of the cut, in situ. For instance, it is clearly evident that there were at least two major sequences to the land fill. First there was an extension beyond Everitt Street into the river at about the elevation of the old Corporation House at ca. four feet above the ground water line to about Furman Street. This was later capped by the fill layer which brought the level to that today.

It is recalled that in the illustrations, there was a kind of a sand ridge on the eastern side of Front Street which paralleled the beach. Also, the high tide level occasionally came to the western side of Front Street well into the end of the 18th century. The elevation of the soil in the area of Front Street appears to confirm the existence of the ridge. It is also to be recalled that the old water line stood about Everitt Street (or crossed the same) and then bent around to the north side of Fulton Street where there seems to have been a still-water cove and followed Front Street to the east and north. The geological profile indicates that westward from the area of Everitt Street is fill, since it had been underwater. Certain buildings, such as the Furman House on Furman and Fulton Streets for instance, were built on filled land.

The Corporation House, which stood opposite Elizabeth Street and slightly up Fulton Street is estimated to have been situated on the flat about the middle of the section opposite bore holes Nos. 46 and 45. This conforms with the illustrations as noted.

The descriptions of the soil horizons are as follows:

Layer a - This is the widespread fill, containing sand, gravel, silt, boulders, brick, wood, concrete, plaster and some shells. It has a depth of about 30 feet plus, toward the East River and a depth of about 15 feet at its eastern end, with a shallower depth about the position of boring No. 44 (ca. 5 feet). The bottom of the fill line follows the natural undulations of the original beach and terrain elevations. By volume, approximately three-fifths of the fill lies above the ground water line. The hypothesis has been advanced that this landfill was made in at

least two major stages, not distinguished in the borings.

Layer b - This is a lens of sand ranging from fine to medium grade sand, containing some organic silt and some shells. It has a marked slope downward to the river resting like a veneer on the front of underlying Layer c. This lens b has a maximum thickness of about three feet and measures about 25 feet on the slope. About 17 feet of this lens is below ground water level. From its position, it would appear that the lens represents the original beach, and it is conceivable that the shells, etc. found in it represents material dumped there as a convenient disposal point by the 18th century inhabitants of the Old Ferry district. The other alternative was that the shells represented ancient Indian kitchen midden remains. Consultation with Dr. Walter Newman of the Department of Geology of Queens College, CUNY, revealed that if the shell deposits were truly aboriginal, they should be ancient. Dr. Newman said that elsewhere in the New York area, aboriginal shell deposits, etc. at a depth of about eight feet below sea level had a date of about 3000 years old. There was another date of about 6000 years age for a sea stand at some 40 feet below sea level.

Layer c - This layer is a widespread lens extending from the foot of Fulton Street to Hicks Street, attenuated at both ends. It is composed of seven sub-lenses or parts, all various mixtures of sand. It slopes toward the East River, following the conformity of the underlying base soil, Layer f. At the top of this soil horizon is a lens of layered brown silt, which lies unconformably over a fine to coarse brown sand containing a trace of silt. Both lenses lay unconformably over a sub-lens of fine brown sand containing a trace of silt and a trace of gravel. It

extends from about Everitt Street to Hicks Street, and overlies at the eastern end two smaller sub-lenses which follow the original ridge elevation at Front Street. These sub-lenses are respectively fine sand with a trace of silt, and layered fine brown sand, containing some gravel and some silt. At the western end is a small thin river sloping veneer of fine to coarse brown sand with a little gravel and a trace of silt. This sub-lens originally stood at the original beach front. The bottom sub-lens of Layer c is composed of fine to coarse brown sand containing some gravel and a trace to little silt. About two-thirds of Layer c lies below 0 datum, or ground water level. It has a maximum thickness of 28 feet.

Layer d - This is a soil horizon fronting on the original East River beach line containing gray organic silt, a trace of fine sand, and a trace of shells. It has a maximum thickness of eight feet. This horizon has a marked downward slope at its base, and a rather flat or horizontal upper surface. It rests unconformably on Layer e.

Layer e - This is a thin lens of soil containing gravel, some organic silt, a little fine sand and some shells. The middle of this horizon stands about the line of Furman Street, and it was there that William Furman had his oyster house in the basement of his dwelling on the corner of Fulton and Furman Streets.

Layer f - This is the Pleistocene age basal horizon containing fine to medium and fine to coarse brown sand, with a trace to some gravel and a trace to little silt. It includes some occasional boulders. This soil horizon slopes toward the river from east to west, with a kind of swale about the line of Everitt Street, which

as has been noted before, is about the line of the old East River front.

The sewer invert will cut across about the middle of the sloping soil horizon Layer c which forms the greater part of the overburden lying unconformably over Layer f.

STREET PAVING:

The following information is derived from two different publications of the "List of Paved Streets in the Borough of Brooklyn", the earlier one annotated by Burt (1943), and the other Anonymous (1960), found in the Department of Highways, 40 Worth Street, New York City. The earliest record for street paving in the ferry district found is 1835, which is about the earliest known for Brooklyn (the earliest date noted by Burt is 1833).

The first record is a note in Burt's hand indicating that the street between Fulton Ferry and Front Street was graded and paved on December 21, 1835. It was next paved with granite blocks, Grade 2 on six inches of concrete, in June, 1911. The widths of the street from the ferry area ranged from 57 to 110 feet, then 45 to 48 feet, and then 49 to 54 feet. Presently the blocks are covered with a thin veneer of asphalt, which has broken through in a number of places under the impact of constant traffic, revealing once again the loaf-shaped granite blocks.

RESUME:

There is clear cut evidence that this proposed sewer cut will traverse a most important historic part of old Brooklyn, and that although the street has already been cut into by various agencies (the old six foot sewer, elevated railroad piers, gas lines, etc.) to all indications there appears to be enough archaeological and historical evidence in the ground to warrant a careful watch. Because the samples resulting from the borings were inadequate for a good and complete appraisal of the cultural materials suspected in the soil horizons, additional borings were suggested at a meeting of the principals involved in the investigation at Federal Plaza, the Environmental Protection Agency on January 12, 1977. The members present included Mr. August Matzdorf, of the engineering firm of Mason & Hanger-Silas Mason Co., Inc., Mr. Richard Walka of the EPA, Mr. Sudhir Parekh of the N.Y.C. D.W.R., Dr. Bert Salwen of New York University (archaeological consultant to the EPA), and the author. At the meeting it was decided to place ten borings at strategic points on Fulton Street and at Joralemon Street. This was followed out over a period of 17 working days between February 7th and March 3rd. A doctoral candidate graduate student from Columbia University, Mr. Thomas McGovern, M.A., M.Phil. (Anthropology) was the archaeological assistant who observed and made the collections for a more detailed scrutiny of the soils.

So far as can be determined from the records, the proposed intercepting branch sewer cut will run through the site of the old "Fly Market" at the foot of Fulton Street. However, it is unlikely that any trace of the building will be seen since according to a contemporary eye-witness, it had been constructed of wood,

and was demolished in 1814. If our calculations and measurements are correct, the present 6-foot sewer cut through the site of the market over a hundred years ago when this sewer was run down to the East River. The proposed intercepting branch sewer will cut very close to the old Corporation House, but so far as can be determined from its location, the excavation will miss it. However, since the site area is readily available for testing with the presence of an open lot over the site plus the fact that there appears to be only about seven or eight feet of overburden of fill, a way should be found to make a test excavation there. Exposure of the tavern foundation will certainly enhance the historic value of the district, and will be a tourist attraction such as not to be found anywhere else in the city to the author's knowledge.

HISTORY OF JORALEMON STREET, ATLANTIC AVENUE
and FURMAN STREET BETWEEN JORALEMON STREET
and ATLANTIC AVENUE

INTRODUCTION

The history of these three streets is divided up into three parts as named, and are described separately. There is necessarily some overlap in information among these three, since the areas are contiguous, in fact form an integral unit. All of these streets had been made on land fill, which covered a sheltering cove which extended between Atlantic Avenue and Joralemon Street. It is presumed that the major portion of the land-fill must have come from the bluffs of Brooklyn Heights in the 1830's when there was an increase in building activity.

The sections called Geological Profile, similarly, consider these three streets separately in describing the subsurface nature of the soil. The section called Street Pavings however considers all of these three streets as a unit, and are described as such.

The total length of the sewer in the proposed work is about 1850 feet, forming a kind of U shaped feature. The U.S. bulkhead line lies about 450 feet west of the western side of Furman Street. Both Atlantic Avenue and Joralemon Street sewers will be laid in open cuts, whereas the Furman Street sewer joining the two above will be mined in a tunnel. The latter street is a very busy one, and the Brooklyn-Queens Expressway which is routed along the east side of Furman Street adds to the complexity of engineering problems at this juncture. The footing, on the eastern side of Furman Street, of the expressway blocked the possibility of putting a test boring in that part of the street. (Fig. 37).

JORALEMON STREET

HISTORY:

According to the early maps of this part of Brooklyn, there was a cove in a kind of half moon arc extending from about the foot of Joralemon Street extending inland and arcing out again in the vicinity of present Atlantic Avenue (formerly District Street)(Fig. 28).

There was originally a large flat extending at the foot of Joralemon, where a Mr. H. Pierrepont erected his distillery in the early 1800's (Stiles, 1869, Vol. II, p.160). It is said that the original Brooklyn ferry did not run from Fulton Street, but from the foot of Joralemon Street, and it was only later that the main ferry point was shifted to Fulton Street. The original ferry ran to present Broad Street on the Manhattan side (Furman, 1865, p.29; Antiquities of Long Island, 1874, p.309). The original Joralemon Street, or Joralemon's Lane, as all early well used roads must have been before the days of regulation and paving, was a miserable rutted dirt road winding its way between the Joralemon and Remsen farms down to the beach. It ran down a ravine along the southern border of present Brooklyn Heights. It was originally laid out as a road of "convenience" down to the Livingston distillery, which stood out on flat near the beach. This road measured about 32 feet wide in 1762. It measured some 50 feet wide after improvements in 1801 (Stiles, Vol. II, p.132; Armbruster, 1919, p.26). Joralemon Street was widened to 60 feet between Henry Street and the East River on August 4, 1842 (Dikeman, 1870, p.64).

On April 13, 1835, H. B. Pierrepont was authorized by the city to erect and maintain a bulkhead, dock, wharf and piers on

his land at the foot of Joralemon Street. A year later, there is noted that the Hicks and Smiths docks were present at the foot of Joralemon Street, (Dikeman, 1870, pp. 108,111).

There was a ship disaster during the American Revolution, when a British Man of War, presumably became loose of its moorings during a storm, was driven ashore near the foot of present Joralemon Street. There she was abandoned, and the local residents made use of her timbers (Stiles, Vol. II, p.132). Livingston, a wealthy resident of Brooklyn, owned a brewery at the foot of Joralemon Street in the late 18th century which was burned during the American Revolution. H. Pierrepont, another very wealthy early Brooklynite, bought the Livingston facility in 1802, and established his distillery there, called the Anchor Gin Distillery (Figs. 33, 34). It was an early monopoly, since it was the only one of its kind in the state, and reportedly highly profitable to Pierrepont (Stiles, 1869, Vol. II, pp.131,148). Pierrepont made a large enterprise of his business, for he rebuilt the old brewery building, adding a large wharf, and a windmill, which was run exclusively for the purposes of the distillery. He kept the gin stored in several large wooden storehouses, aging his product for a full year, thereby acquiring the mellowness and flavor for which Anchor gin became noted and appreciated (Stiles, 1869, Vol. II, Map B, 64). Pierrepont improved his water front using timber in 1818, after he found that the cost of using stone was too expensive. The Old Ferry House at Joralemon's Landing stood nearly on the same site as the Old Eagle Tavern under the cliff of the heights, about the northeast corner of Furman and Joralemon Streets. This point is entirely obliterated now by the Brooklyn-Queens Expressway, which traverses the length of the east side of Furman Street (Fig. 37). It is a pity that cognizance of this

bit of history was not recognized during the construction of the expressway.

There was a public landing place south of Pierrepont's distillery (Stiles, 1869, Vol. II, p.17) which was in existence after the death of Pierrepont. Upwards from Pierrepont's distillery toward Fulton Street there was an open sandy beach along which passage sometimes was rendered impassable by the tide (Stiles, 1869, Vol. II, p.131).

The Anchor gin distillery was discontinued about 1819 after the death of its owner. It was sold to a Mr. Samuel Mitchel, who adapted the plant for use as a candle factory. It came back into its proper use as a distillery by Messrs. Schenck and Tutherford. The old windmill (Stiles, 1869, Vol. II, Map B, 64 b) was unused and it remained until about 1825 (Stiles, 1869, Vol. II, p.131). In 1824 the distillery was converted to a spermaceti factory (Stiles, 1869, Vol. II, p.220). The factory was later enlarged and converted to use as a sugar house (reported in use as such in 1869) (ibid). This use was short-lived however because an event occurred which must have delighted the hearts of the hard drinking people of Brooklyn, when the old Pierrepont factory was shortly after this changed back to a distillery. However, the joy must have been brief, for the Distillery, owned by Schenck and Birdsall, was destroyed by fire in 1831 (Stiles, 1869, Vol. II, p.237).

The ferry landing at the foot of Joralemon Street continued to flourish and was given the name "New South Ferry" (The Atlantic Street Ferry was called the "South Ferry"), (Stiles, 1869, Vol.II, p.24).

The windmill and the distillery and the shore were favorite

scenes depicted in early prints. A view by Hugh Reinagel, dated 1827-34, shows the Fulton Ferry at the left, the beach road on Fulton Street with the sailing ships and docks, and the windmill and distillery at the foot of Joralemon Street. The engraving by R. Kupfer, New York of 1867 shows the Brooklyn Shore including Fulton Street and the length of Furman Street. Because of the outbreak of yellow fever in Brooklyn, the Old Ferry at Fulton Street was temporarily put out of use, and removed to Joralemon Street in 1809 (Furman, 1865, p.34; Furman, 1874, p. 316).

In 1824 there was a real surge of building activity after Pierrepont's start, with "vast mounds of earth" vanishing under the pick and shovel in advance of the pushing through of streets and avenues (Stiles, Vol. 1, 1884, p.141). The most convenient dump again would have been the river. Moreover, Pierrepont, as an enterprising land owner, would not have passed up land fill in the neighborhood of his distillery at the foot of Joralemon's lane (street). Pierrepont's (Stiles, 1884, Vol. 1, pp.129-130) street improvements on the Heights undoubtedly contributed to the building of his docks at the foot of Joralemon's land. The cove to the south was filled in relatively quickly, for by 1838 there appears to have been dry land between Joralemon Street and State and Atlantic Streets west of Furman Street (not yet laid).

SEWER CUT AND GEOLOGICAL PROFILE:

The plan section of Joralemon Street west of Furman Street toward the river is a maze of water mains, gas lines and electric and telephone ducts, under which at -17.0 feet is the outside top of the I.R.T. Lexington Avenue Subway tubes. A number of these facilities are "disused". Joralemon Street is no stranger to open cut "surgery" as evidenced on the plan.

The Joralemon Street branch intercepting sewer will be 12 inches in diameter and about 230 feet long with a downward slope to the east from a regulator (R-14) at its western end joining with a 108-inch intercepting sewer on Furman Street. It will be laid in an open cut measuring 15 feet deep and 5 feet wide. At the western end of the street, the invert elevation of the sewer will be 1.55 feet below "0" datum; or about seven feet below the ground surface. At its eastern end, the sewer will be 9.06 feet below "0" datum (the same as the approximate ground water elevation) or about 21 feet below the street surface level. There is a slope of the street surface from east to west.

The borings went down to a maximum depth of about 40 feet. They could not go down to the full depth in the western part of the section because of the subway tunnel.

The geological borings (Nos. 84-1, 84F, 83-1, 83 and S 10), which were examined in two locations by the author in company with two New York City geologists Irwin Ostrofsky and Peter Kuuk, show that with the exception of a small portion of the eastern part of the sewer, all of its length will be in fill, and all of the sewer will be positioned below "0" datum, or below ground water elevation. Indeed, examination of the profile indicates

that at the location of the proposed sewer, dry land existed easterly of the Joralemon Street-Furman Street sewer connection.

Examination of the geological profile shows that there are four major soil layers, Layers a, b, c, and d. They are described as follows:

Layer a - This is a widespread overburden of fill containing sand, gravel, silt, cinder, wood, and a few shells and brick in a kind of amorphous mixture according to the geological study. It is felt however that were more complete samples taken the length of the street, it would be shown that there are layers of fill. There is a westward slope of the fill down to the river. At the western end, the fill is about four feet above the "0" datum, and at the eastern end the fill is about ten feet above the "0" datum. More than 70% of the fill is below the "0" datum, or ground water elevation. The fill has an average thickness of about 22 feet. The bottom limit of the fill is not known in the western two-thirds of the profile section because the borings were stopped on top of the subway tunnel, as noted above.

Layer b - This layer is a lens truncated at its western end, composed of fine gray sand and a little organic silt. It has a marked downward slope toward the west and measures about six feet thick. This layer will be cut by the proposed sewer line at its eastern end.

Layer c - This layer is a relatively thin lens of peat which intrudes like a thrust between the overlying Layer b and the underlying Layer d. At its thickest, it measures about two or three feet thick. It follows the slope conformity, slanting to the west.

Layer d - This is a multiple layer of four sub-layers of sand containing various materials which form the constituent

parts of the sub-layers. The top sub-lens is composed of fine to coarse brown sand with a trace of some silt, and a trace to little gravel. This lens lies unconformably above a zone of layered fine to medium reddish brown sand and silt. This lens has a reverse slope, angling down steeply to the east. Next comes a wedge of fine yellow sand and silt, overlying a fine to coarse reddish brown sand containing a trace to little gravel and a trace to little silt. The latter two deposits, like the lens preceding them, have marked dips or slopes downward to the east. It should be stated here parenthetically that we cannot be certain of the true geological dip of these beds, since we do not know what the strike of the beds is in all of the cases of the geological profiles discussed here.

RESUME:

So far as can be ascertained from the geological borings and the profile section the fill may possibly contain some historical materials in the mixture. There does not appear to be any original land surface above sea level or ground water level in the profile section, which may indicate that the distillery, windmill and other structures built there by Livingston and Pierrepont and followers were either built on original dry land, or on fill. From all indications, the buildings were placed on fill, and the approximate position appears to be just to the south and slightly west of the junction of Furman and Joralemon Streets (Fig. 28). Since the borings were not recovered in full sequence, it was requested that an additional supplemental boring be made about the position of the suspected location of the Pierrepont distillery under the supervision of an archaeologist assistant. Since the area is of high historic interest, it appears advisable to have a qualified archaeologist on hand to monitor the excavation as a part of the second stage of the project.

ATLANTIC AVENUE

HISTORY:

Between Atlantic Avenue and the end of Joralemon Street lay a deep cove. Atlantic Avenue came to the East River at the southern end of Brooklyn Heights and in effect was a low easy route to the river, easier in grade than the approach to the Fulton Street Ferry from inland. The latter ferry crossing however, had the advantage of being shorter to the Manhattan side. Atlantic Avenue (called District Street originally, and later Atlantic Street on the 1816 Brooklyn map) (Stiles, 1869, Vol. II) (Fig.15) was laid out in 1829 when a narrow lane was straightened out (Langstaff, 1933, p.22). It was originally called Patchen's Lane (Stiles, 1869, Vol. II, p.154), which led down along the present line of Atlantic Avenue (Street) in 1816. It was first laid out as a public lane with a landing place at the end of it on the East River on April 7, 1714. The road was built about three rods wide, with the landing place on the river as about six rods wide (Stiles, Vol.II, p.154). Neither the Atlantic Avenue landing (later called the South Ferry, which was granted in 1834 (Stiles, Vol.II, p.290), nor the Joralemon Landing (New South Ferry) were as wide as the Fulton Street ferry landing. This probably was because of the early establishment of the butcher industry at Fulton Street, since early in its history a cattle yard was established on the south side of Fulton Street, and the central market at the foot of Fulton Street took up much of the space.

Armbruster (1919, p.14) says that in 1774 Brooklyn was reduced to two ferries, one at the Old Ferry, and the other at Red Mills, which was the foot of later Atlantic Street. Once originated, the ferries did not run all the time. There were times when they were for some periods discontinued (Armbruster, 1919, p. 10,14).

The introduction of the railroad to Atlantic is what made this area toward the middle of the 19th Century, by a kind of default. It appears that the village of Brooklyn did not want the Fulton Ferry area obstructed by the iron horse, and blocked the Brooklyn Jamaica Rail Road Company from building its terminus at the Fulton Ferry. This company had received incorporation in 1832, and received a 50 year charter to build a steam railroad upon the Jamaica branch of the Old Ferry Road. After some litigation, the Brooklyn and Jamaica Rail Road Company was authorized to use the alternate route to the South Ferry at Atlantic (District Street) Avenue in 1837. From there it made its connection with downtown New York (Stiles, 1869, Vol. II, pp. 6-7, 248; Armbruster, 1919, p.26). The company became the Long Island Rail Road Company, and as an improvement over its evident dirty and noisy passage, a tunnel was built for the railroad in Atlantic Street, in which the corner stone was laid on May 24, 1844, and the tunnel was opened for travel that December (Stiles, 1869, Vol. II, p.58, 275).

No record has been found of the fact as yet in the researches, (Clark, 1910; Anonymous, 1906; Anonymous, 1833; Anonymous, James A. Kelly Institute, no date) but there is a consensus among historians that the fill from the tunnel was simply hauled to the end of Atlantic Avenue and dumped into the cove and river, filling it out to the present lines. The possibility is that the Corps of Army Engineers may have retained a record of the change in the shore line. The maps indicate that by 1838, land fill had progressed to the point that the cove had vanished.

This street has already been cut up at various times for water mains, gas and electric ducts, and sewer pipes. Some of these facilities are now "disused". The depths to which these various services cut into the street is not known at this writing, but since the excavation of the proposed sewer will not coincide with them, this detail is not considered here. The B.M.T. line is marked as running down the street.

The Atlantic Avenue sewer proposed for construction will be a 12-inch diameter branch intercepting sewer, measuring about 270 feet long beginning at a regulator (R-13) at the western end, and terminating at a 108-inch intercepting sewer (MH 1) at Columbia Street. It will be laid in an open cut measuring five feet wide and fifteen feet deep. It will slope downward toward the intercepting sewer. The inverse depth of the sewer will be about ten feet below the ground surface at the western end, or just at about "0" datum elevation, which at this point is about one foot above the ground water level. At the western end, the sewer will be about seven feet below "0" datum, or about 22 feet below the ground surface. There is a slope of the ground surface from east to west.

GEOLOGICAL BORINGS AND PROFILE:

The seven geological borings (Nos. 90, S7, S8, 91, S6, 92 and 93) on Atlantic Avenue extend from the western end of Atlantic Avenue to past Furman Street eastward to the corner of Atlantic Avenue and Columbia Street. The borings were examined by the author in company with Mr. Irwin Ostrofsky, and Mr. Peter Kuuk, geologists for New York City at a couple of places in the city.

These borings extended down to a depth of about maximum of 70 feet. With the exception of one boring (S-7), all of them were made at the curbside and sidewalks on either side of Atlantic Avenue. The geological profile running down the center of the Street (A-A') is an approximation taken from these borings.

There are five major soil layers which may be distinguished in the soil profile, namely Layers a, b, c, d, and e. They are described as follows:

Layer a - This is a widespread layer of fill, containing sand, silt, gravel, bricks, concrete, wood, asphalt and some shells. As noted elsewhere, no fine distinction of sub-layer could be distinguished in the borings. The sewer cut will be made in this fill with the exception of the eastern terminus, which presumably will cut into the lens of peat at that point (Layer c). The average thickness of the fill is about 200 feet. Approximately half of it lies below the "0" datum elevation, or about the same below the ground water level. The original ground surface of the area lay well below water level in this section.

Layer b - This is an interrupted lens of organic silt penetrated by fill. It extends about half way across the geological profile, and terminates in an attenuation at about Boring No. S8,

just about the southeast corner of Furman Street and Atlantic Avenue. It has a maximum thickness of about eight feet. This layer is superimposed at its western end over Layer d, and over Layer c at the eastern end.

Layer c - This is a layer of peat, which is lensed toward the west, and sloped upward toward the east. It has a maximum thickness of about 12 feet. This lens lies over Layer d.

Layer d - This is a variable layer of sand, with gray sand in the western part and brown sand in the smaller eastern part. There is a lens of fine gray sand and silt in the western part, which lies above a lens of fine coarse gray sand with a trace to some gravel and a trace to little silt. The eastern portion includes fine brown sand, some silt, and a trace to little gravel.

The combined thickness of the sub-lenses is about fifteen feet. Layer d lies over Layer e in which appears to be an unconformity.

Layer e - This is a silty zone composed of three sub-lenses of various silts, presumably of Pleistocene age. The top sub-lens is "varved", which would indicate a still water deposition, possibly at the front of a glacier or in a glacial lake.

RESUME:

There does not appear to be any evidence of aboriginal, or Indian materials which may be encountered in the construction of the proposed sewer. All of the soil is fill material, which extends down to below ground water level, confirming the map study which indicates that the area was part of the cove in the East River at this point. However, since the street was laid down in the early age nearly 125 years ago, it may be advisable to have a qualified archaeologist monitor the excavation. This was an important landing area and it is just possible that some of the fill may have come from burial areas on top of the heights above Furman Street where it is known that British soldiers and sailors were buried.

FURMAN STREET

HISTORY:

Furman Street, names after the Furman family who lived at the corner of what is now Furman Street and Fulton Avenue in the early 1800's, did not exist originally because high tide almost lapped the foot of the sandy heights (Fig. 39). The road ran along the beach, much of it between high and low water (Langstaff, 1933, pp. 8, 12). The heights above this shore way, or the "Heights", was originally covered with, according to Stiles (1884, Vol.II, p.35) a beautiful growth of cedar and locust trees. It was called "Iphetonga" or the "high sandy bank" by the Canarsie Indians. Reportedly a large number of stone arrowheads and other aboriginal implements were found in every stage of manufacture in this area after the washing of the river banks by storms and heavy rains and constant erosion. This bluff and elevation was named "Clover Hill" by the early colonial inhabitants (Stiles, op.cit.).

In the early colonial days, the only means of access to the ferry from along the beach southwards was via Elizabeth Street (said to be named after one of the wives of the early residents of the area) (Stiles, 1884, Vol.II, p.118). From the ferry to Pierrepont's distillery at the foot of Joralemon Street, the stretch was an open sandy beach, along which the tide flowed and ebbed, and at times it was impassable (Stiles, *ibid*, p.131). Furman Street was laid out in 1804 (Anonymous, Block Records; Section 1, Block 200, Liber 8, p.151), but since its situation was not usable, it had to be bulkheaded and filled in. Wharves, warehouses and even residences resulted as if by

magic after this was done, since the street was in a favorable location with respect to the location between the two ferries, viz. the northern at the old Ferry (Fulton Street) and the southerly at Joralemon's Landing (New South Ferry) and later Atlantic Street (South Ferry). But it was nearly 50 years before the deep cove in front of the Joralemon property was filled in and Furman Street was extended to join the foot of Atlantic Street (Langstaff, 1933, pp. 8,12,16) (Fig.40). The street was straightened out in 1842.

An engraving by R. Kupfer, New York, in 1867, shows the Brooklyn shore including Fulton and Furman Streets. It shows much activity and the built-up nature of Furman Street, which by then had been bulkheaded and filled in. One additional street westward of Furman Street is shown toward the East River with ships docked along the shore up and down the street. An earlier view by Hugh Reinagle, dated 1827-1834, shows sailing ships and docks along Furman Street and the windmill and distillery of Pierrepont at the foot of Joralemon Street (Fig. 33, 34). There was a large flat extending up to his distillery at low water at the foot of Joralemon's lane (Stiles, op.cit. p. 160). In 1820 an editorial in the Star said that the street (Furman Street) between the Old Ferry and New South Ferry required raising and should be widened and regulated. It would appear surprising that the newspaper at this early date would have to comment about the neglect of the streets and the danger of fires because of the proximity of highly flammable wooden structures (Stiles, op.cit.pp.197-8), but it should be remembered that the city by this time was already well through its second century and conditions were becoming crowded.

Today the Heights still presents one of the most impressive views of the East River, the harbor and downtown New York, with the Brooklyn-Queens Expressway flanking the river between the Heights and Furman Street certainly has not added to any of the old tranquility of the scene. It enters the area from the south just at Joralemon Street (Fig. 40).

Examination of maps showing the shoreline in the vicinity of Atlantic and Joralemon Streets pinpoints the period when the embayment between these two streets was filled in. Lott's 1816 map (Fig. 28) shows that the Pierrepont distillery and its works had extended Joralemon Street beyond the Furman Street (planned) line into the East River. Hooker's (1827) map of Brooklyn shows that Furman Street was not yet extended through between Joralemon Street and District Street (Atlantic Avenue), but shows a long pier and docking facilities at the end of District Street pointing like a finger into the East River about parallel with the Joralemon Street extension. Actually, the dock does not begin exactly at the end of District Street, but just to the left or south of the street. There is a straight road going down to the shore (which appears to be surveyor's license, because other maps show a curve in Joralemon Street approaching the river, where it winds down between bluffs through a ravine. The windmill plus three other buildings of rectangular shape are shown at the end of Joralemon Street, part of Pierrepont's distillery complex. A point on the landing is indicated where the "Contemplated New South Ferry" was to be located. The area between the District Street dock and the Joralemon Street extension and dock is shown as part of the original cove or embayment area. The curving beach line comes to a point just about west of where Willow Street might be if it

were extended from the Brooklyn Heights. No facilities for docking ships is evident on the map on the beach. Hicks Street is the first street shown behind the water front. There is indicated a high bluff at the southern end of Hicks Street, which appears to be absent today. There is the question if this bluff was used as a borrow pit or "mine" to fill in the cove, or for subsequent undetermined uses. The map of E. W. Bridges (1830) shows the same features as Hooker's 1827 map, and there appears to be no change except that there is an added large building (factory?) and a smaller one in the building complex at the foot of Joralemon Street. Joralemon Street is shown as a curved road, and not straight as on Hooker's map. Furman Street at this time had not been joined with Joralemon Street. It is shown as a tentative light line superimposed over the original bluffs. The Brooklyn Director for 1831-2 has a map showing the cove between Joralemon and District Streets, and the same annual publication shows the same for the year 1834-5. No maps were found in the later editions through 1837. However, the Report of the Commissioners on "Streets, Avenues and Squares for Brooklyn", Commission Appointed April 23, 1835, Report Presented January 1, 1839, gives a map of the City of Brooklyn in 1838 showing some pertinent details concerning the land-fill problem. It shows Columbia Street extended between Joralemon Street and Atlantic Street (not Avenue yet at this date, but changed to this name from District Street), although this plan has not been followed (Fig. 28). It may be remarked that between the surveyor's original street plans and the final opening of streets slips are known to occur. In the 1838 map of Brooklyn, State Street is shown extended to almost the line of the end of Joralemon and Atlantic Streets, and the area between these two

latter streets is solid, as though it had been filled in. The same map shows that Furman Street was not yet connected through from Joralemon Street to State Street and Atlantic Street (Avenue). According to Dikeman (1870, p.73) Furman Street was widened to 50 feet between Joralemon and Atlantic Street on June 10, 1842, and according to Burt's (1943) annotated list of Brooklyn street pavings, the street was paved the following year (1843). The map by Richard Butt (1846) shows Atlantic Street and Joralemon Street joined by Furman Street, confirming the above data. Atlantic Street and Joralemon Street are extended to the river to about the present approximate line. The U.S. Bulkhead line is about 400 feet west of Furman Street here. The land is shown filled in westward of Furman Street, but not completely so since State Street is indicated as a long pier paralleling Atlantic Street, which is also shown as a long pier extending into the old cove of the East River. On the other hand, the map by C.S. Herbert and R. Talford (1855) shows Furman Street laid out in light tentative lines between the two streets, whereas Columbia Street is shown in dark outline behind or to the east of the old cove area. Furman Street is actually shown as a light line between Pierrepont and Atlantic Streets, as though it were not yet constructed but only planned. This may be a draughtman's error. There is shown a bluff along Furman Street between these two points, and the street is superimposed over the bluffs. Joralemon, State, Columbia and Atlantic Streets are shown in heavy dark outlines. The literary evidence appears to indicate that the cove was finally closed just prior to 1838. It is possible that the land-fill was derived both from the bluffs behind, straightening of the streets, etc., and perhaps the customary manner by bulkheading and then scooping up

fill from the river bottom (as had been done at the Atlantic Docks in south Brooklyn).

No documentation showing authorization, payment, etc for this land fill has been found to this date, therefore, we have to resort to inferential data. The real estate development of the Brooklyn Heights area from about the 1820's necessitated much grading and leveling, and it is presumed that some of the soil found its way to the river as a convenient dump. The straightening out of Joralemon Street from its original curved way down the ravine to the river probably yielded a good portion of the land fill. It is very likely that much of the land fill came from another source, namely the construction of the Long Island Railroad on Atlantic Avenue. The tunnel for the railroad which was pushed through in 1844, probably added some spoil to the fill area, but it is not certain at this writing how much, if true. Certainly the river would have been a convenient disposal place, if allowed by the authorities.

SEWER TUNNEL AND THE GEOLOGIC PROFILE:

According to our best information from early map surveys (Perris, 1855) (Fig. 28), the proposed 108 inch sewer tunnel between Atlantic Avenue and Joralemon Street in Furman Street will go through land fill which was placed there about the late 1830's when Furman Street was extended southward in order to join Atlantic Avenue in a straight line with Furman Street farther north (Fig. 40). The original shoreline made an eastward or landward curve from the East River just about Joralemon Street where there had been originally a distillery, windmill and a landing in the late colonial days. The shoreline curved to a point between Columbia Place and Willow Place, then curved back to the river to a point just a few yards west of the junction of Atlantic Avenue and Columbia Street. The embayment so formed was a deep water cover, highly regarded as an anchorage in Colonial days.

The real estate development of the Brooklyn Heights area from about the 1820's necessitated much grading and leveling, and it is presumed that some of the soil found its way to the river as a convenient dump. However, it is very likely that the land fill in quantity came from another source, that of the construction of the Long Island Rail Road, which was pushed through at Atlantic Avenue. We are reminded (personal communications from Prof. Arthur Konop, St. Francis College) that the southern extension of Governor's Island was built up entirely from the fill of the New York Subway system (the I.R.T.) in the early 1900's. If our presumption is correct (no verification of this has been located at this date), the fill in the cove between Atlantic Avenue and Joralemon Street in all likelihood does not

contain materials of archaeological interest.

This section of the proposed tunnel will be 800 feet long and 108 inches in diameter, running between Atlantic Avenue on the south and Joralemon Street on the north (Fig. 40). The base or invert of the tunnel bore will be about 13 feet below the ground water table, and the top of the tunnel will be about 10 feet above the invert, or about three feet below the ground water table. The top of the tunnel will be between 14 to 18 feet below the present ground surface level. The tunnel section will lie west of the "Ancient Water Line" (Perris, 1855) (Fig. 28) or in the old cove area.

An examination of the geologic profile shows that there are five major soil horizons which will be encountered by the tunnel construction. These soil horizons, identified in the accompanying geological section are lettered a to e, as determined by core borings along the street. These core borings are identified as Nos. 92, 89, 88, S-9, 87, 86, 85, S-10 and S-13. They were examined by Dr. R. Solecki in company with Mr. Irving Ostrofsky and Peter Kuuk, geologist with the Department of Public Works, New York City at storage points in a Coney Island sewage treatment plant and in the basement of the Manhattan Municipal Court-house.

The general impression of the section is that below a blanket of fill thickness (Layer a), there is a thickness of soil material (Layers b, c, d) measuring about 15 feet and attenuated at the north end (toward Joralemon Street), overlying a widespread soil

deposit. The latter must be of Pleistocene Age, and related to the last Wisconsin glaciation in this region (presumably part of the ground moraine). There is a definite slope of the middle deposits (Layers b, c, d) from north to south in this section.

The descriptions of the soil horizons are as follows:

Layer a - This is the widespread fill, containing sand, gravel, silt, clay, cinders, brick, timber, plaster, concrete etc. In the section of concern, it has a maximum thickness of 26 feet (toward the Atlantic Avenue or southern end) a minimum thickness of 13 feet (toward Joralemon Street or northern end) with an average of 15 feet thickness. It follows the original upward slope towards Joralemon Street following the presumed original beach line. Better than half of this fill zone lies above the ground water table.

Layer b - This is a lens of sand with organic silt penetrated by fill, containing loose fine to coarse gray sand, some organic silt, trace to little gravel, trace of bricks, trace of cinders, trace of shells etc. It was probably part of the original cove bottom and beach (at the northern end) which stood there in colonial times until Furman Street was extended southward to join Atlantic Avenue. The maximum thickness of this lens is 9 feet, with an average thickness of about 5 feet. It disappears at Atlantic Avenue. As noted above, in the section under investigation, this soil horizon slopes down to the south toward Atlantic Avenue from Joralemon Street. At the latter end, Layer b rises above ground water level, otherwise it is all under this elevation.

Layer c - This is a lens of peat which has been intruded in the middle by Layer b. It has a maximum thickness of 10

feet with an average thickness of 5 feet. It diminishes to 0 feet thickness toward Joralemon Street, and increases in dimensions south toward Atlantic Avenue. It is composed of peat with little to some organic silt.

Layer d - This is a lens of silty sand composed of compact to very compact fine to coarse gray brown sand, little to some silt, and a trace to little gravel. It is attenuated in the northern section just short of Joralemon Street. It has a maximum thickness of 10 feet with an average of 6 feet in thickness.

Layer e - This is a soil horizon of layered silt, containing stiff layered brown silt, little to some fine and little to some clay. It intrudes into the "till" horizon which is widespread at this lower depth. Layer e occurs between 26 feet and 14 feet below the ground water table. There is a marked or abrupt downward slope of this deposit from the area of Joralemon Street southward toward Atlantic Avenue.

RESUME:

So far as can be ascertained from the borings and section, the proposed tunnel between Atlantic Avenue and Joralemon Street will encounter no prehistoric or historic materials. There are traces of timbers in the Layer a which may have originated from fill. These timbers, or wood, probably came from rip-rap, or the custom of throwing down into shore fronts a heterogenous mixture of rocks, timbers, etc. to hold down the fill and to aid in the consolidation of the water frontage. Map study reveals that there were no docking facilities between Joralemon Street and Atlantic Street in the early days, and when the area was filled ca. 1837, the fill went right up close to the present line, so far as can be determined from the maps. This would have taken it well to the west of Furman Street. The surface had been certainly cut into a number of times in order to accommodate utilities, etc. but this would have been well above the proposed sewer tunnel.

STREET PAVINGS:

The following information on street pavings of this area is derived from the records at 40 Worth Street, New York City. The earliest record is a cryptic notation dated 1843 in Burt's (1843) hand.

The earliest notation of a pavement on Furman Street is noted for June 24, 1843, in which the street was graded and paved from State Street to Atlantic Avenue. This presumably would indicate that Furman Street was open to vehicular traffic between these two points.

The card index file (93/9) in the Department of Highways records shown that Furman Street from Atlantic Avenue to Fulton Street had its granite cobble stone pavement replaced, with the job completed August 6, 1906. Old granite blocks were used, which were placed on a 6-inch foundation of concrete. Again, Furman Street between Fulton and State had its granite pavement replaced on 6 inches of concrete foundation; the job was completed August 13, 1923. The railroad on this street was declared abandoned by the "B C R R Co." (Brooklyn City Railroad Co.) on November 8, 1922, which was approved by the Transit Commission on February 20, 1923. The original contract had been modified in that new granite paving blocks were called for. The granite pavement appears to have been continued southward on Furman Street between State and Atlantic Avenue and granite blocks of grade 1 were set on 6 inches of old concrete foundation and 5-1/2 inches of new concrete foundation, with the completion of the job on December 14, 1923. The width of the roadway was set at 32 feet (List of Paved Streets, 1960, p.158). This pavement

job did not last too long because the cobblestones were evidently removed and sheet asphalt was laid down between Fulton and Joralemon Streets on 6 inches of old concrete foundation. The job was done under the old Works Progress Administration (WPA), with the date of completion on July 19, 1937. The width of the roadway was made to 34 feet wide (Anonymous, 1960, p. 158).

The cross streets of Atlantic Avenue and Joralemon Street of course did not escape improvement and surfacing. According to Dikeman (1870, pp. 20, 61) Atlantic Street was improved and corrected to a width of 100 feet from the East River to Fulton Street and the land was opened for use on April 23, 1835. The record shows that Atlantic Avenue was repaved between the East River and Henry Street on December 14, 1870. Again Atlantic Avenue between the East River and Clinton Street (outside the rails) was paved with granite blocks of Grade No. 1 on six inches of old concrete foundation. The width of the roadway, in contrast to the much narrower Furman Street (presumably because of the ferry service at Atlantic Avenue) measured between 60 to 63 feet wide. The job was completed on September 24, 1928 (Anonymous, 1960, p.11).

Neighboring Joralemon Street was graded and paved between the river and Henry Street on September 25, 1843, a very early date (according to the record, the first gradings and pavings on Joralemon Street took place in 1833 between Henry Street and Fulton Street). Joralemon Street between the East River and Hicks Street was paved with granite blocks of class A on a six-inch concrete foundation laid on 1903. The width of the roadway was set at 30 feet. The job was completed on December 2, 1937 (Anonymous, 1960, p.215).

MAIN AND PLYMOUTH STREETS

HISTORY:

The area just to the north of old Fulton Street (now called Cadman Plaza West) is shown on the old early colonial maps as part of the John Rapalve property fronting on the East River. It was occupied by a family of Indians called the Mareykawicks (Bolton, 1920, p.271), a branch of the Canarsie Indians, who controlled much of the western Long Island. The Mareykawick family was ruled over by a sachem called Maganwetinnenim in 1645. The Canarsies sold Mareykawick to the Dutch in 1670 (Bolton, *ibid.*, p.274). This shoreland (Fig. 41) was used by the Indians for fishing and oystering up to Blackwell's Island. Physical evidence of Indian occupation was found and noted by Gabriel Furman in 1826 (Gabriel Furman, 1865, p.34) (Furman, 1874, pp.98-100) at Bridge Street between Front and York and between Jay and Bridge Streets (Fig. 42). At this place were found ashes, cinders, some burned stones and habitation evidence, including fragments of pottery vessels, some arrowheads, and clay tobacco pipes. This material was found in situ (down to a depth of 3 to 4 feet) on the top of a hill about 70 feet high which is shown in Lt. Ratzer's map of 1766 (Bolton, 1922, pp. 133,4). Stiles (1869, Vol.II, pp.94-5) writes in the past tense about a high hill near present Bridge Street, which must have been the same hill. He remarks about a "large establishment" which was called Mount Prospect Tavern, which was a favorite night spot for New York "rowdies", who used to row over to Brooklyn with their girls to disport on the Mount, and held high "full swing" there. The hey-day of this dance

pavilion appears to have been in the 1820's. One must assume that the frolics were either not so bad, or the menfolk held their liquor very well, or they slept it off somewhere in Brooklyn, because a return trip to New York by rowboat on the East River needed a modicum of sobriety. The revelers, as non-residents, could not be checked by village constables, and naturally had no fear of the New York authorities. The spot where the hill stood is unrecognizable today because all of the land has been quite leveled, although there is a perceptible rise in the vicinity of Bridge and Jay Streets at York Street. The fate of the hill is unknown, but it is possible that it contributed to the landfill on the East River, filling in behind the bulkheads in the vicinity of Plymouth and Water Streets.

The lands of John Rapalye, lying between the Fulton Ferry and Wallabout Bay was confiscated by the City Corporation and was sold to the Sands Brothers in 1784 (Armbruster, 1919, p.24). These brothers with the later addition of new partner, Jackson, laid out the land in streets in 1788, and named the place "Olympia", with the belief that this was going to become the "coming city on account of its superior situation" (ibid.), (Stiles, 1884, Vol. I, pp.102-3). The owners, Messrs. Sands and Jackson, claimed that "Olympia is extremely well calculated for a city; on a point of land which presents its front up the East River, surrounded almost with water, the conveniences are almost manifest. A considerable country in the rear affords the easy attainment of produce. A pure and salubrious atmosphere, excellent spring water, and good society, are among a host of other desirable advantages. As regards health in particular, it is situated on the natural soil - no noxious vapors, generated by exhalations, from dock-logs, water and filth sunk a century under its found-

ations, are raised here". The authors of this tract would never recognize the area today. In the same description is the suggestion that a bridge be built from Olympia across to New York, and the Wallabout would form an excellent Navy yard (Stiles, *ibid*, p.103).

It is certain that a number of buildings in old "Olympia" had to be removed in order to build the Brooklyn Bridge, and certain other land gradings had to be effected in the bridge construction. What became of this rubble and earth had not been found in the literature at this writing, but it can be assumed that some of it (like the Indian Hill noted above) at least found its way as landfill in the East River, notably at the foot of Main and Dock Streets, or the river side of the Empire Stores. It does not appear likely that any landfill was placed at the foot of Fulton Street, because this waterfront had its own supply of ready debris from demolished buildings on Fulton Street, etc.

A permit was given to William Furman and Theodosius Hunt (Furman and Furman, 1937, p.7) to establish a ferry at the foot of present Main Street, which met the Old Ferry Road at the point where the latter makes a sharp curve, so that the new ferry road formed almost a straight line. This landing place became known as the "New Ferry". Since the landing point in Manhattan was at Catherine Street, it became later known as the "Catherine Street Ferry". The road to the ferry was originally known as the "New Ferry Road", which later became changed to Main Street (not to be confused with Old Ferry Road or Fulton Street, which had been also called Main Road). The New Ferry, or Catherine Street Ferry was also called at one time "Teamboat Ferry" (Armbruster, 1919, p.25). The Catherine Street Ferry or "Teamboat" Ferry was originally powered by human muscle until 1810 (as were all of

the ferries at this time) for rowboats or pirougues. The horse boat (which gave the name to the New Ferry) was first introduced in 1814 on the Catherine Street Ferry (Booth, 1859, p.686). This ferry was powered by a team of eight horses, or 8 horsepower, in which the crossing of the river was made in between 12 to 20 minutes, a vast improvement over the former method. The iron age competitor, steam, came the same year in the form of the steamboat, the Nassau, at the neighboring older ferry at present Fulton Street (Booth, *ibid.*). The competition must have become highly unequal.

According to Stiles (1884, Vol.II, p.105) there were a few small wooden dwellings on Main Street in the 1820's and with the exception of one domicile, there were no other houses of note on the west side of Main Street up to the junction of Fulton and Main Streets. On the east side of Main Street, there were similarly few buildings. Activity was marked in this period by frequent changes. But up to about 1840, all streets in Brooklyn were simply dirt paved. The City Corporation began tearing down old structures between Pearl and Water Streets on the north side of Dover Street (Furman, 1865, p.185). It is reasonable to assume that the broken up structures (if of brick) found their way to low lying areas as land fill. Land around the shore front was being filled in steadily. The area of Water Street between Main and Washington Streets was raised and "regulated" in 1824 (Stiles, 1884, Vol.II, p.220). At the foot of Catherine Street Ferry was established a small public market, called "Titus's" market, which was in reality a butcher stand, something like the one at the old Fulton Ferry. There was other evidence of a small shopping center, as would naturally arise at a

communication center. There was a tavern and grocery at the northeast corner of Main and Water Streets called VanWinkles (Stiles, 1884, Vol.II, p.94).

Lower Main Street lay between high and low water tide marks (Fig. 41). The old water line went to the corner of the present Gold Street, and from there, along the line of present Marshall Street to the Wallabout Bay or the Navy Yard (Stiles, 1884, Vol. II, Footnote 1). The construction of gravel sidewalks with curbstones was ordered for the New Ferry (Catherine Street ferry) in 1813 (Stiles, 1884, Vol. II, p.31). The records show a low water mark of the East River arching just north of Water Street in 1846 (Section 1, Block 25, Liber 154, p. 100 to grantee Andre B. Hoxton, October 14, 1846). Similarly in another record (Section 1, Block 26, Liber 118, page 52) the land was under water on March 28, 1844. Another record dated January 1, 1848, the same water line is indicated just a little north and parallelling Water Street. Plymouth Street was under water in this record, but there is an indication of where the bulkhead line was planned north of Plymouth Street as of 1835. This bulkhead line was established under the direction of a General Swift who recommended a line of bulkheads along the East River in 1836 (Stiles, 1884, Vol.II, p.252). Mention is made of the avarice and cupidity of the citizens who were shore front owners and who hastened to extend their lots into the water, doing "some injury to the water line", (ibid.).

The first negative impact on the area was the construction of the Brooklyn Bridge in the third quarter of the 19th century. The bridge approach necessitated a lot of room for its long approach on the Brooklyn side, cutting a bifurcating swath

through Old Brooklyn, eliminating blocks of old residences and tenements, shabby stores, saloons (which if they were in the same numbers as on lower Fulton Street, must have been numerous) and similar structures (McCullough, 1972, p.418). At least some of the resultant debris must have gone toward land fill along the river. Presently old "Olympia" presents a forlorn aspect of warehouses and dreary battered business structures. Its demise as a residential and business area can be directly attributed to the erosion of the neighborhood precipitated first by the Brooklyn Bridge, and later by the Manhattan Bridge, which flank this area on the south and north respectively. The latest and final sealing off of this "cul-de-sac" isolation was signaled by the construction of the maze of roadways and concrete servicing the Brooklyn-Queens Expressway twenty years ago. The bridge was opened in 1883, and in just two years, the bridge trains were handling upwards of twenty million passengers, and just five years later in 1888, there were thirty million passengers a year (McCullough, 1972, p.544). The ferries continued to run (the last of the Brooklyn Ferries, the Hamilton-Battery Ferry ran until 1942), but dwindled away into the twentieth century. As a consequence, both the Catherine Street and Fulton Ferries ceased to exist, and so died the neighborhood.

Part of this area was proposed for designation as an Historic District by the Landmarks Preservation Commission at a meeting held at 10:30 A.M. at City Hall, New York, on March 8, 1977 (Figs. 43a, 43b). The only opposition appeared to come from the owners of the structure known as the Empire Stores, located on Water Street, west of Main Street. The residents of the Fulton Street ferry district have proposed their idealized plan for use

of the area (Fig. 44). The Empire Stores and 85 Water Street are indicated on the Historic Sites Register (Rosan et al., 1972). The former building was built in stages; a four story section in 1869, 1874; and a five story section in 1885 (Roberts, 1973). Rennie (1974) has a comprehensive report on the Empire Stores with the proposal that use be made of the building as a maritime museum. The Landmarks Preservation Commission appeared to favor the preservation of this building at their meeting on March 8th, contrary to the advice of the owners, Consolidated Edison, who apparently wished it demolished.

The Rennie (1974) report, which appears to have been widely circulated, gives an unflattering description of the Manhattan Bridge-Brooklyn Bridge head area on the Brooklyn side. According to this report, the area is part of a 50 acre backwater in Brooklyn, that has been studied for over a decade by a number of city agencies in the unlikely hope of discovering some kind of new use to which this bleak section could be put. The report once again indicates that the coming of the Brooklyn Bridge was the beginning of the end for the lower Fulton Ferry district, a condition exacerbated by the opening of the Manhattan Bridge in 1909. The report points out that the new surge of residential development in Brooklyn Heights (always a desirable area to live in) and other areas in Brooklyn left this waterfront district a dying commercial and industrial area. One of the reasons (aside from inaccessibility, etc.) this area is undesirable for residential occupation is the noise level, which by H.U.D. standards is "normally unacceptable". It is 68-80 dBA at Plymouth and Washington Streets (Rennie, 1974, p.22). The author however, found the area among the canyon-like walls of the factories, etc.

relatively quiet compared to the area around Boro Hall in Brooklyn.

SEWER TUNNEL AND THE GEOLOGIC PROFILE:

The proposed sewer tunnel in Main and Plymouth Streets will lie in the area formerly part of the East River (see Fig. 41). According to the Perris map of 1855 (Fig. 28) the "Ancient Water Line" (presumably the high water line) cut to the south of Water Street, or to the south of the proposed tunnel route. The early colonial records indicate that the low water mark cuts roughly between and parallel to Water and Plymouth Streets. This area is in the low lying land facing the East River between the Brooklyn Bridge on the west and the Manhattan Bridge on the east (which actually straddles the proposed tunnel route) to the north of the Brooklyn-Queens Expressway bridge approaches. The tunnel bore having a diameter of 108 inches, is proposed to extend from south of Howard Alley on Main Street northward to the junction of Main Street and Plymouth Street, and thence eastward on Plymouth Street continuing past Pearl Street. Under the bulkhead plan of 1835, the lands were filled in and made available for use a few years later. According to the records about the end of the 18th century, the high tides of the East River sometimes came close to Front Street, or up to the low bluff formerly facing on the East River at that point.

The proposed tunnel which will be about 1,150 feet long in the section under study, will have an invert about 19-20 feet below ground water table. The approximate top of the sewer tunnel will be about ten feet above the invert, or about 9-10 feet below the ground water table. This will be about 15 to 20 feet below the ground. The sewer is planned to be included within the present street limits.

In the line of the presently proposed tunnel there were ten subsurface borings, which Dr. Solecki examined in company with geologists Irving Ostrofsky and Peter Kuuk of the New York City Department of Public Works at their storage area at a sewage treatment plant on Coney Island. These are borings numbered 36 and 35, located on Main Street between Front Street and Water Street; borings 34 and 33 located between Water Street and Plymouth Street on Main Street; borings 31 and 30 located on Plymouth Street between Main Street and Washington Street; borings 26 and N-1 located on Plymouth Street between Washington and Adams Streets; and borings 16 and N-12 between Adams and Pearl Streets on Plymouth Street.

According to the geological profile (Fig. 42) along the route of the proposed sewer tunnel, there is a downward slope of the soil deposits toward the East River from the southerly end of Main Street from Howard Alley (boring No. 36) to Plymouth Street (boring No. 31). This would indicate a natural dip in the stratigraphy toward the river.

The borings on this street line indicate that there are at least four major soil deposits in the history of this shore area, respectively identified in this report as a to d, from top to bottom (see Fig.42). The descriptions are as follows:

Layer a - A widespread blanket of recent fill, including sand, gravel, silt, clay, cinders, brick, concrete, boulders, timber, etc. It has an average thickness of about 11 feet, ranging from 7 feet to 16 feet thick. It lies at about an elevation of about 11 feet above the ground water table in the southern or landward side to 9 feet below ground water level.

Layer b - This is a deposit of organic silt penetrated by

fill. This appears to have been the original land surface dating from the original settler times. This soil horizon includes three lenses of related soils. It is nominally a very soft to soft, gray organic silt, with a trace to some clay, a trace to little sand, and a trace of gravel and a trace of cinders. It has an average thickness of 6 feet ranging from two feet thick to 14 feet thick. This soil horizon overlies a layer of "till" from the landward side, presumably of glacial age (Wisconsin). It has a slope angle of about 2.5% toward the river. Most of layer b lies well below the ground water table, beginning above ground water table (or about plus 5 feet) at a point just a little north of Howard Alley on Main Street, and slopes downward to the north toward the East River. This layer intrudes into the next layer below it, layer c, which slopes similarly downward to the East River. It is made up of a number of isolated lenses and pockets of soil, giving the layer an undulating characteristic. This layer lies well below the ground water table.

Layer c - This is a river sloping thickness of glacial till, including compact to very compact composition of fine to coarse brown sand, a trace to some silt, and a trace to little gravel. Possible boulders are included in the deposit. This layer has a thickness of about five feet, to an uncertain depth not plumbed by the present borings in this section. It lies well below the ground water table. This layer has several intrusive soil pockets and lenses.

Layer d - This is the bottommost soil horizon in this section, which is composed of sand ranging from compact to very compact, with medium to fine gray brown to brown sand with a

trace to little silt present. The deposit in this portion of the section is nearly horizontal in bedding. There is a trace of shells and some mica in the deposit. It lies about 25 feet below the ground water table and its total depth has not been plumbed by the present borings.

The profile section from Main to Pearl Streets on Plymouth indicates a shallow downward slope from the east to the west, or from Pearl Street to Main Street, which in fact appears to conform with the old shore line at this point. The thickness and depths of the deposits appear to be about the same as the dimensions for the deposits between Howard Alley and Plymouth Street on Main Street.

RESUME:

The proposed tunnel section described above will penetrate only a very small part of the fill zone, or layer a in this report. It will cut through soil horizon b, presumably the original ground surface, all below the original sea level of the East River. Thus it does not appear that the cutting of this tunnel will have any adverse effect on the historic or prehistoric heritage in the areas examined.

Although there are traces of timbers in some of the borings, these probably did not originate from the old piers and docks, which were presumably set out in deeper water, with the attendant bulkheading.

The street subsurface was certainly gouged out a number of times in order to accomodate water, sewage, gas and electric lines. However these cuts are well above the line of the proposed sewer tunnel.

STREET PAVINGS:

The following information is derived from two different publications called "List of Paved Streets in the Borough of Brooklyn", one annotated by Burt (1843), and the other Anonymous (1960), found in the Department of Highways, 40 Worth Street, New York City. The earliest pavings in the area at Plymouth and Main Streets near Water Street date from 1842, which is about the earliest pavings anywhere in Brooklyn.

The record shows that Plymouth Street between Main Street and Hudson Avenue was paved on January 26, 1845, presumably as customary with cobble stones. There is no other record evident for Plymouth Street in these environs for over 60 years when Plymouth Street between Main and Bridge Streets was paved with granite blocks, grade 2 on 6 inches of concrete base to a width of 20 feet and finished on August 24, 1908 (Anonymous, 1960, p.275).

Main Street, as befitting its name, was given priority attention on September 19, 1842, when its surface was graded and paved between Water and Prospect Streets. This was about as early as the first pavings elsewhere in Brooklyn. The stretch between Plymouth and Water Streets was repaved on May 29, 1871. The street was next given attention in two different stretches in 1917, when a contract was completed on August 8, 1917 in which granite paving was put on a 6-inch concrete foundation between Plymouth and Front Streets on Main Street (Anonymous, n.d., Card 209/12). Main Street between Plymouth and Water Streets was laid with granite blocks, grade 1, on a 6-inch concrete foundation to a width of 60 feet with a job completion on July 23, 1917. Finally, Main Street between Water and Prospect

Streets was paved with granite blocks, Class B on 6 inches of concrete foundation, which was laid to a width of 24 feet with a job completion on October 13, 1932. There were tracks on this street which were to be removed by the railroad company (Anonymous, n.d., Card 3/5). Main Street between Front Street and Plymouth still retains its cobble stones, in part resurfaced patchily with asphalt. Plymouth Street between Main Street and Pearl Street is practically bare cobble stones, punctuated toward Main Street by railroad tracks.

CONCLUSIONS:

The conclusions are that this is one of the most important parts of old historic Brooklyn, and the opening of the sewer in open cuts in this part of the city is one of the best opportunities presented for archaeological investigation known at present in New York City.

The section around the Fulton Ferry district (Fig.2), which is already registered in the National Historic Register, has been made the object of a proposal to make it a landmark (Fig. 43 a.b.). The local residents of the area have drawn up an ambitious plan for the revitalization of the area as a touristic spot (Fig.44), in which certain key buildings will be emphasized. The proximity of the Fulton Ferry district to the South Street Seaport Museum and the Brooklyn Navy Yard points up its potential use for educational, cultural and recreational purposes.

A new restaurant and a ferry boat landing has been planned and is (at least the restaurant) being constructed at the water's edge (Fig. 45). The historic buildings in the area give the old Brooklyn flavor to the area (Fig. 46). The area would be reached by the proposed ferry (Fig.47).

The location of the site of the old Corporation House on Fulton Street next door to the old Long Island Safety Box Company building is another potential tourist attraction.

The proposed sewer cut in Fulton Street will roughly bifurcate the lower part of the street at the Furman-Water Street end. Extending eastward up Fulton Street, it is planned to go close

to the curb side of the northern side of the street toward Front Street. The lower part of the sewer will cut, if our estimations and map study is correct, through the area where the old Fly Market had stood and was finally demolished in the early 1800's. Since it was reportedly a decrepit wooden structure, there probably is nothing much left to mark its former existence. It appears from the observations of the archaeological assistant, Mr. Thomas McGovern, who collected the soil samples from the supplementary borings made on the project, that the most interesting cultural material comes from a couple of soil lenses at the bottom of the fill material as detailed in the geological profile for Furman Street. These zones, called Layers b and e are marked by numerous shell inclusions. It is possible that the soldiers of George Washington's retreating army may have dumped their surplus army and personal equipment into the river at Fulton Ferry when embarking for Manhattan in the strategic retreat of 1776. This action would have been a preventative one in order that the goods did not fall into the hands of the British. This is a presumption on the author's part, since there seems to be no record of this in the publications examined. There is no record of "scorched earth" policy, as the Russians had followed in their initial retreat in World War II, to the author's knowledge.

The sequence of fill appears to have gone in two major stages at the foot of Fulton Street. The first was a gradual accretional type of landfill, indications of which are shown in the ca. 1750 views of the ferry. This presumably extended the area of the ferry landing beyond the old shoreline at Everitt Street. The second land filling seems to have been a more intensive one somewhere about the period 1813 through the 1830's, when streets were cut

through on the Heights, hillocks taken down, buildings demolished to straighten out Fulton Street and neighboring streets. Following the establishment of the U.S. Bulkhead line about 1835 in this part of Brooklyn, land was stabilized, and it is presumed that the bricks and solid materials of the buildings, plus other scrap timber etc. were all tossed into the river to build up the new shoreline.

The documentary investigations and the supplementary boring No. A 12 turned up something most interesting on the north side of Fulton Street toward Front Street. It will be recalled that this was the location where the old Corporation House stood, and according to Stiles (1884) (Figs. 16,17), the house was located where lot numbers 19, 21 and 23 are today. Lot No. 19 is occupied by a low building, the Waxman Building. Lot Nos. 21 and 23 are comprised of a dirt parking lot, now disused, and behind a high grill fence. Investigations with the boring equipment resulted in the recovery of bricks and other building debris at about a depth of eight feet, which coincides very well with the elevation on the geological profile and the estimation of where the Corporation House ought to be. In the judgement of the boring technicians, there was a building line just a couple feet to the north of the bore hole, which may be the southern limit of the old Corporation House. We would not know this for a positive fact until some kind of excavation were made there. It lies, so far as can be judged from the evidence, just north and outside the proposed sewer cut in this area and thus will not be affected by the operations.

Joralemon Street - The investigations in the Joralemon Street area indicate that there was a lot of fill dumped into this

district, presumably part of the landfill placed there by Pierrepont around the turn of the 19th century (Fig. 15). The eastern portion of the proposed sewer cut appears to cut just into the original soil above ground water level, and there are indications of a possible building zone in this portion of the geological profile at a depth of about ten feet. This has been confirmed by the supplementary boring A9.

Atlantic Avenue - The investigations in the Atlantic Avenue area show that the proposed open sewer cut will go through a zone of fill, not touching the original above ground water surface level at any point. Documentary evidence indicates that filling in and the building of a dock at the end of Atlantic Avenue was well underway in the beginning of the 19th century. South Ferry, which was established at the end of Atlantic Avenue, functioned as sometimes (as during the Yellow Fever epidemic) the only ferry to Manhattan. The establishment of the terminus of the Long Island Railroad on Atlantic Avenue brought additional activity to this area.

Furman Street (between Joralemon Street and Atlantic Avenue) - This portion of the proposed sewer will be mined through a tunnel and will go deep beyond the bounds of archaeological limits, so far as can be determined from the geological profile and the boring samples.

Main and Plymouth Streets - The same observation as for Furman Street appears to hold true for this portion of the proposed sewer, which will be mined through a tunnel.

RECOMMENDATIONS:

The author makes the following recommendations concerning Project 1A. For Fulton Street, there should be a Stage II survey when the actual open cut is made for the sewer. Because of the magnitude of the work envisaged, there should be two qualified archaeologists on the spot to make observations and collections. The manner in which the collections should be made would have to be worked out well in advance with the excavators in order to recover the most material in the time available. The most important zones appear to be the shell zones, Layers b and e, however once the sewer cut is opened, the actual strategy of the archaeological investigations may change. It might be recommended that the initial fill down to the richest and most interesting beds or layers be taken down rapidly, then a more slower approach be maintained in the culturally rich layers. It may be possible to sift the soil in massive sieves, as another tentative recommendation. While it does not appear that the sewer cut will affect the presumed foundations of the Old Corporation House at Nos. 19, 21 and 23 Fulton Street, it would appear to be very timely to make an excavation or "sondage" in the parking lot area. Even a trench measuring fifteen feet long, three feet wide and approximately nine or ten feet deep (the limit of the suspected foundation) would be very instructive.

For Main and Plymouth Streets, no additional archaeological work appears to be necessary since the sewer will be mined through a tunnel and it is a fill area.

For the Atlantic Avenue, Furman Street and Joralemon Street complex, the author's recommendations are that a qualified

archaeologist make a Stage II survey of both Joralemon Street and Atlantic Avenue when these streets are opened for the sewers. In all likelihood, there will be nothing or little to obtain from Atlantic Avenue because this area is all fill lying over the original cove situated there. Joralemon Street on the other hand, even though it has been churned up considerably toward the surface has a zone in the section at a depth of about ten feet which may yield the foundation remains of the early distillery. Thus the presence of an archaeologist on both of these streets during the time of the sewer excavation is deemed a precautionary measure in the possibility that historic remains may be uncovered.

The proposed sewer in Furman Street between Joralemon Street and Atlantic Avenue will be mined through in a tunnel. It will not encounter any archaeological or historic structures etc., so far as could be determined in the present study by the author. No recommendation therefore for additional surveys of this part of the sewer project is made.

It is emphasized here that in the knowledge of the author, unless a Stage II follow up is made by qualified archaeologists, a heritage of great value to Brooklyn and New York City will be lost. Understandably, other portions of the street could be excavated at a future time, but since the opportunity presents itself, it should not be by-passed.

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- Figure 3 - The Original Brooklyn Ferry, A Prospective Passenger Blowing the Horn to Attract Cornelius Dircksen Who is Plowing in the Field. From Stiles (1884) and Rosebreck et al (1975).
- Figure 4 - The Block Numbers in the Fulton Ferry District. From Rosan et al (1972).
- Figure 5 - Detail of the Burgis view of the Old Ferry, drawn about 1717. From Kouwenhoven (1972).
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- Figure 7 - View of the Old Ferry ca. 1746. From Todd, "The Story of the City of New York", G. P. Putnam's Sons.
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- Figure 32- Supplementary boring plan, Fulton Street
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- Figure 39- Shoreline map of Brooklyn Heights showing the "ancient water line" in the vicinity of Furman Street between Atlantic Avenue and Joralemon Street.
- Figure 40- Plan and Section of Furman Street between Atlantic Avenue and Joralemon Street showing the proposed sewer tunnel and geologic profile.
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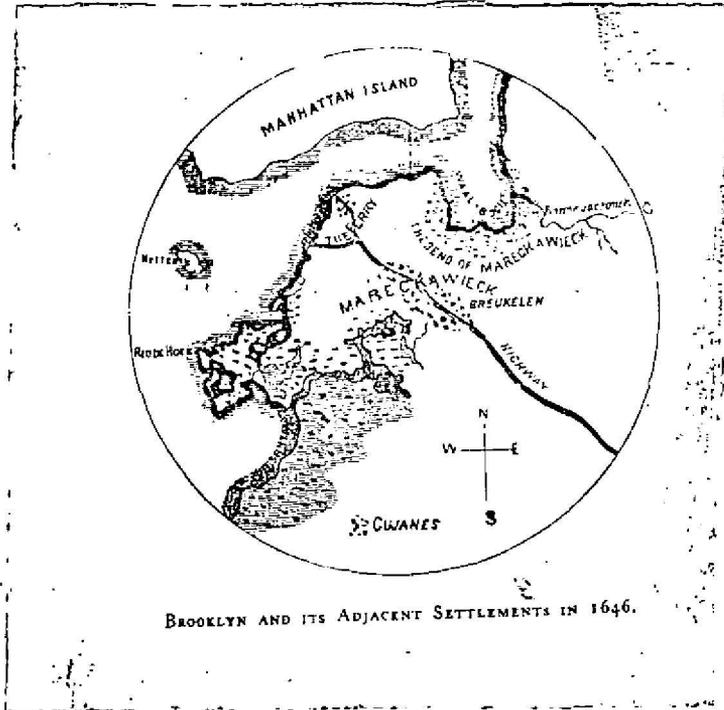


Figure 1

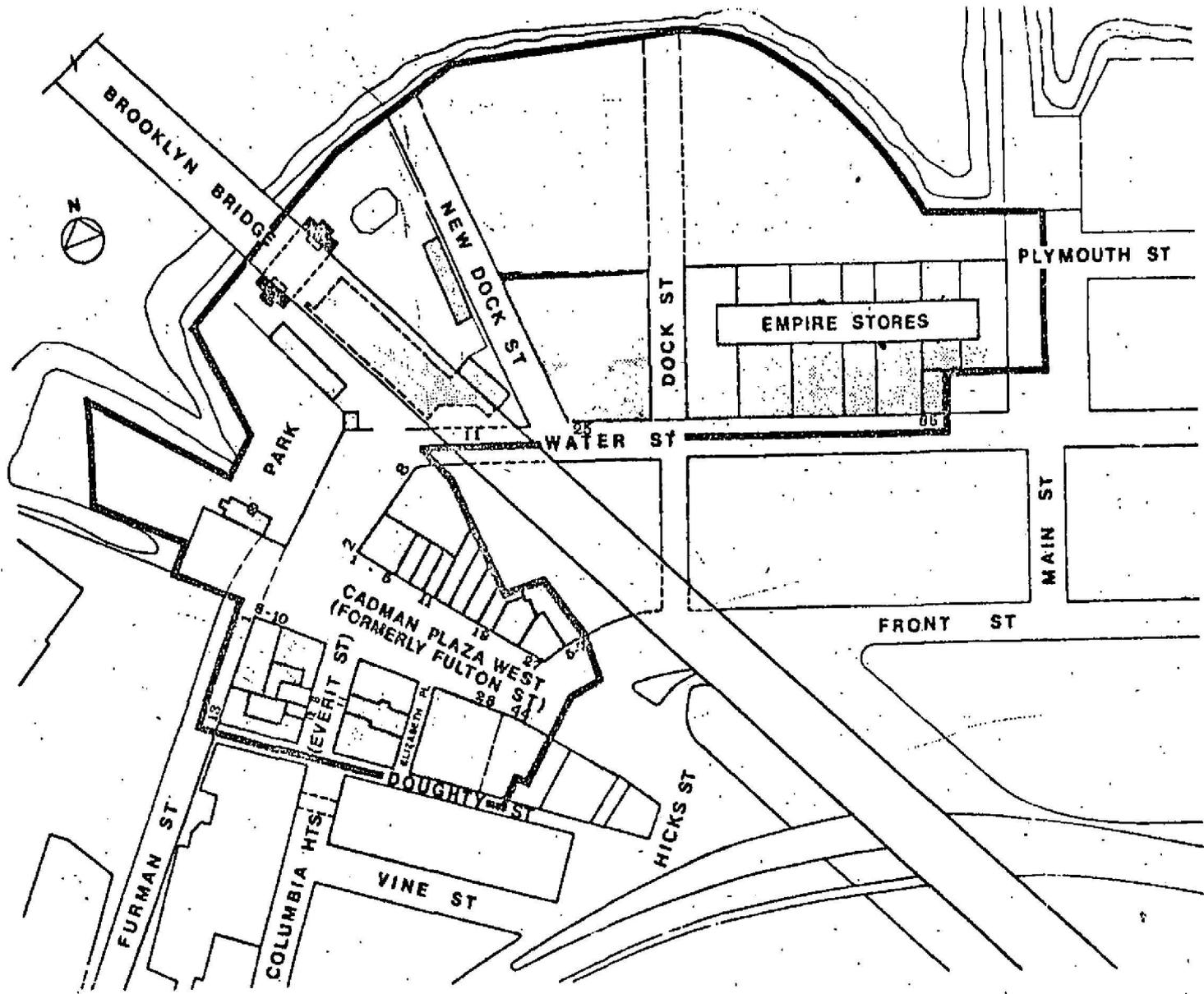
Fulton Ferry Brooklyn



Fig. 3

"First Ferry to Long Island," perhaps one of Cornelius Dircksen's voyages in 1642 (Long Island Historical Society).

Figure 3



**FULTON FERRY HISTORIC DISTRICT
BROOKLYN**

Figure 2

Block Numbers

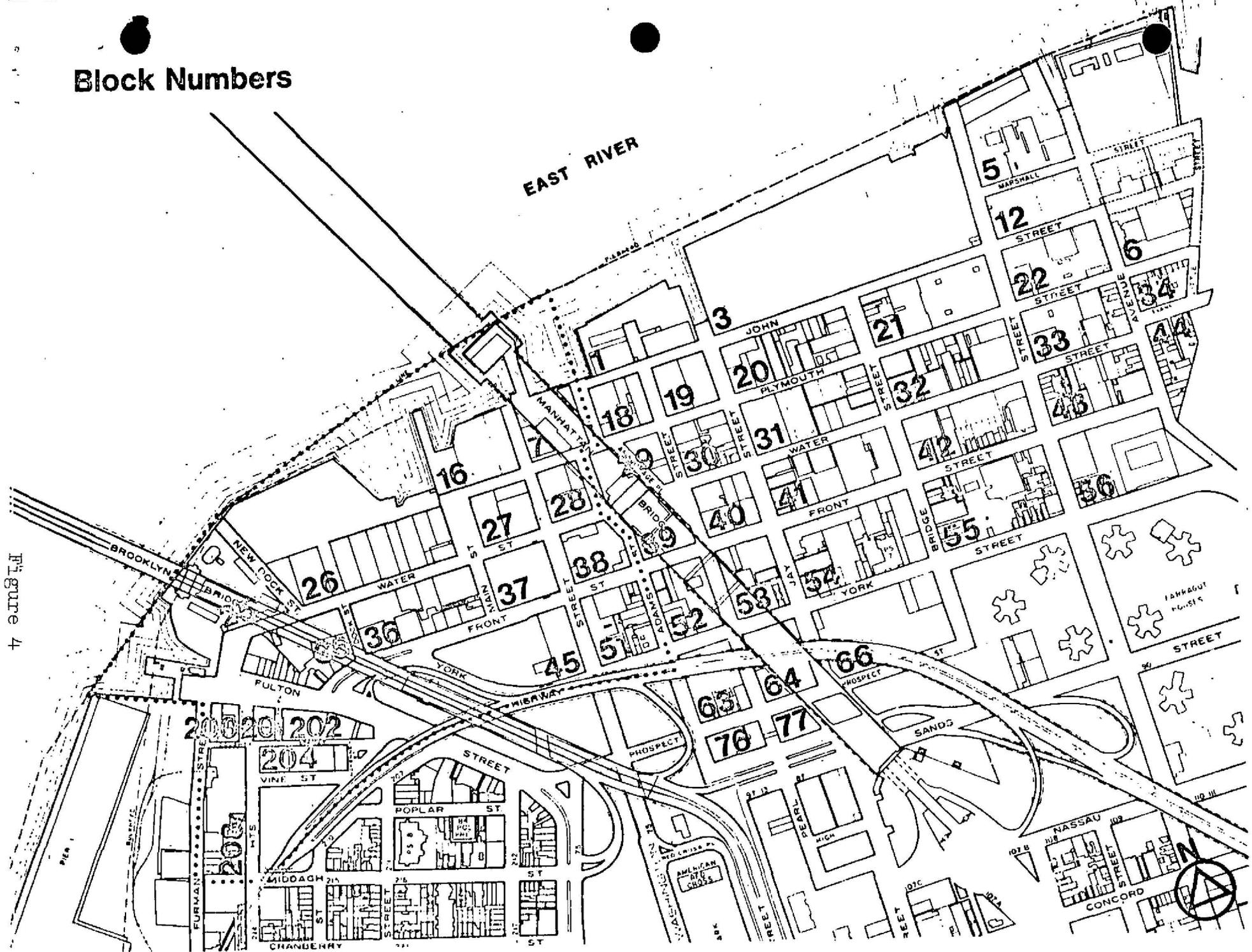


Figure 4

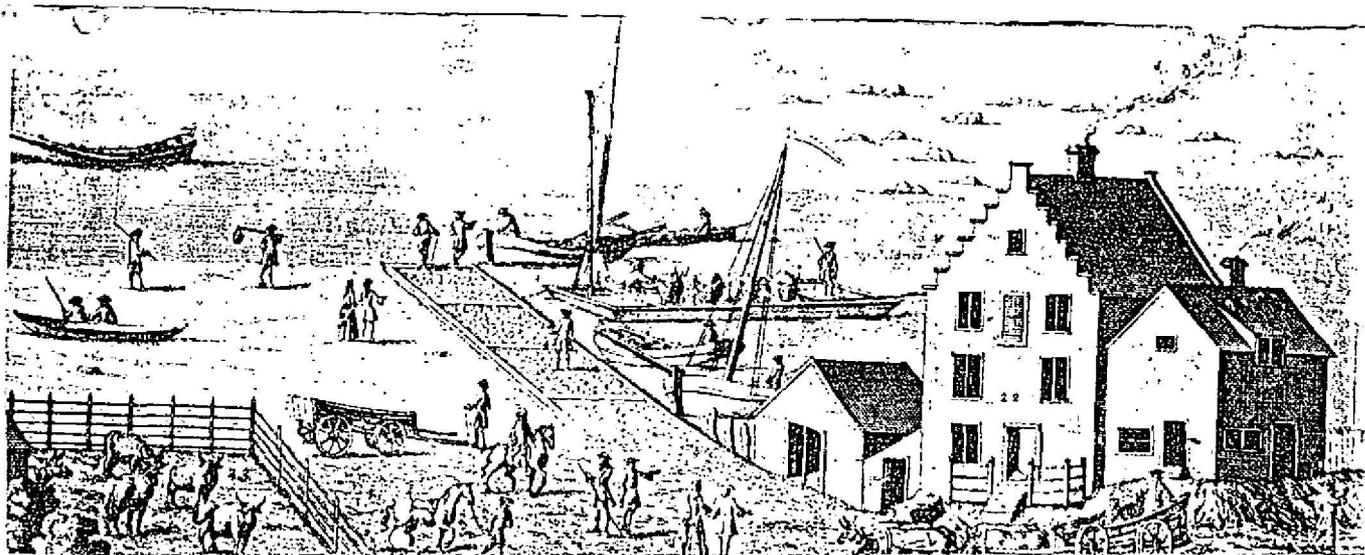
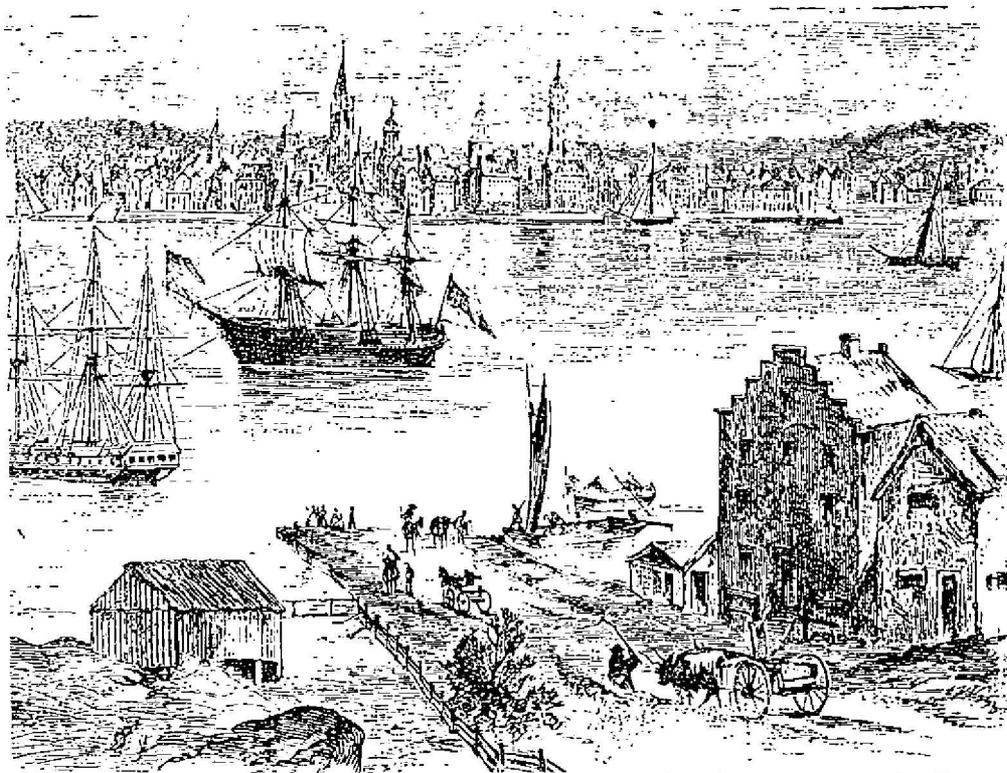
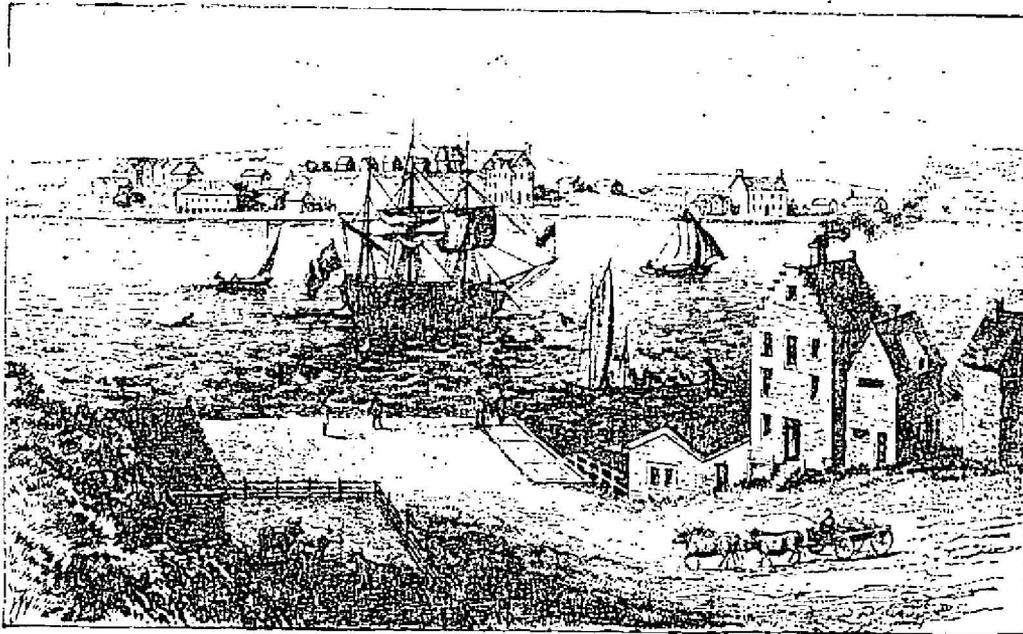


Figure 5



Oxen head down to Ferry pier in 1718, joining horses and cargo aboard sailing scow just landing (left of step-roofed ferry house). Passengers await oarsmen also just pulling in. Artist placed opposite shore much nearer than nature did, and details of slips and spires and small houses can be seen along Water Street, then before Front and South Street landfill, the street nearest the water's edge (SSSM Collection).

Figure 6



FERRY TO BROOKLYN, 1746.

Figure 7

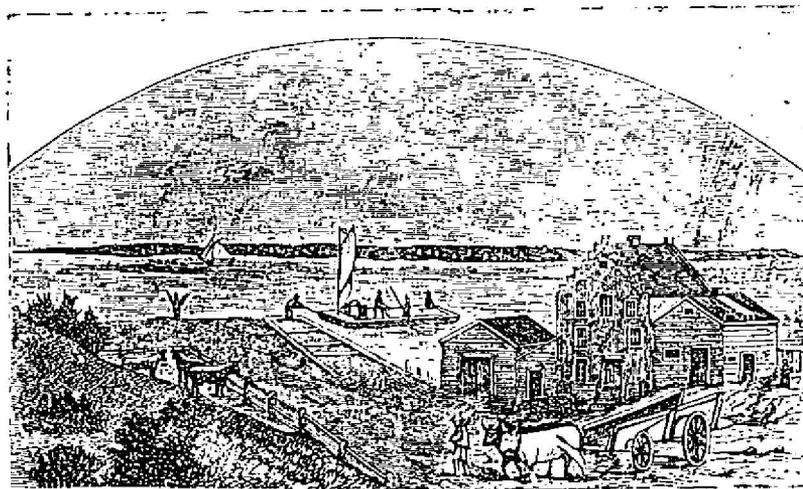


Figure 8

Topography

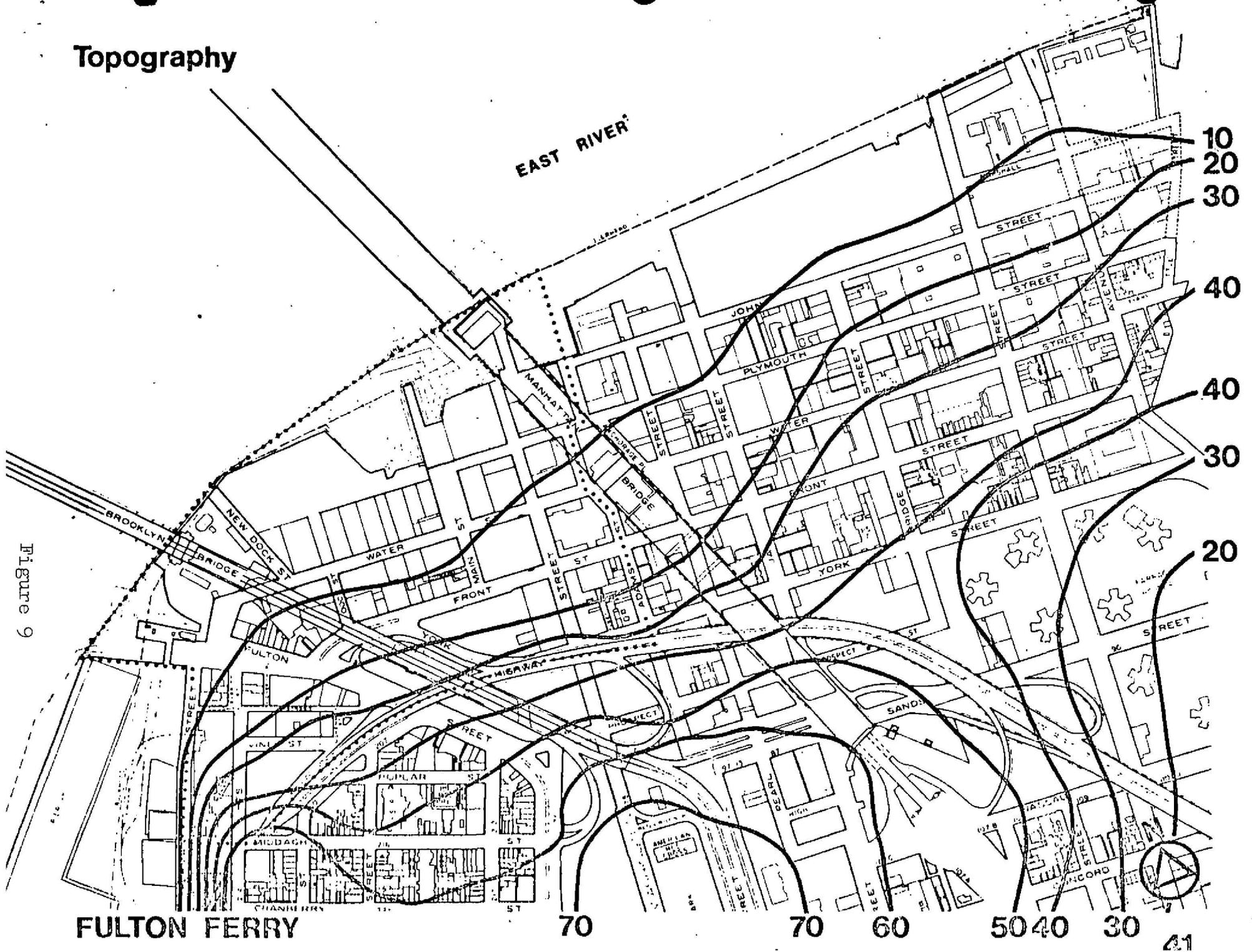


Figure 9

"The Bankers' Corner"—25-27 Fulton Street at left, and 5 Front Street (David Hirsch, Office of Downtown Brooklyn Development).

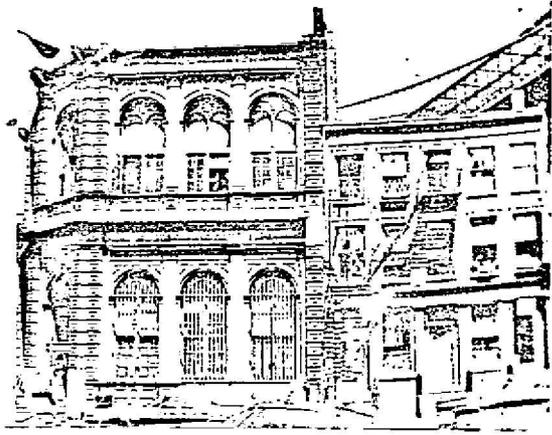
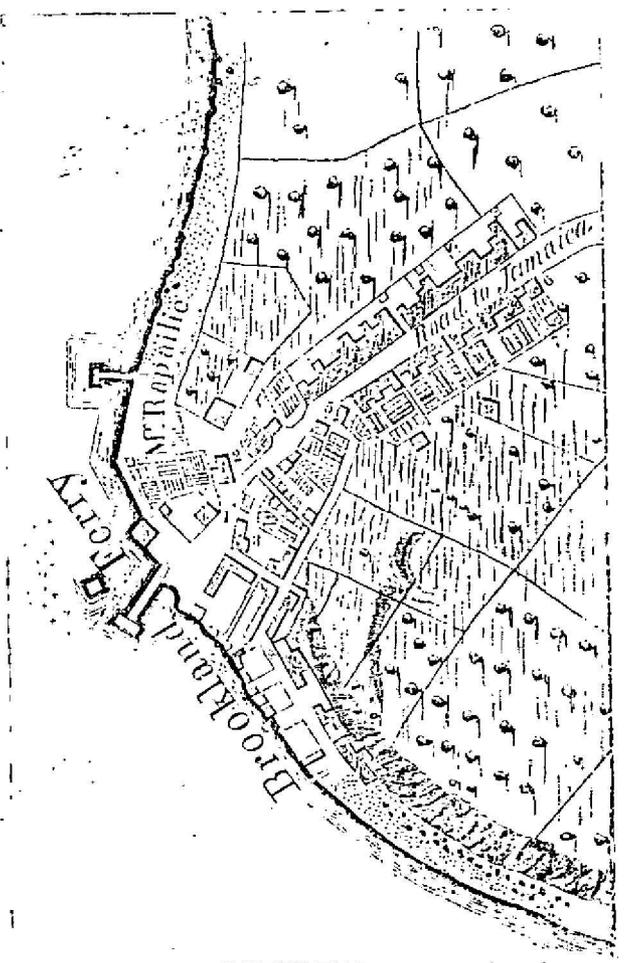


Figure 10



REFERENCES.

1. The "Corporation House," or "Ferry Tavern," occupied during the Revolutionary war by Messrs. Loosely and Elms, as the "King's Head Tavern."
2. John Hatelje's house, with garden extending to the river.
3. The "Old Stone Tavern," kept by Benjamin Smith.
4. Mr. Cary Ludlow's house.
5. The Hicks Mansion.
6. The Middagh Mansion.
7. The Middagh barn.
8. The "Whalebone Gate," so called from its being arched over with whale's rib-bone. It opened at the side of Mr. Thomas Everit's house, into a lane leading up to Mr. Cary Ludlow's house.

Figure 12

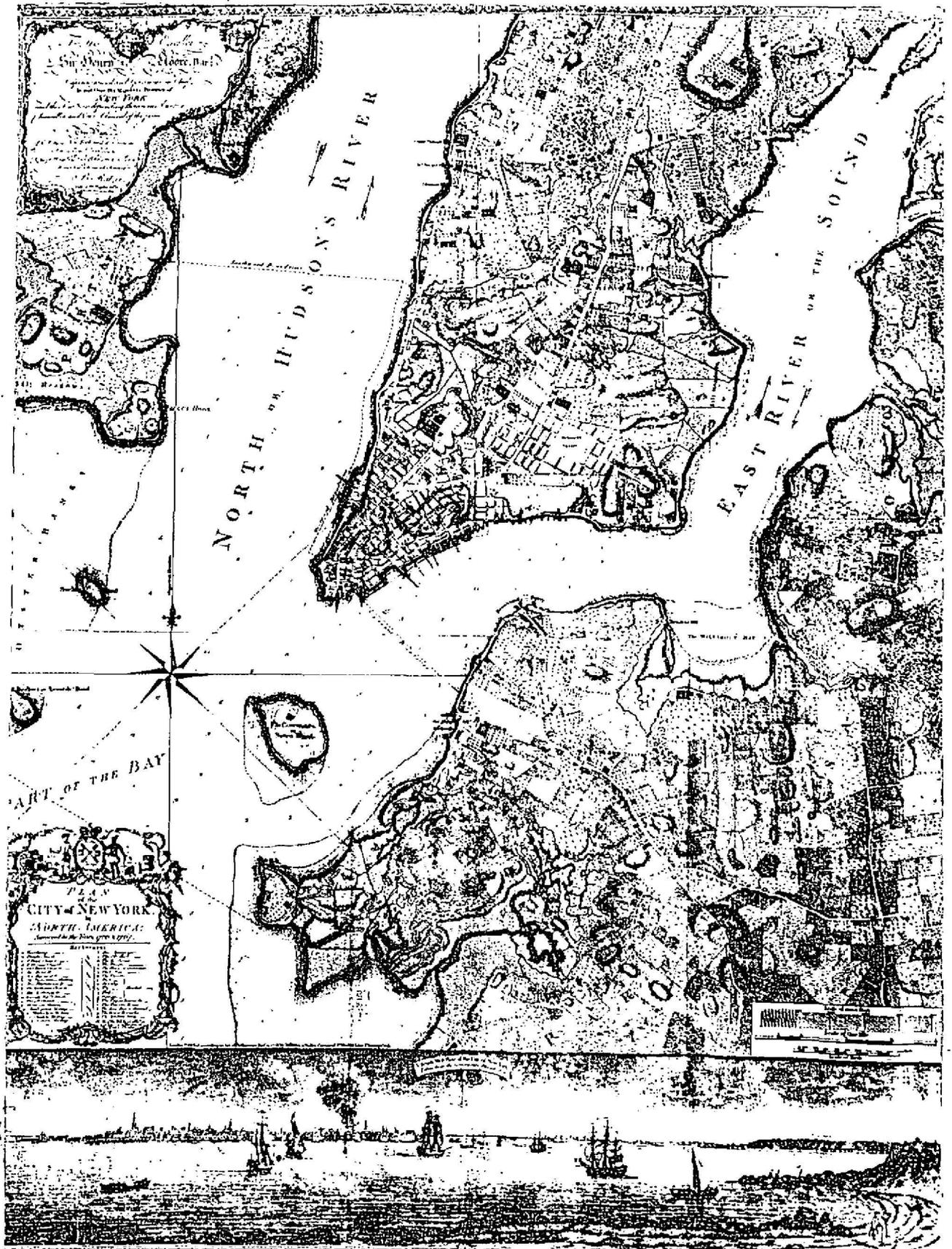
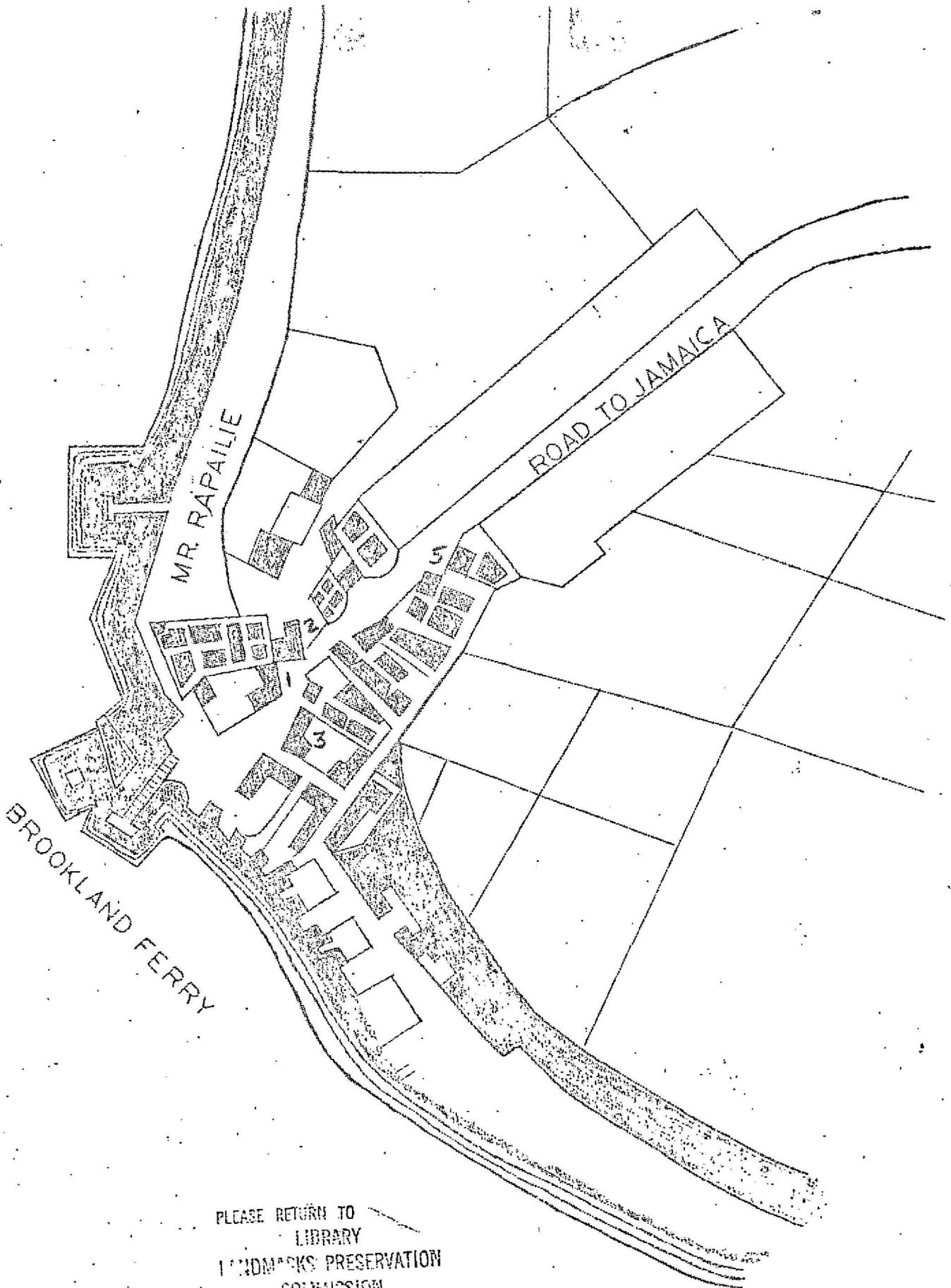


Figure 11



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COMMISSION

FIGURE 13



Figure 14

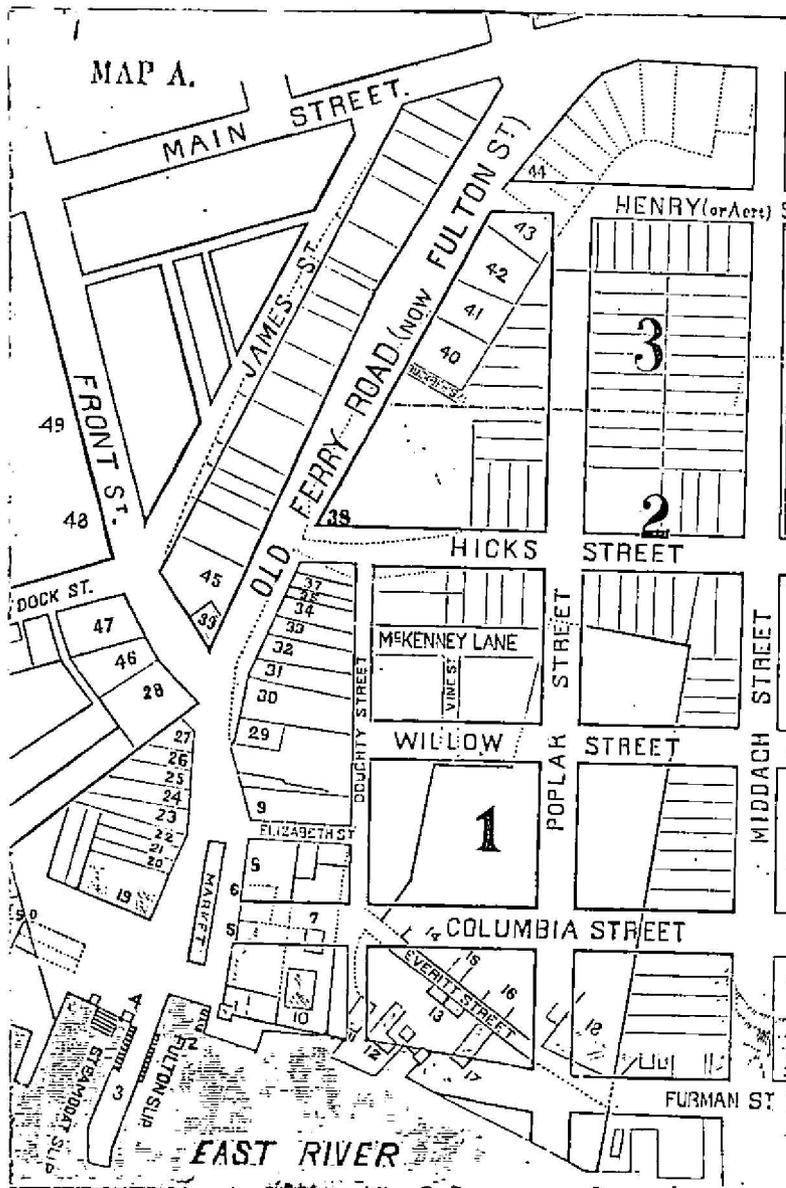


Figure 16



Figure 19

Fulton and Front streets, 1816-1820: Long ago when "Ferry Village" was Brooklyn's biggest town, when Fulton Street was Old Ferry Road, it looked like this. Between 1816 and 1820, Francis Guy painted at least three versions of this winter scene from upper window of Front Street house, looking toward Fulton at right. This one is breathlessly still, but others are full of dung-carts and sleighs, capering boys, and nearby barnyard's chickens and pigs (Long Island Historical Society).

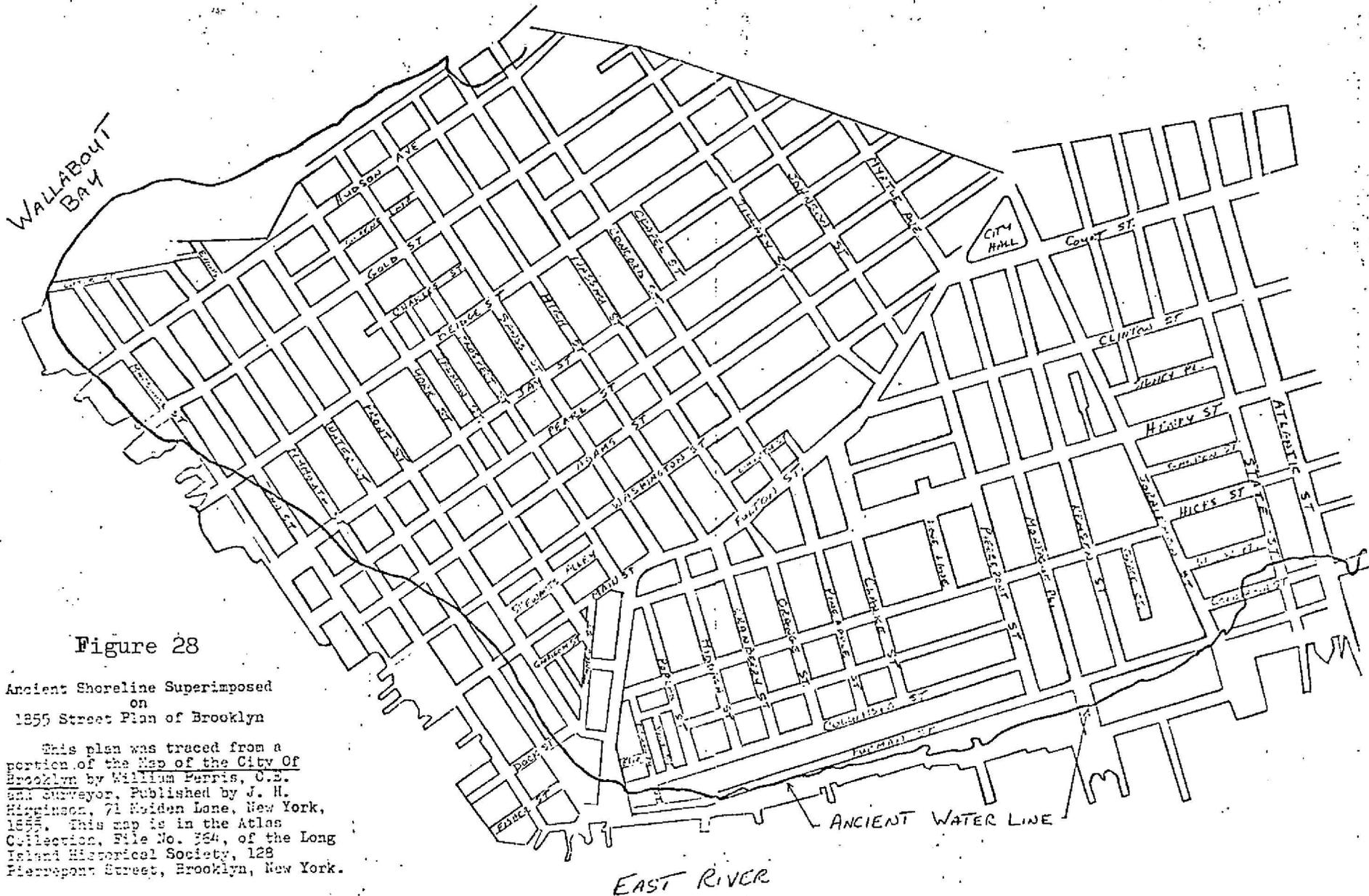
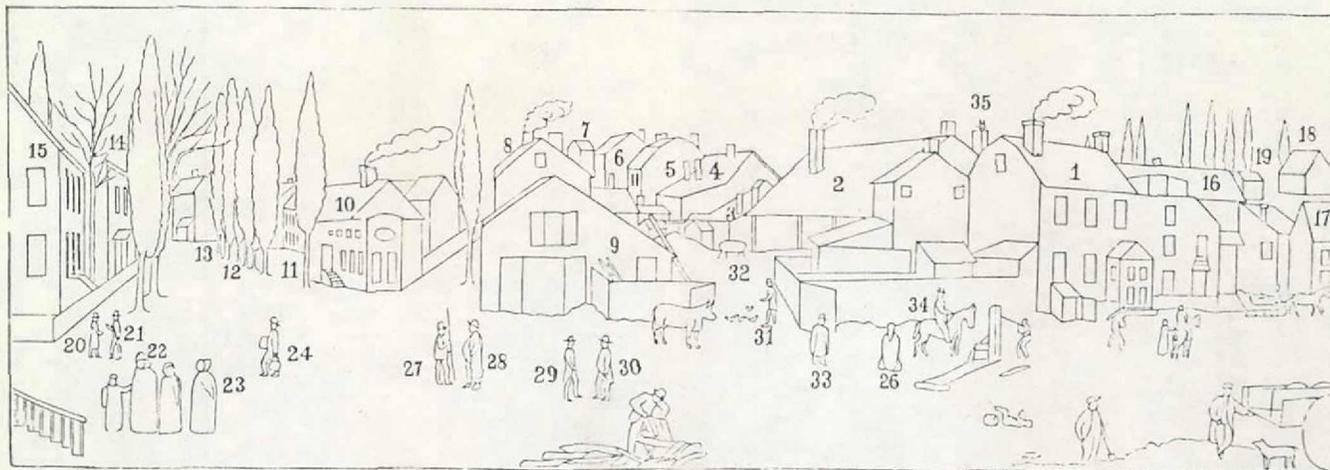


Figure 28

Ancient Shoreline Superimposed
on
1855 Street Plan of Brooklyn

This plan was traced from a portion of the Map of the City of Brooklyn by William Ferris, C.E. and Surveyor. Published by J. H. Hinckson, 71 Maiden Lane, New York, 1855. This map is in the Atlas Collection, File No. 364, of the Long Island Historical Society, 128 Pierrepont Street, Brooklyn, New York.

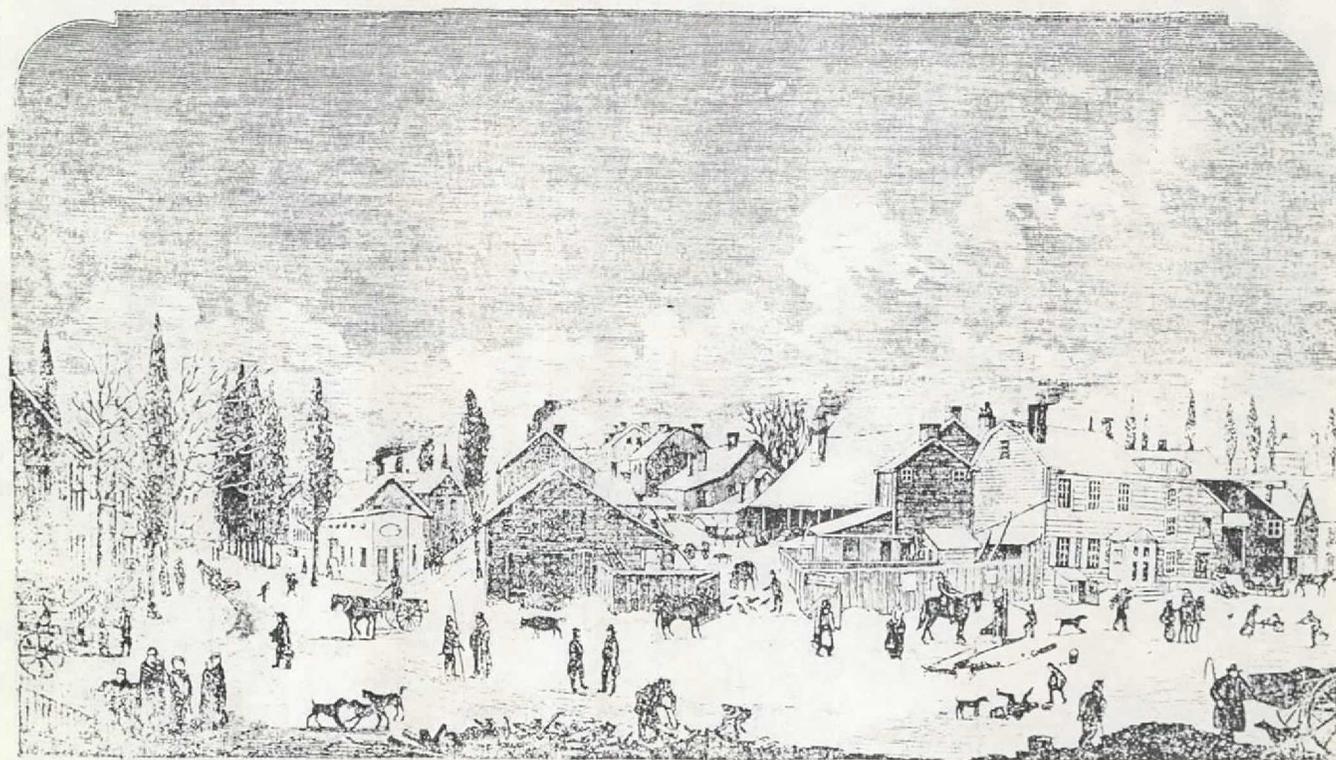


KEY TO GUY'S BROOKLYN SNOW SCENE.

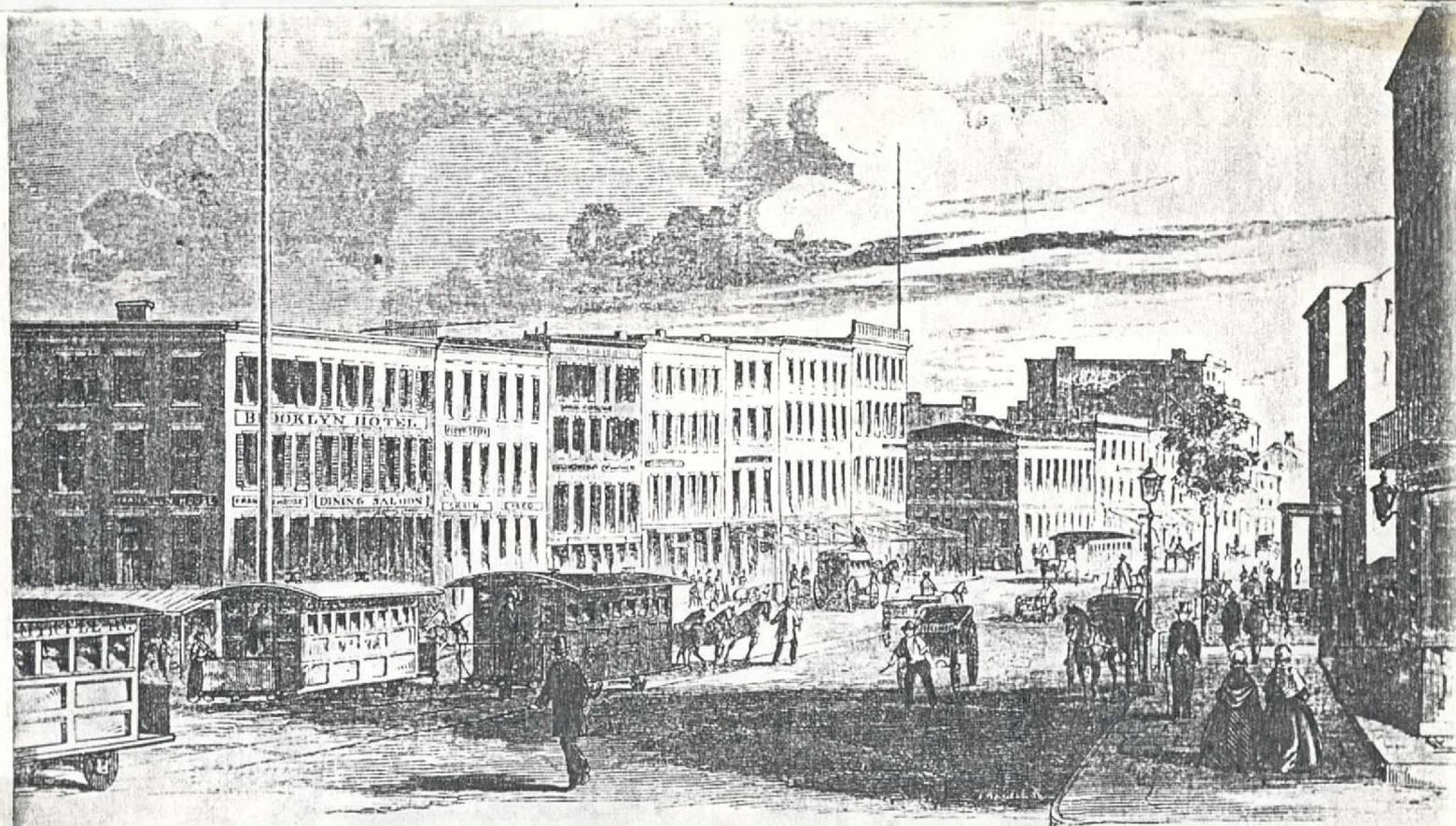
1. Dwelling and store of Thos. W. Birdsall (still living, 1869).
2. House of Abiel Titus — see page 59.
3. Edward Coope's blacksmith shop.
4. Geo. Fricke's carriage shop.
5. Diana Rapelje's house.
6. Mrs. Middagh's house.
7. St. Ann's Church, corner of Sands and Washington streets.
8. Residence of Edward Coope.
9. Abiel Titus's barn and slaughter house.
10. Benjamin Meeker's house and shop.

11. Mrs. Chester's "Coffee Room."
12. Robert Cunningham's.
13. Jacob Hicks's woodyard, corner Main street.
14. Joshua Sand's residence.
15. Augustus Graham's residence, corner Dock street.
16. Bardet Stryker's house and butcher shop.
17. Selah Smith's tavern.
18. Morrison's, on the heights.
19. Dr. Ball's house, opposite Morrison's.
20. Augustus Graham, conversing with
21. Joshua Sands.
22. Mrs. Harner and daughters.

23. Mrs. Guy (the artist's wife).
24. Jacob Patchen.
25. Mrs. Burnett.
26. Benjamin Meeker, talking with
27. Judge John Garrison.
28. Thos. W. Birdsall.
29. Jacob Hicks.
30. Abiel Titus.
31. Abiel Titus's negro servant "Jeff."
32. Mrs. Gilbert Titus.
33. Abiel Titus's negro servant "Jeff."
34. James (son of Abiel Titus, on horseback.
35. Samuel Foster (negro).



GUY'S BROOKLYN SNOW SCENE, 1820



Fulton Street Brooklyn from East River, 1857: Well over a century ago Long Island-bound horse cars draw ferry passengers eastward on Fulton Street, past stores and sidewalks alive with busy people. At right, full-skirted ladies stroll past flower-seller whose bouquets brighten ground near Hinman Brothers' classic "junk shop." At Hinman's, said an old man, remembering, Brooklyn housewives could buy just about anything, "from a spool of thread to a mahogany coffin" (Long Island Historical Society).

Figure 20

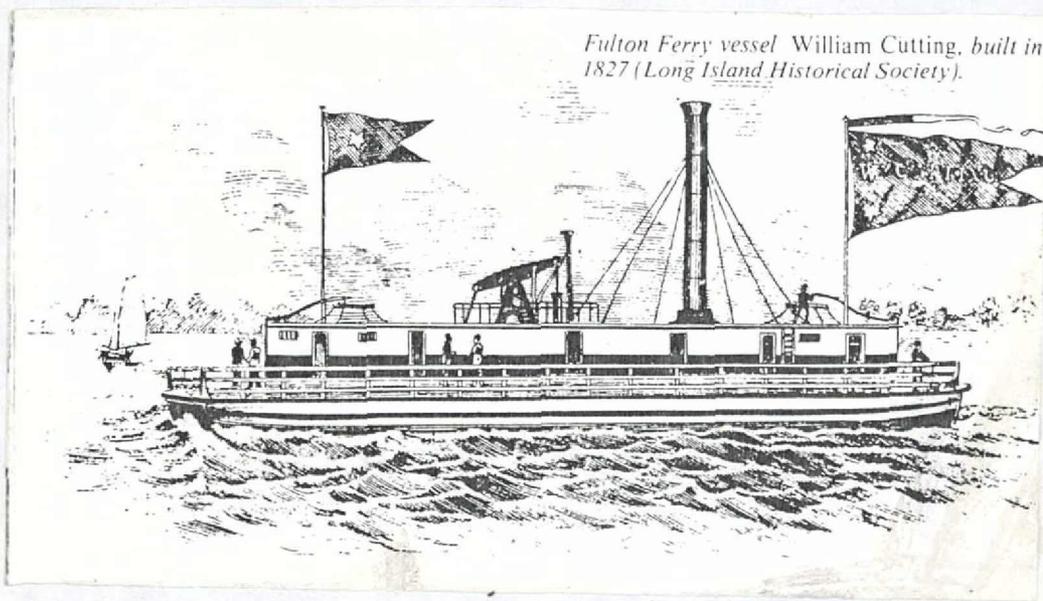


Figure 21

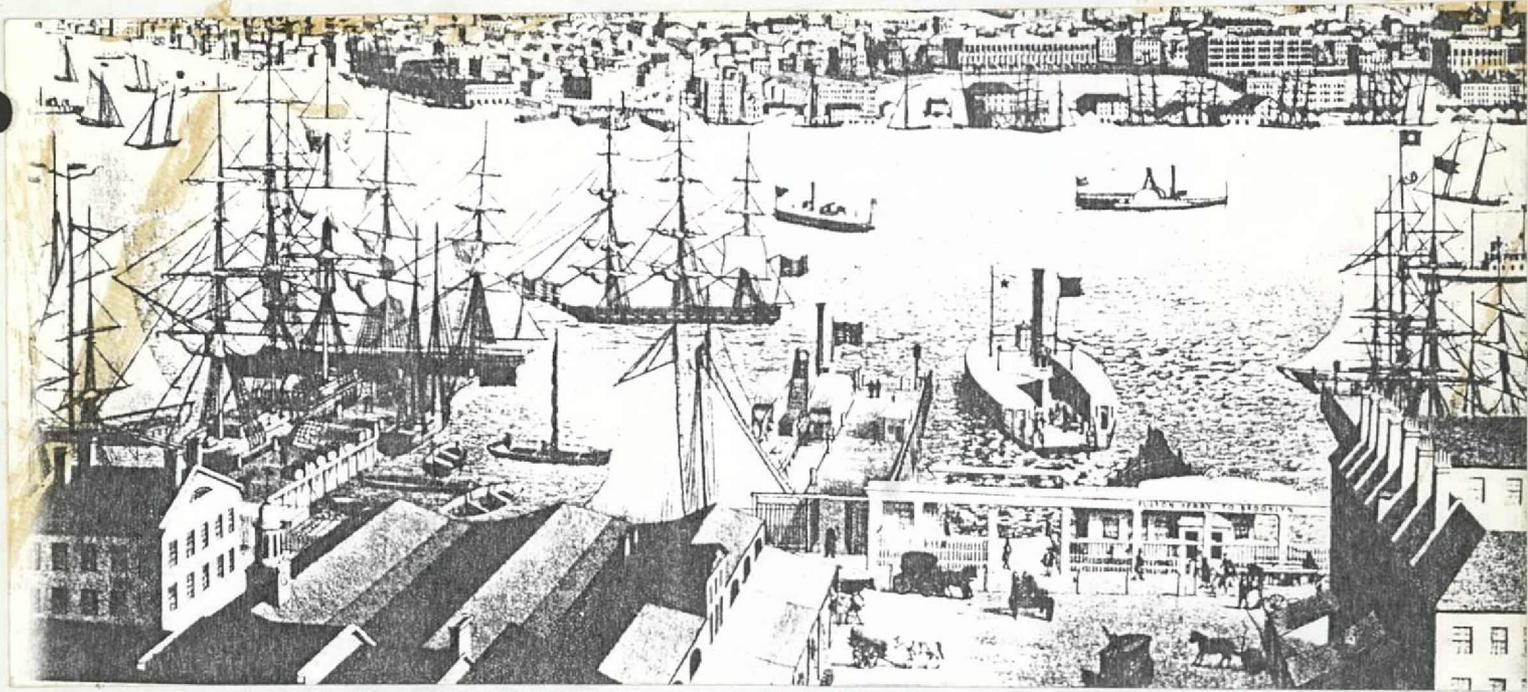


Figure 22

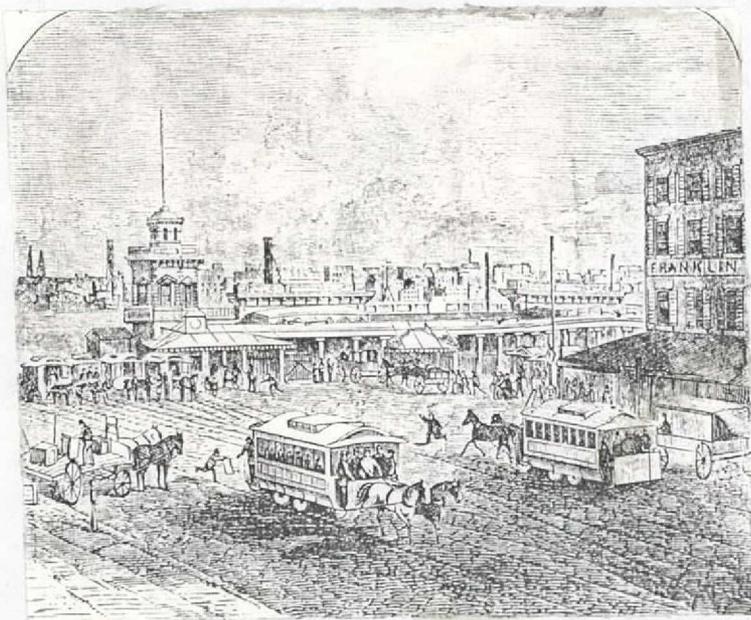


Figure 24



Turreted and crested Brooklyn ferry house, built in 1871. Unsophisticated camera lens blurs horse cars, one marked "City Hall 13" and bearing partially legible placard for "Coney Island... Connect... Steam Cars... Greenwood" (Long Island Historical Society).

Figure 25



Fulton Ferry Brooklyn

Figure 23

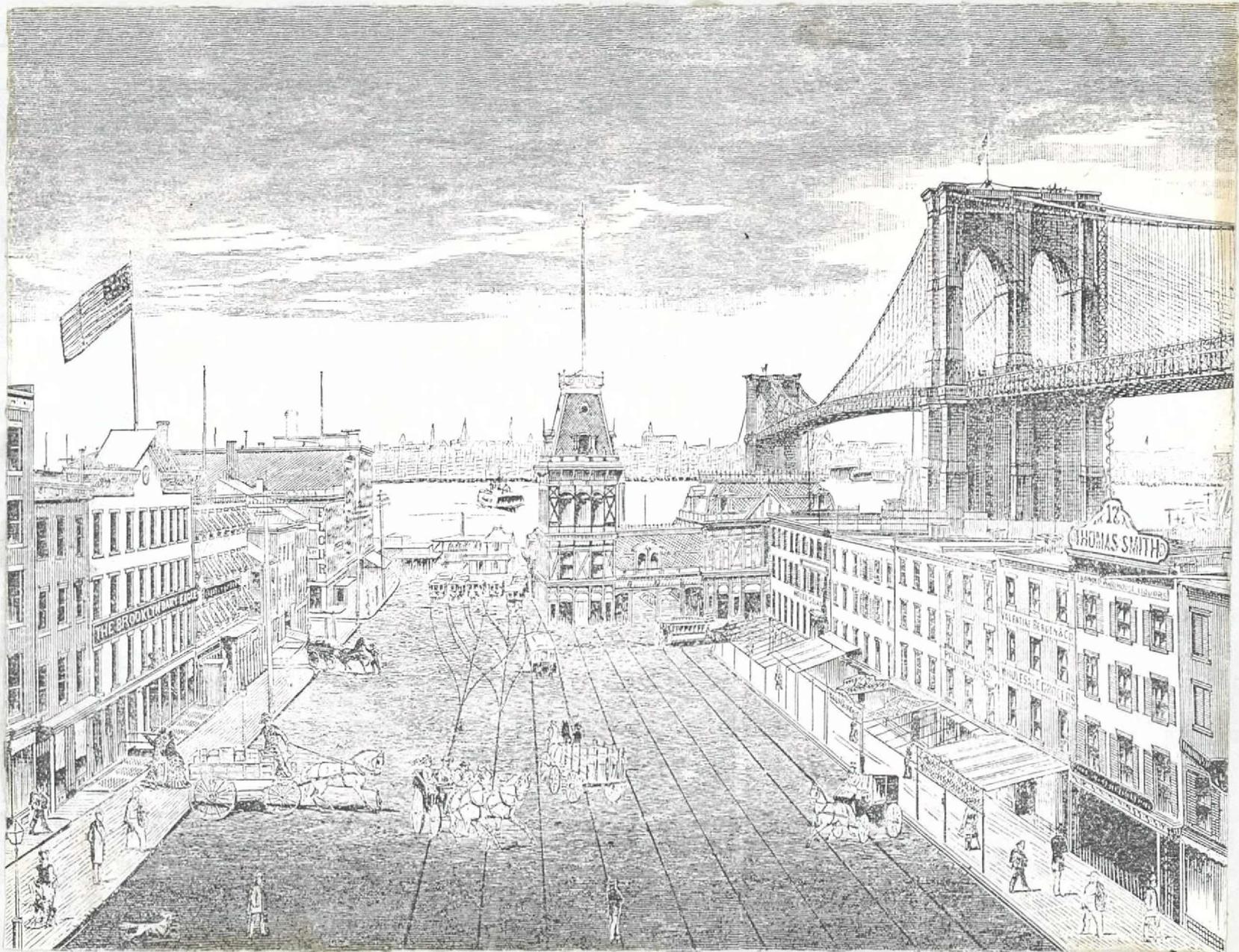


Figure 26

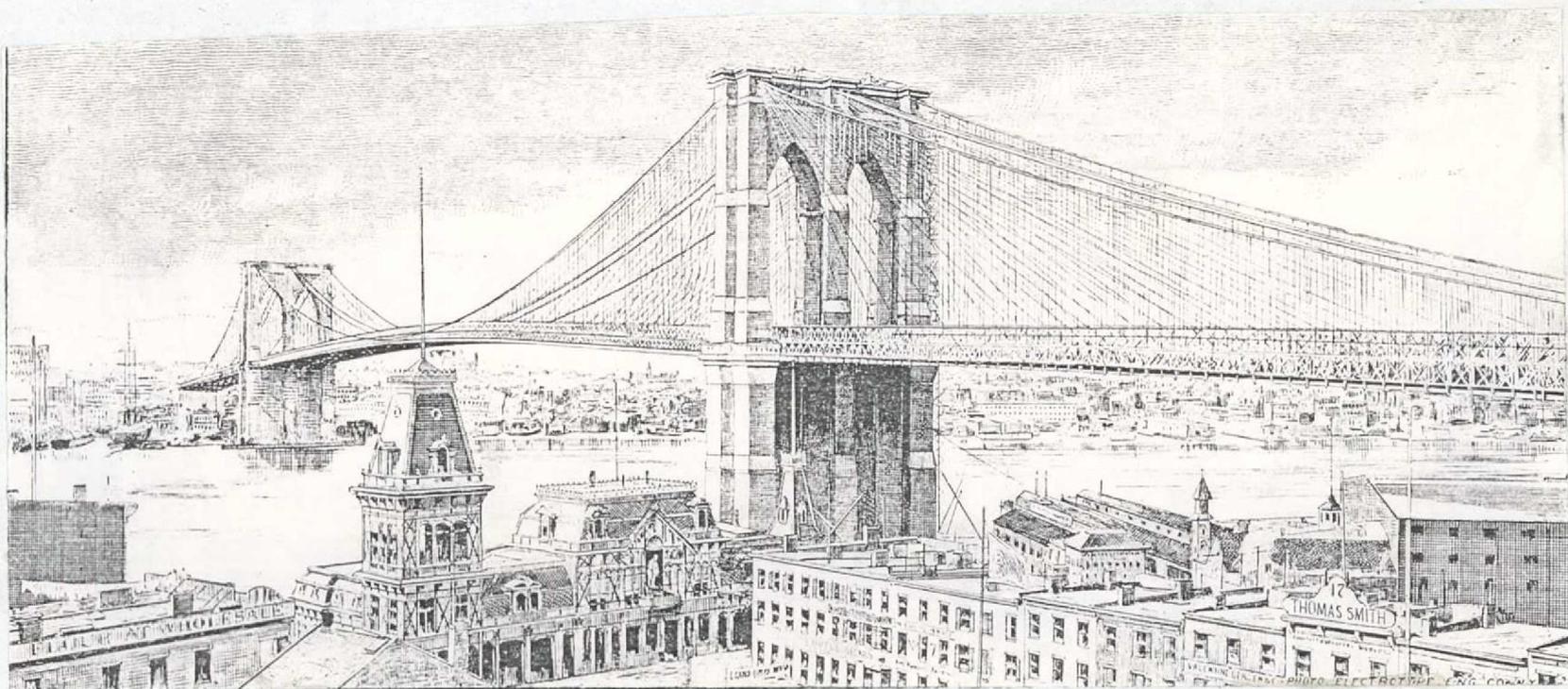
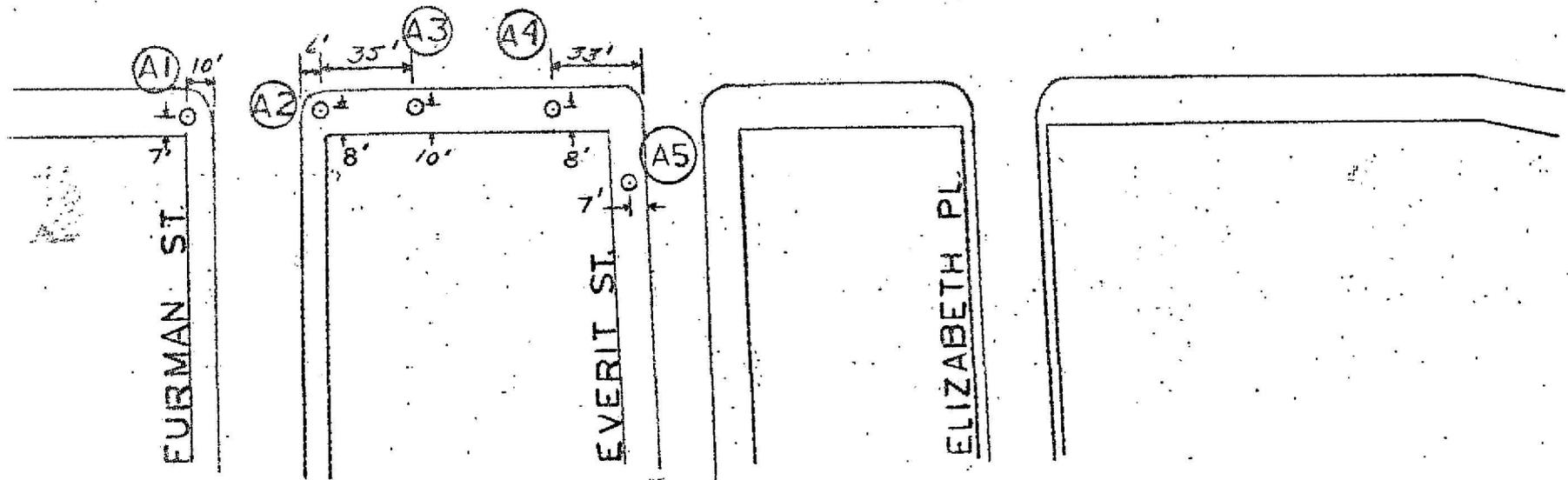
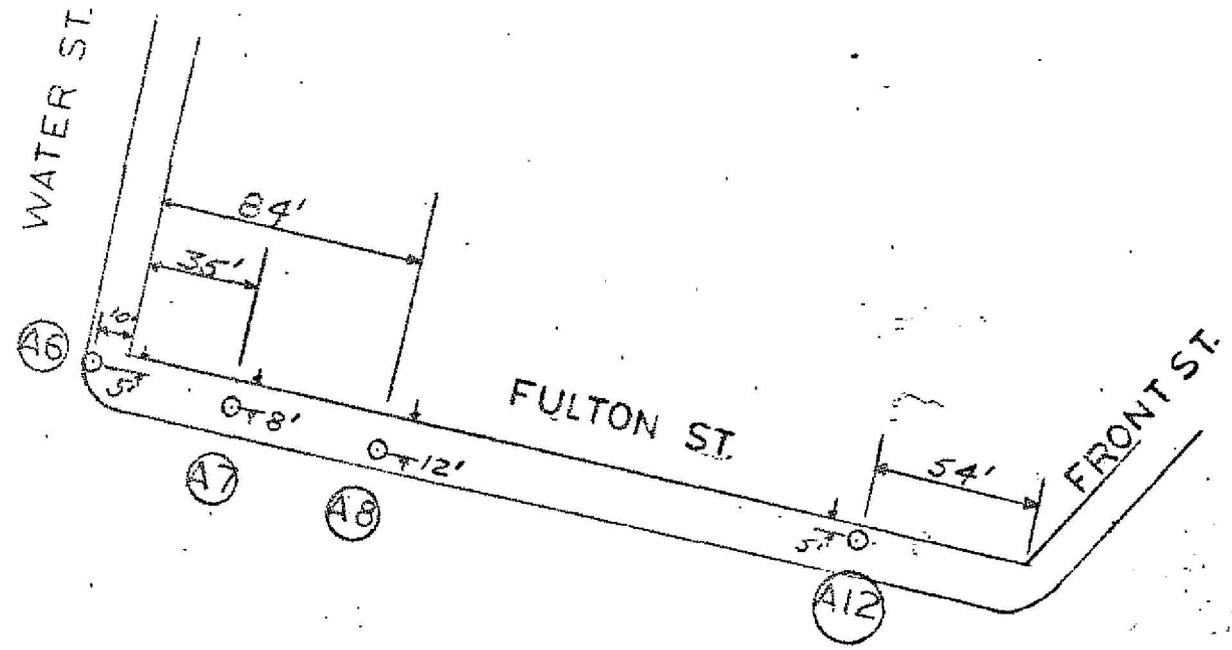
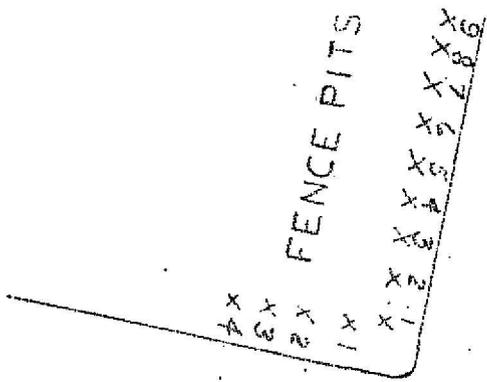


Figure 27



SCALE 1"=60'

LOCATION SURVEY
SUPPLEMENTARY BORINGS

FIGURE 32

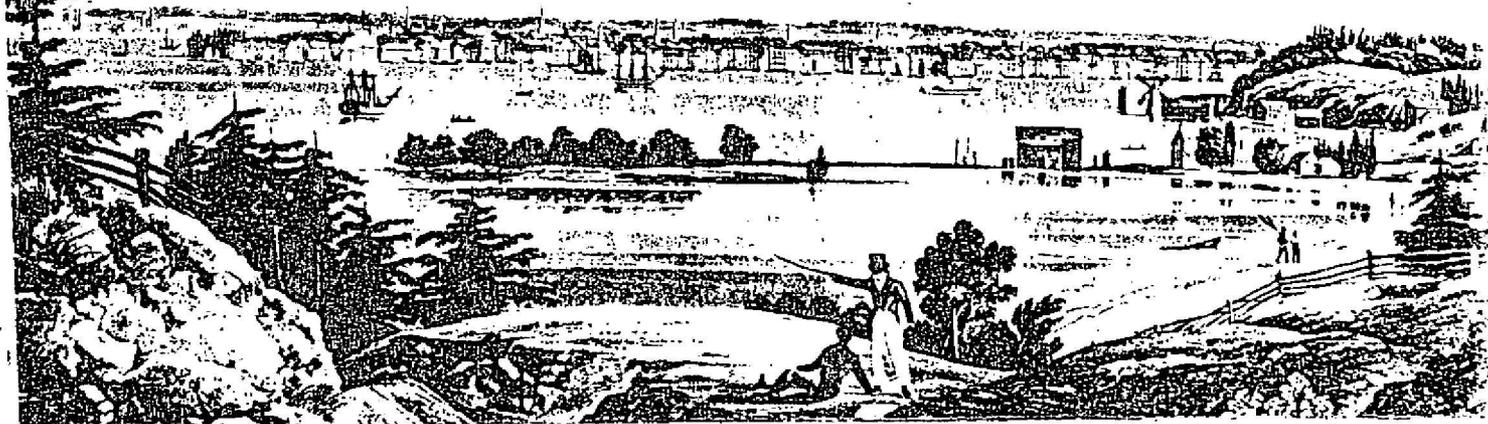


FIGURE 33

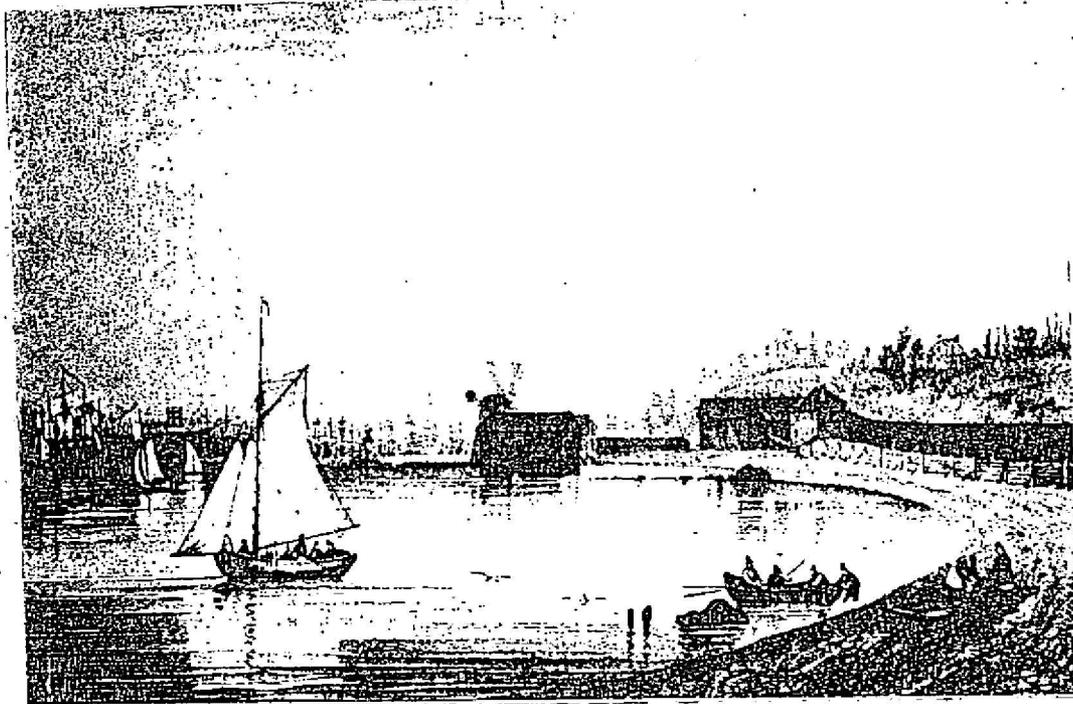
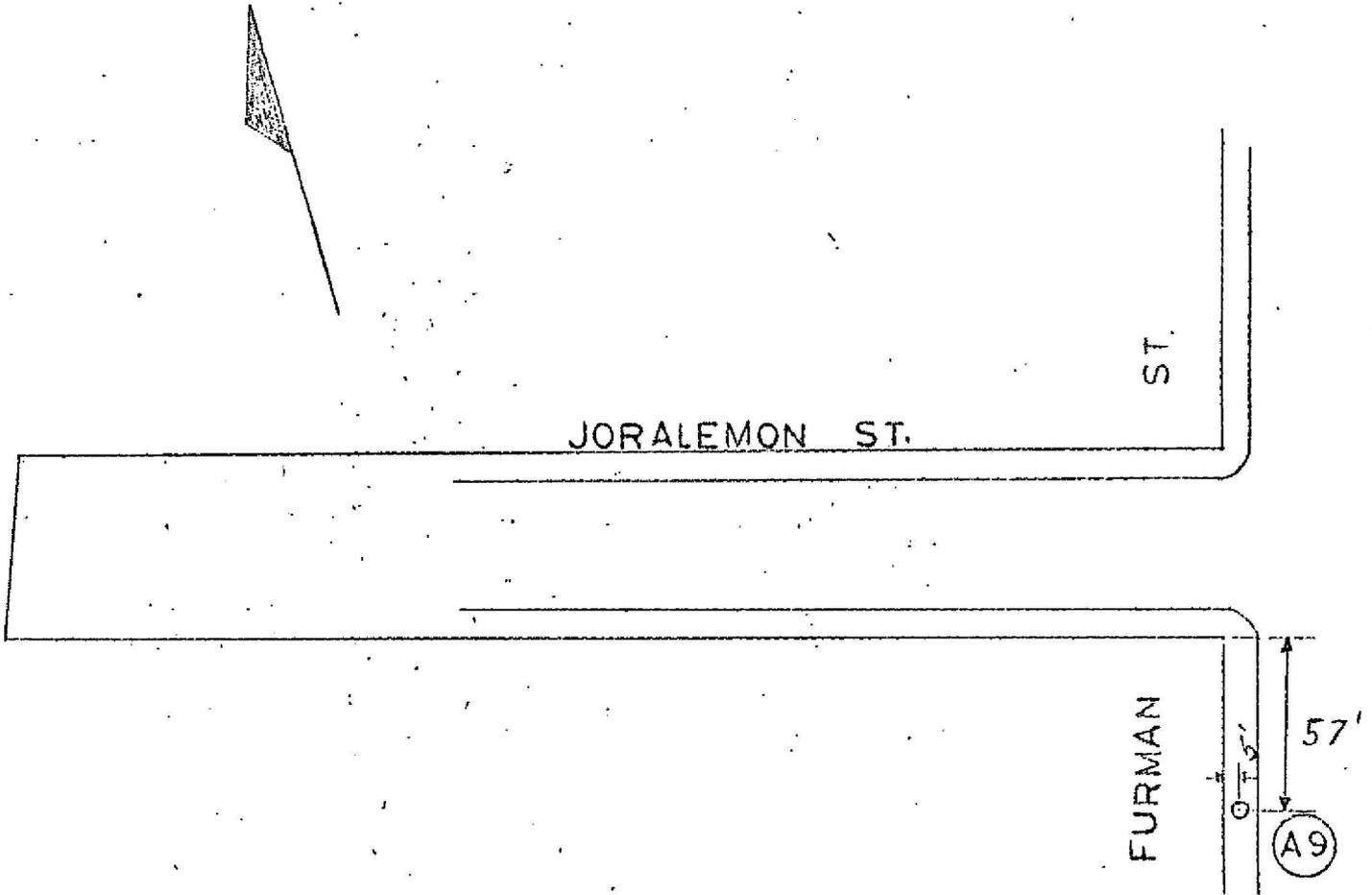


FIGURE 34

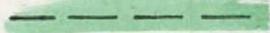


SCALE 1"=60'

LOCATION SURVEY- SUPPLEMENTARY BORINGS

FIGURE 36

FIGURE 39 - SHORELINE MAP, VICINITY OF FURMAN STREET

TUNNEL STUDY LIMITS - 
ANCIENT WATER LINE - 

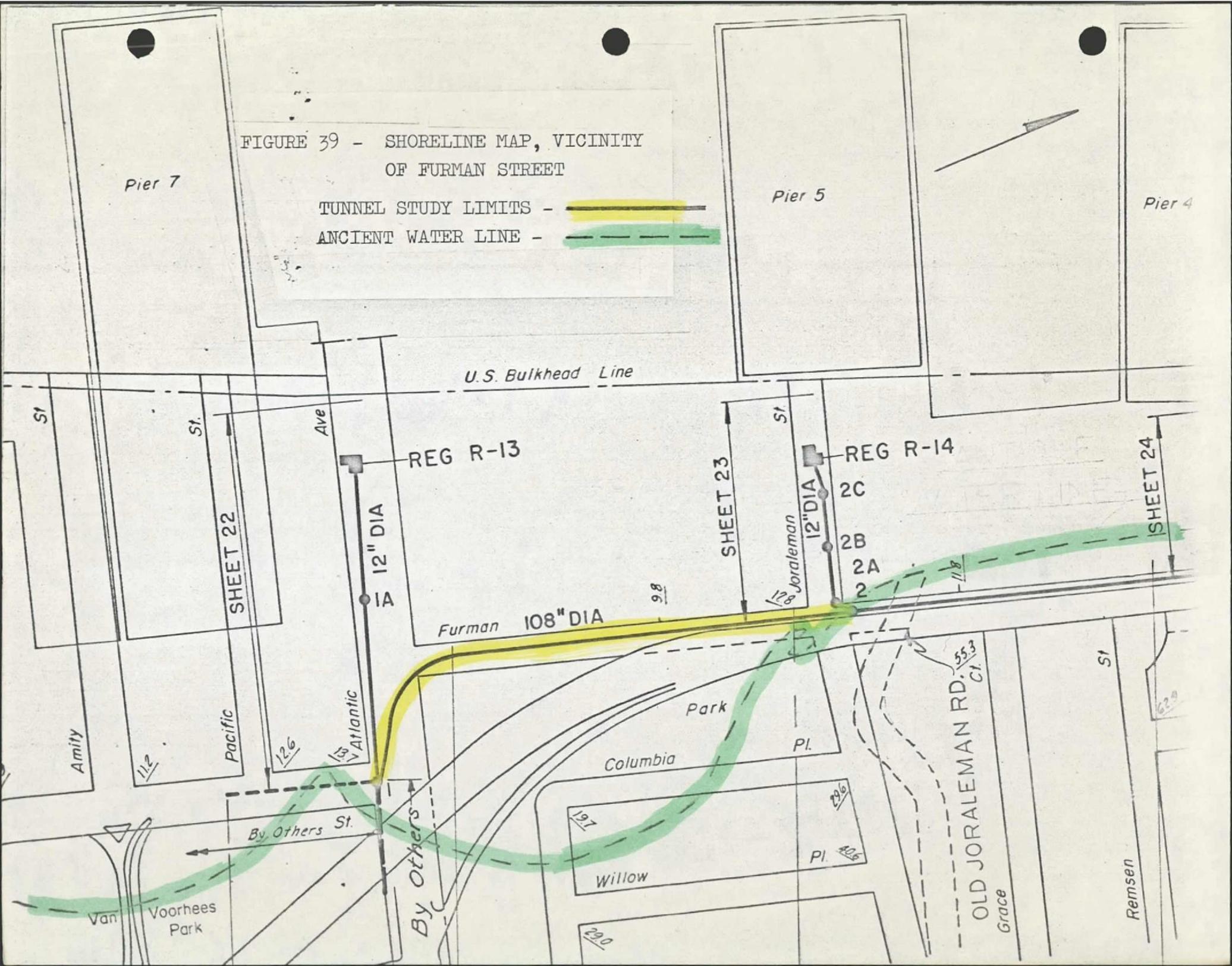
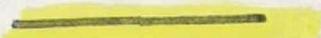
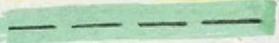


FIGURE 41 - SHORELINE MAP, VICINITY OF
MAIN & PLYMOUTH STREETS

EAST RIVER

TUNNEL STUDY LIMITS - 
 ANCIENT WATER LINE - 

U.S. Pierhead Line

U.S. Bulkhead Line

U.S. Pierhead Line
 U.S. Bulkhead Line

Manhattan Bridge

SHEET 28

DIV. & T.G. R-19A
 John

REG. R-19

SHEET 27

REG. R-18
 St.

708
 24" DIA. 5D

6A

6B

6C

18" DIA. St.

St.

108

1025

883

mouth

St.

24" DIA.

108" DIA. 5

5A

5B

St.

5C

St. 108

1079

St. St.

Pearl

1321
 Water

Jay

155

750

704

698

Dock St.

Front

Howard Main
 Alley St. 101

SHEET 13

Adams

1333

4

12

146



CALENDAR
of the
LANDMARKS PRESERVATION COMMISSION
of
The City of New York

TUESDAY, MARCH 8, 1977

Meeting at 10:30 A.M.

in the
CITY HALL



Abraham D. Beame, Mayor

Volume 8 Number 2

Proposed for Designation as Landmarks and Landmark Sites

BOROUGH OF MANHATTAN

No. 2

(LP-0949)

Pratt-New York Phoenix School of Design (New York School of Applied Design for Women), 160 Lexington Avenue, Manhattan.

Landmark Site: Tax Map Block 886, Lot 21.

This hearing has been duly advertised.

Close the hearing.

No. 3

(LP-0954)

George W. Vanderbilt Residence, 647 Fifth Avenue, Manhattan.

Landmark Site: Tax Map Block 1287, Lot 71.

This hearing has been duly advertised.

Close the hearing.

*Don't
what is our
position?*

MS - what does FRIC mean?

Proposed for Designation as an Historic District

BOROUGH OF BROOKLYN

No. 4

(LP-0956)

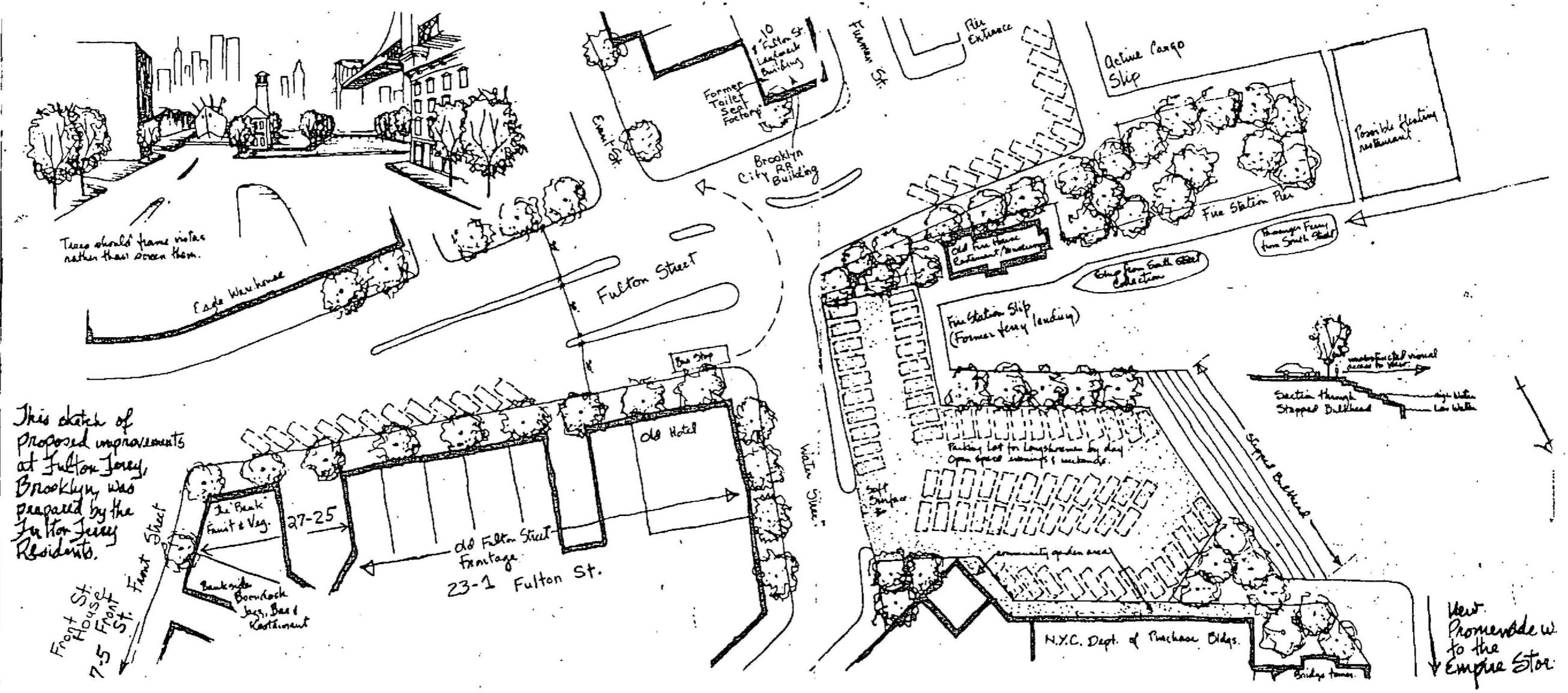
Fulton Ferry Historic District.

Part of the eastern and part of the southern property lines of 40-44 Cadman Plaza West, the remaining part of the eastern property line of 40-44 Cadman Plaza West, Cadman Plaza West, Front Street, the northeastern and northwestern property lines of 5-7 Front Street, the northwestern and northeastern property lines of 19 Cadman Plaza West, the northeastern property lines of 17 through 13 Cadman Plaza West, the northeastern property line of 4-12 Water Street, Water Street, the eastern property line of 85 Water Street, part of the southern property line of Block 26, Lot 1, Main Street, part of the southern property line of the dock at the foot of Main Street, the shoreline of the East River to the north side of the dock at the foot of Cadman Plaza West, the dock at the foot of Cadman Plaza West, the shoreline of the East River at the foot of Cadman Plaza West, the south side of Cadman Plaza West, Furman Street, Doughty Street to the eastern end of the rear of that building described as 40-44 Cadman Plaza West, Brooklyn.

This hearing has been duly advertised.

Close the hearing.

PLEASE RETURN TO
LIBRARY
LANDMARKS PRESERVATION
COMMISSION

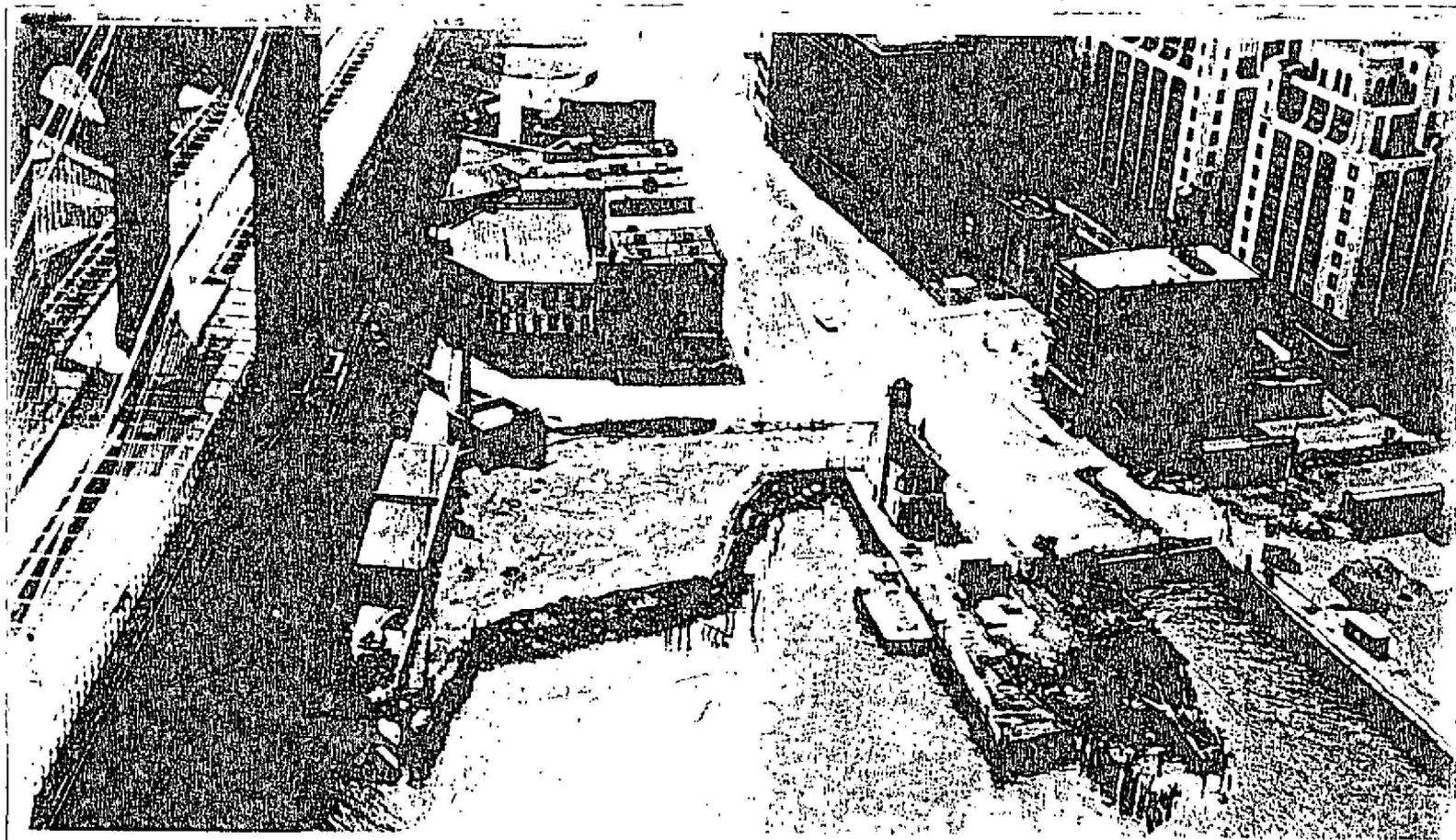


This sketch of proposed improvements at Fulton Jersey, Brooklyn, was prepared by the Fulton Jersey Residents.

Front St. House 7-5

Trees should frame vistas rather than screen them.

FIGURE 44



Fulton Street Brooklyn looking east, 1974: Seen last year by an airborne camera above East River, same Fulton Street as in 1857 print is arched over and bypassed by Brooklyn Bridge. Its ferry slip with old pilings still showing, here a fire boat pier, is by now newly bulkheaded in anticipation of City's plans later this year. At center left is Fulton Ferry Park site, and above it, across Water Street, stand Brooklyn Hotel building and its row, begrimed by their years but still recognizable. Stone sidewalk so carefully drawn in 1857 print—granite-curbed and elegant—is one of wonderful survivals here and there on today's street (Office of Downtown Brooklyn Development).

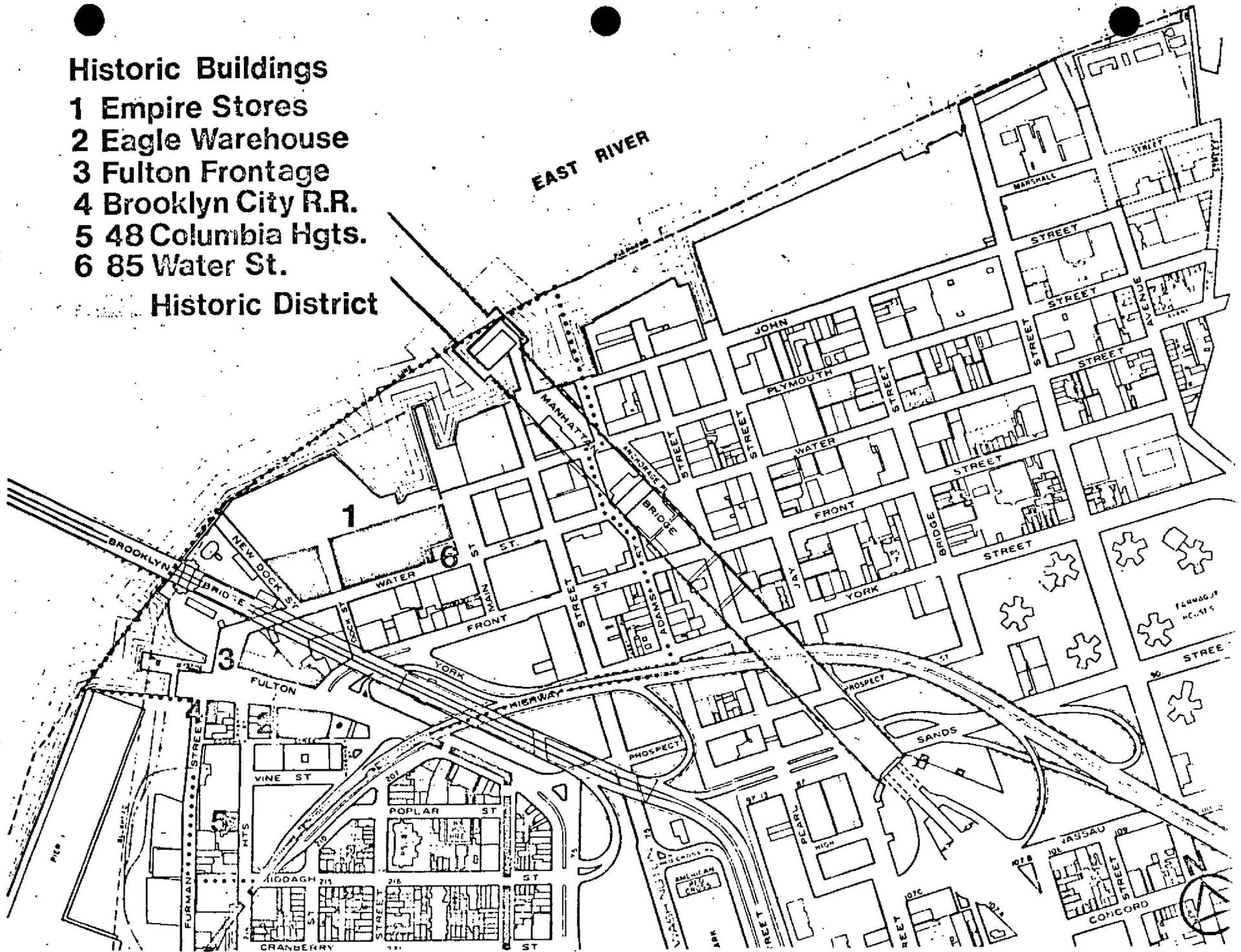
FIGURE 45

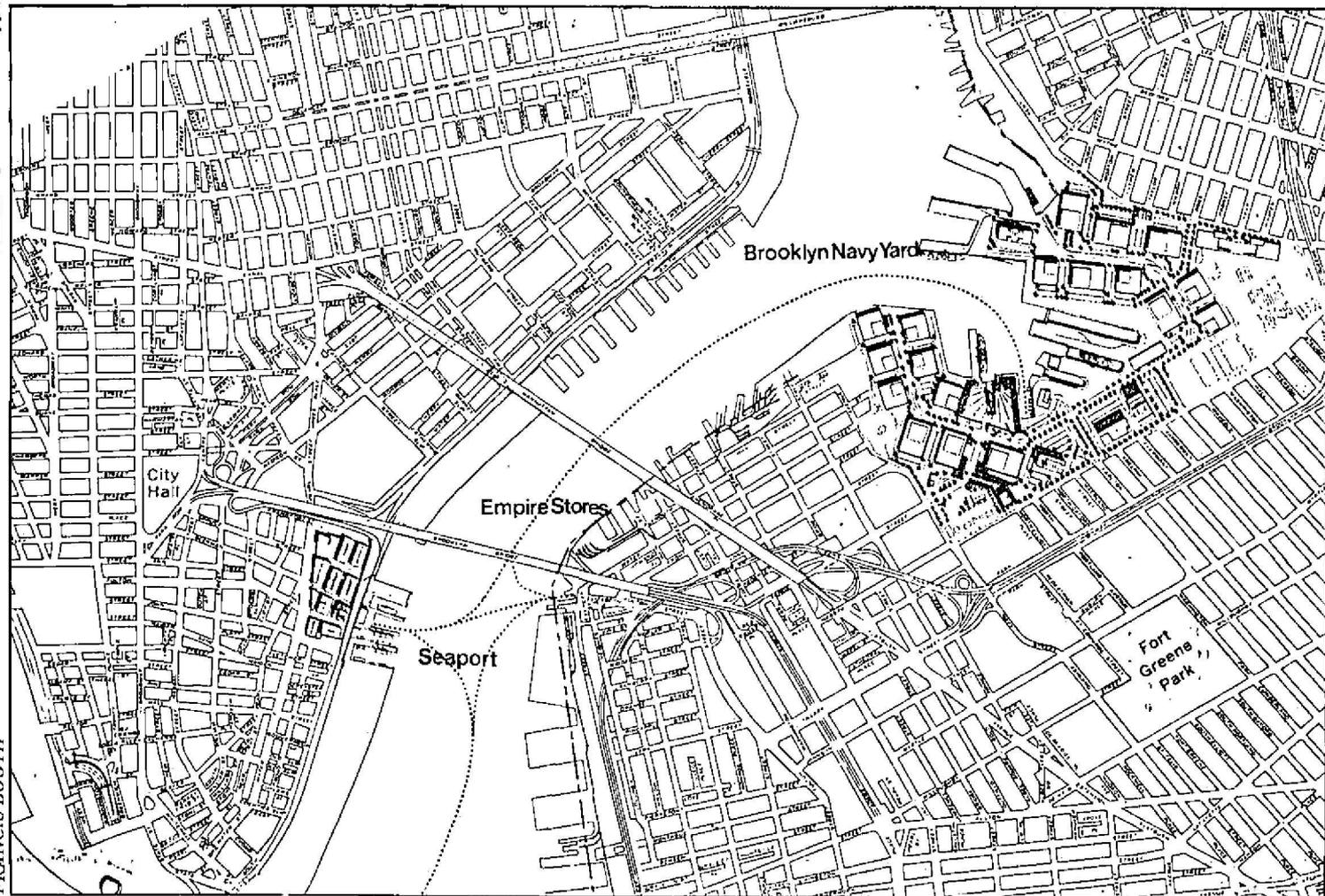
Historic Buildings

- 1 Empire Stores
- 2 Eagle Warehouse
- 3 Fulton Frontage
- 4 Brooklyn City R.R.
- 5 48 Columbia Hgts.
- 6 85 Water St.

Historic District

FIGURE 46





BiCentennial Park would encompass East River edges from Navy Yard, down to Seaport and Empire Stores/Fulton Street complexes, and on to Battery and Fort Clinton and harbor islands. City dwellers already enjoy promenades in lower Manhattan, along Brooklyn Heights, across lofty Brooklyn Bridge.

FIGURE 47

PLATES

- Plate 1 - a. Looking west toward the East River at the foot of Fulton Street. The first major building at the right is the old Long Island Safe Deposit Company. At the end of the street is the Marine Fire House, built in 1924.
- b. Looking northeast over Fulton Street from the corner of Furman and Fulton Streets. Compare this view taken from the same spot as the picture made in 1857 (Fig.20).
- Plate 2 - Core drilling at the south side of lower Fulton Street between Everitt Street and Furman Street. Mr. T. McGovern is cataloging the soil specimens. The drilling rig is in the background.
- Plate 3 - a. The location of the Old Corporation House on the north side of Fulton Street at Nos. 19, 21, 23 occupied presently by the Waxman Building and the parking lot. The building at the right is the iron clad Long Island Safe Deposit Company building, now vacant.
- b. In the center of the view looking north on Front Street from Fulton Street is No. 11 Front Street. From the second floor of the building which occupied the site in 1820, Francis Guy painted his famous "Snow Scenes". At the extreme left is a portion of the Long Island Safe Deposit Company.
- Plate 4 - The corner of Furman Street and Joralemon Street, looking west toward the dock. In this vicinity stood the Pierrepont Anchor Gin Distillery and a windmill.
- Plate 5 - a. Looking west from the corner of Furman and Atlantic Avenue, looking toward the East River.
- b. Looking north on Furman Street from the corner of Atlantic Avenue and Furman Street. The Brooklyn Heights are to the right.
- Plate 6 - Public School No. 7 built the year before the Brooklyn Bridge in 1882, and standing on the approximate location of the "Indian Hill" on York Street between Jay and Bridge Streets.

Plate 7 - a. Looking toward the East River down Main Street. Howard Alley is at the left. The Manhattan Bridge crosses the street in this view.

b. Looking toward Pearl Street and the Manhattan Bridge. The railroad tracks imbedded in the cobble stoned pavement is seen through the snow.

Plate 8 - a. The end of Plymouth Street, looking northwest toward the Brooklyn Bridge. The Empire Stores building is at the left.

b. Looking over the piles of the abandoned docks in front of the Empire Stores at the end of Plymouth Street, looking toward Manhattan.

Plate 9 - The vacant lot at Nos. 21 and 23 Fulton Street, location of the old Corporation House on the north side of the street.

Plate 10- a. Looking northwest at Furman and Fulton Streets showing the Marine Fire Station, built in 1924, and the east tower of the Brooklyn Bridge.

b. Looking west from the foot of Main Street at the East River toward Manhattan.

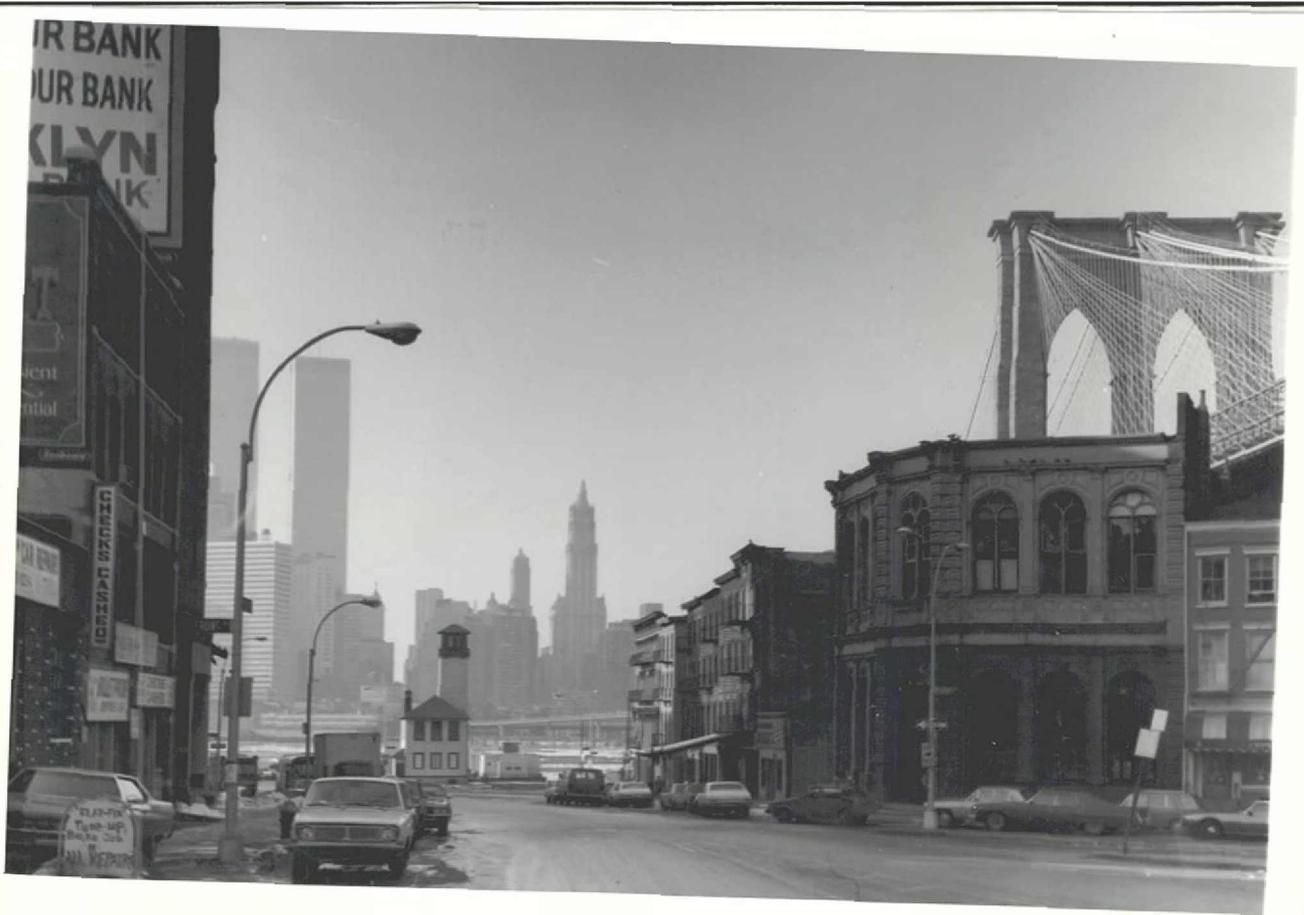


PLATE 1A



PLATE 1B

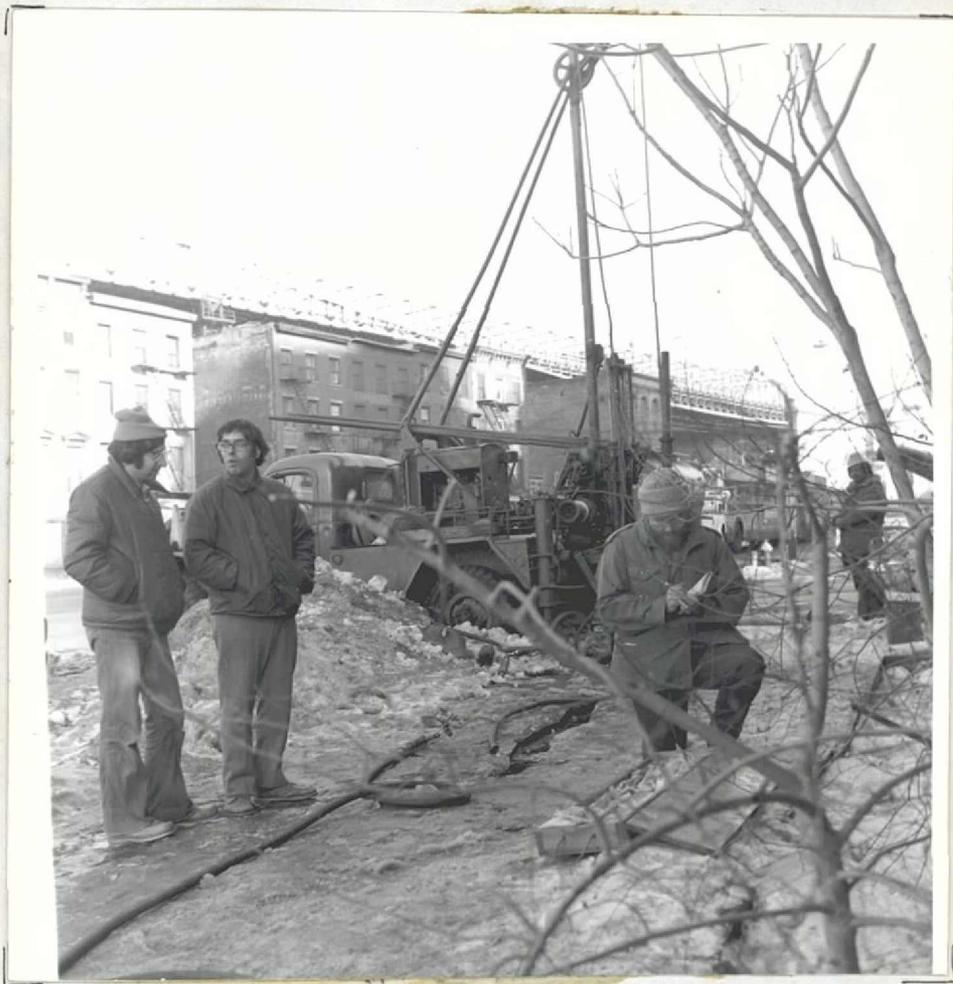


PLATE 2

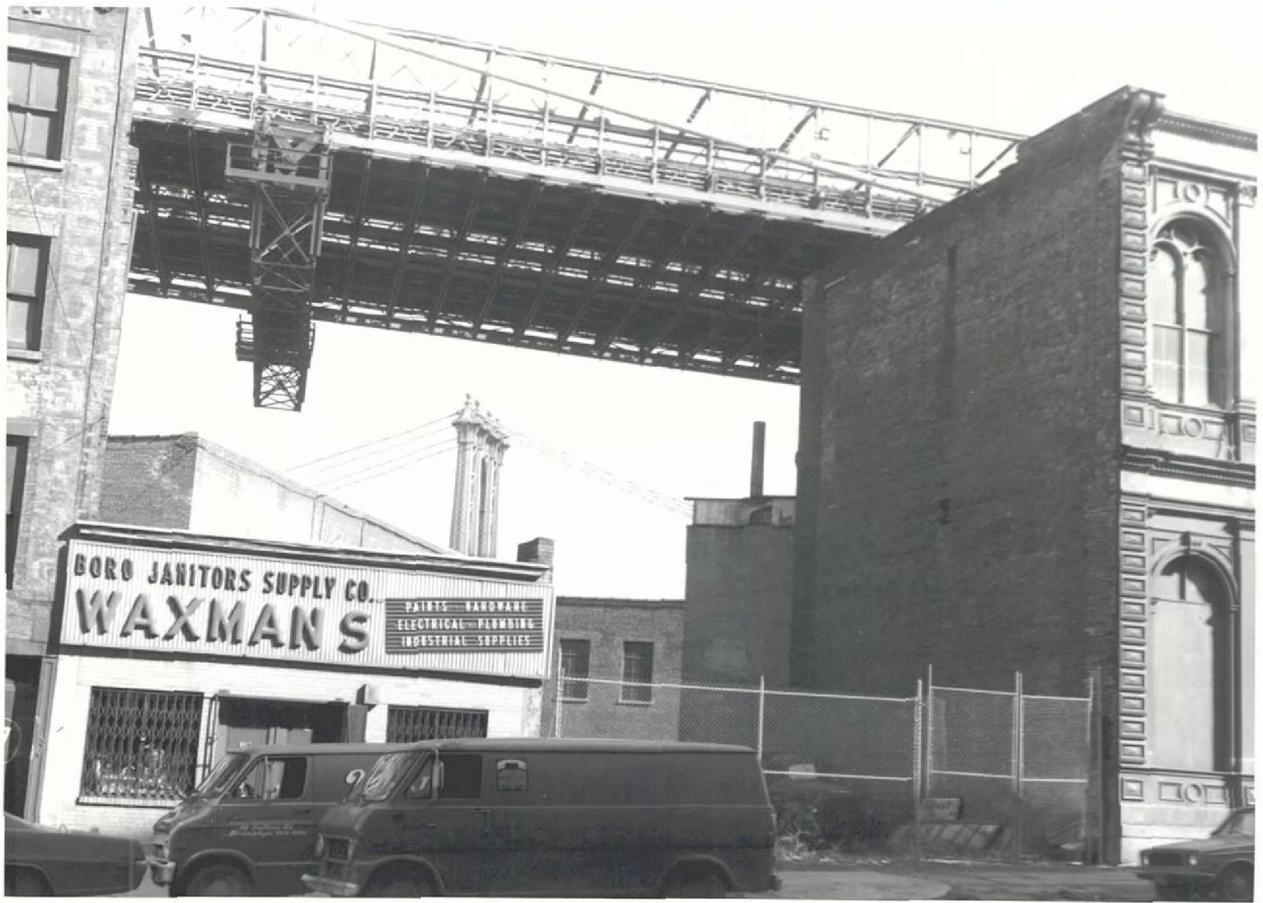


PLATE 3A

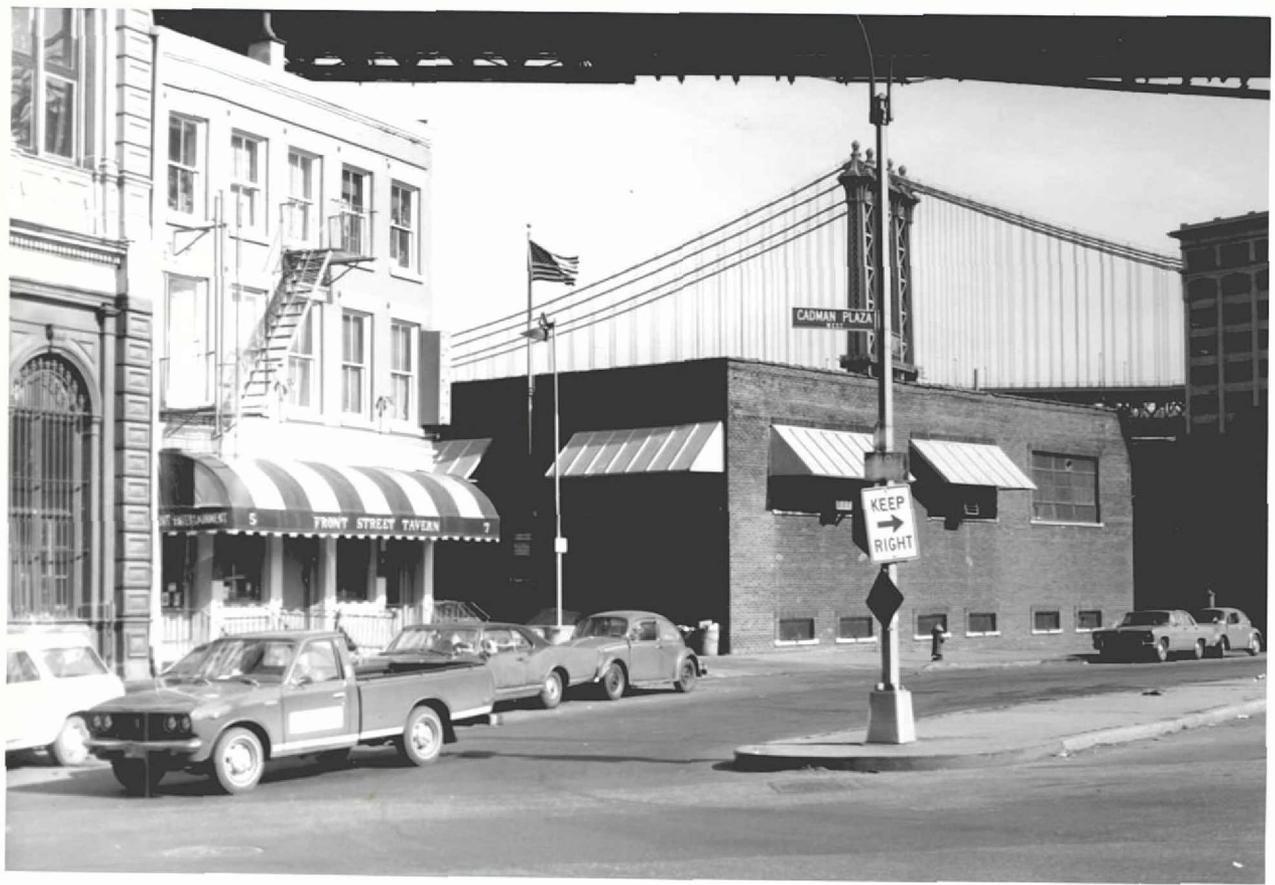


PLATE 3B



PLATE 4



PLATE 5A



PLATE 5B



PLATE 6

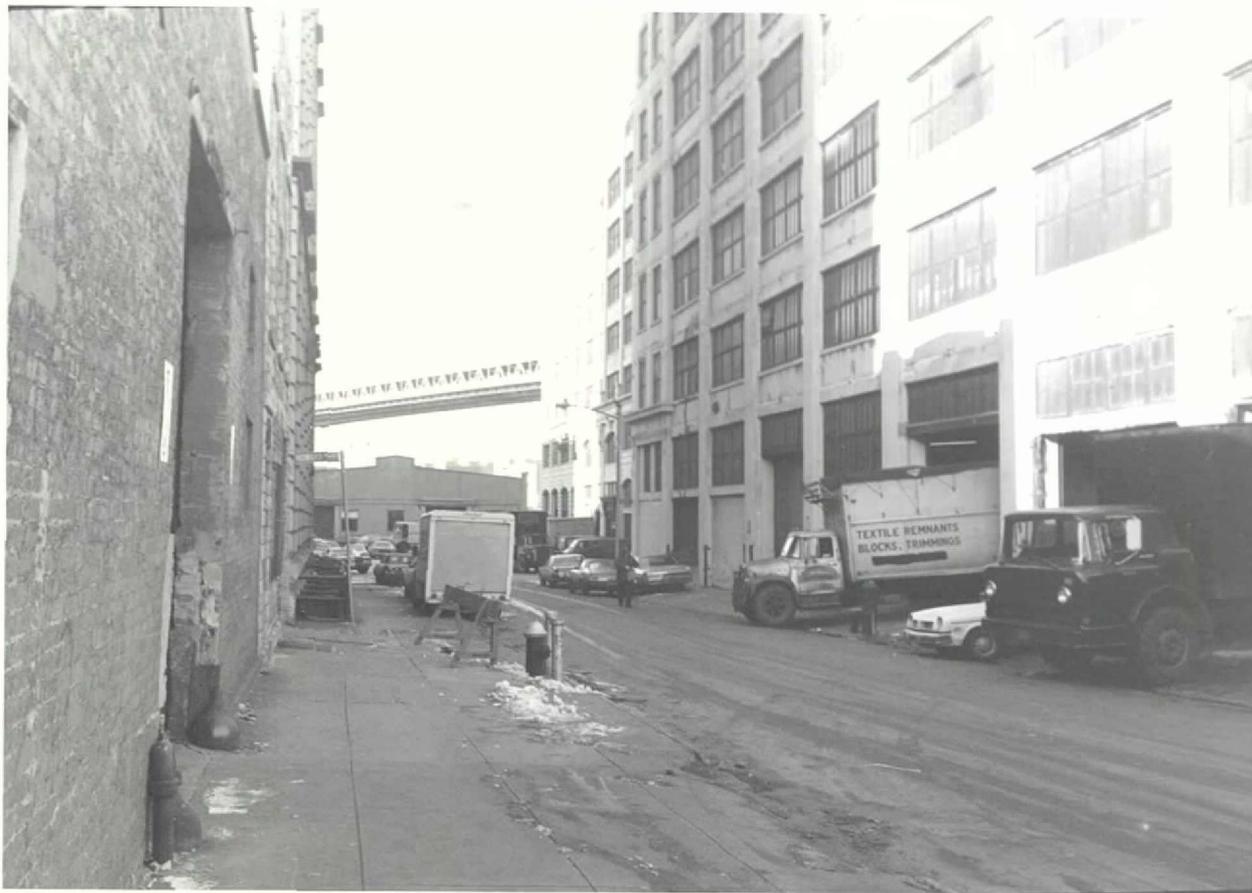


PLATE 7A

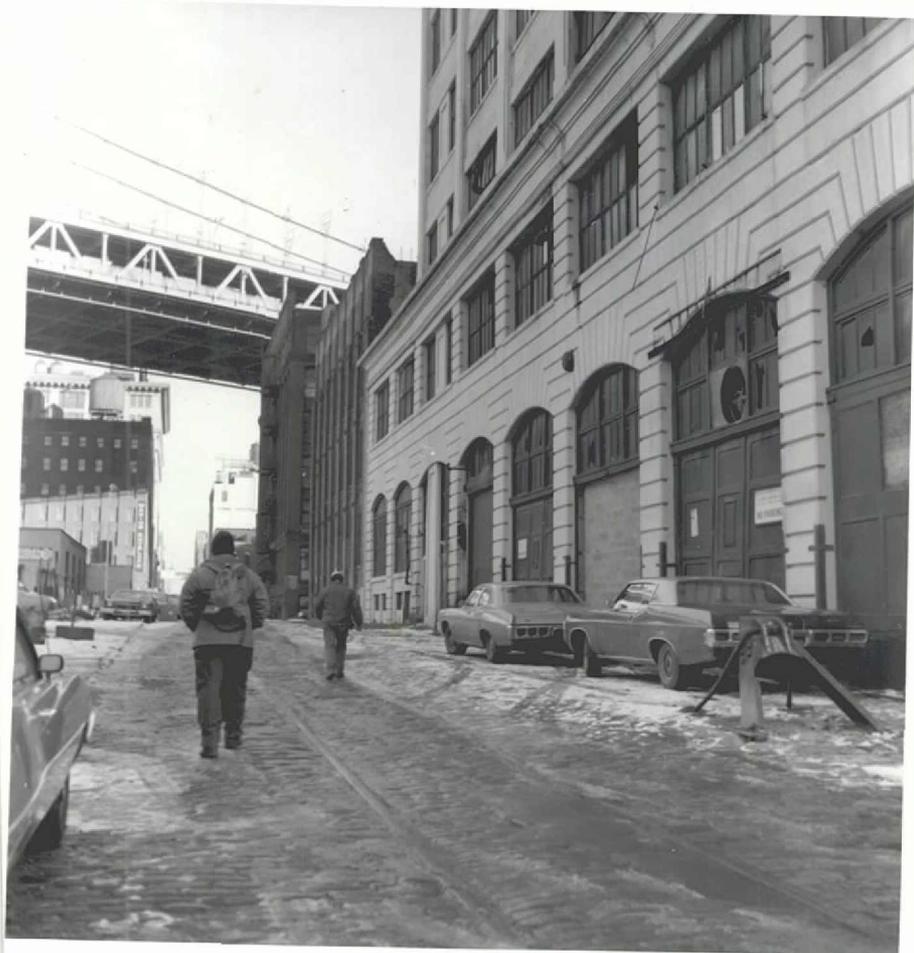


PLATE 7B



PLATE 8A



PLATE 8B



PLATE 9

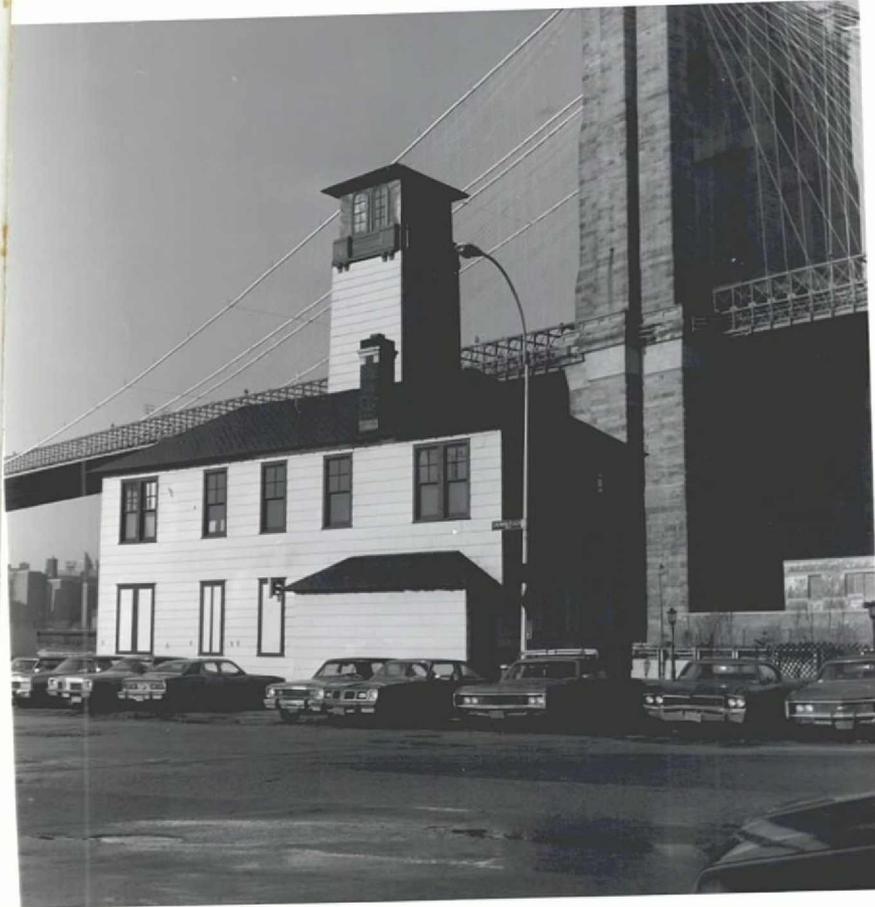


PLATE 10A

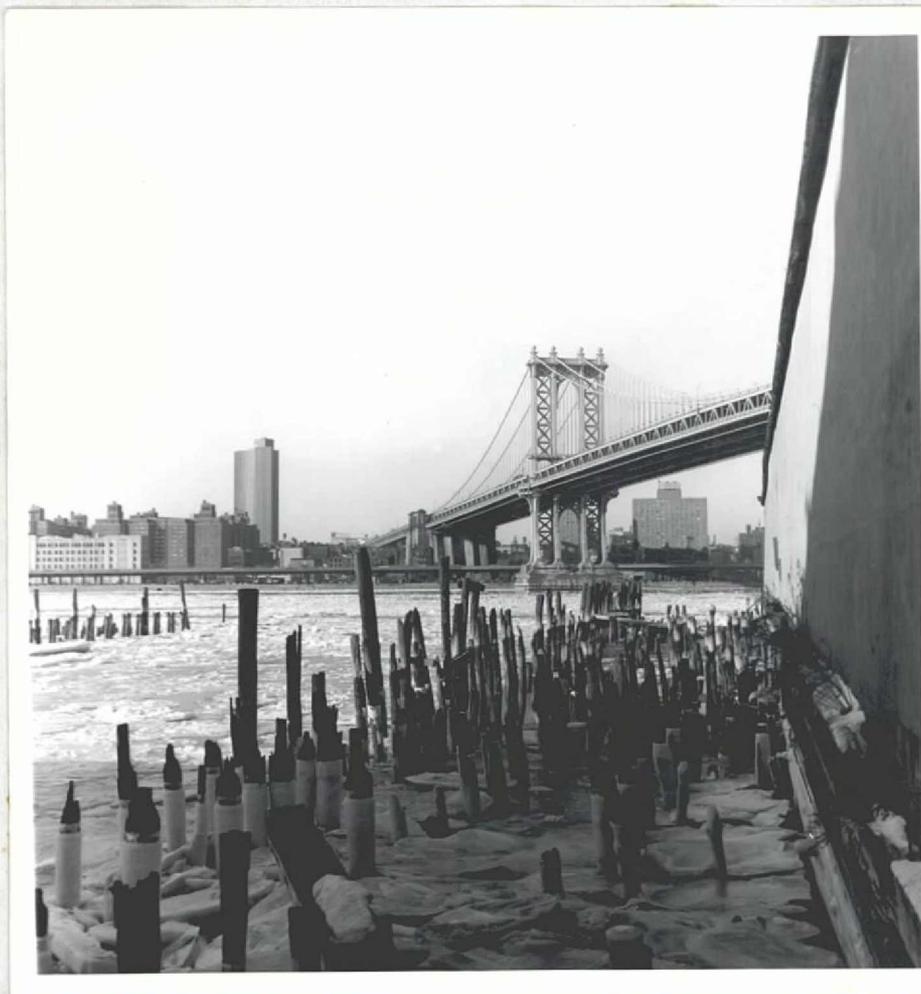


PLATE 10B

A P P E N D I X

THE SUPPLEMENTARY BORINGS

SUPPLEMENTARY BORINGS:

As a result of the conference held on January 11, 1977 at the Environmental Protection Agency headquarters at Federal Plaza, a plan was drawn up on January 14th to make supplementary borings in connection with the proposed sewer project. A total of eight borings was proposed on lower Fulton Street, five (A1, A2, A3, A4, A5) to be located on the south side of Fulton Street, and three (A6, A7, A8) on the north side of Fulton Street near the corner of Water Street (Fig. 32). The object of these borings was to try to ascertain more information in the area between the original borings Nos. S30A and 46, which outlined what appear to be beds of shells (Layer b and Layer e) in the geological profile. It was hoped to be able to obtain a larger sample of shells for possible radio-carbon 14 dating, in the presumption of course that this might represent aboriginal deposits. As it turned out, the associated materials found in the new supplementary borings included non-Indian fragments of bricks, crockery and white clay pipestems as well as wood and leather scraps. This nullified the prospects of obtaining uncontaminated samples for dating. All of the drillings were made in the presence of the archaeologist, Mr. Thomas McGovern. The crew spent a total of 17 days on the job. Mr. McGovern spent two days in making the laboratory analysis. His report forms Appendix I of this report.

The two proposed borings (A10 and A11) on Main Street were not carried out because this was to be a tunnel sewer. One of these borings (A10) was diverted to another point on Fulton Street at No. 21 in front of an empty lot where it is suspected that the Corporation House stood, and renumbered as A12.

The Joralemon Street boring (A9) was moved around to a point about 70 feet south of the intersection of Joralemon Street and Furman Street on the west side of Furman Street (Figs. 36).

All of the supplementary borings were taken in an attempt to obtain a continuous sample (or the best obtainable) down to an approximate depth of 35 feet. Samples were recovered from the spoon of the drill, as well as from the wash from the borings, and bagged in long plastic containers, marked with indelible pencils, and placed in long half tubes of plastic, which were then stored in wooden boxes. The boxes were taken to the Department of Water Resources building on Church Street in Manhattan. The ultimate disposition of the core samples will be to the Lamont-Deherty Geological Observatory of Columbia University, which expressed an interest in the samples.

A summary analysis of the boring results is as follows:

Boring A1 - Cultural material, including pottery fragments, some wood, charcoal and shells were found at a depth of 28 to 30 feet. This marks the lower limit of the lens of shells etc. at Layer e in the geological profile (Fig. 31). The cultural material indicates that this was not an aboriginal deposit, but probably the result of a 19th century dump into the East River. It could be part of William Furman's 1816 oyster house refuse, located at just about this point.

Boring A2 - Glazed pottery chips, and small brick chips and some chips of shells were found down to a depth of between 24 to 28 feet deep, the limit of the cultural material. It confirms the upward slope of the deposit of Layer e in this quarter.

Boring A3 - Cultural material stops at a depth of about 16 to 18 feet deep, confirming the geological profile for Layer e. Nothing indicates aboriginal deposition.

Boring A4 - This boring was less rich in shells and bone refuse than A1, A2 and A3. This boring is close to the original old shoreline. Wood fragments found at a depth of 16-18 feet could have come from old piers.

Boring A5 - Cultural material, including some wood and brick flakes end at about a depth of 12 to 14 feet and 14 to 16 feet. This was just about the location of the old shore, and here the old surface is above ground water level.

Borings A6 to A8 - These borings were probably directed on the site of the old dock structure shown in the 1746 views of the Old Ferry (Fig. 7). Wood recovered from the A6 boring seems to be part of a large beam, perhaps a pier. The soil appears to indicate a shallow-water environment, presumably the still water area just to the north of the pier shown in the early 18th century illustrations. Boring A-6 yielded rich cultural materials, including a pipe stem at 14 to 16 feet and metal, leather and wood in the same level, plus shells. Leather, wood, brick, shell and pottery were recovered from a depth of 16 to 18 feet. This is evidently from the lens Layer b and corroborates the geological profile. Boring A7 confirms the geological profile with Layer b. Dark organic silt containing vegetation and brick and much shell was found between the depths of 14 to 18 feet. Boring A8 confirms the Layer b position. Peaty organic silt deposits found at a depth of 16 to 22 feet. Mr. McGovern thinks that this very likely represents part of the old shoreline.

Boring A12 - This boring was placed near the suspected site of the old Corporation House in front of the empty lot at No. 21 Fulton Street (Fig. 16). According to Mr. McGovern, there is a lack of organic silts in the boring, indicating that this was

dry land. There are fragments of brick, tile and plaster down to about a depth of nine feet. This material runs out at 10 to 12 feet depth, and ceases entirely at about 12 feet. It is confirmed by the location on the geological profile, which indicates that the bottom of the fill at this point goes to about 11 feet.

Boring at Joralemon Street (Fig.36):

Boring A9 - Cultural material was found to a depth of about 8 to 10 feet, with the presence of some "asphalt-macadam", gravel, ashes and slag. Mr. McGovern believes that the boring results are indicative of a secondary deposit because the building material (brick, tile, plaster and slate) plus other materials were so ground up and mixed. The excavations for the Brooklyn-Queens Expressway (Fig.37) and the large building on Joralemon Street (the old Woodruff building) probably churned up the original ground surfaces. Dark organic silt and shells at a depth of between 22 to 28 feet appears to indicate a brackish shore water area. The recommendation for this part of the Joralemon Street site is that too much cannot be expected from investigations there.

LABORATORY ANALYSIS:

Mr. McGovern spent two days in examining the soil samples in cooperation with the Sub-surface Division Geologist at their laboratory on Church Street. He believes that he could distinguish a ca. 1813-16 landfill, which is composed of coarse-red or fine-medium brown sand, with small flecks of brick and shells mixed in it. It is believed that this represents a rapid filling. One of the borings, A12 seems to have located the old Corporation House. At Boring A9, it is possible that the debris at a depth

of between 12 to 13 feet may be part of the old Pierrepont distillery factory, which seems plausible, because this depth would place the position just above the ground water level, and the street slopes upward to the east close to this point.

THE SUPPLEMENTARY BORINGS

by

Thomas McGovern, M.A., M. Phil.
Columbia University, New York

This includes the Weekly Reports from February 13,
1977 to March 3, 1977, plus Mr. McGovern's Diary
Report and his report of the Laboratory Analysis.

Thomas H. McGovern
Weekly Report
Red Hook Sewer Survey
1053

February 13, 1977

Fulton Street Borings A1, A2, A3
Week of February 7, 1977
Days worked: 5

Borings A1, A2, and A3 completed to below 30 feet. Boring A1 is much more productive of cultural material than either A2 or A3, both of which produced much wood at 10' to 14' but little shell, glazed pottery found at 30' level of shells in A1 suggests the shell deposit is not in situ aboriginal.

Wood and shell found in A2-A3 might represent a pier or dock structure extending out into the river, or wooden sleeper foundations for structures built on or over the riverbank.

Recovery methods on A2 and A3 are completely comparable. A1 was not so carefully observed due to intense cold and some mutual confusion about how best to conduct the drilling for archaeological purposes.

Estimate remaining borings will go at about 1.5 days/hole, if utility clearances are prompt and major obstruction is not encountered.

s/Thomas H. McGovern

Personnel:

Mr. Harold Lowenfeld - Public Works Sub-surface Testing Representative
Thomas McGovern - Archaeological Representative
Connors Drilling Co.

F. Goughan - Driller
J. Danke - Helper

Diary Report

February 7, 1977

Weather very cold. Spent most of day observing mechanics of drilling process. No so simple or so reliable as I had believed. Much trouble below six feet in getting the spoon up with sample intact. Did not order re-driving of spoon (sediments would be mixed) which may be correct decision; also did not collect the wash out debris, which I think was not a correct decision. Will try to collect wash out material in future (should get some kind of dipper/screen to aid this). I think the DPW method of putting some wash in little bottles may not be suitable for us. For instance, what if we want to quantify (by weight?) shell density in A1, 6'-8' vs. A2, 6'-8'. Will need not the water but the particulates. May be a bit tricky, will have to experiment. Good liason with Mr. Lowenfeld and drillers. Holes A1 and A2 cleared by Con Ed, Water and Brooklyn Union Gas. Will need to have clearances for other borings, but probably no hassel there. Will use Lowenfeld's on site descriptions of sediments for log purposes and supplement them in the lab analysis later.

Note: Mr. Lowenfeld reports some interesting cultural traces in borings from the Bush Terminal Sewer Works down the way; cobblestones at 4'-5'6" down. Check Job #1027, Bores 7, 8, 9, especially boring #8 at the 4'-5'6" level.

s/Thomas H. McGovern

Photo Report:

On arrival at job area 9:15 A.M., photographed A10 and 11 over at Main and Water Streets, both drilling locations and immediate area (plus NY skyline at morning shot). Roll 1 frames 1-4. Also photographed general area of A1-9. Heavy trucks observed most of area; should re-photograph. Prof. R. S. Solecki has additional photos in B & W and color of general area. Roll 1, frames 5-7. Roll 1 is ASA 125 Kodak Panatomic X B & W.

Personnel:

Mr. Harold Lowenfeld - Public Works Sub-surface Testing Representative
 Thomas McGovern - Archaeological Representative

Connors Drilling Co.

F. Goughan - Driller
 J. Danke - Helper

Boring Report Job #1053
Red Hook Sewer Survey

February 7, 1977
Clear and windy

BORING A1

Southwest corner of Fulton and Furman Streets at Cadman Plaza
Began drilling 9:30 A.M.

0-2'	Sample retrieved (frozen)	
2-4'	Sample retrieved	
4-6'	Sample retrieved	
6'-7'10"	No sample retrieved	No wash collected
7'10"-9'10"	Sample retrieved Some shell and gravel	
9'10"-12'	Sample retrieved (short)	No wash collected
12'-14'	No sample retrieved	
14'-16'	No sample retrieved (Few grains of pea gravel in spoon)	No wash collected
16'-18'	Sample retrieved shell (some burnt)	Wash full of oyster, some burnt
18'-20'	No sample retrieved	

End Drilling 4:30 P.M.

Diary Report

February 8, 1977

Weather warmer, ca 0°c. Drilling went better today, no samples lost. Have begun observing washout and collecting possible cultural material on a regular basis. I think I will continue this right along, as we may pick up some valuable extra data this way. Will use transparent zip-lock bags for these samples. Took tour around the area with Dr. Solecki; saw warehouses etc and got idea of pre-filled shoreline. The pottery (glazed) from the lowest coves showing much cultural material seems to suggest post-contact fill rather than buried aboriginal shell mound. Wood is in good waterlogged state of preservation. Excavators or watchers should expect this and have some PVA or similar handy.

s/ Thomas McGovern

Photo Report:

Shot Roll 1 frames 7-10. ca 10:30 A.M., general A1 area shots showing site and drilling. Frames 10-20 general and scenery shots. Roll 1 ASA 125 Kodak Panatomic B & W

Personnel:

Mr. Harold Lowenfeld - Public Works Sub-surface Testing Representative
Thomas McGovern - Archaeological Representative
Connors Drilling Co.

F. Goughan - Driller
J. Danke - Helper

Boring Report Job #1053
Red Hook Sewer Survey

February 8, 1977

BORING A1

Southwest corner at Fulton and Furman Streets at Cadman Plaza
Began drilling 8:30 A.M.

	Field inspection of core	Wash inspection.
20'-22'	Sample recovered, some shell and ? wood.	Wash scorched, black silty-sand, shell.
22'-24'	Sample recovered, wood and shell.	Wash scorched, mussel and oyster shell.
24'-26'	Sample recovered, wood, shell, some small brick fragments, black silty-sand.	Wash scorched, <u>many</u> shells, oyster and mussel, some burnt.
26'-28'	Sample recovered, shell, wood, black silty sand.	Wash much wood and oyster shell; some wood fragments (water-logged) ca 3-4 cm long.
28'-30'	Sample recovered. Pottery fragments include grey paste "stoneware" w/glaze on one side. Wood, charcoal, shell, dark sandy-silt.	Wash - Several pottery fragments ca. 4 types; shells, some burnt. <u>Bagged and saved.</u>
30'-32'	Sample recovered. Only few chips of shell in upper part of core, bottom third or so looks into natural.	Wash - few chips of shell, very little compared with above two cores.
32'-34'	Sample recovered. No obvious cultural material.	Wash - no cultural material.
34'-36'	Sample recovered. No obvious cultural material. Greyish sand	Wash - no cultural material.
36'-38'	Sample recovered. No obvious cultural material. Sand with some pea gravel and pebbles.	Wash - no cultural material.

Diary Report

February 9, 1977

Weather warmer, clear, less wind. Observing the wash-out closely, picking up anything that looks artifactual. Some of the "brick chips" noted in boring report may turn out to be either red paste pottery or red colored stones. Using zip-lock bags for wash samples. No problem losing samples as in Boring A1. Senior Con Edison man reports old Dutch house on Middagh and Willow Streets in Heights. Informant (Charlie?) seems very knowledgeable about sub-surface Brooklyn, might be good contact. Gas station proprietor (Texaco) at corner of Fulton and Everitt reports presence of sub-street cellar extension under sidewalk at A3 location. Will shift A3 a foot or so to E (uphill) to try to miss this.

s/Thomas H. McGovern

Photo Report:

No new photos taken as work and location have both been recorded February 7th and 8th by myself and Dr. Solecki.

Personnel:

Mr. Harold Lowenfeld - Public Works Sub-surface Testing Representative
Thomas McGovern---Archaeological Representative
Connors Drilling Co.

F. Goughan - Driller

J. Danke - Helper

Boring Report Job #1053
Red Hook Sewer Survey

February 9, 1977

BORING A2

Northwest corner of Fulton and Furman Street at Cadman Plaza west
Began drilling 8:30 A.M.

First Try

0-2' Frozen ground, concrete and slag ships. Note: Drill hits solid concrete(?) obstruction at 2' at building margin. Two other tries near (within 2') of this point also hit obstruction at ca. 2'. Boring A2 moved about 5' out to sidewalk and began again. No wash at this depth.

Second Try

0-2'	Pavement (slate) frozen soil, some slag and charcoal.	No wash at this depth.
2'-4'	Frozen soil and gravel.	No wash at this depth.
4'-6'	Sand, a few fragments of gravel.	No wash at this depth.
6'-8'	Sand, some gravel at top; wet.	No wash at this depth.
8'-10'	Few small fragments of shell, brown sandy silt.	No wash at this depth.
10'-12'	Brown sandy-silt. Thick water-logged wood cut thru at bottom 5-6".	First wash out, 0-12' including brick chips, small shell fragments, small pottery chips, wood fragments.
12'-14'	Gravel, metal chips, more wood, as in bottom at 10'-12'.	Much wood (lg. fragments)
14'-16'	Large piece of wood (as in 10'-12' and 12'-14'), pebbles.	Wood and small brick fragments.
16'-18'	Dark sand, more large pieces of wood (as in 10'-12', 12'-14' and 14'-16').	Wood, large pieces with (?) wormholes. Brick chips, 1 frag. bone (evanial).

End drilling 4:30 P.M.

Diary Report

February 10, 1977

Weather warmer, clear. Observing wash-out as before. Terminated drilling after ca. 6' of natural material (looks to me like the old river bottom. Boulder (?) at 27' really pretzeled the spoon. Started new boring at A3, N.E. corner of building on Fulton and Furman Streets) and got down to 8'. Nasty work due to snow pile and snow melt. Quit at 3:40 as wash was getting hard to collect.

s/Thomas H. McGovern

Photo Report:

No photos taken

Personnel:

Mr. Harold Lowenfeld - Public Works Sub-surface Testing Representative

Thomas McGovern - Archaeological Representative

Connors Drilling Co.

F. Goughan - Driller

J. Danke - Helper

Boring Report Job #1053
Red Hook Sewer Survey

February 10, 1977

BORING A2

Northwest corner of Fulton and Furman Streets at Cadman Plaza West
Began drilling 8:30 A.M.

18'-20'	Dark sandy-silt, some wood chips.	Large wood chips, white glazed pottery shard, brick (?) chips.
20'-22'	White glazed pottery (as in previous wash), brick, metal chip; Dark sandy-silt, some pea gravel.	Wood chips, brick chips, slate fragments, bone fragments.
22'-24'	Very small sample recovered. Took bottle of wash sample to supplement. Dark sand and silt, some small pebbles.	Brick chips (?). Shell chips, slate fragments.
24'-26'	Greyish sandy-silt. Not much obvious cultural material.	Glazed pottery chips, very small brick chips, very small shell chips.
26'-28'	Sand and silt. Not much obvious cultural material.	Brick chip, little cultural material.
28'-30'	Very hard drive, spoon destroyed. Large rock fragments. Boulder???	No cultural material.
30'-32'	No cultural material	No cultural material

End drilling A2 - 1:00 P.M.

Diary Report

February 11, 1977

Warm weather, clear. Observing wash as before. Apart from wooden beam (?) in same general depth range as A2, there seems little cultural material here. Spiral shells and worm holes in wood interesting. Possible pre-fill pier structure provides a home for both woodworms and these small marine snails?? Work at A3 rather nasty due to melt water, hard to observe the wash samples as thoroughly as in A2, but I think results are comparable anyway.

s/Thomas H. McGovern

Photo Report:

No new photos taken

Personnel:

Mr. Harold Lowenfeld - Public Works Sub-surface Testing Representative
Thomas McGovern - Archaeological Representative
Connors Drilling Co.

F. Goudhan - Driller
J. Danke - Helper

Boring Report Job #1053
Red Hook Sewer Survey

February 10/11/1977

Boring A3

Northwest corner of building on Fulton and Furman Streets on property line with Texaco Station
Began drilling 1:30 P.M.

0-2'	Brick, shell, charcoal, ash, soil frozen	No wash this depth.
2'-4'	Pebbles at ca. 2.5-3' then a thick grey silt. No obvious cultural materials. Still frozen.	No wash this depth.
4'-6'	Sand and pebbles, flecks of shell, otherwise no obvious cultural material. Still frozen.	Wash collected 0'-6'. Not much cultural material.
6'-8'	Wood and shell chips. Very little sample recovered. Collected bottle wash sample brown sand.	Few brick chips
8'-10'	Small brick chips, (?)shell, solid piece of water logged wood at bottom 1.5-2".	Large piece water-logged wood. Small brick chips.
End work February 10, 1977.		
10'-12'	Large piece wood in top, looks like same piece as bottom of (8'-10'). Rock fragments. Spoon bent.	Wood fragments. Possible brick chips.
12'-14'	Wood fragments. Greyish sand and silt, stone fragments.	Wood fragments. One piece of green glass.
14'-16'	Wood fragments, greyish sand and silt, stone fragments.	Wood fragments, shell chips, white-glazed, blue-painted pottery shard.
16'-18'	Some shell and wood, pebbles and stone chips.	Shell chips, brick (?) chips.
18'-20'	Gravel, no obvious cultural mat- erial.	Oyster shell fragments.
20'-22'	Silt and some shells, thick or- ganic silt. River bottom???	Many shells, some spiral turret types, sticky silt.
22'-24'	Thick sticky silt changing to sand, some shells.	Few shell fragments.
24'-26'	Sand and pebbles. No obvious cultural material.	No cultural material.
26'-28'	Sand. No obvious cultural material.	No cultural material.

Boring A3

February 10/11/77

28'-30' Sand. No obvious cultural material.

No cultural material.

End Drilling A3.

Thomas H. McGovern
Weekly Report
Red Hook Sewer Survey

February 19, 1977

1053
Fulton Street Borings A4, A5, A8
Week of February 15, 1977
Days Worked: 4

Borings at A4 and A5 completed to below 30 feet, boring A8 completed to 18 feet.

A4 and A5 much less rich in shells and bone refuse than A1, A2 and A3. Closer to original shoreline and perhaps filled at an earlier date, at a comparatively rapid rate allowing comparatively little accumulation of refuse clumped off shore (?).

Heavy wood found in A4 at approximately same depth as wood in A2 and A3. Possible pier structure? A 8 seems to be into natural deposit at 16'-18'.

Cold and windchill cause difficult working conditions and definitely slow work down. Wash was impossible for part of A5 due to temperature, but examination of recovered casing samples was thorough and I believe comparability was maintained.

Samples collected from pits dug along west side of Water Street. Report will be prepared separately.

s/Thomas H. McGovern

Personnel:

Mr. Harold Lowenfeld-Public Works Sub-surface Testing Representative
Thomas McGovern-Archaeological Representative

Connors Drilling Co.:

F. Goughan - Driller
J. Danke - Helper

Diary Report

February 15, 1977

Weather cold and windy. Not much shell in this boring so far. Think wood at ca 10'-16' is rather impressive. Well preserved chunks should give some chance for dendro-chron, C¹⁴, and species identification. Could this be a pier (we are in the ca. 1760's shallows area now)? or a footing-beam? or perhaps part of the pier-dock shown in the 1767 map.

Wood under pressure really caught spoon. Had to drive casing down to cut it free, then drive spoon out of casing with a mallet. This suggests a rather large piece of wood down there rather than just an isolated chunk we happened to hit.

s/Thomas H. McGovern

Boring Report Job #1053
Red Hook Sewer Survey

February 15, 1977

BORING A4

Southwest corner of Fulton and Everit at Cadman Plaza West
Began drilling 9:15 A.M.

0-2'	Concrete, frozen soil, some charcoal.	No wash at this depth.
2'-4'	Concrete, last 3" sandy-silt, some brick and charcoal fragments.	No wash at this depth.
4'-6'	Gravel, sand, brick, charcoal chips.	No wash at this depth.
6'-8'	Brown medium sand, some pebbles. No obvious cultural material.	No wash at this depth.
8'-10'	Brown silty sand; brick, charcoal, pottery fragments.	0-10' brought up both dry casing sample and wash brick, charcoal, brown sand.
10'-12'	Large compact piece of wood at bottom 6". Brown sand, some brick chips.	Much wood (large fragments) and some brick chips.
12'-14'	Spoon is trapped by expanding wood. Over 1.5 hrs. spent trying to get it back. Recovered about 1'6" of solid wood.	Much wood (large fragments).
14'-16'	2" - 3" more wood recovered, small pebbles.	Large wood fragments.
16'-18'	Wood fragments, some gravel.	Wood fragments.
18'-20'	Pea gravel and sand. No obvious cultural material.	No cultural material.
20'-22'	Grey sand and silt. No obvious cultural material.	No cultural material.
22'-24'	Grey sand. No obvious cultural material.	No cultural material.

End drilling.

Diary Report

February 16, 1977

Low temperatures and windchill really hamper work. Drillers keep freezing to the cable, wash water freezed instantly. Border-line working conditions, everything takes longer due to hypothermia-clumsiness. Not really a nice day. (Diary report continues on following A5 Sheet).

No cultural material apparent at this depth. Looks like the old river bottom and little else.

s/Thomas H. McGovern

Boring Report Job #1053
Red Hook Sewer Survey

February 16, 1977

BORING A4

Southwest corner of Fulton and Everit at Cadman Plaza West
Began drilling 8:30 A.M.

24'-26'	Sand. No obvious cultural material.	No obvious cultural material. (Hard to observe due to immediate freezing.)
26'-28'	Sand, some silt at tip. No obvious cultural material	No obvious cultural material.
28'-30'	Brown sand. No obvious cultural material.	No obvious cultural material.

End work on A4 at 12:00 Noon.
Began work on A5. (see other sheet)

Diary Report

February 17, 1977

Very intense cold and windchill. Parkas and cold make the work slower and clumsier for all. Wash-out is abandoned and casing is withdrawn and beaten out. Less desirable than the wash sample, but this seems only practical solution, even though it takes longer to collect.

Brick and mortar wall is near wall line of anything built on southwest corner of Fulton and Everit. Brown sterile sand again seems to represent the former river bottom or strand line. Not positive all "brick chips" are really in situ, as they may drift a good deal and are easily confused in the field with fragments of red sandstone, also present in samples.

Observed a line of pits dug along west side of Water Street at the junction of Fulton and Water. Spoil heaps full of shell and artifacts. Will observe more closely and make collections from spoil heaps. On approximate site of old ferry building.

s/ Thomas H. McGovern

Photo Report:

Roll #2, frames 1-5 Area at A5, Brooklyn harbor area.

5-8 Operation of drill rig, recovery of samples.

ASA 125 Kodak Panatomic, B & W

Boring Report Job #1053
Red Hook Sewer Survey

February 16/17, 1977

BORING A5

Southwest corner of Fulton Street and Everit. Boring moved ca. 6' to clear service station entrance (Texaco Station)

0-2'	Concrete, brick and mortar wall beneath.	No wash at this depth.
2'-4'	Brick and mortar wall.	No wash at this depth.
4'-6'	Brick and mortar wall, bricks clearly outlined in grey, sandy mortar.	No wash at this depth.
6'-8'	No sample recovered (hit boulder?)	No wash at this depth.
8'-10'	Brick and mortar ends ca 7'6". Beneath is fine-medium brown sand with trace of shell.	No wash at this depth.
10'-12'	Coarse-medium brown sand, shell flecks. No obvious cultural material.	No wash due to cold. Will collect casing sample.
12'-14'	Brown sand, shell traces, brick flakes, some wood.	Casing: wood chips, brick flakes.
14'-16'	Medium brown sand, brick chips	Casing: brick flakes.
16'-18'	Brown sand. No obvious cultural material.	Casing: No obvious cultural material.
18'-20'	Brown sand. No obvious cultural material.	Casing: No obvious cultural material.
20'-22'	Brown sand. No obvious cultural material.	Casing: No obvious cultural material.
22'-24'	Brown Sand. No obvious cultural material.	Casing: No obvious cultural material.
24'-26'	Brown sand. No obvious cultural material.	Casing: No obvious cultural material.
26'-28'	Brown sand. No obvious cultural material.	Casing: No obvious cultural material.
28'-30'	Brown sand. No obvious cultural material.	Casing: No obvious cultural material.

Finish A5 - End drilling 4:00 P.M.

Diary Report

February 18, 1977

Weather warmer, less wind. Much nicer. Wash water used again. A8 follows A5 so as to avoid blocking heavy truck traffic. Boring A8 moved 9 feet east to avoid hitting gas line.

Looks like we are into very early fill here (at about the shore end of the 1767 pier), with peat from the stagnant lagoon that must have occupied this stretch of coast (possibly behind a sandbar). See also 1750 view of Brookland Ferry and note some sandbar-lagoon features still remaining.

Made collection of artifacts, bone and shell from the backdirt piles of pits on west side of Water Street. Glass, large oyster shells, brick and iron objects recovered. Photos made of area. Full report will be submitted separately. Will try to get some stratigraphic information too.

s/Thomas H. McGovern

Photo Report:

Roll #2, frames 8-12 Pitson west side of Water Street.

Boring Report Job #1053
Red Hook Sewer Survey

February 18, 1977

BORING A8

North side of Fulton Street at Cadman Plaza West

Began drilling 8:15 A.M. Moved boring 9' east to clear utilities.

0'-2'	Concrete, glass, brick and frozen soil.	No wash at this depth.
2'-4'	Brick at bottom 3", some grey sand just beneath. Possibly an isolated brick.	No wash at this depth.
4'-6'	Brick chips, slate chips, brown sand.	No wash at this depth.
6'-8'	Brown sand, brick chips, pea gravel.	No wash at this depth.
8'-10'	Brown sand, brick chips, shell wood fragments. Dark compact organic material at tip of spoon.	0-10' Brick pottery, (glazed) shell, schist.
10'-12'	Brick, sandstone, boulder (?) Brown sand, small stones.	Shell, brick chips.
12'-14'	Wood scraps, shell, much red sandstone fragments.	Shell
14'-16'	Grey sandy silt, shell	Glazed pottery, shell. Flint fragments (dark color no obvious knapping, except by drill. Gunflint?)
16'-18'	Peat at bottom 1', natural ground surface ca 16'-17'.	Peat

End work at 4:00 P.M.

Thomas H. McGovern
Weekly Report
Red Hook Sewer Survey
Job #1053
Days worked: 4

February 22-25, 1977

A8, A7, and A 6 are on the site of the shore and dock structure indicated on both the 1767 Brookland Ferry Map and the ca. 1750 view. Wood recovered from A6 seems part of a large beam, perhaps a pier. Dark organic silts, peat deposits, and small apiral marine snail shells all indicate a fairly still, brackish, shallow-water environment; probably the area under a dock, protected by a sand bar-lagoon as shown in 1750 oblique view. Leather, bone, wood are excellently preserved by this anaerobic depositional environment. Pipe stems should provide (from interior diameter) some dating information. However, the organic silts at ca 12'-14' and their load of artifacts seem well sealed by the ca. 1800-1816 fill above.

Recommendation: Archaeological representative (s) be on hand to observe the sewer excavation. While machines and "eyeball" supervision may be adequate for upper (to ca. 12') and lower (below ca. 20'), the dark organic silt should be put through screens. Excellent preservation of colonial organic artifacts suggested for this probable pier area. PVA or similar conservation material should be on hand for the wood and leather. Samples for flotation might produce much organic material of interest (especially snail shells). Suggest a ca 4-5mm wet-screen (use hose and hydrant) would efficiently recover artifacts from organic silt. Dry screens will likely clog and will be hard to see artifacts in the dark colored muck.

s/Thomas H. McGovern

Personnel: (for entire week)
Mr. Harold Lowenfeld - Public Works Sub-surface Testing Representative
Thomas McGovern - Archaeological Representative
Connors Drilling Co.: F. Goughan - Driller, J. Danke - Helper

Diary Report

February 22, 1977

Weather warm and wet. Below cultural material in A8. Super from building on north side of Fulton Street warns us of large storage vaults extending out under sidewalk. He aids us to locate A7 and A 6 to clear these. (See following page for continuation of February 22, 1977).

s/THThomas H. McGovern

Boring Report Job #1053
 Red Hook Sewer Survey

February 22, 1977

Boring A8
 North side of Fulton Street at Cadman Plaza West

- | | | |
|---------|--|--|
| 18'-20' | Peat and silty-sand
No obvious cultural material. | No cultural material |
| 20'-22' | Medium grey-brown sand, peat.
No obvious cultural material. | Wood fragments, probably from peaty deposit. |
| 22'-24' | Core sample not recovered
Bottle wash collected.
No obvious cultural material. | No cultural material. |
| 24'-26' | Grey medium sand
No obvious cultural material. | No cultural material. |
| 26'-28' | Sand, some mica, no obvious cultural material. | No cultural material |
| 28'-30' | Sand, some (pyrite) no obvious cultural material. | No cultural material |

End drilling 11:15 AM

Diary Report

February 23, 1977

Rich organic deposits may reflect the area of the ca. 1750 dock/lagoon complex shown in the 1750 "Brookland Ferry" plate. Sand bar shown near pier could have created the marshy conditions reflected by the peaty organic silt deposits at 16'-22'. Pipe stem etc. seem to be debris dropped from pier or shoreline directly into this marshy water, prior to filling in. Thus probably pre-date the ca. 1800-1816 extensions of the ferry dock area.

Brick wall stub hit at 4'-7' probably represents structure demolished to make way for present building.

s/Thomas H. McGovern

BORING A7

North side of Fulton Street at Cadman Plaza West

February 22, 1977

0'-2'	Sand, brick, chips, concrete Charcoal, shell.	No wash at this depth.
2'-4'	Brown sand, concrete, brick chips, charcoal.	No wash at this depth.
4'-6'	Brick wall, ca. 4 courses sandy mortar at bottom, charcoal, shell chips and brown sand.	0-6' casing: brick, plaster, slag, shell.
6'-8'	Bricks, probably isolated, not more wall; gravel & sand.	Brick chips.
8'-10'	Brick and brown sand, pea gravel.	Many brick fragments.
10'-12'	Brick chips, shell, sand.	Shell, brick chips, peat.

February 23, 1977 - Warm and sunny

12'-14'	Shell and brick chips, upper core.	Wood chips, brick chips.
14'-16'	Brick chips, brown sand. At tip of core, grayish silt full of shell.	Much shell, brick, wood Kaolin Pipe Stem.
16'-18'	Dark organic silt, much vegetation, strong smell. Cultural cuts out at ca.17.	Brick, much shell, 1 bone fragment (unidentified).
18'-20'	Dark organic silt, strong smell. Shell and brick in top of core. Probable contamination from above.	Peaty organic material.
20'-22'	Organic silt and peat. No cultural material.	No cultural material.
22'-24'	Grey sand. No obvious cultural material.	No cultural material.
24'-26') do do	do do
26'-28')	
28'-30')	
30'-32')	
32'-34')	

Diary Report

February 24, 1977

Hit strong smelling organic layer ca. 14'-15', seems identical to layer in A7. Wood may be part of ca. 1750 pier structure itself. Leather, etc. clearly indicates basic, anaerobic conditions very favorable to organic preservation. Probably the boggy water under the pier receiving its load at colonial debris. This debris is in the peaty-dark organic layer, and is sealed (as far as I can tell) by the fill above.

February 25, 1977

Past the organic layer and its dense concentration of artifacts. Had to quit work early, as we lack clearances for our two remaining drillings.

s/Thomas H. McGovern

Boring Report Job #1053
Red Hook Sewer Survey

February 24/25, 1977

BORING A6

Northeast corner of Water and Fulton Streets at Cadman Plaza West

0-2'	Concrete, brick fragments brown sand.	No wash at this depth.
2'-4'	Trace brick and cement.	No wash at this depth.
4'-6'	Few shell fragments.	No wash at this depth.
6'-8'	Few shell fragments.	No wash at this depth.
8'-10'	Grey-brown silty sand. No obvious cultural material.	No wash at this depth.
10'-12'	Dark silty sand, ca. 3" of water logged wood at tip of spoon.	Casing: 0-12', brick pottery, (glazed), slag, shell.
12'-14'	Much wood chip, shells, dark organic silt, strong smell	Much wood (large fragments) shell and organic debris.
14'-16'	Pipestem <u>in situ</u> , metal, wood, leather (?) shell, heavy organic silt, spiral shells.	Leather, wood, glazed pottery, shell.
16'-18'	Wood, shell, pottery (glazed) brick chips. Heavy organic silt.	Leather, wood, brick, shell, pottery.
18'-20'	Shell at tip, some vegetation to sandy silt at the bottom. Looks like end of organic culture layer.	Few pieces of shell.

February 25, 1977

20'-22'	Sandy silt, trace shell	No cultural material.
22'-24'	Sandy silt, some pea gravel some shell.	No cultural material.
24'-26'	Sandy silt, gravel.	No cultural material.
26'-28'	Coarse sand and silt.	No cultural material.
28'-30'	Coarse sand and silt.	No cultural material.
30'-32'	Coarse sand and silt.	No cultural material.

March 4, 1977

Thomas H. McGovern
Weekly Report
Red Hook Sewer Survey
Job #1053
Week of February 28/March 3, 1977
Days Worked: 4
Borings A12, A9

Boring A 12 is near the site of the former Corporation House on the corner of Front and Fulton Streets. Its location on or slightly above the original shore line seems confirmed by lack of organic silt deposits and Spirofer Sp. snail shells (both indicating relatively calm and brackish water,) complex layer/lenses of brick, tile and plaster extend to about 9'. Looks like multiple use of same site, just as indicated in historical records. No evidence of waterlogged cultural deposits.

Boring A 9 is on the site of Brooklyn's first distillery. Very little building debris (brick, tile, plaster, slate) recovered. What did come up is so ground up and mixed as to suggest a secondary deposit. Brooklyn-Queens Expressway and large buildings on Joralemon and Furman Streets both may have resulted in major disturbances as the upper 10'-20'. Dark organic silt and Spirofer Sp. shells 22'-28' seems to again indicate the marshy, brackish shore area in aboriginal times.

Recommendation: Major supervision effort should be directed to the Fulton Street area. Joralemon area is probably badly disturbed, with less possibility for recovery of structural remains or artifacts in the anaerobic silts. Suggest wet-screens be used in organic silts in the Fulton Street area.

s/Thomas H. McGovern

Personnel: (for entire week)

Mr. Harold L wenfeld-Public Works Sub-surface Testing Representative
Thomas McGovern-Archaeological Representative
Connors Drilling Co.:

F. Goughan - Driller
J. Danke - Helper

Diary Report

February 28, 1977

March 1, 1977

A 12 located at vacant lot near old Corporation House. Multiple layers of brick and plaster (dense concrete). Suggest the various construction/destruction phases of this persistent feature of the Brooklyn Ferry area. Note the absence of silty organic layers and Spirofer shells, indicating that A12 is located above the aboriginal shore line. Delay in telephone clearance of both A12 and A9 (near Joralemon) slows work. Excavations on site of Corporation House would probably not encounter the excellent anaerobic preservation of the old shoreline deposits.

A 12 (March 1, 1977). Complete A12 down to 30'. No indication of cultural activity, after about 8'6". Joralemon Street not yet cleared so stopped work for the day after finishing A 12.

s/ Thomas H. McGovern

Boring Report Job #1053
Red Hook Sewer Survey

February 28, 1977
March 1, 1977

BORING A 12
At 18-20 Fulton Street (north side)

0-2'	Brick chips, asphalt, trace shell, some plaster and mortar at bottom.	No wash at this depth.
2'-4'	Brick chips, asphalt, plaster traces.	0-4' wash much brick and shell.
4'-6'	Brick chips, plaster, mortar, shells.	Mortar, shells, many brick chips and chunks.
6'-8'	Much sandy plaster and mortar, and brick, glazed tile.	Very large amounts of brick and plaster fragments. Floor?
8'-10'	Brick and plaster at top, brown medium sand below.	Plaster and brick, less than above.
10'-12'	Reddish coarse sand. No obvious cultural material	2-3 very small brick flakes.
12'-14'	Coarse sand and pea gravel. No obvious cultural materials.	No cultural material.
14'-16'	do do	do do
16'-18'	do do	do do
18'-20'	do do	do do
March 1, 1977 (A12 (continued))		
20'-22'	Coarse sand. No obvious cultural materials.	No cultural material.
22'-24'	do do	do do
24'-26'	do do	do do
26'-28'	do do	do do
28'-30'	do do	do do
End A 12 March 1, 1977		

Diary Report

March 2/3, 1977

March 2, 1977 - Warm and clear. Set up on Furman Street, much delay with gas clearances. Nearly got into a 12" gas main. Not desirable. Looks like much of this hole may be in very disturbed ground. Foundation trench of large building on corner of Furman and Joralemon, Brooklyn-Queens Expressway and multiple utility lines have probably pretty much eliminated the old distillery.

March 3, 1977 - Warm and clear. Hit organic silts and Spirofer Sp. shells which seems to indicate the aboriginal shore-tidal zone. Not much in situ looking cultural material. Suspect upper layers largely removed.

Photo Report: Roll #2 Frames 13-15 rig in place. Kodak Pan-X B & W print film.

s/Thomas H. McGovern

Boring Report Job #1053
Red Hook Sewer Survey

March 2/3, 1977

BORING A9

Furman Street near S/W corner of Joralemon and Furman Streets

0-2'	Concrete and asphalt.	No wash at this depth.
2'-4'	Concrete, brown sand.	No wash at this depth
4'-6'	Medium-fine sand, trace brick chips and plaster.	No wash at this depth.
6'-8'	Brown sand, trace plaster, trace organic.	No wash at this depth.
8'-10'	At ca. 9' hit 4"-6" of asphalt-macadam, gravel, ash, slag.	0-10' wash, slag, plaster brick chips.
10-12'	Brown sand. No obvious cultural material.	No cultural material.
12'-14'	Brown sand. No obvious cultural material.	No cultural material.
14'-16'	Brown sand. No obvious cultural material.	No cultural material.
16'-18'	Brown sand. No obvious cultural material.	No cultural material.

March 3, 1977

18'-20'	Brown sand, sm. pea gravel. No cultural material.	No cultural material.
20'-22'	Brown sand, trace silt, wood vegetation.	Trace shell.
22'-24'	Grey silty-sand, trace shell including Spirofer Sp. River edge?	Shell, incl. Spirofer.
24'-26'	do do	do do
26'-28'	do do	do do
28'-30'	At 29' end of dark organic silt and shell.	No cultural material.
30'-32'	Brown sand. No cultural material.	No cultural material.
32'-34'	Brown sand. No cultural material.	No cultural material.
34-36'	Brown sand. No cultural material.	No cultural material.

End A9 March 3, 1977

LAB ANALYSIS

Lab analysis conducted in cooperation with Sub-surface Division Geologist. Organic samples consisting of shell and wood were collected for C¹⁴ whenever they seemed present in useful amount, in clearly stratified position.

The ca. 1813-1816 fill is generally coarse-red or fine-medium brown sand, with small flecks of brick and shell mixed in. This is generally comparatively sterile, apart from these traces, suggesting a brief period of intensive filling rather than a gradual pile-up of occupational debris.

Large cores of wood, obviously part of some pretty sizeable beams (spoon was trapped by wood compression several times) were obtained from A2, A3, A4 starting at ca. 10'-11'6". This wood seemed to cover organic silty deposits with much higher concentrations of burned shell and artifacts; possibly occupational debris thrown from the dock area into shallow, brackish water?? The spiral shells of Spirofer Sp. snails (found also in organic silty layers in A6, A7 and A8) suggest such a shallow, calm, brackish littoral environment.

A5 is marked by a large, well preserved brick wall stub beginning just below modern pavement.

The line at borings on the north side of Fulton Street (A6, A7, A8 and A12) also suggest rapid filling with brown sand. This is overlain by various depths of building debris and pavement, and underlain (A6, A7, A8) by organic silts full of wood chips, pottery, leather, shell and some pipe stem. This again may reflect the colonial-early federal period shallow water deposits of cultural debris. Note that anaerobic, basic conditions favor preservation here.

A 1, on the site of the former "Corporation House" has evidence of multiple building phases down to ca. 10'6". No organic silt deposits, suggesting that this area is above the strand line in aboriginal times.

A 9 at the corner of Furman and Joralemon Streets presents a complex picture of multiple building/destruction phases, and filling with brown sand over the former shallow water deposit (organic peaty silt, shells, Spirofer snails). The upper layers may well be disturbed by recent utilities, the Brooklyn-Queens Expressway and large modern buildings. However, it is possible that the debris ca. 12'-13', just on top of the brown sand fill (ca. 13'6"-21'6") may be part of the old distillery structure.

Note that the brown sand used as fill in both the Joralemon Street area and Fulton Street area is actually the same as the sands found at the bottom of most of the cores. Looks like relatively clean fill, dug from the "natural" elsewhere and dumped into the marshy shore area, sealing in the organic, peaty silts, shells and artifacts.

artifacts.

Pits on Water Street were briefly opened for the erection of a wooden fence. These were about 1.5m. apart, about 1m. wide and about 1m. deep. Collections were made from the backdirt, but stratigraphy could not be recorded before the pits were filled. Rich collections of bone and artifacts from this site of the Old Ferry Terminal suggest what will likely be encountered when large scale excavation takes place. Pits 1-9 (see sketch map) on Water Street - bagged separately. Pits 1-4 (see sketch map) on N. Fulton Street bagged together.

FIELD REPRESENTATIVE RECOMMENDATIONS

1. Archaeological observers be present on whole open-trench phase of construction. Profiles should be drawn prior to shoring.
2. In the Fulton Street area, more archaeological representatives, with screens (and rubber boots) be on hand to screen the organic silt deposits, as these contain well-sealed, well-preserved colonial period artifacts in quantity. PVA or similar preservative should be on hand. Beams suitable for dendrochronology may also be encountered.

s/ Thomas H. McGovern

Suggestions for future drilling surveys:

1. Multiple borings in line, as in the Fulton Street area, are more effective for giving a picture of sub-surface deposits.

BIBLIOGRAPHY and SELECTED REFERENCES CONSULTED

- Anonymous
no date Block Records, Brooklyn ca. 1680-1884 Long Island Historical Society, Brooklyn, New York
- Anonymous
no date Brooklyn Farm Plan, Kings County Clerk Office, File No. B32, Brooklyn, New York
- Anonymous
no date File Index of Street Paving Contracts, Department of Highways, City of New York, 40 Worth Street, Brooklyn Division, New York, New York
- Anonymous
no date List of Paved Streets in the Borough of Brooklyn on January 1, 1960, The City of New York, Office of the Borough of Brooklyn
- Anonymous
no date Maps. Old Ferry Street, Blocks 35, 45, 200, 201, 202. No abstract. James Kelly Institute, St. Francis College, Brooklyn.
- Anonymous
no date Port Communities. The Port of New York Authority. Port Promotion Division PC LLL 12/62 A-90597
- Anonymous
1890 "From Past to Present In The History Of the Ferriage Across The East River." The Brooklyn Daily Eagle, May 11, 1890, p.8.
- Anonymous
1916 Atlas of the Borough of Brooklyn. Vol. 1, Sections 1 to 14. E. Belcher Hyde, Publisher, Brooklyn, New York.
- Anonymous
1927 Old Brooklyn Heights, 1827-1927. Brooklyn Savings Bank, 48 pp.
- Anonymous
1957 Fulton Street Elevated Railroad Before Demolition. Daily News, October 14, 1957. 28 pp.
- Anonymous
1965 Landmarks Preservation Commission, Brooklyn Heights Historic District Designation Report. New York, 33 pp.
- Armbruster, Eugene L.
1912 Eastern District of Brooklyn, New York. Brooklyn
- Armbruster, Eugene L.
1918 Bruijkleen Colonie (Borough of Brooklyn) 1638-1918. Brooklyn, New York

- Armbruster, Eugene L.
1919 The Ferry Road on Long Island, New York, New York
- Bailey, J.
no date Historical Sketch of the City of Brooklyn and Its Surrounding Neighborhood, Williamsburg, Bushwick, Flatbush, Flatlands, New Utrecht and Gravesend.
- Bolton, Reginald P.
1920 New York City in Indian Possession, Vol. 2 No. 7, Indian Notes and Monographs, Museum of the American Indian, Heye Foundation, New York
- Bolton, Reginald P.
1920 New York City in Indian Possession. Heye Foundation, New York
- Bolton, Reginald P.
1922 Indian Paths in the Great Metropolis, Indian Notes and Monographs, Museum of the American Indian, Heye Foundation, New York.
- Booth, Mary L.
1859 History of the City of New York.
- Burt, Leevan M., compiler
1943 History of Paved Streets in Brooklyn, Annotated Volume at the Department of Transportation, Worth Street, New York, New York (March 1943).
- Butt, Richard, (Surveyor)
1846 Map of the City of Brooklyn and Village of Williamsburgh, Showing the Size of Blocks and Width of Streets as Laid out by the Commissioners, the Old Farm Lines, Water Line and all Recent Changes in Streets. No publisher cited. Copy in St. Francis College Library, Brooklyn, New York.
- Clark Edwin P.
1910 Memoranda Relating to Pierhead and Bulkhead Lines in Kings Co., The Borough of Brooklyn. Title Guarantee and Trust Co., Brooklyn, New York
- Cropsey, Frances Bergen, Compiler
1925 Indian Trails of Kings County. Typewritten copy in the Long Island Historical Society, Brooklyn. 8 pp.
- Custer, E.
1911 A synoptic History of the Towns of Kings County from 1525 to Modern Times, New York, 1911.
- Dikeman, John Jr. compiler
1870 The Brooklyn Compendium, Showing the Opening, Closing and Alterations in the Lines of Various Streets, Avenues etc. in the City of Brooklyn (from 1819 to 1870). Brooklyn Common Council, Brooklyn Daily Times.

- Emery, K.O. and R.L. Edwards
1966 Archaeological Potential of the Atlantic Continental Shelf. American Antiquity, Vol. 31, pp. 733-737. Washington, D.C.
- Fairbridge, R. W. and W. S. Newman
1968 Postglacial Subsidence of the New York Area. Zeitschrift fur Geomorphologie, Band 3, pp. 296-317. Stuttgart, Germany.
- Fuller, Myron
1914 Geology of Long Island, Washington, D.C.
- Funk, Robert E.
1965 The Archaic of the Hudson Valley - New Evidence and New Interpretations. Pennsylvania Archaeologist, Vol. 35, Nos. 3-4, pp. 39-59, Gettysburg, Pa.
- Furman, Gabriel
1822 Notes on Brooklyn, New York Made by Gabriel Furman in a Copy of an Old Brooklyn Directory owned by Alfred T. White. Indexed by Edna Huntington. Copy Long Island Historical Society Library, Brooklyn, New York. No date.
- Furman, Gabriel
1824 Notes Geographical and Historical Relating to the Town of Brooklyn in Kings County of Long Island, Printed by a Spooner, New York and reprinted 1968 by Renaissance, Brooklyn, New York.
- Furman, Gabriel
1865 Notes, Geographical and Historical Pertaining to Brooklyn with Notes and a Memoir of the Author. Reprinted. E. B. Spooner and Sons, Publishers.
- Furman, Gabriel
1874 Antiquities of Long Island. Edited by Frank Moore. J. W. Bouton, Publisher, New York, New York.
- Furman, Robert and Consuelo Furman
1937 Furman Homes and Sites. Privately printed, Polographic Co. of America, New York, New York.
- Hanson, Jo Ann
1974 Brooklyn Heights: A Case Study in Historic Preservation, New York. 96 pp.
- Harman, Granville W., Register
no date Map of Earliest Patents and Grants in the Towns of Brooklyn and Bushwick, Kings County, New York. Register's Office, Indexing and Re-Indexing Department, Block System.
- Hooker
1861 Hooker's Map of the Village of Brooklyn, 1827. For Bishop's Manual of the Corporation for 1861. A. Brown and Co., New York.
- Howard, Henry W. B., Edit.
1893 History of the City of Brooklyn. Brooklyn Daily Eagle, Brooklyn.

- Hyde, E. Belcher
1912 Miniature Atlas of the Borough of Brooklyn, Brooklyn,
Vol. 1, 2.
- Hyde, E. Belcher
1922 Desk Atlas of the Borough of Brooklyn. Brooklyn.
- Isham, Henry
1925 The Boroughs of Brooklyn, Queens and Nassau and Suffolk,
Long Island, N.Y. 6 vols. New York.
- Kleinman, Alan M.
1973 Kings County Source Material to 1775, A Bibliography.
Long Island Historical Society. 97 pp. Manuscript.
- Kupfer, R., Engraver
1867 View of New York from the South. Reproduced 1967 by
Historic Urban Plans, Ithaca, New York. R. Lexew in
Clerk's Office of the District Court, U.S.
- Lancaster, Clay
1961 New York's First Suburb: Old Brooklyn Heights, Rutland,
Vermont.
- Langstaff, B. Meredith
1937 Brooklyn Heights, Yesterday, Today, Tomorrow. Brooklyn,
New York.
- Lyman, Terry
1965 Cadman Plaza, Archaeological Exploration. Manuscript
on file in the Long Island Historical Society, Package
No. 237.
- Mackay, Malcolm and Everdell, Wm. R.
1973 Rowboats to Rapid Transit; A History of Brooklyn Heights,
Brooklyn.
- Martin, Alexander (Surveyor)
1839 Map of the City of Brooklyn Showing All of the Streets
and as Permanently Fixed with the Size of the Block.
No publisher citation. Copy in St. Francis College
Library, Brooklyn, N.Y.
- McCullough, Davis
1972 The Great Bridge. Simon and Schuster, Publishers, New York.
- Murphy, Henry, Editor
1867 Journal of a Voyage to New York in 1679-80, by Jaspas
Dankers and Peter Sluyter. Memoirs of the Long Island
Historical Society, Vol. 1, Brooklyn, N.Y.
- Nelson, L.H.
1910 Views of Brooklyn, Portland, Main.
- Nestler, Harold
A Bibliography of New York State Communities. Empire
State Historical Publication Series No. 51. Ira J.
Friedman, Inc., Port Washington, New York.

- Newman, W. S., D. H. Thurber, H. S. Zeiss, A. Rokach and L. Musich.
1969 Late Quaternary Geology of the Hudson River Estuary: & Preliminary Report. Transactions of the New York Academy of Sciences, Vol. 31 pp. 548-570. New York
- Newman, Walter S.
1974 A Comment on Snow's "Rising Sea Level and Prehistoric Cultural Ecology in Northern New England." The Bulletin, New York State Archaeological Association. No. 60 pp. 8-28.
- O'Callaghan, E. B., edit.
1856 Documents Relative to the Colonial History of the State of New York. Weed, Parsons and Co., Printers, Albany, N.Y. 10 Vols.
- O'Callaghan, E. B.
1849 The Documentary History of the State of New York. Albany, New York. 3 Vols.
- Paterson, Lt. Clarence Stewart
1966 Bibliography of Local Histories in the Atlantic States. Baltimore, Maryland.
- Perris, William, E.C. and Surveyor
1855 Map of the City of Brooklyn. Published by J. H. Higginson, New York, New York.
- Ratzer, Lieut. B. (Surveyor for His Majesty's Government)
no date Plan of Brooklyn and Part of Long Island 1766 and 1767. No publisher citation. Copy in St. Francis College Library, Brooklyn, New York.
- Reinagle, Hugh, Engraver
1827-1834 The Heights of Brooklyn. Lithographed by Peter Maverick, New York
- Rennie, Leonard C. et al.
1974 Museum Consultant's Narrative Report, New York State Maritime Museum. New York State Office of Parks and Recreation, Albany. 48 pp.
- Ritchie, W. A.
1958 An Introduction to Hudson Valley Prehistory. New York State Museum Bulletin No. 367. Albany.
- Ritchie, William A.
1969 The Archaeology of New York State (Revised Edition). Natural History Press, Garden City, New York
- Robinson, E. and R. H., Pidgeon, editors
1886 Robinson's Atlas of the City of Brooklyn. E. Robinson, Publisher, New York.
- Rosan, Richard, et al.
1972 Fulton Ferry. Office of Downtown Brooklyn Development, Office of the Mayor; Brooklyn Office, Department of City Planning; and Office of Brooklyn Development, Housing and Development Corporation, City of New York 49 pp.

- Ross, Peter
1933 A History of Long Island, Vol. 1 Lewis Publishing Co.,
New York.
- Salwen, Bert
1965 Sea Levels and the Archaic Archaeology of the Northeast
Coast of the United States. Ph.D. dissertation,
Columbia Univ., N.Y.
- Schubert, Christopher
1968 The Geology of New York City and Its Environs. The
Natural History Press, Garden City, N.Y.
- Seymour, Catryna Ten Eyck
1965 Historical Map of Brooklyn Heights, New York
- Smity, Carlyle S.
1950 The Archaeology of Coastal New York. Anthropological
Papers of the Museum of Natural History, Vol. 43 Pt. 2
pp. 93-200.
- Stiles, Henry R.
1867 A History of the City of Brooklyn. 3 volumes 1867,
1869, Brooklyn, New York
- Stiles, Henry R.
1884 The Civil, Political, Professional and Ecclesiastical
History and Commercial and Industrial Record of the
County of Kings and the City of Brooklyn, New York from
1683 to 1884. 2 volumes. W. W. Munsell Co.
- Stokes, I.N. Phelps
1915 The Iconography of Manhattan Island, Vol. 1, 1498-1909.
New York.
- Weld, Ralph Foster
1938 Brooklyn Village, 1816-1834. Columbia University Press,
New York.
- Weyrauch, Martin H., Compiler and Editor
1916 The Brooklyn Daily Eagle, 1841-1916, 75th Anniversary
October 26, 1916. Brooklyn Daily Eagle.

ADDITIONAL BIBLIOGRAPHY

- Anonymous
1831 Brooklyn Director, Brooklyn (dates examined were 1831 to 1837).
- Anonymous
1839 Report of the Commissioners on "Streets, Avenues and Squares for Brooklyn". Commission appointed April 23, 1835, Report presented January 1, 1839. Long Island Historical Society.
- Anonymous
1904 King's Views of Brooklyn. Lawyer's Title Insurance Co., New York
- Anonymous
1906 History of the Atlantic Avenue Improvement and Report of Progress in 1906. Brooklyn, New York. Copy in the James A. Kelly Institute, St. Francis College.
- Anonymous
1959 "New York Ferry Boats", American Heritage, The Magazine of History, Vol. 10, No. 6, pp. 26-31; 78.
- Anonymous
1975 "Traffic and Discoveries of a River and its City, and Bridges, and Ferries and People". South Street Reporter, Vol. VIII, No. 4, Winter 1974-5, p.10
- Bridges, E. W., City Surveyor
1830 Map of the City of New York Including Brooklyn, Jersey City, Hoboken and C. Published by Richard Patten, New York.
- Herbert, SC and R. Talford, Surveyors
1855 Map of the City of Brooklyn. Improved and Corrected to 1855, New York.
- Judd, Jacob
1959 The History of Brooklyn, 1834-1855, Political and Administrative Aspects. Ph.D. dissertation, NYU, New York.
- Kouwenhoven, John A.
1953 The Columbia Historical Portrait of New York: An Essay in Graphic History, Harper & Row, Publishers, New York, prefaced revised in 1972.
- Rosebrock, Ellen, Christine Townley, Terry Walton
1975 "Fulton Ferry Brooklyn...Our River's Other Shore", South Street Reporter, Vol. VIII, No. 4, Winter 1954-5, pp. 3-9.
- Sanborn Maps
no date General Index of Maps of Brooklyn, New York. No. 40. Worth Street, Department of Transportation.

Sterne, Simon, et al.
1878

Atlantic Avenue Litigations in Relation to the Right
of Way of the Long Island Railroad Co. and the Atlantic
Avenue Railroad Co. of Brooklyn, To Use Steam-Power
on Atlantic Avenue, in the City of Brooklyn. Baker
and Goodwin, New York.

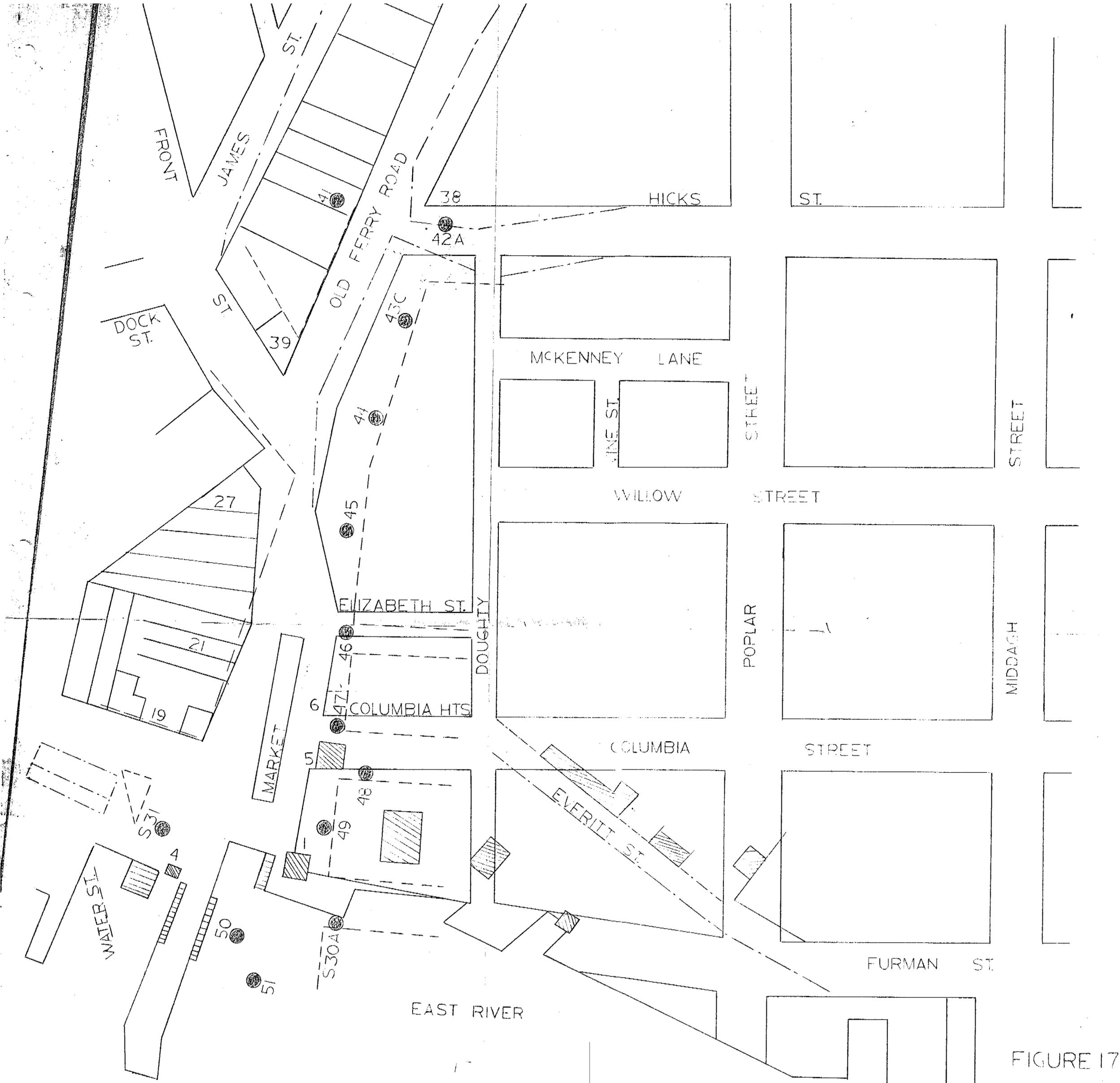
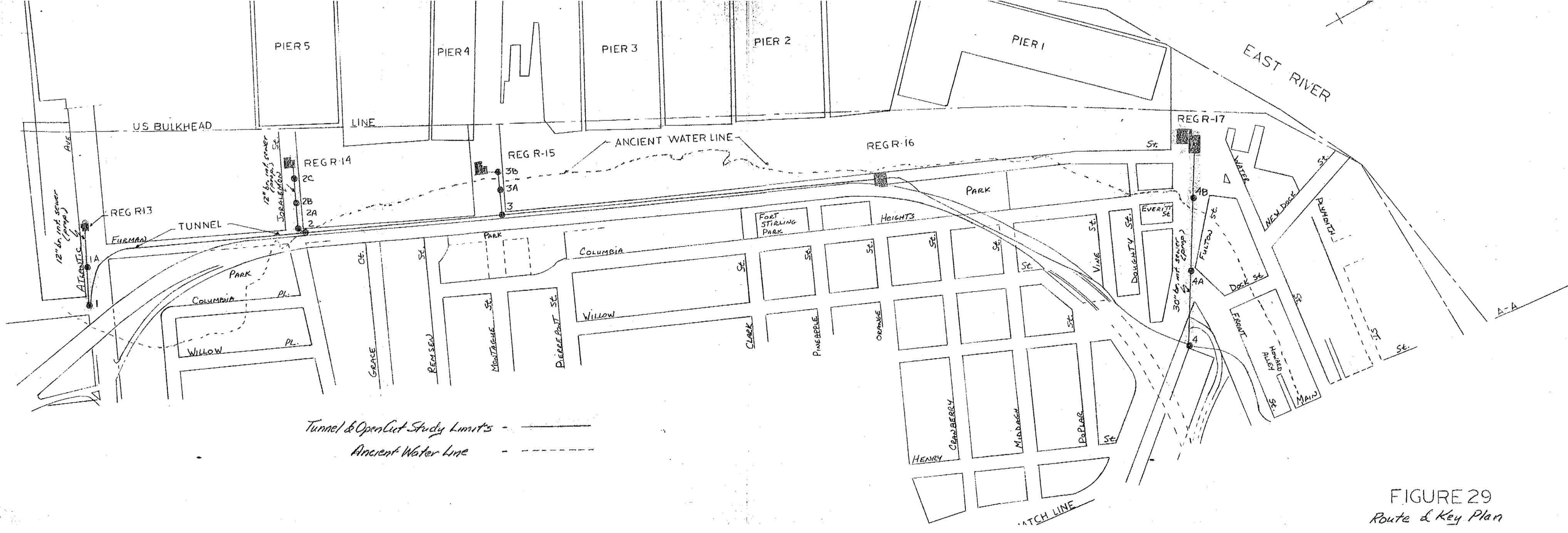
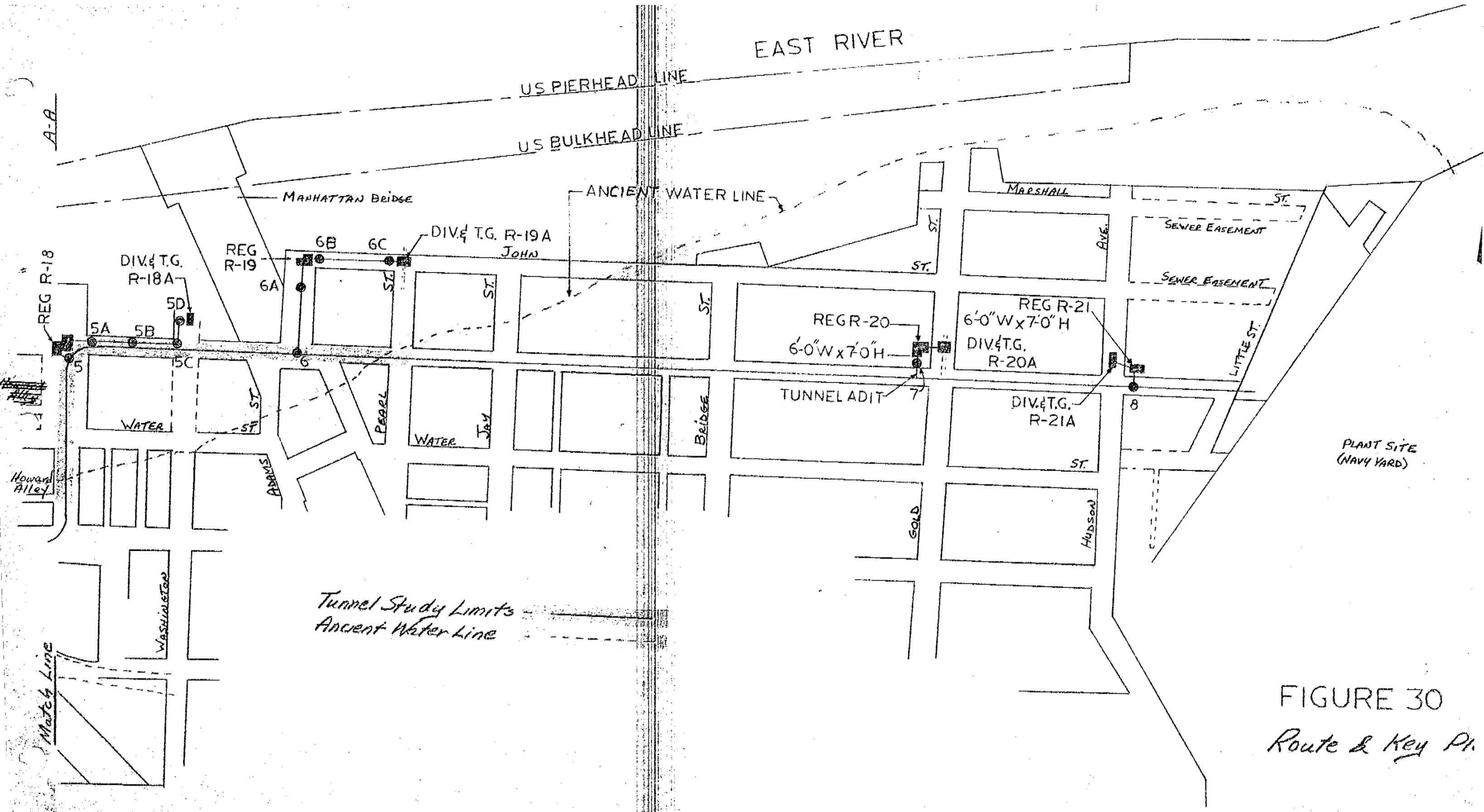


FIGURE 17



Tunnel & Open Cut Study Limits ———
 Ancient Water Line - - - - -

FIGURE 29
 Route & Key Plan



Tunnel Study Limits
Ancient Water Line

FIGURE 30
Route & Key Pt.

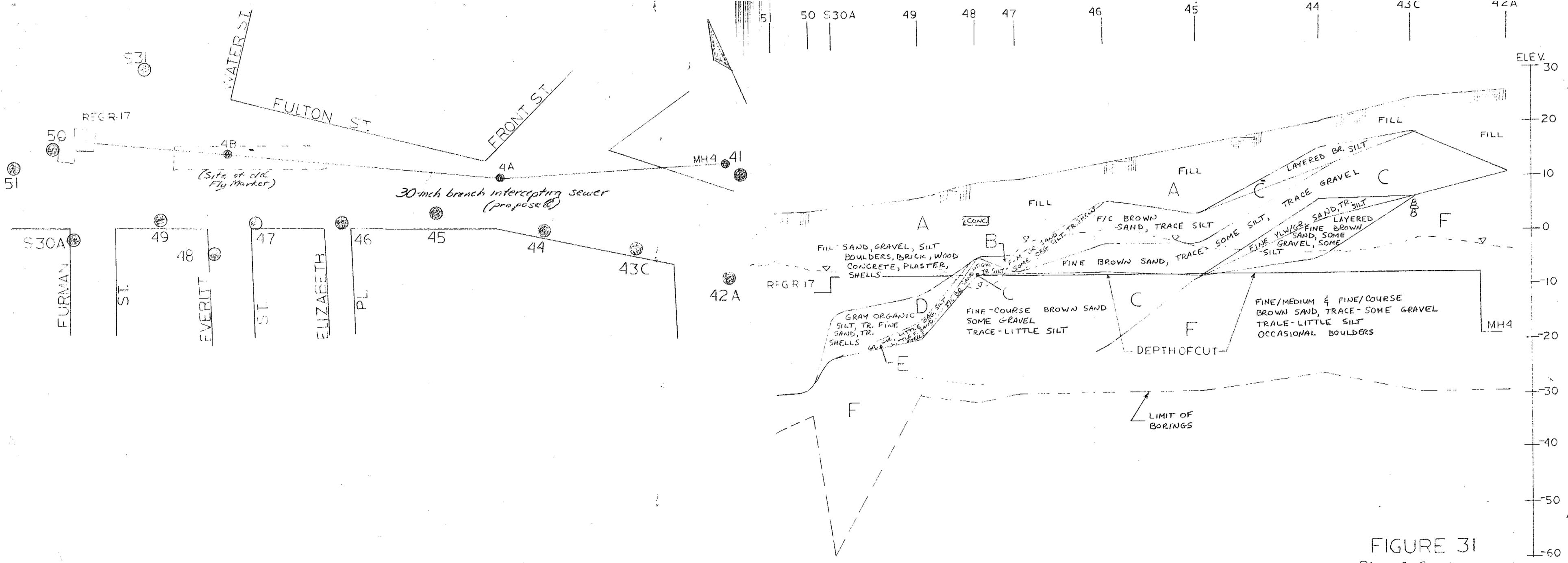


FIGURE 31
Plan & Section

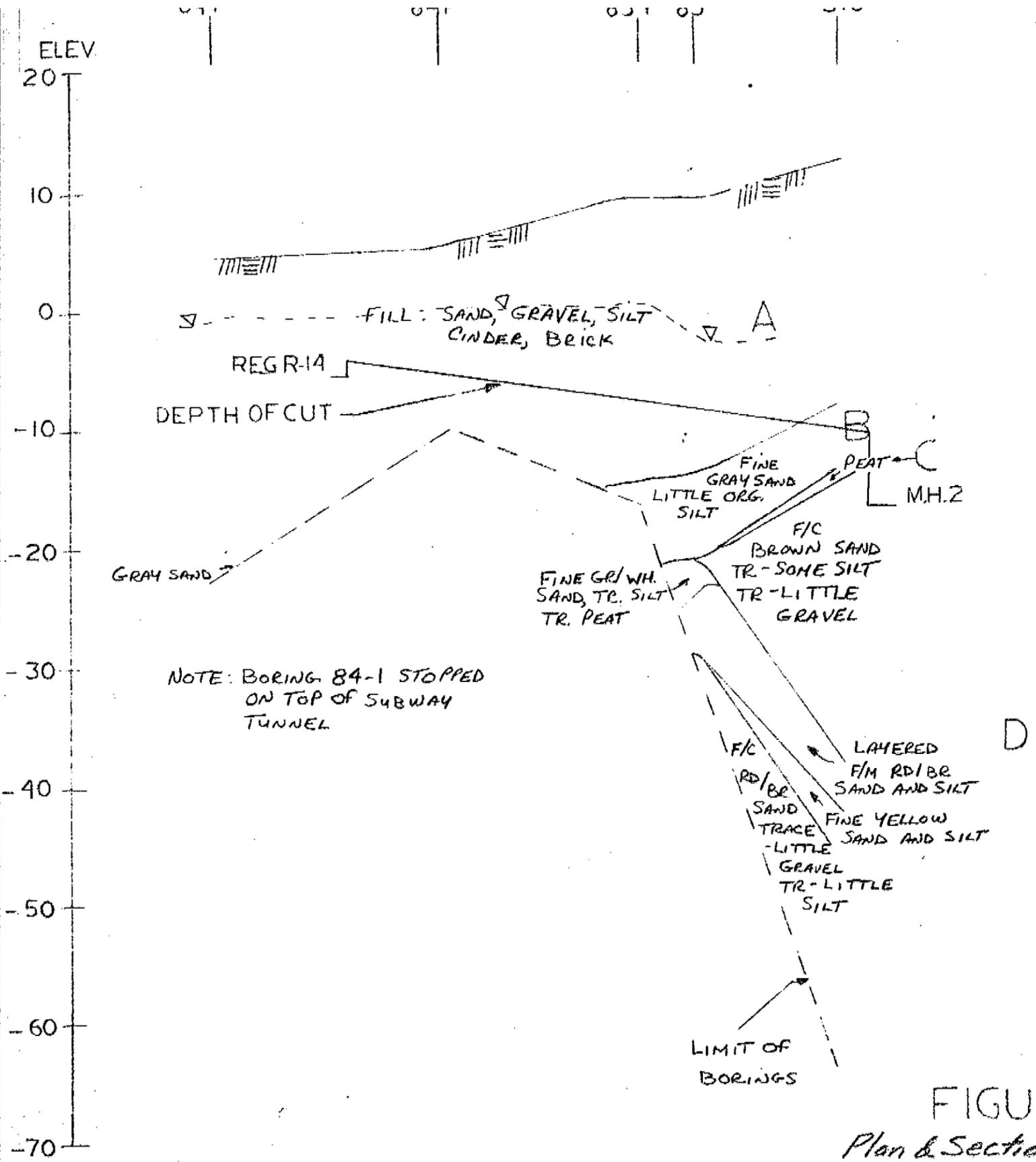
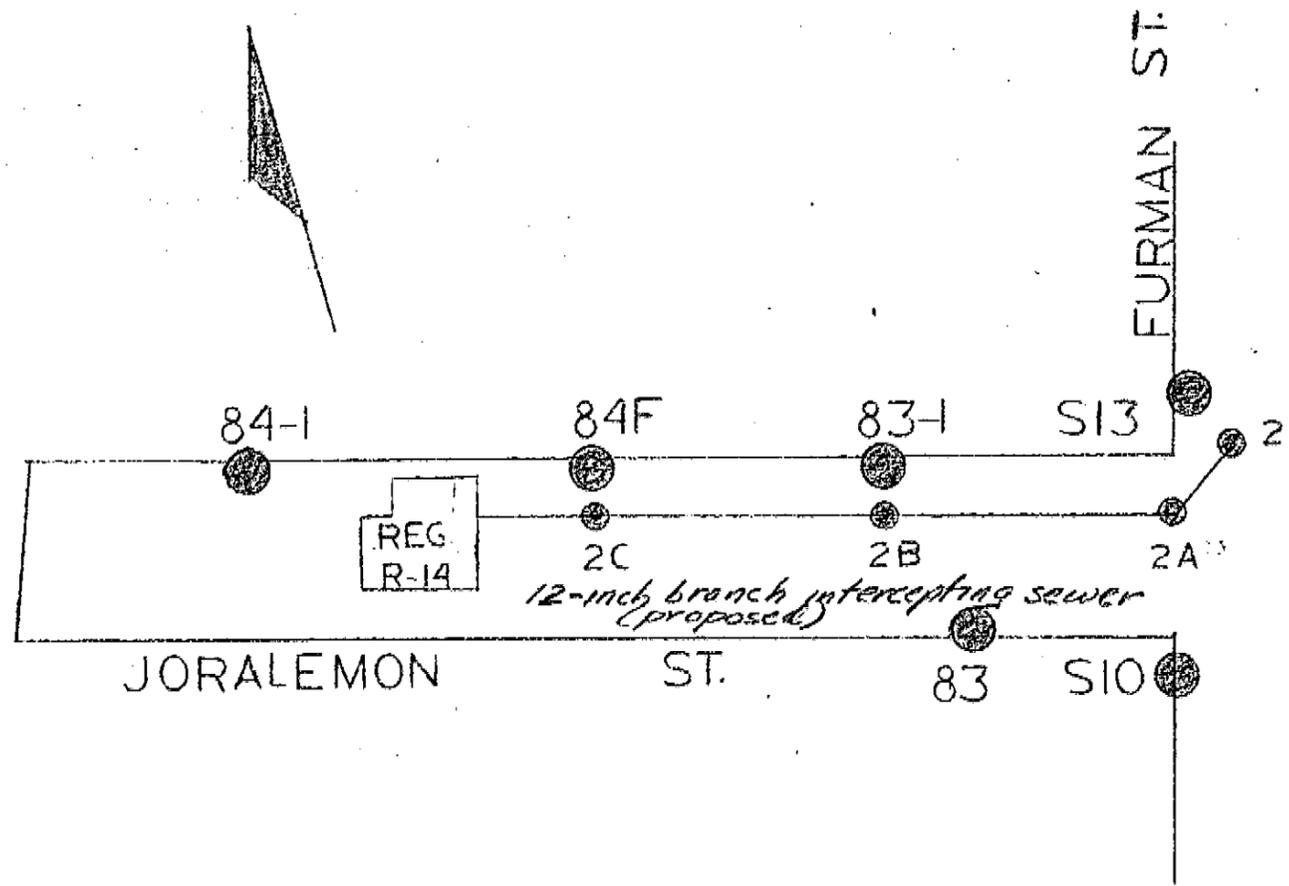
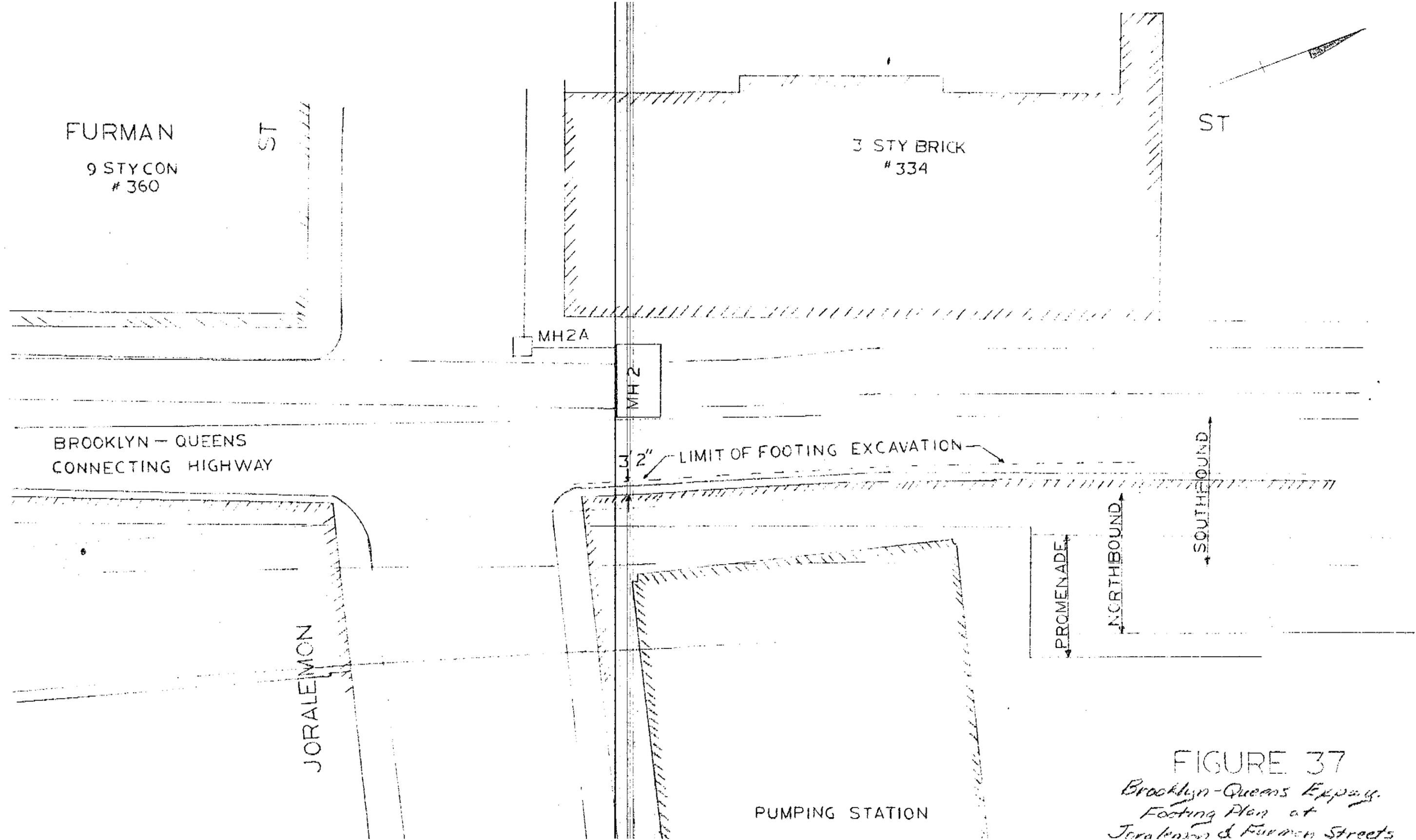


FIGURE 35
Plan & Section
Joralemon Street
west of Furman St.



FURMAN
9 STY CON
360

ST

3 STY BRICK
334

ST

MH 2A

MH 2

BROOKLYN - QUEENS
CONNECTING HIGHWAY

3' 2" LIMIT OF FOOTING EXCAVATION

JORALEMON

PROMENADE

NORTHBOUND

SOUTHBOUND

PUMPING STATION

FIGURE 37
Brooklyn-Queens Expy.
Footing Plan at
Joralemon & Furman Streets

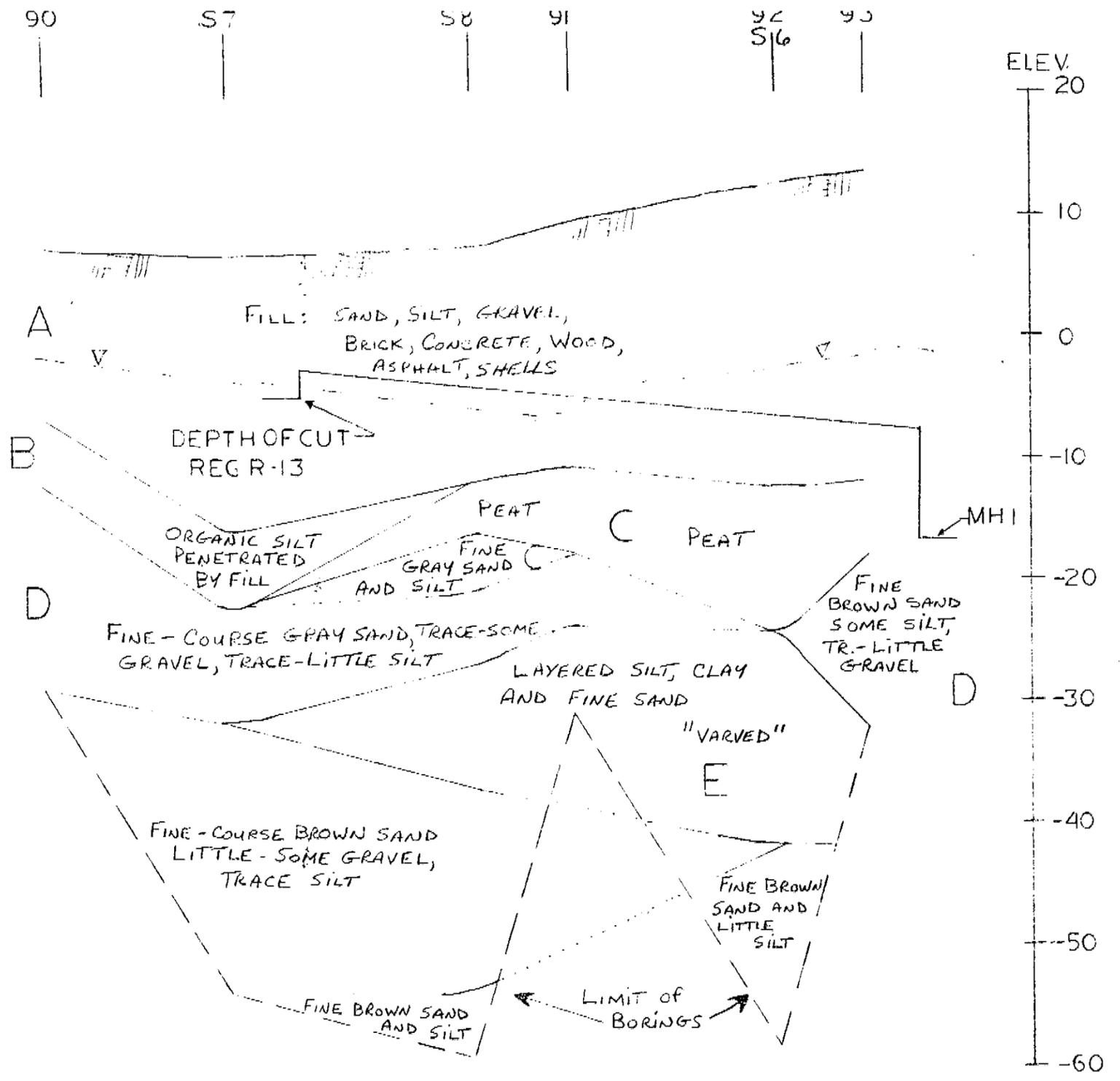
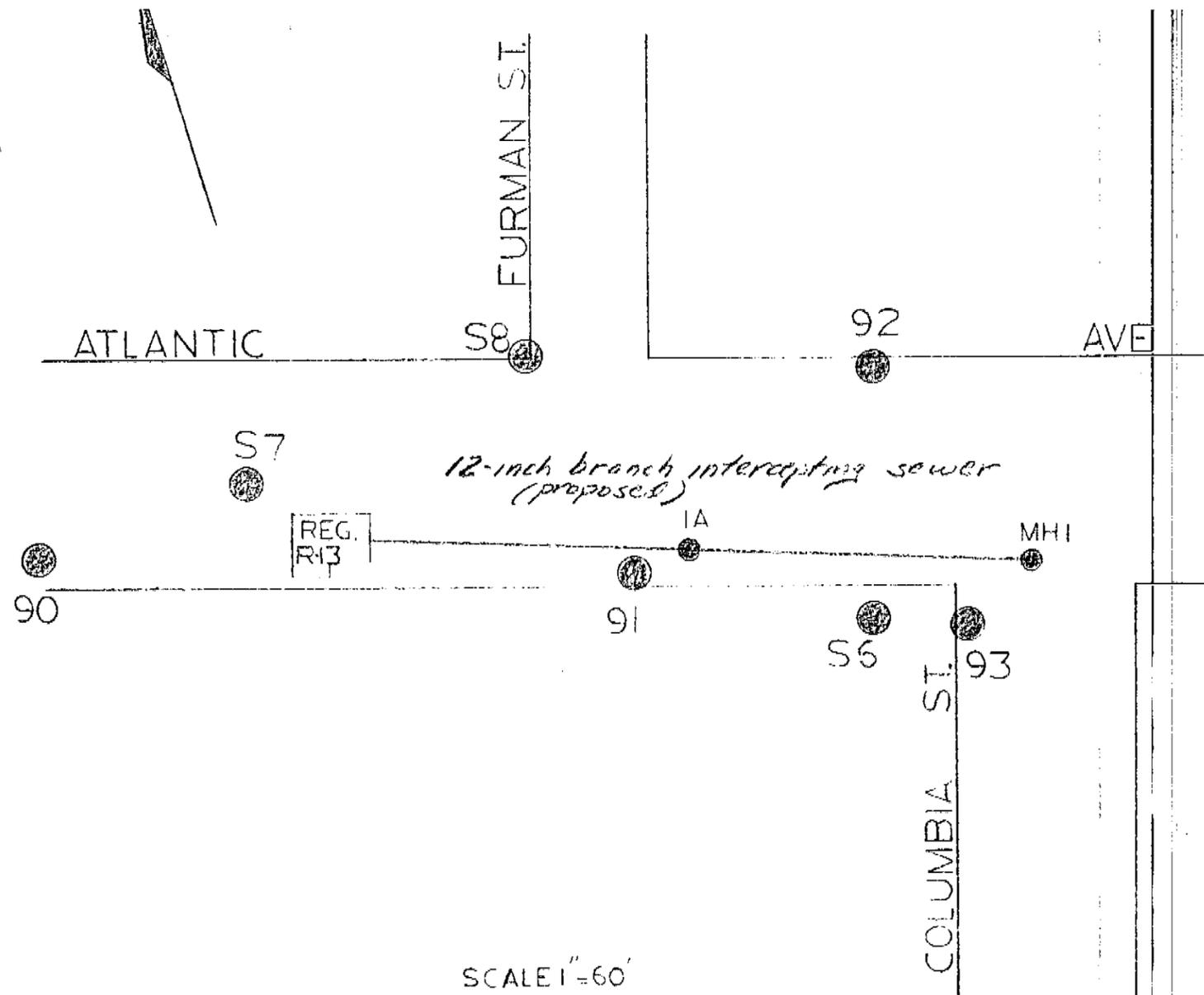


FIGURE 38
 Plan & Section
 Atlantic Avenue
 west of Columbia St.

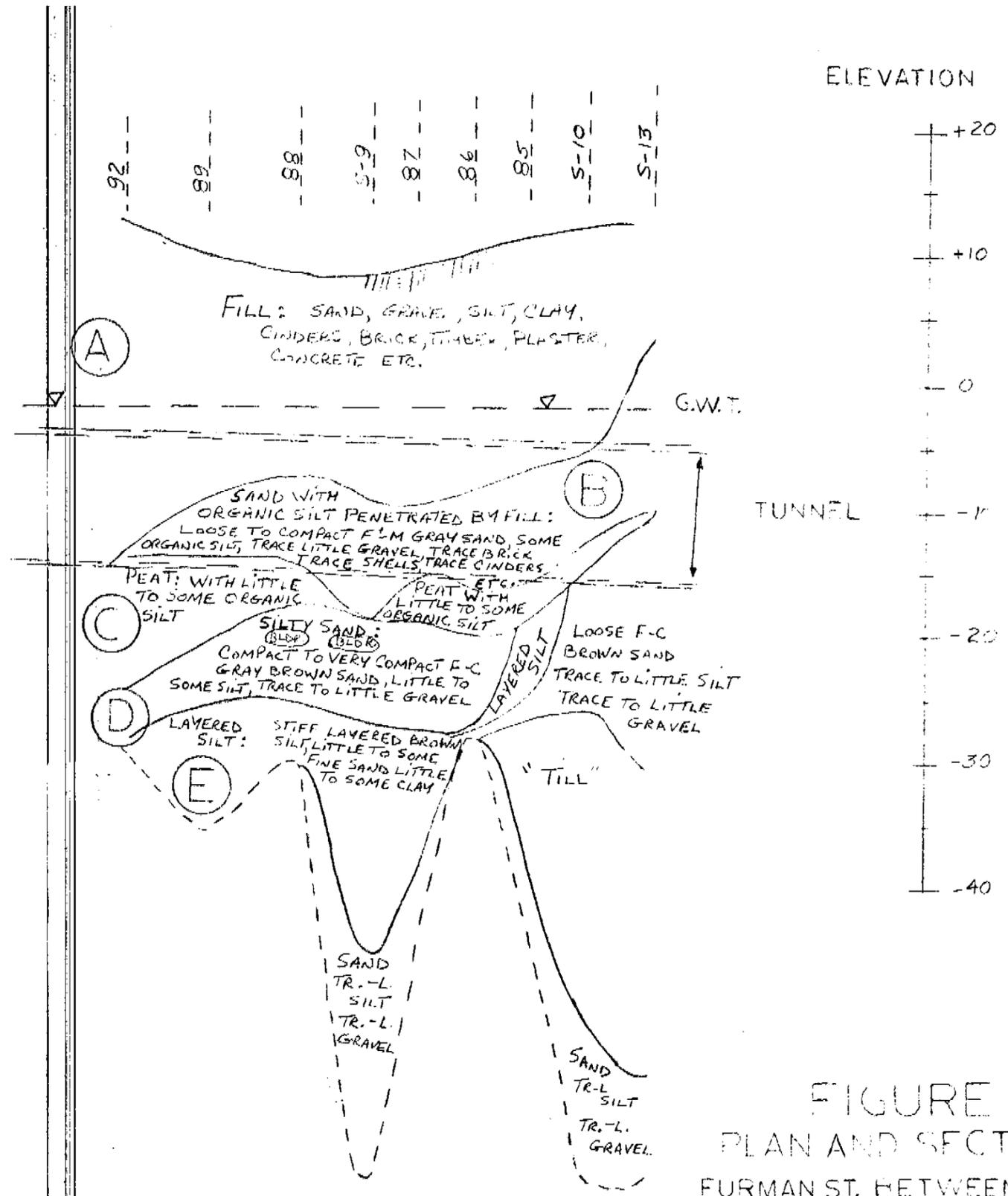
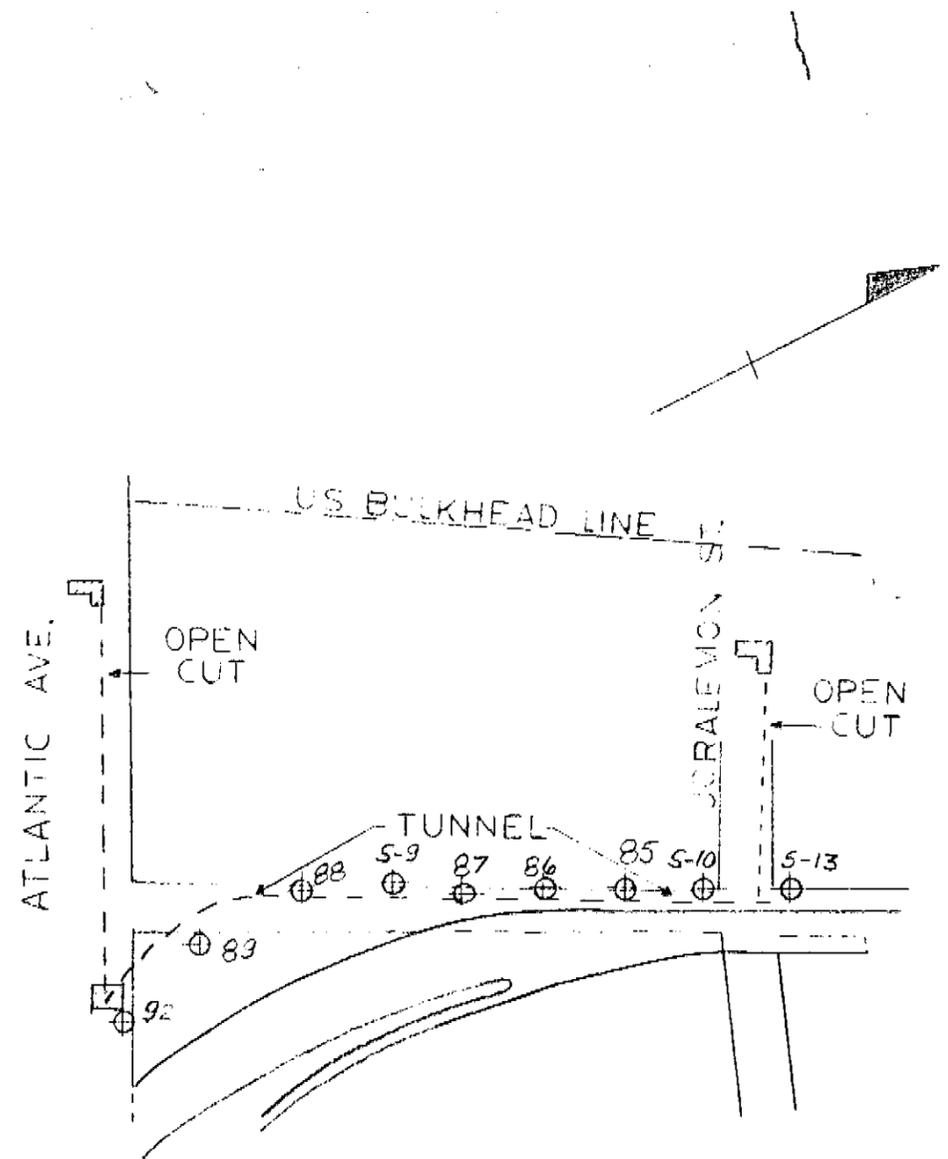


FIGURE 40
 PLAN AND SECTION
 FURMAN ST. BETWEEN
 ATLANTIC AVE. AND JORALEMON ST.