Appendix E: Hydraulic Study

Hydraulic Study
Coney Island Rezoning

BROOKLYN, NEW YORK

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A. INTRODUCTION

AKRF Engineering, P.C. (AKRF) has been retained by the New York City Economic Development Corporation to prepare a Hydraulic Study in conjunction with the proposed rezoning of the Coney Island neighborhood of Brooklyn (Kings County).

PURPOSE

As part of the environmental review process required for the approval of the Coney Island Rezoning, the rezoning project needs to be analyzed to determine the effects that will be incurred by the area's infrastructure. Typically the change in sanitary and storm flows generated by the proposed project are calculated and the potential impact on the Water Pollution Control Plant (WPCP) and/or receiving waterbody is determined, however; the New York City Department of Environmental Protection (DEP) expressed concern that the proposed infrastructure scope of work for the environmental review process was not sufficient and that additional evaluation of the sewer system will be required. A hydraulic analysis of the existing sewer system capacity was to be completed, because the separate sanitary and storm sewer systems in the area may not be adequate to accommodate flows from the higher density rezoned area. This hydraulic study will also assist the Office of the Deputy Mayor for Economic Development, the New York City Economic Development Corporation (EDC), and the New York City Department of City Planning (DCP) identify existing sewer capacities and locations that can potentially be developed (subject to DEP approval) by utilizing existing infrastructure.

STUDY UNDERSTANDING / SCOPE

For the hydraulic analysis, a comparison of the total sanitary and storm sewer capacity for the existing sewer system was made against the estimated waste water and stormwater flows from the project area's existing zoning designations to determine if any sewer segments provide capacity additional to what is needed for existing zoning demand. In areas with additional sewer capacity, the associated increased zoning density that could be accommodated is identified. Supporting hydraulic study calculations are provided in Appendix A and reference sewer information obtained from DEP is provided in Appendix B.

B. BACKGROUND

The Office of the Deputy Mayor for Economic Development, in coordination with EDC and DCP, proposes to rezone, obtain other land uses and approvals, and implement a comprehensive development plan in a portion of Coney Island, Brooklyn. The primary goal of the proposed actions is to safeguard and expand upon Coney Island's iconic amusements and to transform the area into an affordable, year-round urban amusement and entertainment destination while building upon the prime beachfront location to facilitate the development of new residential and retail uses in the surrounding area. The proposed actions call for the redevelopment of an approximately 47-acre area of the Coney Island peninsula.

PROJECT LOCATION AND LIMITS

Coney Island is located at the southern border of Brooklyn, on the Coney Island peninsula, which is defined by Coney Island Creek to the north and the Atlantic Ocean to the west and south. Coney Island is located at the western portion of the peninsula. The rezoning area encompasses approximately 47-acres and is generally bounded to the east by West 8th Street, to the west by West 24th Street, to the north by Mermaid Avenue, and to the south by the Riegelmann Boardwalk (see Figure 1). Of the 47-acres, about 28 acres are currently publicly owned land, and about 22.5 acres are currently mapped parkland.

PROJECT NEED

Coney Island's emergence as a world-renowned, one-of-a-kind amusement destination dates back to the mid-19th century. Over the years, Coney Island has experienced the development and the destruction of some of the most well-known amusement parks in America, including Luna Park, Dreamland, and Steeplechase Park. Since the closing of Steeplechase Park in 1964, the amusement area has significantly declined, consisting today of only a few blocks of largely seasonal amusement attractions. Some of the historic amusement structures remain and are Coney Island icons. A number of these structures are New York City Landmarks (NYCLs), including the Cyclone roller coaster, the Wonder Wheel, the Parachute Jump, and Child's restaurant. However, despite its decline, Coney Island's amusement area continues to attract millions of visitors per year, demonstrating its potential and its unique legacy as an urban beachfront amusement destination.

Much of the land throughout the proposed rezoning area is either vacant or underutilized. Most block frontages on the north and south sides of Surf Avenue—the district's major east-west thoroughfare—are either vacant or used as parking lots. The comprehensive rezoning plan seeks to build on the area's attractions and strengths to create a development framework that will respect and enhance Coney Island's history while providing incentives to help the area realize its full potential. The proposed rezoning and other actions establish a framework for redevelopment of Coney Island that will maintain Coney Island's unique history, character, and culture, and ensure the future of the amusement area by formalizing this public asset as parkland, and developing a vibrant affordable urban amusement and entertainment destination; redevelop Coney Island as part of an integrated vision by strengthening existing amusements, growing indoor

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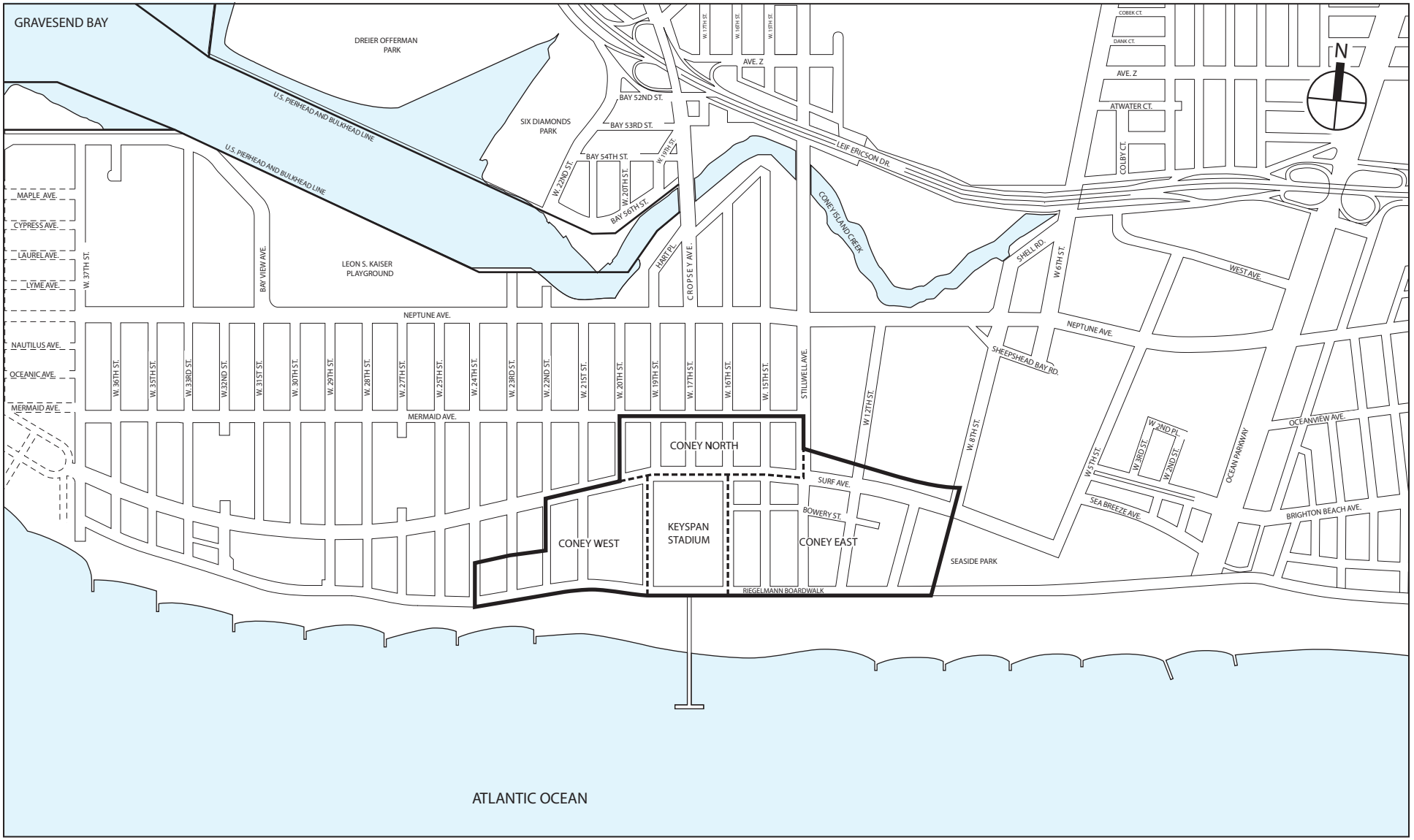

Proposed Rezoning Boundary

Proposed Rezoning Subarea Boundary

0 1000 2000 FEET

SCALE

CONEY ISLAND REZONING • HYDRAULIC STUDY

Project Location
Figure 1

entertainment uses, and capitalizing on beachfront location to bring a critical mass of people who live and work there; and foster economic activity that creates job opportunities for local residents by creating year-round activity and bringing new housing and retail services to the neighborhood.

C. EXISTING CONDITIONS

To assess the infrastructure, the existing conditions of the rezoning area must be fully understood. The existing land use and zoning, topography, soils, groundwater, tidal activity, roadway and sewer infrastructure, sewer complaint history, and other utilities for the study area are discussed below.

ZONING

The area is divided into the three subareas (as shown in Figure 1): Coney East, Coney West, and Coney North. The existing Keyspan Park is located between the Coney East and Coney West subareas. As Figure 2 shows, the rezoning area is almost entirely zoned as a C7 district. All of Coney East and Coney West are mapped within this district, as is the southeastern portion of Coney North. C7 districts are specifically designated for large, open amusement parks. In addition to the types of activities commonly found in amusement parks, like roller coasters, ferris wheels, and games of chance, C7 districts permit boating facilities and other large open and enclosed entertainment facilities such as skating rinks, stadiums, arenas, and miniature golf courses. No residential and community facility uses are permitted. The maximum floor area ratio (FAR) in C7 districts is 2.0.

The north and west portions of Coney North are mapped in an R6 General Residence District. R6 is a medium-density residential district that permits 1- and 2-family houses and apartment buildings of heights generally ranging from 3 to 12 stories. R6 encourages houses or small apartment buildings on small zoning lots, and tall, narrow buildings set back from the street on larger lots. It has a maximum FAR of 2.43 for residential uses, and 4.8 for community facility uses. Within 150 or 250 feet of Mermaid Avenue, Coney North is mapped with a C1-2 commercial overlay district. C1-2 districts are mapped along streets that serve the local retail needs of the surrounding residential neighborhood. Typical retail uses include grocery stores, restaurants, and other businesses that cater to the immediate neighborhood. In an R6 district, C1-2 overlay districts permit a maximum of 2.0 FAR of commercial development at the lower floors of buildings.

Outside the rezoning area, the Coney Island neighborhood is zoned primarily for medium-density residential use, with commercial overlay districts along key commercial streets. A small cluster of manufacturing districts and commercial districts that function as light manufacturing districts is located in the northern portion of Coney Island as shown in Figure 2.

LAND USE

REZONING AREA

As shown in Figure 3, the rezoning area consists mainly of open space/recreational facilities, vacant land, and surface parking facilities. Large portions of each subarea are made up of vacant lots and lots used for surface parking, which tend to be assembled into contiguous parcels. Outside of the three subareas, the remainder of the area is a large parcel between Surf Avenue and Riegelmann Boardwalk and West 16th and West 19th Streets. KeySpan Park, a minor-league baseball stadium and home of the Brooklyn

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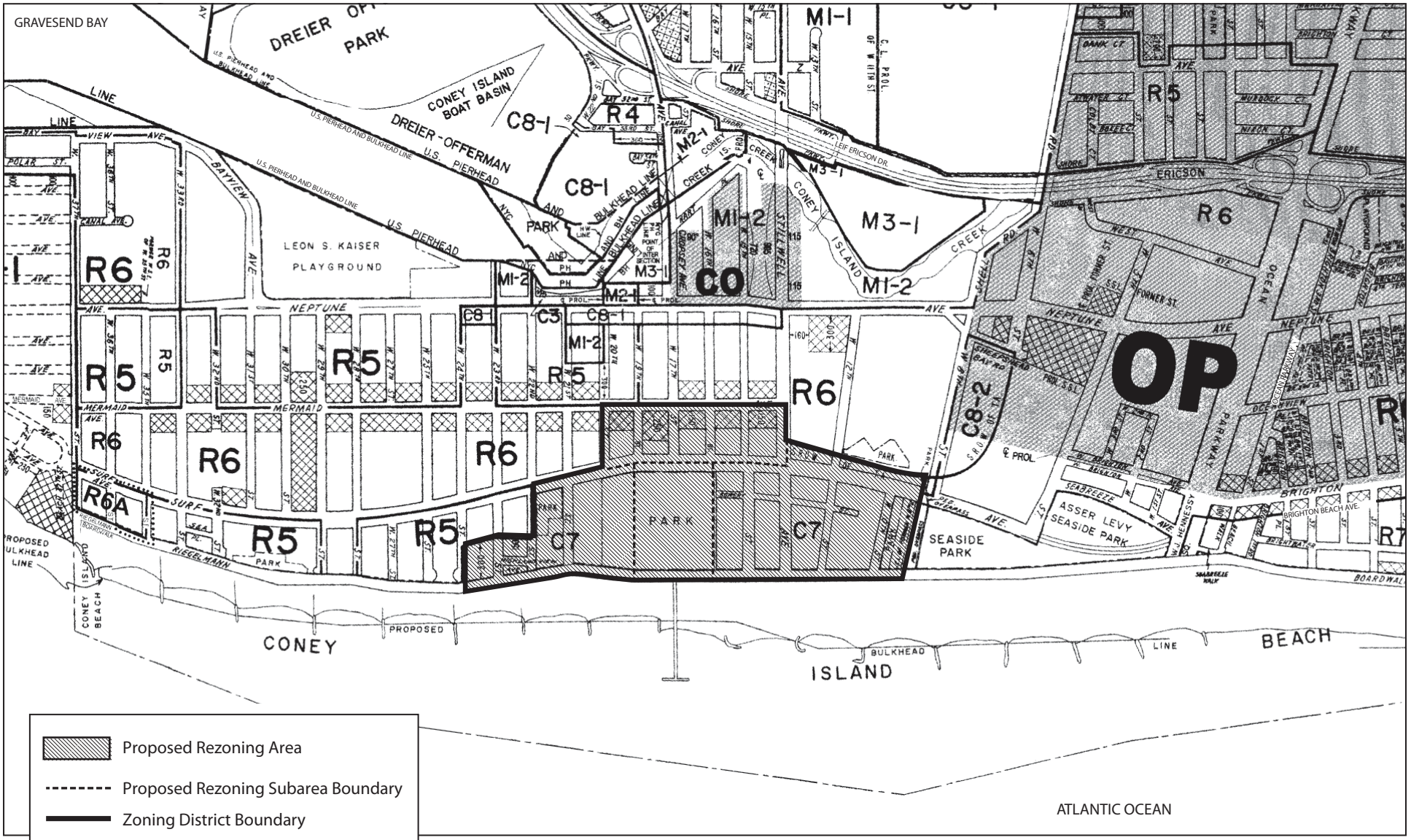

Existing Zoning
Figure 2

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- Primary Study Area Boundary (Project Area Boundary)
- Primary Study Area Subarea Boundary
- Residential
- Residential (with Ground Floor Retail)
- Hotels
- Commercial and Office Buildings
- Industrial and Manufacturing
- Transportation and Utility
- Public Facilities and Institutions
- Open Space and Outdoor Recreation
- Parking Facilities
- Vacant Land
- Vacant Building

0 200 500 FEET
SCALE

Existing Rezoning Area Land Use
Figure 3

Cyclones, occupies the majority of this parcel and its entire Surf Avenue frontage. The Parachute Jump and an area of vacant land are located along the Boardwalk.

Coney East

The predominant land use in the Coney East subarea is the present-day Coney Island amusement area. Other land uses in this subarea include commercial retail, transportation facilities, and vacant land.

The amusements and amusement-related concessions are generally concentrated between West 8th and West 16th Streets, south of Surf Avenue. It is anchored by the historic Cyclone roller coaster and the Wonder Wheel. Astroland Amusement Park and Deno's Wonder Wheel Amusement Park are located in this area. Each of these amusement parks is open seasonally during the temperate months of the year and offers a variety of rides catering to children and adults.

The north side of Surf Avenue (south of the subway viaduct) is predominantly occupied by one- and two-story commercial buildings and the recently rehabilitated Stillwell Avenue subway terminal.

To the west of the existing amusements, the majority of Coney East is vacant land. The original Nathan's Famous restaurant and a number of other concessions, bars, and amusements are present in this area. Aside from these uses, the remaining lots south of Surf Avenue and east of West 16th Street are vacant, occupied by vacant buildings, or used for vehicle storage.

Coney West

The predominant land uses in the Coney West subarea are vacant lots and surface parking facilities. The area between West 20th Street and KeySpan Park contains the Abe Stark Rink, an indoor ice-skating rink operated seasonally by the New York City Department of Parks and Recreation (DPR), and a large surface parking lot that serves this rink and KeySpan Park. The adjacent area between West 20th and West 21st Streets is a vacant lot. An additional surface parking lot for KeySpan Park is located along the south side of Surf Avenue between West 21st and West 22nd Streets. Both this parking lot and the parking lot that shares its parcel with Abe Stark Rink are currently mapped as City parkland. An office facility for the New York City Department of Homeless Services is present on the west side of West 21st Street, adjacent to a vacant building fronting the Boardwalk that formerly housed Child's Restaurant. Boardwalk Garden, a community garden lies to the west of the Child's building. The southern portion of the block bounded by Surf Avenue, Highland View Avenue, West 22nd Street, and West 23rd Street is used for parking school buses and other vehicles. The parcels between Highland View Avenue and the Boardwalk are vacant. The Sea Crest Health Care Center, an assisted living facility, is located along the Boardwalk between West 23rd and West 24th Streets.

Coney North

The five blocks that make up the Coney North subarea are composed mainly of vacant land, commercial retail, and residential land uses. As shown on Figure 3, the blocks between West 15th and West 20th Streets are predominantly vacant along Surf Avenue through to the midblocks. This vacant land is used for vehicle storage and parking

between West 15th and West 17th Streets. There are two community gardens located along West 20th Street. The area consists of 1-story retail buildings and 2- to 4-story residential buildings with ground floor retail. There are also some 1- to 3-story commercial buildings along Surf Avenue.

ADJACENT AREA

Outside the rezoning area, the predominant land use in Coney Island is residential, at various densities. The area consists of low-scale, one- and two-family homes, low-rise apartment buildings, and 15- to 20-story residential complexes, built largely as a result of the urban renewal plans of the 1960s and 1970s.

Commercial uses (such as stores and private day-care centers) and institutional uses (such as churches, schools, libraries, police and fire stations, and the New York Aquarium) are interspersed among the residential uses. Light industrial uses, including small warehouses and auto-repair shops, are also interspersed among the residential uses, particularly north of Neptune Avenue. There are a number of vacant lots and lots used for surface parking throughout the northern part of the study area. Infrastructure associated with the New York City Transit Authority's Stillwell Avenue Terminal occupies the east side of Stillwell Avenue between Surf and Neptune Avenues, and extends to the north.

MAPPED RIGHT-OF-WAY STATUS

Within the study area, all of the existing roadways are mapped. Mapped streets are identified on City Topographic Maps maintained by the Borough President's Office Bureau of Topography. The city street maps and alteration maps were obtained for the Coney Island study area from the Brooklyn Borough President's Office.

The final mapped widths of each street are presented in Table 1. There are several pedestrian walkways within the rezoning area. These walkways are identified on the City maps as record streets but are not mapped.

Additionally, there are several parks within the project area that are identified on the city maps. The following parks are located within or immediately adjacent the rezoning area:

- **Cyclone Site** – The Cyclone rollercoaster is located along the east side of West 10th Street between the Boardwalk and Surf Avenue;
- **Steeplechase Park and Abe Stark Skating Rink** – Steeplechase Park (the location of Keyspan Park) and the skating rink are located in the area bounded by West 20th Street, Surf Avenue, West 16th Street and Boardwalk;
- **Parking Field** – The Parking Field is a parking lot located in the area bounded by West 21st Street, Surf Avenue, West 22nd Street and the Boardwalk;
- **Asser Levy Park –** Asser Levy Park is the location of the New York Aquarium and is located east of West 8th Street and south of Surf Avenue; and,
- **Luna Park –** is a 1.8-acre playground located in the area between West 8th and West 12th Streets, between Surf Avenue and Neptune Avenue.

Table 1: Right-Of-Way Status

Street Name	Extents (From/To)	Final Mapped Right-Of-Way Width
West 8th Street	Surf Avenue / Neptune Avenue	105-Feet
West 10th Street	Boardwalk / Surf Avenue	74.60-Feet
West 12th Street	Boardwalk / Neptune Avenue	70-Feet
Stillwell Avenue	Boardwalk / Coney Is. Creek City Bulkead Line	100-Feet
West 15th Street	Boardwalk / Surf Avenue	60-Feet
West 15th Street	Surf Avenue / Hart Place	88.65-Feet
West 16th Street	Boardwalk / Hart Place	60-Feet
West 17th Street	Surf Avenue / Neptune Avenue	60-Feet
West 19th Street	Boardwalk / Neptune Avenue	60-Feet
West 20th Street	Surf Avenue / Neptune Avenue	60-Feet
West 21St Street	Boardwalk / Coney Is. Creek U.S. Pier and Bulkead Line	60-Feet
West 22nd Street	Boardwalk / Coney Is. Creek U.S. Pier and Bulkead Line	60-Feet
West 23rd Street	Boardwalk / Coney Is. Creek U.S. Pier and Bulkead Line	60-Feet
West 24th Street	Boardwalk / Neptune Avenue	60-Feet
West 25th Street	Boardwalk / Neptune Avenue	60-Feet
Highland Avenue	West 23rd Street to West 22nd Street	60-Feet
Surf Avenue	West 25th Street / West 8th Street	120-Feet
Mermaid Avenue	West 25th Street / Stillwell Avenue	80-Feet
Neptune Avenue	West 25th Street / West 8th Street	120-Feet
Hart Place	West 17th Street / West 15th Street	50-Feet
Cropsey Avenue	Neptune Avenue / Coney Is. Creek U.S. Pier and Bulkead Line	120-Feet
Bowery	West 16th Street / Jones Walk	38-Feet
Kensington Walk	Boardwalk / Surf Avenue	N/A
Schweickerts Walk	Boardwalk / Surf Avenue	N/A
Stratton-Henderson Walk	Boardwalk / Surf Avenue	N/A
Jones Walk	Boardwalk / Surf Avenue	N/A

SOURCE: Brooklyn Borough President's Office Bureau of Topography

TOPOGRAPHY

The existing topography within Coney Island is low and relatively flat. Legal grades are the established theoretical elevations at the top of curb and are identified on topographic maps maintained by the Brooklyn Borough President's Bureau of Topography. Legal Grades within the Coney Island neighborhood are typically between +4.00 and +6.00 Brooklyn Highway Datum (BHD) with some areas as low as +3.52 BHD and as high as +10.09 BHD.

In areas throughout the city, the streets may not always be constructed to meet the established Legal Grade. The legal grades were compared to existing information

obtained as part of a topographical survey conducted for Stillwell Avenue and West 21st Street between Surf Avenue and the Boardwalk. Based on the information shown on the existing survey, the elevations along West 21st Street reveal that the existing grades are up to 7-inches below legal grade. Elevations along Stillwell Avenue reveal that existing grades are at or near legal grade in this area, however; existing grades are up to 9.3-inches higher than legal grade in some isolated areas.

The legal grades identified for Coney Island are designed so that the elevations midblock are higher than those at the intersections. Therefore stormwater runoff during rain events flows towards the intersections. Additionally, there is an existing ridge in Coney Island which runs in an east-west direction between Mermaid Avenue and Neptune Avenue. The area to the north of the ridge slopes down to the north (toward the Coney Island Creek) where the Legal Grade elevation is approximately +5.50 BHD. The area to the south of the ridge slopes down to the south (toward the Atlantic Ocean) where the elevation is approximately +6.00 BHD.

Based on information provided by DEP prepared in 2006, the Mean High Water (MHW) line is +0.65 BSD (Brooklyn Sewer Datum) and the Mean Low Water (MLW) line is -4.05 BSD. BSD is 1.72-feet above mean sea level as established by the United States Coast and Geodetic Survey at Sandy Hook, New Jersey.

GROUNDWATER

In October 2007, a groundwater study was completed by STV Incorporated (STV) for the Coney Island rezoning area between West 10th Street and West 22nd Street, between Surf Avenue and the Boardwalk. Five borings were advanced throughout the study area with observation wells. The wells were observed for a 1-month period in September and October 2007. The observed groundwater elevations ranged from +0 to +0.6 BHD. These groundwater levels varied from approximately 3- to 7-feet below existing grade.

Previous groundwater sampling was done in 1999, for the study area in association with the construction of Keyspan Stadium. As summarized in the report prepared by STV, the groundwater elevation observations made during this period were slightly higher than those in 2007, particularly near Keyspan Stadium (+0.9 BHD). Readings taken outside the stadium were found to decrease further away from the stadium.

TIDAL LEVELS

The 2007 subsurface investigation prepared by STV documented and discussed tidal activity experienced by the Coney Island peninsula. Based on Coney Island's close geographical proximity to Sandy Hook, New Jersey, the tidal records for Sandy Hook were assumed to apply to Coney Island. Based on the historic tidal records, the highest tide experienced was +2.3 BHD. This level is approximately 1-foot lower than the lowest street elevation in Coney Island. STV concluded that Coney Island was not subject to flooding caused by normal tidal activity.

SOILS

The geological conditions of Coney Island have changed since the 1600's. As documented by STV, the neighborhood was originally an island. Over the years, the

extents of Coney Island have changed due to inland fill being deposited in the adjacent wetlands. The island is currently considered to be a peninsula extending from Long Island defined by the Atlantic Ocean to the south and west and the Coney Island Creek to the north.

The five borings that were conducted as part of the STV subsurface investigation revealed that the soil conditions are generally uniform within the rezoning area. All borings were completed to a depth of 52-feet beneath the surface.

The borings identified that there was a layer of fill (New York City Building Code Classification 11-65) that ranged from a depth of 3- to 9-feet below the surface. Beneath the fill, there was a 25- to 35-feet deep layer of fine sand (New York City Classification 8-65). Within this layer, there were organic deposits found which may have been from buried streams or marshes. Beneath this fine sand layer there was a 3- to 4-feet deep layer of silt (New York City Building Code Classification 11-65) followed by a layer of silty sand (New York City Building Code Classification 8-65).

SEWER INFRASTRUCTURE

The Coney Island area is currently served by separate storm and sanitary sewers. The existing sanitary system is estimated to be up to 100-years old in some parts of the rezoning area. Several Amended Drainage Plans have been prepared by DEP over the last century (in years 1941, 1956, 1968, 1970, 1971, 1975, and most recently in 2004) for isolated areas within the Coney Island peninsula, however; the rezoning area has remained widely unchanged. The interceptor in Neptune Avenue was constructed as part of the Amended Drainage Plan prepared in 1941.

Due to Coney Island's flat topography and elevations near sea level, the systems were constructed at depths that provide less than the standard recommended cover at the upper ends of the catchment areas. Additionally, because of the topographical constraints, the sanitary and storm systems are installed at generally the same elevations, and for this reason, there are locations within the systems where conflict chambers are used. Conflict chambers are structures that allow for two pipes to cross at or near the same elevations without the pipes' flows mixing. The current system operates adequately and these nonstandard elements have not compromised the system's integrity, however; to avoid pipe crossing conflicts, conflict chambers have been designed into the system to ensure the system's continued functionality. The existing sanitary and storm sewer systems are discussed below.

SANITARY SEWER SYSTEM

The existing sanitary sewer system collects sewage from the project area and flows by gravity to the interceptor in Neptune Avenue. Primarily 8- and 10-inch sanitary sewers are located beneath the streets and pedestrian walkways within the rezoning area. These collector sewers convey waste water to trunk mains of various sizes which generally flow away from the rezoning area to the north. There are two parallel sewer mains beneath Surf Avenue throughout most of the Coney Island neighborhood. The trunk mains include a 12-inch sewer beneath West 19th Street, an 18-inch sewer beneath West 21st Street, a 24-in sewer located beneath West 12th Street, and a 72-inch sewer beneath West

15th Street. These trunk mains direct the waste water to the sanitary interceptor located in Neptune Avenue. Sewer mains in areas north of Neptune Avenue convey flow south directly to the interceptor. The interceptor directs flow east to the Coney Island WPCP.

There are several sanitary sewer catchment areas which originate in the rezoning area, as shown in Figure 4. The first catchment area (Catchment Area A), at the western portion of the Coney Island, collects sanitary flow along Surf Avenue between West 21st Street and West 27th Street, West 24th Street between the Boardwalk and Mermaid Avenue, and Mermaid Avenue between West 24th Street and West 25th Street. Sanitary sewers located beneath Surf Avenue in this area flow towards West 24th Street. The sewer in West 24th Street conveys wastewater north from the Boardwalk to Mermaid Avenue and then west and north to the interceptor in Neptune Avenue. The sewers in this area are all 8-inch mains with the exception of the sewer beneath West 24th Street between Surf Avenue and Mermaid Avenue (10-inch) and the sewer beneath Mermaid Avenue between West 24th Street and West 25th Street (24-inch). The DEP Infiltration and Inflow Maps as well as DEP GIS Maps for Coney Island, showing existing sewer locations, sizes and inverts, are provided in Appendix B.

The second catchment area (Catchment Area B), lies predominantly within the Coney West subarea and collects sanitary flow along Surf Avenue between West 19th Street and West 23rd Street, West 20th Street between Surf Avenue and Mermaid Avenue, West 21st Street between the Boardwalk and Neptune Avenue, West 22nd and 23rd Streets between the Boardwalk and midway between Mermaid and Neptune Avenues, and Mermaid Avenue between West 19th Street and West 24th Street. The sewers within West 20th, 21st, 22nd, and 23rd Streets convey flow towards Surf and Mermaid Avenues. Sanitary sewers located beneath Surf Avenue and Mermaid Avenue in this area flow towards West 21st Street. The sewer in West 21st Street conveys wastewater north from the Boardwalk to the interceptor in Neptune Avenue. The sewers in this area vary in size and are not smaller than 8-inches and increase to 18-inches before reaching the interceptor.

The third catchment area (Catchment Area C) collects sanitary flow along West 19th Street between the Boardwalk and Neptune Avenue, West 17th Street between the Surf Avenue and Mermaid Avenue, and Mermaid Avenue between West 17th Street and West 19th Street. Sanitary sewers located beneath West 19th Street convey wastewater north from the Boardwalk to the interceptor in Neptune Avenue. The sewers within West 17th Street flow north to the sewers in Mermaid Avenue and then west to West 19th Street. The sewers in this area are largely 8-inch mains with the exception of the sewer beneath West 19th Streets between Surf and Mermaid Avenues (10-inch) and the sewer beneath West 19th Street between Mermaid and Neptune Avenues (12-inch).

The fourth catchment area (Catchment Area D) lies largely within the Coney East area. South of Surf Avenue, wastewater flows north to Surf Avenue through 8- and 9-inch mains. The sanitary mains located beneath Surf Avenue through this area convey flow towards West 15th Street through 8-, 10-, and 12-inch sewers. The sanitary collectors beneath West 16th Street, West 17th Street, Stillwell Avenue and Mermaid Avenue are 8-, 12-, 18-, and 72-inch mains which direct flow towards West 15th Street. A 72-inch trunk

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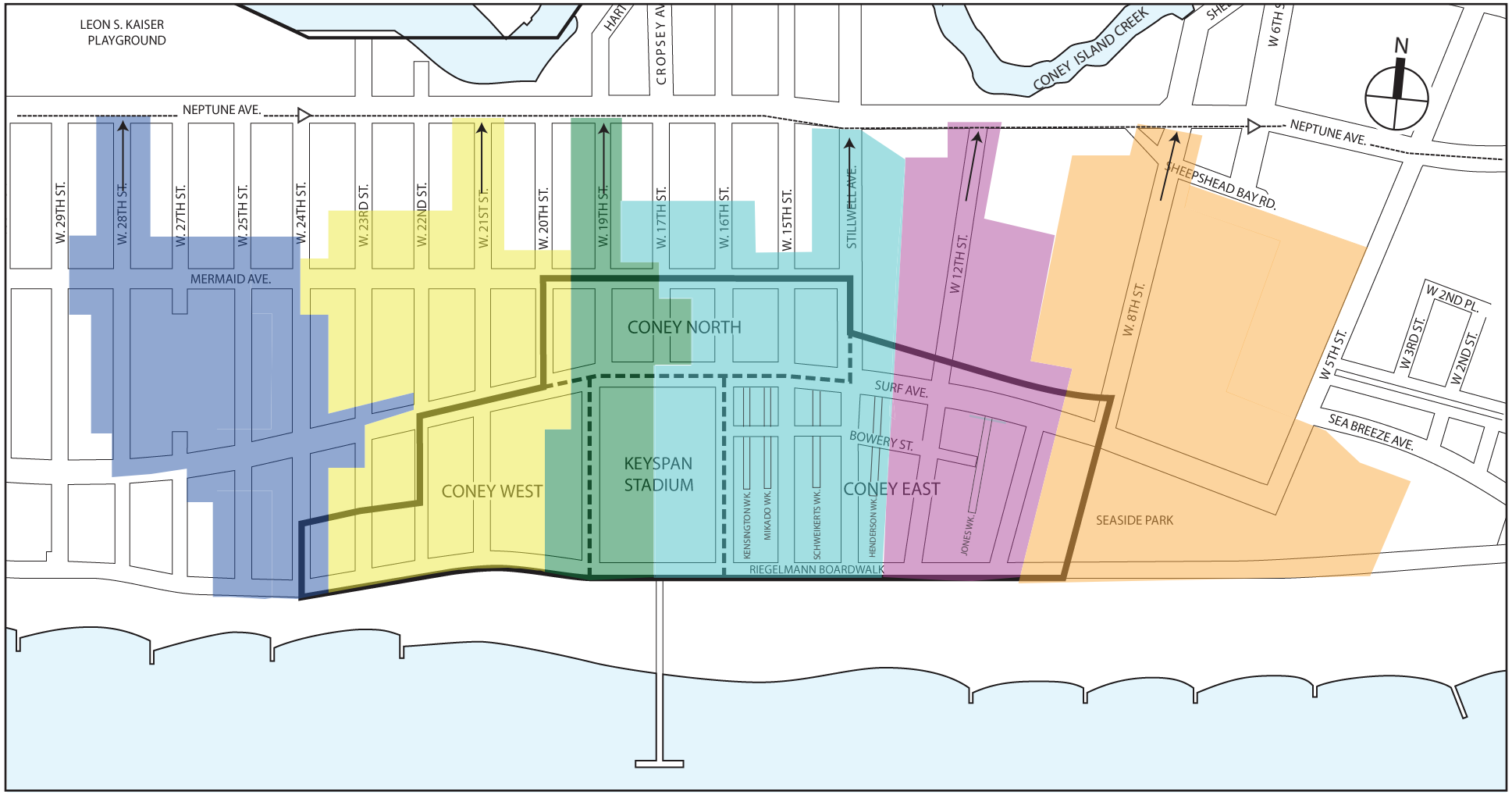

Catchment Area A

Catchment Area B

Catchment Area C

Catchment Area D

Catchment Area E

Catchment Area F

Proposed Rezoning Boundary

Proposed Rezoning Subarea Boundary

Sanitary Discharge Point to Interceptor

Existing Interceptor

Flow Direction

Note: Only Catchment Areas Originating in Rezoning Area are Shown

Existing Sanitary Sewers & Approximate Catchment Areas

main, beneath Mermaid Avenue between West 16th Street and Stillwell Avenue conveys wastewater east to Stillwell Avenue and then north to the interceptor in Neptune Avenue.

The fifth catchment area (Catchment Area E) also lies predominantly within the Coney East area and collects sanitary flow along West 10th Street between the Boardwalk and Surf Avenue, Surf Avenue between West 10th Street and West 12th Street, and West 12th Street between the Boardwalk and Neptune Avenue. The sanitary sewers in this area convey flow north to Surf Avenue and west to West 12th Street where a 24-inch sewer main conveys the wastewater flow north to the interceptor.

The sixth catchment area (Catchment Area F) lies predominantly east of the rezoning area and collects sanitary flow from Surf Avenue between West 5th Street and West 8th Street, West 5th Street between Sea Breeze Avenue and Surf Avenue, and West 8th Street between the Surf and Neptune Avenues. Sanitary sewers located beneath West 5th Street flow south to Surf Avenue and west to West 8th Street. A sanitary sewer located within a sewer easement serves the New York Aquarium and flows north to Surf Avenue and west to West 8th Street. The sewer beneath West 8th Street conveys waste water north to the interceptor in Neptune Avenue. The sewers in this area vary in size and are not smaller than 12-inches and increase to 24-inches before reaching the interceptor.

STORM SEWER SYSTEM

Within the rezoning area, the storm sewer system is limited. For example, within the rezoning area, there are no storm sewers within the streets and walks south of Surf Avenue with the exception of West 21st and 23rd Streets. There are four catchment areas within the rezoning area, as shown in Figure 5, which direct stormwater to various outfalls in both the Atlantic Ocean and the Coney Island Creek.

The first catchment area (Catchment Area A) is located along Surf Avenue between West 19th Street and West 27th Street. Storm sewers located beneath Surf Avenue in this area flow towards West 23rd Street and discharge to the Atlantic Ocean at the southern terminus of West 23rd Street. Sewers sizes in this area include 18-, 20-, 24-, 30-, 36-, and 42-inch mains.

The second area (Catchment Area B) is located along Mermaid Avenue between West 19th Street and West 24th Street and West 21st and West 23rd Streets between Surf Avenue and Neptune Avenue. Storm sewers located beneath Mermaid Avenue in this area flow towards West 21st Street. The sewer in West 21st Street conveys stormwater north from Surf Avenue to its discharge point in the Coney Island Creek near the intersection of West 21st Street and Neptune Avenue. Sewers sizes in this area include 15-, 18-, 20-, 22-, 24-, 2'-1" x 3'-2" egg, and 42-inch mains.

The third area (Catchment Area C) is located along Surf between West 12th Street and West 17th Street, Mermaid Avenue between Stillwell Avenue and West 17th street and West 15th Street between Surf Avenue and the Coney Island Creek. Storm sewers located beneath Surf and Mermaid Avenues in this area flow towards West 15th Street. The sewer in West 15th Street conveys stormwater north from Surf Avenue to its discharge point in the Coney Island Creek near the intersection of Hart Place and West 15th Street. Sewers sizes in this area include 20-, 22-, 24-, 30-, 36-, and 48-inch mains.

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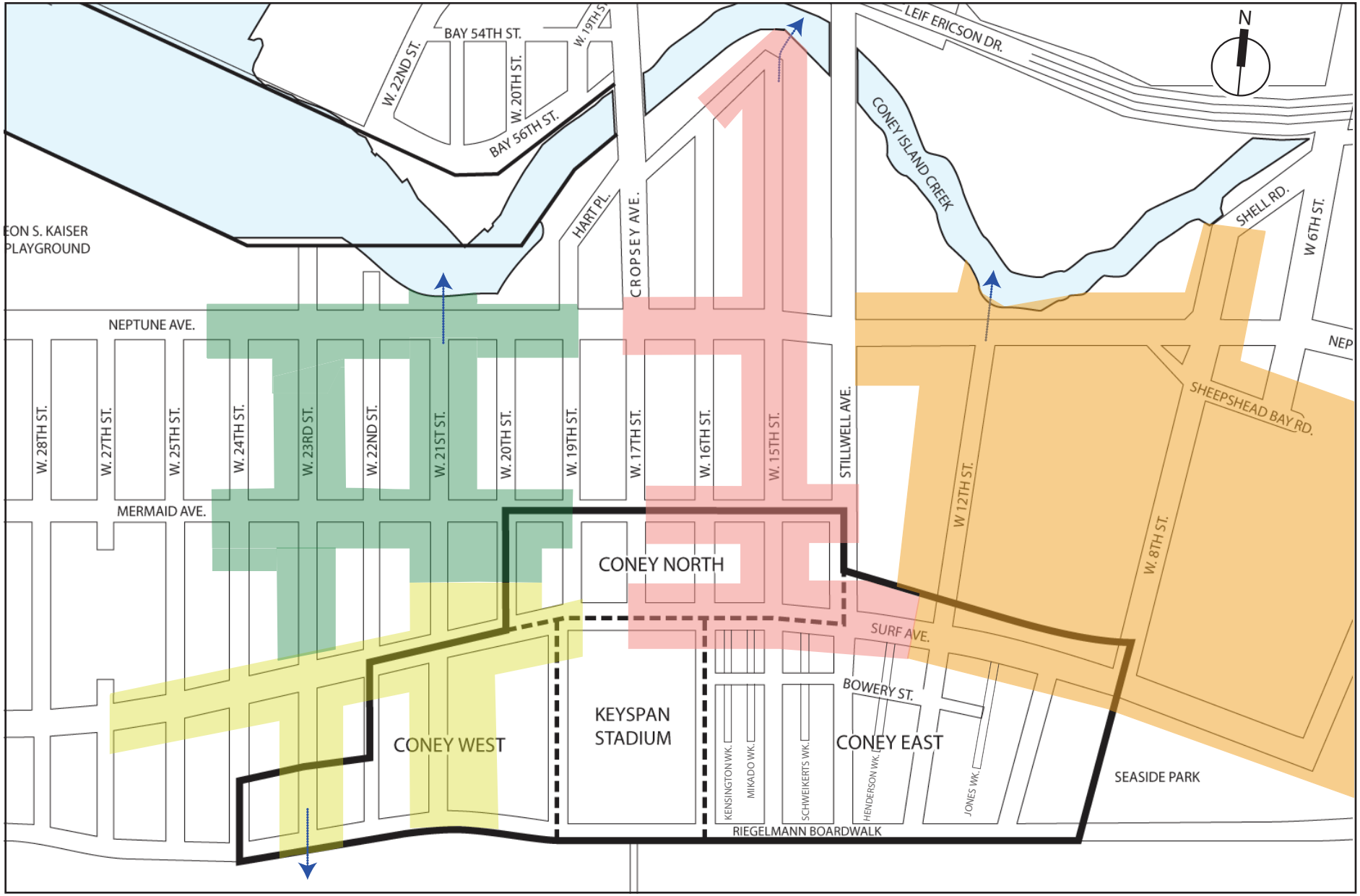

Catchment Area A

Catchment Area B

Catchment Area C

Catchment Area D

Note: Only Catchment Areas Originating in Rezoning Area are Shown

Proposed Rezoning Boundary

Proposed Rezoning Subarea Boundary

Stormwater Discharge Point

Existing Storm Sewers & Approximate Catchment Areas

Figure 5

The fourth area (Catchment Area D) consists of existing storm sewers located beneath Surf Avenue between West 8th Street and West 12th Street and beneath West 12th Street between Surf Avenue and Neptune Avenue. The sewers in this catchment area convey stormwater west beneath Surf Avenue, north beneath West 12th Street and ultimately discharge to the Coney Island Creek at an outfall located near the intersection of West 12th Street and Neptune Avenue. Sewers sizes in this area include 24-, 30-, 42-, and 60-inch mains.

SEWER COMPLAINT HISTORY

Data on recent water and sewer main complaints received by New York City's government information and non-emergency services hotline (311) was compiled from DEP records. These DEP records were obtained for the most recent three year period. The data was obtained for the street segments listed in Table 2, which includes the entire rezoning area and a large portion of the Coney Island neighborhood. Upon reviewing the data, it was noted that the majority of the complaints were in regards to minor infrastructure deficiencies including leaking water mains, broken fire hydrants and clogged catch basins. It should be noted, throughout the duration of the three year period for which records were obtained, the 8-inch sanitary sewer mains along the north and south sides of Surf Avenue between West 19th and West 24th Streets were frequently backed-up. These problems were all investigated and repaired/resolved by DEP within a timely manner.

OTHER UTILITIES

Information regarding the existing utilities located within the project limits was reviewed to understand how these utilities could be impacted by proposed infrastructure improvements within the rezoning area. Existing utilities within the project limits are described below. This information is not based on a completed utility survey.

CITY UTILITIES/AGENCIES

NYCDEP Water

New York City's water supply system is composed of three watersheds—Croton, Delaware, and Catskill—and extends as far north as the Catskill Mountains. In 2006, DEP delivered an average of approximately 1,069 million gallons of water per day (mgd) to the five boroughs and Westchester County. From these watersheds, water is carried to the City via a conveyance system made up of reservoirs, aqueducts, and tunnels extending as far as 125 miles north of the City. Within the City, a grid of water pipes distributes water to customers.

The Croton system supplied an average of 22 mgd, primarily to users in the lower-elevation portions of Manhattan and the Bronx. Groundwater from the Brooklyn Queens Aquifer supplied about 2 mgd, less than 1 percent of the average daily supply. The Delaware and Catskill systems supply all five boroughs and delivered about 98 percent of the City's drinking water in 2005.

Table 2: Sewer Complaint History

Street Name	Extents (From/To)	Final Mapped Right-Of-Way Width
West 8th Street	Boardwalk / Neptune Avenue	No Records
West 10th Street	Boardwalk / Surf Avenue	No Records
West 12th Street	Boardwalk / Neptune Avenue	Obtained
Stillwell Avenue	Boardwalk / Belt Parkway	No Records
West 15th Street	Boardwalk / Surf Avenue	Obtained
West 15th Street	Boardwalk/ Hart Place	Obtained
West 16th Street	Boardwalk / Hart Place	Obtained
West 17th Street	Surf Avenue / Coney Is. Creek U.S. Pier and Bulkead Line	Obtained
West 19th Street	Boardwalk / Neptune Avenue	Obtained
West 20th Street	Surf Avenue / Neptune Avenue	Obtained
West 21St Street	Boardwalk / Neptune Avenue	Obtained
West 22nd Street	Boardwalk / Coney Is. Creek U.S. Pier and Bulkead Line	Obtained
West 23rd Street	Boardwalk / Coney Is. Creek U.S. Pier and Bulkead Line	Obtained
West 24th Street	Boardwalk / Neptune Avenue	Obtained
West 25th Street	Boardwalk / Neptune Avenue	Obtained
West 27th Street	Boardwalk / Neptune Avenue	No Records
Highland Avenue	West 23rd Street to West 22nd Street	No Records
Surf Avenue	West 27th Street / West 8th Street	Obtained
Mermaid Avenue	West 27th Street / Stillwell Avenue	Obtained
Neptune Avenue	West 27th Street / West 8th Street	Obtained
Hart Place	West 17th Street / West 15th Street	Obtained
Cropsey Avenue	Neptune Avenue / Coney Is. Creek U.S. Pier and Bulkead Line	Obtained
Bowery	West 15th Street / Jones Walk	No Records
Kensington Walk	Boardwalk / Surf Avenue	No Records
Schweickerts Walk	Boardwalk / Surf Avenue	No Records
Stratton-Henderson Walk	Boardwalk / Surf Avenue	No Records
Jones Walk	Boardwalk / Surf Avenue	No Records

The Delaware and Catskill water systems collect water from watershed areas in the Catskill Mountains and deliver it to the Kensico Reservoir in Westchester County. This reservoir acts as the seasonally balancing reservoir. Summer demand is usually greater than winter demand. From the Kensico Reservoir, water is sent to the Hillview Reservoir in Yonkers, which balances the daily fluctuations in water demand and pressure to the system. From there, water is delivered to the City through three tunnels, Tunnel Nos. 1, 2, and 3. Tunnel No. 1 carries water through the Bronx and Manhattan to Brooklyn; Tunnel No. 2 travels through the Bronx, Queens, Brooklyn, and then through the Richmond Tunnel to Staten Island; and Tunnel No. 3 goes through the Bronx and Manhattan, terminating in Queens.

Water distribution maps were obtained from DEP in late 2007. Water mains currently exist within all of the roadways and walks within the project limits with the exception of Kensington Walk, Schweickerts Walk, and Bowery. The water mains are oriented in a grid system which equalizes water pressure in an area and allows a section to be cut off for repair and maintenance without affecting users not directly connected to that section. The water main size and the year constructed are summarized for each block in the Table 3 below.

Table 3: Existing Water Mains

Street Name	Extents (From/To)	Size	Year Built
West 8th Street	Boardwalk / midblock	8-Inch	1940
	midblock / Surf Avenue	8-Inch	1924
West 10th Street	Boardwalk / Surf Avenue	12-Inch	1924
West 12th Street	Boardwalk / midblock	6-Inch	1924
	midblock / Surf Avenue	8-Inch	1994
	Surf Avenue / Mermaid Avenue	12-Inch	1965
Stillwell Avenue	Boardwalk / midblock	8-Inch	2002
	midblock / Surf Avenue	8-Inch	1924
	Surf Avenue / Mermaid Avenue	20-Inch	1930
West 15th Street	Boardwalk / Surf Avenue	8-Inch	1924
	Surf Avenue / Mermaid Avenue	8-Inch	1994
West 16th Street	Boardwalk / midblock	8-Inch	1924
	midblock /Surf Avenue	No Records	No Records
	Surf Avenue / Mermaid Avenue	8-Inch	1906
West 17th Street	Surf Avenue / Mermaid Avenue	16-Inch	1905
West 19th Street	Boardwalk / midblock	12-Inch	1929
	midblock /Surf Avenue	12-Inch	1924
	Boardwalk / Surf Avenue	8-Inch	2001
	Surf Avenue / midblock	8-Inch	1916
	midblock / Mermaid Avenue	8-Inch	1921
West 20th Street	Surf Avenue / midblock	8-Inch	1915
	midblock / Mermaid Avenue	6-Inch	1917
West 21st Street	Boardwalk / midblock	8-Inch	1924
	midblock /Surf Avenue	12-Inch	1987
West 22nd Street	Boardwalk / Highland Avenue	6-Inch	1924
	Highland Avenue/Surf Avenue	6-Inch	1921
West 23rd Street	Boardwalk / Highland Avenue	6-Inch	1924
	Highland Avenue/Surf Avenue	8-Inch	1994
West 24th Street	Boardwalk / midblock	8-Inch	1929
	midblock /Surf Avenue	8-Inch	1924
Highland Avenue	West 23rd Street to West 22nd Street	8-Inch	1994
Surf Avenue	West 12th Street / West 8th Street	20-Inch	2005

Street Name	Extents (From/To)	Size	Year Built
	West 24th Street / West 8th Street	6-Inch	2001
	West 24th Street / Stillwell Avenue	8-Inch	1927
	Stillwell Avenue / West 8th Street	12-Inch	2003
	West 24th Street / West 22nd Street	16-Inch	1922
	West 22nd Street / midblock	6-Inch	1896
	midblock / West 17th Street	16-Inch	1922
	West 17th Street / West 16th Street	8-Inch	No Records
	West 16th Street / midblock	16-Inch	1923
	midblock / Stillwell Avenue	8-Inch	No Records
	West 12th Street / midblock	8-Inch	No Records
	midblock / West 8th Street	16-Inch	1923
Mermaid Avenue	West 20th Street / West 17th Street	8-Inch	1910
	West 17th Street / West 15th Street	8-Inch	1914
	West 15th Street / midblock	8-Inch	1994
	midblock / Stillwell Avenue	8-Inch	No Records
Bowery	West 15th Street / Jones Walk	-	-
Kensington Walk	Boardwalk / Surf Avenue	-	-
Schweickerts Walk	Boardwalk / Surf Avenue	-	-
Stratton-Henderson Walk	Boardwalk / Surf Avenue	16-Inch	1929
Jones Walk	Boardwalk / Surf Avenue	6-Inch	No Records
Boardwalk	West 24th Street / West 19th Street	16-Inch	1929
	West 19th Street / West 16th Street	16-Inch	1925
	West 16th Street / midblock	16-Inch	1929
	Midblock / West 15th Street	16-Inch	1940

According to DEP, there are currently no problems with the water distribution system's capacity, coverage, or pressure in the area. In 2007, AKRF initiated a conversation with DEP Bureau of Water Supply to determine existing water pressure within the rezoning area. Based on information provided by DEP, the water pressure within the Coney Island neighborhood at curb elevation is 45 pounds per square inch (psi).

PRIVATE UTILITIES

Electric service within the project limits is provided by Consolidated Edison Companies of New York (ConEd). Gas infrastructure within the project limits is maintained by Keyspan. Telecommunications services are provided within Coney Island and are maintained by Verizon and Empire City Subway.

D. PROPOSED CONDITIONS

DCP proposes zoning text changes to create a Special Coney Island District, establishing distinctive massing and design regulations to accompany the zoning map changes. The goals of the Special District are to facilitate the development of amusement-related and entertainment uses, to grow the amusement district, and to allow for residential development connecting to the existing neighborhood fabric. The Special District would allow for the redevelopment of Surf Avenue as a commercial boulevard with residential and hotel buildings. The massing would also respect the historic legacy of Coney Island's New York City Landmarks: the Parachute Jump, the Cyclone roller coaster, the Wonder Wheel, and Child's Restaurant. The rezoning proposal would establish height limits and massing controls that would create visual corridors to ensure that future developments do not block views to these historic icons.

For this to become a reality, there are several land use, zoning, and mapping changes that are required. The proposed project and the actions associated with the development are discussed below.

DESCRIPTION OF THE PROPOSED ACTIONS

The Office of the Deputy Mayor for Economic Development, in coordination with DCP and EDC, is proposing zoning map and text amendments, street mapping and demapping, disposition of City- and State-owned land for development, and park mapping affecting the Coney Island neighborhood of southern Brooklyn. The proposed actions are subject to *CEQR* procedures. The area affected by the proposed actions covers approximately 19 blocks in Coney Island, and is bounded generally by West 8th Street to the east, West 24th Street to the west, the Riegelmann Boardwalk and the beach to the south, and Mermaid Avenue to the north (see Figure 1).

Under the existing conditions and absent of the proposed rezoning and related actions, the rezoning area would continue to contain vacant land and asphalt parking lots for the majority of the 19 blocks. In the future with the proposed actions, the area would be redeveloped with a 27-acre amusement and entertainment district with a 12-acre amusement park at its centerpiece, as well as mixed-use developments in the Coney North and Coney West subdistricts. The Special Coney Island District will mandate that the buildings be located at the streetwall and that parking be wrapped within the future developments to activate the streets with ground-floor retail and residential uses. The zoning text will also mandate that rooftops be landscaped and that Best Management Practices (BMP) be implemented in future developments to facilitate on-site stormwater detention and to minimize stormwater runoff. The 12-acre amusement park will contain a mixture of pervious landscaped areas, open and enclosed amusements and small-scale buildings fronting on the Boardwalk.

ZONING MAP CHANGES

DCP proposes the creation of a Special Coney Island District that would define development parameters and urban design controls to guide the redevelopment of Coney Island. The Special Coney Island District includes four subareas: Coney East, the amusement and entertainment retail core; Coney North, with residential, hotel, and retail

uses; Mermaid Avenue, with residential and neighborhood retail uses and contextual zoning regulations transitioning to the existing neighborhood; and Coney West, a new beachfront residential neighborhood with retail and improved connections between KeySpan Park and western Coney Island, and between Surf Avenue and the Boardwalk.

As shown in Figure 2, the majority of the rezoning area is currently zoned C7, which allows a limited range of uses related to the operation of large-scale open amusements parks. The remaining portion of the rezoning area between Mermaid and Surf Avenues, West 20th Street, and Stillwell Avenue is zoned R6 with a C1-2 commercial overlay along Mermaid Avenue. The four subareas created within the Special Coney Island District are described below.

CONEY EAST SUBAREA

The Coney East subarea comprises seven blocks encompassing the historic amusement area located between Steeplechase Plaza and KeySpan Park, and the New York Aquarium. The existing C7 zoning district permits development of large scale, open amusement uses at FAR 2.0.

The properties fronting Surf Avenue located outside of the mapped parkland would be rezoned to an amended C7 district that would permit a broader range of amusement-related uses, including enclosed amusements, hotels, entertainment retail, dining and drinking establishments of all sizes, performance venues, and small beach-related retail uses. These uses would complement the uses allowed within the mapped parkland and would facilitate the creation of a year-round entertainment district. Hotel uses would be restricted to the blocks fronting Surf Avenue. Building heights, setback regulations and tower footprints would be defined in the Special District text.

CONEY NORTH SUBAREA

The Coney North subarea would include the five blocks between Mermaid and Surf Avenues, West 20th Street, and Stillwell Avenue. This area is currently zoned C7 and R6. As described above, the C7 district permits development of large open amusement uses at 2.0 FAR. The R6 district designation permits a maximum FAR of 3.0 for residential developments and 4.8 FAR for developments containing community facilities.

Under the proposed action, Block 7064 and portions of Blocks 7060, 7061, 7062, and 7063 fronting on Surf Avenue would be rezoned to R7X with a C2-4 commercial overlay, allowing for high-density residential development with ground-floor retail. Hotel uses would be permitted on Blocks 7063 and 7064 at a maximum depth of 200-feet from Surf Avenue. Entertainment and destination retail, local retail, community facilities, and offices would be allowed up to two stories and mandated on the ground floor on Surf Avenue. Residential building heights and setback regulations would differ from the standard R7D zoning regulations and would be defined in the proposed Special District text.

MERMAID AVENUE SUBAREA

Portions of Blocks 7060, 7061, 7062, and 7063 between West 15th Street and West 20th street within 100-feet of Mermaid Avenue would be rezoned from R6/C1-2 to R7A with a C2-4 commercial overlay at a 100-foot depth.

R7A contextual zoning districts permit residential developments and the contextual regulations of R7A zoning districts would apply to all new developments. The proposed C2-4 commercial overlay district will allow for a broader range of commercial retail and service uses than the existing C1-3 district.

CONEY WEST SUBAREA

The Coney West subarea would include the area located between Keyspan Park and West 22nd Street. These blocks are located within the C7 district. Block 7072 and portions of Blocks 7071 and 7073 located between KeySpan Park and West 22nd Street would be rezoned from C7 to R7D with a C2-4 commercial overlay.

Uses ranging from entertainment and destination retail, local retail to community facilities and offices would be allowed up to two stories and mandated on the ground-floor frontages along Surf Avenue. Buildings fronting on the Boardwalk would be required to provide two stories of commercial space, including beach and amusement related uses as well as small scale hotels limited to the second story. Residential uses would not be permitted directly on the Boardwalk. If the Abe Stark Rink is replaced on-site, it would not count towards FAR. Residential building heights and setback regulations would differ from the R7D regulations and would be defined in the Special District text.

MAP CHANGES OUTSIDE THE SPECIAL CONEY ISLAND DISTRICT

Portions of Block 7072 and 7071 located between West 22nd and West 24th Streets and within the C7 district that are not mapped parkland as part of the creation of Highland View Park would be rezoned to R5 as an extension of the existing adjacent R5 zoning district. These two portions of blocks contain vacant land, surface parking, and a health care facility. The R5 district designation allows for residential development at 1.25 FAR with a maximum building height of 40 feet.

PARKLAND MAPPING ACTIONS

DPR is proposing to map approximately 9 acres of parkland located between the existing KeySpan Park and the landmarked Cyclone roller coaster in order to protect the historic open amusements, and develop an approximately 390,000-sf, affordable, vibrant, open amusement and entertainment park. The proposed mapping action would create a continuous recreational parkland network in Coney Island of about 44 acres from Steeplechase Plaza to Asser Levy Park. Uses within the mapped park would range from rides, open and enclosed amusements, restaurants, indoor and outdoor performance venues, and accessory retail to park activities.

DPR is also proposing to map about 65,000-sf of parkland, located between West 22nd and West 23rd Streets near the Boardwalk, to create a new neighborhood park, tentatively named Highland View Park.

STREET MAPPING ACTIONS

DCP is proposing to amend the City Map to map and demap several new and existing streets within the rezoning area boundary in order to facilitate the development of the open amusement area and Highland View Park, and to allow for larger buildable footprints along Surf Avenue.

In Coney East, portions of West 10th Street, West 12th Street, Stillwell Avenue, and West 15th Street to be included in the mapped parkland area—as well as portions of the Bowery between West 15th and 16th Streets—are proposed to be demapped. A new 56-foot-wide street would be mapped, tentatively named New Bowery East, which would extend in an east-west direction adjacent the proposed mapped parkland boundary between West 10th and 16th Streets. A 43.38-foot wide extension of West 16th Street would be mapped along the existing parkland between Surf Avenue and New Bowery East to serve the newly created blocks and a 38-foot wide extension of Bowery would also be mapped between Jones Walk and West 10th Street. In addition, West 15th Street would be narrowed from 88.67-feet wide to 75-feet wide and West 10th Street would be shifted slightly west and would provide a 56-foot wide mapped right-of-way.

In Coney West, Highland View Avenue and portions of West 22nd Street are proposed to be demapped to facilitate the development of Highland View Park. A new 75-foot-wide street, tentatively named New Bowery, would be mapped from east to west between West 19th Street and West 22nd Street to break down the blocks and create a new street network between Surf Avenue and the Boardwalk. In addition, a new 68-foot-wide street would be mapped between Surf Avenue and the Boardwalk as an extension of West 20th Street with a cul-de-sac near the Boardwalk and a new 56-foot-wide street would also be mapped between Surf Avenue and New Bowery as an extension of West 19th Street. To accommodate the proposed extensions of West 19th and 20th Streets, existing parkland which currently provides an ice skating rink and a parking lot would be demapped.

INFRASTRUCTURE

Independent of the proposed rezoning, DEP has discussed future water and storm sewer main improvements throughout the Coney Island neighborhood that could occur. The Coney Island area is currently served by separate storm and sanitary sewers and the existing storm sewers discharge to both the Atlantic Ocean and the Coney Island Creek. Although there is no identified improvement plan nor a timeline to implement such improvements, DEP has discussed redirecting stormwater runoff currently being discharged into the Atlantic Ocean to the Coney Island Creek, as well as providing storm sewers in streets which currently to do not have storm sewers. Due to topographic limitations, mainly the area's uniform topography, if storm sewer improvements are made within the Coney Island area, extensive sanitary sewer main relocations will also be required due to pipe conflicts which are inevitable when designing sewer systems at the same approximate elevation and with little available depth and/or lateral clearance.

Additionally, as part of the rezoning, several new streets are proposed within the Coney East and Coney West subareas. These proposed streets will typically require both sanitary and storm sewer mains to service the future developments at the adjacent sites. Likewise,

as part of the proposed rezoning, several streets will be demapped within the rezoning area and existing infrastructure provided beneath these demapped streets would be removed. An Amended Drainage Plan (ADP) would need to be developed to address any major changes to the existing DEP sewer network.

In addition to possible sewer main improvements, DEP has identified future water improvements throughout the City and the Coney Island neighborhood. The overall water supply system in New York City is not expected to change extensively in the future. However, certain changes are expected to the water supply system within the City. The City has initiated a comprehensive water conservation program that seeks to reduce water use by implementing a metering program and requiring that all new plumbing fixtures in the City, including those in existing and new structures, be of low-flow design (Local Law No. 29, 1989). Other measures—including leak detection programs, water meters, and locking fire hydrant caps—are aimed at further reducing the City's water needs and will serve to reduce water demand and flows to sewage facilities. DEP projects that over the next decade, the savings from these conservation measures will offset some of the expected increase in water demand from consumers. In addition, Stage 2 of water supply Tunnel No. 3 is now under construction in Manhattan, Queens, and Brooklyn. When Tunnel No. 3 is completed, it will enhance and improve the adequacy and dependability of the entire water supply system and improve service and pressure to outlying areas of the City. It will also allow DEP to inspect and repair Tunnel No. 1 for the first time since it was activated.

DEP is planning future infrastructure improvements to watermains within the Coney Island neighborhood to improve water pressure within the area. The comprehensive plan showing improvements is currently being developed. Based on information obtained from DEP regarding their preliminary plan, it is understood that one (1) 36-inch trunk main will be required in the following locations:

- Stillwell Avenue between Surf and Neptune Avenues;
- Surf Avenue between Stillwell Avenue and West 31st Street;
- West 31st Street or West 37th Street between Surf and Neptune avenues; and,
- Neptune Avenue between Stillwell Avenue and West 31st Street.

Currently, there is no schedule for implementing these water main improvements.

E. HYDRAULIC ANALYSIS

The hydraulic analysis completed as part of this report will determine whether the existing infrastructure throughout Coney Island is capable of supporting existing zoning demand and whether higher density developments and the associated increased wastewater flows that will be generated could also be accommodated. The analysis methodology, assumptions, and results are discussed below.

METHODOLOGY

In order to determine whether the sewers have adequate capacity to certain zoning densities, calculations were completed to determine the capacity of the sewers as well as the estimated flow generated by the existing surrounding zoning designations for both sanitary and storm sewer systems.

The capacity of each sanitary and storm sewer segment was calculated by utilizing the Manning's Formula for Single-Pipe Flow, which is

$$V = 1/nR_h^{2/3}S^{1/2}$$

where V is the velocity of flow within the pipe, n is the Manning's Roughness Coefficient for the pipe segment, R is the pipe's wetted perimeter, and S is the slope of the pipe. With information from the proposed sewer mains (pipe size, cross-sectional area, wetted perimeter, hydraulic radius, slope, length), the velocity of flow within the pipe can be determined. Once the velocity of the pipe segment is found, using the relationship of flow, velocity and pipe size, which is

$$Q = VA$$

where Q is the rate of flow within the pipe, V is the velocity of flow for the pipe segment and A is the area of the pipe, the pipe's capacity can be determined.

The storm and waste water flows within the sanitary and storm sewer mains were estimated using methodology outlined in DEP's Rules and Regulations Governing the Construction of Private Sewers and Drains.

To estimate stormwater volume the Rational Method is applied, which is

$$Q=CRA$$

where Q is the volume of runoff, C is the runoff coefficient, R is the rainfall intensity in inches/hour, and A is the contributory area in square feet. The contributory areas are determined by estimating the area which utilizes the sewer segment. The contributory area for each segment also includes any upstream contributory areas. The rainfall intensity is a function of time and is calculated by

$$R = 125/ (T+15)$$

where R is the rainfall intensity and T is the time of concentration for flow within the sewer segment. The time of concentration is calculated by summing the entrance time of the runoff into the system and the calculated running time of the water within the pipe assuming full capacity. The initial entrance time for developed areas is assumed to be six (6) minutes at the upstream end of a sewer, therefore the highest value of R is equivalent

to 5.95 inches/hour. The runoff coefficient (C) is determined based on approved DEP values. For this analysis, the runoff coefficient was assumed to be 0.75 for developed areas and 0.20 for green park areas (a runoff coefficient of 0.75 was used for mapped parkland where amusements are located under existing and proposed conditions).

The maximum design flow for domestic waste water in the sanitary sewers is calculated with a formula developed by DEP, which is

Max. Design Flow (Q_{des}) = (avg. domestic flow * peak factor) +
(avg. industrial waste flow * industrial peak factor) + infiltration

To calculate the average domestic flow, DEP has developed guidelines which correspond zoning designations to population densities per acre for both commercial and residential areas. Based on the calculated population density for the contributory area and an assumed usage rate of 150 gallons per person per day, the average domestic wastewater flow is calculated. For park areas, it is assumed that 2,000 gallons per acre per day of wastewater is generated (parks are considered to be "green" park areas, not amusement areas mapped as parkland). To account for peak flow, a peak factor is applied to the average domestic flow rate. This peak factor is obtained from the City of New York Board of Estimate Curve for domestic flow.

To calculate average wastewater flows for industrial areas, it is assumed that 10,000 gallons per acre per day of wastewater is generated. This rate of 10,000 gallons is multiplied by a factor dependent on the manufacturing zoning designation. To account for the peak flow within industrial areas, a peak factor of 2 is applied to the average flow. DEP typically requires sanitary sewers be constructed 10-feet beneath the surface (and minimally 8-feet beneath) and it is necessary to account for groundwater infiltration into the pipe. For Coney Island, the surface elevation is below +12.0, and an infiltration rate of 0.00242 cfs/acre was used.

Once the capacity of the sewers is determined and the flow within the sewers is estimated as described above, a comparison of the total flow versus the sewer capacity was made to determine which sewer segments have adequate capacity to support existing and increased zoning densities.

As AKRF analyzed the existing sewer network, using DEP Infiltration and Inflow Maps, DEP GIS data, and DEP sewer as-built drawings, it was assumed that the existing interceptor was sized appropriately and could handle the increased flows generated by the rezoning area. For this reason, AKRF did not analyze the interceptor sewer as part of our analysis.

EXISTING DENSITIES

When calculating wastewater flows, the flow generated is directly correlated to the area's zoning densities, as discussed above under methodology. The Coney Island area includes various existing zoning designations including R5, R6, R7, C7, C8-1, M1-2 and Park. The standard DEP flows assumed to be generated by these designations is summarized in Table 4.

The proposed actions propose to rezone several of these areas, as well as modify the zoning text. By modifying the zoning text, the development and densities allowed within a specific zoning designation changes.

Table 4: Average WasteWater Flows

Zoning Designation	Density	Average Flow
Residential		
R5	100 persons per acre	150 gallons per person per day
R6	170 persons per acre	150 gallons per person per day
R7	230 persons per acre	150 gallons per person per day
R8	375 persons per acre	150 gallons per person per day
Commercial / Industrial		
PARK	N/A	2,000 gal per acre per day
C7	N/A	5,000 gallons per acre per day * zoning designation factor of 2
C8-1	N/A	5,000 gallons per acre per day * zoning designation factor of 1
M1-2	N/A	10,000 gallons per acre per day * zoning designation factor of 2

Source: Based on standard DEP flow rates presented in DEP's Rules and Regulations Governing the Construction of Private Sewers and Drains.

RESULTS

AKRF analyzed sanitary and storm sewer mains that originate within the rezoning area to determine where existing sewer infrastructure could accommodate increased zoning densities. Detailed calculations are provided in Appendix A.

Based on the results of the hydraulic analysis, the majority of the existing sanitary sewer system is sized adequately to accommodate the flow generated by the existing zoning demand, however; to accommodate the proposed rezoning of the entire area, sanitary sewer improvements would be necessary in some areas. Many of the existing storm sewers are not sized to accommodate the current DEP design storm under existing zoning, therefore, where these sewers are beyond capacity, they would need either to be upgraded or stormwater management practices and BMP strategies would need to be implemented to ensure that site developed storm flow would not be greater than existing storm flow to these storm sewers. The hydraulic study results of each system are described in detail below followed by a summary of sewer capacity limitations by general rezoning subarea.

SANITARY SEWER SYSTEM

Of the five sanitary catchment areas analyzed, sanitary sewer mains within the rezoning area within all the catchment areas provide adequate capacity to accommodate full build out of existing zoning densities, however; the mains within Catchment Areas A and B which convey wastewater from the rezoning area to the interceptor beneath Neptune Avenue are either near or beyond capacity for existing zoning demand. The remaining sanitary sewer mains throughout the area have varying amounts of capacity.

Since there are several sanitary mains within Catchment Areas A and B which are near or beyond capacity, assuming full build out of existing zoning densities, increased wastewater flows generated by proposed increased zoning densities in the Coney West and portions of the Coney North subareas could not be handled by the existing 10-inch sanitary sewer main beneath West 24th Street between Surf and Mermaid Avenues (Catchment Area A), 12-inch sanitary sewer main beneath West 21st Street between Surf and Mermaid Avenues (Catchment Area B), and 18-inch sanitary sewer main beneath West 21st Street between Mermaid and Neptune Avenues (Catchment Area B), which are all located outside the rezoning area. These sewer segments are identified in Table 5 and are shown in Figure 6.

Table 5: Sanitary Sewer Mains Near or Beyond Capacity

Street Name	Extents (From/To)	Size (in)	Sanitary Flow (cfs)	Capacity (cfs)	Notes
Sanitary Catchment Area A					
West 24th Street	Surf Ave / Mermaid Ave	10	1.28	1.30	Near Capacity
Sanitary Catchment Area B					
West 21st Street	Surf Ave / Mermaid Ave	12	1.29	1.17	Beyond Capacity
West 21st Street	Mermaid Ave / Neptune Ave	18	3.90	3.68	Beyond Capacity

Sanitary sewer mains within Catchment Areas C, D, and E, which service the Coney East and portions of the Coney North subareas, have varying amounts of additional capacity. The sewers within these catchment areas could accommodate increased wastewater flows generated by increased zoning densities. Table 6 below, identifies each sewer segment within Catchment Areas C, D, and E, the segment's calculated wastewater flow assuming full build out of existing zoning densities, the segment's calculated capacity and the additional percentage of available capacity.

Table 6: Sanitary Sewer Mains with Additional Capacity

Street Name	Extents (From/To)	Size (in)	Sanitary Flow (cfs)	Capacity (cfs)	Add'l Capacity Available cfs[1] / %
Sanitary Catchment Area C					
West 19th St	Boardwalk / Surf Ave	8	0.31	0.77	0.46/60%
West 19th St	Surf Ave / Mermaid Ave	10	0.69	1.20	0.51/42%
West 17th St	Surf Ave / Mermaid Ave	8	0.33	0.81	0.48/60%
Mermaid Ave	West 17th St / West 19th St	8	0.48	0.78	0.30/38%
West 19th St	Mermaid Ave / Neptune Ave	12	1.59	1.70	0.10/6%
Sanitary Catchment Area D					
Surf Ave	West 17th St / West 16th St	8	0.07	0.87	0.81/92%
West 16th St	Mermaid Ave / Surf Ave	12	0.04	4.66	4.62/99%
West 16th St	Boardwalk / Surf Ave	8	0.16	0.81	0.66/81%
West 16th St	Boardwalk / Surf Ave	9	0.12	0.79	0.67/85%

Street Name	Extents (From/To)	Size (in)	Sanitary Flow (cfs)	Capacity (cfs)	Add'l Capacity Available cfs[1] / %
Surf Ave	West 16th St / Kensington Wk	10	0.43	1.38	0.95/67%
Kensington Wk	Boardwalk / Bowery	9	0.04	0.75	0.71/95%
Bowery	West 16th St / Kensington Wk	9	0.02	1.25	1.23/98%
Kensington Wk	Bowery / Surf Ave	9	0.09	0.72	0.64/88%
Surf Ave	Kensington Wk / West 15th St	12	0.53	1.97	1.43/73%
Walk	Boardwalk / Bowery	9	0.02	0.74	0.72/97%
Walk	Bowery / Surf Ave	9	0.03	0.73	0.70/96%
Surf Ave	Kensington Wk / West 15th St	12	0.56	3.76	3.20/85%
West 15th St	Boardwalk / Bowery	8	0.10	0.74	0.64/87%
Bowery	Kensington Wk / West 15th St	9	0.02	2.06	2.04/99%
West 15th St	Bowery / Surf Ave	8	0.14	0.71	0.57/81%
West 15th St	Boardwalk / Bowery	9	0.08	0.65	0.57/88%
West 15th St	Bowery / Surf Ave	9	0.10	0.91	0.80/89%
Surf Avenue	West 12th St / Henderson Wk	8	0.04	0.75	0.71/90%
Bowery	Boardwalk / Bowery	9	0.04	0.91	0.87/96%
Henderson Wk	Boardwalk / Bowery	9	0.10	0.71	0.61/86%
Bowery	Stillwell Ave / Bowery	9	0.02	1.21	1.19/98%
Henderson Wk	Boardwalk / Bowery	9	0.19	0.95	0.76/80%
Surf Ave	Henderson Wk / Stillwell Ave	10	0.28	1.12	0.84/71%
Stillwell Ave	Boardwalk / Bowery	8	0.06	0.77	0.70/92%
Stillwell Ave	Bowery / Surf Ave	8	0.09	0.63	0.54/86%
Stillwell Ave	Boardwalk / Bowery	8	0.07	0.71	0.64/90%
Stillwell Ave	Bowery / Surf Ave	8	0.10	0.60	0.50/84%
Surf Ave	Stillwell Ave / Schweickerts	10	0.48	1.50	1.02/65%
Schweickerts	Boardwalk / Bowery	9	0.10	0.91	0.81/89%
Bowery	Stillwell Ave / Schweickerts	9	0.02	1.14	1.12/98%
Bowery	West 15th St / Schweickerts	9	0.02	1.12	1.10/98%
Schweickerts	Bowery / Surf Ave	9	0.16	0.70	0.54/77%
Surf Avenue	Schweickerts / West 15th St	10	0.67	0.88	0.21/19%
West 15th St	Surf Ave / Mermaid Ave	18	1.58	4.72	3.14/66%
West 17th St	Neptune Ave / Mermaid Ave	12	0.32	2.46	2.13/87%
Mermaid Ave	West 17th St / West 16th St	8	0.48	0.81	0.33/41%
West 16th St	Surf Ave / Mermaid Ave	12	0.17	1.78	1.61/91%
Mermaid Ave	West 16th St / West 15th St	8	0.71	1.16	0.45/39%
Stillwell Ave	Surf Ave / Mermaid Ave	8	0.48	0.86	0.39/44%
Mermaid Ave	Stillwell Ave / West 15th St	8	0.56	1.54	0.98/64%
West 16th St	Neptune Ave / Mermaid Ave	12	0.36	2.79	2.43/87%
Mermaid Ave	West 16th St / West 15th St	72	0.44	68.81	68.37/99%
Mermaid Ave	West 15th St / Stillwell Ave	72	2.90	75.08	72.19/96%

Street Name	Extents (From/To)	Size (in)	Sanitary Flow (cfs)	Capacity (cfs)	Add'l Capacity Available cfs[1] / %
Stillwell Ave	Mermaid Ave / Neptune Ave	72	3.67	73.47	69.80/95%
Sanitary Catchment Area E					
West 10th St	Boardwalk / Surf Ave	12	0.19	2.93	2.73/93%
Surf Ave	West 10th St / Jones Walk	15	0.23	2.41	2.18/91%
Jones Wk	Boardwalk / Bowery	9	0.13	0.92	0.79/77%
Bowery	West 12th St / Jones Walk	9	0.04	0.85	0.81/95%
Jones Wk	Bowery / Surf Ave	9	0.21	0.81	0.60/67%
Surf Ave	Jones Walk / West 12th St	15	0.47	2.41	1.94/81%
Surf Ave	West 10th St / West 12th St	12	0.11	1.79	1.68/94%
West 12th St	Boardwalk / Bowery	9	0.07	1.45	1.38/95%
West 12th St	Bowery / Surf Ave	12	0.10	3.12	3.03/97%
West 12th St	Boardwalk / Bowery	8	0.08	1.07	0.99/93%
West 12th St	Bowery / Surf Ave	8	0.10	1.07	0.97/91%
West 12th St	Surf Ave / Neptune Ave	24	2.27	7.81	5.54/71%
Sanitary Catchment Area F					
Surf Ave	West 10th St / West 8th St	12	0.02	1.27	1.24/98%
Surf Ave	West 10th St / West 8th St	12	0.13	2.16	2.02/94%
West 8th St	Surf Ave / Neptune Ave	24	2.47	6.25	3.78/61%

Notes: 1. Error between sum of Sanitary Flow plus Capacity and Additional Capacity is due to rounding.

In addition to calculating existing zoning demand, a sensitivity analysis was completed to identify the amount of increased zoning can be supported by existing infrastructure. The proposed action will rezone the project area to include areas of R7A, R7D, R7X and a modified C7 district. Therefore, the increased upstream zoning density of R7/R8 was chosen for the sensitivity analysis because, it was assumed that the proposed action would correspond with, and not exceed, the published population densities for these zoning designations. Based on existing zoning demand, sanitary sewers within Sanitary Catchment Areas A and B can not support increased zoning densities, however; infrastructure within Catchment Areas C, D, and E can handle increased wastewater flows generated by R6, R7 and/or R8 zoning densities. Detailed calculations are presented in Appendix A and are summarized below by catchment area.

Catchment Area C: Although the sewer mains within this catchment area, within the rezoning area, can handle increased wastewater flows generated by higher density zoning (R7/R8) for the entire upstream areas, the 12-inch sanitary trunk main (located outside the rezoning area) beneath West 19th Street between Mermaid and Neptune Avenues which conveys sanitary flow from the rezoning area to the interceptor can only handle increased wastewater flows of approximately 0.10 cfs which would correspond to increasing approximately 1.80-acres (10-percent) of the upstream 17.73-acres acres of C7/R6 zoning designations to R7 (see Figure 6 and Appendix C).

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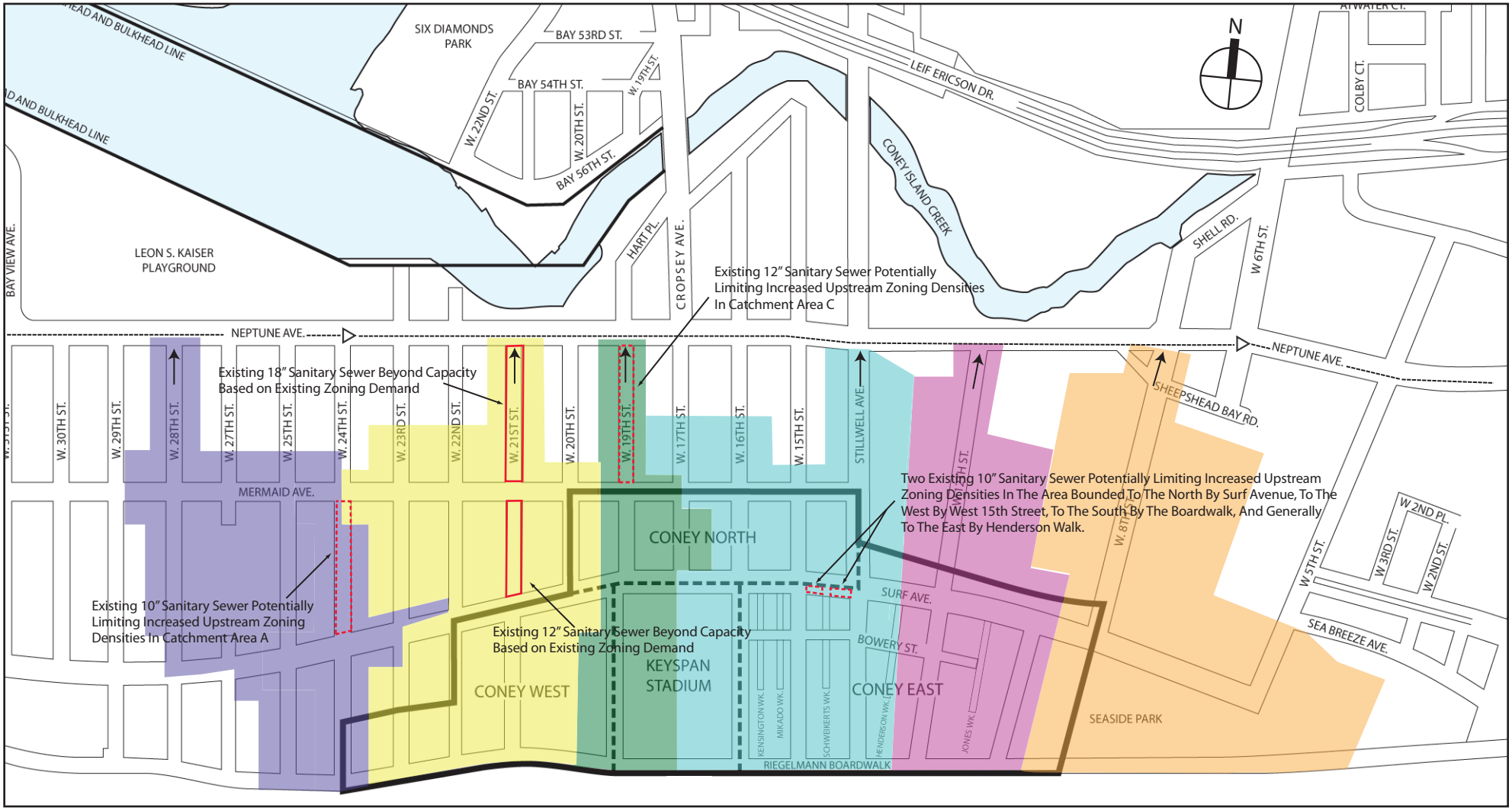

Catchment Area A
Catchment Area B
Catchment Area C
Catchment Area D
Catchment Area E
Catchment Area F

Note: Only Catchment Areas Originating in Rezoning Area are Shown

Identifies Location of Sanitary Sewer Segment Beyond Capacity Based on Existing Zoning Demand

Identifies Location of Sanitary Sewer Segment Which Limits Increased Upstream Zoning Densities Based on Proposed Zoning Demand

Proposed Rezoning Boundary

Proposed Rezoning Subarea Boundary

Sanitary Discharge Point to Interceptor

Existing Interceptor

Flow Direction

CONEY ISLAND REZONING • HYDRAULIC STUDY

Sanitary Sewer • Hydraulic Study Results

Figure 6

Catchment Area D: Almost all the sewer mains within this catchment area can accommodate increased waste water flows generated by higher density zoning (R7/R8) for the entire upstream areas. However, the 10-inch sewer main beneath Surf Avenue between Schweikerts Walk and West 15th Street (shown in Figure 6 and conveys wastewater flow—from the area bounded to the north by Surf Avenue, to the west by West 15th Street, to the south by the Boardwalk, and generally to the east by Henderson Walk—towards the trunk main) can only accommodate increased flows of approximately 0.16 cfs, which would correspond to either increasing 2.05-acres (17-percent) of the existing C7 upstream 11.83-acre area to an R6 zoning designation or increasing 1.30-acres (11-percent) of the existing C7 zoning designation in this area to an R7 zoning designation. In addition, the 10-inch sewer main beneath Surf Avenue between Stillwell Avenue and Schweikerts Walk shown in Figure 6 (which conveys wastewater flow from the area bounded to the north by Surf Avenue, generally to the west by Schweikerts Walk, to the south by Riegelmann Boardwalk, and generally to the east by Henderson Walk towards the trunk main) can only accommodate increased flows of approximately 0.97 cfs, which would correspond to either increasing the entire upstream area (8.49-acres) of the existing C7 zoning designation in this area to an R6 zoning designation, increasing 7.52-acres (89-percent of the upstream area) of the existing C7 zoning designation in this area to an R7 zoning designation, or increasing 3.98-acres (47-percent of the upstream area) of the existing C7 zoning designation in this area to an R8 zoning designation. The existing 72-inch trunk main can accommodate increased flow for the entire catchment area generated from an R8 designation.

Catchment Area E: The sewer mains within this catchment area can handle increased waste water flows generated by higher density zoning (R7/R8) for the entire upstream areas.

Catchment Area F: The sewer mains within this catchment area can handle increased waste water flows generated by higher density zoning (R8) for the entire upstream areas.

It should be noted that this analysis, identifying increased zoning densities, does not consider any infrastructure modifications that would be required to construct the proposed street network (i.e. sewers that may be added/removed as part of the proposed project). In addition it does not consider any changes to the City map related to parkland. This analysis was completed to determine the amount of area where existing zoning densities could be increased without implementing any infrastructure improvements.

Any proposed streets will typically require both sanitary and storm sewer mains to service the future developments at the adjacent sites. Likewise, any infrastructure located beneath any street to be demapped within the rezoning area would be removed and would not be available to adjacent properties for connection. An Amended Drainage Plan would need to be developed to address any major changes to the existing DEP sewer network.

STORM SEWER SYSTEM

As stated above storm sewer infrastructure is limited within the rezoning area and twenty (20) pipe segments located throughout the various catchment areas are currently beyond capacity for the current DEP design storm criteria. Table 7 below, identifies the storm

Table 7: Existing Storm Sewer Mains Flow and Capacity

Street Name	Extents (From/To)	Size (in)	Storm Flow (cfs)	Capacity (cfs)	Notes
Storm Catchment Area A					
Surf Avenue	West 19th St / West 20th St	20	2.90	4.49	
West 20th Street	Mermaid Ave / Surf Ave	18	5.17	4.60	Beyond Capacity
Surf Avenue	West 20th St / West 21st St	24	9.91	3.45	Beyond Capacity
West 21st Street	Mermaid Ave / Surf Ave	18	7.43	4.84	Beyond Capacity
Surf Avenue	West 21st St / West 22nd St	30	16.20	13.54	Beyond Capacity
Surf Avenue	West 22nd St / West 23rd St	36	17.33	22.08	
Surf Avenue	West 19th St / West 20th St	18	2.78	3.85	
Surf Avenue	West 20th St / West 21st St	20	6.58	5.10	Beyond Capacity
West 21st Street	Boardwalk / Surf Ave	30x19	27.47	9.48	Beyond Capacity
Surf Avenue	West 21st St / West 22nd St	24	31.61	4.26	Beyond Capacity
Surf Avenue	West 22nd St / West 23rd St	24	29.90	4.34	Beyond Capacity
Surf Avenue	West 27th St / West 25th St	20	2.87	5.10	
Surf Avenue	West 25th St / West 24th St	24	5.30	8.85	
West 24th Street	Mermaid Ave / Surf Ave	15	2.04	2.64	
Surf Avenue	West 24th St / West 23rd St	30	9.16	12.02	
Surf Avenue	West 27th St / West 25th St	18	2.99	4.08	
Surf Avenue	West 25th St / West 24th St	20	5.50	4.80	Beyond Capacity
Surf Avenue	West 24th St / West 23rd St	24	7.42	7.95	
West 23rd street	Surf Ave / Boardwalk	42	66.56	36.06	Beyond Capacity
Storm Catchment Area B					
Mermaid Ave	West 19th St / West 20th St	20	4.63	7.28	
West 20th Street	Surf Ave / Mermaid Ave	18	6.47	5.59	Beyond Capacity
Mermaid Ave	West 20th St / West 21st St	24	14.72	9.60	Beyond Capacity
Storm Catchment Area C					
Surf Avenue	West 17th St / West 16th St	22	7.45	10.69	
Surf Avenue	West 16th St / West 15th St	30	12.23	14.92	
Surf Avenue	West 12th St / West 15th St	24	14.60	7.99	Beyond Capacity
West 15th St	Surf Ave / Mermaid Ave	36	30.80	18.76	Beyond Capacity
Mermaid Ave	Stillwell Ave / West 15th St	20	4.71	6.23	
Mermaid Ave	West 17th St / West 16th St	20	4.63	4.18	Beyond Capacity
Mermaid Ave	West 16th St / West 15th St	24	8.27	12.28	
West 15th Street	Mermaid Ave / Neptune Ave	48	52.90	43.08	Beyond Capacity
Storm Catchment Area D					
Surf Avenue	West 8th St / West 10th St	24	0.93	6.43	
Surf Avenue	West 10th St / West 12th St	24	10.21	6.43	Beyond Capacity
Sewer Easem'nt	Boardwalk / Surf Ave	24	9.38	6.98	Beyond Capacity

Street Name	Extents (From/To)	Size (in)	Storm Flow (cfs)	Capacity (cfs)	Notes
Sewer Easem'nt	Boardwalk / Surf Ave	30	12.91	11.30	Beyond Capacity
Surf Avenue	Sewer Easem'nt / West 10th St	30	13.78	12.05	Beyond Capacity
Surf Avenue	West 10th St / Jones Walk	42	14.84	23.14	
Surf Avenue	Jones Walk / West 12th St	42	15.64	25.46	
West 12th Street	Surf Ave / Neptune Ave	60	47.33	93.60	

sewer segments within the analyzed catchment areas, the pipe's capacity, and the pipe's calculated flow. Figure 7 identifies the location of the storm sewer segments that are beyond capacity.

As shown in Figure 7 and as identified in Table 7, the stormwater sewers which direct flow downstream of the rezoning area within Catchment Areas A, B, and C are beyond capacity for DEP's current storm criteria, however; the 60-inch main, beneath West 12th Street between Surf and Neptune Avenues which conveys flow from Catchment Area D towards the existing outfall at the Coney Island Creek, has additional capacity.

SEWER CAPACITY LIMITATIONS

With no changes to the existing sewer infrastructure, the storm sewer system would remain limited and many storm sewer mains would continue to operate without sufficient capacity for current DEP design criteria. Additionally, some sanitary sewers would not be able to accommodate proposed zoning demand increases. The storm and sanitary sewer segments that are near or beyond capacity under existing and proposed zoning designations are identified in Figure 8 and are summarized below by general rezoning subarea.

The Coney West subarea is served by sanitary sewers within Sanitary Catchment Areas A, B, and C, and by storm sewers within Storm Catchment Area A which discharges to the Atlantic Ocean. Within this rezoning subarea, the sanitary sewer mains beneath West 19th, West 21st and West 24th Streets (see Figure 8), which convey wastewater from the rezoning area to the interceptor, can not accommodate increased demand from proposed zoning densities. Additionally, five of six existing storms sewer segments serving the Coney West subarea are beyond capacity for the current DEP design storm (see Table 7).

The Coney North subarea is served by sanitary sewers within Sanitary Catchment Areas B, C, and D, and by storm sewers within Storm Catchment Areas A, B, and C. Within this rezoning subarea, the sanitary sewer mains beneath West 19th and West 21st Streets, which convey wastewater from the rezoning area to the interceptor, can accommodate some increased demand from proposed zoning densities. Additionally, some of the existing storms sewers servicing the subarea are beyond capacity; and, the downstream mains which convey stormwater from the subarea to the Atlantic Ocean and Coney Island Creek outfalls for Storm Catchment Areas A, B, and C are beyond capacity.

The Coney East subarea is served by sanitary sewers within Sanitary Catchment Areas D, E, and F, and by storm sewers within Storm Catchment Areas C and D. Within this

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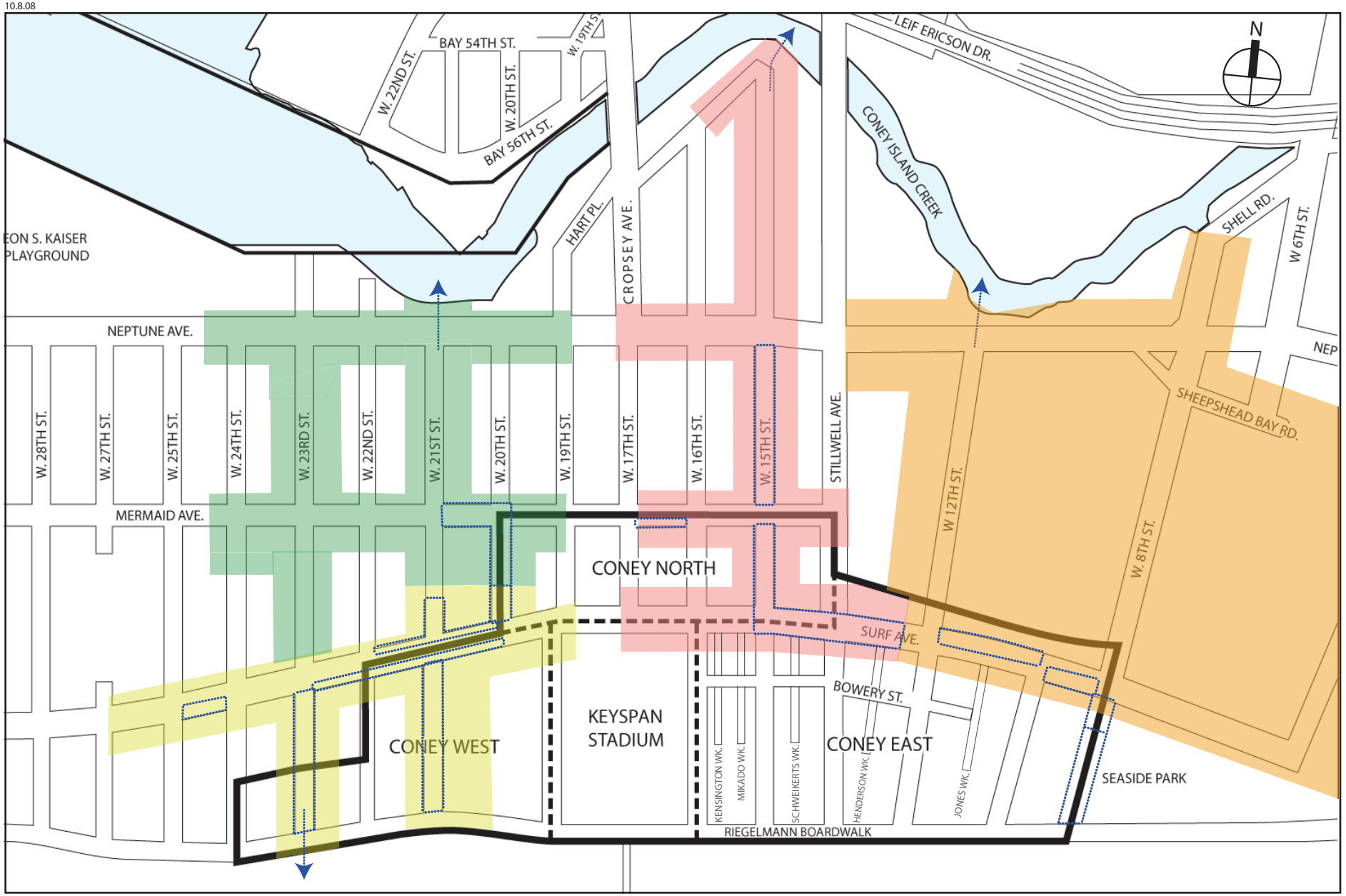


Catchment Area A

Catchment Area B

Catchment Area C

Catchment Area D

Note: Only Catchment Areas Originating in Rezoning Area are Shown

Identifies Location of Storm Sewer Segment Beyond Capacity

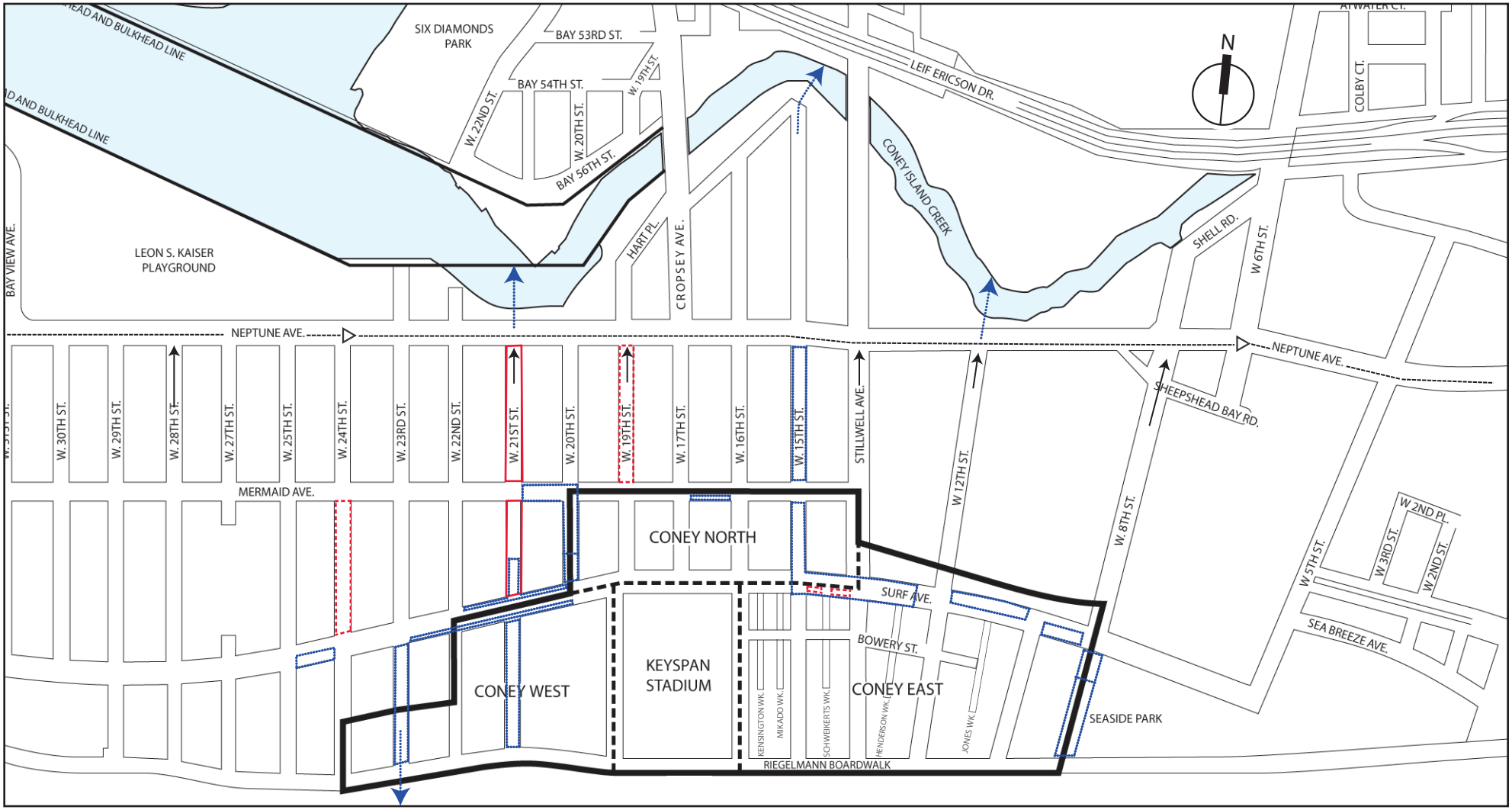
Proposed Rezoning Boundary

Proposed Rezoning Subarea Boundary

Stormwater Discharge Point

Storm Sewer • Hydraulic Study Results

Figure 7



Identifies Location of Sanitary Sewer Segment Beyond Capacity Based on Existing Zoning Demand

Identifies Location of Sanitary Sewer Segment Which Limits Increased Upstream Zoning Densities Based on Proposed Zoning Demand

Identifies Location of Storm Sewer Segment Beyond Capacity Under Current DEP Design Storm Criteria

Proposed Rezoning Boundary

Proposed Rezoning Subarea Boundary

Sanitary Discharge Point to Interceptor

Stormwater Discharge Point

Existing Interceptor

Flow Direction

Sanitary and Storm Sewer • Capacity Limitations
Figure 8

subarea, the sanitary sewers beneath Surf Avenue between West 15th Street and Stillwell Avenue can not accommodate increased demand from proposed zoning densities which limits development within the rezoning area south of Surf Avenue between West 15th Street and Stillwell Avenue. Additionally, the existing storms sewers located within Storm Catchment Area C, within the subarea and outside the subarea which convey stormwater to the Coney Island Creek are beyond capacity. Within Storm Catchment Area D, the existing storm sewer beneath Surf Avenue within the subarea is beyond capacity, however the 60-inch sewer which conveys stormwater to the Coney Island Creek, beneath West 12th Street between Surf and Neptune Avenues, has additional capacity.

These sanitary and storm sewer limitations can be addressed and do not necessarily preclude development from occurring within the rezoning area. The sites adjacent streets which provide both sanitary and storm sewers could potentially be developed immediately where the sanitary sewers adjacent to and downstream of the proposed development have sufficient capacity to accommodate the proposed sanitary flow and the stormwater management practices and BMP strategies are utilized to ensure that the site developed flow does not exacerbate the surcharged conditions of the downstream sewer(s). Otherwise, upgrading of critical sanitary and/or storm sewer segments that are beyond capacity would be required prior to development.

For sewer connection applications, no self-certification of site connection applications would be permitted for any proposed development in the subject rezoning area and all applicants would have to submit "hydraulic analysis" computations to DEP to establish the adequacy of existing sanitary and storm sewers to serve the proposed development. Upon approval of such, site connection applications would be submitted to DEP for review and certification.

The following section will discuss potential stormwater management and BMP strategies that could be used throughout the Coney Island rezoning area to manage stormwater runoff for the site connection approval process, pending the implementation of area-wide sewer improvements.

STORMWATER MANAGEMENT AND BMP STRATEGIES

As mentioned above, the existing stormwater infrastructure throughout the rezoning area is limited and existing sewers (as shown in Figure 7) are currently beyond capacity for DEP's current design storm criteria, therefore stormwater management measures would be required. If a Developer's hydraulic analysis shows that a downstream sewer is beyond capacity and would not be able to accommodate storm flow from the proposed development, then either a sewer upgrade or stormwater management and BMP strategies would need to be implemented to ensure that the site developed flow does not exacerbate the surcharged conditions of the downstream sewer(s). The following discussion outlines several stormwater management and BMP strategies that could be implemented to reduce peak stormwater discharge rates from development sites.

The design of stormwater management measures would be guided by the Office of the Mayor's PlaNYC Sustainability Initiatives, DEP's guidance on BMPs, Special Coney

Island Zoning District text, and CEQR standards to ensure public and environmental health and safety. Under existing conditions, the majority of streets within the rezoning area do not have storm sewers and it is assumed that existing buildings/developments within the proposed rezoning area do not provide any on-site detention system. Through the use of stormwater management practices described below, stormwater runoff would be reduced under the future with the proposed actions as compared to the existing conditions.

Development sites fronting or adjacent to an existing storm sewer would need to develop a stormwater management system and ultimately connect to an existing storm sewer through a site connection (if fronting an existing sewer) or private sewer system (if feasible as per Local Law 103/89). The stormwater management system would primarily utilize on-site detention practices, such as roof and underground storage with a regulating outlet device. As per PlaNYC, the on-site detention system would be sized based for the 10-year storm event at an approved release rate. The Special Coney Island District will mandate that rooftops be landscaped and that BMPs be implemented in future developments to facilitate on-site stormwater detention and to minimize stormwater runoff.

In addition to on-site detention and landscaped roof practices, infiltration, stormwater recycling or re-use (rain barrels/cisterns), and other BMP practices could also be utilized. Preliminary geotechnical information obtained for the Coney East and Coney West subareas identifies that groundwater is located approximately 3- to 7-feet beneath the ground surface within the rezoning area which, in conjunction with unfavorable subsurface conditions, may limit infiltration practices. Site-specific groundwater and soil testing would be needed to confirm infiltration capacity for the use of drywells or other infiltration practices such as permeable pavements, and bioretention/biofiltration practices. Ultimately, the Developer would be able to utilize a number of stormwater management practices to ensure proper controls for the 10-year design storm.

F. CONCLUSION

Based on the results of the hydraulic analysis, all the existing sanitary sewer mains within the proposed rezoning area are able to accommodate wastewater generated by the full build out of existing zoning densities within the rezoning area. The majority of the existing sewers within the eastern portion of the proposed rezoning area and the downstream sanitary sewer system have sufficient capacity to accommodate increased wastewater flows generated by increased zoning densities, however; some sanitary mains located outside the rezoning area downstream of the Coney West and portions of the Coney North subareas which convey wastewater to the interceptor beneath Neptune Avenue are near or beyond capacity, therefore, the sanitary sewers in the western portion of the rezoning area would not be able to accommodate increased wastewater flows (as shown in Figure 6). Alternatively, numerous existing storm sewer mains, located within and outside of the proposed rezoning area, do not currently provide sufficient capacity for current DEP design criteria and several streets within the rezoning area do not provide storm sewer mains (as shown in Figure 7).

As development occurs, self-certification of site connection applications would not be permitted for any proposed development within the rezoning area and all Developers must submit "hydraulic analysis" computations to DEP to establish the adequacy of existing sanitary and storm sewers to serve the proposed development. Upon approval of such, site connection applications would be submitted to DEP for review and certification.

Sites that are adjacent to streets which provide both sanitary and storm sewers could potentially be developed immediately where the sanitary sewers adjacent and downstream of the proposed development have sufficient capacity to accommodate the proposed sanitary flow and the stormwater management practices and BMP strategies are utilized to ensure that the site developed flow does not exacerbate the surcharged conditions of the downstream sewer(s). Otherwise, upgrading of critical sanitary and/or storm sewer segments that are beyond capacity would be required prior to development. For areas where existing sanitary and/or storm sewers are not available, the Developer may be required to build a private sewer that would connect to an existing sanitary or storm sewer, in addition to stormwater management/BMPs or upgrading critical downstream sanitary/storm sewer segments as necessary to ensure satisfactory system operation.

Independent of the proposed actions, DEP has discussed future storm sewer main improvements that could occur throughout the Coney Island neighborhood. The Coney Island area is currently served by separate storm and sanitary sewers and the existing storm sewers discharge to both the Atlantic Ocean and Coney Island Creek. Although there is not a finalized improvement plan or timeline to implement such improvements, DEP has discussed redirecting stormwater runoff currently being discharged into the Atlantic Ocean to Coney Island Creek, as well as providing storm sewers in streets that currently do not have storm sewers. Due to topographic limitations, mainly the area's uniform topography, if storm sewer improvements are made within the Coney Island area, extensive sanitary sewer main relocations would also be required due to potential

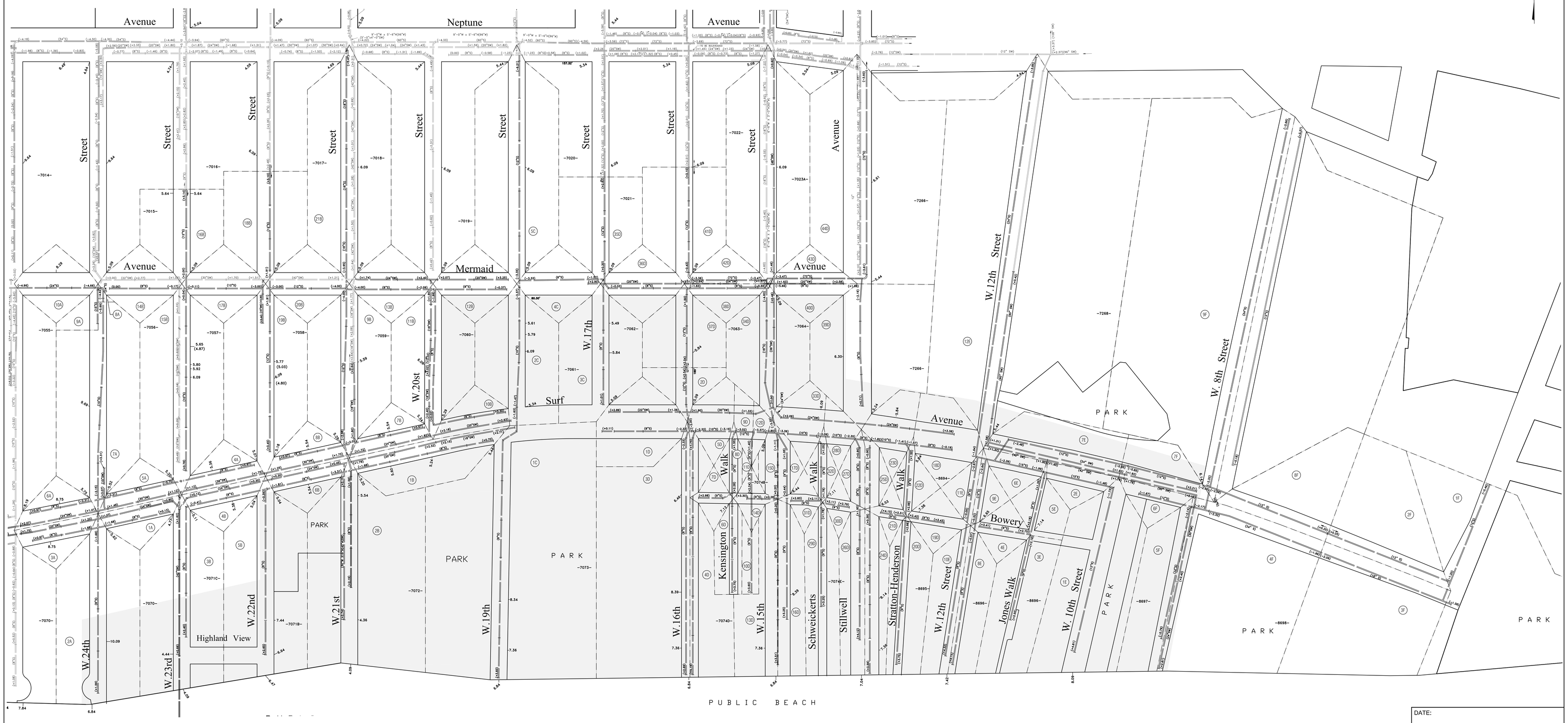
pipe conflicts that are inevitable when designing sewer systems at the same approximate elevation and with little available depth and/or lateral clearance.

An ADP would need to be developed to address any major changes to the existing DEP sewer network, including changes to the storm sewer network, as well as to construct new sewers for proposed streets that are to be constructed under the proposed actions. With the adopted ADP, stormwater management practices and BMP strategies would still be required to meet requirements and with the ADP improvements in place, the sanitary and stormwater sewer systems would be able to accommodate the increased storm and wastewater flows generated by the proposed rezoning.

SECTION 2: APPENDICES

APPENDIX A: HYDRAULIC STUDY CALCULATIONS

SANITARY SEWER HYDRAULIC STUDY CALCULATIONS
EXISTING ZONING



DATE:

DECEMBER 04, 2008

SHEET TITLE:

CONEY ISLAND REZONING
HYDRAULIC STUDY
SANITARY CONTRIBUTARY AREAS

PREPARED BY:

AKRF
AKRF ENGINEERING, P.C.
440 PARK AVENUE SOUTH
NEW YORK, NY 10016
(212) 696-0670 (PHONE)
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PREPARED FOR:

NEW YORK CITY
ECONOMIC DEVELOPMENT
CORPORATION

SCALE:

0' 60' 120' 240'
APPROX. SCALE IN FEET

NOTE: PLAN PREPARED IN BROOKLYN SEWER DATUM

BASEMAP SOURCE: NYCDEP GIS MAPS AND NYCDEP INFILTRATION AND INFLOW MAPS

- EXISTING SANITARY SEWER NOT ANALYZED
- EXISTING STORM SEWER NOT ANALYZED
- EXISTING ANALYZED SANITARY SEWER AND INNER TOP ELEVATION (FT.)
- EXISTING ANALYZED STORM SEWER AND INNER TOP ELEVATION (FT.)
- 5.18 — LEGAL GRADE (FT.)
- CONTRIBUTARY DIVIDES
- 12A — CONTRIBUTARY AREA NO.
- APPROX. BOUNDARY OF PROPOSED CONEY ISLAND REZONING AREA

CONEY IS. REZONING;
BROOKLYN, NY
12-04-08
BROOKLYN SEWER DATUM
PREPARED
FOR:NYC EDC
BY:AKRF

HYDRAULIC STUDY
EX. SANITARY SEWER AND EX. ZONING

COMPUTED BY: DC
CHECKED BY: KF

	LOCATION	FROM	TO	ZONING	AREA UNIT (SF)	AREA		DOMESTIC FLOW (CFS)					INDUSTRIAL WASTE FLOW (CFS)				INFILTRATION	TOTAL SANITARY FLOW WITHOUT INFILTRATION (CFS)	TOTAL SANITARY FLOW WITH INFILTRATION (CFS)	SURFACE ELEV.		COVER (FT.)		INVERT		INNER TOP		FALL (FT.)	LENGTH (FT.)	SLOPE	SHAPE OF SEWER	DIMENSION OF SEWER (INCHES)	CAPACITY OF SEWER @ .78 DEPTH	CAPACITY OF SEWER (CFS) NOT AT FULL CAPACITY	FULL CAPACITY OF CIRCULAR SEWER (CFS)	"N"	VELOCITY (FPS)	TIME IN SECTION (FULL) (MIN)	TIME ELAPSED (MIN)			REMARKS
						INCREMENT (ACRES)	TOTAL (ACRES)	DENSITY (PERSONS/ACRE)	TOTAL POPULATION	AVERAGE FLOW	PEAK FLOW FACTOR	PEAK FLOW	IND. FACTOR	INCREMENT AVERAGE FLOW	IND. PEAK FACTOR	PEAK FLOW				UPPER END	LOWER END	UPPER END	LOWER END	UPPER END	LOWER END	UPPER END	LOWER END											UPPER END OF SECTION	IN SECTION	LOWER END OF SECTION	
1A	Surf Avenue	West 23rd Street	West 24th Street	R-5	28,420	**0.65**	**0.65**	100	65	**0.015**	**3.90**	**0.059**	---	---	---	**0**	**0.002**	0.06	**0.06**	4.77	5.62	4.64	7.30	-0.54	-2.35	0.13	-1.68	1.81	270	0.0067	CIRCULAR	8	0.83	0.83	0.86	0.015	2.46	1.83	6.00	1.83	7.83	
				R-5	125,080	2.87	2.87	100	287	0.067	---	---	---	---	---	0	---	---																								
				C-7	45,336	1.04	1.04	---	---	0.016	---	---	---	---	---	0	---	---																								
2A	West 24th Street	Boardwalk	Surf Avenue	R-5/C-7		**3.91**	**3.91**	---	---	**0.083**	**3.90**	**0.324**	---	---	---	**0.000**	**0.009**	0.32	**0.33**	6.84	5.62	5.25	7.30	0.92	-2.35	1.59	-1.68	3.27	620	0.0053	CIRCULAR	8	0.73	0.73	0.76	0.015	2.18	4.73	6.00	4.73	10.73	
3A	Surf Avenue	West 25th Street	West 24th Street	R-5	29,794	**0.68**	**0.68**	100	68	**0.016**	**3.90**	**0.062**	---	---	---	**0**	**0.002**	0.06	**0.06**	8.19	5.62	7.52	7.30	0.00	-2.35	0.67	-1.68	2.35	255	0.0092	CIRCULAR	8	0.97	0.97	1.01	0.015	2.89	1.47	6.00	1.47	7.47	
4A	Surf Avenue	West 22nd Street	West 23rd Street	R-6	28,609	**0.66**	**0.66**	170	112	**0.026**	**3.90**	**0.101**	---	---	---	**0**	**0.002**	0.10	**0.10**	5.01	5.20	4.34	5.90	0.00	-1.37	0.67	-0.70	1.37	255	0.0054	CIRCULAR	8	0.74	0.74	0.77	0.015	2.21	1.93	6.00	1.93	7.93	
5A	Surf Avenue	West 23rd Street	West 24th Street	R-6	28,763	**0.66**	**1.32**	170	224	**0.052**	**3.90**	**0.203**	---	---	---	**0**	**0.003**	0.20	**0.21**	5.20	5.52	5.90	7.83	-1.37	-2.98	-0.70	-2.31	1.61	310	0.0052	CIRCULAR	8	0.73	0.73	0.76	0.015	2.17	2.38	7.93	2.38	10.31	
6A	Surf Avenue	West 25th Street	West 24th Street	R-6	28,810	**0.66**	**0.66**	170	112	**0.026**	**3.90**	**0.101**	---	---	---	**0**	**0.002**	0.10	**0.10**	8.19	5.75	7.52	8.06	0.00	-2.98	0.67	-2.31	2.98	255	0.0117	CIRCULAR	8	1.09	1.09	1.14	0.015	3.25	1.31	6.00	1.31	7.31	
				R-5	0	0.00	4.21	100	421	0.098	---	---	---	---	---	0	---	---																								
				R-6	176,569	4.05	6.03	170	1025	0.238	---	---	---	---	---	0	---	---																								
				C-7	0	0.00	1.04	---	---	0.016	---	---	---	---	---	0	---	---																								
7A	West 24th Street	Surf Avenue	Mermaid Avenue	R-5/R-6/C-7		**4.05**	**11.28**	---	---	**0.352**	**3.55**	**1.250**	---	---	---	**0.000**	**0.027**	1.25	**1.28**	5.52	5.38	7.67	11.17	-2.98	-6.62	-2.15	-5.79	3.64	720	0.0051	CIRCULAR	10	1.30	1.30	1.35	0.015	2.48	4.83	10.73	4.83	15.56	
				R-5	0	0.00	4.21	100	421	0.098	---	---	---	---	---	0	---	---																								
				R-6	1,698	0.04	6.07	170	1032	0.240	---	---	---	---	---	0	---	---																								
				C-7	0	0.00	1.04	---	---	0.016	---	---	---	---	---	0	---	---																								
8A	West 24th Street	Surf Avenue	Mermaid Avenue	R-5/R-6/C-7		**0.04**	**11.32**	---	---	**0.354**	**3.55**	**1.257**	---	---	---	**0.000**	**0.027**	1.26	**1.28**	5.38	5.09	10.00	9.75	-6.62	-6.66	-4.62	-4.66	0.04	40	0.0010	CIRCULAR	24	5.97	5.97	6.22	0.015	1.98	0.34	15.56	0.34	15.90	
9A	West 24th Street	Surf Avenue	Mermaid Avenue	R-6	13,242	**0.30**	**0.30**	170	52	**0.012**	**3.90**	**0.047**	---	---	---	**0**	**0.001**	0.05	**0.05**	8.19	6.54	4.63	3.80	2.31	1.49	3.56	2.74	0.82	150	0.0055	CIRCULAR	15	3.98	3.98	4.15	0.015	3.38	0.74	6.00	0.74	6.74	
				R-5	0	0.00	4.21	100	421	0.098	---	---	---	---	---	0	---	---																								
				R-6	45,172	1.04	7.41	170	1260	0.292	---	---	---	---	---	0	---	---																								
				C-7	0	0.00	1.04	---	---	0.016	---	---	---	---	---	0	---	---																								
10A	Mermaid Avenue	West 24th Street	West 25th Street	R-5/R-6/C-7		**1.04**	**12.66**	---	---	**0.406**	**3.55**	**1.441**	---	---	---	**0.000**	**0.031**	1.44	**1.47**	5.09	7.64	9.75	12.60	-6.66	-6.96	-4.66	-4.96	0.30	300	0.0010	CIRCULAR	24	5.97	5.97	6.22	0.015	1.98	2.53	15.90	2.53	18.43	
				C-7	35,170	0.81	0.81	---	---	0.012	---	---	---	---	---	0	---	---																								
				PARK	35,589	0.82	0.82	---	---	0.005	---	---	---	---	---	0	---	---																								
1B	Surf Avenue	West 19th Street	West 21st Street	C-7/PARK		**1.62**	**1.62**	---	---	**0.017**	**3.90**	**0.066**	---	---	---	**0.000**	**0.004**	0.07	**0.07**	5.44	5.20	4.74	6.88	0.03	-2.35	0.70	-1.68	2.38	560	0.0043	CIRCULAR	8	0.66	0.66	0.68	0.015	1.96	4.76	6.00	4.76	10.76	
				C-7	234,382	5.38	5.38	---	---	0.083	---	---	---	---	---	0	---	---																								
				PARK	33,627	0.77	0.77	---	---	0.005	---	---	---	---	---	0	---	---																								
2B	West 21st Street	Boardwalk	Surf Avenue	C-7/PARK		**6.15**	**6.15**	---	---	**0.088**	**3.90**	**0.343**	---	---	---	**0.000**	**0.015**	0.34	**0.36**	4.09	5.20	1.90	3.62	1.52	0.91	2.19	1.58	0.61	410	0.0015	CIRCULAR	8	0.39	0.39	0.41	0.015	1.16	5.89	6.00	5.89	11.89	
				R-5	89,172	2.05	2.05	100	205	0.048	---	---	---	---	---	0	---	---																								
				C-7	88,018	2.02	2.02	---	---	0.031	---	---	---	---	---	0	---	---																								
3B	West 23rd Street	Boardwalk	Surf Avenue	R-5/C-7		**4.07**	**4.07**	---	---	**0.079**	**3.90**	**0.308**	---	---	---	**0.000**	**0.010**	0.31	**0.32**	4.09	5.11	1.69	5.52	1.73	-1.08	2.40	-0.41	2.81	490	0.0057	CIRCULAR	8	0.76	0.76	0.80	0.015	2.28	3.58	6.00	3.58	9.58	
				R-5	28,609	0.66	2.70	100	270	0.063	---	---	---	---	---	0	---	---																								
				C-7	0	0.00	2.02	---	---	0.031	---	---	---	---	---	0	---	---																								
4B	Surf Avenue	West 23rd Street	West 22nd Street	R-5/C-7		**0.66**	**4.72**	---	---	**0.094**	**3.90**	**0.367**	---	---	---	**0.000**	**0.011**	0.37	**0.38**	5.11	5.04	5.52	6.85	-1.08	-2.48	-0.41	-1.81	1.40	260	0.0054	CIRCULAR	8	0.74	0.74	0.77	0.015	2.21	1.96	9.58	1.96	11.55	Inverts from I & I
				R-5	51,269	1.18	1.18	100	118	0.027	---	---	---	---	---	0	---	---																								
				C-7	84,753	1.95	1.95	---	---	0.030	---	---	---	---	---	0	---	---																								
				PARK	46,019	1.06	1.06	---	---	0.007	---	---	---	---	---	0	---	---																								
5B	West 22nd Street	Boardwalk	Surf Avenue	R-5/C-7/PARK		**4.18**	**4.18**	---	---	**0.064**	**3.90**	**0.250**	---	---	---	**0.000**	**0.010**	0.25	**0.26**	6.47	5.04	3.82	5.43	1.98	-1.06	2.65	-0.39	3.04	580	0.0052	CIRCULAR	8	0.73	0.73	0.76	0.015	2.18	4.44	6.00	4.44	10.44	
				R-5	0	0.00	3.88	100	388	0.090	---	---	---	---	---	0	---	---																								
				C-7	0	0.00	3.97	---	---	0.061	---	---	---	---	---	0	---	---																								
				PARK	28,617	0.66	1.71	---	---	0.011	---	---	---	---	---	0	---	---																								
6B	Surf Avenue	West 22nd Street	West 21st Street	R-5/C-7/PARK		**0.66**	**9.56**	---	---	**0.162**	**3.80**	**0.616**	---	---	---	**0.000**	**0.023**	0.62	**0.64**	5.04	5.20	6.85	8.51	-2.48	-3.98	-1.81	-3.31	1.50	325	0.0046	CIRCULAR	8	0.68	0.68	0.71	0.015	2.04	2.65	11.55	2.65	14.20	
7B	Surf Avenue	West 20th Street	West 21st Street	R-6	28,632	**0.66**	**0.66**	170	112	**0.026**	**3.90**	**0.101**	---	---	---	**0**	**0.002**	0.10	**0.10**	5.34	5.29	4.67	7.31	0.00	-2.69	0.67	-2.02	2.69	255	0.0105	CIRCULAR	8	1.04	1.04	1.08	0.015	3.09	1.38	6.00	1.38	7.38	
8B	Surf Avenue	West 22nd Street	West 21st Street	R-6	28,637	**0.66**	**0.66**	170	112	**0.026**	**3.90**	**0.101**	---	---	---	**0**	**0.002**	0.10	**0.10**	5.18	5.29	4.51	7.31	0.00	-2.69	0.67	-2.02	2.69	260	0.0103	CIRCULAR	8	1.03	1.03	1.07	0.015	3.06	1.42	6.00	1.42	7.42	
				R-5	0	0.00	3.88	100	388	0.090	---	---	---	---	---	0	---	---																								
				R-6	133,012	3.05	4.37	170	743	0.172	---	---	---	---	---	0	---	---																								
				C-7	0	0.00	10.15	---	---	0.157	---	---	---	---	---	0	---	---																								
				PARK	0	0.00	3.30	---	---	0.020	---	---	---	---	---	0	---	---																								
9B	West 21st Street	Surf Avenue	Mermaid Avenue	R-5/R-6/C-7/PARK		**3.05**	**21.71**	---	---	**0.349**	**3.55**	**1.239**	---	---	---	**0.000**	**0.053**	1.24	**1.29**	5.29	5.09	8.27	9.09	-3.98	-5.00	-2.98	-4.00	1.02	660	0.0015	CIRCULAR	12	1.17	1.17	1.22	0.015	1.55	7.10	14.20	7.10	21.30	
10B	Surf Avenue	West 19th Street	West 20th Street	R-6	28,326	**0.65**	**0.65**	170	111	**0.026**	**3.90**	**0.101**	---	---	---	**0**	**0.002**	0.10	**0.10**	5.34	5.29	5.04	5.27	-0.37	-0.65	0.30	0.02	0.28	255	0.0011	CIRCULAR	8	0.33	0.33	0.35	0.015	1.00	4.26	6.00	4.26	10.26	

CONEY IS. REZONING;
BROOKLYN, NY
12-04-08
BROOKLYN SEWER DATUM
PREPARED
FOR:NYC EDC
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HYDRAULIC STUDY
EX. SANITARY SEWER AND EX. ZONING

COMPUTED BY: DC
CHECKED BY: KF

	LOCATION	FROM	TO	ZONING	AREA UNIT (SF)	AREA		DOMESTIC FLOW (CFS)					INDUSTRIAL WASTE FLOW (CFS)				INFILTRATION	TOTAL SANITARY FLOW WITHOUT INFILTRATION (CFS)	TOTAL SANITARY FLOW WITH INFILTRATION (CFS)	SURFACE ELEV.		COVER (FT.)		INVERT		INNER TOP		FALL (FT.)	LENGTH (FT.)	SLOPE	SHAPE OF SEWER	DIMENSION OF SEWER (INCHES)	CAPACITY OF SEWER @ 7/8 DEPTH	CAPACITY OF SEWER (CFS) NOT AT FULL CAPACITY	FULL CAPACITY OF CIRCULAR SEWER (CFS)	"N"	VELOCITY (FPS)	TIME IN SECTION (FULL) (MIN)	TIME ELAPSED (MIN)			REMARKS
						INCREMENT (ACRES)	TOTAL (ACRES)	DENSITY (PERSONS/ACRE)	TOTAL POPULATION	AVERAGE FLOW	PEAK FLOW FACTOR	PEAK FLOW	IND. FACTOR	INCREMENT AVERAGE FLOW	IND. PEAK FACTOR	PEAK FLOW				UPPER END	LOWER END	UPPER END	LOWER END	UPPER END	LOWER END	UPPER END	LOWER END												UPPER END OF SECTION	IN SECTION	LOWER END OF SECTION	
11B	West 20th Street	Surf Avenue	Mermaid Avenue	R-6	113,554	**2.61**	**3.26**	170	554	**0.129**	**3.85**	**0.497**	---	---	---	**0**	**0.008**	0.50	**0.50**	5.29	5.09	5.27	7.07	-0.65	-2.65	0.02	-1.98	2.00	490	0.0041	CIRCULAR	8	0.64	0.64	0.67	0.015	1.92	4.25	10.26	4.25	14.51	
				R-5	22,586	0.52	0.52	100	52	0.012	---	---	---	---	---	0	---	---																								
				R-6	22,586	0.52	0.52	170	88	0.020	---	---	---	---	---	0	---	---																								
12B	Mermaid Avenue	West 19th Street	West 20th Street	R-5/R-6		**1.04**	**1.04**	---	---	**0.032**	**3.90**	**0.125**	---	---	---	**0.000**	**0.003**	0.12	**0.13**	5.09	5.09	5.46	7.18	-1.04	-2.76	-0.37	-2.09	1.72	255	0.0067	CIRCULAR	8	0.83	0.83	0.86	0.015	2.47	1.72	6.00	1.72	7.72	
				R-5	22,586	0.52	1.04	100	104	0.024	---	---	---	---	---	0	---	---																								
				R-6	22,586	0.52	4.29	170	730	0.169	---	---	---	---	---	0	---	---																								
13B	Mermaid Avenue	West 20th Street	West 21st Street	R-5/R-6		**1.04**	**5.33**	---	---	**0.193**	**3.70**	**0.714**	---	---	---	**0.000**	**0.013**	0.71	**0.73**	5.09	5.09	7.18	9.09	-2.76	-4.67	-2.09	-4.00	1.91	295	0.0065	CIRCULAR	8	0.81	0.81	0.84	0.015	2.42	2.03	14.51	2.03	16.54	
14B	Mermaid Avenue	West 24th Street	West 23rd Street	R-6	45,172	**1.04**	**1.04**	170	176	**0.041**	**3.90**	**0.160**	---	---	---	**0**	**0.003**	0.16	**0.16**	5.09	5.09	5.09	5.26	-0.67	-0.84	0.00	-0.17	0.17	265	0.0006	CIRCULAR	8	0.26	0.26	0.27	0.015	0.76	5.80	6.00	5.80	11.80	
15B	West 23rd Street	Surf Avenue	Mermaid Avenue	R-6	172,068	**3.95**	**3.95**	170	672	**0.156**	**3.80**	**0.593**	---	---	---	**0**	**0.010**	0.59	**0.60**	5.20	5.09	4.42	5.05	-0.05	-0.79	0.78	0.04	0.74	680	0.0011	CIRCULAR	10	0.60	0.60	0.63	0.015	1.15	9.84	6.00	9.84	15.84	
				R-5	38,773	0.89	0.89	100	89	0.021	---	---	---	---	---	0	---	---																								
				R-6	38,773	0.89	0.89	170	151	0.035	---	---	---	---	---	0	---	---																								
16B	West 23rd Street	Neptune Avenue	Mermaid Avenue	R-5/R-6		**1.78**	**1.78**	---	---	**0.056**	**3.90**	**0.218**	---	---	---	**0.000**	**0.004**	0.22	**0.22**	5.64	5.09	2.50	3.09	2.14	1.00	3.14	2.00	1.14	420	0.0027	CIRCULAR	12	1.55	1.55	1.61	0.015	2.05	3.41	6.00	3.41	9.41	
				R-5	22,586	0.52	1.41	100	141	0.033	---	---	---	---	---	0	---	---																								
				R-6	22,586	0.52	6.40	170	1087	0.252	---	---	---	---	---	0	---	---																								
17B	Mermaid Avenue	West 23rd Street	West 22nd Street	R-5/R-6		**1.04**	**7.80**	---	---	**0.285**	**3.60**	**1.026**	---	---	---	**0.000**	**0.019**	1.03	**1.04**	5.09	5.09	4.98	8.09	-0.89	-4.00	0.11	-3.00	3.11	315	0.0099	CIRCULAR	12	2.95	2.95	3.08	0.015	3.92	1.34	15.84	1.34	17.18	
18B	West 22nd Street	Neptune Avenue	Mermaid Avenue	R-5	96,462	**2.21**	**2.21**	100	221	**0.051**	**3.90**	**0.199**	---	---	---	**0**	**0.005**	0.20	**0.20**	5.97	5.09	2.87	3.18	2.10	0.91	3.10	1.91	1.19	425	0.0028	CIRCULAR	12	1.57	1.57	1.64	0.015	2.09	3.40	6.00	3.40	9.40	
19B	West 22nd Street	Surf Avenue	Mermaid Avenue	R-6	152,536	**3.50**	**3.50**	170	595	**0.138**	**3.85**	**0.531**	---	---	---	**0**	**0.008**	0.53	**0.54**	5.18	5.09	1.73	3.18	2.45	0.91	3.45	1.91	1.54	610	0.0025	CIRCULAR	12	1.49	1.49	1.56	0.015	1.98	5.13	6.00	5.13	11.13	
				R-5	22,586	0.52	4.14	100	414	0.096	---	---	---	---	---	0	---	---																								
				R-6	22,586	0.52	10.42	170	1771	0.411	---	---	---	---	---	0	---	---																								
20B	Mermaid Avenue	West 22nd Street	West 21st Street	R-5/R-6		**1.04**	**14.56**	---	---	**0.507**	**3.45**	**1.749**	---	---	---	**0.000**	**0.035**	1.75	**1.78**	5.09	5.09	8.09	9.09	-4.00	-5.00	-3.00	-4.00	1.00	275	0.0036	CIRCULAR	12	1.79	1.79	1.87	0.015	2.38	1.93	17.18	1.93	19.11	
				R-5	140,529	3.23	12.29	100	1229	0.285	---	---	---	---	---	0	---	---																								
				R-6	0	0.00	19.08	170	3243	0.753	---	---	---	---	---	0	---	---																								
				C-7	0	0.00	10.15	---	---	0.157	---	---	---	---	---	0	---	---																								
				C8-1	9,841	0.23	0.23	---	---	0.002	---	---	---	---	---	0	---	---																								
				M1-2	52,083	1.20	1.20	---	---	---	---	---	2.000	0.037	2.000	0.074	---	---																								
				PARK	0	0.00	3.30	---	---	0.020	---	---	---	---	---	0	---	---																								
21B	West 21st Street	Mermaid Avenue	Neptune Avenue	R-5/R-6/C-7/C8-1/ M12/PARK		**4.65**	**46.24**	---	---	**1.217**	**3.05**	**3.712**				**0.074**	**0.112**	3.79	**3.90**	5.09	4.69	9.04	10.16	-5.45	-6.97	-3.95	-5.47	1.52	860	0.0018	CIRCULAR	18	3.68	3.68	3.84	0.015	2.17	6.60	21.30	6.60	27.90	Inverts from I and I
1C	West 19th Street	Boardwalk	Surf Avenue	PARK	503,481	**11.56**	**11.56**	---	---	**0.072**	**3.90**	**0.281**	---	---	---	**0**	**0.028**	0.28	**0.31**	6.84	5.44	3.01	7.07	3.16	-2.30	3.83	-1.63	5.46	940	0.0058	CIRCULAR	8	0.77	0.77	0.80	0.015	2.29	6.83	6.00	6.83	12.83	
				R-6	114,517	2.63	2.63	170	447	0.104	---	---	---	---	---	0	---	---																								
				PARK	0	0.00	11.56	---	---	0.072	---	---	---	---	---	0	---	---																								
2C	West 19th Street	Surf Avenue	Mermaid Avenue	R-6/PARK		**2.63**	**14.19**	---	---	**0.176**	**3.75**	**0.660**	---	---	---	**0.000**	**0.034**	0.66	**0.69**	5.34	5.09	6.81	8.46	-2.30	-4.20	-1.47	-3.37	1.90	440	0.0043	CIRCULAR	10	1.20	1.20	1.25	0.015	2.29	3.20	12.83	3.20	16.03	
				R-6	78,619	1.80	1.80	170	307	0.071	---	---	---	---	---	0	---	---																								
				C-7	30,695	0.70	0.70	---	---	0.011	---	---	---	---	---	0	---	---																								
3C	West 17th Street	Surf Avenue	Mermaid Avenue	R-6/C-7		**2.51**	**2.51**	---	---	**0.082**	**3.90**	**0.320**	---	---	---	**0.000**	**0.006**	0.32	**0.33**	5.09	5.09	4.08	6.61	0.34	-2.19	1.01	-1.52	2.53	395	0.0064	CIRCULAR	8	0.81	0.81	0.84	0.015	2.41	2.73	6.00	2.73	8.73	
				R-6	45,171	1.04	2.84	170	483	0.112	---	---	---	---	---	0	---	---																								
				C-7	0	0.00	0.70	---	---	0.011	---	---	---	---	---	0	---	---																								
4C	Mermaid Avenue	West 17th Street	West 19th Street	R-6/C-7		**1.04**	**3.55**	---	---	**0.123**	**3.85**	**0.474**	---	---	---	**0.000**	**0.009**	0.47	**0.48**	5.09	5.09	6.61	8.42	-2.19	-4.00	-1.52	-3.33	1.81	300	0.0060	CIRCULAR	8	0.78	0.78	0.82	0.015	2.34	2.14	8.73	2.14	10.87	
				R-5	91,386	2.10	2.10	100	210	0.049	---	---	---	---	---	0	---	---																								
				R-6	91,385	2.10	7.57	170	1287	0.299	---	---	---	---	---	0	---	---																								
				C-7	0	0.00	0.70	---	---	0.011	---	---	---	---	---	0	---	---																								
				C8-1	19,681	0.45	0.45	---	---	0.003	---	---	---	---	---	0	---	---																								
				PARK	0	0.00	11.56	---	---	0.072	---	---	---	---	---	0	---	---																								
5C	West 19th Street	Mermaid Avenue	Neptune Avenue	R-5/R-6/C-7/C8-1/ PARK		**4.65**	**22.38**	---	---	**0.434**	**3.55**	**1.541**	---	---	---	**0.000**	**0.054**	1.54	**1.59**	5.09	5.44	8.44	11.65	-4.35	-7.21	-3.35	-6.21	2.86	875	0.0033	CIRCULAR	12	1.70	1.70	1.77	0.015	2.25	6.47	16.03	6.47	22.50	Inverts from I and I
				C-7	28,689	0.66	0.66	---	---	0.010	---	---	---	---	---	0	---	---																								
				PARK	44,036	1.01	1.01	---	---	0.006	---	---	---	---	---	0	---	---																								
1D	Surf Avenue	West 17th Street	West 16th Street	C-7/PARK		**1.67**	**1.67**	---	---	**0.016**	**3.90**	**0.062**	---	---	---	**0.000**	**0.004**	0.06	**0.07**	5.09	5.09	4.98	7.42	-0.56	-3.00	0.11	-2.33	2.44	325	0.0075	CIRCULAR	8	0.87	0.87	0.91	0.015	2.61	2.08	6.00	2.08	8.08	
2D	West 16th Street	Mermaid Avenue	Surf Avenue	C-7	29,314	**0.67**	**0.67**	---	---	**0.010**	**3.90**	**0.039**	---	---	---	**0**	**0.002**	0.04	**0.04**	5.61	5.09	3.07	7.09	1.54	-3.00	2.54	-2.00	4.54	185	0.0245	CIRCULAR	12	4.66	4.66	4.85	0.015	6.18	0.50	6.00	0.50	6.50	
3D	West 16th Street	Boardwalk	Surf Avenue	PARK	258,708	**5.94**	**5.94**	---	---	**0.037**	**3.90**	**0.144**	---	---	---	**0**	**0.014**	0.14	**0.16**	6.84	5.09	4.15	7.42	2.02	-3.00	2.69	-2.33	5.02	770	0.0065	CIRCULAR	8	0.81	0.81	0.85	0.015	2.43	5.28	6.00	5.28	11.28	
4D	West 16th Street	Boardwalk	Surf Avenue	C-7	83,627	**1.92**	**1.92**	---	---	**0.030**	**3.90**	**0.117**	---	---	---	**0**	**0.005**	0.12	**0.12**	6.84	5.09	2.65	3.34	3.44	1.00	4.19	1.75	2.44	740	0.0033	CIRCULAR	9	0.79	0.79	0.83	0.015	1.87	6.60	6.00	6.60	12.60	
				C-7	31,497	0.72	3.97	---	---	0.061	---	---	---	---	---	0	---	---																								
				PARK	0	0.00	6.95	---	---	0.043	---	---	---	---	---	0	---	---																								
5D	Surf Avenue	West 16th Street	Kensington Walk	C-7/PARK		**0.72**	**10.92**	---	---	**0.104**	**3.90**	**0.406**	---	---	---	**0.000**	**0.026**	0.41	**0.43**	5.09	5.09	7.42	8.28	-3.16	-4.02	-2.33	-3.19	0.86	150	0.0057	CIRCULAR	10	1.38	1.38	1.44	0.015	2.64	0.95	12.60	0.95	13.55	
6D	Kensington Walk	Boardwalk	Bowery	C-7	29,202	**0.67**	**0.67**	---	---	**0.010**	**3.90**	**0.039**	---	---	---	**0**	**0.002**	0.04	**0.04**	8.39	7.13	4.64	4.85	3.00	1.53	3.75	2.28	1.47	500	0.0029	CIRCULAR	9	0.75	0.75	0.78	0.015	1.76	4.72	6.00	4.72	10.72	

CONEY IS. REZONING;
BROOKLYN, NY
12-04-08
BROOKLYN SEWER DATUM
PREPARED
FOR:NYC EDC
BY:AKRF

HYDRAULIC STUDY
EX. SANITARY SEWER AND EX. ZONING

COMPUTED BY: DC
CHECKED BY: KF

	LOCATION	FROM	TO	ZONING	AREA UNIT (SF)	AREA		DOMESTIC FLOW (CFS)					INDUSTRIAL WASTE FLOW (CFS)				INFILTRATION	TOTAL SANITARY FLOW WITHOUT INFILTRATION (CFS)	TOTAL SANITARY FLOW WITH INFILTRATION (CFS)	SURFACE ELEV.		COVER (FT.)		INVERT		INNER TOP		FALL (FT.)	LENGTH (FT.)	SLOPE	SHAPE OF SEWER	DIMENSION OF SEWER (INCHES)	CAPACITY OF SEWER @ .7/0 DEPTH	CAPACITY OF SEWER (CFS) NOT AT FULL CAPACITY	FULL CAPACITY OF CIRCULAR SEWER (CFS)	"N"	VELOCITY (FPS)	TIME IN SECTION (FULL) (MIN)	TIME ELAPSED (MIN)			REMARKS
						INCREMENT (ACRES)	TOTAL (ACRES)	DENSITY (PERSONS/ACRE)	TOTAL POPULATION	AVERAGE FLOW	PEAK FLOW FACTOR	PEAK FLOW	IND. FACTOR	INCREMENT AVERAGE FLOW	IND. PEAK FACTOR	PEAK FLOW				UPPER END	LOWER END	UPPER END	LOWER END	UPPER END	LOWER END	UPPER END	LOWER END											UPPER END OF SECTION	IN SECTION	LOWER END OF SECTION	
7D	Bowery	West 16th Street	Kensington Walk	C-7	15,822	**0.36**	**0.36**	---	---	**0.006**	**3.90**	**0.023**	---	---	---	**0**	**0.001**	0.02	**0.02**	6.46	7.13	3.48	4.85	2.23	1.53	2.98	2.28	0.70	85	0.0082	CIRCULAR	9	1.25	1.25	1.30	0.015	2.95	0.48	6.00	0.48	6.48	
8D	Kensington Walk	Bowery	Surf Avenue	C-7	14,832	**0.34**	**1.37**	---	---	**0.021**	**3.90**	**0.082**	---	---	---	**0**	**0.003**	0.08	**0.09**	7.13	5.09	4.85	3.54	1.53	0.80	2.28	1.55	0.73	265	0.0028	CIRCULAR	9	0.72	0.72	0.75	0.015	1.71	2.59	10.72	2.59	13.31	
				C-7	13,464	0.31	5.66	---	---	0.088	---	---	---	---	---	0	---	---																								
				PARK	0	0.00	6.95	---	---	0.043	---	---	---	---	---	0	---	---																								
9D	Surf Avenue	Kensington Walk	Mikado Walk	C-7/PARK		**0.31**	**12.61**	---	---	**0.131**	**3.85**	**0.504**	---	---	---	**0.000**	**0.031**	0.50	**0.53**	5.09	5.09	8.11	8.46	-4.02	-4.37	-3.02	-3.37	0.35	80	0.0044	CIRCULAR	12	1.97	1.97	2.05	0.015	2.61	0.51	13.55	0.51	14.06	
10D	Mikado Walk	Boardwalk	Bowery	C-7	14,960	**0.34**	**0.34**	---	---	**0.005**	**3.90**	**0.020**	---	---	---	**0**	**0.001**	0.02	**0.02**	8.39	7.13	4.79	4.89	2.85	1.49	3.60	2.24	1.36	470	0.0029	CIRCULAR	9	0.74	0.74	0.77	0.015	1.75	4.48	6.00	4.48	10.48	
11D	Mikado Walk	Bowery	Surf Avenue	C-7	3,373	**0.08**	**0.42**	---	---	**0.007**	**3.90**	**0.027**	---	---	---	**0**	**0.001**	0.03	**0.03**	7.13	5.09	4.89	3.69	1.49	0.65	2.24	1.40	0.84	300	0.0028	CIRCULAR	9	0.73	0.73	0.76	0.015	1.72	2.90	10.48	2.90	13.38	
				C-7	8,431	0.19	6.27	---	---	0.097	---	---	---	---	---	0	---	---																								
				PARK	0	0.00	6.95	---	---	0.043	---	---	---	---	---	0	---	---																								
12D	Surf Avenue	Mikado Walk	West 15th Street	C-7/PARK		**0.19**	**13.22**	---	---	**0.140**	**3.80**	**0.532**	---	---	---	**0.000**	**0.032**	0.53	**0.56**	5.09	5.09	8.46	8.94	-4.37	-4.85	-3.37	-3.85	0.48	30	0.0160	CIRCULAR	12	3.76	3.76	3.92	0.015	4.99	0.10	14.06	0.10	14.16	
13D	West 15th Street	Boardwalk	Bowery	C-7	66,748	**1.53**	**1.53**	---	---	**0.024**	**3.90**	**0.094**	---	---	---	**0**	**0.004**	0.09	**0.10**	6.84	6.44	3.33	6.24	2.84	-0.47	3.51	0.20	3.31	615	0.0054	CIRCULAR	8	0.74	0.74	0.77	0.015	2.21	4.64	6.00	4.64	10.64	
14D	Bowery	Kensington Walk	West 15th Street	C-7	14,389	**0.33**	**0.33**	---	---	**0.005**	**3.90**	**0.020**	---	---	---	**0**	**0.001**	0.02	**0.02**	7.13	6.44	3.83	6.16	2.55	-0.47	3.30	0.28	3.02	135	0.0224	CIRCULAR	9	2.06	2.06	2.15	0.015	4.87	0.46	6.00	0.46	6.46	
15D	West 15th Street	Bowery	Surf Avenue	C-7	13,923	**0.32**	**2.18**	---	---	**0.034**	**3.90**	**0.133**	---	---	---	**0**	**0.005**	0.13	**0.14**	6.44	5.09	6.24	6.20	-0.47	-1.78	0.20	-1.11	1.31	265	0.0049	CIRCULAR	8	0.71	0.71	0.74	0.015	2.12	2.09	10.64	2.09	12.73	
16D	West 15th Street	Boardwalk	Bowery	C-7	56,887	**1.31**	**1.31**	---	---	**0.020**	**3.90**	**0.078**	---	---	---	**0**	**0.003**	0.08	**0.08**	6.84	6.44	3.59	4.00	2.50	1.69	3.25	2.44	0.81	360	0.0023	CIRCULAR	9	0.65	0.65	0.68	0.015	1.54	3.89	6.00	3.89	9.89	
17D	West 15th Street	Bowery	Surf Avenue	C-7	15,014	**0.34**	**1.65**	---	---	**0.026**	**3.90**	**0.101**	---	---	---	**0**	**0.004**	0.10	**0.10**	6.44	5.09	4.00	4.04	1.69	0.30	2.44	1.05	1.39	320	0.0043	CIRCULAR	9	0.91	0.91	0.95	0.015	2.14	2.49	9.89	2.49	12.37	
18D	Surf Avenue	West 12th Street	Henderson Walk	C-7	54,793	**1.26**	**1.26**	---	---	**0.019**	**3.90**	**0.074**	---	---	---	**0**	**0.003**	0.07	**0.08**	5.44	5.84	5.63	7.41	-0.86	-2.24	-0.19	-1.57	1.38	250	0.0055	CIRCULAR	8	0.75	0.75	0.78	0.015	2.24	1.86	6.00	1.86	7.86	
19D	Bowery	West 12th Street	Henderson Walk	C-7	25,992	**0.60**	**0.60**	---	---	**0.009**	**3.90**	**0.035**	---	---	---	**0**	**0.001**	0.04	**0.04**	6.65	7.38	3.22	4.95	2.68	1.68	3.43	2.43	1.00	230	0.0043	CIRCULAR	9	0.91	0.91	0.95	0.015	2.15	1.79	6.00	1.79	7.79	Invert Information from 1899 As-Builts
20D	Henderson Walk	Boardwalk	Bowery	C-7	70,907	**1.63**	**1.63**	---	---	**0.025**	**3.90**	**0.098**	---	---	---	**0**	**0.004**	0.10	**0.10**	7.23	7.38	3.48	4.40	3.00	2.23	3.75	2.98	0.77	290	0.0027	CIRCULAR	9	0.71	0.71	0.74	0.015	1.68	2.88	6.00	2.88	8.88	
21D	Bowery	Stillwell Avenue	Henderson Walk	C-7	12,992	**0.30**	**0.30**	---	---	**0.005**	**3.90**	**0.020**	---	---	---	**0**	**0.001**	0.02	**0.02**	6.53	7.38	2.38	4.07	3.40	2.56	4.15	3.31	0.84	110	0.0076	CIRCULAR	9	1.21	1.21	1.26	0.015	2.84	0.64	6.00	0.64	6.64	
22D	Henderson Walk	Bowery	Surf Avenue	C-7	22,023	**0.51**	**3.03**	---	---	**0.047**	**3.90**	**0.183**	---	---	---	**0**	**0.007**	0.18	**0.19**	7.38	5.84	4.40	4.29	2.23	0.80	2.98	1.55	1.43	300	0.0048	CIRCULAR	9	0.95	0.95	0.99	0.015	2.25	2.23	8.88	2.23	11.11	
23D	Surf Avenue	Henderson	Stillwell Avenue	C-7	35,407	**0.81**	**5.10**	---	---	**0.079**	**3.90**	**0.308**	---	---	---	**0**	**0.012**	0.31	**0.32**	5.84	5.24	7.25	7.06	-2.24	-2.65	-1.41	-1.82	0.41	110	0.0037	CIRCULAR	10	1.12	1.12	1.16	0.015	2.13	0.86	11.11	0.86	11.97	
24D	Stillwell Avenue	Boardwalk	Bowery	C-7	45,291	**1.04**	**1.04**	---	---	**0.016**	**3.90**	**0.062**	---	---	---	**0**	**0.003**	0.06	**0.06**	7.04	6.53	3.45	6.14	2.92	-0.28	3.59	0.39	3.20	555	0.0058	CIRCULAR	8	0.77	0.77	0.80	0.015	2.28	4.05	6.00	4.05	10.05	
25D	Stillwell Avenue	Bowery	Surf Avenue	C-7	17,039	**0.39**	**1.43**	---	---	**0.022**	**3.90**	**0.086**	---	---	---	**0**	**0.003**	0.09	**0.09**	6.53	5.24	6.14	6.14	-0.28	-1.57	0.39	-0.90	1.29	330	0.0039	CIRCULAR	8	0.63	0.63	0.66	0.015	1.88	2.92	10.05	2.92	12.97	
26D	Stillwell Avenue	Boardwalk	Bowery	C-7	50,508	**1.16**	**1.16**	---	---	**0.018**	**3.90**	**0.070**	---	---	---	**0**	**0.003**	0.07	**0.07**	7.04	6.53	2.92	4.58	3.45	1.28	4.12	1.95	2.17	440	0.0049	CIRCULAR	8	0.71	0.71	0.74	0.015	2.11	3.47	6.00	3.47	9.47	Inverts and size from I and I
27D	Stillwell Avenue	Bowery	Surf Avenue	C-7	16,426	**0.38**	**1.54**	---	---	**0.024**	**3.90**	**0.094**	---	---	---	**0**	**0.004**	0.09	**0.10**	6.53	5.24	4.58	4.34	1.28	0.23	1.95	0.90	1.05	300	0.0035	CIRCULAR	8	0.60	0.60	0.62	0.015	1.78	2.81	9.47	2.81	12.28	Inverts and size from I and I
28D	Surf Avenue	Stillwell Avenue	Schweickerts Walk	C-7	18,332	**0.42**	**8.49**	---	---	**0.131**	**3.85**	**0.504**	---	---	---	**0**	**0.021**	0.50	**0.52**	5.24	6.09	7.59	9.18	-3.18	-3.92	-2.35	-3.09	0.74	110	0.0067	CIRCULAR	10	1.50	1.50	1.56	0.015	2.86	0.64	12.97	0.64	13.61	
29D	Schweickerts Walk	Boardwalk	Bowery	C-7	68,571	**1.57**	**1.57**	---	---	**0.024**	**3.90**	**0.094**	---	---	---	**0**	**0.004**	0.09	**0.10**	8.31	7.11	5.06	5.33	2.50	1.03	3.25	1.78	1.47	340	0.0043	CIRCULAR	9	0.91	0.91	0.95	0.015	2.14	2.65	6.00	2.65	8.65	
30D	Bowery	Stillwell Avenue	Schweickerts Walk	C-7	12,965	**0.30**	**0.30**	---	---	**0.005**	**3.90**	**0.020**	---	---	---	**0**	**0.001**	0.02	**0.02**	6.53	7.11	3.74	5.00	2.04	1.36	2.79	2.11	0.68	100	0.0068	CIRCULAR	9	1.14	1.14	1.19	0.015	2.68	0.62	6.00	0.62	6.62	
31D	Bowery	West 15th Street	Schweickerts Walk	C-7	14,691	**0.34**	**0.34**	---	---	**0.005**	**3.90**	**0.020**	---	---	---	**0**	**0.001**	0.02	**0.02**	6.44	7.11	3.61	5.00	2.08	1.36	2.83	2.11	0.72	110	0.0065	CIRCULAR	9	1.12	1.12	1.16	0.015	2.63	0.70	6.00	0.70	6.70	
32D	Schweickerts Walk	Bowery	Surf Avenue	C-7	15,622	**0.36**	**2.57**	---	---	**0.040**	**3.90**	**0.156**	---	---	---	**0**	**0.006**	0.16	**0.16**	7.11	6.09	5.33	5.04	1.03	0.30	1.78	1.05	0.73	280	0.0026	CIRCULAR	9	0.70	0.70	0.73	0.015	1.66	2.81	8.65	2.81	11.46	
33D	Surf Avenue	Schweickerts Walk	West 15th Street	C-7	33,957	**0.78**	**11.83**	---	---	**0.183**	**3.75**	**0.686**	---	---	---	**0**	**0.029**	0.69	**0.71**	6.09	5.09	9.18	8.48	-3.92	-4.22	-3.09	-3.39	0.30	130	0.0023	CIRCULAR	10	0.88	0.88	0.91	0.015	1.68	1.29	13.61	1.29	14.91	
				R-6	33,962	0.78	0.78	170	133	0.031	---	---	---	---	---	0	---	---																								
				C-7	62,767	1.44	23.38	---	---	0.362	---	---	---	---	---	0	---	---																								
				PARK	0	0.00	6.95	---	---	0.043	---	---	---	---	---	0	---	---																								
34D	West 15th Street	Surf Avenue	Mermaid Avenue	R-5/R-6/C-7/PARK		**2.22**	**31.11**	---	---	**0.436**	**3.55**	**1.548**	---	---	---	**0.000**	**0.075**	1.55	**1.62**	5.09	5.09	8.44	9.92	-4.85	-6.33	-3.35	-4.83	1.48	510	0.0029	CIRCULAR	18	4.72	4.72	4.92	0.015	2.78	3.05	14.91	3.05	17.96	
35D	West 17th Street	Neptune Avenue	Mermaid Avenue	R-6	90,509	**2.08**	**2.08**	170	353	**0.082**	**3.90**	**0.320**	---	---	---	**0**	**0.005**	0.32	**0.32**	6.09	5.09	3.26	4.79	1.83	-0.70	2.83	0.30	2.53	370	0.0068	CIRCULAR	12	2.46	2.46	2.56	0.015	3.26	1.89	6.00	1.89	7.89	
36D	Mermaid Avenue	West 17th Street	West 16th Street	R-6	45,172	**1.04**	**3.11**	170	530	**0.123**	**3.85**	**0.474**	---	---	---	**0**	**0.008**	0.47	**0.48**	5.09	5.09	5.12	6.92	-0.70	-2.50	-0.03	-1.83	1.80	280	0.0064	CIRCULAR	8	0.81	0.81	0.84	0.015	2.41	1.93	7.89	1.93	9.83	
				R-6	33,962	0.78	0.78	170	133	0.031	---	---	---	---	---	0	---	---																								
				C-7	32,093	0.74	0.74	---	---	0.011	---	---	---	---	---	0	---	---																								
37D	West 16th Street	Surf Avenue	Mermaid Avenue	R-6/C-7		**1.52**	**1.52**	---	---	**0.042**	**3.90**	**0.164**	---	---	---	**0.000**	**0.004**	0.16	**0.17**	5.61	5.09	3.07	3.59	1.54	0.50	2.54	1.50	1.04	290	0.0036	CIRCULAR	12	1.78	1.78	1.85	0.015	2.36	2.05	6.00	2.05	8.05	
				R-6	22,586	0.52	4.41	170	750	0.174	---	---	---	---	---	0	---	---																								
				C-7	0	0.00	0.74	---	---	0.011	---	---	---	---	---	0	---	---																								
38D	Mermaid Avenue	West 16th Street	West 15th Street	R-6/C-7		**0.52**	**5.15**	---	---	**0.185**	**3.75**	**0.694**	---	---	---	**0.000**	**0.012**	0.69	**0.71**	5.09	5.09	6.92	10.75	-2.50	-6.33	-1.83	-5.66	3.83	290	0.0132	CIRCULAR	8	1.16	1.16	1.21	0.015	3.46	1.40	9.83	1.40	11.22	

CONEY IS. REZONING;
BROOKLYN, NY
12-04-08
BROOKLYN SEWER DATUM
PREPARED
FOR:NYC EDC
BY:AKRF

HYDRAULIC STUDY
EX. SANITARY SEWER AND EX. ZONING

SHEET: 4 OF 5
COMPUTED BY: DC
CHECKED BY: KF

	LOCATION	FROM	TO	ZONING	AREA UNIT (SF)	AREA		DOMESTIC FLOW (CFS)					INDUSTRIAL WASTE FLOW (CFS)				INFILTRATION	TOTAL SANITARY FLOW WITHOUT INFILTRATION (CFS)	TOTAL SANITARY FLOW WITH INFILTRATION (CFS)	SURFACE ELEV.		COVER (FT.)		INVERT		INNER TOP		FALL (FT.)	LENGTH (FT.)	SLOPE	SHAPE OF SEWER	DIMENSION OF SEWER (INCHES)	CAPACITY OF SEWER @ .78 DEPTH	CAPACITY OF SEWER (CFS) NOT AT FULL CAPACITY	FULL CAPACITY OF CIRCULAR SEWER (CFS)	"N"	VELOCITY (FPS)	TIME IN SECTION (FULL) (MIN)	TIME ELAPSED (MIN)			REMARKS
						INCREMENT (ACRES)	TOTAL (ACRES)	DENSITY (PERSONS/ACRE)	TOTAL POPULATION	AVERAGE FLOW	PEAK FLOW FACTOR	PEAK FLOW	IND. FACTOR	INCREMENT AVERAGE FLOW	IND. PEAK FACTOR	PEAK FLOW				UPPER END	LOWER END	UPPER END	LOWER END	UPPER END	LOWER END	UPPER END	LOWER END												UPPER END OF SECTION	IN SECTION	LOWER END OF SECTION	
				R-6	114,561	2.63	2.63	170	447	0.104	---	---	---	---	---	0	---	---																							
				C-7	53,808	1.24	1.24	---	---	0.019	---	---	---	---	---	0	---	---																							
39D	Stillwell Avenue	Surf Avenue	Mermaid Avenue	R-6/C-7		**3.87**	**3.87**	---	---	**0.123**	**3.85**	**0.474**	---	---	---	**0.000**	**0.009**	0.47	**0.48**	5.24	5.44	4.53	7.63	0.04	-2.86	0.71	-2.19	2.90	385	0.0075	CIRCULAR	8	0.87	0.87	0.91	0.015	2.61	2.46	6.00	2.46	8.46	
				R-6	22,986	0.53	3.16	170	537	0.125	---	---	---	---	---	0	---	---																							
				C-7	0	0.00	1.24	---	---	0.019	---	---	---	---	---	0	---	---																							
40D	Mermaid Avenue	Stillwell Avenue	West 15th Street	R-6/C-7		**0.53**	**4.39**	---	---	**0.144**	**3.80**	**0.547**	---	---	---	**0.000**	**0.011**	0.55	**0.56**	5.44	5.09	3.86	10.75	0.91	-6.33	1.58	-5.66	7.24	310	0.0234	CIRCULAR	8	1.54	1.54	1.60	0.015	4.60	1.12	8.46	1.12	9.58	
41D	West 16th Street	Neptune Avenue	Mermaid Avenue	R-6	100,927	**2.32**	**2.32**	170	394	**0.091**	**3.90**	**0.355**	---	---	---	**0**	**0.006**	0.35	**0.36**	6.09	5.09	2.99	5.52	2.10	-1.43	3.10	-0.43	3.53	400	0.0088	CIRCULAR	12	2.79	2.79	2.91	0.015	3.70	1.80	6.00	1.80	7.80	
42D	Mermaid Avenue	West 16th Street	West 15th Street	R-6	22,586	**0.52**	**2.84**	170	482	**0.112**	**3.85**	**0.431**	---	---	---	**0**	**0.007**	0.43	**0.44**	5.09	5.09	8.45	8.56	-9.36	-9.47	-3.36	-3.47	0.11	290	0.0004	CIRCULAR	72	68.81	68.81	71.68	0.015	2.54	1.91	7.80	1.91	9.71	
				R-6	22,986	0.53	11.71	170	1991	0.462	---	---	---	---	---	0	---	---																							
				C-7	0	0.00	25.35	---	---	0.392	---	---	---	---	---	0	---	---																							
				PARK	0	0.00	6.95	---	---	0.043	---	---	---	---	---	0	---	---																							
43D	Mermaid Avenue	West 15th Street	Stillwell Avenue	R-6/C-7		**0.53**	**44.02**	---	---	**0.897**	**3.15**	**2.826**	---	---	---	**0.000**	**0.107**	2.83	**2.93**	5.09	5.44	8.56	9.05	-9.47	-9.61	-3.47	-3.61	0.14	310	0.0005	CIRCULAR	72	75.08	75.08	78.21	0.015	2.77	1.87	17.96	1.87	19.83	
				R-6	305,053	7.00	18.72	170	3182	0.738	---	---	---	---	---	0	---	---																							
				C-7	0	0.00	25.35	---	---	0.392	---	---	---	---	---	0	---	---																							
				C8-1	12,403	0.28	0.28	---	---	0.002	---	---	---	---	---	0	---	---																							
				PARK	0	0.00	6.95	---	---	0.043	---	---	---	---	---	0	---	---																							
44D	Stillwell Avenue	Mermaid Avenue	Neptune Avenue	R-6/C-7		**7.29**	**51.30**	---	---	**1.175**	**3.05**	**3.584**	---	---	---	**0.000**	**0.124**	3.58	**3.71**	5.44	5.09	9.05	9.02	-9.61	-9.93	-3.61	-3.93	0.32	740	0.0004	CIRCULAR	72	73.47	73.47	76.53	0.015	2.71	4.56	19.83	4.56	24.38	
				C-7	96,886	2.22	2.22	---	---	0.034	---	---	---	---	---	0	---	---																							
				PARK	88,223	2.03	2.03	---	---	0.013	---	---	---	---	---	0	---	---																							
1E	West 10th Street	Boardwalk	Surf Avenue			**4.25**	**4.25**	---	---	**0.047**	**3.90**	**0.183**	---	---	---	**0.000**	**0.010**	0.18	**0.19**	8.09	5.90	3.28	7.63	3.81	-2.73	4.81	-1.73	6.54	675	0.0097	CIRCULAR	12	2.93	2.93	3.05	0.015	3.88	2.90	6.00	2.90	8.90	
				C-7	23,358	0.54	2.76	---	---	0.043	---	---	---	---	---	0	---	---																							
				PARK	0	0.00	2.03	---	---	0.013	---	---	---	---	---	0	---	---																							
2E	Surf Avenue	West 10th Street	Jones Walk			**0.54**	**4.79**	---	---	**0.056**	**3.90**	**0.218**	---	---	---	**0.000**	**0.012**	0.22	**0.23**	5.90	5.63	7.38	7.62	-2.73	-3.24	-1.48	-1.99	0.51	255	0.0020	CIRCULAR	15	2.41	2.41	2.51	0.015	2.05	2.08	8.90	2.08	10.98	
3E	Jones Walk	Boardwalk	Bowery	C-7	91,442	**2.10**	**2.10**	---	---	**0.032**	**3.90**	**0.125**	---	---	---	**0**	**0.005**	0.13	**0.13**	7.76	7.14	4.21	4.96	2.80	1.43	3.55	2.18	1.37	310	0.0044	CIRCULAR	9	0.92	0.92	0.96	0.015	2.16	2.39	6.00	2.39	8.39	
4E	Bowery	West 12th Street	Jones Walk	C-7	24,596	**0.56**	**0.56**	---	---	**0.009**	**3.90**	**0.035**	---	---	---	**0**	**0.001**	0.04	**0.04**	6.65	7.14	3.24	4.39	2.66	2.00	3.41	2.75	0.66	175	0.0038	CIRCULAR	9	0.85	0.85	0.88	0.015	2.00	1.46	6.00	1.46	7.46	
5E	Jones Walk	Surf Avenue	Bowery	C-7	30,161	**0.69**	**3.36**	---	---	**0.052**	**3.90**	**0.203**	---	---	---	**0**	**0.008**	0.20	**0.21**	7.14	5.64	4.96	4.29	1.43	0.60	2.18	1.35	0.83	240	0.0035	CIRCULAR	9	0.81	0.81	0.85	0.015	1.91	2.09	8.39	2.09	10.48	
				C-7	21,814	0.50	6.62	---	---	0.102	---	---	---	---	---	0	---	---																							
				PARK	0	0.00	2.03	---	---	0.013	---	---	---	---	---	0	---	---																							
6E	Surf Avenue	Jones Walk	West 12th Street			**0.50**	**8.64**	---	---	**0.115**	**3.90**	**0.449**	---	---	---	**0.000**	**0.021**	0.45	**0.47**	5.64	5.44	7.63	7.83	-3.24	-3.64	-1.99	-2.39	0.40	200	0.0020	CIRCULAR	15	2.41	2.41	2.51	0.015	2.05	1.63	10.48	1.63	12.11	
				R-6	4,372	0.10	0.10	170	17	0.004	---	---	---	---	---	0	---	---																							
				C-7	62,903	1.44	1.44	---	---	0.022	---	---	---	---	---	0	---	---																							
				PARK	2,703	0.06	0.06	---	---	0.000	---	---	---	---	---	0	---	---																							
7E	Surf Avenue	West 10th Street	West 12th Street			**1.61**	**1.61**	---	---	**0.026**	**3.90**	**0.101**	---	---	---	**0.000**	**0.004**	0.10	**0.11**	5.90	5.44	6.75	7.92	-1.85	-3.48	-0.85	-2.48	1.63	450	0.0036	CIRCULAR	12	1.79	1.79	1.86	0.015	2.37	3.16	6.00	3.16	9.16	
8E	West 12th Street	Boardwalk	Bowery	C-7	49,678	**1.14**	**1.14**	---	---	**0.018**	**3.90**	**0.070**	---	---	---	**0**	**0.003**	0.07	**0.07**	7.42	6.65	2.67	7.22	4.00	-1.32	4.75	-0.57	5.32	480	0.0111	CIRCULAR	9	1.45	1.45	1.51	0.015	3.43	2.34	6.00	2.34	8.34	
9E	West 12th Street	Bowery	Surf Avenue	C-7	16,546	**0.38**	**1.52**	---	---	**0.024**	**3.90**	**0.094**	---	---	---	**0**	**0.004**	0.09	**0.10**	6.65	5.44	6.97	8.08	-1.32	-3.64	-0.32	-2.64	2.32	210	0.0110	CIRCULAR	12	3.12	3.12	3.25	0.015	4.14	0.84	8.34	0.84	9.18	
10E	West 12th Street	Boardwalk	Bowery	C-7	52,557	**1.21**	**1.21**	---	---	**0.019**	**3.90**	**0.074**	---	---	---	**0**	**0.003**	0.07	**0.08**	7.42	6.65	3.09	6.70	3.66	-0.72	4.33	-0.05	4.38	390	0.0112	CIRCULAR	8	1.07	1.07	1.11	0.015	3.19	2.04	6.00	2.04	8.04	
11E	West 12th Street	Bowery	Surf Avenue	C-7	17,300	**0.40**	**1.60**	---	---	**0.025**	**3.90**	**0.098**	---	---	---	**0**	**0.004**	0.10	**0.10**	6.65	5.44	6.70	8.41	-0.72	-3.64	-0.05	-2.97	2.92	260	0.0112	CIRCULAR	8	1.07	1.07	1.11	0.015	3.19	1.36	8.04	1.36	9.40	
				R-6	725,838	16.66	16.76	170	2850	0.661	---	---	---	---	---	0	---	---																							
				C-7	18,513	0.43	11.61	---	---	0.180	---	---	---	---	---	0	---	---																							
				PARK	48,519	1.11	3.20	---	---	0.020	---	---	---	---	---	0	---	---																							
12E	West 12th Street	Surf Avenue	Mermaid Avenue			**18.20**	**31.58**	---	---	**0.861**	**3.30**	**2.841**	---	---	---	**0.000**	**0.076**	2.84	**2.92**	5.44	4.94	7.08	8.79	-3.64	-5.85	-1.64	-3.85	2.21	1290	0.0017	CIRCULAR	24	7.81	7.81	8.14	0.015	2.59	8.30	12.11	8.30	20.41	
				R-6	68,185	1.57	1.57	170	267	0.062	---	---	---	---	---	0	---																							
				PARK	261,256	6.00	6.00	---	---	0.019	---	---	---	---	---	0	---	---																							
1F	West 5th Street	Brighton Ave	Surf Ave			**7.57**	**7.57**	---	---	**0.081**	**3.90**	**0.316**	---	---	---	**0.000**	**0.018**	0.32	**0.33**	6.09	5.44	6.55	6.64	-1.46	-2.20	-0.46	-1.20	0.74	350	0.0021	CIRCULAR	12	1.37	1.37	1.42	0.015	1.81	3.22	6.00	3.22	9.22	Inverts from I and I
2F	Surf Avenue	West 8th St	West 5th St	R-6	146,244	**3.36**	**3.36**	170	571	**0.133**	**3.85**	**0.510**	---	---	---	**0**	**0.008**	0.51	**0.52**	6.64	5.44	6.39	6.64	-0.75	-2.20	0.25	-1.20	1.45	475	0.0031	CIRCULAR	12	1.64	1.64	1.71	0.015	2.18	3.63	6.00	3.63	9.63	Inverts from I and I
				R-6	0	0.00	4.93	170	838	0.195	---	---	---	---	---	0	---																							
				PARK	198,312	4.55	10.55	---	---	0.033	---	---	---	---	---	0	---	---																							
3F	Surf Avenue	West 5th St	West 8th St			**4.55**	**15.48**	---	---	**0.228**	**3.70**	**0.842**	---	---	---	**0.000**	**0.037**	0.84	**0.88**	5.44	6.64	6.80	8.70	-2.86	-3.56	-1.36	-2.06	0.70	450	0.0016	CIRCULAR	18	3.46	3.46	3.60	0.015	2.04	3.68	9.63	3.68	13.32	

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HYDRAULIC STUDY
EX. SANITARY SEWER AND EX. ZONING

COMPUTED BY: DC
CHECKED BY: KF

	LOCATION	FROM	TO	ZONING	AREA UNIT (SF)	AREA		DOMESTIC FLOW (CFS)					INDUSTRIAL WASTE FLOW (CFS)				INFILTRATION	TOTAL SANITARY FLOW WITHOUT INFILTRATION (CFS)	TOTAL SANITARY FLOW WITH INFILTRATION (CFS)	SURFACE ELEV.		COVER (FT.)		INVERT		INNER TOP		FALL (FT.)	LENGTH (FT.)	SLOPE	SHAPE OF SEWER	DIMENSION OF SEWER (INCHES)	CAPACITY OF SEWER @ .7/0 DEPTH	CAPACITY OF SEWER (CFS) NOT AT FULL CAPACITY	FULL CAPACITY OF CIRCULAR SEWER (CFS)	"N"	VELOCITY (FPS)	TIME IN SECTION (FULL) (MIN)	TIME ELAPSED (MIN)			REMARKS
						INCREMENT (ACRES)	TOTAL (ACRES)	DENSITY (PERSONS/ACRE)	TOTAL POPULATION	AVERAGE FLOW	PEAK FLOW FACTOR	PEAK FLOW	IND. FACTOR	INCREMENT AVERAGE FLOW	IND. PEAK FACTOR	PEAK FLOW				UPPER END	LOWER END	UPPER END	LOWER END	UPPER END	LOWER END	UPPER END	LOWER END											UPPER END OF SECTION	IN SECTION	LOWER END OF SECTION	
				R-6	0	0.00	4.93	170	838	0.195	---	---	---	---	---	0	---																								
				PARK	273,852	6.29	16.84	---	---	0.052	---	---	---	---	---	0	---	---																								
4F	Surf Avenue	West 5th St	West 8th St			**6.29**	**21.77**	---	---	**0.247**	**3.65**	**0.900**	---	---	---	**0.000**	**0.053**	0.90	**0.95**	6.64	6.14	8.53	8.46	-3.89	-4.32	-1.89	-2.32	0.43	425	0.0010	CIRCULAR	24	6.00	6.00	6.25	0.015	1.99	3.56	13.32	3.56	16.87	
				C-7	64,520	1.48	1.48	---	---	0.023	---	---	---	---	---	0	---																								
				PARK	13,301	0.31	0.31	---	---	0.001	---	---	---	---	---	0	---	---																								
5F	Permanent Sewer Easement	Boardwalk	Surf Ave			**1.79**	**1.79**	---	---	**0.024**	**3.90**	**0.094**	---	---	---	**0.000**	**0.004**	0.09	**0.10**	8.09	6.14	8.88	8.28	-1.79	-3.14	-0.79	-2.14	1.35	450	0.0030	CIRCULAR	12	1.63	1.63	1.70	0.015	2.16	3.47	6.00	3.47	9.47	
				C-7	17,646	0.41	0.41	---	---	0.006	---	---	---	---	---	0	---																								
				PARK	2,244	0.05	0.05	---	---	0.000	---	---	---	---	---	0	---	---																								
6F	Surf Avenue	West 10th St	West 8th St			**0.46**	**0.46**	---	---	**0.006**	**3.90**	**0.023**	---	---	---	**0.000**	**0.001**	0.02	**0.02**	5.85	6.14	7.52	8.31	-2.67	-3.17	-1.67	-2.17	0.50	275	0.0018	CIRCULAR	12	1.27	1.27	1.32	0.015	1.68	2.73	6.00	2.73	8.73	
				R-6	22,818	0.52	0.52	170	88	0.021	---	---	---	---	---	0	---																								
				C-7	33,848	0.78	0.78	---	---	0.012	---	---	---	---	---	0	---																								
				PARK	14,809	0.34	0.34	---	---	0.001	---	---	---	---	---	0	---	---																								
7F	Surf Avenue	West 10th St	West 8th St			**1.64**	**1.64**	---	---	**0.034**	**3.90**	**0.131**	---	---	---	**0.000**	**0.004**	0.13	**0.13**	5.85	6.14	6.70	8.70	-1.85	-3.56	-0.85	-2.56	1.71	325	0.0053	CIRCULAR	12	2.16	2.16	2.25	0.015	2.86	1.89	6.00	1.89	7.89	
8F	Surf Avenue	West 5th St	West 8th St	R-6	122,906	**2.82**	**2.82**	170	479	**0.111**	**3.90**	**0.434**	---	---	---	**0**	**0.007**	0.43	**0.44**	6.64	6.14	6.39	8.70	-0.75	-3.56	0.25	-2.56	2.81	425	0.0066	CIRCULAR	12	2.42	2.42	2.52	0.015	3.21	2.21	6.00	2.21	8.21	
				R-6	1,080,141	24.80	33.07	170	5622	1.305	---	---	---	---	---	0	---																								
				C-7	13,601	0.31	2.98	---	---	0.046	---	---	---	---	---	0	---	---																								
				PARK	41,288	0.95	18.49	---	---	0.057	---	---	---	---	---	0	---	---																								
9F	West 8th Street	Surf Ave	Neptune Ave			**26.06**	**54.54**	---	---	**1.408**	**2.95**	**4.153**	---	---	---	**0.000**	**0.132**	4.15	**4.29**	6.14	5.00	8.46	8.66	-4.32	-5.66	-2.32	-3.66	1.34	1220	0.0011	CIRCULAR	24	6.25	6.25	6.52	0.015	2.07	9.80	16.87	9.80	26.68	

SANITARY SEWER HYDRAULIC STUDY CALCULATIONS
PROPOSED ZONING

CONEY IS. REZONING;
BROOKLYN, NY
12-04-08
BROOKLYN SEWER DATUM
PREPARED
FOR:NYC EDC
BY:AKRF

SAN. SEWER SENSITIVITY ANALYSIS
CATCHMENT AREAS C,D,E,F

COMPUTED BY: DC
CHECKED BY: KF

	LOCATION	FROM	TO	ZONING	AREA UNIT (SF)	AREA		DOMESTIC FLOW (CFS)					INDUSTRIAL WASTE FLOW (CFS)				INFILTRATION	TOTAL SANITARY FLOW WITHOUT INFILTRATION (CFS)	TOTAL SANITARY FLOW WITH INFILTRATION (CFS)	SURFACE ELEV.		COVER (FT.)		INVERT		INNER TOP		FALL (FT.)	LENGTH (FT.)	SLOPE	SHAPE OF SEWER	DIMENSION OF SEWER (INCHES)	CAPACITY OF SEWER @ 7/8-DEPTH	CAPACITY OF SEWER (CFS) USED AT FULL CAPACITY	FULL CAPACITY OF CIRCULAR SEWER (CFS)	"N"	VELOCITY (FPS)	TIME IN SECTION (FULL) (MIN)	TIME ELAPSED (MIN)			REMARKS
						INCREMENT (ACRES)	TOTAL (ACRES)	DENSITY (PERSON/ACRE)	TOTAL POPULATION	AVERAGE FLOW	PEAK FLOW FACTOR	PEAK FLOW	IND. FACTOR	INCREMENT AVERAGE FLOW	IND. PEAK FACTOR	PEAK FLOW				UPPER END	LOWER END	UPPER END	LOWER END	UPPER END	LOWER END	UPPER END	LOWER END											UPPER END OF SECTION	IN SECTION	LOWER END OF SECTION	
1C	West 19th Street	Boardwalk	Surf Avenue	PARK	503,481	**11.56**	**11.56**	---	---	**0.072**	**3.90**	**0.281**	---	---	---	**0**	**0.028**	0.28	**0.31**	6.84	5.44	3.01	7.07	3.16	-2.30	3.83	-1.63	5.46	940	0.0058	CIRCULAR	8	0.77	0.77	0.80	0.015	2.29	6.83	6.00	6.83	12.83	N/A
				R-8	114,517	2.63	2.63	375	986	0.229	---	---	---	---	---	0	---	---																							
				PARK	0	0.00	11.56	---	---	0.072	---	---	---	---	---	0	---	---																							
2C	West 19th Street	Surf Avenue	Mermaid Avenue	R-8/PARK		**2.63**	**14.19**	---	---	**0.301**	**3.60**	**1.084**	---	---	---	**0.000**	**0.034**	1.08	**1.12**	5.34	5.09	6.81	8.46	-2.30	-4.20	-1.47	-3.37	1.90	440	0.0043	CIRCULAR	10	1.20	1.20	1.25	0.015	2.29	3.20	12.83	3.20	16.03	Increased from C-7 to R-8
				R-7	109,314	2.51	2.51	230	577	0.134	---	---	---	---	---	0	---	---																							
				C-7	0	0.00	0.00	---	---	0.000	---	---	---	---	---	0	---	---																							
3C	West 17th Street	Surf Avenue	Mermaid Avenue	R-7/C-7		**2.51**	**2.51**	---	---	**0.134**	**3.85**	**0.516**	---	---	---	**0.000**	**0.006**	0.52	**0.52**	5.09	5.09	4.08	6.61	0.34	-2.19	1.01	-1.52	2.53	395	0.0064	CIRCULAR	8	0.81	0.81	0.84	0.015	2.41	2.73	6.00	2.73	8.73	Increased from R-6/C-7 to R-7
				R-7	45,171	1.04	3.55	230	816	0.189	---	---	---	---	---	0	---	---																							
				C-7	0	0.00	0.00	---	---	0.000	---	---	---	---	---	0	---	---																							
4C	Mermaid Avenue	West 17th Street	West 19th Street	R-7/C-7		**1.04**	**3.55**	---	---	**0.189**	**3.70**	**0.699**	---	---	---	**0.000**	**0.009**	0.70	**0.71**	5.09	5.09	6.61	8.42	-2.19	-4.00	-1.52	-3.33	1.81	300	0.0060	CIRCULAR	8	0.78	0.78	0.82	0.015	2.34	2.14	8.73	2.14	10.87	Increased from R-6/C-7 to R-7
				R-5	91,386	2.10	2.10	100	210	0.049	---	---	---	---	---	0	---	---																							
				R-6	91,385	2.10	6.48	170	1102	0.256	---	---	---	---	---	0	---	---																							
				R-7	0	0.00	1.80	230	414	0.096	---	---	---	---	---	0	---	---																							
				C-7	0	0.00	0.00	---	---	0.000	---	---	---	---	---	0	---	---																							
				C8-1	19,681	0.45	0.45	---	---	0.003	---	---	---	---	---	0	---	---																							
				PARK	0	0.00	11.56	---	---	0.072	---	---	---	---	---	0	---	---																							
5C	West 19th Street	Mermaid Avenue	Neptune Avenue	R-5/R-6/R-7/C-7/C8-1/ PARK		**4.65**	**22.39**	---	---	**0.476**	**3.45**	**1.642**	---	---	---	**0.000**	**0.054**	1.64	**1.70**	5.09	5.44	8.44	11.65	-4.35	-7.21	-3.35	-6.21	2.86	875	0.0033	CIRCULAR	12	1.70	1.70	1.77	0.015	2.25	6.47	16.03	6.47	22.50	Increased 1.8 Acres R-6/C-7 to R-7 / Inverts from I and I
				R-8	28,689	0.66	0.66	375	247	0.057	---	---	---	---	---	0	---	---																							
				PARK	44,036	1.01	1.01	---	---	0.006	---	---	---	---	---	0	---	---																							
1D	Surf Avenue	West 17th Street	West 16th Street	R-8/PARK		**1.67**	**1.67**	---	---	**0.063**	**3.90**	**0.246**	---	---	---	**0.000**	**0.004**	0.25	**0.25**	5.09	5.09	4.98	7.42	-0.56	-3.00	0.11	-2.33	2.44	325	0.0075	CIRCULAR	8	0.87	0.87	0.91	0.015	2.61	2.08	6.00	2.08	8.08	Increased C-7 to R-8
2D	West 16th Street	Mermaid Avenue	Surf Avenue	R-8	29,314	**0.67**	**0.67**	375	252	**0.059**	**3.90**	**0.230**	---	---	---	**0**	**0.002**	0.23	**0.23**	5.61	5.09	3.07	7.09	1.54	-3.00	2.54	-2.00	4.54	185	0.0245	CIRCULAR	12	4.66	4.66	4.85	0.015	6.18	0.50	6.00	0.50	6.50	Increased C-7 to R-8
3D	West 16th Street	Boardwalk	Surf Avenue	PARK	258,708	**5.94**	**5.94**	---	---	**0.037**	**3.90**	**0.144**	---	---	---	**0**	**0.014**	0.14	**0.16**	6.84	5.09	4.15	7.42	2.02	-3.00	2.69	-2.33	5.02	770	0.0065	CIRCULAR	8	0.81	0.81	0.85	0.015	2.43	5.28	6.00	5.28	11.28	
4D	West 16th Street	Boardwalk	Surf Avenue	R-8	83,627	**1.92**	**1.92**	375	720	**0.167**	**3.80**	**0.635**	---	---	---	**0**	**0.005**	0.64	**0.64**	6.84	5.09	2.65	3.34	3.44	1.00	4.19	1.75	2.44	740	0.0033	CIRCULAR	9	0.79	0.79	0.83	0.015	1.87	6.60	6.00	6.60	12.60	Increased C-7 to R-8
				R-7	31,497	0.72	3.97	230	914	0.212	---	---	---	---	---	0	---	---																							
				PARK	0	0.00	6.95	---	---	0.043	---	---	---	---	---	0	---	---																							
5D	Surf Avenue	West 16th Street	Kensington Walk	R-7/PARK		**0.72**	**10.92**	---	---	**0.255**	**3.65**	**0.931**	---	---	---	**0.000**	**0.026**	0.93	**0.96**	5.09	5.09	7.42	8.28	-3.16	-4.02	-2.33	-3.19	0.86	150	0.0057	CIRCULAR	10	1.38	1.38	1.44	0.015	2.64	0.95	12.60	0.95	13.55	Increased C-7 to R-7
6D	Kensington Walk	Boardwalk	Bowery	R-8	29,202	**0.67**	**0.67**	375	251	**0.058**	**3.90**	**0.226**	---	---	---	**0**	**0.002**	0.23	**0.23**	8.39	7.13	4.64	4.85	3.00	1.53	3.75	2.28	1.47	500	0.0029	CIRCULAR	9	0.75	0.75	0.78	0.015	1.76	4.72	6.00	4.72	10.72	Increased C-7 to R-8
7D	Bowery	West 16th Street	Kensington Walk	R-8	15,822	**0.36**	**0.36**	375	136	**0.032**	**3.90**	**0.125**	---	---	---	**0**	**0.001**	0.13	**0.13**	6.46	7.13	3.48	4.85	2.23	1.53	2.98	2.28	0.70	85	0.0082	CIRCULAR	9	1.25	1.25	1.30	0.015	2.95	0.48	6.00	0.48	6.48	Increased C-7 to R-8
8D	Kensington Walk	Bowery	Surf Avenue	R-8	14,832	**0.34**	**1.37**	375	515	**0.120**	**3.90**	**0.468**	---	---	---	**0**	**0.003**	0.47	**0.47**	7.13	5.09	4.85	3.54	1.53	0.80	2.28	1.55	0.73	265	0.0028	CIRCULAR	9	0.72	0.72	0.75	0.015	1.71	2.59	10.72	2.59	13.31	Increased C-7 to R-8
				R-7	0	0.00	3.97	230	914	0.212	---	---	---	---	---	0	---	---																							
				R-8	13,464	0.31	1.68	375	631	0.147	---	---	---	---	---	0	---	---																							
				PARK	0	0.00	6.95	---	---	0.043	---	---	---	---	---	0	---	---																							
9D	Surf Avenue	Kensington Walk	West 15th Street	R-7/R-8/PARK		**0.31**	**12.61**	---	---	**0.402**	**3.55**	**1.427**	---	---	---	**0.000**	**0.031**	1.43	**1.46**	5.09	5.09	8.11	8.46	-4.02	-4.37	-3.02	-3.37	0.35	80	0.0044	CIRCULAR	12	1.97	1.97	2.05	0.015	2.61	0.51	13.55	0.51	14.06	Increased C-7 to R-8
10D	Walk	Boardwalk	Bowery	R-8	14,960	**0.34**	**0.34**	375	129	**0.030**	**3.90**	**0.117**	---	---	---	**0**	**0.001**	0.12	**0.12**	8.39	7.13	4.79	4.89	2.85	1.49	3.60	2.24	1.36	470	0.0029	CIRCULAR	9	0.74	0.74	0.77	0.015	1.75	4.48	6.00	4.48	10.48	Increased C-7 to R-8
11D	Walk	Bowery	Surf Avenue	R-8	3,373	**0.08**	**0.42**	375	158	**0.037**	**3.90**	**0.144**	---	---	---	**0**	**0.001**	0.14	**0.15**	7.13	5.09	4.89	3.69	1.49	0.65	2.24	1.40	0.84	300	0.0028	CIRCULAR	9	0.73	0.73	0.76	0.015	1.72	2.90	10.48	2.90	13.38	Increased C-7 to R-8
				R-7	0	0.00	3.97	230	914	0.212	---	---	---	---	---	0	---	---																							
				R-8	8,431	0.19	2.30	375	862	0.200	---	---	---	---	---	0	---	---																							
				PARK	0	0.00	6.95	---	---	0.043	---	---	---	---	---	0	---	---																							
12D	Surf Avenue	Kensington Walk	West 15th Street	R-7/R-8/PARK		**0.19**	**13.22**	---	---	**0.455**	**3.40**	**1.547**	---	---	---	**0.000**	**0.032**	1.55	**1.58**	5.09	5.09	8.46	8.94	-4.37	-4.85	-3.37	-3.85	0.48	30	0.0160	CIRCULAR	12	3.76	3.76	3.92	0.015	4.99	0.10	14.06	0.10	14.16	Increased C-7 to R-8
13D	West 15th Street	Boardwalk	Bowery	R-8	66,748	**1.53**	**1.53**	375	575	**0.133**	**3.85**	**0.512**	---	---	---	**0**	**0.004**	0.51	**0.52**	6.84	6.44	3.33	6.24	2.84	-0.47	3.51	0.20	3.31	615	0.0054	CIRCULAR	8	0.74	0.74	0.77	0.015	2.21	4.64	6.00	4.64	10.64	Increased C-7 to R-8
14D	Bowery	Kensington Walk	West 15th Street	R-8	14,389	**0.33**	**0.33**	375	124	**0.029**	**3.90**	**0.113**	---	---	---	**0**	**0.001**	0.11	**0.11**	7.13	6.44	3.83	6.16	2.55	-0.47	3.30	0.28	3.02	135	0.0224	CIRCULAR	9	2.06	2.06	2.15	0.015	4.87	0.46	6.00	0.46	6.46	Increased C-7 to R-8
15D	West 15th Street	Bowery	Surf Avenue	R-8	13,923	**0.32**	**2.18**	375	818	**0.190**	**3.70**	**0.703**	---	---	---	**0**	**0.005**	0.70	**0.71**	6.44	5.09	6.24	6.20	-0.47	-1.78	0.20	-1.11	1.31	265	0.0049	CIRCULAR	8	0.71	0.71	0.74	0.015	2.12	2.09	10.64	2.09	12.73	Increased C-7 to R-8
16D	West 15th Street	Boardwalk	Bowery	R-8	56,887	**1.31**	**1.31**	375	490	**0.114**	**3.90**	**0.445**	---	---	---	**0**	**0.003**	0.45	**0.45**	6.84	6.44	3.59	4.00	2.50	1.69	3.25	2.44	0.81	360	0.0023	CIRCULAR	9	0.65	0.65	0.68	0.015	1.54	3.89	6.00	3.89	9.89	Increased C-7 to R-8
17D	West 15th Street	Bowery	Surf Avenue	R-8	15,014	**0.34**	**1.65**	375	619	**0.144**	**3.80**	**0.547**	---	---	---	**0**	**0.004**	0.55	**0.55**	6.44	5.09	4.00	4.04	1.69	0.30	2.44	1.05	1.39	320	0.0043	CIRCULAR	9	0.91	0.91	0.95	0.015	2.14	2.49	9.89	2.49	12.37	Increased C-7 to R-8
18D	Surf Avenue	West 12th Street	Henderson Walk	R-8	54,793	**1.26**	**1.26**	375	472	**0.109**	**3.90**	**0.425**	---	---	---	**0**	**0.003**	0.43	**0.43**	5.44	5.84	5.63	7.41	-0.86	-2.24	-0.19	-1.57	1.38	250	0.0055	CIRCULAR	8	0.75	0.75	0.78	0.015	2.24	1.86	6.00	1.86	7.86	Increased C-7 to R-8
19D	Bowery	West 12th Street	Henderson Walk	R-8	25,992	**0.60**	**0.60**	375	224	**0.052**	**3.90**	**0.203**	---	---	---	**0**	**0.001**	0.20	**0.20**	6.65	7.38	3.22	4.95	2.68	1.68	3.43	2.43	1.00	230	0.0043	CIRCULAR	9	0.91	0.91	0.95	0.015	2.15	1.79	6.00	1.79	7.79	Increased C-7 to R-8 Invert Information from 1899 As-Builts
20D	Henderson Walk	Boardwalk	Bowery	R-8	70,907	**1.63**	**1.63**	375	610	**0.142**	**3.80**	**0.540**	---	---	---	**0**	**0.004**	0.54	**0.54**	7.23	7.38	3.48	4.40	3.00	2.23	3.75	2.98	0.77	290	0.0027	CIRCULAR	9	0.71	0.71	0.74	0.015	1.68	2.88	6.00	2.88	8.88	Increased C-7 to R-8

CONEY IS. REZONING;
BROOKLYN, NY
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BROOKLYN SEWER DATUM
PREPARED
FOR:NYC EDC
BY:AKRF

SAN. SEWER SENSITIVITY ANALYSIS
CATCHMENT AREAS C,D,E,F

COMPUTED BY: DC
CHECKED BY: KF

	LOCATION	FROM	TO	ZONING	AREA UNIT (SF)	AREA		DOMESTIC FLOW (CFS)					INDUSTRIAL WASTE FLOW (CFS)				INFILTRATION	TOTAL SANITARY FLOW WITHOUT INFILTRATION (CFS)	TOTAL SANITARY FLOW WITH INFILTRATION (CFS)	SURFACE ELEV.		COVER (FT.)		INVERT		INNER TOP		FALL (FT.)	LENGTH (FT.)	SLOPE	SHAPE OF SEWER	DIMENSION OF SEWER (INCHES)	CAPACITY OF SEWER @ 7/8-DEPTH	CAPACITY OF SEWER (CFS) 7/8 OF FULL CAPACITY	FULL CAPACITY OF CIRCULAR SEWER (CFS)	"N"	VELOCITY (FPS)	TIME IN SECTION (FULL) (MIN)	TIME ELAPSED (MIN)			REMARKS
						INCREMENT (ACRES)	TOTAL (ACRES)	DENSITY (PERSONS/ACRE)	TOTAL POPULATION	AVERAGE FLOW	PEAK FLOW FACTOR	PEAK FLOW	IND. FACTOR	INCREMENT AVERAGE FLOW	IND. PEAK FACTOR	PEAK FLOW				UPPER END	LOWER END	UPPER END	LOWER END	UPPER END	LOWER END	UPPER END	LOWER END											UPPER END OF SECTION	IN SECTION	LOWER END OF SECTION	
21D	Bowery	Stillwell Avenue	Henderson Walk	R-8	12,992	**0.30**	**0.30**	375	112	**0.026**	**3.90**	**0.101**	---	---	---	**0**	**0.001**	0.10	**0.10**	6.53	7.38	2.38	4.07	3.40	2.56	4.15	3.31	0.84	110	0.0076	CIRCULAR	9	1.21	1.21	1.26	0.015	2.84	0.64	6.00	0.64	6.64	Increased C-7 to R-8
22D	Henderson Walk	Bowery	Surf Avenue	R-7	22,023	**0.51**	**3.03**	230	697	**0.162**	**3.80**	**0.616**	---	---	---	**0**	**0.007**	0.62	**0.62**	7.38	5.84	4.40	4.29	2.23	0.80	2.98	1.55	1.43	300	0.0048	CIRCULAR	9	0.95	0.95	0.99	0.015	2.25	2.23	8.88	2.23	11.11	Increased C-7 to R-7
23D	Surf Avenue	Henderson	Stillwell Avenue	R-7	35,407	**0.81**	**5.10**	230	1173	**0.272**	**3.60**	**0.979**	---	---	---	**0**	**0.012**	0.98	**0.99**	5.84	5.24	7.25	7.06	-2.24	-2.65	-1.41	-1.82	0.41	110	0.0037	CIRCULAR	10	1.12	1.12	1.16	0.015	2.13	0.86	11.11	0.86	11.97	Increased C-7 to R-7
24D	Stillwell Avenue	Boardwalk	Bowery	R-8	45,291	**1.04**	**1.04**	375	390	**0.090**	**3.90**	**0.351**	---	---	---	**0**	**0.003**	0.35	**0.35**	7.04	6.53	3.45	6.14	2.92	-0.28	3.59	0.39	3.20	555	0.0058	CIRCULAR	8	0.77	0.77	0.80	0.015	2.28	4.05	6.00	4.05	10.05	Increased C-7 to R-8
25D	Stillwell Avenue	Bowery	Surf Avenue	R-8	17,039	**0.39**	**1.43**	375	537	**0.125**	**3.85**	**0.481**	---	---	---	**0**	**0.003**	0.48	**0.48**	6.53	5.24	6.14	6.14	-0.28	-1.57	0.39	-0.90	1.29	330	0.0039	CIRCULAR	8	0.63	0.63	0.66	0.015	1.88	2.92	10.05	2.92	12.97	Increased C-7 to R-8
26D	Stillwell Avenue	Boardwalk	Bowery	R-8	50,508	**1.16**	**1.16**	375	435	**0.101**	**3.90**	**0.394**	---	---	---	**0**	**0.003**	0.39	**0.40**	7.04	6.53	2.92	4.58	3.45	1.28	4.12	1.95	2.17	440	0.0049	CIRCULAR	8	0.71	0.71	0.74	0.015	2.11	3.47	6.00	3.47	9.47	Increased C-7 to R-8 Inverts and size from I and I
27D	Stillwell Avenue	Bowery	Surf Avenue	R-8	16,426	**0.38**	**1.54**	375	576	**0.134**	**3.85**	**0.516**	---	---	---	**0**	**0.004**	0.52	**0.52**	6.53	5.24	4.58	4.34	1.28	0.23	1.95	0.90	1.05	300	0.0035	CIRCULAR	8	0.60	0.60	0.62	0.015	1.78	2.81	9.47	2.81	12.28	Increased C-7 to R-8 Inverts and size from I and I
				R-7	18,332	0.42	7.52	230	1730	0.401	---	---	---	---	---	0	---	---																							
				C-7	0	0.00	0.97	---	---	0.015	---	---	---	---	---	0	---	---																							
28D	Surf Avenue	Stillwell Avenue	Schweickerts Walk	R-7/C-7		**0.42**	**8.49**	---	---	**0.416**	**3.55**	**1.477**	---	---	---	**0.000**	**0.021**	1.48	**1.50**	5.24	6.09	7.59	9.18	-3.18	-3.92	-2.35	-3.09	0.74	110	0.0067	CIRCULAR	10	1.50	1.50	1.56	0.015	2.86	0.64	12.97	0.64	13.61	Increased 3.98 Acres C-7 to R-8 or 7.52 Acres to R-7 or 8.49 Acres to R-6
29D	Schweickerts Walk	Boardwalk	Bowery	R-8	68,571	**1.57**	**1.57**	375	590	**0.137**	**3.85**	**0.527**	---	---	---	**0**	**0.004**	0.53	**0.53**	8.31	7.11	5.06	5.33	2.50	1.03	3.25	1.78	1.47	340	0.0043	CIRCULAR	9	0.91	0.91	0.95	0.015	2.14	2.65	6.00	2.65	8.65	Increased C-7 to R-8
30D	Bowery	Stillwell Avenue	Schweickerts Walk	R-8	12,965	**0.30**	**0.30**	375	112	**0.026**	**3.90**	**0.101**	---	---	---	**0**	**0.001**	0.10	**0.10**	6.53	7.11	3.74	5.00	2.04	1.36	2.79	2.11	0.68	100	0.0068	CIRCULAR	9	1.14	1.14	1.19	0.015	2.68	0.62	6.00	0.62	6.62	Increased C-7 to R-8
31D	Bowery	West 15th Street	Schweickerts Walk	R-8	14,691	**0.34**	**0.34**	375	126	**0.029**	**3.90**	**0.113**	---	---	---	**0**	**0.001**	0.11	**0.11**	6.44	7.11	3.61	5.00	2.08	1.36	2.83	2.11	0.72	110	0.0065	CIRCULAR	9	1.12	1.12	1.16	0.015	2.63	0.70	6.00	0.70	6.70	Increased C-7 to R-8
32D	Schweickerts Walk	Bowery	Surf Avenue	R-7	15,622	**0.36**	**2.57**	230	591	**0.137**	**3.85**	**0.527**	---	---	---	**0**	**0.006**	0.53	**0.53**	7.11	6.09	5.33	5.04	1.03	0.30	1.78	1.05	0.73	280	0.0026	CIRCULAR	9	0.70	0.70	0.73	0.015	1.66	2.81	8.65	2.81	11.46	Increased C-7 to R-7
				R-7	0	0.00	1.30	230	299	0.069	---	---	---	---	---	0	---	---																							
				C-7	33,957	0.78	10.53	---	---	0.163	---	---	---	---	---	0	---	---																							
33D	Surf Avenue	Schweickerts Walk	West 15th Street	R-7/C-7		**0.78**	**11.83**	---	---	**0.232**	**3.65**	**0.847**	---	---	---	**0.000**	**0.029**	0.85	**0.88**	6.09	5.09	9.18	8.48	-3.92	-4.22	-3.09	-3.39	0.30	130	0.0023	CIRCULAR	10	0.88	0.88	0.91	0.015	1.68	1.29	13.61	1.29	14.91	Increased 1.30 Acres from C-7 to R-7 or 2.05 Acres to R-6
				R-7	33,962	0.78	0.78	230	179	0.042	---	---	---	---	---	0	---	---																							
				R-7	62,767	1.44	23.38	230	5377	1.248	---	---	---	---	---	0	---	---																							
				PARK	0	0.00	6.95	---	---	0.043	---	---	---	---	---	0	---	---																							
34D	West 15th Street	Surf Avenue	Mermaid Avenue	R-7/PARK		**2.22**	**31.11**	---	---	**1.333**	**3.05**	**4.066**	---	---	---	**0.000**	**0.075**	4.07	**4.14**	5.09	5.09	8.44	9.92	-4.85	-6.33	-3.35	-4.83	1.48	510	0.0029	CIRCULAR	18	4.72	4.72	4.92	0.015	2.78	3.05	14.91	3.05	17.96	Increased R-6/C-7 to R-7
35D	West 17th Street	Neptune Avenue	Mermaid Avenue	R-6	90,509	**2.08**	**2.08**	170	353	**0.082**	**3.90**	**0.320**	---	---	---	**0**	**0.005**	0.32	**0.32**	6.09	5.09	3.26	4.79	1.83	-0.70	2.83	0.30	2.53	370	0.0068	CIRCULAR	12	2.46	2.46	2.56	0.015	3.26	1.89	6.00	1.89	7.89	
				R-6	22,586	0.52	2.60	170	441	0.102	---	---	---	---	---	0	---	---																							
				R-8	22,586	0.52	0.52	375	194	0.045	---	---	---	---	---	0	---	---																							
36D	Mermaid Avenue	West 17th Street	West 16th Street	R-6/R-8		**1.04**	**3.11**	---	---	**0.147**	**3.80**	**0.559**	---	---	---	**0.000**	**0.008**	0.56	**0.57**	5.09	5.09	5.12	6.92	-0.70	-2.50	-0.03	-1.83	1.80	280	0.0064	CIRCULAR	8	0.81	0.81	0.84	0.015	2.41	1.93	7.89	1.93	9.83	Increased R-6 to R-8
				R-8	33,962	0.78	0.78	375	292	0.068	---	---	---	---	---	0	---	---																							
				R-8	32,093	0.74	0.74	375	276	0.064	---	---	---	---	---	0	---	---																							
37D	West 16th Street	Surf Avenue	Mermaid Avenue	R-8		**1.52**	**1.52**	375	569	**0.132**	**3.85**	**0.508**	---	---	---	**0.000**	**0.004**	0.51	**0.51**	5.61	5.09	3.07	3.59	1.54	0.50	2.54	1.50	1.04	290	0.0036	CIRCULAR	12	1.78	1.78	1.85	0.015	2.36	2.05	6.00	2.05	8.05	Increased R-6/C-7 to R-8
				R-6	0	0.00	2.60	170	441	0.102	---	---	---	---	---	0	---	---																							
				R-7	22,586	0.52	2.55	230	587	0.136	---	---	---	---	---	0	---	---																							
38D	Mermaid Avenue	West 16th Street	West 15th Street	R-6/R-7		**0.52**	**5.15**	---	---	**0.238**	**3.65**	**0.869**	---	---	---	**0.000**	**0.012**	0.87	**0.88**	5.09	5.09	6.92	10.75	-2.50	-6.33	-1.83	-5.66	3.83	290	0.0132	CIRCULAR	8	1.16	1.16	1.21	0.015	3.46	1.40	9.83	1.40	11.22	Increased R-6/C-7 to R-7
				R-6	92,648	2.13	2.13	170	362	0.084	---	---	---	---	---	0	---	---																							
				R-8	75,721	1.74	1.74	375	652	0.151	---	---	---	---	---	0	---	---																							
39D	Stillwell Avenue	Surf Avenue	Mermaid Avenue	R-6/R-8		**3.87**	**3.87**	---	---	**0.235**	**3.65**	**0.858**	---	---	---	**0.000**	**0.009**	0.86	**0.87**	5.24	5.44	4.53	7.63	0.04	-2.86	0.71	-2.19	2.90	385	0.0075	CIRCULAR	8	0.87	0.87	0.91	0.015	2.61	2.46	6.00	2.46	8.46	Increased R-6/C-7 to R-8
				R-6	0	0.00	2.13	170	362	0.084	---	---	---	---	---	0	---	---																							
				R-8	22,986	0.53	2.27	375	850	0.035	---	---	---	---	---	0	---	---																							
40D	Mermaid Avenue	Stillwell Avenue	West 15th Street	R-6/R-8		**0.53**	**4.39**	---	---	**0.119**	**3.90**	**0.464**	---	---	---	**0.000**	**0.011**	0.46	**0.47**	5.44	5.09	3.86	10.75	0.91	-6.33	1.58	-5.66	7.24	310	0.0234	CIRCULAR	8	1.54	1.54	1.60	0.015	4.60	1.12	8.46	1.12	9.58	Increased R-6 to R-8
41D	West 16th Street	Neptune Avenue	Mermaid Avenue	R-6	100,927	**2.32**	**2.32**	170	394	**0.091**	**3.90**	**0.355**	---	---	---	**0**	**0.006**	0.35	**0.36**	6.09	5.09	2.99	5.52	2.10	-1.43	3.10	-0.43	3.53	400	0.0088	CIRCULAR	12	2.79	2.79	2.91	0.015	3.70	1.80	6.00	1.80	7.80	
42D	Mermaid Avenue	West 16th Street	West 15th Street	R-6	22,586	**0.52**	**2.84**	170	482	**0.112**	**3.90**	**0.437**	---	---	---	**0**	**0.007**	0.44	**0.44**	5.09	5.09	8.45	8.56	-9.36	-9.47	-3.36	-3.47	0.11	290	0.0004	CIRCULAR	72	68.81	68.81	71.68	0.015	2.54	1.91	7.80	1.91	9.71	
				R-6	22,986	0.53	8.09	170	1375	0.319	---	---	---	---	---	0	---	---																							
				R-8	0	0.00	28.98	375	10867	2.522	---	---	---	---	---	0	---	---																							
				PARK	0	0.00	6.95	---	---	0.043	---	---	---	---	---	0	---	---																							
43D	Mermaid Avenue	West 15th Street	Stillwell Avenue	R-6/R-8/PARK		**0.53**	**44.02**	---	---	**2.884**	**2.60**	**7.498**	---	---	---	**0.000**	**0.107**	7.50	**7.60**	5.09	5.44	8.56	9.05	-9.47	-9.61	-3.47	-3.61	0.14	310	0.0005	CIRCULAR	72	75.08	75.08	78.21	0.015	2.77	1.87	17.96	1.87	19.83	
				R-6	305,053	7.00	15.09	170	2565	0.595	---	---	---	---	---	0	---	---																							
				R-8	0	0.00	28.98	375	10867	2.522	---	---	---	---	---	0	---	---																							
				C8-1	12,403	0.28	0.28	---	---	0.002	---	---	---	---	---	0	---	---																							
				PARK	0	0.00	6.95	---	---	0.043	---	---	---	---	---	0	---	---																							
44D	Stillwell Avenue	Mermaid Avenue	Neptune Avenue	R-6/R-8/C8-1/PARK		**7.29**	**51.30**	---	---	**3.162**	**2.55**	**8.063**	---	---	---	**0.000**	**0.124**	8.06	**8.19**	5.44	5.09	9.05	9.02	-9.61	-9.93	-3.61	-3.93	0.32	740	0.0004	CIRCULAR	72	73.47	73.47	76.53	0.015	2.71	4.56	19.83	4.56	24.38	

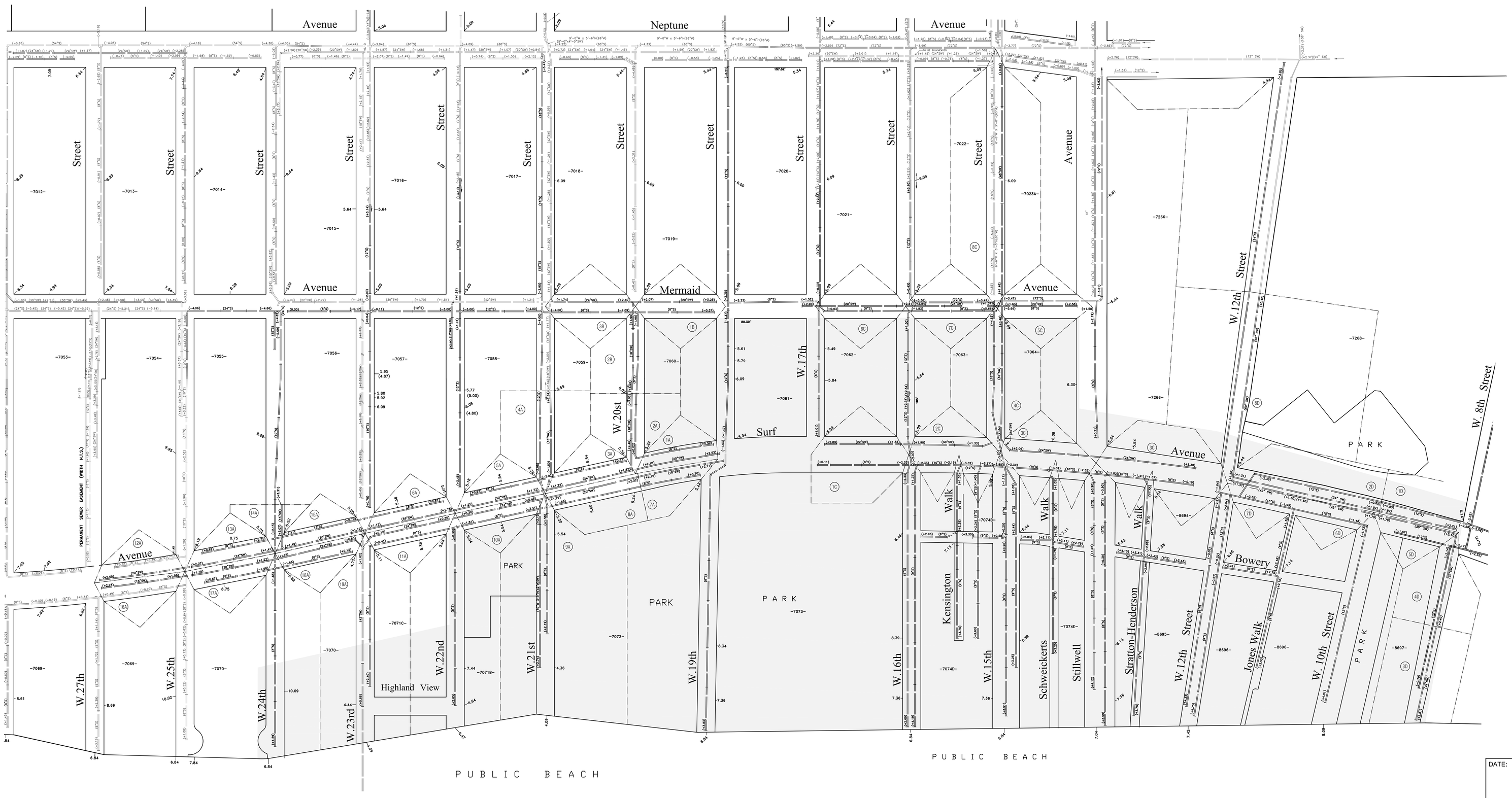
CONEY IS. REZONING;
BROOKLYN, NY
12-04-08
BROOKLYN SEWER DATUM
PREPARED
FOR:NYC EDC
BY:AKRF

SAN. SEWER SENSITIVITY ANALYSIS
CATCHMENT AREAS C,D,E,F

COMPUTED BY: DC
CHECKED BY: KF

	LOCATION	FROM	TO	ZONING	AREA UNIT (SF)	AREA		DOMESTIC FLOW (CFS)					INDUSTRIAL WASTE FLOW (CFS)				INFILTRATION	TOTAL SANITARY FLOW WITHOUT INFILTRATION (CFS)	TOTAL SANITARY FLOW WITH INFILTRATION (CFS)	SURFACE ELEV.		COVER (FT.)		INVERT		INNER TOP		FALL (FT.)	LENGTH (FT.)	SLOPE	SHAPE OF SEWER	DIMENSION OF SEWER (INCHES)	CAPACITY OF SEWER @ 7/8-DEPTH	CAPACITY OF SEWER (CFS) AT FULL CAPACITY	FULL CAPACITY OF CIRCULAR SEWER (CFS)	"N"	VELOCITY (FPS)	TIME IN SECTION (FULL) (MIN)	TIME ELAPSED (MIN)			REMARKS
						INCREMENT (ACRES)	TOTAL (ACRES)	DENSITY (PERSONS/ACRE)	TOTAL POPULATION	AVERAGE FLOW	PEAK FLOW FACTOR	PEAK FLOW	IND. FACTOR	INCREMENT AVERAGE FLOW	IND. PEAK FACTOR	PEAK FLOW				UPPER END	LOWER END	UPPER END	LOWER END	UPPER END	LOWER END	UPPER END	LOWER END												UPPER END OF SECTION	IN SECTION	LOWER END OF SECTION	
				R-8	96,886	2.22	2.22	375	834	0.194	---	---	---	---	---	0	---	---																						
				PARK	88,223	2.03	2.03	---	---	0.013	---	---	---	---	---	0	---	---																						
1E	West 10th Street	Boardwalk	Surf Avenue	R-8/PARK		**4.25**	**4.25**	---	---	**0.207**	**3.70**	**0.766**	---	---	---	**0.000**	**0.010**	0.77	**0.78**	8.09	5.90	3.28	7.63	3.81	-2.73	4.81	-1.73	6.54	675	0.0097	CIRCULAR	12	2.93	2.93	3.05	0.015	3.88	2.90	6.00	2.90	8.90	Increased C-7 to R-8
				R-8	23,358	0.54	2.76	375	1035	0.240	---	---	---	---	---	0	---	---																						
				PARK	0	0.00	2.03	---	---	0.013	---	---	---	---	---	0	---	---																						
2E	Surf Avenue	West 10th Street	Jones Walk	R-8/PARK		**0.54**	**4.79**	---	---	**0.253**	**3.65**	**0.923**	---	---	---	**0.000**	**0.012**	0.92	**0.94**	5.90	5.63	7.38	7.62	-2.73	-3.24	-1.48	-1.99	0.51	255	0.0020	CIRCULAR	15	2.41	2.41	2.51	0.015	2.05	2.08	8.90	2.08	10.98	Increased C-7 to R-8
3E	Jones Walk	Boardwalk	Bowery	R-8	91,442	**2.10**	**2.10**	375	787	**0.183**	**3.70**	**0.677**	---	---	---	**0**	**0.005**	0.68	**0.68**	7.76	7.14	4.21	4.96	2.80	1.43	3.55	2.18	1.37	310	0.0044	CIRCULAR	9	0.92	0.92	0.96	0.015	2.16	2.39	6.00	2.39	8.39	Increased C-7 to R-8
4E	Bowery	West 12th Street	Jones Walk	R-8	24,596	**0.56**	**0.56**	375	212	**0.049**	**3.90**	**0.191**	---	---	---	**0**	**0.001**	0.19	**0.19**	6.65	7.14	3.24	4.39	2.66	2.00	3.41	2.75	0.66	175	0.0038	CIRCULAR	9	0.85	0.85	0.88	0.015	2.00	1.46	6.00	1.46	7.46	Increased C-7 to R-8
5E	Jones Walk	Surf Avenue	Bowery	R-7	30,161	**0.69**	**3.36**	230	772	**0.179**	**3.70**	**0.662**	---	---	---	**0**	**0.008**	0.66	**0.67**	7.14	5.64	4.96	4.29	1.43	0.60	2.18	1.35	0.83	240	0.0035	CIRCULAR	9	0.81	0.81	0.85	0.015	1.91	2.09	8.39	2.09	10.48	Increased C-7 to R-7
				R-8	21,814	0.50	6.62	375	2482	0.576	---	---	---	---	---	0	---	---																						
				PARK	0	0.00	2.03	---	---	0.013	---	---	---	---	---	0	---	---																						
6E	Surf Avenue	Jones Walk	West 12th Street	R-8/PARK		**0.50**	**8.64**	---	---	**0.589**	**3.35**	**1.973**	---	---	---	**0.000**	**0.021**	1.97	**1.99**	5.64	5.44	7.63	7.83	-3.24	-3.64	-1.99	-2.39	0.40	200	0.0020	CIRCULAR	15	2.41	2.41	2.51	0.015	2.05	1.63	10.48	1.63	12.11	Increased C-7 to R-8
				R-6	4,372	0.10	0.10	170	17	0.004	---	---	---	---	---	0	---	---																						
				R-8	62,903	1.44	1.44	375	542	0.126	---	---	---	---	---	0	---	---																						
				PARK	2,703	0.06	0.06	---	---	0.000	---	---	---	---	---	0	---	---																						
7E	Surf Avenue	West 10th Street	West 12th Street	R-6/R-8/PARK		**1.61**	**1.61**	---	---	**0.130**	**3.85**	**0.501**	---	---	---	**0.000**	**0.004**	0.50	**0.50**	5.90	5.44	6.75	7.92	-1.85	-3.48	-0.85	-2.48	1.63	450	0.0036	CIRCULAR	12	1.79	1.79	1.86	0.015	2.37	3.16	6.00	3.16	9.16	Increased C-7 to R-8
8E	West 12th Street	Boardwalk	Bowery	R-8	49,678	**1.14**	**1.14**	375	428	**0.099**	**3.90**	**0.386**	---	---	---	**0**	**0.003**	0.39	**0.39**	7.42	6.65	2.67	7.22	4.00	-1.32	4.75	-0.57	5.32	480	0.0111	CIRCULAR	9	1.45	1.45	1.51	0.015	3.43	2.34	6.00	2.34	8.34	Increased C-7 to R-8
9E	West 12th Street	Bowery	Surf Avenue	R-8	16,546	**0.38**	**1.52**	375	570	**0.132**	**3.85**	**0.508**	---	---	---	**0**	**0.004**	0.51	**0.51**	6.65	5.44	6.97	8.08	-1.32	-3.64	-0.32	-2.64	2.32	210	0.0110	CIRCULAR	12	3.12	3.12	3.25	0.015	4.14	0.84	8.34	0.84	9.18	Increased C-7 to R-8
10E	West 12th Street	Boardwalk	Bowery	R-8	52,557	**1.21**	**1.21**	375	452	**0.105**	**3.90**	**0.410**	---	---	---	**0**	**0.003**	0.41	**0.41**	7.42	6.65	3.09	6.70	3.66	-0.72	4.33	-0.05	4.38	390	0.0112	CIRCULAR	8	1.07	1.07	1.11	0.015	3.19	2.04	6.00	2.04	8.04	Increased C-7 to R-8
11E	West 12th Street	Bowery	Surf Avenue	R-8	17,300	**0.40**	**1.60**	375	601	**0.140**	**3.80**	**0.532**	---	---	---	**0**	**0.004**	0.53	**0.54**	6.65	5.44	6.70	8.41	-0.72	-3.64	-0.05	-2.97	2.92	260	0.0112	CIRCULAR	8	1.07	1.07	1.11	0.015	3.19	1.36	8.04	1.36	9.40	Increased C-7 to R-8
				R-6	725,838	16.66	16.76	170	2850	0.661	---	---	---	---	---	0	---	---																						
				R-8	18,513	0.43	11.61	375	4354	1.011	---	---	---	---	---	0	---	---																						
				PARK	48,519	1.11	3.20	---	---	0.020	---	---	---	---	---	0	---	---																						
12E	West 12th Street	Surf Avenue	Mermaid Avenue	R-6/R-8/PARK		**18.20**	**31.58**	---	---	**1.692**	**2.95**	**4.991**	---	---	---	**0.000**	**0.076**	4.99	**5.07**	5.44	4.94	7.08	8.79	-3.64	-5.85	-1.64	-3.85	2.21	1290	0.0017	CIRCULAR	24	7.81	7.81	8.14	0.015	2.59	8.30	12.11	8.30	20.41	
				R-6	68,185	1.57	1.57	170	267	0.062	---	---	---	---	---	0	---																						
				PARK	261,256	6.00	6.00	---	---	0.019	---	---	---	---	---	0	---	---																						
1F	West 5th Street	Brighton Ave	Surf Ave	R-6/PARK		**7.57**	**7.57**	---	---	**0.081**	**3.90**	**0.316**	---	---	---	**0.000**	**0.018**	0.32	**0.33**	6.09	5.44	6.55	6.64	-1.46	-2.20	-0.46	-1.20	0.74	350	0.0021	CIRCULAR	12	1.37	1.37	1.42	0.015	1.81	3.22	6.00	3.22	9.22	Inverts from I and I
2F	Surf Avenue	West 8th St	West 5th St	R-6	146,244	**3.36**	**3.36**	170	571	**0.133**	**3.85**	**0.510**	---	---	---	**0**	**0.008**	0.51	**0.52**	6.64	5.44	6.39	6.64	-0.75	-2.20	0.25	-1.20	1.45	475	0.0031	CIRCULAR	12	1.64	1.64	1.71	0.015	2.18	3.63	6.00	3.63	9.63	Inverts from I and I
				R-6	0	0.00	4.93	170	838	0.195	---	---	---	---	---	0	---																						
				PARK	198,312	4.55	10.55	---	---	0.033	---	---	---	---	---	0	---	---																						
3F	Surf Avenue	West 5th St	West 8th St	R-6/PARK		**4.55**	**15.48**	---	---	**0.228**	**3.70**	**0.842**	---	---	---	**0.000**	**0.037**	0.84	**0.88**	5.44	6.64	6.80	8.70	-2.86	-3.56	-1.36	-2.06	0.70	450	0.0016	CIRCULAR	18	3.46	3.46	3.60	0.015	2.04	3.68	9.63	3.68	13.32	
				R-6	0	0.00	4.93	170	838	0.195	---	---	---	---	---	0	---																						
				PARK	273,852	6.29	16.84	---	---	0.052	---	---	---	---	---	0	---	---																						
4F	Surf Avenue	West 5th St	West 8th St	R-6/PARK		**6.29**	**21.77**	---	---	**0.247**	**3.65**	**0.900**	---	---	---	**0.000**	**0.053**	0.90	**0.95**	6.64	6.14	8.53	8.46	-3.89	-4.32	-1.89	-2.32	0.43	425	0.0010	CIRCULAR	24	6.00	6.00	6.25	0.015	1.99	3.56	13.32	3.56	16.87	
				R-8	64,520	1.48	1.48	375	555	0.129	---	---	---	---	---	0	---	---																						Increased from C-7 to R-8
				PARK	13,301	0.31	0.31	---	---	0.001	---	---	---	---	---	0	---	---																						
5F	Permanent Sewer Easement	Boardwalk	Surf Ave	R-8/PARK		**1.79**	**1.79**	---	---	**0.130**	**3.85**	**0.501**	---	---	---	**0.000**	**0.004**	0.50	**0.50**	8.09	6.14	8.88	8.28	-1.79	-3.14	-0.79	-2.14	1.35	450	0.0030	CIRCULAR	12	1.63	1.63	1.70	0.015	2.16	3.47	6.00	3.47	9.47	
				R-8	17,646	0.41	0.41	375	154	0.036	---	---	---	---	---	0	---																						Increased from C-7 to R-8
				PARK	2,244	0.05	0.05	---	---	0.000	---	---	---	---	---	0	---	---																						
6F	Surf Avenue	West 10th St	West 8th St	R-8/PARK		**0.46**	**0.46**	---	---	**0.036**	**3.90**	**0.140**	---	---	---	**0.000**	**0.001**	0.14	**0.14**	5.85	6.14	7.52	8.31	-2.67	-3.17	-1.67	-2.17	0.50	275	0.0018	CIRCULAR	12	1.27	1.27	1.32	0.015	1.68	2.73	6.00	2.73	8.73	
				R-6	22,818	0.52	0.52	170	88	0.021	---	---	---	---	---	0	---																						
				R-8	33,848	0.78	0.78	375	293	0.068	---	---	---	---	---	0	---																						
				PARK	14,809	0.34	0.34	---	---	0.001	---	---	---	---	---	0	---	---																						
7F	Surf Avenue	West 10th St	West 8th St	R-6/R-8/PARK		**1.64**	**1.64**	---	---	**0.090**	**3.90**	**0.351**	---	---	---	**0.000**	**0.004**	0.35	**0.35**	5.85	6.14	6.70	8.70	-1.85	-3.56	-0.85	-2.56	1.71	325	0.0053	CIRCULAR	12	2.16	2.16	2.25	0.015	2.86	1.89	6.00	1.89	7.89	Increased from C-7 to R-8
8F	Surf Avenue	West 5th St	West 8th St	R-6	122,906	**2.82**	**2.82**	170	479	**0.111**	**3.90**	**0.434**	---	---	---	**0**	**0.007**	0.43	**0.44**	6.64	6.14	6.39	8.70	-0.75	-3.56	0.25	-2.56	2.81	425	0.0066	CIRCULAR	12	2.42	2.42	2.52	0.015	3.21	2.21	6.00	2.21	8.21	
				R-6	1,080,141	24.80	33.07	170	5622	1.305	---	---	---	---	---	0	---																						
				R-8	13,601	0.31	2.98	375	1118	0.259	---	---	---	---	---	0	---																						
				PARK	41,288	0.95	18.49	---	---	0.057	---	---	---	---	---	0	---	---																						
9F	West 8th Street	Surf Ave	Neptune Ave	R-6/R-8/PARK		**26.06**	**54.54**	---	---	**1.621**	**2.90**	**4.701**	---	---	---	**0.000**	**0.132**	4.70	**4.83**	6.14	5.00	8.46	8.66	-4.32	-5.66	-2.32	-3.66	1.34	1220	0.0011	CIRCULAR	24	6.25	6.25	6.52	0.015	2.07	9.80	16.87	9.80	26.68	Increased from C-7 to R-8

STORM SEWER HYDRAULIC STUDY CALCULATIONS
EXISTING ZONING



DATE:

DECEMBER 04, 2008

SHEET TITLE:

CONEY ISLAND REZONING
HYDRAULIC STUDY
STORM SEWER DRAINAGE AREAS

PREPARED BY:

AKRF ENGINEERING, P.C.
440 PARK AVENUE SOUTH
NEW YORK, NY 10016
(212) 696-0670 (PHONE)
(212) 726-0942 (FAX)

PREPARED FOR:

NEW YORK CITY
ECONOMIC DEVELOPMENT
CORPORATION

SCALE:

0 60' 120' 240'
APPROX. SCALE IN FEET

NOTE: PLAN PREPARED IN BROOKLYN SEWER DATUM

BASEMAP SOURCE: NYCDEP GIS MAPS AND NYCDEP INFILTRATION AND INFLOW MAPS

- EXISTING SANITARY SEWER NOT ANALYZED
- EXISTING STORM SEWER NOT ANALYZED
- EXISTING ANALYZED SANITARY SEWER AND INNER TOP ELEVATION (FT.)
- EXISTING ANALYZED STORM SEWER AND INNER TOP ELEVATION (FT.)
- 5.18 — LEGAL GRADE (FT.)
- CONTRIBUTARY DIVIDES
- 12A — CONTRIBUTARY AREA NO.
- APPROX. BOUNDARY OF PROPOSED CONEY ISLAND REZONING AREA

CONEY IS. REZONING; BROOKLYN, NY
12-04-08
BROOKLYN SEWER DATUM
PREPARED
FOR: NYC EDC
BY: AKRF

HYDRAULIC STUDY
EX. STORM SEWER AND EX. ZONING

COMPUTED BY: DC
CHECKED BY: KF

	LOCATION	FROM	TO	AREA UNIT (SF)	AREA		RAINFALL INTENSITY (IN./HR.) R=125(T+15)	RUN-OFF COEFF.	STORM TOTAL RUNOFF (CFS)	TOTAL FLOW (CFS)	SURFACE		COVER		INVERT		INNER TOP		FALL (FT.)	LENGTH (FT.)	SLOPE (ft/ft)	SLOPE (%)	SHAPE OF SEWER	DIMENSION OF SEWER	EQUIV DIAM	"N"	CAPACITY OF SEWER (CFS)	CAPACITY OF SEWER @ 7/8-DEPTH	CAPACITY OF SEWER (CFS) NOT AT FULL CAPACITY	VELOCITY (FPS)	TIME ELAPSED (MIN)			REMARKS
					INCREMENT (ACRES)	TOTAL (ACRES)					UPPER END	LOWER END	UPPER END	LOWER END	UPPER END	LOWER END	UPPER END	LOWER END													UPPER END OF SECTION	IN SECTION	LOWER END OF SECTION	
1A	SURF AVENUE	WEST 19TH ST	WEST 20TH ST	28,326	**0.65**	**0.65**	5.95	0.75	**2.90**	**2.90**	5.34	5.29	2.71	3.11	0.96	0.51	2.63	2.18	0.45	300	0.0015	0.15	CIR	20	20.0	0.015	4.68	4.49	4.49	2.15	6.00	2.33	8.33	
2A	WEST 20TH STREET	MERMAID AVE	SURF AVE	50,432	**1.16**	**1.16**	5.95	0.75	**5.17**	**5.17**	6.09	5.29	3.07	2.89	1.52	0.90	3.02	2.40	0.62	225	0.0028	0.28	CIR	18	18.0	0.015	4.79	4.60	**4.60**	2.71	6.00	1.38	7.38	
3A	SURF AVENUE	WEST 20TH ST	WEST 21ST ST	28,632	**0.66**	**2.47**	5.36	0.75	**9.91**	**9.91**	5.29	5.29	3.47	3.57	-0.18	-0.28	1.82	1.72	0.10	300	0.0003	0.03	CIR	24	24.0	0.015	3.59	3.45	**3.45**	1.14	8.33	4.38	12.71	
4A	WEST 21ST STREET	MERMAID AVE	SURF AVE	72,485	**1.66**	**1.66**	5.95	0.75	**7.43**	**7.43**	5.59	5.29	2.95	3.49	1.14	0.30	2.64	1.80	0.84	275	0.0031	0.31	CIR	18	18.0	0.015	5.05	4.84	**4.84**	2.85	6.00	1.61	7.61	
5A	SURF AVENUE	WEST 21ST ST	WEST 22ND ST	28,637	**0.66**	**4.79**	4.51	0.75	**16.20**	**16.20**	5.29	5.01	3.57	3.76	-0.78	-1.25	1.72	1.25	0.47	300	0.0016	0.16	CIR	30	30.0	0.015	14.11	13.54	**13.54**	2.87	12.71	1.74	14.45	Lower Invert Interpolated from GIS Map
6A	SURF AVENUE	WEST 22ND ST	WEST 23RD ST	28,609	**0.66**	**5.44**	4.25	0.75	**17.33**	**17.33**	5.01	5.20	3.26	4.08	-1.25	-1.88	1.75	1.12	0.63	400	0.0016	0.16	CIR	36	36.0	0.015	23.00	22.08	22.08	3.25	14.45	2.05	16.49	Upper Invert Interpolated from GIS Map
7A	SURF AVENUE	WEST 19TH ST	WEST 20TH ST	27,096	**0.62**	**0.62**	5.95	0.75	**2.78**	**2.78**	5.44	5.24	2.73	3.09	1.21	0.65	2.71	2.15	0.56	290	0.0019	0.19	CIR	18	18.0	0.015	4.01	3.85	3.85	2.27	6.00	2.13	8.13	
8A	SURF AVENUE	WEST 20TH ST	WEST 21ST ST	43,617	**1.00**	**1.62**	5.40	0.75	**6.58**	**6.58**	5.24	5.20	2.92	3.41	0.65	0.12	2.32	1.79	0.53	275	0.0019	0.19	CIR	20	20.0	0.015	5.31	5.10	**5.10**	2.43	8.13	1.88	10.01	
9A	WEST 21ST STREET	BOARDWALK	SURF AVE	268,004	**6.15**	**6.15**	5.95	0.75	**27.47**	**27.47**	4.36	5.20	3.12	4.60	-0.76	-1.40	1.24	0.60	0.64	475	0.0013	0.13	EGG	30" X 19"	24.0	0.015	9.87	9.48	**9.48**	3.14	6.00	2.52	8.52	
10A	SURF AVENUE	WEST 21ST ST	WEST 22ND ST	28,617	**0.66**	**8.43**	5.00	0.75	**31.61**	**31.61**	5.20	5.04	4.75	4.74	-1.55	-1.70	0.45	0.30	0.15	295	0.0005	0.05	CIR	24	24.0	0.015	4.43	4.26	**4.26**	1.41	10.01	3.48	13.50	
11A	SURF AVENUE	WEST 22ND ST	WEST 23RD ST	28,609	**0.66**	**9.09**	4.39	0.75	**29.90**	**29.90**	5.04	5.11	4.74	4.99	-1.70	-1.88	0.30	0.12	0.18	340	0.0005	0.05	CIR	24	24.0	0.015	4.52	4.34	**4.34**	1.44	13.50	3.94	17.43	
12A	SURF AVENUE	WEST 27TH ST	WEST 25TH ST	27,969	**0.64**	**0.64**	5.95	0.75	**2.87**	**2.87**	6.88	8.19	4.23	6.12	0.98	0.40	2.65	2.07	0.58	300	0.0019	0.19	CIR	20	20.0	0.015	5.32	5.10	5.10	2.44	6.00	2.05	8.05	Inverts from I and I
13A	SURF AVENUE	WEST 25TH ST	WEST 24TH ST	28,810	**0.66**	**1.30**	5.42	0.75	**5.30**	**5.30**	8.19	5.52	6.12	4.11	0.07	-0.59	2.07	1.41	0.66	300	0.0022	0.22	CIR	24	24.0	0.015	9.22	8.85	8.85	2.94	8.05	1.70	9.76	Inverts from I and I
14A	WEST 24TH STREET	MERMAID AVE	SURF AVE	19,865	**0.46**	**0.46**	5.95	0.75	**2.04**	**2.04**	7.04	5.52	3.73	2.45	2.06	1.82	3.31	3.07	0.24	100	0.0024	0.24	CIR	15	15.0	0.015	2.75	2.64	2.64	2.24	6.00	0.74	6.74	Inverts from I and I
15A	SURF AVENUE	WEST 24TH ST	WEST 23RD ST	28,763	**0.66**	**2.42**	5.05	0.75	**9.16**	**9.16**	5.52	5.20	4.03	4.08	-1.01	-1.38	1.49	1.12	0.37	300	0.0012	0.12	CIR	30	30.0	0.015	12.52	12.02	12.02	2.55	9.76	1.96	11.72	Inverts from I and I
16A	SURF AVENUE	WEST 27TH ST	WEST 25TH ST	29,141	**0.67**	**0.67**	5.95	0.75	**2.99**	**2.99**	6.88	8.19	4.65	6.61	0.73	0.08	2.23	1.58	0.65	300	0.0022	0.22	CIR	18	18.0	0.015	4.25	4.08	4.08	2.40	6.00	2.08	8.08	Inverts from I and I
17A	SURF AVENUE	WEST 25TH ST	WEST 24TH ST	29,794	**0.68**	**1.35**	5.42	0.75	**5.50**	**5.50**	8.19	5.62	6.44	4.40	0.08	-0.45	1.75	1.22	0.53	310	0.0017	0.17	CIR	20	20.0	0.015	5.00	4.80	**4.80**	2.29	8.08	2.25	10.33	Inverts from I and I
18A	SURF AVENUE	WEST 24TH ST	WEST 23RD ST	28,420	**0.65**	**2.01**	4.93	0.75	**7.42**	**7.42**	5.62	4.77	4.35	3.97	-0.73	-1.20	1.27	0.80	0.47	265	0.0018	0.18	CIR	24	24.0	0.015	8.28	7.95	7.95	2.64	10.33	1.68	12.01	Inverts from I and I
19A	WEST 23RD STREET	SURF AVE	BOARDWALK	177,190	**4.07**	**23.03**	3.85	0.75	**66.56**	**66.56**	4.77	4.09	3.15	3.43	-1.88	-2.84	1.62	0.66	0.96	520	0.0018	0.18	CIR	42	42.0	0.015	37.57	36.06	**36.06**	3.90	17.43	2.22	19.65	
1B	MERMAID AVENUE	WEST 19TH ST	WEST 20TH ST	45,172	**1.04**	**1.04**	5.95	0.75	**4.63**	**4.63**	5.09	5.09	1.84	3.02	1.58	0.40	3.25	2.07	1.18	300	0.0039	0.39	CIR	20	20.0	0.015	7.58	7.28	7.28	3.48	6.00	1.44	7.44	
2B	WEST 20TH STREET	SURF AVE	MERMAID AVE	63,122	**1.45**	**1.45**	5.95	0.75	**6.47**	**6.47**	6.09	5.09	3.07	3.19	1.52	0.40	3.02	1.90	1.12	275	0.0041	0.41	CIR	18	18.0	0.015	5.83	5.59	**5.59**	3.30	6.00	1.39	7.39	
3B	MERMAID AVENUE	WEST 20TH ST	WEST 21ST ST	45,172	**1.04**	**3.52**	5.57	0.75	**14.72**	**14.72**	5.09	5.09	2.69	3.35	0.40	-0.26	2.40	1.74	0.66	255	0.0026	0.26	CIR	24	24.0	0.015	10.00	9.60	**9.60**	3.18	7.44	1.33	8.77	
1C	SURF AVENUE	WEST 17TH ST	WEST 16TH ST	72,725	**1.67**	**1.67**	5.95	0.75	**7.45**	**7.45**	5.09	5.09	2.20	3.73	1.06	-0.47	2.89	1.36	1.53	300	0.0051	0.51	CIR	22	22.0	0.015	11.13	10.69	10.69	4.22	6.00	1.19	7.19	Invert from I and I
2C	SURF AVENUE	WEST 16TH ST	WEST 15TH ST	53,392	**1.23**	**2.90**	5.63	0.75	**12.23**	**12.23**	5.09	5.09	3.19	3.76	-0.60	-1.17	1.90	1.33	0.57	300	0.0019	0.19	CIR	30	30.0	0.015	15.54	14.92	14.92	3.17	7.19	1.58	8.77	Invert from I and I
3C	SURF AVENUE	WEST 12TH ST	WEST 15TH ST	142,490	**3.27**	**3.27**	5.95	0.75	**14.60**	**14.60**	5.44	5.09	2.06	3.00	1.38	0.09	3.38	2.09	1.29	720	0.0018	0.18	CIR	24	24.0	0.015	8.32	7.99	**7.99**	2.65	6.00	4.53	10.53	Invert Interpolated from I and I
4C	WEST 15TH STREET	SURF AVE	MERMAID AVE	96,729	**2.22**	**8.39**	4.90	0.75	**30.80**	**30.80**	5.09	5.09	4.05	4.63	-1.96	-2.54	1.04	0.46	0.58	510	0.0011	0.11	CIR	36	36.0	0.015	19.55	18.76	**18.76**	2.77	10.53	3.07	13.60	
5C	MERMAID AVENUE	STILLWELL AVE	WEST 15TH ST	45,972	**1.06**	**1.06**	5.95	0.75	**4.71**	**4.71**	5.44	5.09	2.86	3.46	0.91	-0.04	2.58	1.63	0.95	330	0.0029	0.29	CIR	20	20.0	0.015	6.49	6.23	6.23	2.97	6.00	1.85	7.85	Invert from I and I
6C	MERMAID AVENUE	WEST 17TH ST	WEST 16TH ST	45,171	**1.04**	**1.04**	5.95	0.75	**4.63**	**4.63**	5.09	5.09	2.19	2.58	1.23	0.84	2.90	2.51	0.39	300	0.0013	0.13	CIR	20	20.0	0.015	4.36	4.18	**4.18**	2.00	6.00	2.50	8.50	
7C	MERMAID AVENUE	WEST 16TH ST	WEST 15TH ST	45,172	**1.04**	**2.07**	5.32	0.75	**8.27**	**8.27**	5.09	5.09	2.25	3.52	0.84	-0.43	2.84	1.57	1.27	300	0.0042	0.42	CIR	24	24.0	0.015	12.79	12.28	12.28	4.07	8.50	1.23	9.73	
8C	WEST 15TH STREET	MERMAID AVE	NEPTUNE AVE	201,473	**4.63**	**16.14**	4.37	0.75	**52.90**	**52.90**	5.09	5.09	3.63	4.47	-2.54	-3.38	1.46	0.62	0.84	650	0.0013	0.13	CIR	48	48.0	0.015	44.87	43.08	**43.08**	3.57	13.60	3.03	16.64	Interpolated Inverts from GIS Map
1D	SURF AVENUE	WEST 8TH ST	WEST 10TH ST	9,071	**0.21**	**0.21**	5.95	0.75	**0.93**	**0.93**	6.14	5.79	3.93	3.87	0.21	-0.08	2.21	1.92	0.29	250	0.0012	0.12	CIR	24	24.0	0.015	6.70	6.43	6.43	2.13	6.00	1.96	7.96	Invert from I and I
2D	SURF AVENUE	WEST 10TH ST	WEST 12TH ST	99,874	**2.29**	**2.50**	5.45	0.75	**10.21**	**10.21**	5.79	5.44	3.87	4.13	-0.08	-0.69	1.92	1.31	0.61	525	0.0012	0.12	CIR	24	24.0	0.015	6.70	6.43	**6.43**	2.13	7.96	4.10	12.06	Invert from I and I
3D	SEWER EASEMENT	BOARDWALK	MIDBLOCK	91,571	**2.10**	**2.10**	5.95	0.75	**9.38**	**9.38**	8.09	7.16	5.28	4.76	0.81	0.40	2.81	2.40	0.41	300	0.0014	0.14	CIR	24	24.0	0.015	7.27	6.98	**6.98**	2.31	6.00	2.16	8.16	Invert from I and I
5D	SEWER EASEMENT	MIDBLOCK	SURF AVE	47,399	**1.09**	**3.19**	5.40	0.75	**12.91**	**12.91**	7.16	6.14	4.76	4.04	-0.10	-0.40	2.40	2.10	0.30	275	0.0011	0.11	CIR	30	30.0	0.015	11.77	11.30	**11.30**	2.40	8.16	1.91	10.07	Invert from I and I

CONEY IS. REZONING; BROOKLYN, NY
12-04-08
BROOKLYN SEWER DATUM
PREPARED
FOR: NYC EDC
BY: AKRF

HYDRAULIC STUDY
EX. STORM SEWER AND EX. ZONING

COMPUTED BY: DC
CHECKED BY: KF

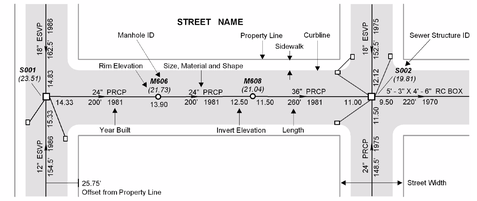
	LOCATION	FROM	TO	AREA UNIT (SF)	AREA		RAINFALL INTENSITY (IN./HR.) I=125/(T+15)	RUN-OFF COEFF.	STORM TOTAL RUNOFF (CFS)	TOTAL FLOW (CFS)	SURFACE		COVER		INVERT		INNER TOP		FALL (FT.)	LENGTH (FT.)	SLOPE (ft/ft)	SLOPE (%)	SHAPE OF SEWER	DIMENSION OF SEWER	EQUIV DIAM	"N"	CAPACITY OF SEWER (CFS)	CAPACITY OF SEWER @ 7/8 DEPTH	CAPACITY OF SEWER (CFS) NOT AT FULL CAPACITY	VELOCITY (FPS)	TIME ELAPSED (MIN)			REMARKS
					INCREMENT (ACRES)	TOTAL (ACRES)					UPPER END	LOWER END	UPPER END	LOWER END	UPPER END	LOWER END	UPPER END	LOWER END													UPPER END OF SECTION	IN SECTION	LOWER END OF SECTION	
6D	SURF AVENUE	SEWER EASEMENT	WEST 10TH ST	21,565	**0.50**	**3.69**	4.99	0.75	**13.78**	**13.78**	6.14	5.90	4.04	4.11	-0.40	-0.71	2.10	1.79	0.31	250	0.0012	0.12	CIR	30	30.0	0.015	12.55	12.05	**12.05**	2.56	10.07	1.63	11.70	Invert from I and I
7D	SURF AVENUE	WEST 10TH ST	JONES WALK	23,522	**0.54**	**4.23**	4.68	0.75	**14.84**	**14.84**	5.90	5.63	4.11	4.03	-1.71	-1.90	1.79	1.60	0.19	250	0.0008	0.08	CIR	42	42.0	0.015	24.10	23.14	23.14	2.51	11.70	1.66	13.37	Invert from I and I
8D	SURF AVENUE	JONES WALK	WEST 12TH ST	22,128	**0.51**	**4.73**	4.41	0.75	**15.64**	**15.64**	5.64	5.44	4.04	4.07	-1.90	-2.13	1.60	1.37	0.23	250	0.0009	0.09	CIR	42	42.0	0.015	26.52	25.46	25.46	2.76	13.37	1.51	14.88	Invert from I and I
9D	WEST 12TH STREET	SURF AVE	NEPTUNE AVE	341,857	**7.85**	**15.08**	4.18	0.75	**47.33**	**47.33**	5.44	5.19	3.86	4.77	-3.42	-4.58	1.58	0.42	1.16	625	0.0019	0.19	CIR	60	60.0	0.015	97.50	93.60	93.60	4.97	14.88	2.10	16.97	Invert from I and I

APPENDIX B: NYCDEP INFILTRATION AND INFLOW MAPS / BROOKLYN SEWER GIS MAPS

LEGEND:

	NYC DEP	NYS DOT	
Sanitary Sewer	○	○	Manhole (M###)
Storm Sewer	□	□	Chamber (S###)
Relief Storm Sewer	▯		Weir Chamber (S###)
High Level Storm Sewer and Highway Drain	▭		Regulator (S###)
Combined Sewer	⊘		Tide Gate (S###)
Relief Combined Sewer	▫	▫	Catch Basin
Interceptor	▭	▭	Double Catch Basin
Interceptor Collector	⋈	⋈	Outfall (D### / SPDES ID###)
Branch Interceptor	⋈	⋈	Headwall (S###)
Force Main	⋈	⋈	Culvert
Combined Sewer Overflow	▮	▮	Bulkhead
Emergency Construction Sewer	▭	▭	Pump Station (P###)
Unknown Sewer	◔	◔	Seepage Basin (B###)
NYS DOT Sewer	○	○	Cleanout Manhole
NYS DOT Trough	▱	▱	Manhole Catch Basin
Temporary Connection and Plumber's Drain	●	●	Downspout
Offset from Property Line	⊠	⊠	Scupper Discharging to Street Drainage
Sewer Easement	⊡	⊡	Scupper with Freefall Downspout
Railroads (NYCMAP)	⊠	⊠	Scupper with Downspout Connected to Sewer
Roads (NYCMAP)	⋈	⋈	Double Scupper Discharging to Street Drainage
Elevated Structures (NYCMAP)	⊡	⊡	Double Scupper with Freefall Downspout
Buildings (NYCMAP)	⊠	⊠	Double Scupper with Downspout Connected to Sewer
Open Space (NYCMAP)			
Water Bodies (NYCMAP)			
Index Grids (NYCMAP)			
Private Communities			
Treatment Plants (BWT)			
Tax Lots (COGIS)			
Blocks (COGIS)			
Borough Boundary (COGIS)			

ANNOTATION GRAPHIC:



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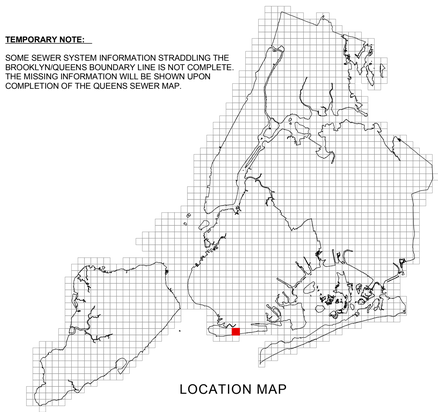

LOCATION MAP

NYC Department of Environmental Protection
Bureau of Water and Sewer Operations
Engineering

Brooklyn Sewer Map

Grid No.	Datum:	Map Date:	
990147	NAD, 1983 Brooklyn Borough Sewer Datum	10/23/2007	*Baker Engineering NY, Inc.* Baker

1 inch equals 100 feet

100 50 0 100 200 300 400 500 Feet

N W E S

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December 25, 2006

Sewer Shape	Abbreviation								
• Double Circular	DCIR	• Box	BOX	• Oval	OVL	• Circular Pipe	CIRC		
• Egg	EGG	• Double Barrel	DB	• Flat Top	FT	• Arch	ARCH		
• Elliptical	ELP	• Triple Barrel	TB	• Double Flat Top	DFT	• Irregular	IRRG		
• Vertical Elliptical	VELP	• Quadruple Barrel	QB	• Tunnel	TUN	• Unknown	UNK		
• Horizontal Elliptical	HELP	• Circular Barrel	CIRB	• Double Tunnel	DTUN				

Sewer Material	Abbreviation								
• Brick	BRK	• Concrete Pipe	CRTP	• Reinforced Concrete Culvert Pipe	RCCP	• Wood	WD	• Steel	STL
• Reinforced Concrete Brick	RC/BR	• Reinforced Concrete	RC	• Corrugated Metal Pipe	CMP	• Wood Pipe	WDP	• Steel Pipe	STLP
• Cement Pipe	CMTP	• Reinforced Concrete Pipe	RCP	• Polyethylene	PLET	• Clay Pipe	CP	• Cast Iron	CI
• Asbestos Cement Pipe	ASBCMTP	• Precast Reinforced Concrete	PRC	• Corrugated High Density Polyethylene Pipe	HDPEP	• Vitrified Clay Pipe	VCP	• Cast Iron Pipe	CIP
• Concrete	CRT	• Precast Reinforced Concrete Pipe	PRCP	• Polyvinyl Chloride Pipe	PVCP	• Extra Strength Vitrified Clay Pipe	ESVCP	• Ductile Iron Pipe	DIP

• Liner Plate	LRPL	• Block	BLK						
• Reinforced Concrete Liner Plate	RC LRPL	• Tile	TILE						
• Steel Liner Plate	STL LRPL	• Stone	STON						
• Cast Iron Liner Plate	CI LRPL	• Fiberglass	FBGL						
• Ductile Liner Plate	DI LRPL	• Unknown	UNK						

Sewer Ownership	Abbreviation
• Private	PVt
• Temporary Connection	TC
• Plumber's Drain	PID

LEGEND:

	NYC DEP	NYS DOT	
Sanitary Sewer	○	○	Manhole (M###)
Storm Sewer	□	□	Chamber (S###)
Relief Storm Sewer	▥		Weir Chamber (S###)
High Level Storm Sewer and Highway Drain	▭		Regulator (S###)
Combined Sewer	⊘		Tide Gate (S###)
Relief Combined Sewer	▫	▫	Catch Basin
Interceptor	▭	▭	Double Catch Basin
Interceptor Collector	⋈	⋈	Outfall (D### / SPDES ID###)
Branch Interceptor	⋈	⋈	Headwall (S###)
Force Main	⋈	⋈	Culvert
Combined Sewer Overflow	▮	▮	Bulkhead
Emergency Construction Sewer	▭	▭	Pump Station (P###)
Unknown Sewer	◔	◔	Seepage Basin (B###)
NYS DOT Sewer	○	○	Cleanout Manhole
NYS DOT Trough	▱	▱	Manhole Catch Basin
Temporary Connection and Plumber's Drain	●	●	Downspout
Offset from Property Line	⊠	⊠	Scupper Discharging to Street Drainage
Sewer Easement	⊡	⊡	Scupper with Freefall Downspout
Railroads (NYCMAP)	⊠	⊠	Scupper with Downspout Connected to Sewer
Roads (NYCMAP)	⋈	⋈	Double Scupper Discharging to Street Drainage
Elevated Structures (NYCMAP)	⋈	⋈	Double Scupper with Freefall Downspout
Buildings (NYCMAP)	⋈	⋈	Double Scupper with Downspout Connected to Sewer
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Blocks (COGIS)			
Borough Boundary (COGIS)			

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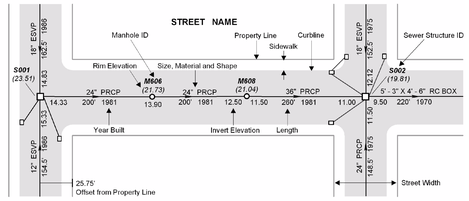

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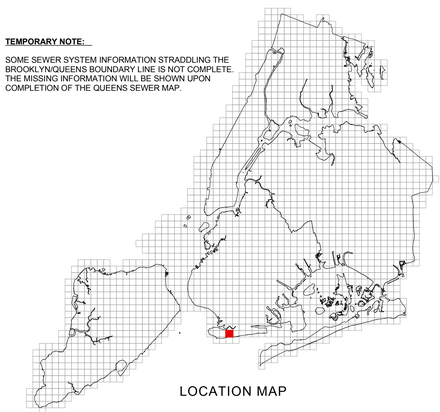

LOCATION MAP

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Bureau of Water and Sewer Operations
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Grid No.	Datum:	Map Date:	
987147	NAD, 1983 Brooklyn Borough Sewer Datum	10/23/2007	*Baker Engineering NY, Inc.* Baker

1 inch equals 100 feet

100 50 0 100 200 300 400 500 Feet

N W E S

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December 25, 2006

Sewer Shape / **Abbreviation**
- Double Circular — DCIR
- Egg — EGG
- Elliptical — ELP
- Vertical Elliptical — VELP
- Horizontal Elliptical — HELP
- Box — BOX
- Double Barrel — DB
- Triple Barrel — TB
- Quadruple Barrel — QB
- Circular Barrel — CIRB
- Oval — OVL
- Flat Top — FT
- Double Flat Top — DFT
- Tunnel — TUN
- Double Tunnel — DTUN
- Circular Pipe — CIRC
- Arch — ARCH
- Irregular — IRRG
- Unknown — UNK

Sewer Material / **Abbreviation**
- Brick — BRK
- Reinforced Concrete Brick — RC/BR
- Cement Pipe — CMTP
- Asbestos Cement Pipe — ASBCMTP
- Concrete — CRT
- Concrete Pipe — CRTP
- Reinforced Concrete — RC
- Reinforced Concrete Pipe — RCP
- Precast Reinforced Concrete — PRC
- Precast Reinforced Concrete Pipe — PRCP
- Reinforced Concrete Culvert Pipe — RCCP
- Corrugated Metal Pipe — CMP
- Polyethylene — PLET
- Corrugated High Density Polyethylene Pipe — HDPEP
- Polyvinyl Chloride Pipe — PVCP
- Wood — WD
- Wood Pipe — WDP
- Clay Pipe — CP
- Vitrified Clay Pipe — VCP
- Extra Strength Vitrified Clay Pipe — ESVCP
- Steel — STL
- Steel Pipe — STLP
- Cast Iron — CI
- Cast Iron Pipe — CIP
- Ductile Iron Pipe — DIP
- Liner Plate — LRPL
- Reinforced Concrete Liner Plate — RC LRPL
- Steel Liner Plate — STL LRPL
- Cast Iron Liner Plate — CI LRPL
- Ductile Liner Plate — DI LRPL
- Block — BLK
- Tile — TILE
- Stone — STON
- Fiberglass — FBGL
- Unknown — UNK

Sewer Ownership / **Abbreviation**
- Private — Pvt
- Temporary Connection — TC
- Plumber's Drain — PID

LEGEND:

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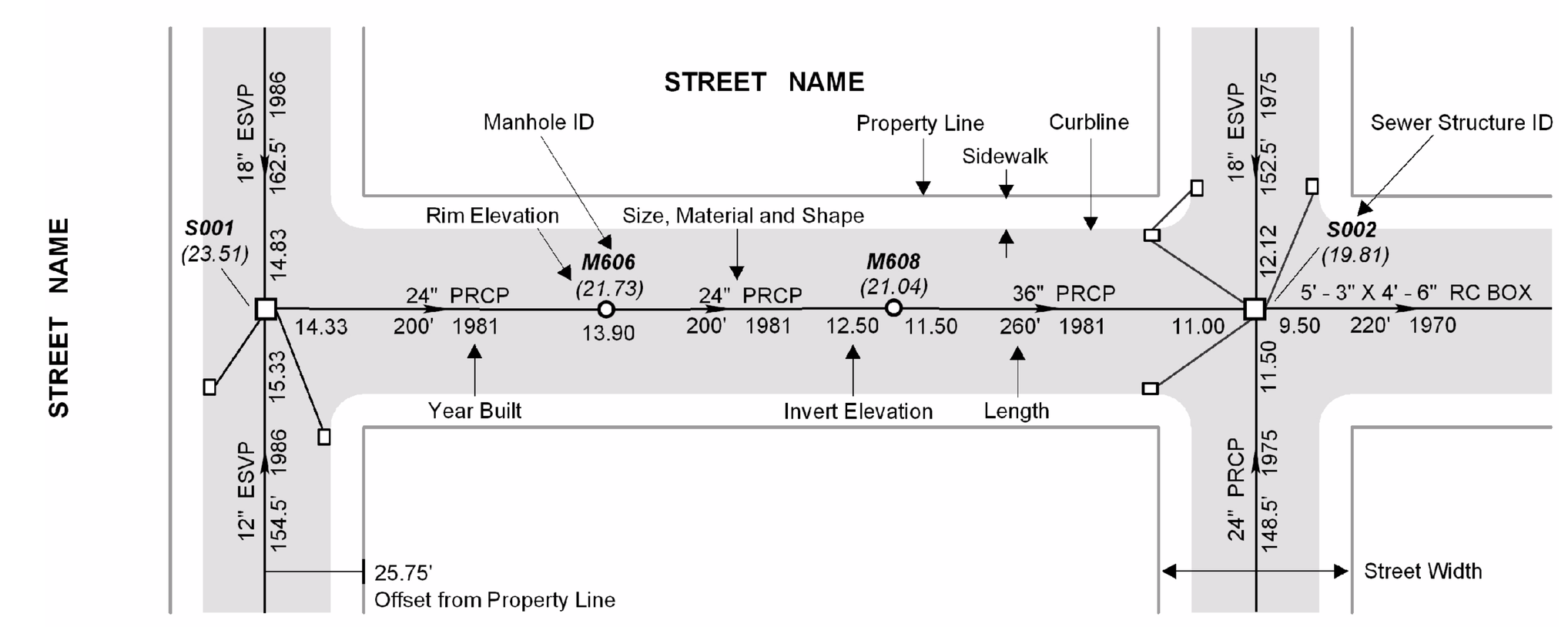

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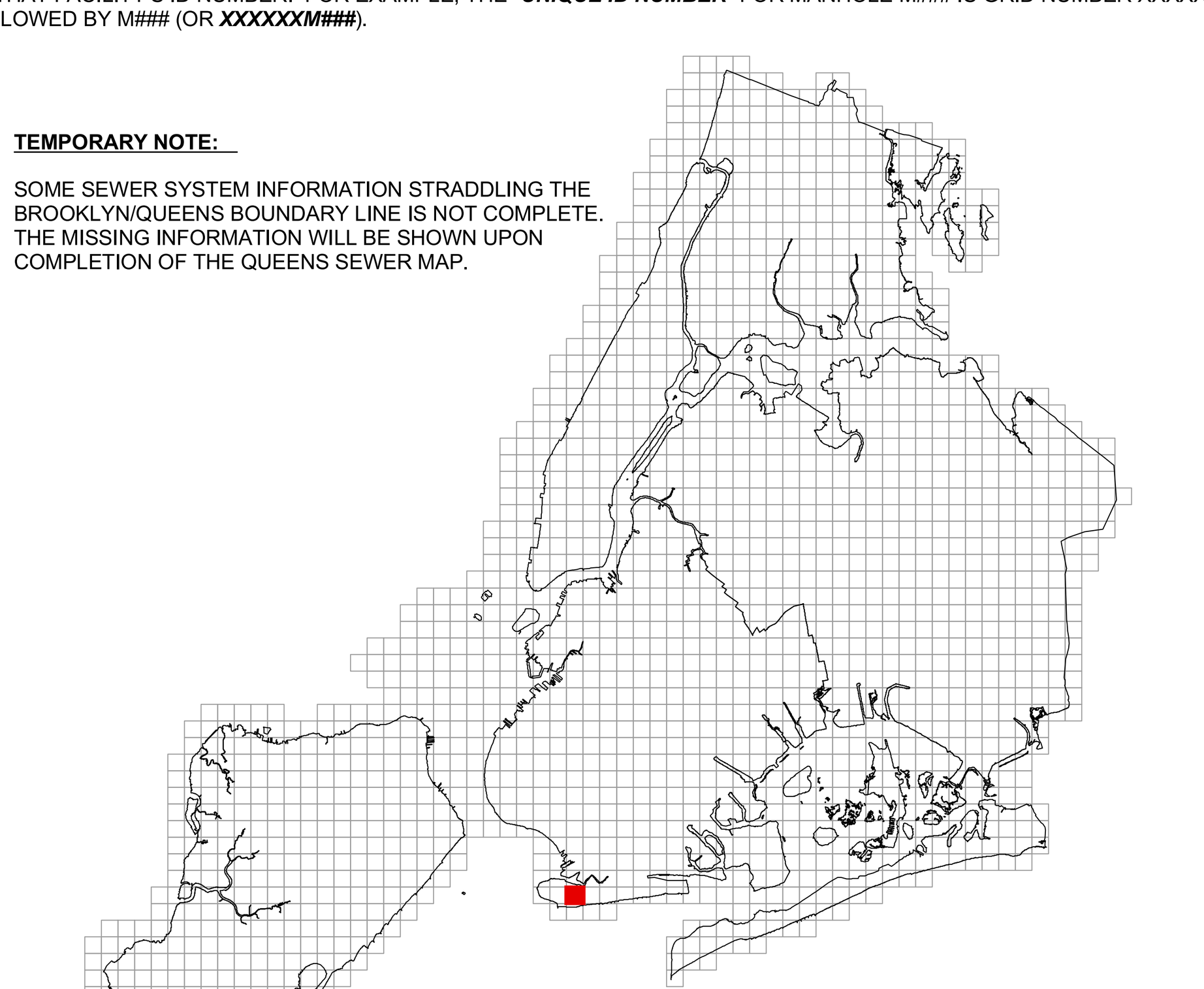

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Brooklyn Sewer Map

Grid No.	Datum:	Map Date:	Baker Engineering NY, Inc.
985147	NAD, 1983 Brooklyn Borough Sewer Datum	10/23/2007	Baker

1 inch equals 100 feet

100 50 0 100 200 300 400 500 Feet

This map is intended to be a schematic representation of the sewer system ONLY, and is not warranted to be accurate for construction purposes.

December 25, 2006

Sewer Shape	Abbreviation						
Double Circular	DCIR	*Box*	BOX	*Oval*	OVL	*Circular Pipe*	CIRC
Egg	EGG	*Double Barrel*	DB	*Flat Top*	FT	*Arch*	ARCH
Elliptical	ELP	*Triple Barrel*	TB	*Double Flat Top*	DFT	*Irregular*	IRRG
Vertical Elliptical	VELP	*Quadruple Barrel*	QB	*Tunnel*	TUN	*Unknown*	UNK
Horizontal Elliptical	HELP	*Circular Barrel*	CIRB	*Double Tunnel*	DTUN		

Sewer Material	Abbreviation												
Brick	BRK	*Concrete Pipe*	CRTP	*Reinforced Concrete Culvert Pipe*	RCCP	*Wood*	WD	*Steel*	STL	*Liner Plate*	LRPL	*Block*	BLK
Reinforced Concrete Brick	RC/BR	*Reinforced Concrete*	RC	*Corrugated Metal Pipe*	CMP	*Wood Pipe*	WDP	*Steel Pipe*	STLP	*Reinforced Concrete Liner Plate*	RC LRPL	*Tile*	TILE
Cement Pipe	CMTP	*Reinforced Concrete Pipe*	RCP	*Polyethylene*	PLET	*Clay Pipe*	CP	*Cast Iron*	CI	*Steel Liner Plate*	STL LRPL	*Stone*	STON
Asbestos Cement Pipe	ASBCMTP	*Precast Reinforced Concrete*	PRC	*Corrugated High Density Polyethylene Pipe*	HDPEP	*Vitrified Clay Pipe*	VCP	*Cast Iron Pipe*	CIP	*Cast Iron Liner Plate*	CI LRPL	*Fiberglass*	FBGL
Concrete	CRT	*Precast Reinforced Concrete Pipe*	PRCP	*Polyvinyl Chloride Pipe*	PVCP	*Extra Strength Vitrified Clay Pipe*	ESVCP	*Ductile Iron Pipe*	DIP	*Ductile Liner Plate*	DI LRPL	*Unknown*	UNK

Sewer Ownership	Abbreviation
Private	Pvt
Temporary Connection	TC
Plumber's Drain	PID