APPENDIX I

MUNICIPAL SERVICES ALTERNATIVE REPORT

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I. EXECUTIVE SUMMARY

The Municipal Services Alternative (MSA) would involve the construction of new water mains and separate storm and sanitary sewers in the District. This report addresses the feasibility of, and cost to implement, this alternative. Current street elevations, general and area-specific geotechnical conditions and overall District conditions were used in preparing this assessment.

The analysis assumes that existing water mains would be replaced because their age exceeds New York City Department of Environmental Protection (NYCDEP) requirements. However, the 72" distribution main located in Willets Point Boulevard would remain in place and would be tapped within the District for domestic and fire use. New storm and sanitary sewers would also be installed.

NYCDEP requires that storm and sanitary sewers front each development lot and that they be installed at existing legal grades. Legal grades are elevations recorded on the City Map, filed in the Borough President's Office, Topographical Bureau. These grades are set by each borough as a design control and follow the natural contours of the land, to ensure that sewers drain by gravity toward their ultimate discharge point. Within the District, legal grades range from 0.5 feet to 3.0 feet higher than existing street grades. Therefore, in order to install sewers to legal grades, fill material would need to be added over a large portion of the District roadways so that the newly installed sewer system would be hydraulically adequate. The addition of fill would leave some properties in the District at a lower elevation than adjacent roadways. All sewers would be designed and constructed on piles. Based on the need to elevate portions of the roadways up to 3.0 feet above the current elevation, some properties may not be able to connect to gravity storm sewers without some form of engineered pumping system; DEP would require such sites to meet DEP pretreatment standards by installation of treatment devices as oil-water separators. It is possible that due to space limitations, such pumping and treatment may be infeasible to construct and operate.

The storm sewer flow to the stormwater outfalls at 126th Street and 127th Street would need to meet New York State Department of Environmental Conservation (NYSDEC) water quality design discharge criteria. Stormwater contaminated from the automotive and industrial uses in the District has historically been detained in large depressions and potholes in the streets after rainfall events and has infiltrated on-site despite the presence of the existing storm sewer collection system. An upgrade of the storm sewer system would capture and efficiently convey flow to Flushing Bay; therefore, additional water quality treatment devices prior to the point of discharge would be required to treat this contaminated or potentially contaminated stormwater in order to avoid violating the NYSDEC discharge criteria. Water quality devices, such as oil-water separators and detention basins, would have large footprints in order to accommodate the flow and would most likely be located in the parking lot on New York City Department of Parks and Recreation property near Flushing Bay, outside of the property limits of the District and just upstream of each outfall into Flushing Bay. In the event that a District-wide system would not be installed, individual properties would be required to ensure discharges would not violate the NYSDEC criteria, which would necessitate individual water quality design systems at each property hookup. The engineering and installation of many of these would pose engineering and financial challenges to site owners because of lack of adequate space to accommodate such systems.

Because of capacity limitations of the current system, the sanitary sewer flow in the District could not discharge by gravity to a Water Pollution Control Plant (WPCP); therefore, a new sanitary sewage pump station would be required to pump the collected flow via a force main to the nearest discharge point in the gravity sewer system. The pump station would most likely be located in the southern area of the District on a development lot purchased from private land owners. The sanitary force main route would be directed across Corona Park to connect to the nearest system en route to the Bowery Bay WPCP.

Industrial development lots that maintain scrap metal, auto body repair, demolition, or open refuse handling within the District, and discharge industrial wastewater to the new sanitary system, would have to retrofit pre-treatment devices on each lot, depending on the particular use, to discharge to the sanitary sewer. Many development parcels in the District are small and built-out to the overall footprint of the lot, making the construction of these individual treatment devices very expensive for permit compliance.

The MSA, while theoretically feasible, presents numerous design challenges, with the most serious being the problems associated with the grade changes that would result from raising street elevations to install new sanitary and storm sewers without making concomitant changes to the existing lots. In addition, finding sufficient property for stormwater treatment, and in some cases sanitary treatment, devices in an existing developed area would also present serious challenges. The overall cost, as set forth below, for the infrastructure improvements described herein would be approximately $190 million.

II. INTRODUCTION

The District is generally bounded by the Van Wyck Expressway and an undeveloped lot owned by the Metropolitan Transportation Authority (MTA) to the east, by Roosevelt Avenue to the south, by 126th Street to the west, and by Northern Boulevard to the north. The area is currently developed at a moderate density for industrial uses and is, in large part, covered by impervious surfaces. During scoping for the Draft Environmental Impact Statement (DGEIS) for the Willets Point Development Plan, members of the public suggested an alternative to the Plan that would allow for the continued operation of existing businesses. Under this alternative, the City would provide new public infrastructure, including streets and utility lines, to serve the District. For purposes of the following analysis, this alternative will be referred to as the Municipal Services Alternative ("MSA").

Under the MSA, the City would supply new infrastructure to the District, including new streets and sidewalks, sanitary sewer and storm sewers, water supply, and a new pump station for sanitary flow. Citi Field, upon completion in 2009, will direct its sanitary sewage to the 37th Avenue Pump Station outside the District, and will direct storm flow from Citi Field to the existing sewer in 126th Street within the District. The current 37th Avenue sewage pump station does not have sufficient capacity to accommodate additional sanitary sewage from the District under the MSA. The capacity of the pump station is exceeded in terms of wet weather flow, and no additional dry weather flow can be added. Therefore, a new pump station and force main within the District would be necessary to transmit sanitary flow to the existing 96-inch-diameter sewer in 108th Street or to another gravity sewer that flows to the Bowery Bay Water Pollution Control Plant (WPCP).

Under the MSA, the District streets would not be elevated to the 100-year flood elevation because to do so would be infeasible given that the grades of existing developed lots would remain at the current elevations. However, the New York Department of City Planning (NYCDCP), NYCDEP, and the New York City Department of Transportation (NYCDOT) require the storm sewers and streets to be raised to the legal grade. This would also be necessary for the storm sewers to function hydraulically. Current legal grades would require streets to be raised within the District, creating differences in elevation between the new streets and existing lots. In addition, the outfalls to which the storm sewers drain are not properly sized and, therefore, they would require reconstruction.

While the construction of new storm sewers and reconstruction of the outfalls would decrease the frequency and severity of flooding in the District, there would still be a potential for flooding during storm conditions because much of the District would remain below the 100-year flood plain, though the flooding across the overall District streets would likely be less severe than under current conditions due to the improved stormwater conveyance system. Flooding on individual properties, could, as a result of the elevation of the roadbeds, be more severe than current conditions, and in those cases would require an engineered solution for each site. The current NYSDEC petroleum spills database indicates that a significant number of reported spills included oil or petroleum floating on standing water in the streets within the District. If the storm sewer system functioned properly, discharges of floating oil or petroleum could be discharged directly to Flushing Bay.

To avoid adverse water quality impacts, pretreatment of stormwater discharged within the District would be required to meet NYSDEC water quality criteria. The location for pretreatment facilities would be between the point of collection and the point of discharge either on parkland, within the NYSDOT right-of-way, or within the District. The most likely location for the pretreatment facilities would be in the parking lot on New York City Department of Parks and Recreation property near Flushing Bay, outside of the property limits of the District. If no common facility was put in place, based on the current quality of water that is generated during storm events and the industrial and auto-related uses within the District, individual stormwater treatment systems could be required on many industrial or commercial properties, Such individual treatment systems could pose significant engineering and financial challenges to area businesses given the lack of available space on many lots to accommodate such systems.

While the MSA would permit the continued industrial use of the District, some businesses may require temporary relocation to allow for construction of streets and utilities. For other businesses, access would be restricted for at least the duration of construction of streets, sidewalks and utilities.

III. CONCEPTUAL LAYOUT OF A NEW STORM SEWER SYSTEM

EXISTING CONDITIONS

Stormwater runoff is flowing surface water generated by rainfall. Stormwater runoff volume is dependent upon the type of land cover and slope. The Rational Method was used to calculate the amount of stormwater runoff generated within the District.

Stormwater runoff generated in the District is currently discharged into Flushing Bay via two 60-inch reinforced concrete outfalls; one in 126th Street and another one in 127th Street. The outfall in 126th Street

extends from the intersection of 126th Street and Northern Boulevard, under Northern Boulevard and an existing parking area, and terminates with a concrete headwall at Flushing Bay. The outfall in 127th Street extends from the intersection of 127th Street and Northern Boulevard, under Northern Boulevard and an existing parking area, and also terminates with a concrete headwall at Flushing Bay. Figure 1 shows the 127th Street outfall, which is similar in construction to the 126th Street outfall.

According to the latest as-built drawings available at the local NYCDEP office, the existing storm sewer system was constructed circa 1937 during the time just before the first World's Fair. These storm sewers (18" diameter and larger) are constructed of reinforced concrete pipe (RCP), and spur sewers (15" diameter and smaller) are constructed of extra strong vitrified clay pipe (ESVP).

FIGURE 1: 127TH STREET OUTFALL CONCRETE HEADWALL

The District lacks an adequate storm sewer system due to the lack of infrastructure and improper grading of the site. At many intersections, the existing grading creates low points without outlets or catch basins. There is a lack of infrastructure at these low points preventing proper drainage to convey the stormwater to the appropriate outfall. A portion of the District is below elevations that allow gravity flow of stormwater runoff toward an outfall. Exhibit "D" highlights the area for which a storm sewer system could not be designed while maintaining existing elevations.

Because the District does not have an adequate storm sewer system, much of the runoff discharges as overland flow and creates standing water in low elevation areas, causing streets to flood during storm events. Furthermore, runoff from the many business facilities in the area is neither controlled nor treated prior to entering storm drains that convey this stormwater to the outfalls. Figure 2 shows flooding near the intersection of Willets Point Boulevard and 38th Avenue after a recent rainfall event due to the flat topography and lack of adequate drainage.

FIGURE 2: EXISTING FLOOD CONDITIONS AT INTERSECTION OF WILLETS POINT BOULEVARD AND 38TH AVENUE

CONCEPTUAL LAYOUT

Under the MSA, separate storm and sanitary sewer systems would be installed and maintained, in accordance with the City's goals to reduce combined sewer overflow (CSO) events. For this conceptual layout, the existing infrastructure was maintained to the maximum extent possible to reduce disturbance to the District. However, some existing storm pipes would need to be replaced based on capacity analysis requirements and configuration of proposed storm sewers.

The current storm sewer system is insufficiently sized to accommodate the runoff that is currently being generated. To eliminate this deficiency, a new storm sewer system, including new piping and infrastructure such as manholes and catch basins to accommodate the stormwater that is beyond the capacity of the existing system, would be installed.

Exhibit "A" shows the conceptual plan and layout for both the new and existing storm sewer systems. This new system was schematically configured to meet NYCDEP storm flow calculation requirements. The system layout is consistent with the NYCDEP's requirement for providing a storm sewer to front every development lot. Each sewer in the District was analyzed for adequate capacity in comparison to the calculated flows from tributary areas for each length of sewer between manholes. The hydraulic calculations for stormwater flow are included in Appendix A.

The conceptual layout endeavors to maintain as much existing infrastructure as possible, including the two existing 60 inch diameter outfalls and any adjacent storm sewers to the maximum extent possible. Calculations were performed that correspond to the new layout. The following NYCDEP criteria, were used to lay out and then analyze existing and new storm sewers within the District:

- 3.0 fps (feet per second) minimum velocity for pipes flowing full
- 18 foot maximum depth to the invert of the pipe
- 10% maximum slope of pipe
- 3.5 feet absolute minimum cover to the outer top of pipe for all proposed pipes
- 12" minimum pipe diameter
- 5-year storm frequency (intensity of 5.95 inches/hour)

Tailwater elevation refers to the elevation of the surface water at the point of discharge. The tailwater elevation at both outfalls, or the high water mark, was verified in the field to be at the crown of the existing outfall pipes. This tailwater elevation was used in the hydraulic analysis of the existing 60-inch outfalls to Flushing Bay. A Hydraulic Grade Line (HGL) was produced for each sewer using these elevations and the actual stormwater flows generated from the District; these are included in Appendix B. The HGL is a measure of flow energy coinciding with the water surface elevation at any point along the sewer. For sewers flowing under pressure conditions, the HGL is the level to which water would rise in a vertical tube (open to atmospheric pressure) at any point along the pipe. As shown in Appendix B, when the HGL is above the crown of the sewer, this indicates that a pressure flow condition exists. According to this analysis, with the conceptual storm sewer layout for the MSA, the existing stormwater flow from the District, combined with the existing tail water elevation of Flushing Bay at each outfall would not cause the runoff in the systems to surcharge above the elevation of catch basin grates and manhole castings, and therefore would not cause flooding in the street.

An additional 14.3 cfs (cubic feet per second) of stormwater flow would be added to the new storm sewers in 126th Street from the adjacent Citi Field development, based on that project's site connection proposals. (Design drawings prepared by HOK Sports Facilities Architects, P.C. (HOK) and DMJM+Harris show four separate connection points to the existing 126th Street sewer.) Individually, 2.63 cfs will be discharged to a manhole near 39th Avenue, 5.96 cfs will be discharged between 36th and 37th Avenue, 3.02 cfs will be discharged to a manhole near 35th Avenue, and 2.69 cfs will be discharged to a 36" sewer that connects to a manhole located at the intersection of 126th Street and 34th Avenue. These stormwater flow values were accounted for in the MSA storm sewer layout.

Connections and sewer inverts (bottom inside elevation of the pipe) provided by HOK from the Citi Field development site would need to be field verified for as-built conditions before reconstruction of the infrastructure located in 126th Street commences. From the inverts provided by HOK, it appears that the connections and schematic layout from the Willets Point Development would be compatible with the existing 126th Street outfall.

Since Flushing Bay is a NYSDEC regulated water body, stormwater would have to be pretreated prior to discharge and pretreatment measures would be subject to NYCDEP review and approval. Since the design of a pretreatment facility is dependent on site grades and sewer system elevations, the most likely location for a site pretreatment facility would probably be before the point of discharge on parkland and in a parking lot adjacent to Flushing Bay. The pretreatment facility would capture sediments, oils, grease,

trash and debris. Based on preliminary flow calculations, this unit would need to be approximately 500 to 600 square feet (sf) in area to a depth of 25 to 30 feet below grade and would probably contain several pumps. This facility would also require regular maintenance and periodic inspection after major rainfall events and clean out when the collection sump is 75% full. If a central pretreatment facility was not constructed, then individual lot owners would have to install systems on their individual lots, which might pose financial and design challenges due to inadequate space to accommodate such systems.

DESIGN SUMMARY

The following is an approximate summary of the proposed storm system, including total length of existing pipe and replaced pipe within the system.

Size (in)	Total Length (ft)	Total Length of Existing Pipe to Remain (ft)	Total Length of New or Replaced Pipe (ft)
10	63	39	24
12	4,601	817	3,784
15	1,926	40	1,886
18	2,518	0	2,518
20	164	55	109
24	1,893	344	1,549
30	253	0	253
36	254	0	254
42	651	0	651
48	879	727	152
54	858	743	115
60	1,389	1,271	118

The following is a summary of the structures designed for the system, including manholes and catch basins:

Structure Type	Quantity
Existing Manholes/Catch Basins to Remain	39
New/Replaced Manholes/Catch Basins	154

EXISTING OUTFALL RECONSTRUCTION

The proposed storm sewer system considers reuse of the two existing 60 inch diameter stormwater outfalls. However, based on the MSA layout and site conditions, the three pipe sections upstream of the outfall located in 126th Street have insufficient capacity to handle the stormwater flows that would drain

to them. In order to reuse the remainder of the main storm sewer in 126th Street, these three sections would need to be upgraded, replaced, or adjusted to convey the stormwater flow to Flushing Bay. These options include upgrading the pipe diameter to a larger size, replacing the circular pipe with a reinforced concrete box culvert, or adjusting the inverts of the circular pipes to allow greater capacity within the pipes. The following is a summary of adjustments that would be required for the outfall in 126th Street for these options:

	Length of Pipe to be Replaced	Diameter of Existing Pipe	Dimensions of Replacement Pipe	Approximate Adjustments to Existing Inverts
Continue Use of A Circular Pipe System	235 ft.	60”	72” Dia.	3”
	260 ft.	60”	66” Dia.	
	260 ft.	48”	54” Dia.	
Replace Existing System with Reinforced Concrete Box Culvert	495 ft.	60”	4 ft. x 7 ft.	6”
	260 ft.	54”	60” Dia.	
	260 ft.	48”	54” Dia.	
Retain Current 60” Pipe Diameter Configuration	260 ft.	48”	54” Dia.	6” (multiple sections)

The outfall located on 127th Street is also hydraulically inadequate for the projected flow from the new system due to existing slope and capacity conditions. The four most downstream sections of this pipe would require similar replacement options to reuse the remaining infrastructure in 127th Street and the following table lists the adjustments that would be required for the outfall in 127th Street for these options:

	Length of Pipe to be Replaced	Diameter of Existing Pipe	Dimensions of Replacement Pipe	Approximate Adjustments to Existing Inverts
Continue Use of A Circular Pipe System	200 ft.	60”	72” Dia.	4”
	350 ft.	60”	66” Dia.	
	260 ft.	48”	54” Dia.	

Replace Existing System with Reinforced Concrete Box Culvert	315 ft.	60”	4 ft. x 8 ft.	6”
	233 ft.	60”	4 ft. x 7 ft.	
Retain Current 60” Pipe Diameter Configuration	NA	NA	NA.	6” (multiple sections)

In all three options, the 126th and 127th outfall reconstructions would cause significant disturbance and disruption to 126th and 127th Streets, Northern Boulevard, and the surrounding parking areas located near Flushing Bay. In addition, the majority of pipe in 127th Street would need to be reconstructed with new invert elevations to allow for the current flow requirements.

NEW OUTFALL CONSTRUCTION

One option investigated in lieu of reconstruction of the pipe sections in 126th and 127th Streets is to construct an additional outfall in 127th Place. This outfall would drain to Flushing Bay, similar to the existing outfalls located on 126th and 127th Streets and is the only option to construct a new sewer on City property to Flushing Bay. Constructing this outfall would alleviate demand on the existing outfall on 127th Street and would drain approximately 5 acres from the site. The area tributary to the 127th Street outfall is shown in Exhibit “G.”

Even with the construction of a new 127th Place outfall, the existing outfalls in 126th and 127th Streets are not hydraulically adequate and would require partial reconstruction. Three pipe sections (instead of four) would need to be replaced with the additional outfall in place. The new outfall would need to extend from the District on 127th Place, across Northern Boulevard, the adjacent parking area, and terminate at Flushing Bay. This option appears to be neither practicable nor the most cost effective to resolve the drainage issues within the District for the following reasons:

- Construction of the additional outfall would still require alterations to the existing outfalls in 126th and 127th Streets.
- An additional outfall in 126th Place or 127th Place without reconstruction of the entire existing system would only capture small tributary areas. These small drainage areas would not reduce the drainage to 126th or 127th Street by enough volume to make the additional outfall sufficiently beneficial to justify its cost.
- The area to the north of the District (property along Northern Boulevard) is topographically the highest on the site. Collection of drainage areas from the south of the District would be very difficult via a gravity system and require very deep manholes and sewers.

Accordingly, if the MSA were to be implemented, the existing outfall reconstruction option, in lieu of the new outfall and partial existing outfall reconstruction, would be the recommended approach.

IV. CONCEPTUAL LAYOUT OF A NEW SANITARY SEWER SYSTEM

EXISTING CONDITIONS

Most of the sanitary sewer systems within New York City are combined sewer systems, which carry both sanitary sewage from buildings and stormwater collected in catch basins and storm drains. However, some areas of the City, primarily in Queens and Staten Island, have separate systems for sanitary sewage and stormwater. In addition, small areas of Staten Island, Brooklyn, and Queens, including the District, use septic systems to dispose of sanitary sewage. As noted previously, in order to minimize CSO discharges, a separate system would be constructed under the MSA.

The District is located within the service area of the Bowery Bay Water Pollution Control Plant (WPCP), which is located on the East River in Astoria, Queens. Currently, the Willets Point area is not connected to the New York City sanitary sewer system and relies entirely on septic systems as the means of sewage treatment. The nearest connection to the City sewer infrastructure from the District is at the existing below-grade 37th Avenue Pump Station, located approximately 4,000 feet southeast of the District. The existing 37th Avenue pump station does not have sufficient capacity to take additional flow during wet weather conditions. Accordingly, a new pump station would be required to convey the sanitary sewage flow from the Willets Point area to the Bowery Bay WPCP.

CONCEPTUAL LAYOUT

The MSA would include the development of sanitary sewer infrastructure in the area, thereby eliminating the need for septic systems on private development lots. Wastewater from development lots within the District would be conveyed to a new sanitary sewage pump station, which would most likely be constructed within the District. The sanitary sewage pump station would be designed and constructed to NYCDEP and NYSDEC standards. A new force main would be constructed to convey sanitary flow from the new sanitary sewage pump station within the District to the existing 96-inch diameter City sewer in 108th Street, which flows to the Bowery Bay WPCP.

Exhibit “B” shows the conceptual layout for a new sanitary sewer system. This system also follows the Rational Method. The pipe capacity and time of concentration calculations have been included in Appendix C.

The conceptual layout is based on topography, creating a single low point for efficient collection within the District for sanitary flow. As shown on Exhibit “B”, this low point is located near the intersection of 39th Avenue and Willets Point Boulevard (Manhole Label #S1-1). This location was chosen based on existing District terrain, minimum depth of cover, and velocity requirements as set forth in the criteria mentioned above. Each sewer throughout the District was analyzed for adequate capacity using the tributary areas for each section of pipe.

For the MSA, the majority of the District flow would be collected into the sewer system and directed by gravity to the low point and pump station location mentioned above. For this layout, the following criteria was used to schematically prepare the new sanitary sewer conveyance system:

- 3.0 feet per second minimum velocity for pipes flowing full
- 18 foot maximum depth to the invert of the pipe
- 10% maximum slope of pipe
- 8.5 feet absolute minimum cover to the outer top of pipe for all proposed pipes
- 10" minimum pipe diameter

One possible location for the new sanitary pump station would be on or near existing Block 1826, Lot 35 in the southern section of the District which is at a lower elevation and allows for the maximum coverage area for a gravity sanitary sewer line. This conceptual location for the pump station also provides adequate clearance between sanitary and storm sewers, allowing the sanitary lines to run lower than the storm sewer and avoid conflicts throughout the site. A sanitary forcemain would then carry flow from the new pump station to the existing 96-inch-diameter City sewer in 108th Street or another point of discharge tributary to the Bowery Bay WPCP. This area is privately owned and contains a number of businesses, as described below.

DESIGN SUMMARY

The following is an approximate summary of the pipe layout for the proposed sanitary sewer system:

Size (in)	Total Length of New Pipe (ft)
10	9,193
12	431

The following is a summary of the structures designed for the system, including manholes and catch basins:

Structure Type	Quantity
New Manholes	54

NEW SANITARY SEWAGE PUMP STATION

The conceptual layout for the construction of a new pump station in the District locates the pump station within development block 1826. Figure 3 shows an aerial view of the pump station vicinity. The proposed pump station would require an approximate final footprint of 4,800 sf (60 ft x 80 ft building footprint). The following table is a summary of the block and lots located within development block 1826. Not all of these parcels would be affected by the construction of the pump station; however, since the exact location of the station has not yet been determined they were included for reference. The affected businesses could be permanently displaced due to the construction and continued operation of the pump station.

Lot	Address	Owner	Land Use	Lot Size	Building Footprint

1826, Lot 1	38-15 126th Street	NK Properties	Auto related businesses	12,500 sq ft	1,800 sq ft
1826, Lots 5 & 14	38-05 & 38-14 126th Street	Stadium Storage	10 different Auto Related businesses and a large junkyard	Lot 5 – 12,500 sq ft Lot 14 – 10,000 sq ft	Lot 5 – 3,800 sq ft Lot 14 – 900 sq ft
1826, Lot 18	126-20 38th Avenue	Serrone Vincent	Auto Glass & Salvage Inc.	3,667 sq ft	800 sq ft Quonset building
1826, Lot 20	126-61 38th Avenue	JY Utica Corp	5 Auto repair businesses	15,110 sq ft	2,700 sq ft
1826, Lot 31	126-45 Willets Point Blvd.	Willets Storage, LLC	Muffler, Tire and Auto Body shops	7,080 sq ft	6,314 sq ft
1826, Lot 35	126-25 Willets Point Blvd	Willets Storage, LLC	Deli, and 4 or 5 Auto related businesses	12,625 sq ft	12,600 sq ft

FIGURE 3: AERIAL VIEW OF APPROXIMATE PUMP STATION LOCATION

V. CONCEPTUAL ANALYSIS OF DISTRICT GRADING

LEGAL GRADE AND TOPOGRAPHIC SURVEY COMPARISON

Legal grades are elevations recorded on the City Map, filed in the Borough President's Office, Topographical Bureau. These grades are set by each borough as a design control and follow the natural contours of the land. Legal grades for the project study area have been compared with the existing street topography as shown on surveys of the area. Legal grades were converted from the City of New York City Planning Commission Office of Technical Controls map showing a change in the street system, dated May 24, 1967. The legal grades presented in the 1967 map were shown in Queens Datum, which is 2.725 feet above the U.S.C. & G. Datum at Sandy Hook. These elevations were converted to NAVD88 vertical datum to compare with the existing survey elevations, which are also in the NAVD88 vertical datum. Queens Datum is approximately 1.635 feet above NAVD88.

Legal grades in the northern section of the District are similar in comparison to the existing survey, ranging in differences from 0.0 feet to 0.8 feet as shown on Exhibit "C". However, comparisons of the southern section of the District (areas near the intersections of Willets Point Boulevard and 38th or 39th Avenues), reveal substantial differences. The legal grades for the southern section (approximately 16 acres or 25% of the entire site) range from 1.8 feet to 2.5 feet higher than the existing topography.

LEGAL GRADES AND DRAINAGE ISSUES

For this analysis, both the sanitary and storm systems were originally conceptualized using the existing site topography. The sanitary system could completely be constructed without building to the legal grade elevations. However, the storm sewer system could not be completely designed using the current existing elevations due to NYCDEP pipe cover and hydraulic requirements. These requirements include minimum velocity, maximum depth, minimum cover, and minimum pipe slope as discussed in the conceptual layout sections above. Exhibit "D" highlights the area for which a storm sewer system could not be designed while maintaining existing elevations. The southern section of the District would be too low in elevation to drain by gravity if the sewer remained at existing elevations instead of legal grades, and thus storm sewers would not function in that portion of the District. Raising the streets to legal grades would have an impact on local businesses, buildings and driveways. Constructing the roads to the legal grades would require raising the majority of the streets in the entire District, resulting in roads that are approximately 6 inches to 3 feet higher than the surrounding buildings and properties. Thus, the storm sewers would effectively only convey runoff from the streets in these areas and not the properties located at lower elevations adjacent to those streets. Exhibit "H" shows the individual lots that would not be able to drain properly if the roads were constructed to legal grade elevations. These lots would be one foot or more below the street elevation and would not drain on the surface by gravity to the street. This condition created by the construction of streets to a higher elevation would force development lot owners to design individual stormwater systems that could incorporate pumping of stormwater where gravity drainage could not be maintained. Each of these lot owners would become responsible for a site connection to the stormwater system that could involve installing and maintaining a stormwater detention system designed to treat stormwater prior to its entry into the public stormwater system. Such individual systems could pose a financial and engineering challenge to individual lot owners. Some parcels may not have adequate

space or be properly oriented to accommodate the necessary stormwater treatment systems. The following is a summary of negative impacts that would result from raising the streets to legal grade elevations unless pumps were installed on the lots adjacent to the elevated streets:

- Ponding of water on development lots that are lower than the street grade
- Driveway and access issues to development lots

In addition, as a result of NYCDEP industrial pretreatment requirements, zoning and land use, each lot may also require individual water quality pretreatment units, such as an oil/water separator, before connecting to the sanitary sewer system.

VI. ENVIRONMENTAL PERMITTING

In order to comply with current NYSDEC stormwater pretreatment permit requirements pursuant to Article 17, Title 8 of the Environmental Conservation Law and 6 NYCRR Parts 750-757, it is assumed that water quality features (pretreatment facilities) would need to be constructed before the discharge point of each outfall in 126th Street and 127th Street. This assumption is reasonable, based upon the current prevalence of automotive and industrial uses in the Willets Point area and the numerous petroleum spills reported in the NYSDEC Spill Database as floating petroleum on ponded water. It is anticipated that the construction of new streets and storm sewers would not prevent future discharges of petroleum and other chemicals from the industrial businesses within the District. Indeed, it is reasonable to assume that a properly constructed street and storm sewer system, while improving collection of runoff, may more readily direct future contaminant discharges directly to the bay. Thus, stormwater water quality features, similar to the separation unit mentioned above, would be needed to treat stormwater before it is discharged into Flushing Bay.

The current NYSDEC classification for Flushing Bay is Class I, for which the cited best usages are secondary contact recreation and fishing. Water leaving the District would be required to meet or exceed the standards for this waterbody class. The following is a summary of acceptable NYSDEC requirements for a Class I waterbody:

Parameter	Class I Standard
pH	The normal range shall not be extended by more than one-tenth (0.1) of a pH unit.
Dissolved Oxygen (DO)	Shall not be less than 4.0 mg/L at any time.
Total Coliforms (number per 100 ml)	The monthly geometric mean, from a minimum of five examinations, shall not exceed 10,000
Fecal Coliforms (number per 100 ml)	The monthly geometric mean, from a minimum of five examinations, shall not exceed 2,000.

Pretreatment devices like a separation unit mentioned above, could help improve water quality to an acceptable level before discharge.

VII. WATER SUPPLY

The replacement of the water supply and service connections within the District would also be included as part of the MSA. The majority of existing water mains were installed between 1946 and 1951 and are adequate for the existing development and use. These sections would be replaced both due to the age as required by NYCDEP (50 years) and the fact that each street will be excavated, filled, and have significant new storm and sanitary utilities installed within them. Existing water mains located in areas where the street is being reconstructed would also require replacement according to NYCDEP requirements. The existing 72" water distribution main (constructed on piles in 1972) that is located in Willets Point Boulevard would remain in place and will be tapped within the District for domestic and fire use.

Approximately 13,500 linear feet of new ductile iron pipe (DIP) would be required and approximately 45 new fire hydrants would be installed under the MSA. It is assumed that all pipes for this conceptual layout would not need piles but would be constructed on concrete cradle and would require at least four feet of cover over the top of the pipe. Design, excavation and installation would be coordinated concurrently with the storm and sanitary sewer systems, and private utilities such as gas and electric. Water main layout and design would be subject to NYCDEP and New York City Fire Department (FDNY) review and approval.

VIII. PRIVATE UTILITIES

To the maximum extent possible, the proposed sanitary and storm sewer lines have been designed to provide minimum disturbance to the existing businesses located within the District and to existing public and private utilities. The shaded areas shown on Exhibit "E" highlight some conflicts with existing utilities and the proposed sanitary or storm pipe lines. These areas represent the most congested areas according to the existing utility survey and are located at various locations throughout the site. Some of these areas include the intersections of 127th Place and 34th Avenue, 127th Street and 34th Avenue and approximately 570 linear feet of Willets Point Boulevard between 37th Avenue and 39th Avenue. Subsurface private utility replacement would be required in these areas.

A typical cross section shown in Exhibit "F" shows the placement of a new sanitary sewer line, in relation to the existing storm sewer, gas, water, and electric in Willets Point Boulevard. At this location, it appears that from a constructability standpoint, that a new sanitary sewer line could feasibly be constructed in relation to the existing utilities. A full construction analysis would be required to provide a safe and effective installation method.

All overhead utilities that are in areas along streets that would be raised in elevation would require replacement. This includes electric power and telecommunication lines.

IX. HAZARDOUS AND CONTAMINATED WASTE

Based on the results of Phase II testing, it is anticipated that the materials encountered during trenching and excavation activities necessary to install sanitary and storm sewers in the District would consist primarily of historic fill. The fill was placed in the District during the initial filling of the swamp. It is composed of incinerated ash, coal and garbage. This material is expected to be inconsistent in nature and

may be unacceptable for use as backfill material. Any material deemed unsuitable for backfill would have to be handled as Regulated Solid Waste in accordance with the NYCRR Part 360 Solid Waste Regulations. Much of the incinerated material may be classified as Industrial Waste. Disposal of material classified as Industrial Waste would require sampling of the material and proper disposal at a regulated Solid Waste Facility.

The removal of the existing catch basins is also anticipated to generate excess soils impacted by historic discharges to the existing storm system. This material may also require sampling and proper disposal at a regulated Solid Waste Facility. Given the shallow depth to groundwater (approximately 5 ft below existing grade), there would be a significant effort and therefore a significant cost involved in dewatering construction excavations for the pump station and utilities that extend into the water table. This effort could include large excavations, sheeting or shoring construction and design, and continuous pumping operations. Groundwater is likely to contain significant particulate content as a result of the ash fill as well as the potential for contaminants that are likely to exist on many of the sites. The contaminants could include petroleum and automotive chemicals in dissolved and free phase. This water would require pretreatment prior to discharge to either the NYC sanitary sewer system or Flushing Bay.

Given that trenching would be required in nearly all streets, it is highly likely that individual areas of contaminated groundwater from these sites would be encountered, and systems would need to be in place in order to treat this contaminated groundwater when encountered.

X. ENGINEER'S OPINION OF PROBABLE COST

An Engineer's Opinion of Probable Cost includes anticipated costs for the completion of the MSA using assumptions made to establish those costs. The estimate included Storm Water, Sanitary Sewer, Streetwork, Water, Electric, Telecom, Gas, Demolition, Remediation and Site Fill. These costs pertain to the MSA layout and are not Final design costs. It was also assumed that all streets would remain as public streets in their current configuration. The associated costs to acquire property outside of the District for the pretreatment facilities for water quality purposes for the sanitary sewage pump station have not been included. A brief description of the breakdown of each item is described below. The Engineer's Opinion of Probable Cost has been included as Exhibit "I."

1. Storm Water – This item includes onsite concept design sewers, installation and pile supports, disposal of excavated historic fill materials, and the replacement of 730 feet of the 126th Street outfall sewer and 320 feet of the 127th Street outfall sewer. ($80,000,000)
2. Sanitary Sewer – This item includes onsite piping, installation and pile support, as well as disposal of excavated historic fill material and the construction of an onsite sanitary pump station. Conceptual design was not completed for the new sanitary sewage pump station. ($57,500,000)
3. Streetwork – This item includes the paving of all currently mapped streets within the District. Street luminares, light poles, sidewalks, curbs, trees, and signs were also included. ($14,300,000)
4. Water – This item includes onsite piping, and installation, as well as disposal of excavated historic fill materials. This also included the tapping of existing distribution lines currently located within the District. ($13,600,000)

5. Electric – This item includes medium voltage distribution cabling and cutovers, as well as disposal of excavated historic fill materials. ($6,000,000)
6. Telecom – There is no cost associated with telecom installation for this analysis as it is assumed it will be installed by private utilities. ($0)
7. Gas – This item includes distribution piping, installation, and disposal of excavated historic fill materials. ($5,600,000)
8. Demolition – This item includes the demolition of the existing roadways and the shutoff of existing utilities. ($5,000,000)
9. Remediation – This item includes the removal of the existing catch basins, as well as sampling and disposal of impacted soils. ($1,700,000)
10. Site Fill – This item includes the importation and spreading of fill required to bring the District street elevations to legal grade. ($3,500,000)

XI. PROJECT SCHEDULE

The following is a summary of the anticipated staging and overall project schedule. The total project length is estimated to be approximately 5 years with overlapping Stages of construction (see Appendix D for the detailed project schedule).

- Stage 1 – Preconstruction (6 months)
  - Mobilization
  - Maintenance and Protection of Traffic
    - Setup barriers, construction signs, routing
  - Erosion and Sediment Control
    - Install silt fence
    - Install stabilized construction entrances

- Stage 2 – Sanitary Sewage Pump Station (36 months)
    - Clear site
    - Demolition
    - Excavation, foundation and building
    - Mechanical work
    - Finish construction of station
    - Start up of Sewage Pump Station
    - Connect new sanitary sewer system to the new station

- Stage 3 – Storm Sewer Construction (60 months)

- Construction will begin on downstream end of 126th Street outfall
  - Trench and sheet areas for pipe replacement in nearby parking area
  - Complete pipe installation from outfall up to Northern Boulevard
  - Lane closures on Northern Boulevard
  - Trench and sheet partial lanes across Northern Boulevard for pipe replacement
  - Connect and replace pipe from outfall across Northern Boulevard up to site
  - Trench and construct tributary lines to the 126th outfall on 34th through 39th Avenues
  - Fill as required to bring street to legal grade
- Construction will continue on downstream end of 127th outfall
  - Trench and sheet area for pipe replacement in nearby parking area
  - Complete pipe installation from outfall up to Northern Boulevard
  - Lane closures on Northern Boulevard
  - Trench and sheet partial lanes across Northern Boulevard for pipe replacement
  - Connect and replace pipe from outfall across Northern Boulevard up to site
  - Trench and construct tributary lines to the 126th outfall on 34th through 39th Avenues

- Stage 4 - Sanitary Sewer Construction (36 months)
  - During trenching for storm sewers, construct sanitary sewers simultaneously if possible
  - If sanitary sewers cannot be constructed at same time of the storm sewers, lane closures to trench and sheet for sanitary sewer installation
  - Trench and sheet area for main pipe installation
  - Construct house/business connections and tie into main line

- Stage 5 – Water Main Construction (36 months)
  - Trench and sheet areas for water main installation
  - Fill as required to bring street to legal grade

- Stage 6 – Private Utility Construction (30 months)
  - Trench and sheet areas for utility installation
  - Fill as required to bring street to legal grade

- Stage 7 – Street and Sidewalk Construction (30 months)
  - Fill as required to bring street to legal grade
  - Repave and restore pavement in parking area and Northern boulevard

- Check final grades, adjust with fill and level
- Construct subbase and base of road
- Construct sidewalks and other road improvements
- Final pavement

- Stage 8 - Finish Landscaping (4 months)
  - Topsoil as required
  - Mulch and seed
  - Plant required trees
  - Finish landscaping (stone walls or signs required)

Appendix A

STORM SYSTEM DESIGN AND CAPACITY ANALYSIS

Line	Manhole #	New Pipe? Enter "y"	Up-stream? Enter "y"	Down-stream? Enter "y"	Rim Elev. (ft)	Upper Inv. Elev. (ft)	Lower Inv. Elev. (ft)	Between Manholes															
								Cover (ft) upper	Cover (ft) lower	Fall to next (ft)	Length to next (ft)	Slope to next (ft)	Shape enter	Dimensions downstream				Area (ft^2)	Inner Top Upper (ft)	Inner Top Lower (ft)	Velocity (ft/s)	Capacity (cfs)	Time in pipe (s)
STORM A																							
NEW	A-9		y		7.00	3.40	3.40	2.35	2.35	0.10	50.10	0.0020	circ	diameter=	15			1.2272	4.65	4.65	2.0407	2.8684	24.5508
NEW	A-8				8.00	3.30	3.30	1.20	1.20	0.10	111.67	0.0009	circ	diameter=	42			9.6211	6.80	6.80	2.7247	30.0267	40.9844
	A-7				8.00	3.20	3.20	0.80	0.80	0.40	309.50	0.0013	circ	diameter=	48			12.5664	7.20	7.20	3.5797	51.5246	86.4610
	A-6				9.00	2.80	2.80	2.20	2.20	0.30	157.50	0.0019	circ	diameter=	48			12.5664	6.80	6.80	4.3457	62.5511	36.2426
NEW	A-5A				9.00	2.50	2.50	2.50	2.50	0.20	152.30	0.0013	circ	diameter=	48			12.5664	6.50	6.50	3.6083	51.9373	42.2079
	A-5				9.40	2.30	2.30	3.10	3.10	0.50	260.00	0.0019	circ	diameter=	48			12.5664	6.30	6.30	4.3666	62.8511	59.5435
	A-4				9.50	1.80	1.80	3.20	3.20	0.80	260.00	0.0031	circ	diameter=	54			15.9043	6.30	6.30	5.9768	108.8805	43.5013
	A-3				9.60	1.00	1.00	4.10	4.10	0.90	260.00	0.0035	circ	diameter=	54			15.9043	5.50	5.50	6.3394	115.4852	41.0134
	A-2				9.93	0.10	0.10	4.83	4.83	0.30	260.00	0.0012	circ	diameter=	60			19.6350	5.10	5.10	3.9278	88.3361	66.1955
	A-1				9.00	-0.20	-0.20	4.20	4.20	0.10	117.00	0.0009	circ	diameter=	60			19.6350	4.80	4.80	3.3805	76.0276	34.6105
	A-1B				9.00	-0.30	-0.30	4.30	4.30	0.20	118.00	0.0017	circ	diameter=	60			19.6350	4.70	4.70	4.7604	107.0627	24.7878
	A-1A			y	9.00	-0.50	-0.50	4.50	4.50	0	0.00	0	circ	diameter=	60			19.6350	4.50	4.50	0	0	0
STORM A-5A																							
NEW	A-5B		y		9.00	2.60	2.60	5.40	5.40	2.20	53.22	0.0413	circ	diameter=	12			0.7854	3.60	3.60	7.9971	7.1943	6.6549
NEW	A-5A			y	9.00	2.50	2.50	5.50	5.50	0	0.00	0	circ	diameter=	12			0.7854	3.50	3.50	0	0	0
STORM A-7A																							
NEW	A-7A6		y		10.30	5.30	5.30	3.50	3.50	0.10	26.11	0.0038	circ	diameter=	18			1.7671	6.80	6.80	3.1940	6.4651	8.1746
NEW	A-7A5				10.30	5.20	5.20	3.60	3.60	0.40	116.31	0.0034	circ	diameter=	18			1.7671	6.70	6.70	3.0267	6.1263	38.4285
NEW	A-7A4				10.10	4.80	4.80	3.80	3.80	0.20	20.70	0.0097	circ	diameter=	18			1.7671	6.30	6.30	5.0731	10.2685	4.0804
NEW	A-7A3				10.10	4.60	4.60	3.50	3.50	0.30	97.80	0.0031	circ	diameter=	24			3.1416	6.60	6.60	3.4661	12.4726	28.2161
NEW	A-7A2				10.10	4.30	4.30	3.80	3.80	0.55	104.11	0.0053	circ	diameter=	24			3.1416	6.30	6.30	4.5487	16.3682	22.8879
NEW	A-7A1				10.10	3.75	3.75	4.35	4.35	0.15	20.06	0.0075	circ	diameter=	24			3.1416	5.75	5.75	5.4117	19.4735	3.7068
NEW	A-7A				10.10	3.60	3.60	4.50	4.50	0.40	67.98	0.0059	circ	diameter=	24			3.1416	5.60	5.60	4.8005	17.2744	14.1609
	A-7			y	8.00	3.20	3.20	0.80	0.80	0	0.00	0	circ	diameter=	48			12.5664	7.20	7.20	0	0	0
STORM A-7B																							
NEW	A-7B		y		10.10	4.80	4.80	4.30	4.30	0.45	24.47	0.0184	circ	diameter=	12			0.7854	5.80	5.80	5.3340	4.7985	4.5876
NEW	A-7A2			y	10.10	4.35	4.35	3.75	3.75	0	0.00	0	circ	diameter=	24			3.1416	6.35	6.35	0	0	0
STORM A-7C																							
NEW	A-7C		y		10.80	6.00	6.00	3.55	3.55	1.20	201.76	0.0059	circ	diameter=	15			1.2272	7.25	7.25	3.5226	4.9515	57.2758
NEW	A-7A4			y	10.10	4.80	4.80	3.80	3.80	0	0.00	0	circ	diameter=	18			1.7671	6.30	6.30	0	0	0
STORM A-NB																							
NEW	A-NB5		y		13.00	8.00	8.00	3.75	3.75	0.20	30.29	0.0066	circ	diameter=	15			1.2272	9.25	9.25	3.7116	5.2171	8.1610
NEW	A-NB4				13.00	7.80	7.80	3.95	3.95	0.30	22.81	0.0132	circ	diameter=	15			1.2272	9.05	9.05	5.2383	7.3631	4.3545
NEW	A-NB3				13.00	7.50	7.50	4.25	4.25	1.50	208.83	0.0072	circ	diameter=	15			1.2272	8.75	8.75	3.8711	5.4414	53.9453
NEW	A-NB2				13.00	6.00	6.00	5.75	5.75	3.00	201.94	0.0149	circ	diameter=	15			1.2272	7.25	7.25	5.5672	7.8255	36.2729
NEW	A-NB1				12.30	3.00	3.00	8.05	8.05	3.20	54.78	0.0584	circ	diameter=	15			1.2272	4.25	4.25	11.0396	15.5177	4.9621
	A-1			y	9.00	-0.20	-0.20	4.20	4.20	0	0.00	0	circ	diameter=	60			19.6350	4.80	4.80	0	0	0
STORM B																							
NEW	B-6		y		13.80	9.30	9.30	3.50	3.50	1.00	141.32	0.0071	circ	diameter=	12			0.7854	10.30	10.30	3.3087	2.9765	42.7115
NEW	B-5				12.80	8.30	8.30	3.50	3.50	0.40	57.26	0.0070	circ	diameter=	12			0.7854	9.30	9.30	3.2875	2.9575	17.4175
NEW	B-4				12.50	7.90	7.90	3.60	3.60	0.90	149.43	0.0060	circ	diameter=	12			0.7854	8.90	8.90	3.0526	2.7461	48.9525
NEW	B-3				11.90	7.00	7.00	3.65	3.65	1.60	192.13	0.0083	circ	diameter=	15			1.2272	8.25	8.25	4.1682	5.8590	46.0938
REPLACE	B-2				10.25	5.40	5.40	3.60	3.60	1.50	22.00	0.0682	circ	diameter=	15			1.2272	6.65	6.65	11.9268	16.7648	1.8446
	B-1				10.15	3.90	3.20	4.58	5.28	0.90	55.00	0.0164	circ	diameter=	20			2.1817	5.57	4.87	7.0850	17.7048	7.7629
	A-2			y	9.93	2.30	2.30	5.96	5.96	0	0.00	0	circ	diameter=	20			2.1817	3.97	3.97	0	0	0
STORM C																							
NEW	C-3		y		12.50	8.00	8.00	3.50	3.50	0.90	149.14	0.0060	circ	diameter=	12			0.7854	9.00	9.00	3.0555	2.7488	48.8100
NEW	C-2				11.90	7.10	7.10	3.55	3.55	0.90	191.88	0.0047	circ	diameter=	15			1.2272	8.35	8.35	3.1282	4.3971	61.3385
REPLACE	C-1				9.74	6.20	6.20	2.29	2.29	1.30	23.00	0.0565	circ	diameter=	15			1.2272	7.45	7.45	10.8592	15.2641	2.1180
REPLACE	B-1			y	10.15	4.90	4.90	4.00	4.00	0	0.00	0	circ	diameter=	15			1.2272	6.15	6.15	0	0	0
STORM D																							
NEW	D-5A		y		11.80	7.30	7.30	3.50	3.50	0.25	16.10	0.0155	circ	diameter=	12			0.7854	8.30	8.30	4.9014	4.4093	3.2848
NEW	D-5				11.80	7.05	7.05	3.50	3.50	0.55	117.79	0.0047	circ	diameter=	15			1.2272	8.30	8.30	3.1212	4.3872	37.7390
NEW	D-4				11.80	6.50	6.50	3.80	3.80	1.20	200.03	0.0060	circ	diameter=	18			1.7671	8.00	8.00	3.9975	8.0914	50.0392
NEW	D-3				10.90	5.30	5.30	3.60	3.60	0.70	112.36	0.0062	circ	diameter=	24			3.1416	7.30	7.30	4.9396	17.7749	22.7467
REPLACE	D-2				10.16	4.60	4.60	3.56	3.56	0.20	23.40	0.0085	circ	diameter=	24			3.1416	6.60	6.60	5.7857	20.8196	4.0444
REPLACE	D-1				10.33	4.40	4.40	3.93	3.93	3.40	53.66	0.0634	circ	diameter=	24			3.1416	6.40	6.40	15.7531	56.6864	3.4063
	A-3			y	9.60	1.00	1.00	6.93	6.93	0	0.00	0	circ	diameter=	20			2.1817	2.67	2.67	0	0	0
STORM D-A																							
NEW	D-4A		y		11.80	6.70	6.70	4.10	4.10	0.20	17.32	0.0115	circ	diameter=	12			0.7854	7.70	7.70	4.2267	3.8024	4.0978

Line	Manhole #	New Pipe? Enter "y"	Up-stream? Enter "y"	Down-stream? Enter "y"	Rim Elev. (ft)	Upper Inv. Elev. (ft)	Lower Inv. Elev. (ft)	Between Manholes															
								Cover (ft) upper	Cover (ft) lower	Fall to next (ft)	Length to next (ft)	Slope to next (ft)	Shape enter	Dimensions downstream				Area (ft^2)	Inner Top Upper (ft)	Inner Top Lower (ft)	Velocity (ft/s)	Capacity (cfs)	Time in pipe (s)
NEW	D-4			y	11.80	6.50	6.50	4.30	4.30	0	200.03	0	circ	diameter=	12			0.7854	7.50	7.50	0	0	0
STORM D-A																							
NEW	D-3A		y		10.90	5.70	5.70	4.20	4.20	0.20	19.08	0.0105	circ	diameter=	12			0.7854	6.70	6.70	4.0270	3.6228	4.7380
NEW	D-3			y	10.90	5.50	5.50	4.40	4.40	0	112.36	0	circ	diameter=	12			0.7854	6.50	6.50	0	0	0
STORM E																							
	E-1		y		10.40	6.00	6.00	3.40	3.40	0.60	24.00	0.0250	circ	diameter=	12			0.7854	7.00	7.00	6.2191	5.5948	3.8591
	D-1			y	10.33	5.40	3.30	3.93	6.03	0	0.00	0	circ	diameter=	12			0.7854	6.40	4.30	0	0	0
STORM F																							
NEW	F-4A		y		11.50	6.50	6.50	4.00	4.00	0.20	20.84	0.0096	circ	diameter=	12			0.7854	7.50	7.50	3.8532	3.4664	5.4084
NEW	F-4				11.50	6.30	6.30	4.20	4.20	0.70	109.15	0.0064	circ	diameter=	12			0.7854	7.30	7.30	3.1499	2.8337	34.6518
NEW	F-3				11.50	5.60	5.60	4.65	4.65	1.30	199.91	0.0065	circ	diameter=	15			1.2272	6.85	6.85	3.6834	5.1775	54.2737
REPLACE	F-2				9.66	4.30	4.30	3.86	3.86	0.20	22.57	0.0089	circ	diameter=	18			1.7671	5.80	5.80	4.8584	9.8339	4.6456
REPLACE	F-1				9.93	4.10	3.30	4.16	4.96	1.50	54.64	0.0275	circ	diameter=	20			2.1817	5.77	4.97	9.1768	22.9319	5.9542
	A-4			y	9.50	1.80	1.80	6.03	6.03	0	0.00	0	circ	diameter=	20			2.1817	3.47	3.47	0	0	0
STORM F-A																							
NEW	F-3A		y		11.50	6.00	6.00	4.50	4.50	0.20	22.35	0.0089	circ	diameter=	12			0.7854	7.00	7.00	3.7208	3.3473	6.0068
NEW	F-3			Y	11.50	5.80	5.80	4.70	4.70	0	22.00	0	circ	diameter=	12			0.7854	6.80	6.80	0	0	0
STORM G																							
REPLACE	G-1		y		9.40	5.40	5.40	2.50	2.50	0.10	22.00	0.0045	circ	diameter=	18			1.7671	6.90	6.90	3.4796	7.0431	6.3225
	F-1			y	9.93	5.30	3.30	3.13	5.13	0	0.00	0	circ	diameter=	18			1.7671	6.80	4.80	0	0	0
STORM H																							
NEW	H-4A		y		10.30	5.80	5.80	3.50	3.50	0.20	24.37	0.0082	circ	diameter=	12			0.7854	6.80	6.80	3.5633	3.2055	6.8392
NEW	H-4				10.30	5.60	5.60	3.45	3.45	1.00	165.78	0.0060	circ	diameter=	15			1.2272	6.85	6.85	3.5475	4.9865	46.7313
NEW	H-3				10.10	4.60	4.60	4.00	4.00	1.10	185.18	0.0059	circ	diameter=	18			1.7671	6.10	6.10	3.9778	8.0515	46.5536
REPLACE	H-2				9.41	3.50	3.50	4.41	4.41	0.30	22.28	0.0135	circ	diameter=	18			1.7671	5.00	5.00	5.9889	12.1222	3.7202
REPLACE	H-1				9.87	3.20	3.20	5.00	5.00	0.90	54.31	0.0166	circ	diameter=	20			2.1817	4.87	4.87	7.1299	17.8169	7.6173
	A-5			y	9.40	2.30	2.30	5.43	5.43	0	0.00	0	circ	diameter=	20			2.1817	3.97	3.97	0	0	0
STORM H-A																							
NEW	H-3A		y		11.50	6.00	6.00	4.50	4.50	0.20	22.35	0.0089	circ	diameter=	12			0.7854	7.00	7.00	3.7208	3.3473	6.0068
NEW	H-3			y	11.50	5.80	5.80	4.70	4.70	0	22.00	0	circ	diameter=	12			0.7854	6.80	6.80	0	0	0
STORM I																							
	I-1		y		9.17	7.20	7.20	0.97	0.97	3.10	23.00	0.1348	circ	diameter=	12			0.7854	8.20	8.20	14.4403	12.9907	1.5928
	H-1			y	9.87	4.10	2.90	4.77	5.97	0	0.00	0	circ	diameter=	12			0.7854	5.10	3.90	0	0	0
STORM J																							
NEW	J-7		y		10.40	5.90	5.90	3.50	3.50	0.35	58.60	0.0060	circ	diameter=	12			0.7854	6.90	6.90	3.0398	2.7346	19.2775
NEW	J-6				10.80	5.55	5.55	4.00	4.00	0.15	19.43	0.0077	circ	diameter=	15			1.2272	6.80	6.80	4.0133	5.6412	4.8414
NEW	J-5				10.80	5.40	5.40	3.90	3.90	1.20	184.52	0.0065	circ	diameter=	18			1.7671	6.90	6.90	4.1621	8.4246	44.3336
NEW	J-4				11.80	4.20	4.20	6.10	6.10	0.40	63.04	0.0063	circ	diameter=	18			1.7671	5.70	5.70	4.1112	8.3215	15.3339
NEW	J-3				11.60	3.80	3.80	5.80	5.80	0.70	159.61	0.0044	circ	diameter=	24			3.1416	5.80	5.80	4.1445	14.9136	38.5115
REPLACE	J-2				9.03	3.10	3.10	3.43	3.43	0.10	22.50	0.0044	circ	diameter=	30			4.9087	5.60	5.60	4.8449	27.2410	4.6440
REPLACE	J-1				9.30	3.00	3.00	3.80	3.80	0.20	53.77	0.0037	circ	diameter=	30			4.9087	5.50	5.50	4.4321	24.9200	12.1325
	A-6			y	9.00	2.80	2.80	3.70	3.70	0	0.00	0	circ	diameter=	30			4.9087	5.30	5.30	0	0	0
STORM J-4A																							
NEW	J-4A		y		11.80	4.50	4.50	6.30	6.30	0.30	19.92	0.0151	circ	diameter=	12			0.7854	5.50	5.50	4.8270	4.3424	4.1268
NEW	J-4			y	11.80	4.20	4.20	6.60	6.60	0	0.00	0	circ	diameter=	12			0.7854	5.20	5.20	0	0	0
STORM J-3A																						0.0000	
NEW	J-3A		y		11.60	4.20	4.20	6.40	6.40	0.40	20.07	0.0199	circ	diameter=	12			0.7854	5.20	5.20	5.5529	4.9954	3.6144
NEW	J-3			y	11.60	3.80	3.80	6.55	6.55	0	0.00	0	circ	diameter=	15			1.2272	5.05	5.05	0	0	0
STORM K																							
	K-1		y		8.89	7.10	7.10	0.79	0.79	2.90	22.00	0.1318	circ	diameter=	12			0.7854	8.10	8.10	14.2807	12.8470	1.5405
	J-1			y	9.30	4.20	3.20	4.10	5.10	0	0.00	0	circ	diameter=	12			0.7854	5.20	4.20	0	0	0
STORM L																							
	L-1		y		8.26	5.00	5.00	2.26	2.26	0.30	33.00	0.0091	circ	diameter=	12			0.7854	6.00	6.00	3.7503	3.3738	8.7993
	J-1			y	9.30	4.70	3.20	3.60	5.10	0	0.00	0	circ	diameter=	12			0.7854	5.70	4.20	0	0	0
STORM M																							
	M-3		y		9.91	4.30	4.30	3.61	3.61	0.70	116.00	0.0060	circ	diameter=	24			3.1416	6.30	6.30	4.8615	17.4938	23.8609
	M-2				11.12	3.60	3.60	5.52	5.52	0.90	228.00	0.0039	circ	diameter=	24			3.1416	5.60	5.60	3.9319	14.1488	57.9869
	M-1			y	10.76	2.70	2.70	6.06	6.06	0	0.00	0	circ	diameter=	24			3.1416	4.70	4.70	0	0	0
STORM M-1A																							
NEW	M-1A		y		10.90	3.00	3.00	6.90	6.90	0.30	20.01	0.0150	circ	diameter=	12			0.7854	4.00	4.00	4.8161	4.3326	4.1548
	M-1			y	10.76	2.70	2.70	6.06	6.06	0	0.00	0	circ	diameter=	24			3.1416	4.70	4.70	0	0	0

Line	Manhole #	New Pipe? Enter "y"	Up-stream? Enter "y"	Down-stream? Enter "y"	Rim Elev. (ft)	Upper Inv. Elev. (ft)	Lower Inv. Elev. (ft)	Between Manholes																
								Cover (ft) upper	Cover (ft) lower	Fall to next (ft)	Length to next (ft)	Slope to next (ft)	Shape enter	Dimensions downstream				Area (ft^2)	Inner Top Upper (ft)	Inner Top Lower (ft)	Velocity (ft/s)	Capacity (cfs)	Time in pipe (s)
STORM M-3A																								
NEW	M-3A2		y		12.80	6.80	6.80	5.00	5.00	0.30	35.00	0.0086	circ	diameter=	12			0.7854	7.80	7.80	3.6416	3.2760	9.6113
NEW	M-3A1				12.80	6.50	6.50	5.30	5.30	1.50	182.97	0.0082	circ	diameter=	12			0.7854	7.50	7.50	3.5614	3.2038	51.3764
NEW	M-3A				10.00	5.00	5.00	3.75	3.75	0.70	39.42	0.0178	circ	diameter=	15			1.2272	6.25	6.25	6.0867	8.5557	6.4764
	M-3			y	9.91	4.30	4.30	4.36	4.36	0	0.00	0	circ	diameter=	15			1.2272	5.55	5.55	0	0	0
STORM M-3B																								
NEW	M-3B		y		10.90	5.90	5.90	4.00	4.00	1.60	58.93	0.0272	circ	diameter=	12			0.7854	6.90	6.90	6.4812	5.8305	9.0925
	M-3			y	9.91	4.30	4.30	4.61	4.61	0	0.00	0	circ	diameter=	12			0.7854	5.30	5.30	0	0	0
STORM N																								
	N-1		y		9.39	6.60	6.60	1.79	1.79	1.10	37.00	0.0297	circ	diameter=	12			0.7854	7.60	7.60	6.7820	6.1011	5.4556
	M-3			y	9.91	5.50	4.30	3.41	4.61	0	0.00	0	circ	diameter=	12			0.7854	6.50	5.30	0	0	0
STORM O																								
NEW	O-2		y		11.34	8.00	8.00	2.34	2.34	1.70	186.05	0.0091	circ	diameter=	12			0.7854	9.00	9.00	3.7598	3.3824	49.4834
NEW	O-1				9.57	6.30	6.30	2.27	2.27	0.40	24.00	0.0167	circ	diameter=	12			0.7854	7.30	7.30	5.0779	4.5681	4.7264
	M-3			y	9.91	5.90	4.30	3.01	4.61	0	0.00	0	circ	diameter=	12			0.7854	6.90	5.30	0	0	0
STORM P																								
REPLACE	P-7		y		8.83	5.30	5.30	2.03	2.03	0.30	87.00	0.0034	circ	diameter=	18			1.7671	6.80	6.80	3.0307	6.1345	28.7062
REPLACE	P-6				9.04	5.00	5.00	2.54	2.54	0.20	78.00	0.0026	circ	diameter=	18			1.7671	6.50	6.50	2.6134	5.2899	29.8459
REPLACE	P-5				9.17	5.20	5.20	1.97	1.97	0.50	89.00	0.0056	circ	diameter=	24			3.1416	7.20	7.20	4.6907	16.8793	18.9736
REPLACE	P-4				9.50	4.70	4.70	2.80	2.80	0.60	91.00	0.0066	circ	diameter=	24			3.1416	6.70	6.70	5.0817	18.2860	17.9075
REPLACE	P-3				9.10	4.10	4.10	3.00	3.00	0.70	115.00	0.0061	circ	diameter=	24			3.1416	6.10	6.10	4.8826	17.5697	23.5530
REPLACE	P-2				9.23	3.40	3.40	3.83	3.83	1.20	118.00	0.0102	circ	diameter=	24			3.1416	5.40	5.40	6.3110	22.7098	18.6974
REPLACE	P-1				10.20	2.20	2.20	6.00	6.00	0.90	117.00	0.0077	circ	diameter=	24			3.1416	4.20	4.20	5.4888	19.7512	21.3160
	M-1			y	10.76	1.30	1.30	7.46	7.46	0	0.00	0	circ	diameter=	24			3.1416	3.30	3.30	0	0	0
STORM P-5A																								
NEW	P-5A		y		9.10	5.30	5.30	2.80	2.80	0.10	7.71	0.0130	circ	diameter=	12			0.7854	6.30	6.30	4.4795	4.0298	1.7212
	P-5			y	9.17	5.20	5.20	2.72	2.72	0	0.00	0	circ	diameter=	15			1.2272	6.45	6.45	0	0	0
STORM P-5B																								
NEW	P-5B		y		9.10	5.30	5.30	2.80	2.80	0.10	17.14	0.0058	circ	diameter=	12			0.7854	6.30	6.30	3.0044	2.7028	5.7050
	P-5			y	9.17	5.20	5.20	2.72	2.72	0	0.00	0	circ	diameter=	15			1.2272	6.45	6.45	0	0	0
STORM P-2A																								
NEW	P-2A		y		9.20	4.00	4.00	4.20	4.20	0.40	14.03	0.0285	circ	diameter=	12			0.7854	5.00	5.00	6.6414	5.9747	2.1125
	P-2			y	9.23	3.60	3.60	3.88	3.88	0	0.00	0	circ	diameter=	21			2.4053	5.35	5.35	0	0	0
STORM P-2B																								
NEW	P-2B		y		9.00	4.00	4.00	4.00	4.00	0.40	15.39	0.0260	circ	diameter=	12			0.7854	5.00	5.00	6.3412	5.7046	2.4270
	P-2			y	9.23	3.60	3.60	3.88	3.88	0	0.00	0	circ	diameter=	21			2.4053	5.35	5.35	0	0	0
STORM Q																						0.0000		
	Q-1		y		7.92	5.50	5.50	1.42	1.42	0.20	23.22	0.0086	circ	diameter=	12			0.7854	6.50	6.50	3.6504	3.2840	6.3609
	P-7			y	8.83	5.70	5.40	2.13	2.43	0	0.00	0	circ	diameter=	12			0.7854	6.70	6.40	0	0	0
STORM R																								
	R-1		y		8.18	4.90	4.90	2.28	2.28	0.50	25.87	0.0193	circ	diameter=	12			0.7854	5.90	5.90	5.4682	4.9193	4.7310
	P-7			y	8.83	5.40	5.30	2.43	2.53	0	0.00	0	circ	diameter=	12			0.7854	6.40	6.30	0	0	0
STORM S																								
	S-2		y		7.46	6.00	6.00	0.63	0.63	0.50	39.00	0.0128	circ	diameter=	10			0.5454	6.83	6.83	3.9415	2.4624	9.8947
	S-1				7.39	5.50	5.50	0.89	0.89	0.50	33.00	0.0152	circ	diameter=	12			0.7854	6.50	6.50	4.8416	4.3555	6.8159
	P-3			y	9.10	5.00	4.30	3.10	3.80	0	0.00	0	circ	diameter=	12			0.7854	6.00	5.30	0	0	0
STORM T																								
	T-1		y		9.00	4.70	4.70	3.30	3.30	0.40	35.00	0.0114	circ	diameter=	12			0.7854	5.70	5.70	4.2049	3.7828	8.3236
	P-3			y	9.10	4.30	4.10	3.80	4.00	0	0.00	0	circ	diameter=	12			0.7854	5.30	5.10	0	0	0
STORM U																								
REPLACE	M-1		y		10.76	3.00	3.00	4.26	4.26	0.50	92.99	0.0054	circ	diameter=	42			9.6211	6.50	6.50	6.6766	73.5772	13.9278
NEW	U-12				11.90	2.50	2.50	5.90	5.90	0.50	84.54	0.0059	circ	diameter=	42			9.6211	6.00	6.00	7.0023	77.1667	12.0732
NEW	U-11				12.50	2.00	2.00	7.00	7.00	0.90	318.94	0.0028	circ	diameter=	42			9.6211	5.50	5.50	4.8367	53.3019	65.9411
NEW	U-10				11.50	1.10	1.10	6.90	6.90	0.20	42.85	0.0047	circ	diameter=	42			9.6211	4.60	4.60	6.2205	68.5513	6.8885
	U-9				11.00	0.90	0.90	5.60	5.60	0.80	223.46	0.0036	circ	diameter=	54			15.9043	5.40	5.40	6.4470	117.4457	34.6610
NEW	U-8				12.30	0.10	0.10	7.70	7.70	0.30	38.25	0.0078	circ	diameter=	54			15.9043	4.60	4.60	9.5424	173.8348	4.0084
	U-7				13.23	-0.20	-0.20	8.43	8.43	0.66	113.64	0.0058	circ	diameter=	60			19.6350	4.80	4.80	8.8121	198.1850	12.8960
	U-6				13.78	-0.86	-0.86	9.64	9.64	0.22	118.92	0.0018	circ	diameter=	60			19.6350	4.14	4.14	4.9734	111.8532	23.9111
	U-5				14.00	-1.08	-1.08	10.08	10.08	0.17	114.86	0.0015	circ	diameter=	60			19.6350	3.92	3.92	4.4485	100.0471	25.8201
REPLACE	U-4				13.34	-1.25	-1.25	9.59	9.59	0.35	118.41	0.0030	circ	diameter=	60			19.6350	3.75	3.75	6.2865	141.3853	18.8355
	U-3				11.69	-1.60	-1.60	8.29	8.29	0.20	114.82	0.0017	circ	diameter=	60			19.6350	3.40	3.40	4.8259	108.5352	23.7925

Line	Manhole #	New Pipe? Enter "y"	Up-stream? Enter "y"	Down-stream? Enter "y"	Rim Elev. (ft)	Upper Inv. Elev. (ft)	Lower Inv. Elev. (ft)	Between Manholes															
								Cover (ft) upper	Cover (ft) lower	Fall to next (ft)	Length to next (ft)	Slope to next (ft)	Shape enter	Dimensions downstream				Area (ft^2)	Inner Top Upper (ft)	Inner Top Lower (ft)	Velocity (ft/s)	Capacity (cfs)	Time in pipe (s)
	U-2				11.58	-1.80	-1.80	8.38	8.38	0.20	200.00	0.0010	circ	diameter=	60			19.6350	3.20	3.20	3.6565	82.2365	54.6965
	U-1			y	9.00	-2.00	-2.00	6.00	6.00	0	0.00	0	circ	diameter=	60			19.6350	3.00	3.00	0	0	0
STORM U-12A																							
NEW	U-12A2		y		11.30	6.30	6.30	4.00	4.00	1.30	163.81	0.0079	circ	diameter=	12			0.7854	7.30	7.30	3.5040	3.1522	46.7496
NEW	U-12A1				10.90	5.00	5.00	4.90	4.90	1.00	85.33	0.0117	circ	diameter=	12			0.7854	6.00	6.00	4.2580	3.8306	20.0397
NEW	U-12A				13.00	4.00	4.00	8.00	8.00	1.50	27.31	0.0549	circ	diameter=	12			0.7854	5.00	5.00	9.2182	8.2928	2.9626
NEW	U-12			y	11.90	2.50	2.50	8.40	8.40	0	0.00	0	circ	diameter=	12			0.7854	3.50	3.50	0	0	0
STORM U-12B																							
NEW	U-12B		y		11.00	3.00	3.00	7.00	7.00	0.50	30.09	0.0166	circ	diameter=	12			0.7854	4.00	4.00	5.0703	4.5613	5.9345
NEW	U-12			y	11.90	2.50	2.50	8.40	8.40	0	0.00	0	circ	diameter=	12			0.7854	3.50	3.50	0	0	0
STORM U-11A																							
NEW	U-11A		y		12.50	3.00	3.00	8.50	8.50	1.00	27.13	0.0369	circ	diameter=	12			0.7854	4.00	4.00	7.5515	6.7934	3.5926
NEW	U-11			y	12.50	2.00	2.00	9.50	9.50	0	0.00	0	circ	diameter=	12			0.7854	3.00	3.00	0	0	0
STORM U-10A																							
NEW	U-10A1		y		13.00	7.00	7.00	5.00	5.00	4.00	187.25	0.0214	circ	diameter=	12			0.7854	8.00	8.00	5.7488	5.1717	32.5718
NEW	U-10A				11.50	3.00	3.00	7.50	7.50	1.90	29.77	0.0638	circ	diameter=	12			0.7854	4.00	4.00	9.9368	8.9393	2.9959
NEW	U-10			y	11.50	1.10	1.10	9.40	9.40	0	0.00	0	circ	diameter=	12			0.7854	2.10	2.10	0	0	0
STORM U-10B																						0.0000	
NEW	U-10B		y		11.90	6.50	6.50	4.40	4.40	1.50	27.23	0.0551	circ	diameter=	12			0.7854	7.50	7.50	9.2317	8.3049	2.9496
NEW	U-10			y	11.50	5.00	1.10	5.50	9.40	0	0.00	0	circ	diameter=	12			0.7854	6.00	2.10	0	0	0
STORM U-9A																							
NEW	U-9A2		y		11.10	6.10	6.10	4.00	4.00	0.10	14.84	0.0067	circ	diameter=	12			0.7854	7.10	7.10	3.2288	2.9047	4.5961
NEW	U-9A1				11.10	6.00	6.00	4.10	4.10	2.00	117.29	0.0171	circ	diameter=	12			0.7854	7.00	7.00	5.1362	4.6206	22.8358
NEW	U-9A				11.00	4.00	4.00	6.00	6.00	3.10	44.56	0.0696	circ	diameter=	12			0.7854	5.00	5.00	10.3745	9.3330	4.2951
	U-9			y	11.00	0.90	0.90	6.60	6.60	0	0.00	0	circ	diameter=	42			9.6211	4.40	4.40	0	0	0
STORM U-9B																							
NEW	U-9B		y		11.00	6.00	6.00	4.00	4.00	0.50	44.05	0.0114	circ	diameter=	12			0.7854	7.00	7.00	4.1906	3.7699	10.5117
NEW	U-9A			y	11.00	5.50	4.00	4.50	6.00	0	0.00	0	circ	diameter=	12			0.7854	6.50	5.00	0	0	0
STORM U-9C																							
NEW	U-9C		y		11.00	6.00	6.00	4.00	4.00	0.50	17.51	0.0286	circ	diameter=	12			0.7854	7.00	7.00	6.6466	5.9794	2.6344
NEW	U-9A			y	11.00	5.50	4.00	4.50	6.00	0	0.00	0	circ	diameter=	12			0.7854	6.50	5.00	0	0	0
STORM U-9D																							
NEW	U-9D9		y		10.50	6.00	6.00	3.50	3.50	0.50	21.89	0.0228	circ	diameter=	12			0.7854	7.00	7.00	5.9446	5.3478	3.6823
NEW	U-9D8				10.50	5.50	5.50	3.50	3.50	0.70	78.94	0.0089	circ	diameter=	18			1.7671	7.00	7.00	4.8601	9.8374	16.2426
NEW	U-9D7				10.30	4.80	4.80	3.50	3.50	1.10	200.07	0.0055	circ	diameter=	24			3.1416	6.80	6.80	4.6404	16.6982	43.1147
NEW	U-9D6				9.20	3.70	3.70	3.50	3.50	0.10	42.10	0.0024	circ	diameter=	24			3.1416	5.70	5.70	3.0501	10.9755	13.8030
NEW	U-9D5				9.10	3.60	3.60	3.50	3.50	0.15	51.00	0.0029	circ	diameter=	24			3.1416	5.60	5.60	3.3940	12.2131	15.0265
NEW	U-9D4				9.10	3.45	3.45	3.65	3.65	0.55	86.82	0.0063	circ	diameter=	24			3.1416	5.45	5.45	4.9811	17.9240	17.4300
NEW	U-9D3				9.00	2.90	2.90	3.60	3.60	0.50	143.38	0.0035	circ	diameter=	30			4.9087	5.40	5.40	4.2916	24.1299	33.4093
NEW	U-9D2				10.00	2.40	2.40	5.10	5.10	0.40	33.58	0.0119	circ	diameter=	30			4.9087	4.90	4.90	7.9318	44.5968	4.2336
NEW	U-9D1				10.00	2.00	2.00	5.00	5.00	0.85	200.42	0.0042	circ	diameter=	36			7.0686	5.00	5.00	5.3477	43.2979	37.4775
NEW	U-9D				11.00	1.15	1.15	6.85	6.85	0.25	53.15	0.0047	circ	diameter=	36			7.0686	4.15	4.15	5.6318	45.5981	9.4374
	U-9			y	11.00	0.90	0.90	5.60	5.60	0	0.00	0	circ	diameter=	54			15.9043	5.40	5.40	0	0	0
STORM U-9E																							
NEW	U-9E		y		9.00	4.00	4.00	4.00	4.00	0.90	22.31	0.0403	circ	diameter=	12			0.7854	5.00	5.00	7.9001	7.1070	2.8240
NEW	U-9D3			y	9.00	3.10	3.10	3.40	3.40	0	0.00	0	circ	diameter=	30			4.9087	5.60	5.60	0	0	0
STORM U-9F																							
NEW	U-9F		y		10.80	3.00	3.00	6.80	6.80	0.55	25.43	0.0216	circ	diameter=	12			0.7854	4.00	4.00	5.7845	5.2038	4.3962
NEW	U-9D1			y	10.00	2.45	2.45	4.55	4.55	0	0.00	0	circ	diameter=	36			7.0686	5.45	5.45	0	0	0
STORM U-9G																							
NEW	U-9G		y		11.00	6.00	6.00	4.00	4.00	1.00	21.87	0.0457	circ	diameter=	12			0.7854	7.00	7.00	8.4108	7.5664	2.6002
NEW	U-9D			y	11.00	5.00	1.25	3.00	6.75	0	0.00	0	circ	diameter=	36			7.0686	8.00	4.25	0	0	0
STORM U-9H																							
NEW	U-9H2		y		11.50	6.50	6.50	4.00	4.00	0.15	20.30	0.0074	circ	diameter=	12			0.7854	7.50	7.50	3.3811	3.0417	6.0040
NEW	U-9H1				11.50	6.35	6.35	4.15	4.15	1.35	132.95	0.0102	circ	diameter=	12			0.7854	7.35	7.35	3.9635	3.5656	33.5432
NEW	U-9H				10.80	5.00	5.00	4.30	4.30	2.55	194.37	0.0131	circ	diameter=	18			1.7671	6.50	6.50	5.9115	11.9656	32.8800
NEW	U-9D1			y	10.00	2.45	2.45	4.55	4.55	0	0.00	0	circ	diameter=	36			7.0686	5.45	5.45	0	0	0
STORM U-9I																							
NEW	U-9I		y		10.80	5.50	5.50	4.30	4.30	0.50	19.48	0.0257	circ	diameter=	12			0.7854	6.50	6.50	6.3016	5.6690	3.0913
NEW	U-9H			y	10.80	5.00	5.00	4.80	4.80	0	0.00	0	circ	diameter=	12			0.7854	6.00	6.00	0	0	0
STORM U-9J																							

Line	Manhole #	New Pipe? Enter "y"	Up-stream? Enter "y"	Down-stream? Enter "y"	Rim Elev. (ft)	Upper Inv. Elev. (ft)	Lower Inv. Elev. (ft)	Between Manholes															
								Cover (ft) upper	Cover (ft) lower	Fall to next (ft)	Length to next (ft)	Slope to next (ft)	Shape enter	Dimensions downstream				Area (ft^2)	Inner Top Upper (ft)	Inner Top Lower (ft)	Velocity (ft/s)	Capacity (cfs)	Time in pipe (s)
NEW	U-9J2		y		10.50	5.75	5.75	3.75	3.75	0.25	23.22	0.0108	circ	diameter=	12			0.7854	6.75	6.75	4.0813	3.6716	5.6893
NEW	U-9J1				10.50	5.50	5.50	4.00	4.00	2.00	161.29	0.0124	circ	diameter=	12			0.7854	6.50	6.50	4.3800	3.9403	36.8244
NEW	U-9J				9.00	3.50	4.00	4.00	3.50	0.55	100.45	0.0055	circ	diameter=	18			1.7671	5.00	5.50	3.8190	7.7301	26.3028
NEW	U-9D4			y	9.00	3.45	3.45	3.45	4.05	0	0.00	0	circ	diameter=	18			1.7671	4.95	4.95	0	0	0
STORM U-9K																							
NEW	U-9K		y		9.00	4.60	4.60	3.40	3.40	0.10	19.57	0.0051	circ	diameter=	12			0.7854	5.60	5.60	2.8117	2.5294	6.9603
NEW	U-9J			y	9.00	4.50	4.50	3.50	3.50	0	0.00	0	circ	diameter=	12			0.7854	5.50	5.50	0	0	0
STORM U-9L																							
NEW	U-9L		y		10.30	5.30	5.30	4.00	4.00	0.50	24.52	0.0204	circ	diameter=	12			0.7854	6.30	6.30	5.6168	5.0529	4.3655
NEW	U-9D7			y	10.30	4.80	4.80	4.50	4.50	0	0.00	0	circ	diameter=	12			0.7854	5.80	5.80	0	0	0
STORM U-8A																							
NEW	U-8A5		y		13.80	8.80	8.80	4.00	4.00	0.90	128.54	0.0070	circ	diameter=	12			0.7854	9.80	9.80	3.2913	2.9609	39.0549
NEW	U-8A4				12.90	7.90	7.90	4.00	4.00	0.20	28.20	0.0071	circ	diameter=	12			0.7854	8.90	8.90	3.3125	2.9799	8.5133
NEW	U-8A3				12.90	7.70	7.70	4.20	4.20	1.70	199.84	0.0085	circ	diameter=	12			0.7854	8.70	8.70	3.6278	3.2636	55.0856
NEW	U-8A2				13.80	6.00	6.00	6.30	6.30	1.00	34.33	0.0291	circ	diameter=	18			1.7671	7.50	7.50	8.8086	17.8296	3.8973
NEW	U-8A1				13.00	5.00	5.00	6.50	6.50	1.00	29.83	0.0335	circ	diameter=	18			1.7671	6.50	6.50	9.4496	19.1272	3.1567
NEW	U-8A				12.00	4.00	4.00	6.50	6.50	1.00	23.50	0.0426	circ	diameter=	18			1.7671	5.50	5.50	10.6465	21.5498	2.2073
NEW	U-8			y	12.30	3.00	0.10	4.80	7.70	0	38.25	0	circ	diameter=	54			15.9043	7.50	4.60	0	0	0
STORM U-8B																							
NEW	U-8B		y		13.50	6.50	6.50	6.00	6.00	0.50	30.51	0.0164	circ	diameter=	12			0.7854	7.50	7.50	5.0353	4.5298	6.0592
NEW	U-8A2			y	13.80	6.00	6.00	6.80	6.80	0	0.00	0	circ	diameter=	12			0.7854	7.00	7.00	0	0	0
STORM U-8C																							
NEW	U-8C		y		12.90	7.90	7.90	4.00	4.00	0.20	29.22	0.0068	circ	diameter=	12			0.7854	8.90	8.90	3.2541	2.9274	8.9793
NEW	U-8A3			y	12.90	7.70	7.70	4.20	4.20	0	0.00	0	circ	diameter=	12			0.7854	8.70	8.70	0	0	0
STORM U-8D																							
NEW	U-8D1		y		11.00	6.00	6.00	4.00	4.00	2.00	188.78	0.0106	circ	diameter=	12			0.7854	7.00	7.00	4.0485	3.6421	46.6292
NEW	U-8D				12.10	4.00	4.00	7.10	7.10	1.00	20.91	0.0478	circ	diameter=	12			0.7854	5.00	5.00	8.6017	7.7382	2.4309
NEW	U-8			y	12.30	3.00	0.10	4.80	7.70	0	38.25	0	circ	diameter=	54			15.9043	7.50	4.60	0	0	0
STORM U-8E																							
NEW	U-8E		y		12.90	7.00	7.00	4.90	4.90	1.00	25.63	0.0390	circ	diameter=	12			0.7854	8.00	8.00	7.7694	6.9894	3.2988
NEW	U-8D			y	12.10	6.00	4.00	5.10	7.10	0	0.00	0	circ	diameter=	12			0.7854	7.00	5.00	0	0	0
STORM U-5A																							
NEW	U-5A		y		14.00	6.00	6.00	7.00	7.00	1.00	12.58	0.0795	circ	diameter=	12			0.7854	7.00	7.00	11.0897	9.9764	1.1344
	U-5			y	14.00	5.00	-1.08	4.00	10.08	0	0.00	0	circ	diameter=	60			19.6350	10.00	3.92	0	0	0
STORM U-5B																							
NEW	U-5B		y		14.00	6.00	6.00	7.00	7.00	1.00	21.79	0.0459	circ	diameter=	12			0.7854	7.00	7.00	8.4262	7.5803	2.5860
	U-5			y	14.00	5.00	-1.08	4.00	10.08	0	0.00	0	circ	diameter=	60			19.6350	10.00	3.92	0	0	0
STORM U-3A																						0.0000	
NEW	U-3A		y		11.61	5.00	5.00	5.61	5.61	0.50	16.13	0.0310	circ	diameter=	12			0.7854	6.00	6.00	6.9251	6.2299	2.3292
	U-3			y	11.69	4.50	-1.60	2.19	8.29	0	0.00	0	circ	diameter=	60			19.6350	9.50	3.40	0	0	0
STORM U-3B																							
NEW	U-3B5		y		13.00	8.00	8.00	4.00	4.00	1.00	163.00	0.0061	circ	diameter=	12			0.7854	9.00	9.00	3.0808	2.7715	52.9079
NEW	U-3B4				14.00	7.00	7.00	5.75	5.75	1.00	157.23	0.0064	circ	diameter=	15			1.2272	8.25	8.25	3.6427	5.1203	43.1631
NEW	U-3B3				13.00	6.00	6.00	5.75	5.75	0.20	26.49	0.0076	circ	diameter=	15			1.2272	7.25	7.25	3.9688	5.5788	6.6745
NEW	U-3B2				13.00	5.80	5.80	5.70	5.70	0.60	98.83	0.0061	circ	diameter=	18			1.7671	7.30	7.30	4.0214	8.1397	24.5763
NEW	U-3B1				12.00	5.20	5.20	5.30	5.30	1.20	144.40	0.0083	circ	diameter=	18			1.7671	6.70	6.70	4.7049	9.5232	30.6915
NEW	U-3B				11.50	4.00	4.00	6.00	6.00	1.00	22.44	0.0446	circ	diameter=	18			1.7671	5.50	5.50	10.8951	22.0530	2.0596
	U-3			y	11.69	3.00	-1.60	3.69	8.29	0	0.00	0	circ	diameter=	60			19.6350	8.00	3.40	0	0	0
STORM V																							
NEW	V-6		y		12.90	8.40	8.40	3.50	3.50	0.25	34.85	0.0072	circ	diameter=	12			0.7854	9.40	9.40	3.3314	2.9970	10.4610
NEW	V-5				12.90	8.15	8.15	3.25	3.25	1.15	194.82	0.0059	circ	diameter=	18			1.7671	9.65	9.65	3.9653	8.0262	49.1314
NEW	V-4				13.10	7.00	7.00	4.60	4.60	0.10	14.52	0.0069	circ	diameter=	18			1.7671	8.50	8.50	4.2831	8.6695	3.3901
REPLACE	V-3				13.08	6.90	6.90	4.68	4.68	0.60	35.84	0.0167	circ	diameter=	18			1.7671	8.40	8.40	6.6778	13.5167	5.3670
REPLACE	V-2				13.32	6.30	6.30	5.02	5.02	1.30	41.70	0.0312	circ	diameter=	24			3.1416	8.30	8.30	11.0498	39.7620	3.7738
REPLACE	V-1				13.47	5.00	5.00	6.47	6.47	5.20	227.81	0.0228	circ	diameter=	24			3.1416	7.00	7.00	9.4551	34.0236	24.0939
	U-7			y	13.23	-0.20	-0.20	8.43	8.43	0	0.00	0	circ	diameter=	60			19.6350	4.80	4.80	0	0	0
STORM V-1A																							
NEW	V-1A		y		13.50	7.00	7.00	5.50	5.50	1.00	19.44	0.0514	circ	diameter=	12			0.7854	8.00	8.00	8.9210	8.0254	2.1791
REPLACE	V-1			y	13.47	6.00	6.00	5.97	5.97	0	0.00	0	circ	diameter=	18			1.7671	7.50	7.50	0	0	0
STORM W																							
REPLACE	W-1		y		12.66	7.50	7.50	4.16	4.16	0.60	23.21	0.0259	circ	diameter=	12			0.7854	8.50	8.50	6.3241	5.6892	3.6701

Line	Manhole #	New Pipe? Enter "y"	Up-stream? Enter "y"	Down-stream? Enter "y"	Rim Elev. (ft)	Upper Inv. Elev. (ft)	Lower Inv. Elev. (ft)	Between Manholes															
								Cover (ft) upper	Cover (ft) lower	Fall to next (ft)	Length to next (ft)	Slope to next (ft)	Shape enter	Dimensions downstream				Area (ft^2)	Inner Top Upper (ft)	Inner Top Lower (ft)	Velocity (ft/s)	Capacity (cfs)	Time in pipe (s)
REPLACE	V-3			y	13.08	6.90	6.90	5.18	5.18	0	0.00	0	circ	diameter=	12			0.7854	7.90	7.90	0	0	0
STORM X																							
NEW	X-5		y		14.00	9.00	9.00	4.00	4.00	0.20	26.98	0.0074	circ	diameter=	12			0.7854	10.00	10.00	3.3865	3.0466	7.9669
NEW	X-4				14.00	8.80	8.80	4.20	4.20	0.80	138.06	0.0058	circ	diameter=	12			0.7854	9.80	9.80	2.9941	2.6936	46.1101
NEW	X-3				13.80	8.00	8.00	4.30	4.30	1.20	194.25	0.0062	circ	diameter=	18			1.7671	9.50	9.50	4.0565	8.2109	47.8861
REPLACE	X-2				12.97	6.80	6.80	4.67	4.67	0.15	16.63	0.0090	circ	diameter=	18			1.7671	8.30	8.30	4.9016	9.9215	3.3927
REPLACE	X-1				13.34	6.65	6.65	5.19	5.19	0.35	37.38	0.0094	circ	diameter=	18			1.7671	8.15	8.15	4.9941	10.1086	7.4848
REPLACE	V-2			y	13.32	6.30	6.30	5.52	5.52	0	0.00	0	circ	diameter=	18			1.7671	7.80	7.80	0	0	0
STORM X-3A																							
NEW	X-3A		y		13.80	8.80	8.80	4.00	4.00	0.80	27.16	0.0295	circ	diameter=	12			0.7854	9.80	9.80	6.7506	6.0729	4.0234
NEW	X-3			y	13.80	8.00	8.00	4.80	4.80	0	0.00	0	circ	diameter=	12			0.7854	9.00	9.00	0	0	0
STORM Y																							
REPLACE	Y-1		y		13.06	7.00	7.00	5.06	5.06	1.00	21.94	0.0456	circ	diameter=	12			0.7854	8.00	8.00	8.3974	7.5543	2.6127
REPLACE	V-1			y	13.34	6.00	6.00	6.34	6.34	0	0.00	0	circ	diameter=	12			0.7854	7.00	7.00	0	0	0
STORM Z																							
REPLACE	Z-2		y		12.48	7.50	7.50	4.15	4.15	0.50	24.00	0.0208	circ	diameter=	10			0.5454	8.33	8.33	5.0245	3.1389	4.7766
REPLACE	Z-1				12.85	7.00	7.00	4.85	4.85	1.00	37.00	0.0270	circ	diameter=	12			0.7854	8.00	8.00	6.4664	5.8172	5.7219
	U-7			y	13.23	6.00	-0.20	2.23	8.43	0	113.64	0	circ	diameter=	60			19.6350	11.00	4.80	0	0	0

Storm Sewer Lines			New Pipe	First in Line	Area Values (sq ft)	Area Values (acres) (A)	Cum. Area (acres)	Runoff Coefficients (C)	Time in Area (min)	Cum. Time Pipe (min)	Time of Conc. (min)	Runoff val. (R) (in/hr)	Cum. Actual Storm Flow (cfs) (Based on Cum. Area)	Cum. Allowable Queens Storm Flow (Q = 0.5x4.8xA) (cfs)	Lines	Manhole	Cap Flow from Manhole (cfs)	Time from Manhole (s)	Time from Manhole (min)	Cum. Time from Manhole (min)
STORM A		A-9	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM A	A-9	2.87	24.55	0.41	0.00
STORM A	A-9	A-8	0	0	15,350.00	0.35	0.35	0.85	6	0.41	6.41	5.95	1.78	0.85	STORM A	A-8	30.03	40.98	0.68	0.41
STORM A	A-8	A-7	0	0	4,348.00	0.10	0.45	0.85	6	1.09	7.50	5.95	2.29	1.09	STORM A	A-7	51.52	86.46	1.44	1.09
STORM A	A-7	A-6	0	0	11,478.00	0.26	3.72	0.85	6	2.53	10.03	5.95	21.47	8.94	STORM A	A-6	62.55	36.24	0.60	2.53
STORM A	A-6	A-5A	0	0	5,711.00	0.13	6.85	0.85	6	3.14	13.17	5.95	37.25	16.43	STORM A	A-5A	51.94	42.21	0.70	3.14
STORM A	A-5A	A-5	0	0	5,411.00	0.12	7.34	0.85	6	3.84	17.01	5.95	39.73	17.61	STORM A	A-5	62.85	59.54	0.99	3.84
STORM A	A-5	A-4	0	0	16,740.00	0.38	12.46	0.85	6	4.83	21.85	5.95	71.61	29.90	STORM A	A-4	108.88	43.50	0.73	4.83
STORM A	A-4	A-3	0	0	16,897.00	0.39	14.91	0.85	6	5.56	27.40	5.95	83.99	35.78	STORM A	A-3	115.49	41.01	0.68	5.56
STORM A	A-3	A-2	0	0	17,249.00	0.40	18.24	0.85	6	6.24	33.65	5.95	103.88	43.79	STORM A	A-2	88.34	66.20	1.10	6.24
STORM A	A-2	A-1	0	0	17,427.00	0.40	20.16	0.85	6	7.35	40.99	5.95	116.27	48.39	STORM A	A-1	76.03	34.61	0.58	7.35
STORM A	A-1	A-1B	0	0	0.00	0.00	22.12	0.85	6	7.92	48.91	5.95	126.17	53.08	STORM A	A-1B	107.06	24.79	0.41	7.92
STORM A	A-1B	A-1A	0	0	0.00	0.00	22.12	0.85	6	8.33	57.25	5.95	126.17	53.08	STORM A	A-1A	0	0	0.00	8.33
STORM A-7A		A-7A6	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM A-7A	A-7A5	6.13	38.43	0.64	0.00
STORM A-7A	A-7A6	A-7A5	0	0	17,832.00	0.41	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM A-7A	A-7A5	6.13	38.43	0.64	0.00
STORM A-7A	A-7A5	A-7A4	0	0	27,695.00	0.64	0.64	0.85	6	0.64	6.00	5.95	3.22	1.53	STORM A-7A	A-7A4	10.27	4.08	0.07	0.64
STORM A-7A	A-7A4	A-7A3	0	0	17,308.00	0.40	1.99	0.85	6	0.71	6.64	5.95	10.08	4.79	STORM A-7A	A-7A3	12.47	28.22	0.47	0.71
STORM A-7A	A-7A3	A-7A2	0	0	16,267.00	0.37	2.37	0.85	6	1.18	7.35	5.95	11.97	5.68	STORM A-7A	A-7A2	16.37	22.89	0.38	1.18
STORM A-7A	A-7A2	A-7A1	0	0	10,904.00	0.25	2.70	0.85	6	1.56	8.53	5.95	13.67	6.48	STORM A-7A	A-7A1	19.47	3.71	0.06	1.56
STORM A-7A	A-7A1	A-7A	0	0	10,397.00	0.24	2.94	0.85	6	1.62	10.09	5.95	14.87	7.06	STORM A-7A	A-7A	17.27	14.16	0.24	1.62
STORM A-7A	A-7A	A-7	0	0	2,954.00	0.07	3.01	0.85	6	1.86	11.71	5.95	15.22	7.22	STORM A-7A	A-7	51.52	86.46	1.44	1.86
STORM A-7B		A-7B	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM A-7B	A-7B	4.80	4.59	0.08	0.00
STORM A-7B	A-7B	A-7A2	0	0	3,677.00	0.08	0.08	0.85	6	0.08	6.08	5.95	0.43	0.20	STORM A-7B	A-7A2	16.37	22.89	0.38	0.08
STORM A-7C		A-7C	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM A-7C	A-7C	4.95	57.28	0.95	0.00
STORM A-7C	A-7C	A-7A4	0	0	41,847.00	0.96	0.96	0.85	6	0.95	6.95	5.95	4.86	2.31	STORM A-7C	A-7A4	10.27	4.08	0.07	0.95
STORM A-NB		A-NB5	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM A-NB	A-NB5	5.22	8.16	0.14	0.00
STORM A-NB	A-NB5	A-NB4	0	0	27,424.00	0.63	0.63	0.85	6	0.14	6.14	5.95	3.18	1.51	STORM A-NB	A-NB4	7.36	4.35	0.07	0.14
STORM A-NB	A-NB4	A-NB3	0	0	11,315.00	0.26	0.89	0.85	6	0.21	6.21	5.95	4.50	2.13	STORM A-NB	A-NB3	5.44	53.95	0.90	0.21
STORM A-NB	A-NB3	A-NB2	0	0	3,179.00	0.07	0.96	0.85	6	1.11	7.11	5.95	4.87	2.31	STORM A-NB	A-NB2	7.83	36.27	0.60	1.11
STORM A-NB	A-NB2	A-NB1	0	0	20,488.00	0.47	1.43	0.85	6	1.71	7.71	5.95	7.25	3.44	STORM A-NB	A-NB1	15.52	4.96	0.08	1.71
STORM A-NB	A-NB1	A-1	0	0	22,824.00	0.52	1.96	0.85	6	1.79	7.79	5.95	9.90	4.70	STORM A-NB	A-1	76.03	34.61	0.58	1.79
STORM A-5B		A-5B	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM A-5B	A-5B	7.19	6.65	0.11	0.00
STORM A-5B	A-5B	A-5A	0	0	15,955.00	0.37	0.37	0.85	6	0.11	6.11	5.95	1.85	0.88	STORM A-5B	A-5A	51.94	42.21	0.70	0.11
STORM B		B-6	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM B	B-6	2.98	42.71	0.71	0.00
STORM B	B-6	B-5	0	0	10,425.00	0.24	0.24	0.85	6	0.71	6.71	5.95	1.21	0.57	STORM B	B-5	2.96	17.42	0.29	0.71
STORM B	B-5	B-4	0	0	5,377.00	0.12	0.36	0.85	6	1.00	7.71	5.95	1.83	0.87	STORM B	B-4	2.75	48.95	0.82	1.00
STORM B	B-4	B-3	0	0	5,047.00	0.12	0.48	0.85	6	1.82	9.53	5.95	2.42	1.15	STORM B	B-3	5.86	46.09	0.77	1.82
STORM B	B-3	B-2	0	0	19,179.00	0.44	0.92	0.85	6	2.59	12.12	5.95	4.65	2.21	STORM B	B-2	16.76	1.84	0.03	2.59
STORM B	B-2	B-1	0	0	26,106.00	0.60	1.52	0.85	6	2.62	14.74	5.95	7.68	3.64	STORM B	B-1	17.70	7.76	0.13	2.62
STORM B	B-1	A-2	0	0	0.00	0.00	1.52	0.85	6	2.75	17.48	5.95	7.68	3.64	STORM B	A-2	88.34	66.20	1.10	2.75
STORM C		C-3	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM C	C-3	2.75	48.81	0.81	0.00
STORM C	C-3	C-2	0	0	13,938.00	0.32	0.32	0.85	6	0.81	6.81	5.95	1.62	0.77	STORM C	C-2	4.40	61.34	1.02	0.81
STORM C	C-2	C-1	0	0	18,433.00	0.42	0.74	0.85	6	1.84	8.65	5.95	3.76	1.78	STORM C	C-1	15.26	2.12	0.04	1.84
STORM B	C-1	B-2	0	0	25,886.00	0.59	1.34	0.85	6	1.87	10.52	5.95	6.76	3.21	STORM B	B-2	16.76	1.84	0.03	1.87
STORM D		D-5A	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM D	D-5A	4.41	3.28	0.05	0.00
STORM D	D-5A	D-5	0	0	13,404.00	0.31	0.31	0.85	6	0.05	6.05	5.95	1.56	0.74	STORM D	D-5	4.39	37.74	0.63	0.05
STORM D	D-5	D-4	0	0	14,136.00	0.32	0.63	0.85	6	0.68	6.74	5.95	3.20	1.52	STORM D	D-4	8.09	50.04	0.83	0.68

Storm Sewer Lines			New Pipe	First in Line	Area Values (sq ft)	Area Values (acres) (A)	Cum. Area (acres)	Runoff Coefficients (C)	Time in Area (min)	Cum. Time Pipe (min)	Time of Conc. (min)	Runoff val. (R) (in/hr)	Cum. Actual Storm Flow (cfs) (Based on Cum. Area)	Cum. Allowable Queens Storm Flow (Q = 0.5x4.8xA) (cfs)	Lines	Manhole	Cap Flow from Manhole (cfs)	Time from Manhole (s)	Time from Manhole (min)	Cum. Time from Manhole (min)
STORM D	D-4	D-3	0	0	8,141.00	0.19	1.00	0.85	6	1.52	8.26	5.95	5.05	2.40	STORM D	D-3	17.77	22.75	0.38	1.52
STORM D	D-3	D-2	0	0	26,283.00	0.60	2.19	0.85	6	1.90	10.15	5.95	11.10	5.27	STORM D	D-2	20.82	4.04	0.07	1.90
STORM D	D-2	D-1	0	0	16,215.00	0.37	2.57	0.85	6	1.96	12.12	5.95	12.98	6.16	STORM D	D-1	56.69	3.41	0.06	1.96
STORM D	D-1	A-3	0	0	0.00	0.00	2.94	0.85	6	2.02	14.14	5.95	14.87	7.06	STORM D	A-3	115.49	41.01	0.68	2.02
STORM D-A		D-4A	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM D	D-4A	3.80	4.10	0.07	0.00
STORM D-A	D-4A	D-4	0	0	7,814.00	0.18	0.18	0.85	6	0.07	6.07	5.95	0.91	0.43	STORM D	D-4	8.09	50.04	0.83	0.07
STORM D-A		D-3A	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM D	D-3A	3.62	4.74	0.08	0.00
STORM D-A	D-3A	D-3	0	0	25,790.00	0.59	0.59	0.85	6	0.08	6.08	5.95	2.99	1.42	STORM D	D-3	17.77	22.75	0.38	0.08
STORM E		E-1	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM E	E-1	5.59	3.86	0.06	0.00
STORM E	E-1	D-1	0	0	16,281.00	0.37	0.37	0.85	6	0.06	6.06	5.95	1.89	0.90	STORM E	D-1	56.69	3.41	0.06	0.06
STORM F		F-4A	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM F	F-4A	3.47	5.41	0.09	0.00
STORM F	F-4A	F-4	0	0	9,339.00	0.21	0.21	0.85	6	0.09	6.09	5.95	1.08	0.51	STORM F	F-4	2.83	34.65	0.58	0.09
STORM F	F-4	F-3	0	0	9,664.00	0.22	0.44	0.85	6	0.67	6.67	5.95	2.21	1.05	STORM F	F-3	5.18	54.27	0.90	0.67
STORM F	F-3	F-2	0	0	8,712.00	0.20	0.84	0.85	6	1.57	7.57	5.95	4.23	2.01	STORM F	F-2	9.83	4.65	0.08	1.57
STORM F	F-2	F-1	0	0	26,685.00	0.61	1.45	0.85	6	1.65	7.65	5.95	7.33	3.48	STORM F	F-1	22.93	5.95	0.10	1.65
STORM F	F-1	A-4	0	0	0.00	0.00	2.06	0.85	6	1.75	7.75	5.95	10.42	4.94	STORM F	A-4	108.88	43.50	0.73	1.75
STORM F-A		F-3A	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM D	D-3A	3.62	4.74	0.08	0.00
STORM F-A	F-3A	F-3	0	0	8,734.00	0.20	0.20	0.85	6	0.08	6.08	5.95	1.01	0.48	STORM D	D-3	17.77	22.75	0.38	0.08
STORM G		G-1	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM G	G-1	7.04	6.32	0.11	0.00
STORM G	G-1	F-1	0	0	26,593.00	0.61	0.61	0.85	6	0.11	6.11	4.98	2.59	1.47	STORM G	F-1	22.93	5.95	0.10	0.11
STORM H		H-4A	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM H	H-4A	3.21	6.84	0.11	0.00
STORM H	H-4A	H-4	0	0	12,285.00	0.28	0.28	0.85	6	0.11	6.11	5.95	1.43	0.68	STORM H	H-4	4.99	46.73	0.78	0.11
STORM H	H-4	H-3	0	0	12,368.00	0.28	0.57	0.85	6	0.89	7.01	5.95	2.86	1.36	STORM H	H-3	8.05	46.55	0.78	0.89
STORM H	H-3	H-2	0	0	13,491.00	0.31	1.18	0.85	6	1.67	8.68	5.95	5.98	2.84	STORM H	H-2	12.12	3.72	0.06	1.67
STORM H	H-2	H-1	0	0	25,253.00	0.58	1.76	0.85	6	1.73	10.41	5.95	8.92	4.23	STORM H	H-1	17.82	7.62	0.13	1.73
STORM H	H-1	A-5	0	0	0.00	0.00	4.74	0.85	6	1.86	12.26	5.95	23.97	11.38	STORM H	A-5	62.85	59.54	0.99	1.86
STORM H-A		H-3A	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM D	H-3A	3.35	6.01	0.10	0.00
STORM H-A	H-3A	H-3	0	0	13,397.00	0.31	0.31	0.85	6	0.10	6.10	5.95	1.56	0.74	STORM D	H-3	8.05	46.55	0.78	0.10
STORM I		I-1	0	y	0.00	0.00	2.45	0.85	6	0.00	6.00	5.95	12.41	5.89	STORM I	I-1	12.99	1.59	0.03	0.00
STORM I	I-1	H-1	0	0	22,780.00	0.52	2.98	0.85	6	0.03	6.03	5.95	15.06	7.15	STORM I	H-1	17.82	7.62	0.13	0.03
STORM J		J-7	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM J	J-7	2.73	19.28	0.32	0.00
STORM J	J-7	J-6	0	0	21,124.00	0.48	0.48	0.85	6	0.00	6.00	5.95	2.45	1.16	STORM J	J-6	5.64	4.84	0.08	0.00
STORM J	J-6	J-5	0	0	8,181.00	0.19	0.67	0.85	6	0.00	6.00	5.95	3.40	1.61	STORM J	J-5	8.42	44.33	0.74	0.00
STORM J	J-5	J-4	0	0	19,661.00	0.45	1.12	0.85	6	0.00	6.00	5.95	5.69	2.70	STORM J	J-4	8.32	15.33	0.26	0.00
STORM J	J-4	J-3	0	0	10,582.00	0.24	1.57	0.85	6	0.26	6.26	5.95	7.95	3.77	STORM J	J-3	14.91	38.51	0.64	0.26
STORM J	J-3	J-2	0	0	13,579.00	0.31	2.19	0.85	6	0.90	7.15	5.95	11.10	5.27	STORM J	J-2	27.24	4.64	0.08	0.90
STORM J	J-2	J-1	0	0	11,346.00	0.26	2.45	0.85	6	0.97	8.13	5.95	12.41	5.89	STORM J	J-1	24.92	12.13	0.20	0.97
STORM J	J-1	A-6	0	0	0.00	0.00	2.99	0.85	6	1.18	9.30	5.95	15.12	7.18	STORM J	A-6	62.55	36.24	0.60	1.18
STORM J-4A		J-4A	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM J-4A	J-4A	4.34	4.13	0.07	0.00
STORM J-4A	J-4A	J-4	0	0	8,883.00	0.20	0.20	0.85	6	0.07	6.00	5.95	1.03	0.49	STORM J-4A	J-4	8.32	15.33	0.26	0.07
STORM J-3A		J-3A	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM J-3A	J-3A	5.00	3.61	0.06	0.00
STORM J-3A	J-3A	J-3	0	0	13,551.00	0.31	0.31	0.85	6	0.06	6.00	5.95	1.57	0.75	STORM J-3A	J-3	14.91	38.51	0.64	0.06

Storm Sewer Lines			New Pipe	First in Line	Area Values (sq ft)	Area Values (acres) (A)	Cum. Area (acres)	Runoff Coefficients (C)	Time in Area (min)	Cum. Time Pipe (min)	Time of Conc. (min)	Runoff val. (R) (in/hr)	Cum. Actual Storm Flow (cfs) (Based on Cum. Area)	Cum. Allowable Queens Storm Flow (Q = 0.5x4.8xA) (cfs)	Lines	Manhole	Cap Flow from Manhole (cfs)	Time from Manhole (s)	Time from Manhole (min)	Cum. Time from Manhole (min)
STORM K		K-1	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM K	K-1	12.85	1.54	0.03	0.00
STORM K	K-1	J-1	0	0	9,393.00	0.22	0.22	0.85	6	0.03	6.00	5.95	1.09	0.52	STORM K	J-1	24.92	12.13	0.20	0.03
STORM L		L-1	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM L	L-1	3.37	8.80	0.15	0.00
STORM L	L-1	J-1	0	0	13,941.00	0.32	0.32	0.85	6	0.15	6.00	5.95	1.62	0.77	STORM L	J-1	24.92	12.13	0.20	0.15
STORM M		M-3	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM M	M-3	17.49	23.86	0.40	0.00
STORM M	M-3	M-2	0	0	0.00	0.00	1.93	0.85	6	0.40	6.00	5.95	9.77	4.64	STORM M	M-2	14.15	57.99	0.97	0.40
STORM M	M-2	M-1	0	0	0.00	0.00	1.93	0.85	6	1.36	6.40	5.95	9.77	4.64	STORM M	M-1	0	0	0.00	1.36
STORM M		M-1A	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM M-1A	M-1A	4.33	4.15	0.07	0.00
STORM M	M-1A	M-1	0	0	18,526.00	0.43	0.43	0.85	6	0.07	6.00	5.95	2.15	1.02	STORM M-1A	M-1	0	0	0.00	0.07
STORM M		M-3A2	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM M-3A	M-3A2	3.28	9.61	0.16	0.00
STORM M	M-3A2	M-3A1	0	0	4,577.00	0.11	0.11	0.85	6	0.16	6.00	5.95	0.53	0.25	STORM M-3A	M-3A1	3.20	51.38	0.86	0.16
STORM M	M-3A1	M-3A	0	0	5,867.00	0.13	0.24	0.85	6	1.02	6.16	5.95	1.21	0.58	STORM M-3A	M-3A	8.56	6.48	0.11	1.02
STORM M	M-3A	M-3	0	y	23,504.00	0.54	0.98	0.85	6	1.12	7.18	5.95	4.95	2.35	STORM M-3A	M-3	17.49	23.86	0.40	1.12
STORM M		M-3B	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM M-3B	M-3B	5.83	9.09	0.15	0.00
STORM M	M-3B	M-3	0	y	8,716.00	0.20	0.20	0.85	6	0.15	6.00	5.95	1.01	0.48	STORM M-3B	M-3	17.49	23.86	0.40	0.15
STORM N		N-1	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM N	N-1	6.10	5.46	0.09	0.00
STORM N	N-1	M-3	0	y	5,628.00	0.13	0.13	0.85	6	0.09	6.09	5.95	0.65	0.31	STORM N	M-3	17.49	23.86	0.40	0.09
STORM O		O-2	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM 0	O-2	3.38	49.48	0.82	0.00
STORM O	O-2	O-1	0	0	25,143.00	0.58	0.58	0.85	6	0.82	6.82	5.95	2.92	1.39	STORM 0	O-1	4.57	4.73	0.08	0.82
STORM O	O-1	M-3	0	y	10,740.00	0.25	0.82	0.85	6	0.90	6.90	5.95	4.17	1.98	STORM 0	M-3	17.49	23.86	0.40	0.90
STORM P		P-7	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM P	P-7	6.13	28.71	0.48	0.00
STORM P	P-7	P-6	0	0	0.00	0.00	0.77	0.85	6	0.48	6.48	5.95	3.89	1.85	STORM P	P-6	5.29	29.85	0.50	0.48
STORM P	P-6	P-5	0	0	0.00	0.00	0.77	0.85	6	0.98	6.98	5.95	3.89	1.85	STORM P	P-5	16.88	18.97	0.32	0.98
STORM P	P-5	P-4	0	0	0.00	0.00	1.62	0.85	6	1.29	7.29	5.95	8.20	3.89	STORM P	P-4	18.29	17.91	0.30	1.29
STORM P	P-4	P-3	0	0	0.00	0.00	1.62	0.85	6	1.59	7.59	5.95	8.20	3.89	STORM P	P-3	17.57	23.55	0.39	1.59
STORM P	P-3	P-2	0	0	0.00	0.00	2.75	0.85	6	1.98	7.98	5.95	13.92	6.61	STORM P	P-2	22.71	18.70	0.31	1.98
STORM P	P-2	P-1	0	0	0.00	0.00	3.77	0.85	6	2.29	8.29	5.95	19.05	9.04	STORM P	P-1	19.75	21.32	0.36	2.29
STORM P	P-1	M-1	0	0	0.00	0.00	3.77	0.85	6	2.65	8.65	5.95	19.05	9.04	STORM P	M-1	0	0	0.00	2.65
STORM P-5A		P-5A	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM P-5A	P-5A	4.03	1.72	0.03	0.00
STORM P-5A	P-5A	P-5	0	0	24,965.00	0.57	0.57	0.85	6	0.03	6.03	5.95	2.90	1.38	STORM P-5A	P-5	16.88	18.97	0.32	0.03
STORM P-5B		P-5B	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM P-5B	P-5B	2.70	5.70	0.10	0.00
STORM P-5B	P-5B	P-5	0	0	12,114.00	0.28	0.28	0.85	6	0.10	6.10	5.95	1.41	0.67	STORM P-5B	P-5	16.88	18.97	0.32	0.10
STORM P-2A		P-2A	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM P-2A	P-2A	5.97	2.11	0.04	0.00
STORM P-2A	P-2A	P-2	0	0	33,321.00	0.76	0.76	0.85	6	0.04	6.04	5.95	3.87	1.84	STORM P-2A	P-2	22.71	18.70	0.31	0.04
STORM P-2B		P-2B	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM P-2B	P-2B	5.70	2.43	0.04	0.00
STORM P-2B	P-2B	P-2	0	0	10,889.00	0.25	0.25	0.85	6	0.04	6.04	5.95	1.26	0.60	STORM P-2B	P-2	22.71	18.70	0.31	0.04
STORM Q		Q-1	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM Q	Q-1	3.28	6.36	0.11	0.00
STORM Q	Q-1	P-7	0	y	9,886.00	0.23	0.23	0.85	6	0.11	6.11	5.95	1.15	0.54	STORM Q	P-7	6.13	28.71	0.48	0.11
STORM R		R-1	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM R	R-1	4.92	4.73	0.08	0.00
STORM R	R-1	P-7	0	y	23,651.00	0.54	0.54	0.85	6	0.08	6.08	5.95	2.75	1.30	STORM R	P-7	6.13	28.71	0.48	0.08

Storm Sewer Lines			New Pipe	First in Line	Area Values (sq ft)	Area Values (acres) (A)	Cum. Area (acres)	Runoff Coefficients (C)	Time in Area (min)	Cum. Time Pipe (min)	Time of Conc. (min)	Runoff val. (R) (in/hr)	Cum. Actual Storm Flow (cfs) (Based on Cum. Area)	Cum. Allowable Queens Storm Flow (Q = 0.5x4.8xA) (cfs)	Lines	Manhole	Cap Flow from Manhole (cfs)	Time from Manhole (s)	Time from Manhole (min)	Cum. Time from Manhole (min)
STORM S		S-2	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM S	S-2	2.46	9.89	0.16	0.00
STORM S	S-2	S-1	0	0	18,717.00	0.43	0.43	0.85	6	0.16	6.16	5.95	2.17	1.03	STORM S	S-1	4.36	6.82	0.11	0.16
STORM S	S-1	P-3	0	0	13,679.00	0.31	0.74	0.85	6	0.28	6.28	5.95	3.76	1.78	STORM S	P-3	17.57	23.55	0.39	0.28
STORM T		T-1	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM T	T-1	3.78	8.32	0.14	0.00
STORM T	T-1	P-3	0	0	16,878.00	0.39	0.39	0.85	6	0.14	6.14	5.95	1.96	0.93	STORM T	P-3	17.57	23.55	0.39	0.14
STORM U		M-1	0	0	0.00	0.00	0.00	0.85	6	6.83	12.83	5.95	0.00	0.00	STORM U	M-1	0	0	0.00	6.83
STORM U	M-1	U-12	0	0	0.00	0.00	6.12	0.85	6	7.03	13.03	5.95	30.98	14.70	STORM U	U-12	77.17	12.07	0.20	7.03
STORM U	U-12	U-11	0	0	0.00	0.00	7.19	0.85	6	7.23	13.23	5.95	36.38	17.27	STORM U	U-11	53.30	65.94	1.10	7.23
STORM U	U-11	U-10	0	0	0.00	0.00	7.55	0.85	6	8.33	14.33	5.95	38.20	18.13	STORM U	U-10	68.55	6.89	0.11	8.33
STORM U	U-10	U-9	0	0	0.00	0.00	9.01	0.85	6	8.45	14.45	5.95	45.57	21.63	STORM U	U-9	117.45	34.66	0.58	8.45
STORM U	U-9	U-8	0	0	0.00	0.00	17.23	0.85	6	9.03	15.03	5.95	87.12	41.34	STORM U	U-8	173.83	4.01	0.07	9.03
STORM U	U-8	U-7	0	0	0.00	0.00	19.99	0.85	6	9.09	15.09	5.95	101.08	47.97	STORM U	U-7	198.18	12.90	0.21	9.09
STORM U	U-7	U-6	0	0	0.00	0.00	24.22	0.85	6	9.09	15.09	5.95	122.51	58.14	STORM U	U-6	111.85	23.91	0.40	9.09
STORM U	U-6	U-5	0	0	0.00	0.00	24.22	0.85	6	9.09	15.09	5.95	122.51	58.14	STORM U	U-5	100.05	25.82	0.43	9.09
STORM U	U-5	U-4	0	0	0.00	0.00	24.64	0.85	6	9.31	15.31	5.95	124.64	59.15	STORM U	U-4	141.39	18.84	0.31	9.31
STORM U	U-4	U-3	0	0	0.00	0.00	24.64	0.85	6	9.31	15.31	5.95	124.64	59.15	STORM U	U-3	108.54	23.79	0.40	9.31
STORM U	U-3	U-2	0	0	0.00	0.00	27.16	0.85	6	9.49	15.49	5.95	137.37	65.19	STORM U	U-2	82.24	54.70	0.91	9.49
STORM U	U-2	U-1	0	0	0.00	0.00	27.16	0.85	6	9.52	15.52	5.95	137.37	65.19	STORM U	U-1	0	0	0.00	9.52
STORM U-12A		U-12A2	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM U-12A	U-12A2	3.15	46.75	0.78	0.00
STORM U-12A	U-12A2	U-12A1	0	0	7,286.00	0.17	0.17	0.85	6	0.00	6.00	5.95	0.85	0.40	STORM U-12A	U-12A1	3.83	20.04	0.33	0.00
STORM U-12A	U-12A1	U-12A	0	0	14,807.00	0.34	0.51	0.85	6	0.00	6.00	5.95	2.57	1.22	STORM U-12A	U-12A	8.29	2.96	0.05	0.00
STORM U-12A	U-12A	U-12	0	0	14,223.00	0.33	0.83	0.85	6	0.05	6.05	5.95	4.22	2.00	STORM U-12A	U-12	77.17	12.07	0.20	0.05
STORM U-12B		U-12B	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM U-12B	U-12B	4.56	5.93	0.10	0.00
STORM U-12B	U-12B	U-12	0	0	10,252.00	0.24	0.24	0.85	6	0.10	6.10	5.95	1.19	0.56	STORM U-12B	U-12	77.17	12.07	0.20	0.10
STORM U-11A		U-11A	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM U-11A	U-11A	6.79	3.59	0.06	0.00
STORM U-11A	U-11A	U-11	0	0	15,650.00	0.36	0.36	0.85	6	0.06	6.06	5.95	1.82	0.86	STORM U-11A	U-11	53.30	65.94	1.10	0.06
STORM U-10A		U-10A1	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM U-10A1	U-10A1	5.17	32.57	0.54	0.00
STORM U-10A	U-10A1	U-10A	0	0	15,102.00	0.35	0.35	0.85	6	0.54	6.54	5.95	1.75	0.83	STORM U-10A	U-10A	8.94	3.00	0.05	0.54
STORM U-10A	U-10A	U-10	0	0	24,144.00	0.55	0.90	0.85	6	0.59	7.14	5.95	4.56	2.16	STORM U-10	U-10	68.55	6.89	0.11	0.59
STORM U-10B		U-10B	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM U-10B	U-10B	8.30	2.95	0.05	0.00
STORM U-10B	U-10B	U-10	0	0	24,259.00	0.56	0.56	0.85	6	0.05	6.05	5.95	2.82	1.34	STORM U-10B	U-10	68.55	6.89	0.11	0.05
STORM U-9A		U-9A2	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM U-9A	U-9A2	2.90	4.60	0.08	0.00
STORM U-9A	U-9A2	U-9A1	0	0	6,505.00	0.15	0.15	0.85	6	0.08	6.08	5.95	0.76	0.36	STORM U-9A	U-9A1	4.62	22.84	0.38	0.08
STORM U-9A	U-9A1	U-9A	0	0	6,955.00	0.16	0.31	0.85	6	0.46	6.53	5.95	1.56	0.74	STORM U-9A	U-9A	9.33	4.30	0.07	0.46
STORM U-9A	U-9A	U-9	0	0	13,811.00	0.32	1.14	0.85	6	0.53	7.06	5.95	5.77	2.74	STORM U-9A	U-9	117.45	34.66	0.58	0.53
STORM U-9B		U-9B	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM U-9B	U-9B	3.77	10.51	0.18	0.00
STORM U-9B	U-9B	U-9A	0	0	11,600.00	0.27	0.27	0.85	6	0.18	6.18	5.95	1.35	0.64	STORM U-9B	U-9A	9.33	4.30	0.07	0.18
STORM U-9C		U-9C	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM U-9C	U-9C	5.98	2.63	0.04	0.00
STORM U-9C	U-9C	U-9A	0	0	10,851.00	0.25	0.25	0.85	6	0.04	6.04	5.95	1.26	0.60	STORM U-9C	U-9A	9.33	4.30	0.07	0.04
STORM U-9D		U-9D9	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM U-9D	U-9D9	5.35	3.68	0.06	0.00
STORM U-9D	U-9D9	U-9D8	0	0	12,606.00	0.29	0.29	0.85	6	0.06	6.06	5.95	1.46	0.69	STORM U-9D	U-9D8	9.84	16.24	0.27	0.06

Storm Sewer Lines			New Pipe	First in Line	Area Values (sq ft)	Area Values (acres) (A)	Cum. Area (acres)	Runoff Coefficients (C)	Time in Area (min)	Cum. Time Pipe (min)	Time of Conc. (min)	Runoff val. (R) (in/hr)	Cum. Actual Storm Flow (cfs) (Based on Cum. Area)	Cum. Allowable Queens Storm Flow (Q = 0.5x4.8xA) (cfs)	Lines	Manhole	Cap Flow from Manhole (cfs)	Time from Manhole (s)	Time from Manhole (min)	Cum. Time from Manhole (min)
STORM U-9D	U-9D8	U-9D7	0	0	12,186.00	0.28	0.57	0.85	6	0.33	6.39	5.95	2.88	1.37	STORM U-9D	U-9D7	16.70	43.11	0.72	0.33
STORM U-9D	U-9D7	U-9D6	0	0	29,438.00	0.68	1.64	0.85	6	1.05	7.44	5.95	8.29	3.93	STORM U-9D	U-9D6	10.98	13.80	0.23	1.05
STORM U-9D	U-9D6	U-9D5	0	0	14,931.00	0.34	1.98	0.85	6	0.00	6.00	5.95	10.02	4.75	STORM U-9D	U-9D5	12.21	15.03	0.25	0.00
STORM U-9D	U-9D5	U-9D4	0	0	11,424.00	0.26	2.24	0.85	6	0.25	6.25	5.95	11.35	5.38	STORM U-9D	U-9D4	17.92	17.43	0.29	0.25
STORM U-9D	U-9D4	U-9D3	0	0	0.00	0.00	3.36	0.85	6	0.54	6.79	5.95	16.97	8.05	STORM U-9D	U-9D3	24.13	33.41	0.56	0.54
STORM U-9D	U-9D3	U-9D2	0	0	19,598.00	0.45	4.29	0.85	6	1.10	7.89	5.95	21.72	10.31	STORM U-9D	U-9D2	44.60	4.23	0.07	1.10
STORM U-9D	U-9D2	U-9D1	0	0	18,418.00	0.42	4.72	0.85	6	1.17	9.06	5.95	23.86	11.32	STORM U-9D	U-9D1	43.30	37.48	0.62	1.17
STORM U-9D	U-9D1	U-9D	0	0	26,623.00	0.61	6.75	0.85	6	1.79	10.85	5.95	34.16	16.21	STORM U-9D	U-9D	45.60	9.44	0.16	1.79
STORM U-9D	U-9D	U-9	0	0	6,736.00	0.15	7.07	0.85	6	1.95	12.80	5.95	35.77	16.98	STORM U-9D	U-9	117.45	34.66	0.58	1.95
STORM U-9E		U-9E	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM U-9E	U-9E	7.11	2.82	0.05	0.00
STORM U-9E	U-9E	U-9D3	0	0	21,294.00	0.49	0.49	0.85	6	0.05	6.05	5.95	2.47	1.17	STORM U-9E	U-9D3	24.13	33.41	0.56	0.05
STORM U-9F		U-9F	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM U-9F	U-9F	5.20	4.40	0.07	0.00
STORM U-9F	U-9F	U-9D1	0	0	19,451.00	0.45	0.45	0.85	6	0.07	6.07	5.95	2.26	1.07	STORM U-9F	U-9D1	43.30	37.48	0.62	0.07
STORM U-9G		U-9G	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM U-9G	U-9G	7.57	2.60	0.04	0.00
STORM U-9G	U-9G	U-9D	0	0	7,152.00	0.16	0.16	0.85	6	0.04	6.04	5.95	0.83	0.39	STORM U-9G	U-9D	45.60	9.44	0.16	0.04
STORM U-9H		U-9H2	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM U-9H	U-9H2	3.04	6.00	0.10	0.00
STORM U-9H	U-9H2	U-9H1	0	0	9,511.00	0.22	0.22	0.85	6	0.10	6.10	5.95	1.10	0.52	STORM U-9H	U-9H1	3.57	33.54	0.56	0.10
STORM U-9H	U-9H1	U-9H	0	0	9,789.00	0.22	0.44	0.85	6	0.66	6.76	5.95	2.24	1.06	STORM U-9H	U-9H	11.97	32.88	0.55	0.66
STORM U-9H	U-9H	U-9D1	0	0	11,986.00	0.28	0.98	0.85	6	1.21	7.97	5.95	4.95	2.35	STORM U-9H	U-9D1	43.30	37.48	0.62	1.21
STORM U-9I		U-9I	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM U-9I	U-9I	5.67	3.09	0.05	0.00
STORM U-9I	U-9I	U-9H	0	0	11,366.00	0.26	0.26	0.85	6	0.05	6.05	5.95	1.32	0.63	STORM U-9I	U-9H	11.97	32.88	0.55	0.05
STORM U-9J		U-9J2	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM U-9J	U-9J2	3.67	5.69	0.09	0.00
STORM U-9J	U-9J2	U-9J1	0	0	8,281.00	0.19	0.19	0.85	6	0.09	6.09	5.95	0.96	0.46	STORM U-9J	U-9J1	3.94	36.82	0.61	0.09
STORM U-9J	U-9J1	U-9J	0	0	8,304.00	0.19	0.38	0.85	6	0.71	6.80	5.95	1.93	0.91	STORM U-9J	U-9J	7.73	26.30	0.44	0.71
STORM U-9J	U-9J	U-9D4	0	0	17,629.00	0.40	1.11	0.85	6	1.15	7.95	5.95	5.63	2.67	STORM U-9J	U-9D4	17.92	17.43	0.29	1.15
STORM U-9K		U-9K	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM U-9K	U-9K	2.53	6.96	0.12	0.00
STORM U-9K	U-9K	U-9J	0	0	14,249.00	0.33	0.33	0.85	6	0.12	6.12	5.95	1.65	0.79	STORM U-9K	U-9J	7.73	26.30	0.44	0.12
STORM U-9L		U-9L	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM U-9L	U-9L	5.05	4.37	0.07	0.00
STORM U-9L	U-9L	U-9D7	0	0	17,141.00	0.39	0.39	0.85	6	0.07	6.07	5.95	1.99	0.94	STORM U-9L	U-9D7	16.70	43.11	0.72	0.07
STORM U-8A		U-8A5	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM U-8A	U-8A5	2.96	39.05	0.65	0.00
STORM U-8A	U-8A5	U-8A4	0	0	10,169.00	0.23	0.23	0.85	6	0.65	6.65	5.95	1.18	0.56	STORM U-8A	U-8A4	2.98	8.51	0.14	0.65
STORM U-8A	U-8A4	U-8A3	0	0	6,829.00	0.16	0.39	0.85	6	0.79	7.44	5.95	1.97	0.94	STORM U-8A	U-8A3	3.26	55.09	0.92	0.79
STORM U-8A	U-8A3	U-8A2	0	0	2,782.00	0.06	0.59	0.85	6	1.71	9.15	5.95	2.96	1.40	STORM U-8A	U-8A2	17.83	3.90	0.06	1.71
STORM U-8A	U-8A2	U-8A1	0	0	15,474.00	0.36	1.42	0.85	6	1.78	10.93	5.95	7.18	3.41	STORM U-8A	U-8A1	19.13	3.16	0.05	1.78
STORM U-8A	U-8A1	U-8A	0	0	16,880.00	0.39	1.81	0.85	6	1.83	12.76	5.95	9.14	4.34	STORM U-8A	U-8A	21.55	2.21	0.04	1.83
STORM U-8A	U-8A	U-8	0	0	3,268.00	0.08	1.88	0.85	6	1.87	14.62	5.95	9.52	4.52	STORM U-8A	U-8	173.83	4.01	0.07	1.87
STORM U-8B		U-8B	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM U-8B	U-8B	4.53	6.06	0.10	0.00
STORM U-8B	U-8B	U-8A2	0	0	20,859.00	0.48	0.48	0.85	6	0.10	6.10	5.95	2.42	1.15	STORM U-8B	U-8A2	17.83	3.90	0.06	0.10
STORM U-8C		U-8C	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM U-8C	U-8C	2.93	8.98	0.15	0.00
STORM U-8C	U-8C	U-8A3	0	0	5,712.00	0.13	0.13	0.85	6	0.15	6.15	5.95	0.66	0.31	STORM U-8C	U-8A3	3.26	55.09	0.92	0.15
STORM U-8D		U-8D1	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM U-8D	U-8D1	3.64	46.63	0.78	0.00
STORM U-8D	U-8D1	U-8D	0	0	16,401.00	0.38	0.38	0.85	6	0.78	6.78	5.95	1.90	0.90	STORM U-8D	U-8D	7.74	2.43	0.04	0.78

Storm Sewer Lines			New Pipe	First in Line	Area Values (sq ft)	Area Values (acres) (A)	Cum. Area (acres)	Runoff Coefficients (C)	Time in Area (min)	Cum. Time Pipe (min)	Time of Conc. (min)	Runoff val. (R) (in/hr)	Cum. Actual Storm Flow (cfs) (Based on Cum. Area)	Cum. Allowable Queens Storm Flow (Q = 0.5x4.8xA) (cfs)	Lines	Manhole	Cap Flow from Manhole (cfs)	Time from Manhole (s)	Time from Manhole (min)	Cum. Time from Manhole (min)
STORM U-8D	U-8D	U-8	0	0	2,970.00	0.07	0.88	0.85	6	0.82	7.59	5.95	4.44	2.11	STORM U-8D	U-8	173.83	4.01	0.07	0.82
STORM U-8B		U-8E	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM U-8B	U-8B	4.53	6.06	0.10	0.00
STORM U-8B	U-8E	U-8D	0	0	18,873.00	0.43	0.43	0.85	6	0.10	6.10	5.95	2.19	1.04	STORM U-8B	U-8A2	17.83	3.90	0.06	0.10
STORM U-5A		U-5A	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM U-5A	U-5A	9.98	1.13	0.02	0.00
STORM U-5A	U-5A	U-5	0	0	10,131.00	0.23	0.23	0.85	6	0.02	6.02	5.95	1.18	0.56	STORM U-5A	U-5	100.05	25.82	0.43	0.02
STORM U-5B		U-5B	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM U-5B	U-5B	7.58	2.59	0.04	0.00
STORM U-5B	U-5B	U-5	0	0	8,154.00	0.19	0.19	0.85	6	0.04	6.04	5.95	0.95	0.45	STORM U-5B	U-5	100.05	25.82	0.43	0.04
STORM U-3A		U-3A	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM U-3A	U-3A	6.23	2.33	0.04	0.00
STORM U-3A	U-3A	U-3	0	0	25,822.00	0.59	0.59	0.85	6	0.04	6.04	5.95	3.00	1.42	STORM U-3A	U-3	108.54	23.79	0.40	0.04
STORM U-3B		U-3B5	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM U-3B	U-3B5	2.77	52.91	0.88	0.00
STORM U-3B	U-3B5	U-3B4	0	0	13,667.00	0.31	0.31	0.85	6	0.88	6.00	5.95	1.59	0.75	STORM U-3B	U-3B4	5.12	43.16	0.72	0.88
STORM U-3B	U-3B4	U-3B3	0	0	14,094.00	0.32	0.64	0.85	6	1.60	6.88	5.95	3.22	1.53	STORM U-3B	U-3B3	5.58	6.67	0.11	1.60
STORM U-3B	U-3B3	U-3B2	0	0	12,868.00	0.30	0.93	0.85	6	1.71	8.48	5.95	4.72	2.24	STORM U-3B	U-3B2	8.14	24.58	0.41	1.71
STORM U-3B	U-3B2	U-3B1	0	0	7,691.00	0.18	1.11	0.85	6	2.12	10.20	5.95	5.61	2.66	STORM U-3B	U-3B1	9.52	30.69	0.51	2.12
STORM U-3B	U-3B1	U-3B	0	0	8,437.00	0.19	1.30	0.85	6	2.63	12.32	5.95	6.59	3.13	STORM U-3B	U-3B	22.05	2.06	0.03	2.63
STORM U-3B	U-3B	U-3	0	0	27,049.00	0.62	1.92	0.85	6	2.67	14.99	5.95	9.73	4.62	STORM U-3B	U-3	108.54	23.79	0.40	2.67
STORM V		V-6	0	y	0.00	0.00	0.00	0.85	6	0.21	6.00	5.95	0.00	0.00	STORM V	V-6	3.00	10.46	0.17	0.21
STORM V	V-6	V-5	0	0	17,750.00	0.41	0.41	0.85	6	0.26	6.21	5.95	2.06	0.98	STORM V	V-5	8.03	49.13	0.82	0.26
STORM V	V-5	V-4	0	0	19,500.00	0.45	0.86	0.85	6	0.00	6.47	5.95	4.32	2.05	STORM V	V-4	8.67	3.39	0.06	0.00
STORM V	V-4	V-3	0	0	20,074.00	0.46	1.32	0.85	6	0.06	6.47	5.95	6.66	3.16	STORM V	V-3	13.52	5.37	0.09	0.06
STORM V	V-3	V-2	0	0	0.00	0.00	1.65	0.85	6	0.15	6.53	5.95	8.32	3.95	STORM V	V-2	39.76	3.77	0.06	0.15
STORM V	V-2	V-1	0	0	0.00	0.00	3.22	0.85	6	0.21	6.68	5.95	16.31	7.74	STORM V	V-1	34.02	24.09	0.40	0.21
STORM V	V-1	U-7	0	0	0.00	0.00	3.39	0.85	6	0.26	6.90	5.95	17.16	8.14	STORM V	U-7	198.18	12.90	0.21	0.26
STORM V		V-1A	0	y	0.00	0.00	0.00	0.85	6	0.00	0.00	5.95	0.00	0.00	STORM V-1A	V-1A	8.03	2.18	0.04	0.00
STORM V	V-1A	V-1	0	0	5,581.00	0.13	0.13	0.85	6	0.08	0.00	5.95	0.65	0.31	STORM V-1A	V-1	34.02	24.09	0.40	0.08
STORM W		W-1	0	y	0.00	0.00	0.00	0.85	6	0.06	6.00	5.95	0.00	0.00	STORM W	W-1	5.69	3.67	0.06	0.06
STORM W	W-1	V-3	0	0	14,334.00	0.33	0.33	0.85	6	0.06	6.06	5.95	1.66	0.79	STORM W	W-1	5.69	3.67	0.06	0.06
STORM X		X-5	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM X	X-5	3.05	7.97	0.13	0.00
STORM X	X-5	X-4	0	0	10,224.00	0.23	0.23	0.85	6	0.13	6.13	5.95	1.19	0.56	STORM X	X-4	2.69	46.11	0.77	0.13
STORM X	X-4	X-3	0	0	11,489.00	0.26	0.50	0.85	6	0.90	7.03	5.95	2.52	1.20	STORM X	X-3	8.21	47.89	0.80	0.90
STORM X	X-3	X-2	0	0	17,144.00	0.39	1.26	0.85	6	1.70	8.73	5.95	6.35	3.01	STORM X	X-2	9.92	3.39	0.06	1.70
STORM X	X-2	X-1	0	0	14,101.00	0.32	1.58	0.85	6	1.76	10.49	5.95	7.99	3.79	STORM X	X-1	10.11	7.48	0.12	1.76
STORM X	X-1	V-2	0	0	0.00	0.00	1.58	0.85	6	1.88	12.37	5.95	7.99	3.79	STORM X	V-2	39.76	3.77	0.06	1.88
STORM X-3A		X-3A	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM X-3A	X-3A	6.07	4.02	0.07	0.00
STORM X-3A	X-3A	X-3	0	0	15,859.00	0.36	0.36	0.85	6	0.07	6.07	5.95	1.84	0.87	STORM X-3A	X-3	8.21	47.89	0.80	0.07
STORM Y		Y-1	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM Y	Y-1	7.55	2.61	0.04	0.00
STORM Y	Y-1	V-1	0	0	1,723.00	0.04	0.04	0.85	6	0.04	6.04	5.95	0.20	0.09	STORM Y	V-1	34.02	24.09	0.40	0.04
STORM Z		Z-2	0	y	0.00	0.00	0.00	0.85	6	0.00	6.00	5.95	0.00	0.00	STORM Z	Z-2	3.14	4.78	0.08	0.00
STORM Z	Z-2	Z-1	0	0	17,515.00	0.40	0.40	0.85	6	0.08	6.08	5.95	2.03	0.97	STORM Z	Z-1	5.82	5.72	0.10	0.08
STORM Z	Z-1	U-7	0	0	19,344.00	0.44	0.85	0.85	6	0.17	6.25	5.95	4.28	2.03	STORM Z	U-7	198.18	12.90	0.21	0.17

Appendix B

126TH AND 127TH STREET OUTFALLS TAILWATER ANALYSIS

Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf		Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf	Ave Sf	Enrgy loss		
	(in)	(cfs)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(ft)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(%)	(ft)	(K)	(ft)
1	60	126.2	-0.50	4.50	5.00	19.63	6.43	0.64	5.14	0.235	117.99	-0.30	4.78	5.00	19.63	6.43	0.64	5.42	0.235	0.235	0.277	0.15	0.10
2	60	126.2	-0.30	4.87	5.00	19.63	6.43	0.64	5.52	0.235	117.00	-0.20	5.15	5.00	19.63	6.43	0.64	5.79	0.235	0.235	0.275	0.15	0.10
3	60	116.3	-0.20	5.24	5.00	19.63	5.92	0.55	5.79	0.199	258.39	0.10	5.76	5.00	19.63	5.92	0.55	6.30	0.199	0.199	0.515	0.15	0.08
4	54	103.9	0.10	5.84	4.50	15.90	6.53	0.66	6.51	0.279	259.79	1.00	6.57	4.50	15.90	6.53	0.66	7.23	0.279	0.279	0.725	0.15	0.10
5	54	83.99	1.00	6.67	4.50	15.90	5.28	0.43	7.10	0.182	260.12	1.80	7.14	4.50	15.90	5.28	0.43	7.57	0.182	0.182	0.475	0.15	0.07
6	48	71.61	1.80	7.21	4.00	12.56	5.70	0.51	7.71	0.249	259.73	2.30	7.85	4.00	12.57	5.70	0.50	8.36	0.249	0.249	0.646	0.15	0.08
7	48	39.73	2.30	7.93	4.00	12.56	3.16	0.16	8.08	0.077	152.30	2.50	8.04	4.00	12.57	3.16	0.16	8.20	0.077	0.077	0.117	0.15	0.02
8	48	37.25	2.50	8.07	4.00	12.56	2.96	0.14	8.20	0.067	157.50	2.80	8.17	4.00	12.57	2.96	0.14	8.31	0.067	0.067	0.106	0.15	0.02
9	48	21.47	2.80	8.19	4.00	12.56	1.71	0.05	8.24	0.022	309.50	3.20	8.26	4.00	12.57	1.71	0.05	8.31	0.022	0.022	0.069	0.15	0.01
10	42	2.29	3.20	8.27	3.50	9.62	0.24	0.00	8.27	0.001	111.67	3.30	8.27	3.50	9.62	0.24	0.00	8.27	0.001	0.001	0.001	1.00	0.00
11	15	1.78	3.30	8.27	1.25	1.23	1.45	0.03	8.30	0.076	50.06	3.40	8.31	1.25	1.23	1.45	0.03	8.34	0.076	0.076	0.038	1.00	0.03

Project File: Willets Point 126th Outfall.stm | Number of lines: 11 | Run Date: 08-06-2008

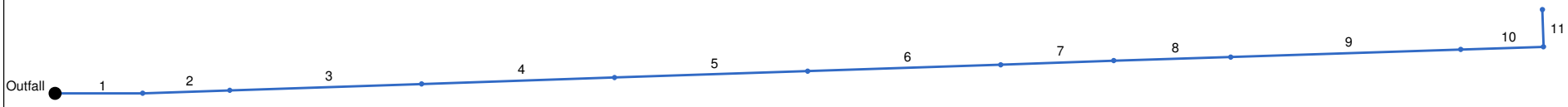
; c = cir e = ellip b = box

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El Dn (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line shape	N value (n)	J-loss coeff (K)	Inlet/ Rim El (ft)	
1	End	117.99	0.00	MH	0.00	0.00	0.00	0.0	-0.50	0.17	-0.30	60	Cir	0.013	0.15	8.00	
2	1	117.00	-1.91	MH	9.90	0.00	0.00	0.0	-0.30	0.09	-0.20	60	Cir	0.013	0.15	8.00	
3	2	258.39	0.00	MH	12.39	0.00	0.00	0.0	-0.20	0.12	0.10	60	Cir	0.013	0.15	9.00	
4	3	259.79	0.00	MH	19.89	0.00	0.00	0.0	0.10	0.35	1.00	54	Cir	0.013	0.15	9.00	
5	4	260.12	0.00	MH	12.38	0.00	0.00	0.0	1.00	0.31	1.80	54	Cir	0.013	0.15	9.40	
6	5	259.73	0.00	MH	31.88	0.00	0.00	0.0	1.80	0.19	2.30	48	Cir	0.013	0.15	9.50	
7	6	152.30	-0.18	MH	2.48	0.00	0.00	0.0	2.30	0.13	2.50	48	Cir	0.013	0.15	9.60	
8	7	157.50	0.36	MH	15.78	0.00	0.00	0.0	2.50	0.19	2.80	48	Cir	0.013	0.15	9.93	
9	8	309.50	-0.18	MH	19.18	0.00	0.00	0.0	2.80	0.13	3.20	48	Cir	0.013	0.15	9.00	
10	9	111.67	0.00	MH	0.51	0.00	0.00	0.0	3.20	0.09	3.30	42	Cir	0.013	1.00	9.00	
11	10	50.06	-90.00	MH	1.78	0.00	0.00	0.0	3.30	0.20	3.40	15	Cir	0.013	1.00	9.00	

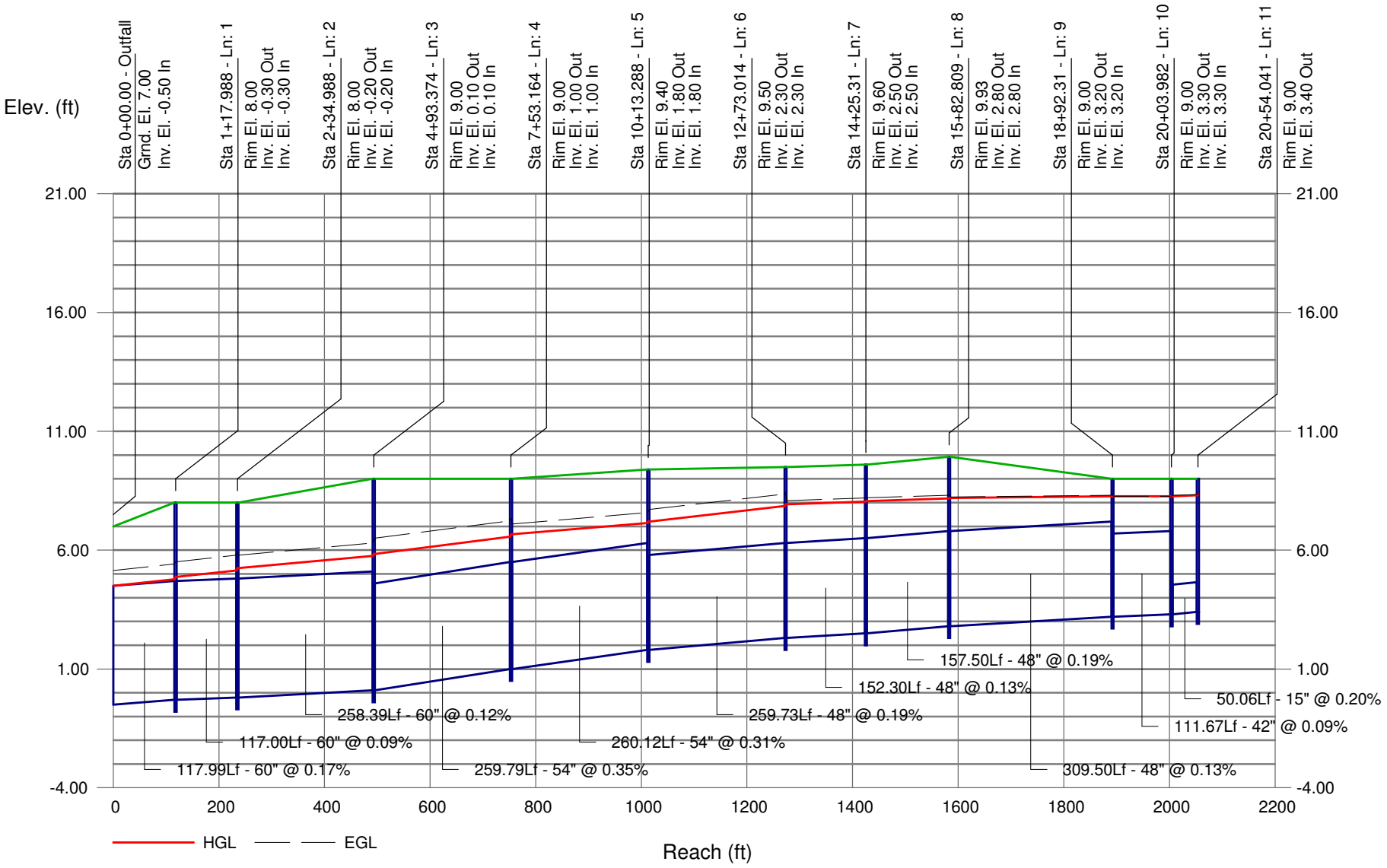
Project File: Willets Point 126th Outfall.stm | Number of lines: 11 | Date: 08-06-2008

Hydraflow Storm Sewers Extension for AutoCAD® Civil 3D® 2008 Plan



Project File: Willets Point 126th Outfall.stm	Number of lines: 11	Date: 08-06-2008

Storm Sewer Profile



Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.	Junction Type
1		126.2	60	Cir	117.99	-0.50	-0.30	0.170	4.50*	4.78*	0.10	4.87	End	Manhole
2		126.2	60	Cir	117.00	-0.30	-0.20	0.085	4.87*	5.15*	0.10	5.24	1	Manhole
3		116.3	60	Cir	258.39	-0.20	0.10	0.116	5.24*	5.76*	0.08	5.84	2	Manhole
4		103.9	54	Cir	259.79	0.10	1.00	0.346	5.84*	6.57*	0.10	6.67	3	Manhole
5		83.99	54	Cir	260.12	1.00	1.80	0.308	6.67*	7.14*	0.07	7.21	4	Manhole
6		71.61	48	Cir	259.73	1.80	2.30	0.193	7.21*	7.85*	0.08	7.93	5	Manhole
7		39.73	48	Cir	152.30	2.30	2.50	0.131	7.93*	8.04*	0.02	8.07	6	Manhole
8		37.25	48	Cir	157.50	2.50	2.80	0.190	8.07*	8.17*	0.02	8.19	7	Manhole
9		21.47	48	Cir	309.50	2.80	3.20	0.129	8.19*	8.26*	0.01	8.27	8	Manhole
10		2.29	42	Cir	111.67	3.20	3.30	0.090	8.27*	8.27*	0.00	8.27	9	Manhole
11		1.78	15	Cir	50.06	3.30	3.40	0.200	8.27*	8.31*	0.03	8.34	10	Manhole

Project File: Willets Point 126th Outfall.stm | Number of lines: 11 | Run Date: 08-06-2008

NOTES: Return period = 5 Yrs. ; *Surcharged (HGL above crown).

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El Dn (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line shape	N value (n)	J-loss coeff (K)	Inlet/ Rim El (ft)	
1	End	61.50	-11.08	MH	0.00	0.00	0.00	0.0	-2.00	0.33	-1.80	60	Cir	0.013	0.15	11.58	
2	1	114.82	0.00	MH	12.73	0.00	0.00	0.0	-1.80	0.17	-1.60	60	Cir	0.013	0.23	11.69	
3	2	118.41	10.98	MH	0.00	0.00	0.00	0.0	-1.60	0.30	-1.25	60	Cir	0.013	0.15	13.34	
4	3	114.87	0.00	MH	2.13	0.00	0.00	0.0	-1.25	0.15	-1.08	60	Cir	0.013	0.15	14.00	
5	4	118.92	0.00	MH	0.00	0.00	0.00	0.0	-1.08	0.18	-0.86	60	Cir	0.013	0.16	13.78	
6	5	113.64	-7.45	MH	13.44	0.00	0.00	0.0	-0.86	0.58	-0.20	60	Cir	0.013	0.15	13.23	
7	6	37.96	0.85	MH	13.96	0.00	0.00	0.0	-0.20	0.79	0.10	54	Cir	0.013	0.15	12.30	
8	7	223.46	-0.69	MH	41.55	0.00	0.00	0.0	0.10	0.36	0.90	54	Cir	0.013	1.00	11.00	
9	8	42.85	-89.88	MH	7.37	0.00	0.00	0.0	0.90	0.47	1.10	42	Cir	0.013	0.15	11.50	
10	9	318.94	0.00	MH	1.82	0.00	0.00	0.0	1.10	0.28	2.00	42	Cir	0.013	0.15	12.50	
11	10	84.54	0.00	MH	5.40	0.00	0.00	0.0	2.00	0.59	2.50	42	Cir	0.013	0.15	11.90	
12	11	92.99	0.00	MH	30.98	0.00	0.00	0.0	2.50	0.54	3.00	42	Cir	0.013	1.00	10.76	

Project File: Willets Point 127th Outfall.stm | Number of lines: 12 | Date: 08-06-2008

Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf		Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf	Ave Sf	Enrgy loss		
	(in)	(cfs)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(ft)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(%)	(ft)	(K)	(ft)
1	60	129.4	-2.00	3.00	5.00	19.63	6.59	0.68	3.68	0.247	61.50	-1.80	3.14	4.94	19.60	6.60	0.68	3.82	0.226	0.237	0.145	0.15	0.10
2	60	129.4	-1.80	3.25	5.00	19.63	6.59	0.68	3.92	0.247	114.82	-1.60	3.53	5.00	19.63	6.59	0.68	4.20	0.247	0.247	0.283	0.23	0.16
3	60	116.7	-1.60	3.68	5.00	19.63	5.94	0.55	4.23	0.201	118.41	-1.25	3.92	5.00	19.63	5.94	0.55	4.47	0.201	0.201	0.238	0.15	0.08
4	60	116.7	-1.25	4.00	5.00	19.63	5.94	0.55	4.55	0.201	114.87	-1.08	4.23	5.00	19.63	5.94	0.55	4.78	0.201	0.201	0.230	0.15	0.08
5	60	114.5	-1.08	4.32	5.00	19.63	5.83	0.53	4.85	0.193	118.92	-0.86	4.55	5.00	19.63	5.83	0.53	5.08	0.193	0.193	0.230	0.16	0.08
6	60	114.5	-0.86	4.63	5.00	19.63	5.83	0.53	5.16	0.193	113.64	-0.20	4.85	5.00	19.63	5.83	0.53	5.38	0.193	0.193	0.220	0.15	0.08
7	54	101.1	-0.20	4.93	4.50	15.90	6.36	0.63	5.56	0.264	37.96	0.10	5.03	4.50	15.90	6.36	0.63	5.66	0.264	0.264	0.100	0.15	0.09
8	54	87.12	0.10	5.13	4.50	15.90	5.48	0.47	5.59	0.196	223.46	0.90	5.56	4.50	15.90	5.48	0.47	6.03	0.196	0.196	0.439	1.00	0.47
9	42	45.57	0.90	6.03	3.50	9.62	4.74	0.35	6.38	0.205	42.85	1.10	6.12	3.50	9.62	4.74	0.35	6.47	0.205	0.205	0.088	0.15	0.05
10	42	38.20	1.10	6.17	3.50	9.62	3.97	0.25	6.42	0.144	318.94	2.00	6.63	3.50	9.62	3.97	0.25	6.88	0.144	0.144	0.460	0.15	0.04
11	42	36.38	2.00	6.67	3.50	9.62	3.78	0.22	6.89	0.131	84.54	2.50	6.78	3.50	9.62	3.78	0.22	7.00	0.131	0.131	0.111	0.15	0.03
12	42	30.98	2.50	6.81	3.50	9.62	3.22	0.16	6.97	0.095	92.99	3.00	6.90	3.50	9.62	3.22	0.16	7.06	0.095	0.095	0.088	1.00	0.16

Project File: Willets Point 127th Outfall.stm | Number of lines: 12 | Run Date: 08-06-2008

; c = cir e = ellip b = box

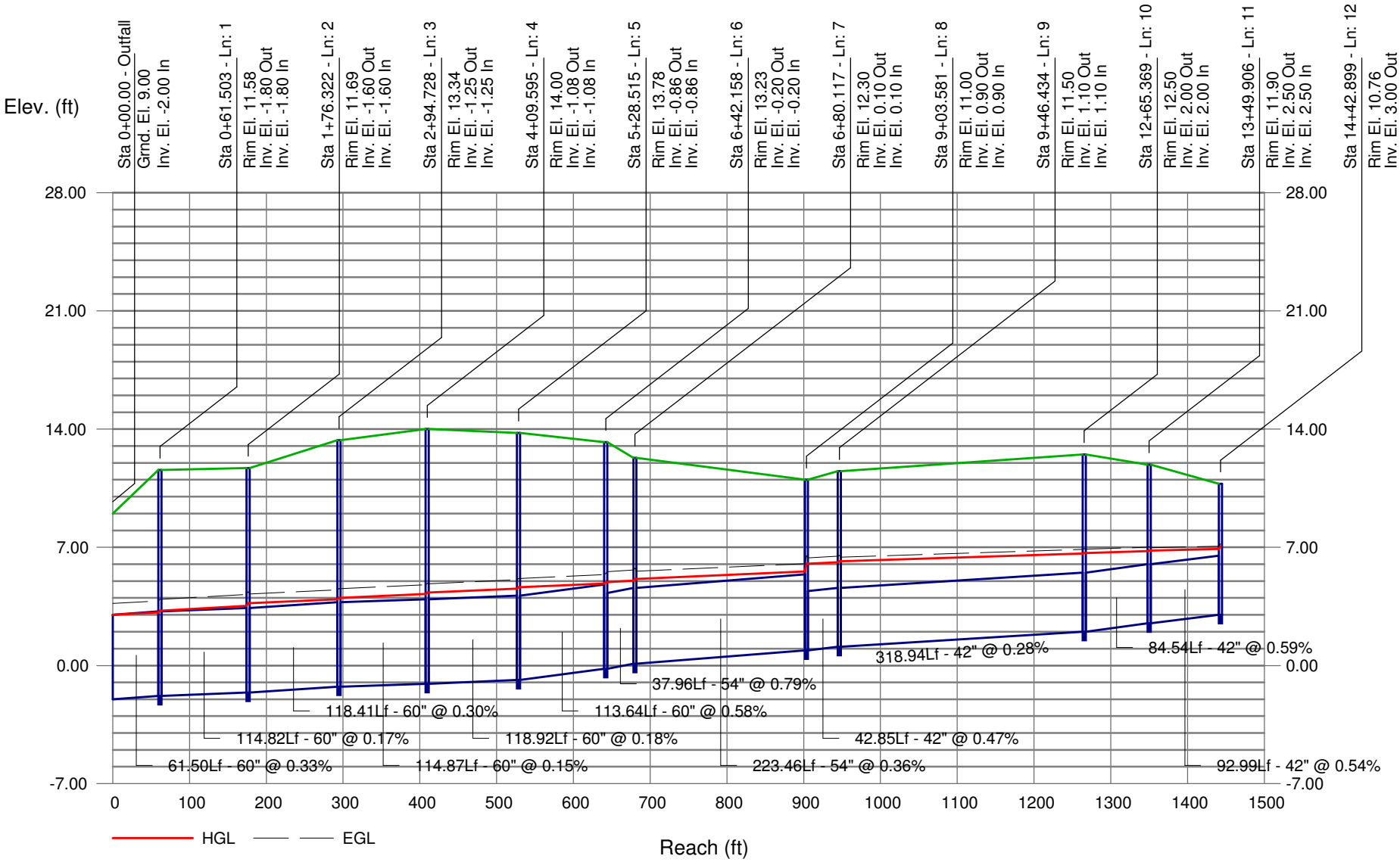
Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.	Junction Type
1		129.4	60	Cir	61.50	-2.00	-1.80	0.325	3.00	3.14	0.10	3.25	End	Manhole
2		129.4	60	Cir	114.82	-1.80	-1.60	0.174	3.25*	3.53*	0.16	3.68	1	Manhole
3		116.7	60	Cir	118.41	-1.60	-1.25	0.296	3.68*	3.92*	0.08	4.00	2	Manhole
4		116.7	60	Cir	114.87	-1.25	-1.08	0.148	4.00*	4.23*	0.08	4.32	3	Manhole
5		114.5	60	Cir	118.92	-1.08	-0.86	0.185	4.32*	4.55*	0.08	4.63	4	Manhole
6		114.5	60	Cir	113.64	-0.86	-0.20	0.581	4.63*	4.85*	0.08	4.93	5	Manhole
7		101.1	54	Cir	37.96	-0.20	0.10	0.790	4.93*	5.03*	0.09	5.13	6	Manhole
8		87.12	54	Cir	223.46	0.10	0.90	0.358	5.13*	5.56*	0.47	6.03	7	Manhole
9		45.57	42	Cir	42.85	0.90	1.10	0.467	6.03*	6.12*	0.05	6.17	8	Manhole
10		38.20	42	Cir	318.94	1.10	2.00	0.282	6.17*	6.63*	0.04	6.67	9	Manhole
11		36.38	42	Cir	84.54	2.00	2.50	0.591	6.67*	6.78*	0.03	6.81	10	Manhole
12		30.98	42	Cir	92.99	2.50	3.00	0.538	6.81*	6.90*	0.16	7.06	11	Manhole

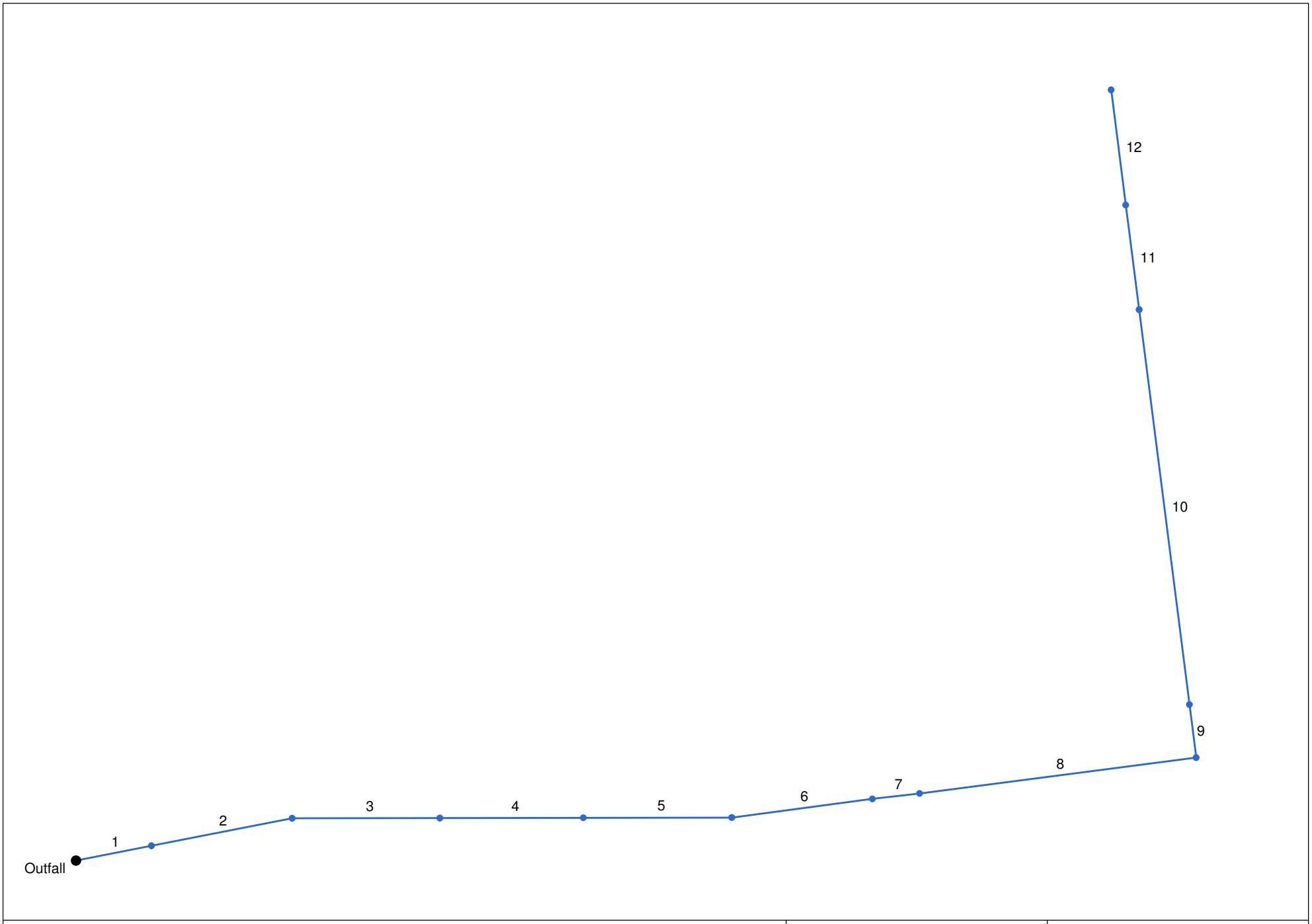
Project File: Willets Point 127th Outfall.stm | Number of lines: 12 | Run Date: 08-06-2008

NOTES: Return period = 5 Yrs. ; *Surcharged (HGL above crown).

Storm Sewer Profile



Hydraflow Storm Sewers Extension for AutoCAD® Civil 3D® 2008 Plan



Project File: Willets Point 127th Outfall.stm	Number of lines: 12	Date: 08-06-2008

Appendix C

SANITARY SYSTEM DESIGN AND CAPACITY ANALYSIS

Line	Manhole #	New Pipe? Enter "y"	Up-stream? Enter "y"	Down-stream? Enter "y"	Rim Elev. (ft)	Upper Inv. Elev. (ft)	Lower Inv. Elev. (ft)	Between Manholes												Inner Top Upper (ft)	Inner Top Lower (ft)	Velocity (ft/s)	Capacity (cfs)	Time in pipe (s)
								Cover (ft) upper	Cover (ft) lower	Fall to next (ft)	Length to next (ft)	Slope to next (ft)	Shape enter	Dimensions downstream				Area (ft^2)						
S1	S1-9	y	y		12.30	2.30	2.30	9.17	9.17	1.55	200.00	0.0078	circ	diameter=	10			0.5454	3.13	3.13	3.0645	1.9145	65.2634
S1	S1-8	y			10.80	0.75	0.75	9.22	9.22	1.30	238.83	0.0054	circ	diameter=	10			0.5454	1.58	1.58	2.5682	1.6045	92.9934
S1	S1-7	y			10.30	-0.55	-0.55	10.02	10.02	1.95	262.08	0.0074	circ	diameter=	10			0.5454	0.28	0.28	3.0027	1.8759	87.2819
S1	S1-6	y			10.10	-2.50	-2.50	11.77	11.77	1.95	259.81	0.0075	circ	diameter=	10			0.5454	-1.67	-1.67	3.0158	1.8840	86.1504
S1	S1-5	y			9.90	-4.45	-4.45	13.52	13.52	1.80	239.28	0.0075	circ	diameter=	10			0.5454	-3.62	-3.62	3.0192	1.8862	79.2527
S1	S1-4	y			9.20	-6.25	-6.25	14.62	14.62	1.50	200.00	0.0075	circ	diameter=	10			0.5454	-5.42	-5.42	3.0147	1.8834	66.3422
S1	S1-3	y			8.90	-7.75	-7.75	15.82	15.82	1.25	167.97	0.0074	circ	diameter=	10			0.5454	-6.92	-6.92	3.0030	1.8760	55.9350
S1	S1-2	y			8.20	-9.00	-9.00	16.37	16.37	1.50	200.00	0.0075	circ	diameter=	10			0.5454	-8.17	-8.17	3.0147	1.8834	66.3422
S1	S1-1	y		y	7.50	-10.50	-10.50	17.17	17.17	0.00	0.00	0	circ	diameter=	10			0.5454	-9.67	-9.67	0	0	0
S2	S2-10	y			10.80	1.00	1.00	8.97	8.97	1.20	228.49	0.0053	circ	diameter=	10			0.5454	1.83	1.83	2.5227	1.5760	90.5734
S2	S2-9	y			10.90	-0.20	-0.20	10.27	10.27	1.05	200.00	0.0053	circ	diameter=	10			0.5454	0.63	0.63	2.5223	1.5757	79.2941
S2	S2-8	y			9.90	-1.25	-1.25	10.32	10.32	1.05	200.00	0.0053	circ	diameter=	10			0.5454	-0.42	-0.42	2.5223	1.5757	79.2941
S2	S2-7	y			9.10	-2.30	-2.30	10.57	10.57	1.10	200.00	0.0055	circ	diameter=	10			0.5454	-1.47	-1.47	2.5816	1.6128	77.4710
S2	S2-6	y			9.10	-3.40	-3.40	11.67	11.67	1.05	200.00	0.0053	circ	diameter=	10			0.5454	-2.57	-2.57	2.5223	1.5757	79.2941
S2	S2-5	y			9.10	-4.45	-4.45	12.72	12.72	1.50	200.00	0.0075	circ	diameter=	10			0.5454	-3.62	-3.62	3.0147	1.8834	66.3422
S2	S2-4	y			8.70	-5.95	-5.95	13.82	13.82	1.50	200.00	0.0075	circ	diameter=	10			0.5454	-5.12	-5.12	3.0147	1.8834	66.3422
S2	S2-3	y			8.10	-7.45	-7.28	14.55	14.38	1.67	200.00	0.0083	circ	diameter=	12			0.7854	-6.45	-6.28	3.5942	3.2334	55.6450
S2	S2-2	y			8.30	-8.95	-8.95	16.25	16.25	1.35	200.00	0.0068	circ	diameter=	12			0.7854	-7.95	-7.95	3.2316	2.9071	61.8896
S2	S2-1	y			7.50	-10.30	-10.30	16.80	16.80	0.20	30.96	0.0065	circ	diameter=	12			0.7854	-9.30	-9.30	3.1614	2.8440	9.7932
S2	S1-1	y		y	7.50	-10.50	-10.50	17.00	17.00	0.00	0.00	0	circ	diameter=	12			0.7854	-9.50	-9.50	0	0	0
S3	S3-3	y	y		11.30	1.50	1.50	8.97	8.97	1.50	200.00	0.0075	circ	diameter=	10			0.5454	2.33	2.33	3.0147	1.8834	66.3422
S3	S3-2	y			11.00	0.00	0.00	10.17	10.17	1.50	200.00	0.0075	circ	diameter=	10			0.5454	0.83	0.83	3.0147	1.8834	66.3422
S3	S3-1	y			10.40	-1.50	-1.50	11.07	11.07	0.60	75.00	0.0080	circ	diameter=	10			0.5454	-0.67	-0.67	3.1135	1.9451	24.0883
S3	S1-6	y		y	10.30	-2.10	-2.10	11.57	11.57	0.00	0.00	0	circ	diameter=	10			0.5454	-1.27	-1.27	0	0	0
S4	S4-2	y	y		11.30	0.45	0.45	10.02	10.02	1.15	150.00	0.0077	circ	diameter=	10			0.5454	1.28	1.28	3.0480	1.9042	49.2129
S4	S4-1	y			11.10	-0.70	-0.70	10.97	10.97	1.50	200.00	0.0075	circ	diameter=	10			0.5454	0.13	0.13	3.0147	1.8834	66.3422
S4	S1-5	y		y	10.10	-2.20	-2.20	11.47	11.47	0.00	0.00	0	circ	diameter=	10			0.5454	-1.37	-1.37	0	0	0
S5	S5-2	y	y		10.30	-0.55	-0.55	10.02	10.02	1.55	200.00	0.0078	circ	diameter=	10			0.5454	0.28	0.28	3.0645	1.9145	65.2634
S5	S5-1	y			9.80	-2.10	-2.10	11.07	11.07	1.30	173.71	0.0075	circ	diameter=	10			0.5454	-1.27	-1.27	3.0114	1.8813	57.6841
S5	S1-4	y		y	9.90	-3.40	-3.40	12.47	12.47	0.00	0.00	0	circ	diameter=	10			0.5454	-2.57	-2.57	0	0	0
S6	S6-3	y	y		8.90	-0.50	-0.50	8.57	8.57	1.50	200.00	0.0075	circ	diameter=	10			0.5454	0.33	0.33	3.0147	1.8834	66.3422
S6	S6-2	y			8.70	-2.00	-2.00	9.87	9.87	1.50	200.00	0.0075	circ	diameter=	10			0.5454	-1.17	-1.17	3.0147	1.8834	66.3422
S6	S6-1	y			8.30	-3.50	-3.50	10.97	10.97	0.50	37.18	0.0134	circ	diameter=	10			0.5454	-2.67	-2.67	4.0368	2.5219	9.2102
S6	S2-3	y		y	8.10	-4.00	-4.00	11.27	11.27	0.00	0.00	0	circ	diameter=	10			0.5454	-3.17	-3.17	0	0	0
S7	S7-1	y	y		7.80	-3.10	-3.10	10.07	10.07	1.50	200.00	0.0075	circ	diameter=	10			0.5454	-2.27	-2.27	3.0147	1.8834	66.3422
S7	S2-1	y		y	7.50	-4.60	-4.60	11.27	11.27	0.00	0.00	0	circ	diameter=	10			0.5454	-3.77	-3.77	0	0	0
S8	S8-4	y	y		11.20	1.20	1.20	9.17	9.17	1.60	200.00	0.0080	circ	diameter=	10			0.5454	2.03	2.03	3.1135	1.9451	64.2356
S8	S8-3	y			11.10	-0.40	-0.40	10.67	10.67	1.80	258.32	0.0070	circ	diameter=	10			0.5454	0.43	0.43	2.9058	1.8153	88.8979
S8	S8-2	y			10.00	-2.20	-2.20	11.37	11.37	2.00	259.10	0.0077	circ	diameter=	10			0.5454	-1.37	-1.37	3.0584	1.9107	84.7182
S8	S8-1	y			9.10	-4.20	-4.20	12.47	12.47	0.25	32.97	0.0076	circ	diameter=	10			0.5454	-3.37	-3.37	3.0312	1.8937	10.8767
S8	S2-5	y		y	9.10	-4.45	-4.45	12.72	12.72	0.00	0.00	0	circ	diameter=	10			0.5454	-3.62	-3.62	0	0	0
S9	S9-2	y	y		11.30	1.75	1.75	8.72	8.72	1.50	200.00	0.0075	circ	diameter=	10			0.5454	2.58	2.58	3.0147	1.8834	66.3422
S9	S9-1	y			10.40	0.25	0.25	9.32	9.32	1.00	140.34	0.0071	circ	diameter=	10			0.5454	1.08	1.08	2.9385	1.8357	47.7598
S9	S8-2	y		y	10.00	-0.75	-0.75	9.92	9.92	0.00	0.00	0	circ	diameter=	10			0.5454	0.08	0.08	0	0	0
S10	S10-1	y	y		10.20	-0.75	-0.75	10.12	10.12	2.25	299.23	0.0075	circ	diameter=	10			0.5454	0.08	0.08	3.0185	1.8858	99.1305
S10	S8-1	y		y	9.10	-3.00	-3.00	11.27	11.27	0.00	0.00	0	circ	diameter=	10			0.5454	-2.17	-2.17	0	0	0
S11	S11-3	y	y		12.90	3.55	3.55	8.52	8.52	1.35	202.73	0.0067	circ	diameter=	10			0.5454	4.38	4.38	2.8406	1.7746	71.3676
S11	S11-2	y			13.90	2.20	2.20	10.87	10.87	1.30	200.00	0.0065	circ	diameter=	10			0.5454	3.03	3.03	2.8065	1.7533	71.2630
S11	S11-1	y			12.80	0.90	0.90	11.07	11.07	1.30	250.00	0.0052	circ	diameter=	10			0.5454	1.73	1.73	2.5102	1.5682	99.5930
S11	S8-3	y		y	11.10	-0.40	-0.40	10.67	10.67	0.00	0.00	0	circ	diameter=	10			0.5454	0.43	0.43	0	0	0
S12	S12-4	y	y		13.85	4.50	4.50	8.52	8.52	1.30	220.00	0.0059	circ	diameter=	10			0.5454	5.33	5.33	2.6759	1.6717	82.2154
S12	S12-3	y			13.00	3.20	3.20	8.97	8.97	0.45	74.34	0.0061	circ	diameter=	10			0.5454	4.03	4.03	2.7083	1.6920	27.4485
S12	S12-2	y			12.90	2.75	2.75	9.32	9.32	1.15	165.00	0.0070	circ	diameter=	10			0.5454	3.58	3.58	2.9061	1.8155	56.7764

S12	S12-1	y			13.00	1.60	1.60	10.57	10.57	0.70	94.26	0.0074	circ	diameter=	10			0.5454	2.43	2.43	2.9998	1.8741	31.4219
S12	S11-1	y		y	12.80	0.90	0.90	11.07	11.07	0.00	0.00	0	circ	diameter=	10			0.5454	1.73	1.73	0	0	0
S13	S13-2	y	y		12.90	3.55	3.55	8.52	8.52	1.05	200.00	0.0053	circ	diameter=	10			0.5454	4.38	4.38	2.5223	1.5757	79.2941
S13	S13-1	y			12.00	2.50	2.50	8.67	8.67	1.75	245.22	0.0071	circ	diameter=	10			0.5454	3.33	3.33	2.9407	1.8371	83.3884
S13	S1-8	y		y	10.80	0.75	0.75	9.22	9.22	0.00	0.00	0	circ	diameter=	10			0.5454	1.58	1.58	0	0	0
S14	S14-3	y	y		13.00	3.65	3.65	8.52	8.52	1.35	213.28	0.0063	circ	diameter=	10			0.5454	4.48	4.48	2.7695	1.7302	77.0103
S14	S14-2	y			13.00	2.30	2.30	9.87	9.87	1.20	231.60	0.0052	circ	diameter=	10			0.5454	3.13	3.13	2.5057	1.5654	92.4289
S14	S14-1	y			13.00	1.10	1.10	11.07	11.07	0.20	38.24	0.0052	circ	diameter=	10			0.5454	1.93	1.93	2.5175	1.5727	15.1898
S14	S11-1	y		y	12.80	0.90	0.90	11.07	11.07	0.00	0.00	0	circ	diameter=	10			0.5454	1.73	1.73	0	0	0
S15	S15-3	y	y		14.00	4.65	4.65	8.52	8.52	0.65	120.00	0.0054	circ	diameter=	10			0.5454	5.48	5.48	2.5620	1.6005	46.8388
S15	S15-2	y			14.00	4.00	4.00	9.17	9.17	1.05	200.00	0.0053	circ	diameter=	10			0.5454	4.83	4.83	2.5223	1.5757	79.2941
S15	S15-1	y			13.50	2.95	2.95	9.72	9.72	0.65	129.20	0.0050	circ	diameter=	10			0.5454	3.78	3.78	2.4691	1.5425	52.3272
S15	S14-2	y		y	13.00	2.30	2.30	9.87	9.87	0.00	0.00	0	circ	diameter=	10			0.5454	3.13	3.13	0	0	0
S16	S16-2	y	y		12.80	3.45	3.45	8.52	8.52	2.05	152.55	0.0134	circ	diameter=	10			0.5454	4.28	4.28	4.0353	2.5210	37.8035
S16	S16-1	y			11.00	1.40	1.40	8.77	8.77	0.40	34.13	0.0117	circ	diameter=	10			0.5454	2.23	2.23	3.7685	2.3543	9.0566
S16	S2-10	y		y	10.80	1.00	1.00	8.97	8.97	0.00	0.00	0	circ	diameter=	10			0.5454	1.83	1.83	0	0	0

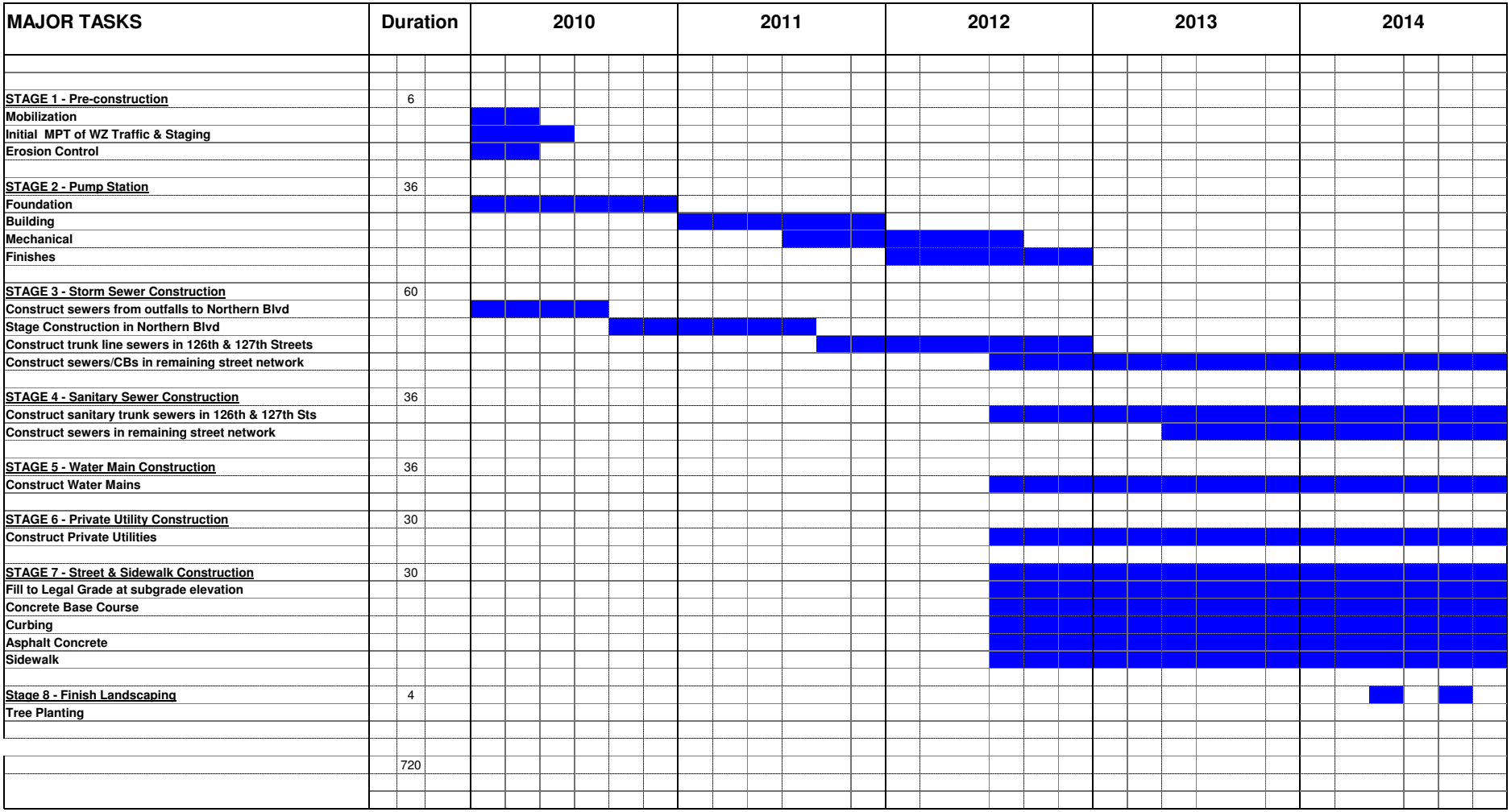
Areas	Sewer Lines			New Pipe	First in Line	Area Values (sq ft)	Area Values (acres)	Cum. Area Val (acres)	Runoff Coefficients	Time in Area (min)	Cum. Time Pipe (min)	Time of Conc. (min)	Runoff val. (in/hr)	Zoning	Density (flow/acre)	Average Flow (cfs)	Peak Value	Peak Sani. Flow (fcs)	Cum. Peak Sani (cfs)	Lines	Manhole	Cap Flow from Manhole (cfs)	Time from Manhole (s)	Time from Mahole (min)	Cum. Time from Manhole (min)
	S1		S1-9	y	y	0.00	0.00	0.00	0.85	6	1.09	6.00	5.95	M3-1	20000	0.0000	2	0.0000	0.0000	S1	S1-9	1.9145	65.2634	1.0877	0.0000
1	S1	S1-9	S1-8	y	0	44,544.00	1.02	1.02	0.85	6	1.55	7.09	5.66	M3-1	20000	0.0316	2	0.0633	0.0633	S1	S1-8	1.6045	92.9934	1.5499	1.0877
2	S1	S1-8	S1-7	y	0	25,915.00	0.59	3.62	0.85	6	1.45	8.64	5.29	M3-1	20000	0.0184	2	0.0368	0.2242	S1	S1-7	1.8759	87.2819	1.4547	2.6376
3	S1	S1-7	S1-6	y	0	29,546.00	0.68	6.85	0.85	6	1.44	10.09	4.98	M3-1	20000	0.0210	2	0.0420	0.4239	S1	S1-6	1.8840	86.1504	1.4358	4.0923
4	S1	S1-6	S1-5	y	0	29,426.00	0.68	9.28	0.85	6	1.32	11.53	4.71	M3-1	20000	0.0209	2	0.0418	0.5746	S1	S1-5	1.8862	79.2527	1.3209	5.5282
5	S1	S1-5	S1-4	y	0	33,177.00	0.76	12.15	0.85	6	1.11	12.85	4.49	M3-1	20000	0.0236	2	0.0471	0.7520	S1	S1-4	1.8834	66.3422	1.1057	6.8490
6	S1	S1-4	S1-3	y	0	23,362.00	0.54	12.69	0.85	6	0.93	13.95	4.32	M3-1	20000	0.0166	2	0.0332	0.7852	S1	S1-3	1.8760	55.9350	0.9322	7.9547
7	S1	S1-3	S1-2	y	0	23,504.00	0.54	13.23	0.85	6	1.11	14.89	4.18	M3-1	20000	0.0167	2	0.0334	0.8186	S1	S1-2	1.8834	66.3422	1.1057	8.8870
8	S1	S1-2	S1-1	y	0	25,731.00	0.59	13.82	0.85	6	0.00	15.99	4.03	M3-1	20000	0.0183	2	0.0366	0.8551	S1	S1-1	0	0	0.0000	9.9927
	S2		S2-10	y	0	0.00	0.00	0.00	0.85	6	1.51	6.00	5.95	M3-1	20000	0.0000	2	0.0000	0.0000	S2	S2-10	1.5760	90.5734	1.5096	0.0000
9	S2	S2-10	S2-9	y	0	177,303.00	4.07	6.00	0.85	6	1.32	7.51	5.55	M3-1	20000	0.1260	2	0.2519	0.3711	S2	S2-9	1.5757	79.2941	1.3216	1.5096
10	S2	S2-9	S2-8	y	0	139,411.00	3.20	9.20	0.85	6	1.32	8.83	5.25	M3-1	20000	0.0990	2	0.1981	0.5692	S2	S2-8	1.5757	79.2941	1.3216	2.8311
11	S2	S2-8	S2-7	y	0	111,004.00	2.55	11.74	0.85	6	1.29	10.15	4.97	M3-1	20000	0.0789	2	0.1577	0.7269	S2	S2-7	1.6128	77.4710	1.2912	4.1527
12	S2	S2-7	S2-6	y	0	91,115.00	2.09	13.84	0.85	6	1.32	11.44	4.73	M3-1	20000	0.0647	2	0.1295	0.8564	S2	S2-6	1.5757	79.2941	1.3216	5.4439
13	S2	S2-6	S2-5	y	0	79,539.00	1.83	15.66	0.85	6	1.11	12.77	4.50	M3-1	20000	0.0565	2	0.1130	0.9694	S2	S2-5	1.8834	66.3422	1.1057	6.7654
14	S2	S2-5	S2-4	y	0	82,952.00	1.90	24.17	0.85	6	1.11	13.87	4.33	M3-1	20000	0.0589	2	0.1179	1.4960	S2	S2-4	1.8834	66.3422	1.1057	7.8712
15	S2	S2-4	S2-3	y	0	86,259.00	1.98	26.15	0.85	6	0.93	14.98	4.17	M3-1	20000	0.0613	2	0.1226	1.6185	S2	S2-3	3.2334	55.6450	0.9274	8.9769
16	S2	S2-3	S2-2	y	0	82,525.00	1.89	30.27	0.85	6	1.03	15.90	4.04	M3-1	20000	0.0586	2	0.1173	1.8735	S2	S2-2	2.9071	61.8896	1.0315	9.9043
17	S2	S2-2	S2-1	y	0	85,439.00	1.96	32.23	0.85	6	0.16	16.94	3.91	M3-1	20000	0.0607	2	0.1214	1.9949	S2	S2-1	2.8440	9.7932	0.1632	10.9358
18	S2	S2-1	S1-1	y	0	35,611.00	0.82	34.87	0.85	6	0.00	17.10	3.89	M3-1	20000	0.0253	2	0.0506	2.1585	S2	S1-1	0	0	0.0000	11.0990
	S3		S3-3	y	y	0.00	0.00	0.00	0.85	6	1.11	6.00	5.95	M3-1	20000	0.0000	2	0.0000	0.0000	S3	S3-3	1.8834	66.3422	1.1057	0.0000
20	S3	S3-3	S3-2	y	0	60,104.00	1.38	1.38	0.85	6	1.11	7.11	5.65	M3-1	20000	0.0427	2	0.0854	0.0854	S3	S3-2	1.8834	66.3422	1.1057	1.1057
21	S3	S3-2	S3-1	y	0	46,954.00	1.08	2.46	0.85	6	0.40	8.21	5.39	M3-1	20000	0.0334	2	0.0667	0.1521	S3	S3-1	1.9451	24.0883	0.4015	2.2114
22	S3	S3-1	S1-7	y	0	3,956.00	0.09	2.55	0.85	6	1.45	8.61	5.29	M3-1	20000	0.0028	2	0.0056	0.1577	S3	S1-7	1.8759	87.2819	1.4547	2.6129
	S4		S4-2	y	y	0.00	0.00	0.00	0.85	6	0.82	6.00	5.95	M3-1	20000	0.0000	2	0.0000	0.0000	S4	S4-2	1.9042	49.2129	0.8202	0.0000
23	S4	S4-2	S4-1	y	0	45,177.00	1.04	1.04	0.85	6	1.11	6.82	5.73	M3-1	20000	0.0321	2	0.0642	0.0642	S4	S4-1	1.8834	66.3422	1.1057	0.8202
24	S4	S4-1	S1-6	y	0	31,471.00	0.72	1.76	0.85	6	1.44	7.93	5.45	M3-1	20000	0.0224	2	0.0447	0.1089	S4	S1-6	1.8840	86.1504	1.4358	1.9259
	S5		S5-2	y	y	0.00	0.00	0.00	0.85	6	1.09	6.00	5.95	M3-1	20000	0.0000	2	0.0000	0.0000	S5	S5-2	1.9145	65.2634	1.0877	0.0000
25	S5	S5-2	S5-1	y	0	66,113.00	1.52	1.52	0.85	6	0.96	7.09	5.66	M3-1	20000	0.0470	2	0.0939	0.0939	S5	S5-1	1.8813	57.6841	0.9614	1.0877
26	S5	S5-1	S1-5	y	0	25,518.00	0.59	2.10	0.85	6	1.32	8.05	5.42	M3-1	20000	0.0181	2	0.0363	0.1302	S5	S1-5	1.8862	79.2527	1.3209	2.0491
	S6		S6-3	y	y	0.00	0.00	0.00	0.85	6	1.11	6.00	5.95	M3-1	20000	0.0000	2	0.0000	0.0000	S6	S6-3	1.8834	66.3422	1.1057	0.0000
27	S6	S6-3	S6-2	y	0	49,502.00	1.14	1.14	0.85	6	1.11	7.11	5.65	M3-1	20000	0.0352	2	0.0703	0.0703	S6	S6-2	1.8834	66.3422	1.1057	1.1057
28	S6	S6-2	S6-1	y	0	44,340.00	1.02	2.15	0.85	6	0.15	8.21	5.39	M3-1	20000	0.0315	2	0.0630	0.1333	S6	S6-1	2.5219	9.2102	0.1535	2.2114
29	S6	S6-1	S2-3	y	0	3,099.00	0.07	2.23	0.85	6	0.93	8.36	5.35	M3-1	20000	0.0022	2	0.0044	0.1377	S6	S2-3	3.2334	55.6450	0.9274	2.3649
	S7		S7-1	y	y	0.00	0.00	0.00	0.85	6	1.11	6.00	5.95	M3-1	20000	0.0000	2	0.0000	0.0000	S7	S7-1	1.8834	66.3422	1.1057	0.0000
19	S7	S7-1	S2-1	y	0	79,477.00	1.82	1.82	0.85	6	0.16	7.11	5.65	M3-1	20000	0.0565	2	0.1129	0.1129	S7	S2-1	2.8440	9.7932	0.1632	1.1057
	S8		S8-4	y	y	0.00	0.00	0.00	0.85	6	1.07	6.00	5.95	M3-1	20000	0.0000	2	0.0000	0.0000	S8	S8-4	1.9451	64.2356	1.0706	0.0000
30	S8	S8-4	S8-3	y	0	42,041.00	0.97	0.97	0.85	6	1.48	7.07	5.66	M3-1	20000	0.0299	2	0.0597	0.0597	S8	S8-3	1.8153	88.8979	1.4816	1.0706
32	S8	S8-3	S8-2	y	0	64,050.00	1.47	2.44	0.85	6	1.41	8.55	5.31	M3-1	20000	0.0455	2	0.0910	0.1507	S8	S8-2	1.9107	84.7182	1.4120	2.5522
33	S8	S8-2	S8-1	y	0	35,711.00	0.82	5.01	0.85	6	0.18	9.96	5.01	M3-1	20000	0.0254	2	0.0507	0.3099	S8	S8-1	1.8937	10.8767	0.1813	3.9642
34	S8	S8-1	S2-5	y	0	1,473.00	0.03	6.60	0.85	6	1.11	10.15	4.97	M3-1	20000	0.0010	2	0.0021	0.4087	S8	S2-5	1.8834	66.3422	1.1057	4.1455
	S9		S9-2	y	y	0.00	0.00	0.00	0.85	6	1.11	6.00	5.95	M3-1	20000	0.0000	2	0.0000	0.0000	S9	S9-2	1.8834	66.3422	1.1057	0.0000
35	S9	S9-2	S9-1	y	0	58,096.00	1.33	1.33	0.85	6	0.80	7.11	5.65	M3-1	20000	0.0413	2	0.0825	0.0825	S9	S9-1	1.8357	47.7598	0.7960	1.1057
36	S9	S9-1	S8-2	y	0	18,227.00	0.42	1.75	0.85	6	1.41	7.90	5.46	M3-1	20000	0.0129	2	0.0259	0.1084	S9	S8-2	1.9107	84.7182	1.4120	1.9017
	S10		S10-1	y	y	0.00	0.00	0.00	0.85	6	1.65	6.00	5.95	M3-1	20000	0.0000	2	0.0000	0.0000	S10	S10-1	1.8858	99.1305	1.6522	0.0000
37	S10	S10-1	S8-1	y	0	68,058.00	1.56	1.56	0.85	6	0.18	7.65	5.52	M3-1	20000	0.0484	2	0.0967	0.0967	S10	S8-1	1.8937	10.8767	0.1813	1.6522
	S11		S11-3	y	y	0.00	0.00	0.00	0.85	6	1.19	6.00	5.95	M3-1	20000	0.0000	2	0.0000	0.0000	S11	S11-3	1.7746	71.3676	1.1895	0.0000
38	S11	S11-3	S11-2	y	0	79,664.00	1.83	1.83	0.85	6	1.19	7.19	5.63	M3-1	20000	0.0566	2	0.1132	0.1132	S11	S11-2	1.7533	71.2630	1.1877	1.1895
39	S11	S11-2	S11-1	y	0	33,667.00	0.77	2.60	0.85	6	1.66	8.38	5.35	M3-1	20000	0.0239	2	0.0478	0.1610	S11	S11-1	1.5682	99.5930	1.6599	2.3772
31	S11	S11-1	S8-3	y	0	51,453.00	1.18	14.18	0.85	6	1.48	10.04	4.99	M3-1	20000	0.0366	2	0.0731	0.8773	S11	S8-3	1.8153	88.8979	1.4816	4.0371
	S12		S12-4	y	y	0.00	0.00	0.00	0.85	6	1.37	6.00	5.95	M3-1	20000	0.0000	2	0.0000	0.0000	S12	S12-4	1.6717	82.2154	1.3703	0.0000
40	S12	S12-4	S12-3	y	0	117,618.00	2.70	2.70	0.85	6	0.46	7.37	5.59	M3-1	20000	0.0836	2	0.1671	0.1671	S12	S12-3	1.6920	27.4485	0.4575	1.3703
41	S12	S12-3	S12-2	y	0	2,571.00	0.06	2.76	0.85	6	0.95	7.83	5.48	M3-1	20000	0.0018	2	0.0037	0.1708	S12	S12-2	1.8155	56.7764	0.9463	1.8277
42	S12	S12-2	S12-1	y	0	34,351.00	0.79	3.55	0.85	6	0.52	8.77	5.26	M3-1	20000	0.0244	2	0.0488	0.2196	S12	S12-1	1.8741	31.4219	0.5237	2.7740
43	S12	S12-1	S11-1	y	0	6,670.00	0.15	3.70	0.85	6	1.66	9.30	5.14	M3-1	20000	0.0047	2	0.0095	0.2291	S12	S11-1	1.5682	99.5930	1.6599	3.2977
	S13		S13-2	y	y	0.00	0.00	0.00	0.85	6	1.32	6.00	5.95	M3-1	20000	0.0000	2	0.0000	0.0000	S13	S13-2	1.5757	79.2941	1.3216	0.0000
44	S13	S13-2	S13-1	y	0	41,450.00	0.95	0.95	0.85	6	1.39	7.32	5.60	M3-1	20000	0.0294	2	0.0589	0.0589	S13	S13-1	1.8371	83.3884	1.3898	1.3216
45	S13	S13-1	S1-8	y	0	45,871.00	1.05	2.00	0.85	6	1.55	8.71	5.27	M3-1	20000	0.0326	2	0.0652	0.1241	S13	S1-8	1.6045	92.9934	1.5499	2.7114
	S14		S14-3	y	y	0.00	0.00	0.00	0.85	6	1.28	6.00	5.95	M3-1	20000	0.0000	2	0.0000	0.0000	S14	S14-3	1.7302	77.0103	1.2835	0.0000
46	S14	S14-3	S14-2	y	0	52,347.00	1.20	1.20	0.85	6	1.54	7.28	5.61	M3-1	20000	0.0372	2	0.0744	0.0744	S14	S14-2	1.5654	92.4289	1.5405	1.2835
47	S14	S14-2	S14-1	y	0	43,564.00	1.00	6.66	0.85	6	0.25	8.82	5.25	M3-1	20000	0.0309	2	0.0619	0.4119	S14	S14-1	1.5727	15.1898	0.2532	2.8240
48	S14	S14-1	S11-1	y	0	1,571.00	0.04	6.69	0.85	6	1.66	9.08	5.19	M3-1	20000	0.0011	2	0.0022	0.4141	S14	S11-1	1.5682	99.5930	1.6599	3.0772
	S15		S15-3	y	y	0.00	0.00	0.00	0.85	6	0.78	6.00	5.95	M3-1	20000	0.0000	2	0.0000	0.0000	S15	S15-3	1.6005	46.8388	0.7806	0.0000

49	S15	S15-3	S15-2	y	0	99,632.00	2.29	2.29	0.85	6	1.32	6.78	5.74	M3-1	20000	0.0708	2	0.1416	0.1416		S15	S15-2	1.5757	79.2941	1.3216	0.7806
50	S15	S15-2	S15-1	y	0	82,805.00	1.90	4.19	0.85	6	0.87	8.10	5.41	M3-1	20000	0.0588	2	0.1177	0.2592		S15	S15-1	1.5425	52.3272	0.8721	2.1022
51	S15	S15-1	S14-2	y	0	11,554.00	0.27	4.45	0.85	6	1.54	8.97	5.21	M3-1	20000	0.0082	2	0.0164	0.2756		S15	S14-2	1.5654	92.4289	1.5405	2.9743
	S16		S16-2	y	y	0.00	0.00	0.00	0.85	6	0.63	6.00	5.95	M3-1	20000	0.0000	2	0.0000	0.0000		S16	S16-2	2.5210	37.8035	0.6301	0.0000
52	S16	S16-2	S16-1	y	0	82,566.00	1.90	1.90	0.85	6	0.15	6.63	5.78	M3-1	20000	0.0587	2	0.1173	0.1173		S16	S16-1	2.3543	9.0566	0.1509	0.6301
53	S16	S16-1	S2-10	y	0	1,304.00	0.03	1.93	0.85	6	1.51	6.78	5.74	M3-1	20000	0.0009	2	0.0019	0.1192		S16	S2-10	1.5760	90.5734	1.5096	0.7810

Appendix D

PROJECT SCHEDULE

WILLETS POINT
MSA PROJECT SCHEDULE
pg 1 of 1



EXHIBITS

SHEET NO. OF	PLAN NO. OF

VAN WICK EXPRESSWAY EXTENSION

FLUSHING AVENUE

NORTHERN BOULEVARD

WILLETS POINT BOULEVARD

PARCEL WILLETS POINT

PARCEL MTA

1820 1821 1822 1823 1824 1825 1826 1827 1828 1829 1830 1831 1832 1833

34TH AVENUE · 35TH AVENUE · 36TH AVENUE · 37TH AVENUE · 38TH AVENUE

126 PLACE · 127TH PLACE · 126TH STREET · 127TH STREET

STORM RUN U · STORM A

ROOSEVELT AVENUE

Scale: 100' 0 100' 200'

IN CHARGE _____ DESIGNED BY _____

DRAWN BY _____ CHECKED BY _____

CITY OF NEW YORK
ECONOMIC DEVELOPMENT CORPORATION

PROPOSED STORM SEWER SYSTEM
WILLETS POINT

EXHIBIT A

SHEET 1 OF 8	CONTRACT NO.

SHEET NO. OF	PLAN NO. OF

VAN WICK EXPRESSWAY EXTENSION

SOUTHBOUND

FLUSHING AVENUE

ROOSEVELT AVENUE

NORTHERN BOULEVARD (A.K.A. JACKSON AVENUE) (150' WIDE)

WILLETS POINT BOULEVARD

127TH PLACE

126 PLACE (50' WIDE)

127TH STREET (A.K.A. ADELINE STREET) (70' WIDE)

126TH STREET (50' WIDE) (A.K.A. HEWITT AVENUE)

126TH STREET (A.K.A. HEWITT AVENUE) (50' WIDE)

34TH AVENUE (A.K.A. 126TH STREET) (80' WIDE)

35TH AVENUE (A.K.A. 126TH STREET) (80' WIDE)

36TH AVENUE (A.K.A. 126TH STREET) (80' WIDE)

37TH AVENUE

36TH AVE.

PARCEL WILLETS POINT

PARCEL MTA

PUMP STATION LOCATION
AREA 8
25,731 SF

"AREA UNDER CONSTRUCTION – CITY FIELD (NEW BALLPARK)"

1820 1821 1822 1823 1824 1825 1826 1827 1828 1829 1830 1831 1832 1833

AREA 1 44,544 SF
AREA 2 25,915 SF
AREA 3 29,546 SF
AREA 4 29,426 SF
AREA 5 33,177 SF
AREA 6 23,362 SF
AREA 7 23,504 SF
AREA 8 25,731 SF
AREA 9 177,303 SF
AREA 10 139,411 SF
AREA 11 111,004 SF
AREA 12 91,115 SF
AREA 13 79,539 SF
AREA 14 82,952 SF
AREA 15 86,259 SF
AREA 16 82,525 SF
AREA 17 85,439 SF
AREA 19 79,477 SF
AREA 20 60,104 SF
AREA 21 46,954 SF
AREA 22 3,956 SF
AREA 23 45,177 SF
AREA 24 31,471 SF
AREA 25 66,113 SF
AREA 26 25,518 SF
AREA 27 49,502 SF
AREA 28 44,340 SF
AREA 29 3,099 SF
AREA 30 42,041 SF
AREA 31 51,453 SF
AREA 33 5,711 SF
AREA 34 773 SF
AREA 35 58,096 SF
AREA 36 18,227 SF
AREA 37 68,058 SF
AREA 38 79,664 SF
AREA 39 33,667 SF
AREA 40 117,618 SF
AREA 41 2,571 SF
AREA 42 34,351 SF
AREA 43 6,670 SF
AREA 44 41,450 SF
AREA 45 45,871 SF
AREA 46 52,347 SF
AREA 47 43,564 SF
AREA 48 1,570 SF
AREA 49 99,632 SF
AREA 50 82,805 SF
AREA 51 11,554 SF
AREA 53 1,304 SF

Scale: 100' 0 100' 200'

IN CHARGE _____ DESIGNED BY _____

DRAWN BY _____ CHECKED BY _____

CITY OF NEW YORK
ECONOMIC DEVELOPMENT CORPORATION

PROPOSED SANITARY SEWER SYSTEM WILLETS POINT

EXHIBIT B

SHEET 2 OF 8	CONTRACT NO.

SHEET NO. OF	PLAN NO. OF

NOTES:

1. VERTICAL DATUM NAVD88 (FEET).

2. LEGAL GRADES HAVE BEEN CONVERTED FROM QUEENS BOROUGH DATUM TO NAVD88 (FEET) FOR COMPARISON.

CITY OF NEW YORK
ECONOMIC DEVELOPMENT CORPORATION

LEGAL GRADE AND SURVEY COMPARISON
WILLETS POINT

EXHIBIT C

Scale: 100' 0 100' 200'

IN CHARGE _____ DESIGNED BY _____

DRAWN BY _____ CHECKED BY _____

SHEET 3 OF 8 | CONTRACT NO.

SHEET NO. OF	PLAN NO. OF

VAN WICK EXPRESSWAY EXTENSION

SOUTHBOUND

FLUSHING AVENUE

ROOSEVELT AVENUE

NORTHERN BOULEVARD (A.K.A. JACKSON AVENUE) (150' WIDE)

WILLETS POINT BOULEVARD (80' WIDE)

127TH PLACE (60' WIDE)

126 PLACE (60' WIDE)

127TH STREET (A.K.A. HAMMEL STREET) (70' WIDE)

126TH STREET (80' WIDE) (A.K.A. HEWITT AVENUE)

34TH AVENUE (A.K.A. BOWNE STREET) (80' WIDE)

35TH AVENUE (A.K.A. BOWNE STREET) (80' WIDE)

36TH AVENUE (80' WIDE)

37TH AVENUE (80' WIDE)

39TH AVE. (80' WIDE)

PARCEL WILLETS POINT

PARCEL MTA

1820 1821 1822 1823 1824 1825 1826 1827 1828 1829 1830 1831 1832 1833

AREA UNDER CONSTRUCTION – CITI FIELD (NEW BALLPARK)

NOTES:

1. THE HIGHLIGHTED AREA ON THIS MAP REPRESENTS THE AREA THAT WOULD NOT BE CAPTURED IN THE CONVEYANCE SYSTEM IF THE SITE REMAINED AT CURRENT EXISTING ELEVATIONS INSTEAD OF LEGAL GRADES

CITY OF NEW YORK
ECONOMIC DEVELOPMENT CORPORATION

AREA UNABLE TO REACH STORM CONVEYANCE SYSTEM IF SITE REMAINS AT CURRENT ELEVATIONS WILLETS POINT

EXHIBIT D

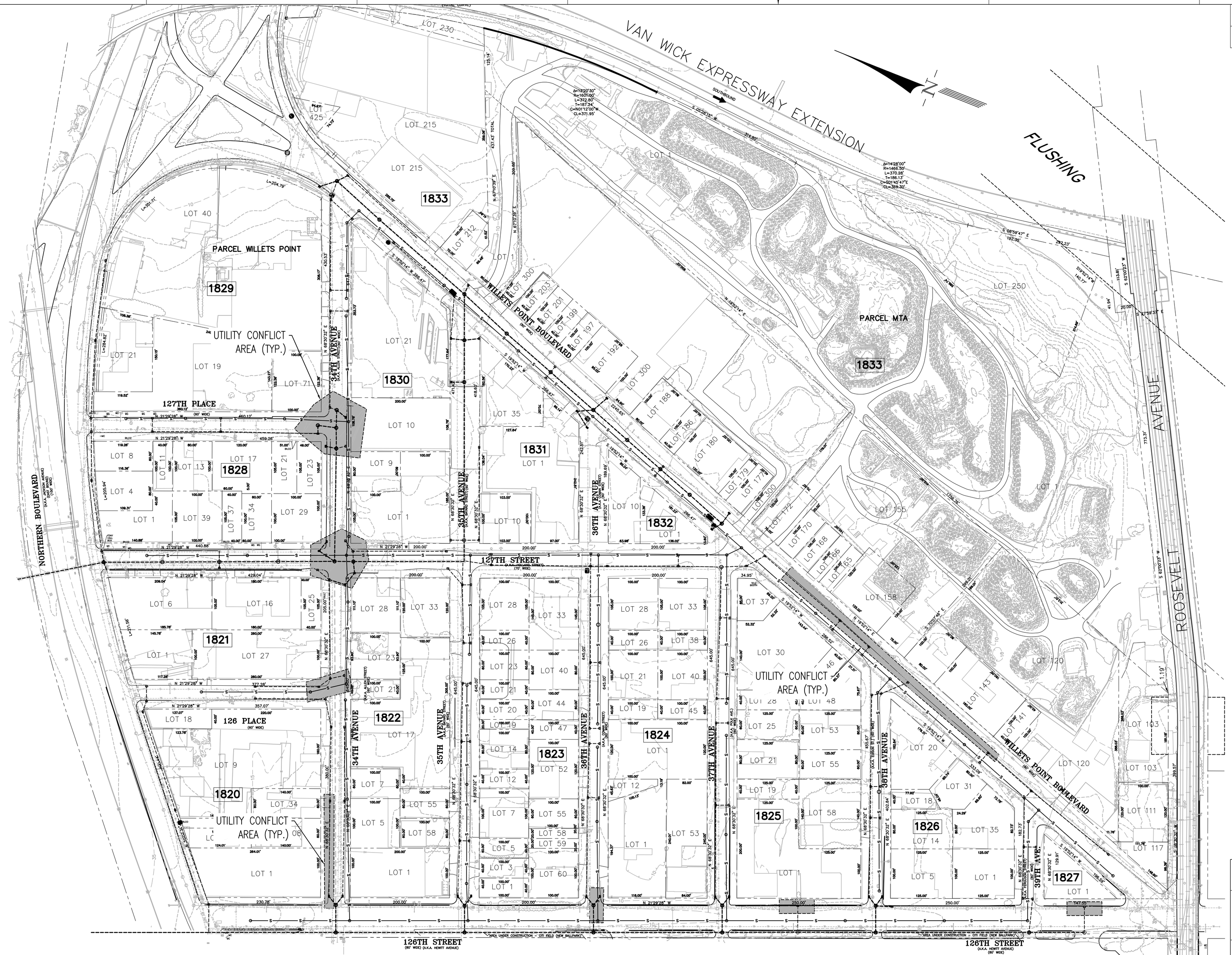
Scale: 100' 0 100' 200'

IN CHARGE _____ DESIGNED BY _____

DRAWN BY _____ CHECKED BY _____

SHEET 4 OF 8	CONTRACT NO.

SHEET NO. OF	PLAN NO. OF



NOTES:

1. VERTICAL DATUM NAVD88 (FEET).

2. LEGAL GRADES HAVE BEEN CONVERTED FROM QUEENS BOROUGH DATUM TO NAVD88 (FEET) FOR COMPARISON.

Scale: 100' 0 100' 200'

IN CHARGE _____ DESIGNED BY _____

DRAWN BY _____ CHECKED BY _____

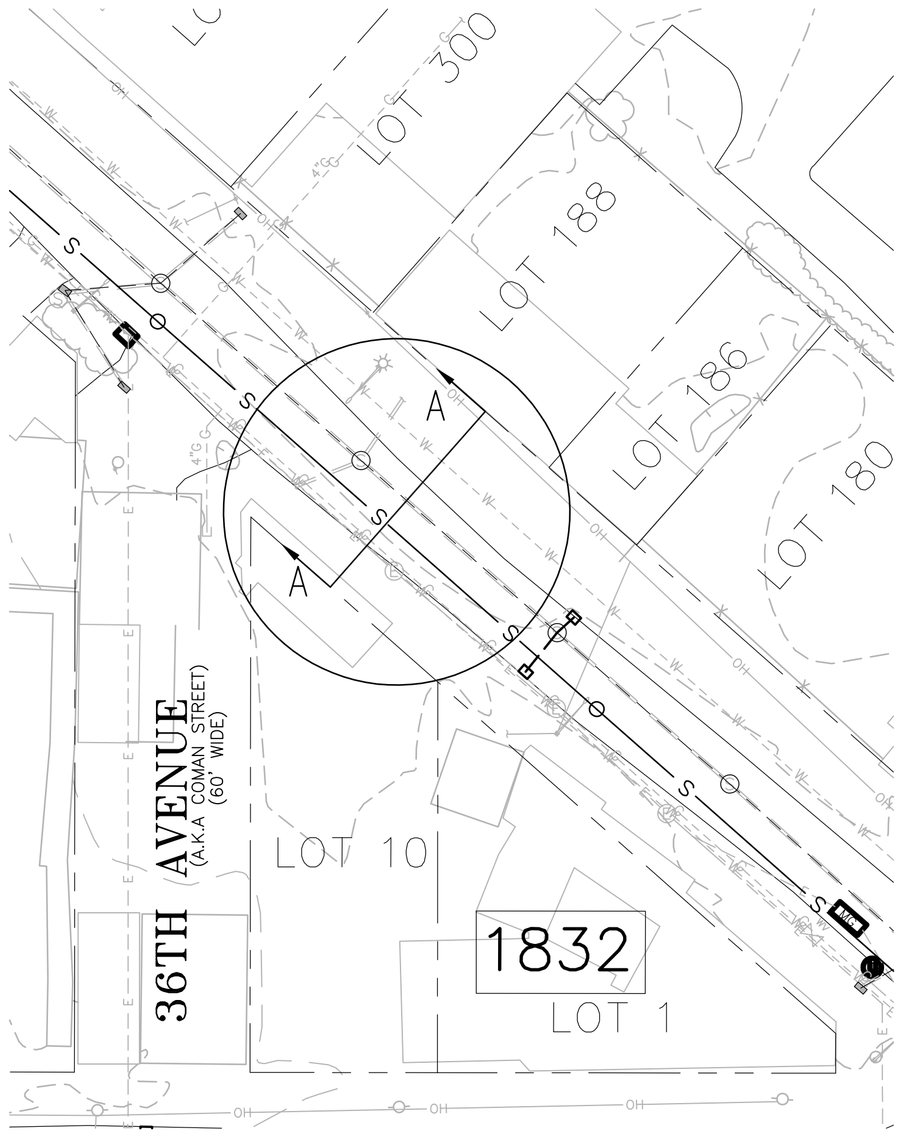
CITY OF NEW YORK
ECONOMIC DEVELOPMENT CORPORATION

PUBLIC AND PRIVATE UTILITY CONFLICTS WILLETS POINT

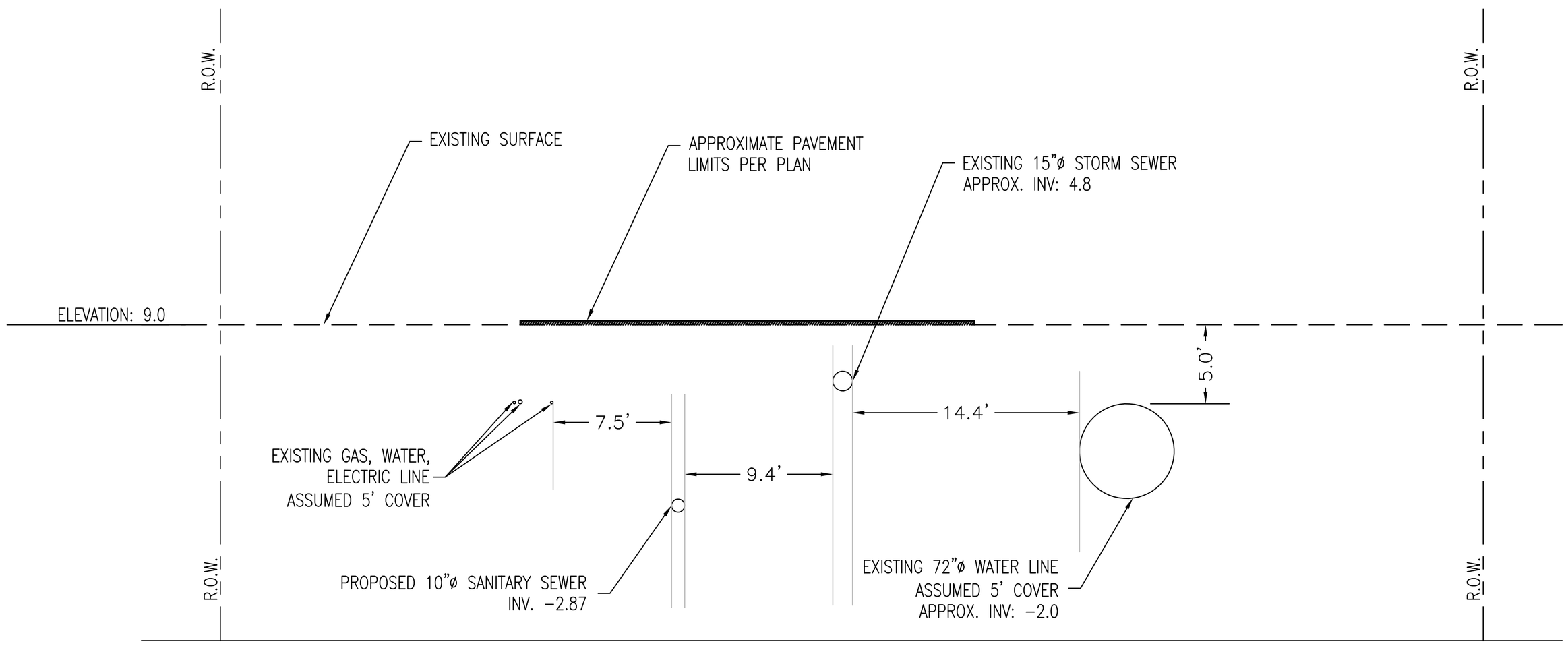
EXHIBIT E

SHEET 5 OF 8	CONTRACT NO.

SHEET NO. OF	PLAN NO. OF



SECTION A–A
PLAN VIEW
SCALE: 1" = 40'



CROSS SECTION A–A
SCALE: 1" = 5'

Scale: 100' 0 100' 200'

IN CHARGE _____ DESIGNED BY _____

DRAWN BY _____ CHECKED BY _____

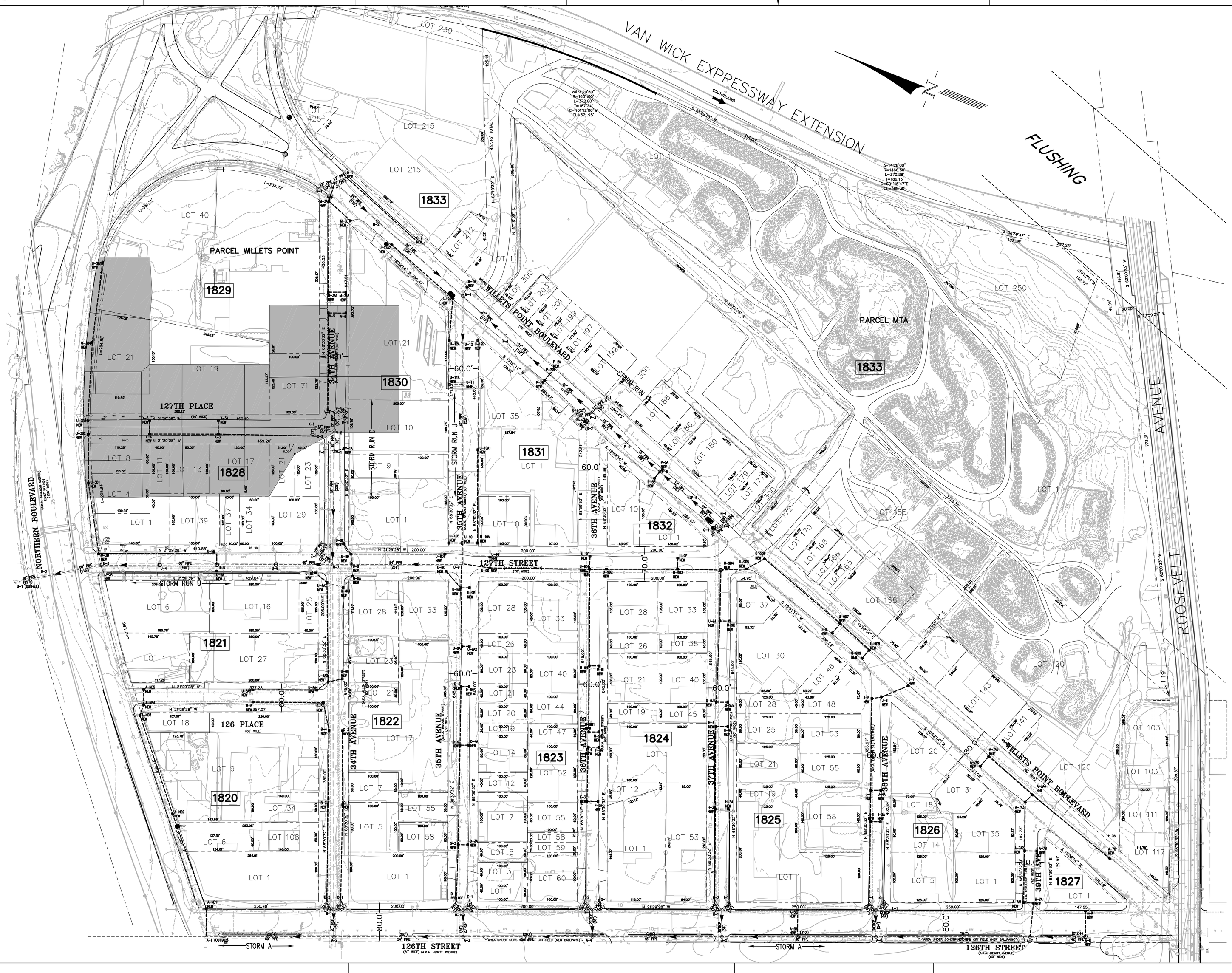
CITY OF NEW YORK
ECONOMIC DEVELOPMENT CORPORATION

TYPICAL CROSS SECTION
WILLETS POINT

EXHIBIT F

SHEET 6 OF 8	CONTRACT NO.

SHEET NO. OF	PLAN NO. OF



NOTES:

1. THE HIGHLIGHTED AREA ON THIS MAP REPRESENTS THE DRAINAGE AREA CAPTURED IF A NEW OUTFALL WAS CONSTRUCTED ON 127TH PLACE.

Scale: 100' 0 100' 200'

IN CHARGE _____ DESIGNED BY _____

DRAWN BY _____ CHECKED BY _____

CITY OF NEW YORK
ECONOMIC DEVELOPMENT CORPORATION

POSSIBLE NEW OUTFALL DRAINAGE AREA WILLETS POINT

EXHIBIT G

SHEET 7 OF 8	CONTRACT NO.

SHEET NO. OF	PLAN NO. OF

VAN WICK EXPRESSWAY EXTENSION

SOUTHBOUND

FLUSHING AVENUE

ROOSEVELT AVENUE

NORTHERN BOULEVARD (A.K.A. JACKSON AVENUE) (150' WIDE)

WILLETS POINT BOULEVARD (80' WIDE)

PARCEL WILLETS POINT

PARCEL MTA

1820 1821 1822 1823 1824 1825 1826 1827 1828 1829 1830 1831 1832 1833

LOT 1 LOT 4 LOT 6 LOT 8 LOT 9 LOT 10 LOT 18 LOT 21 LOT 28 LOT 35 LOT 37 LOT 40 LOT 46 LOT 53 LOT 120 LOT 155 LOT 158 LOT 215 LOT 230 LOT 250

126 PLACE (80' WIDE)

127TH PLACE (80' WIDE)

126TH STREET (80' WIDE) (A.K.A. HEWITT AVENUE)

127TH STREET (A.K.A. JOHN HENRY STREET) (70' WIDE)

126TH STREET (A.K.A. HEWITT AVENUE) (80' WIDE)

34TH AVENUE (A.K.A. 126TH STREET) (80' WIDE)

35TH AVENUE (A.K.A. 35TH PLACE) (80' WIDE)

36TH AVENUE (A.K.A. 127TH PLACE) (80' WIDE)

37TH AVENUE (A.K.A. CROSS ST.) (80' WIDE)

38TH AVENUE (A.K.A. TRIBOR STREET) (80' WIDE)

35TH AVE. (80' WIDE)

AREA UNDER CONSTRUCTION – CITI FIELD (NEW BALLPARK)

LG:12.2 SUR:10.8 DIFF:1.4

LG:11.1 SUR:10.7 DIFF:0.4

LG:12.8 SUR:13.0 DIFF:0.2

LG:12.9 SUR:13.0 DIFF:0.1

LG:11.4 SUR:9.1 DIFF:2.3

LG:11.6 SUR:11.8 DIFF:0.2

LG:12.3 SUR:13.0 DIFF:0.7

LG:10.2 SUR:11.1 DIFF:0.9

LG:11.6 SUR:10.0 DIFF:1.6

LG:9.0 SUR:9.1 DIFF:0.1

LG:13.0 SUR:13.0 DIFF:0.0

LG:12.1 SUR:12.9 DIFF:0.8

LG:12.1 SUR:11.3 DIFF:0.8

LG:12.8 SUR:11.3 DIFF:1.5

LG:10.5 SUR:8.2 DIFF:2.3

LG:12.1 SUR:10.0 DIFF:2.1

LG:11.8 SUR:8.7 DIFF:2.1

LG:10.1 SUR:7.5 DIFF:2.5

LG:12.4 SUR:12.1 DIFF:0.3

LG:10.7 SUR:10.9 DIFF:0.2

LG:10.4 SUR:10.3 DIFF:0.1

LG:10.5 SUR:10.1 DIFF:0.4

LG:10.9 SUR:9.9 DIFF:1.0

LG:10.1 SUR:9.1 DIFF:1.0

LG:10.1 SUR:8.2 DIFF:1.9

LG:11.4 SUR:8.0 DIFF:3.4

NOTES:

1. THE HIGHLIGHTED AREA ON THIS MAP REPRESENTS THE INDIVIDUAL LOTS THAT WOULD BE UNABLE TO DRAIN BY GRAVITY IF ROADS WERE CONSTRUCTED TO LEGAL GRADE ELEVATIONS.

Scale: 100' 0 100' 200'

IN CHARGE _____ DESIGNED BY _____

DRAWN BY _____ CHECKED BY _____

CITY OF NEW YORK
ECONOMIC DEVELOPMENT CORPORATION

LOTS UNABLE TO DRAIN WHEN ROADS CONSTRUCTED TO LEGAL GRADES WILLETS POINT

EXHIBIT H

SHEET 8 OF 8	CONTRACT NO.

Willets Point Infrastructure Opinion of Probable Cost - Municipal Services Alternative, August 22, 2008 - Exhibit "I"

In this estimate all roads remain in their current configuration and are public streets.

General Assumptions:

- All estimates are in 2008 dollars, construction costs have not been escalated for this estimate
- Construction costs associated with the development of individual parcels have not been included in this estimate.
- All roads have been filled to a resulting elevation equal to the legal grades currently on record with NYCDEP.
- Estimated costs represent environmental cleanup in accordance with all current regulations
- Estimated costs represent the installation of underground utilities, and street construction
- Costs for dewatering have not been included in this estimate however it may be necessary in some phases of construction due to shallow groundwater
- All construction will be built to NYC standards
- All utility estimates were based on an average size pipes, generic appurtenances and estimated lengths and depths, unless otherwise noted.
- Electrical estimates were based on generic distribution systems
- All infrastructure costs include materials and installation unless otherwise noted
- The following items including but not limited to; NYCDEP Discharge Permits, NYSDEC Wetland permits, USACE Waterfront Permitting, NYCDOS FMO Permit, NYSDEC SWPPP, NYSDEC Point Source Discharge Permit, Air Particulate Permit or any testing, reporting, labor, equipment and documentation required for these efforts are not included; timing for these efforts needs to be evaluated
- The estimate assumes that the project continues unabated, and on schedule
- No costs are included for coordination with structure erection, dewatering, archeological discovery or property purchase.
- There are also no costs associated with staged construction and coordination related to DOT, Con Edison, Phone/cable company/ Gas distribution system, the MTA, NYSDEC or NYSDEP.
- Subtotal values for items are rounded to the next $100,000
- There are no O&M costs associated with this effort as all streets are public.

Definitions:

Construction Cost (CC): Trade cost only. Does not include general conditions or overhead and profit

Design Cost: Assumes 10% of CC

CM/REI: Construction Manager/Resident Engineer. Assumes 10% of CC

General Conditions: Assumes 10% of CC. (This probably will need to be adjusted to include overhead and profit)

Contingency: Assumes 30% of CC unless otherwise noted.

Subtotal: Total cost of each major item i.e. Storm water, Roadwork, Electric, etc.

Sustainability Initiative: Identifies opportunities where including "green" infrastructure items should be investigated

Remediation: Clean up of environmental contamination required by city state of federal regulation of law and/or to be in compliance with existing State cleanup programs

Engineering Controls: Environmental mitigation methods used to remove potential for exposure to any existing or suspected contaminants (in compliance with existing State guidelines)

Item #	Item	Item Description	Detailed Assumptions	Units	Quantity	Lump Sum/ Unit Price	Construction Cost	Design Cost	CM/REI	General Conditions	Contingency	Subtotal
1	**Storm water**											**$80,000,000**
	1a) Onsite storm water system	i) 10in dia pipe	total length 63 ft assumes use of 39 ft of existing and replacement of 24 ft	linear foot	24	$107.35	$2,576	$258	$258	$258	$773	$4,122
		ii) 12in dia pipe	total length 4601 ft assumes use of 817 ft of existing and replacement of 3784 ft	linear foot	3,784	$120.95	$457,693	$45,769	$45,769	$45,769	$137,308	$732,309
		iii) 15in dia pipe	total length 1926 ft assumes use of 40 ft of existing and replacement of 1886 ft	linear foot	1,886	$143.93	$271,474	$27,147	$27,147	$27,147	$81,442	$434,358
		iv) Piles	Cost for 16 in pile supports have been assumed for all piping less than 16inches (Zone one assumed at 55%, Zone 2 at 45% = 88ft/pile)	pile footage	125,275	$70.00	$8,769,222	$876,922	$876,922	$876,922	$2,630,767	$14,030,755
		v) 18in dia pipe	total length 2518 ft assumes use of 0 ft of existing and replacement of 2518 ft	linear foot	2,518	$171.28	$431,245	$43,125	$43,125	$43,125	$129,374	$689,993
		vi) 20in dia pipe	total length 164 ft assumes use of 55 ft of existing and replacement of 109 ft	linear foot	109	$192.97	$21,024	$2,102	$2,102	$2,102	$6,307	$33,639
		vii) 21 in dia pipe	total length 0 ft assumes use of 0 ft of existing and replacement of 0 ft	linear foot	0	$205.19	$0	$0	$0	$0	$0	$0
		viii) 24 in dia pipe	total length 1893 ft assumes use of 344 ft of existing and replacement of 1549 ft	linear foot	1,549	$244.18	$378,227	$37,823	$37,823	$37,823	$113,468	$605,164
		ix) Piles	Cost for 24 in pile supports have been assumed for all piping between 16 and 24 inches (Zone one assumed at 55%, Zone 2 at 45% = 88ft/pile)	pile footage	91,865	$70.00	$6,430,578	$643,058	$643,058	$643,058	$1,929,173	$10,288,925
		x) 30 in dia pipe	total length 253 ft assumes use of 0 ft of existing and replacement of 253 ft	linear foot	253	$336.96	$85,329	$8,533	$8,533	$8,533	$25,599	$136,527
		xi) 36 in dia pipe	total length 254 ft assumes use of 0 ft of existing and replacement of 254 ft	linear foot	254	$465.00	$117,910	$11,791	$11,791	$11,791	$35,373	$188,656
		xii) Piles	Cost for 36 in pile supports have been assumed for all piping between 24 and 36 inches (Zone one assumed at 55%, Zone 2 at 45% = 88ft/pile)	pile footage	12,934	$70.00	$905,353	$90,535	$90,535	$90,535	$271,606	$1,448,565
		xiii) 42 in dia pipe	total length 651 ft assumes use of 0 ft of existing and replacement of 651 ft	linear foot	651	$641.69	$417,734	$41,773	$41,773	$41,773	$125,320	$668,374
		xiv) 48 in dia pipe	total length 879 ft assumes use of 727 ft of existing and replacement of 152 ft	linear foot	152	$885.53	$134,866	$13,487	$13,487	$13,487	$40,460	$215,786
		xv) 54 in dia pipe	total length 858 ft assumes use of 743 ft of existing and replacement of 115 ft	linear foot	115	$1,222.02	$140,227	$14,023	$14,023	$14,023	$42,068	$224,363
		xvi) 60 in dia pipe	total length 1389 ft assumes use of 1271 ft of existing and replacement of 118 ft	linear foot	118	$1,686.38	$199,684	$19,968	$19,968	$19,968	$59,905	$319,495
		xvii) Piles	Cost for 36 in pile supports have been assumed for all piping between 24 and 36 inches (Zone one assumed at 55%, Zone 2 at 45% = 88ft/pile)	pile footage	40,131	$70.00	$2,809,194	$280,919	$280,919	$280,919	$842,758	$4,494,711
		xviii) Manholes	Assumes 123 new manholes and replacement of 31 existing	manhole	154	$4,025.00	$619,850	$61,985	$61,985	$61,985	$185,955	$991,760
		xiiii) Disposal of material displaced during excavation	assumes that material removed/displaced during pipe installation with have to be disposed of in accordance with all applicable NYS regulations	tons	11,811	$125.00	$1,476,385	$147,638	$147,638	$147,638	$442,915	$2,362,215
		xx) Detention	There has been no detention analysis for this effort as it is usually a private responsibility and would not be located in public streets or rights of way.	linear foot	0	$280.00	$0	$0	$0	$0	$0	$0
	1b)Offsite storm outfalls 126th Street and 127th Street	i)Demo 60" Pipe for Replacement	Demo approximately 1,050 feet of 60" existing pipe	linear foot	1050	$200.00	$210,000	$21,000	$21,000	$21,000	$63,000	$336,000
		ii) Replace 60" Pipe with 4' x 7' Concrete Box Section	Replace approximately 730 feet of 60" existing pipe with 4' x 7' concrete box sections	linear foot	730	$3,000.00	$2,190,000	$219,000	$219,000	$219,000	$657,000	$3,504,000
		iii) Replace 60" Pipe with 4' x 8' Concrete Box Section	Replace approximately 320 feet of 60" existing pipe with 4' x 8' concrete box sections	linear foot	320	$3,200.00	$1,024,000	$102,400	$102,400	$102,400	$307,200	$1,638,400
		iv) Pile Supports	Assumes the same pile support as the 60in pipe	pile footage	40,656	$70.00	$2,845,920	$284,592	$284,592	$284,592	$853,776	$4,553,472
	1c) Offsite storm water quality treatment devices	i) Treatment unit	Assumes no property acquisition costs	lump sum	2	$10,000,000.00	$20,000,000	$2,000,000	$2,000,000	$2,000,000	$6,000,000	$32,000,000
2	**Sanitary Sewer**		It is assumed that the current DEP treatment plant has the capacity to, and will accept the additional flow and that the current CSO configuration is adequate and will still meet the permit requirements.									**$57,500,000**
	2a)New Sanitary Sewage Pump Station	i) Pump Station Design Assumptions	Approximately 2.8 MGD of sanitary flow only will travel by gravity sewer to a new pump station located within the WP district. The station footprint is 30 feet x 30 feet and the depth below grade is assumed to be 20 feet. The pump station is was assumed to located toward the middle of the WP District. The station will be designed to handle potential future flow from the area north of the WP District along Flushing Bay. This scheme was chosen because NYCDEP stated that the existing pump station at 114th Street cannot take any addition sanitary flow. A 50% contingency has been added to this item due to complexity of design and alternative scenario analysis. $500,000 has been added for foundation costs. $125,000 was added for the increase in material disposal costs. Assumes no property acquisition costs.	lump sum	1	$8,925,000.00	$8,925,000	$892,500	$892,500	$1,874,250	$4,462,500	$17,046,750
	2b)Offsite connection from WP District pump station to 108th or Ditmars	i) 12" DIP Force main	All sanitary flow from the WP District Pump station to a discharge pressure relief manhole in either 108th Street or Ditmars Boulevard will be by force main along property owned or controlled by NYC. Assume sewer installation by trenching. $500,000 added for the import and export of soils with the increase in fuel costs	linear foot	5,000	$825.00	$4,625,000	$462,500	$462,500	$971,250	$1,387,500	$7,908,750
		ii) Installation under the Grand Central Parkway	Install/micro tunnel a 24-inch sleeve line under the Grand Central Parkway	linear foot	400	$1,500.00	$600,000	$60,000	$60,000	$126,000	$180,000	$1,026,000
		iii) Disposal of material displaced during excavation	assumes that material removed/displaced during pipe installation with have to be disposed of in accordance with all applicable NYS regulations	tons	6,417	$125.00	$802,083	$80,208	$80,208	$80,208	$240,625	$1,283,333
	2c)Onsite sanitary sewer system	i) 10 in dia pipe		linear foot	9,193	$223.66	$2,056,075	$205,608	$205,608	$431,776	$616,823	$3,515,888
		ii) 12 in dia pipe		linear foot	431	$264.19	$113,855	$11,386	$11,386	$23,910	$34,157	$194,693
		iii) Manholes		manhole	54	$4,025.00	$217,350	$21,735	$21,735	$45,644	$65,205	$371,669
		iv) Piles	Cost for 16 in pile supports have been assumed for all piping less than 16inches (Zone one assumed at 55%, Zone 2 at 45% = 88ft/pile)	Pile Footage	211,724	$70.00	$14,820,683	$1,482,068	$1,482,068	$1,482,068	$4,446,205	$23,713,092
		v) Disposal of material displaced during excavation	assumes that material removed/displaced during pipe installation with have to be disposed of in accordance with all applicable NYS regulations	tons	11,976	$125.00	$1,497,039	$149,704	$149,704	$149,704	$449,112	$2,395,262
3	**Road Work**											**$14,300,000**
	3a)Road Construction	i) Paving material including DOT sub-base and grading	The estimate includes a NYCDOT engineered pavement that will be necessary in order to accommodate site settling. These costs are based on existing supply and current petroleum costs. The street width has been estimated to be approximately 60ft.	square foot	727,610	$6.50	$4,729,465	$472,947	$472,947	$472,947	$1,418,840	$7,567,144
	3b)Street lighting	i) Lights and light poles	Light spacing assumed to be 1 light every 150 feet.	light pole	75	$7,875.00	$587,685	$58,769	$58,769	$58,769	$176,306	$940,296
	3c)Sidewalks and curbs	i) Concrete Sidewalk	Assumes all sidewalks and curbs will have to be replaced to their current state of disrepair and that they will be 10ft wide	square foot	223,880	$8.00	$1,791,040	$179,104	$179,104	$179,104	$537,312	$2,865,664
		ii) Steel faced concrete curb	Assumes all sidewalks and curbs will have to be replaced to their current state of disrepair	linear foot	22,388	$55.00	$1,231,340	$123,134	$123,134	$123,134	$369,402	$1,970,144
	3d)Street Trees and Tree Pits	i) Trees	A tree will be planted every 20 linear feet of street.	tree	560	$790.00	$442,163	$44,216	$44,216	$44,216	$132,649	$707,461
		ii) Tree pit pavers	It is assumed 3 square yards of tree pit pavers will be used for each tree	square yard	1,679	$55.00	$92,351	$9,235	$9,235	$9,235	$27,705	$147,761
	3e)Signage	i) Willets Point signage	Each intersection is assumed to have 5 signs and 20 on-site intersections were counted, in addition a sign every 100 linear feet a street will be installed.	sign	223	$250.00	$55,673	$5,567	$5,567	$5,567	$16,702	$89,076
4	**Water**		No piles will be assumed to be needed for the 20" piping. It is assumed that the 72" distribution pipe will remain in Willets Point Blvd. and will be tapped for service. Costs assume mechanical joints for all pipe. All pipe will have approximately 4 ft of cover. $20 linear foot added for shoring excavations. General Conditions for this section have been increased to 21% (10% profit & 10% overhead)									**$13,600,000**
	4a)Domestic water mains	i) 20" DIP	Prices include building connections. Water demand was based on assumed rates for sewage consumption for each building type. For this cost estimate a mean water pipe diameter of 20-inch was assumed.	linear foot	13,496	$513.00	$6,923,397	$692,340	$692,340	$1,453,913	$2,077,019	$11,839,008
		ii) Tap	Cost to tap the 72" line for domestic and fire use in the district.	lump sum	1	$150,000.00	$150,000	$15,000	$15,000	$15,000	$45,000	$240,000
		iii) Disposal of material displaced during excavation	assumes that material removed/displaced during pipe installation with have to be disposed of in accordance with all applicable NYS regulations	tons	7,198	$125.00	$899,727	$89,973	$89,973	$89,973	$269,918	$1,439,563

Willets Point Infrastructure Opinion of Probable Cost - Municipal Services Alternative, August 22, 2008 - Exhibit "I"

In this estimate all roads remain in their current configuration and are public streets.

General Assumptions:

- All estimates are in 2008 dollars, construction costs have not been escalated for this estimate
- Construction costs associated with the development of individual parcels have not been included in this estimate.
- All roads have been filled to a resulting elevation equal to the legal grades currently on record with NYCDEP.
- Estimated costs represent environmental cleanup in accordance with all current regulations
- Estimated costs represent the installation of underground utilities, and street construction
- Costs for dewatering have not been included in this estimate however it may be necessary in some phases of construction due to shallow groundwater
- All construction will be built to NYC standards
- All utility estimates were based on an average size pipes, generic appurtenances and estimated lengths and depths, unless otherwise noted.
- Electrical estimates were based on generic distribution systems
- All infrastructure costs include materials and installation unless otherwise noted
- The following items including but not limited to; NYCDEP Discharge Permits, NYSDEC Wetland permits, USACE Waterfront Permitting, NYCDOS FMO Permit, NYSDEC SWPPP, NYSDEC Point Source Discharge Permit, Air Particulate Permit or any testing, reporting, labor, equipment and documentation required for these efforts are not included; timing for these efforts needs to be evaluated
- The estimate assumes that the project continues unabated, and on schedule
- No costs are included for coordination with structure erection, dewatering, archeological discovery or property purchase.
- There are also no costs associated with staged construction and coordination related to DOT, Con Edison, Phone/cable company/ Gas distribution system, the MTA, NYSDEC or NYSDEP.
- Subtotal values for items are rounded to the next $100,000
- There are no O&M costs associated with this effort as all streets are public.

Definitions:

Construction Cost (CC): Trade cost only. Does not include general conditions or overhead and profit
Design Cost: Assumes 10% of CC
CM/REI: Construction Manager/Resident Engineer. Assumes 10% of CC
General Conditions: Assumes 10% of CC. (This probably will need to be adjusted to include overhead and profit)
Contingency: Assumes 30% of CC unless otherwise noted.
Subtotal: Total cost of each major item i.e. Storm water, Roadwork, Electric, etc.
Sustainability Initiative: Identifies opportunities where including "green" infrastructure items should be investigated
Remediation: Clean up of environmental contamination required by city state of federal regulation of law and/or to be in compliance with existing State cleanup programs
Engineering Controls: Environmental mitigation methods used to remove potential for exposure to any existing or suspected contaminants (in compliance with existing State guidelines)

Item #	Item	Item Description	Detailed Assumptions	Units	Quantity	Lump Sum/ Unit Price	Construction Cost	Design Cost	CM/REI	General Conditions	Contingency	Subtotal
5	**Electric**		All infrastructure will be built to ConEd specifications and it is assumed that there will be no pile support needed for electrical cables and feeders. These Costs do not include the relocation of the electrical feeders currently located in 34th Ave. and Willets Point Blvd. or the relocation of the exiting 6 transformers located in parcel A-20.									**$6,000,000**
	5a) Electric utility and distribution system.	i) Medium voltage distribution cabling.	Includes Medium voltage dist cabling in order to move the lines underground	linear foot	33,582	$85.00	$2,692,800	$269,280	$269,280	$269,280	$807,840	$4,308,480
		ii) Cutover	Assumes 160 man-hours per cutover and assumes 2 cutovers will have to take place to run new distribution cabling underground	cutover	2	$32,000.00	$64,000					
		iii) Disposal of material displaced during excavation	assumes that material removed/displaced during pipe installation with have to be disposed of in accordance with all applicable NYS regulations	tons	7,960	$125.00	$995,022	$99,502	$99,502	$99,502	$298,507	$1,592,036
6	**Telecom**											**$0**
	6a) Telephone System		All infrastructure will be provided by others	linear foot		$0.00	$0	$0	$0	$0	$0	$0
	6b)Cable/broadband system		All infrastructure will be provided by others	linear foot		$0.00	$0	$0	$0	$0	$0	$0
7	**Gas**		Gas line installations are assumed to be incompliance with standard ConEd requirements.									**$5,600,000**
	7a)Onsite 6"gas distribution network	i) Pipes and valves		lump sum	1	$500,000.00	$500,000	$50,000	$50,000	$50,000	$150,000	$800,000
		ii) Trenching and bedding		lump sum	1	$900,000.00	$900,000	$90,000	$90,000	$90,000	$270,000	$1,440,000
		iii) Labor		lump sum	1	$1,300,000.00	$1,300,000	$130,000	$130,000	$130,000	$390,000	$2,080,000
		iv) Engineering and management		lump sum	1	$300,000.00	$300,000	$30,000	$30,000	$30,000	$90,000	$480,000
		v) Disposal of material displaced during excavation	assumes that material removed/displaced during pipe installation with have to be disposed of in accordance with all applicable NYS regulations	tons	3,980	$125.00	$497,511	$49,751	$49,751	$49,751	$149,253	$796,018
8	**Demolition**		Existing Conditions based on NYCDOF RPAD 2005; business information provided by the NYCEDC.									**$5,000,000**
	8a) Roadway removal	i) Pavement removal	Existing average road width is 65ft. Only pavement removal is included in this cost no soil removal. Estimated costs for sidewalk removal are less than or equivalent to road removal and have been incorporated into this cost.	square foot	727,610	$3.00	$2,182,830	$0	$109,142	$218,283	$654,849	$3,165,104
		ii) Structure/utility removal (light posts etc.)	There are minimal above ground utilities currently in the area. Lump sum includes approximately 75 street lights and $25,000 for various other structures/surface utilities.	lump sum	1	$100,000.00	$100,000	$0	$10,000	$10,000	$30,000	$150,000
		iii) Curb removal	Assumes that 75% of the existing area roads have curbs	linear foot	16,791	$4.00	$67,164	$0	$6,716	$6,716	$20,149	$100,746
	8b)Utility shut-off	i) Shutting off and abandoning all existing utilities	Shut off of utilities parcel wide. This cost does not account for the shut off and transfer of trunk and distribution lines (electric feeders, 24" gas main or 72" water line). 500,000 has been added for the removal and disposal of the existing storm sewer lines	lump sum	1	$1,000,000.00	$1,000,000	$0	$100,000	$100,000	$300,000	$1,500,000
9	**Remediation**		Cleanup costs based on phase II recommended strategy.									**$1,700,000**
	9a) Catch Basin Removal	i) Removal of catch basin and associated contaminated soil	Removal of 30 catch basins 15 with associated contamination	day	15	$2,000.00	$30,000	$3,000	$3,000	$3,000	$9,000	$48,000
		ii) Material Sampling	Disposal samples require 1 per 500 tons with an addition 6 end point samples per building	sample	915	$750.00	$685,913	$68,591	$68,591	$68,591	$205,774	$1,097,460
		iii) Material Removal	Removal of 50cyds per dry well is required. 50% of the material will be classified hazardous and 50% will be classified petroleum contaminated. Removal includes sanitary septic tanks and floor drains. (numbers have changed to include the increase in disposal cost)	tons	1,275	$225.25	$287,194	$28,719	$28,719	$28,719	$86,158	$459,510
10	**Site Fill**											**$3,500,000**
	10a)Standard Fill (density of approximately 125pcf)	i) Fill for roadways	Assumes standard fill in order to bring the site back to the legal grades identified by NYCDEP. This does not include fill to correct for any drainage problems created on private parcels due to filling in the ROWs.	cubic yards	30,000	$30.00	$900,000	$90,000	$90,000	$90,000	$270,000	$1,440,000
		ii) Spreading and compacting		cubic yards	30,000	$5.00	$150,000	$15,000	$15,000	$15,000	$45,000	$240,000
		iii) Replacement Fill	Includes the fill displaced during remediation and utility installation and demolition	cubic yards	31,636	$30.00	$949,071	$94,907	$94,907	$94,907	$284,721	$1,518,514
		iii) Spreading/ compacting		cubic yards	31,636	$5.00	$158,179	$15,818	$15,818	$15,818	$47,454	$253,086
	Construction Subtotal											**$187,200,000**

$190,000,000
Total Project Cost