Chapter 11: WATER AND SEWER INFRASTRUCTURE

11.1 Introduction

This chapter assesses the potential effects of the proposed action on the City's water supply, sanitary sewage, and storm water management infrastructure in accordance with the *CEQR Technical Manual.* The purpose of the Water and Sewer Infrastructure analysis is to determine whether the proposed action may adversely affect the City's water distribution or sewer systems.

As described in Chapter 1, "Project Description," and Chapter 2, "Land Use, Zoning, and Public Policy," much of the developed area surrounding the project site has been undergoing development since the late 1990s. As described in Chapter 9, "Natural Resources," the project site and the surrounding area are located within the Jamaica Bay Watershed, which includes wetlands and other natural resources. The topography of the project site and surrounding area is relatively flat, and all the developed areas are properly served by existing water supply and separate sanitary and storm sewers, as documented by New York City Department of Environmental Protection ("NYCDEP").

The Brooklyn Developmental Center ("BDC"), including the project site, has a total area of approximately 34.3 acres, and approximately 165,000 square feet of the parcel is occupied by buildings. The BDC property contains non-permeable surface areas of approximately 16 acres, equivalent to approximately 47 percent of the property. The property includes administrative offices with 200 workers that contribute to the water and sanitary sewage generation existing at the site.

The proposed action would not result in an exceptionally large demand for water (e.g., one million gallons per day or more), and is not located in an area known to have consistently low water pressure; therefore, a detailed water supply assessment is not warranted, per the guidance of the *CEQR Technical Manual*. However, the proposed action would introduce a mixture of land uses in amounts greater than the thresholds provided in the *CEQR Technical Manual,* thereby warranting a preliminary wastewater/ stormwater analysis. The preliminary analysis of sewers focuses on the effects of increased sanitary and stormwater flows on the City's infrastructure serving the site. The sanitary sewage generation and its impact on wastewater treatment are also analyzed in this chapter.

The stormwater management infrastructure is expected to experience an increase in runoff flow as a result of increasing the non-permeable surface area to approximately 21.5 acres, equivalent to approximately 64 percent of the BDC property. The impact of this increase in flowrate is analyzed herein. In addition, this chapter presents calculations of the Water Quality Volume ("WQv") as the design

parameter for potential non-structural stormwater management practices to be implemented as part of the proposed action. The *New York State Stormwater Management ("NYS SWM") Design Manual* (January 2015) is used for this calculation, as required in the *CEQR Technical Manual*. The proposed action includes stormwater treatment systems to be designed following the Design Manual. The *NYC Green Infrastructure Plan (2011 Update)* is referenced herein in the context of its objective of properly managing stormwater quality.

11.2 Principal Conclusions

The proposed action would not result in a significant adverse impact on the water, sanitary, and stormwater management infrastructure, as presented below for each category.

WATER

The proposed action would add approximately 316,535 gallons per day ("GPD") of water demand in 2028. The project-generated increment in water demand would be less than 0.02 percent of New York City's average daily demand of 1.2 billion GPD. This demand does not represent an exceptionally large demand for water, and therefore would not result in a significant adverse impact to the water supply system or its ability to adequately deliver water to New York City or Brooklyn.

SANITARY SEWERS AND WASTEWATER TREATMENT

The proposed action would generate approximately 295,706 GPD of sanitary sewage in 2028. This projected increase in wastewater flow would not have a significant adverse impact on the ability of the sewage collection system to convey water to the 26th Ward Wastewater Treatment Plant ("WWTP"), or on treatment performance and the WWTP's projected compliance status upon completing ongoing facility upgrades. The 26th Ward WWTP is currently subject to a Consent Order with New York State Department of Environmental Conservation ("NYSDEC") that requires actions to bring the WWTP into compliance with the State Pollutant Discharge Elimination System ("SPDES") permit. The actions required by the Consent Order are being implemented by means of a capital improvement project. It is important to recognize that some of the non-compliance problems are a result of the impact of wet weather flow handling at the facility, which is influenced by combined sewers that exist outside the project site.

STORMWATER AND DRAINAGE MANAGEMENT

The proposed action would result in an increase in runoff quantity from the project site when compared to existing conditions. However, a significant adverse impact would be avoided by implementing Stormwater Management Practices ("SMPs") and adopting a Stormwater Pollution Prevention Plan

("SWPPP") that would be prepared for the proposed action in compliance with the standards of NYSDEC. The SMPs would include structural improvements as part of the proposed action, including runoff detention tanks with flowrate control structures to mitigate this increment in flow.

Stormwater quality impacts as a result of the anticipated increment in flow would also be addressed as part of the proposed action. WQv calculations result in 0.20 acre-feet ("ac-ft") for Parcel A, and 0.41 ac-ft for Parcel B, using the procedure in Chapter 4: Unified Stormwater Sizing Criteria of the *NYS SWM Design Manual*. Treatment for the calculated WQvs would be provided using non-structural SMPs, which are expected to include green roofs; the open space comprising Schroeders Walk on Parcel B, would include planting areas. Therefore, the proposed action would not result in significant adverse impacts on the natural and built stormwater management systems of the region.

11.3 Methodology

The *CEQR Technical Manual* provides the following specific guidelines that are applicable to the proposed action, for the assessment of impacts on water, sewer and stormwater infrastructure.

- Water Supply – An analysis of an action's impact on the New York City water supply system should be conducted only for actions that would have an exceptionally large demand for water, such as power plants, very large cooling systems, or large developments (e.g., those that use more than one million gallons per day ("MGD")). In addition, an analysis should be done for actions located in areas that experience low water pressure, such as at the end of the water distribution system. None of these conditions are a concern for the proposed action. This chapter will document the estimated water demand and connection points needed for the proposed action.

- Sewage and stormwater conveyance – Because the City is committed to adequately treating all wastewater generated in the City, and to maintaining its WWTPs at or below the capacity permitted by applicable state and federal permits, orders, and decrees, only unusual actions with very large flows could have the potential for significant impacts on sewage treatment capacity. The City's sewers are sized and designed based on the designated zoning for an area, related population density, and surface coverage characteristics. Projects that greatly increase density or that could substantially increase impervious surfaces merit further analysis for potential impacts to the City's wastewater and stormwater infrastructure. However, to require further analysis, the *CEQR Technical Manual* establishes the following conditions*:*
    1. For separate sewered areas and projects in R7A Zoning Districts, the threshold for requiring further analysis is projects with at least 100 residential units or 100,000 square feet of commercial/retail area.
    2. Projects that involve the development of an area of five acres or larger.
    3. Projects located in the Jamaica Bay Watershed.

All of these conditions are met or exceeded by the proposed action; therefore, the incremental flow of sewage and stormwater runoff are assessed.

To analyze impacts on sanitary infrastructure, sewage generation calculations are made using unit demand factors published in the *CEQR Technical Manual*, and population or area of development. The evaluation of impacts on stormwater management infrastructure includes calculation of stormwater runoff flows using a methodology known as the Rational Method, Q=CiA, where "C" is a runoff coefficient based on impermeability of the soil in the subject area, "i" is the storm intensity, and "A" is the area of the parcel generating the desired runoff flow. The matrix found in the *CEQR Technical Manual* for this purpose is used to calculate the weighted "C" coefficient for each condition of analysis: existing (which is assumed to be the same in the future without the proposed action), and in the future with the proposed action. The weighted "C" coefficient is a single number used in runoff flow calculations that represents the combined permeability conditions for either the existing/No Action conditions, or With Action conditions.

In addition, the Jamaica Bay Watershed Protection Plan, developed pursuant to Local Law 71 of 2005, and applicable to projects located within the Jamaica Bay Watershed is intended to provide an evaluation of the current and future threats to Jamaica Bay, and ensure that environmental remediation and protection efforts are coordinated in a focused and cost-effective manner. Projects to which the Jamaica Bay Watershed Protection Plan applies must complete the Jamaica Bay Watershed Protection Plan Project Tracking Form to document the conditions of the site, including groundwater, habitat, and surface coverage, and to describe the proposed area of ground disturbance and proposed stormwater management practices (see Appendix G).

The following methodology is used in this chapter to accomplish the preliminary impact analysis pursuant to the *CEQR Technical Manual*:

1. Provide a description of the existing water supply network currently serving the project site; and, using water demand rates from the *CEQR Technical Manual*, calculate the proposed action's incremental increase in water demand for the analysis year.
    - Since preliminary calculations indicate that no adverse impact is expected from the proposed action, the analysis information is provided for documentation purposes and no further analysis is required.
2. Provide data on the existing flows to the 26th Ward WWTP for the latest 12-month period; provide SPDES permit compliance information, and capital improvement projects being considered; estimate the proposed action's projected sanitary sewage generation; and, assess the proposed action's effects on the local sanitary sewer system and operations at the 26th Ward WWTP.
3. Calculate the baseline stormwater runoff conditions; estimate the stormwater runoff flow for both the complete BDC property (regional) and also for each individual parcel (A and B) included

in the proposed action; gather data from the existing stormwater management infrastructure; describe the proposed infrastructure selected to mitigate the increment in flow; and assess the project impacts on stormwater runoff patterns and local sewers for the analysis year.

The rates used to calculate water demand and sewage generation are pursuant to the guidelines outlined in the *CEQR Technical Manual*, and are shown in Table 11-1, "Water Demand and Sanitary Sewer Generation Rates."

Table 11-1: Water Demand and Sanitary Sewage Generation Rates

	Use		Rate	Unit
Water Demand	Residential		100	GPD/Person
	Retail Stores	Domestic	0.24	GPD/sf
	Retail Stores	Air Conditioning	0.17	GPD/sf
	Commercial/Offices	Domestic	0.10	GPD/sf
	Commercial/Offices	Air Conditioning	0.17	GPD/sf
Sanitary Sewage Generation	Residential		100	GPD/Person
	Retail Stores	Domestic	0.24	GPD/sf
	Commercial/Offices	Domestic	0.10	GPD/sf

Source: *CEQR Technical Manual*, 2014.

11.4 Existing Conditions

WATER SUPPLY

New York City draws water from three watersheds and a network of reservoirs, aqueducts, and tunnels extending as far north as approximately 125 miles from the City. Within the City, a grid of mains distributes water to individual buildings. NYCDEP operates the water supply system and the sewer system. The Delaware and Catskill systems collect water from the Catskill Mountains and deliver it to Kensico Reservoir in Westchester County, and then to the Hillview Reservoir in Yonkers. The Croton system collects water from Westchester and Putnam counties and delivers it to the Jerome Park Reservoir in the Bronx. From there, it is distributed to the Bronx and Manhattan through the New Croton Aqueduct, which travels beneath the Bronx and Manhattan. The Croton system has lower pressure than the Delaware and Catskill systems, and supplies domestic uses primarily in the lower elevations of Manhattan and the Bronx.

The higher-pressure Delaware and Catskill systems serve all five boroughs and higher elevations where the water pressure of the Croton system would be inadequate. Of the three systems, the Croton

watershed supplies an average of 10 percent of the City's water, primarily to users in the lower elevation portions of Manhattan and the Bronx. The Delaware and Catskill systems supply all five boroughs and typically deliver about 90 percent of the City's drinking water. Water is distributed to the City through three tunnels: City Tunnel Number 1, through the Bronx and Manhattan to Brooklyn; and City Tunnel Number 2, through the Bronx, Queens, and Brooklyn. A third tunnel, City Tunnel Number 3, is under construction, but the first portion became operational in August 1999.

The project site and adjoining streets currently have a grid of water distribution mains that are available to serve the proposed action. Following is a list of the available infrastructure:

- The principal water main that serves the project site is a 20-inch water main located under Flatlands Avenue.
- From a spur on the 20-inch main, two 12-inch mains are looped to Vandalia Avenue and Fountain Avenue.
- The 12-inch main under Fountain Avenue continues to Seaview Avenue and Erskine Street to complete a loop around the project site.

SANITARY SEWER AND WASTEWATER TREATMENT

The project site is located in the service area of the 26th Ward WWTP, located at 12266 Flatlands Avenue in Brooklyn. The 26th Ward WWTP, like each of the City's WWTPs, is regulated through a SPDES permit (Permit # NY0267678) issued by NYSDEC. The permit specifies the maximum average monthly dry-weather flow in MGD based on the quantity of wastewater that the plant can adequately treat. The permit also specifies as effluent limits the minimum percent removal for biological oxygen demand ("BOD") as 85 percent; the minimum percent removal for suspended solids as 85 percent; the maximum effluent concentrations of suspended solids, fecal coliform, settleable solids and other pollutants; and the range of acceptable pH levels. The permit also stipulates monitoring requirements for the regulated parameters, as well as for odor control, and requires infiltration/inflow assessments and correction programs if the plant reaches a certain percent of the permitted flowrate capacity.

A review of the 26th Ward WWTP enforcement and compliance status (Table 11-2, "Facility Compliance Record") shows that there have been violations of the facility's discharge permit limit for three parameters on multiple occasions: Suspended Solids Percent Removal; Total Suspended Solids; and pH. These violations indicate that operational improvements may be required in terms of the control and removal of solids within the treatment process. As discussed below, these issues appear to be related to wet weather discharges received from combined sewers located in the Jamaica Bay Watershed.[1]

[1] http://www.nyc.gov/html/dep/pdf/jamaica_bay/vol-1-exec-summ.pdf

The NYCDEP capital improvement program[2] shows that significant efforts are currently dedicated to bringing the 26th Ward WWTP into compliance with the current permit requirements. These requirements were recently revised, as documented in an amended permit and compliance plan document that was published on July 29, 2015.[3] Permit limits, as well as sampling and analysis requirements and other reporting requirements, were also modified by the new permit/compliance plan.

Regarding hydraulic capacity, the 26th Ward WWTP shows that it has excess capacity when the permitted capacity is compared to the flowrates that are received and processed at the facility. Table 11-3, "26th Ward WWTP Hydraulic Capacity," shows the observed average dry weather flow for the months of September 2014 to August 2015 as 46 MGD, which is well below the permitted level of 85 MGD. This observation suggests that the proposed action would have no impact on the ability of the WWTP to comply with the discharge flowrate limit.

[2] http://www.nyc.gov/html/omb/downloads/pdf/ccp_10_13a.pdf
[3] http://www.dec.ny.gov/docs/permits_ej_operations_pdf/26wardfctsht2.pdf.

Table 11-2: Facility Compliance Record

CWA (Source ID: NY0026212)	07/01-09/30 2012	10/01-12/31 2012	01/01-03/31 2013	04/01-06/30 2013	07/01-09/30 2013	10/01-12/31 2013	01/01-03/31 2014	04/01-06/30 2014	07/01-09/30 2014	10/01-12/31 2014	01/01-03/31 2015	04/01-06/30 2015	07/01-09/30 2015
Facility-Level Status	In Viol	In Viol	SNC/Cat 1	In Viol	In Viol	In Viol	In Viol	SNC/Cat 1	SNC/Cat 1	SNC/Cat 1	SNC/Cat 1	SNC/Cat 1	In Viol
SNC/RNC History	N(RptViol)	N(RptViol)	X(EffNMth)	N(RptViol)	N(RptViol)	N(RptViol)	N(RptViol)	S(CSchVio)	S(CSchVio)	S(CSchVio)	S(CSchVio)	S(CSchVio)	
Pollutant													
Solids, suspended percent removal			13%										
Solids, total suspended		210%	384%				136%	76%			120%		
pH								LIMIT VIOL				LIMIT VIOL	

Notes:
In Viol = in violation during period
S(CSchVio) = SNC/Category I - an enforcement action has been issued, and the facility is not meeting its compliance schedule
E(EffViol) = SNC/Category I - effluent violations of monthly average limits (Technical Review Criteria and chronic)
X(EffNMth) = SNC/Category I - effluent violations of non-monthly average limits (Technical Review Criteria and chronic)
T(CSchRpt) = SNC/Category I - compliance schedule reporting violation
D(DMR NR) = SNC/Category I - reporting violation - non-receipt of DMR
N(RptViol) = RNC/Category II - reportable non-compliance
V(NonRNCV) = non-RNC violations – the facility has effluent, compliance schedule, permit schedule, or single-event

Source: https://echo.epa.gov/detailed-facility-report?fid=NY0026212&sys=ICP

Table 11-3: 26th Ward WWTP Hydraulic Capacity Record

Year	Month	Sanitary Sewage Flow (MGD)
2014	September	45
	October	46
	November	47
	December	47
2015	January	47
	February	47
	March	47
	April	46
	May	45
	June	45
	July	44
	August	45
Monthly Average	-	**46**
SPDES Permit Limit/Minimum		**85**

Source: USEPA, Discharge Monitoring Report (DMR) Pollutant Loading Tool, available online at http://cfpub.epa.gov/dmr/facility_detail.cfm?fac=NY0026212#_ga=1.230473372.1676444924.1421156633

SANITARY SEWER SYSTEM

The project site is served by an existing 60-inch sanitary interceptor sewer, which is located under Vandalia Avenue and loops towards Egan Street to terminate at the 26th Ward WWTP. No connections to buildings or houses are allowed into this interceptor sewer. An existing 18-inch sewer is located under Erskine Street and connects to the 60-inch interceptor. Sanitary flows from the BDC and the existing Gateway Center connect to this existing sanitary sewer.

STORMWATER AND DRAINAGE MANAGEMENT

The project site is located in the Jamaica Bay Watershed, which has a sub-watershed (or tributary area) of approximately 90 acres that includes both the BDC (approximately 40 acres), and a portion of the Gateway Estates development (approximately 49 acres). The project site is currently served by separate storm sewer systems generally located within the bed of Vandalia Avenue, Erskine Street, Seaview Avenue and Fountain Avenue. At the northwest portion of the project site, there is a 46-inch storm sewer along Erskine Street that flows north and discharges to a 72-inch storm sewer that runs along Vandalia Avenue, and intercepts a 78-inch storm sewer that flows south along Fountain Avenue discharging into Spring Creek. The stormwater runoff draining from the Gateway Estates development and the north area of the project site follows in a southward and eastward flow pattern until reaching the catch basins associated with the 46 and 78-inch storm sewers. This runoff is then conveyed to the 78-inch outfall in Spring Creek.

At the southwest portion of the project site, a 54-inch storm sewer runs along Seaview Avenue towards Fountain Avenue, ultimately discharging into Spring Creek. Most of the BDC property stormwater runoff follows a south and eastward flow pattern, until reaching the catch basins in the 54-inch storm sewer. This runoff is then conveyed to the 54-inch outfall in Spring Creek.

Figure 11-1, "Stormwater Flows with the Existing Conditions 5-Year Storm Events," presents the region's tributary areas related to the study area. This study area is represented by the Gateway Estates development (Area 1), and the BDC (Area 2), where the project parcels (A and B) are located. Stormwater runoff flows are calculated for existing conditions using the Rational Formula (Q = C*i*A). Assumptions to calculate flowrate include: 10-year storm event, with an intensity of 4.3 inches per hour; *"C"* coefficients of 0.8 for the offsite areas (Gateway Estates development); and a weighted value of 0.62 for the onsite (BDC) area.

Table 11-4, "Existing Runoff Calculations for the Study Area," indicates existing runoff on the order of 199.8 cfs ("cubic feet per second") for Area 1 and 100.2 cfs for Area 2.

Table 11-4: Existing Runoff Calculations for the Study Area

Map Area[1]	Description	Coefficient "C"	I, in/hr[4]	Area, acre	Flow, cfs	Increment
1	Gateway Estates	0.80	4.3	49.941	199.8	N/A
2	BDC	0.62	4.3	40.091	100.2	N/A

Notes:
1. Refers to map on Figure 11-1, "Stormwater Flows with the Existing Conditions 5-Year Storm Events."
2. BDC = Brooklyn Developmental Center
3. Rational Formula Q=CiA, cfs is used for flow calculations
4. Storm intensity for 10 yrs-24 hrs design storm with 90 percent confidence interval.

Source NOAA's PSD Server, Point Precipitation Frequency Estimates for Brooklyn, NY

Source: CSA Group, 2016.

Existing Outfall Stormwater

Hydrography

Area tributary to Spring Creek

Area 1 (Offsite):
C = 0.80; i = 4.3 in/hr;
Area = 49.941 acres; Q = 199.8 cfs

Area 2 (Onsite):
C = 0.62; i = 4.3 in/hr;
Area = 40.091 acres; Q = 100.2 cfs

Figure 11-1

STORMWATER FLOWS WITH THE EXISTING CONDITIONS 5-YEAR STORM EVENTS

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Table 11-5, "Weighted Runoff Coefficients of Existing Conditions," presents the calculated coefficients using the *CEQR Technical Manual*'s WS1 Matrix for the existing conditions at parcels A and B.

Table 11-5: Weighted Runoff Coefficients of Existing Conditions

	Weighted Runoff Coefficient, C					
	Surface Type[1]	**Roof[2]**	**Pavement & Sidewalks**	**Other**	**Grass & Soft Scape**	**Total**
Parcel A	**Area, %**	0%	14%	8%	78%	100%
	Surface Area, Sf	0.00	12,346	6,977	67,797	87,120
	Runoff Coefficient	1.00	0.85	0.85	0.2	**0.34**
Parcel B	**Area, %**	1%	13%	0%	86%	100%
	Surface Area, Sf	2,500	27,615	0	178,444	208,559
	Runoff Coefficient	1.00	0.85	0.85	0.2	**0.30**

Notes:
1. Runoff coefficients for each surface type are as per NYCDEP.
2. Total roof areas onsite.
3. Identify any other surfaces onsite and obtain runoff coefficients from NYCDEP.

Source: *CEQR Technical Manual*, 2014.

Table 11-6, "Existing Parcel Runoff Calculations," presents the runoff calculations for parcels A and B using the weighted runoff coefficients. A 10-year design storm with an intensity of five inches per hour is used, together with weighted runoff coefficients that represent green areas with portions of pavement. The calculated stormwater runoff flow for Parcel A is 3.44 cfs, and for Parcel B is 7.08 cfs.

Table 11-6: Existing Parcel Runoff Calculations

Parcel	Storm Intensity, i (in/hr)	Weighted Runoff Coefficient, C (unitless)[2]	Area, A (sf)	Area, A (acres)	Flow, Q (cfs)
A	5.0	0.34	87,120	2.00	3.44
B	5.0	0.30	208,559	4.79	7.08
Total	-	-	295,679	6.79	10.52

Notes:
1. Rational Formula Q=CiA, cfs is used for flow calculations
2. Runoff coefficients from WS1_Surfaces Calculation (*CEQR Technical Manual*)
3. Storm intensity for 10 yrs-24 hrs design storm with 90 percent confidence interval.

Source: NOAA PSD Server, Point Precipitation Frequency Estimates for Brooklyn, NY

11.5 The Future Without The Proposed Action ("No Action" Conditions)

Population and building density in the vicinity of the project site will expand by 2028. The Gateway Estates development, currently under construction, will be completed, adding new residents to the area of the proposed action. The study area will also realize an increase in retail activity. The BDC will remain in operation at the current level of operation as explained above. This level of development will increase demand on infrastructure within the study area.

WATER SUPPLY

In the future without the proposed action, New York City's water supply system is not expected to change significantly or be impacted by development in the study area. It is expected that the benefits of the City's comprehensive water conservation programs, through metering and low-flow fixtures requirements (Local Law No. 29, 1989), will continue to be realized. These and other measures - including leak detection programs and locking fire hydrant caps - are aimed at reducing the City's water needs, and are expected to continue to further the City's efforts to reduce flows to WWTP facilities. In addition, NYCDEP's routine maintenance and system upgrades of old water mains and other components of the water system will further benefit the City's water distribution system.

The Brooklyn-Queens section of City Tunnel 3 is scheduled for completion in 2018. Tunnel 3 has been under construction since 1970. Stages 1 and 2 of the City Tunnel 3 are already in service, and shaft work is already underway to create the connections necessary to feed the distribution system that Tunnel 3 is being built to support. When complete, Tunnel 3 will improve the adequacy and dependability of the entire water supply system, as well as service and water pressure in outlying areas of the City. It will also allow NYCDEP to inspect and repair Tunnels 1 and 2 for the first time since they were activated.

In the future without the proposed action, water demand in the study area is expected to increase by 1,050,106 GPD. This demand includes projected demands from the Gateway Estates development[4] .

SANITARY SEWER AND WASTEWATER TREATMENT

NYCDEP is in the process of upgrading certain components of the 26th Ward WWTP in order to make the plant consistent with the 2004 Consent Order with NYSDEC. The NYCDEP 2004-2013 Capital Program has over $2 billion dollars set aside for upgrading work, including: construction, plant upgrading,

[4] New York City Department of Housing Preservation and Development, *Gateway Estates II Final Environmental Impact Statement ("FEIS"),* February 4, 2009.

reconstruction; and, plant component stabilization, according to the modified SPDES permit (2015), but there are no plans to expand the dry weather capacity of the 26th Ward WWTP. As outlined in the compliance plan, there is an ongoing $150 million upgrade in progress at the 26th Ward WWTP. This project will upgrade the plant to provide critical redundancies and ensure it remains in a state of good repair. NYCDEP will be adding a fifth preliminary treatment tank to improve the capacity to receive wet weather discharges. Additionally, upgrades to treatment equipment and sludge handling operations are being implemented to achieve energy efficiency and sustainability features at the existing facility.

In the future without the proposed action, the study area is expected to observe an increase in sewage generation of 907,836[5] from the Gateway Estates development. With the 26th Ward WWTP operating at nearly 40 MGD below its dry weather design capacity under existing conditions, it is expected that the WWTP would have the capacity to treat the additional amount of sewage that will be generated in the future without the proposed action. During wet weather, this WWTP apparently operates near capacity. This problem is being addressed by NYCDEP via construction of new tank capacity, and other process changes, as explained above.

STORMWATER AND DRAINAGE MANAGEMENT

In the future without the proposed action, the storm sewer water generation and drainage system is not expected to change significantly. The east portion of the Gateway Estates development is part of the stormwater drainage area of the study area and, therefore, its impact is referenced herein. The Gateway Estates development is currently under construction and, although it will generate additional runoff when compared to existing conditions, this runoff will undergo mitigation measures in the form of a mechanical treatment unit to remove pollutants, sediment, and floatables, and also through storm swales as described in the project's FEIS.

11.6 The Future With The Proposed Action ("With Action" Conditions)

As stated in Chapter 1, "Project Description," the proposed action would develop approximately 1,169 dwelling units and 122,500 square feet ("sf") of commercial space by 2028. The proposed action includes connections to existing water, storm and sanitary infrastructure. Parcel B includes Schroeders Walk, which would also serve as an easement for underground storm and sanitary infrastructure to connect

[5] New York City Department of Housing Preservation and Development, *Gateway Estates II FEIS,* February 4, 2009.

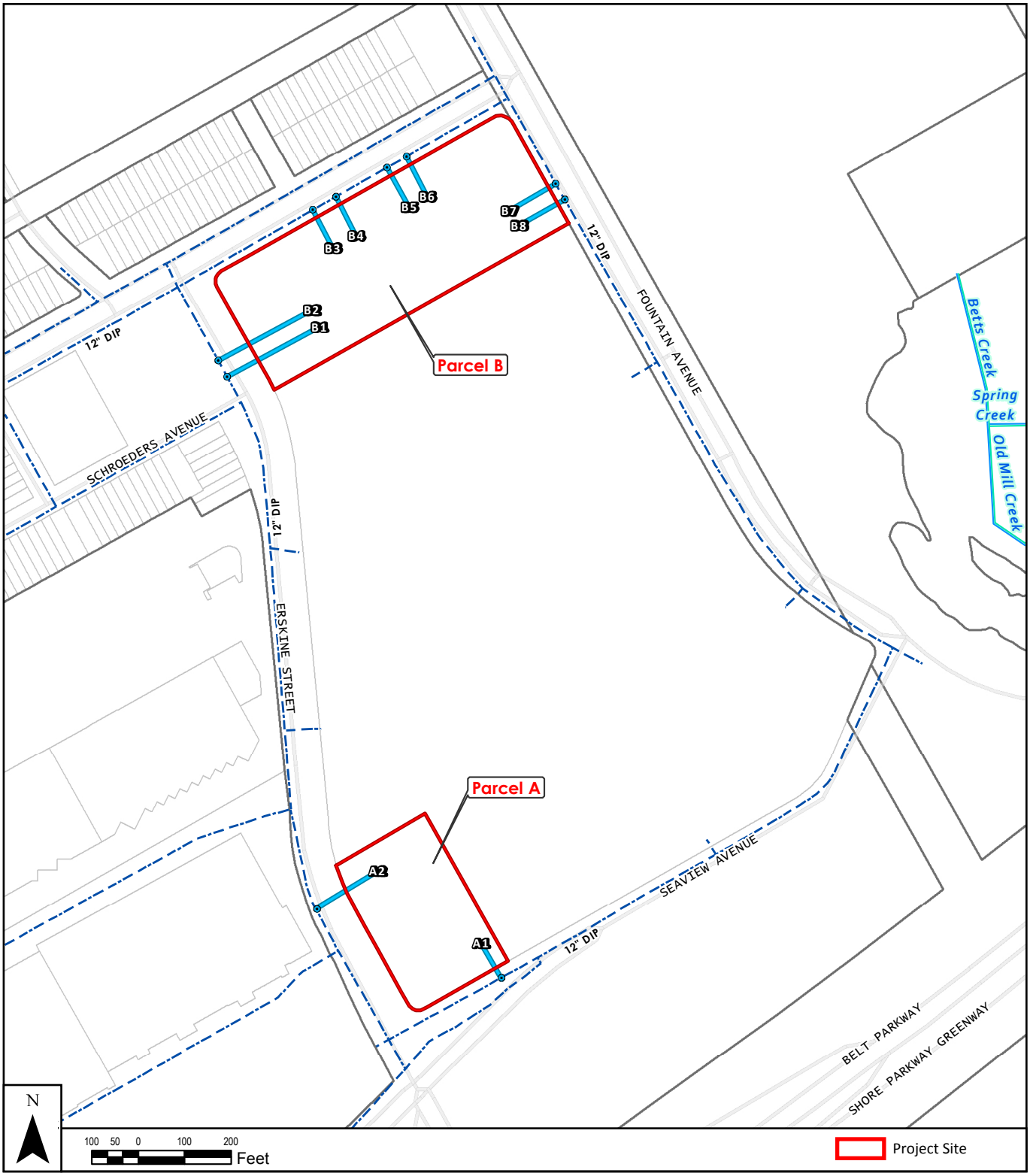
discharges from new buildings to existing infrastructure located at Erskine Street, Vandalia Avenue, and Fountain Avenue.

WATER SUPPLY

As part of the proposed action, connections to existing water lines would be installed under existing city streets. These connections would be designed and built to meet NYCDEP requirements, and would become the responsibility of NYCDEP after their completion.

The proposed action would add approximately 316,535 GPD of water demand (see Table 11-7, "Proposed Action Water Demand Increment") to the project site infrastructure. This demand would be less than 0.02 percent of New York City's average daily demand of 1.2 billion GPD.

The proposed water supply connections to individual buildings include: two connections to the existing 12" ductile iron pipe ("DIP") located on Seaview Avenue and Erskine Street for Parcel A buildings, and eight connections to the existing 12" DIP located on Erskine Street, Vandalia Avenue and Fountain Avenue for Parcel B buildings. Figure 11-2, "Water Main Connections," presents a diagram of the proposed connection points. The estimated water demand would not have a significant adverse impact on the water supply system's ability to adequately deliver water to New York City or Brooklyn. However, NYCDEP may require hydraulic modeling to identify any specific issues with the system pressure at the proposed connections.



Source: NYCDEP - approved Master Plan, as prepared by Brooker Engineering, Inc., 2016; CSA Group, 2016.

Figure 11-2

WATER MAIN CONNECTIONS

- Hydrography
- Proposed Connection
- Existing Water Main
- Proposed Water Main

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Table 11-7: Proposed Action Water Demand Increment

Condition	Domestic Water Demand Increment (GPD)	Air Conditioning Demand Increment (GPD)	Total Increment (GPD)
Proposed Residential[1]	266,300	0	266,300
Proposed Retail[2]	29,406	20,829	50,235
Total Increase	**295,706**	**20,829**	**316,535**

Notes:
1. Includes an estimated population of 2,663, based on 1,169 residential units at, and 2.278 persons per residential unit
2. Includes 122,524 sq ft of retail area

Source: CSA Group, 2016.

SANITARY SEWER AND WASTEWATER TREATMENT

The proposed action would generate approximately 295,706 GPD of sanitary sewage in the future with the proposed action (see Table 11-8, "Proposed Action Sewage Generation Increment").

Table 11-8: Proposed Sewage Generation Increment

Condition	Total Increment in Sanitary Sewage Generation (GPD)
Proposed Action	
Residential[1]	266,300
Retail[2]	29,406
Total Increase	**295,706**

Notes:
1. Includes an estimated population of 2,663 , based on 1,169 residential units at, and 2.278 persons per residential unit
2. Includes retail space of 122,524 sf

Source: CSA Group, 2016.

To determine the proposed flowrate at connection points, a Master Plan has been prepared and approved by NYCDEP that accounts for existing and incremental sewage flow conditions. The Master Plan includes flowrate calculations to be used to size the individual connections of each building to the existing sanitary trunk sewer. The sanitary sewage flowrates are based on a unit sewage generation factor of 150 GPD per person, and a population density of 50 persons per acre of developed land. A peak flow factor is then applied to the resulting flowrate to determine the allowable sanitary flowrate. The calculated total sanitary flowrates are 0.0928 cfs for Parcel A, and 0.2223 cfs for Parcel B (see Table 11-9, "Sanitary Flow Rates Based on Master Plan"). The Master Plan includes the location of each building connection to the existing sanitary sewer infrastructure.

Table 11-9: Sanitary Flowrates Based on Master Plan

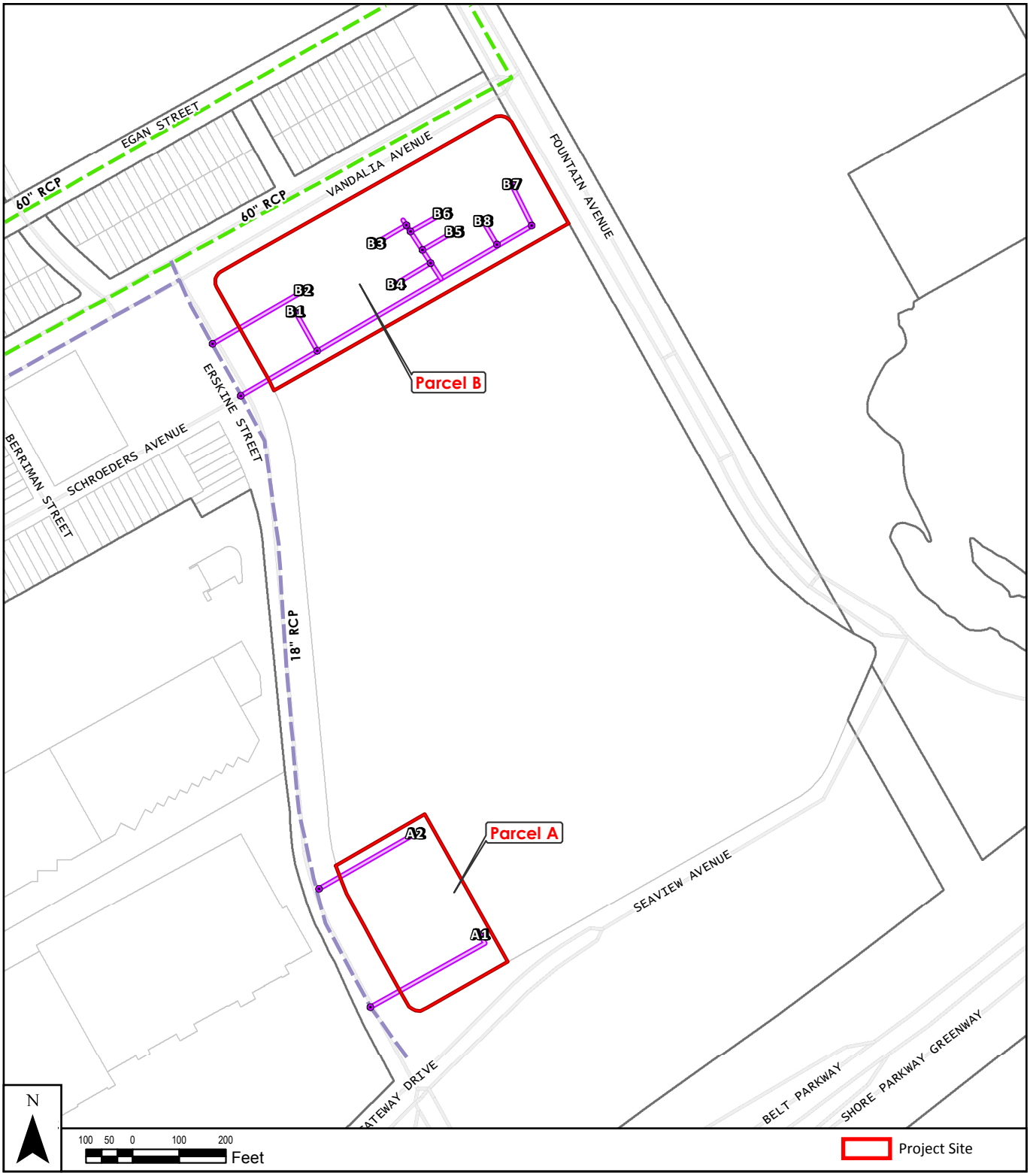
Sanitary Allowance Calculation					
Parcel/Building	**Development Area, sf**	**Development Area, acres**	**Allowable Sanitary Flow, GPD**	**Allowable Sanitary Flow, cfs**	**Allowable Peak Sanitary Flow, cfs**
Parcel A	-	-	-	-	-
A1	36,002	0.826	6,199	0.0096	0.0384
A2	51,118	1.174	8,801	0.0136	0.0545
Total Parcel A	**87,120**	**2.00**	**15,000**	**0.0232**	**0.0928**
Parcel B	-	-	-	-	-
B1	70,715	1.623	12,175	0.0188	0.0754
B2	18,001	0.413	3,099	0.0048	0.0192
B3	20,200	0.464	3,478	0.0054	0.0215
B4	20,843	0.478	3,589	0.0056	0.0222
B5	20,843	0.478	3,589	0.0056	0.0222
B6	20,200	0.464	3,478	0.0054	0.0215
B7	18,001	0.413	3,099	0.0048	0.0192
B8	19,756	0.454	3,402	0.0053	0.0211
Total Parcel B	208,559	**4.79**	**35,909**	**0.0556**	**0.2223**
Notes: Unit Generation 150 GPD/person Population Basis 50 people/acre Peak factor 4-					

Source: NYCDEP–approved Master Plan, as prepared by Brooker Engineering Inc., 2016.

Figure 11-3, "Sanitary Sewer Connections," presents a map of the proposed connections to the existing sanitary collection system; construction drawings would be subject to additional NYCDEP review, prior to construction to ensure appropriate sizing of connections[6]:

- Sewer connection from building A1, A2, and B2 to the trunk sewer located in Erskine Street, near Seaview Avenue.
- Sewer connections from buildings and commercial/retail areas (B1, B3, B4, B5, B6, B7, and B8) include installing a new collector sewer along Schroeders Walk in Parcel B, with connection to the existing trunk sewer in Erskine Street near Schroeders Avenue.

[6] Project Master Plans for Site Connection Proposals, 888 Fountain Avenue Tax Lots 500 (Parcel A) and 200 (Parcel B), January 25, 2016, Brooker Engineering, PLLC.



Source: NYCDEP - approved Master Plan, as prepared by Brooker Engineering, Inc., 2016; CSA Group, 2016.

Hydrography
Proposed Connection
Proposed Pipeline
Existing Sewer
Existing Interceptor

Figure 11-3

SANITARY SEWER CONNECTIONS

Fountain Avenue Land Use Improvement and Residential Project

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The sewage from the project site would be treated at the 26th Ward WWTP. As stated above, the 26th Ward WWTP has a permitted capacity of 85 MGD, and is estimated to be treating approximately 46 MGD of dry weather flow on average. The total sewage from the proposed action would represent about 1.4 percent of the 26th Ward WWTP's permitted capacity, and would not cause the WWTP to exceed its permitted capacity or impair its ability to properly treat sanitary sewage. Because the flowrate generated by the proposed action would be relatively low, it would not contribute to non-compliance events or conditions at the 26th Ward WWTP.

Although wet weather conditions are currently of concern at the 26th Ward WWTP, the project site, served by separate storm and sanitary sewers, would not contribute stormwater to wet weather flows. Finally, the current capital improvements projects currently underway at the WWTP were designed to address limitations of the facility to comply with its permit during wet weather conditions. Therefore, no adverse impacts are expected at the 26th Ward WWTP from the increase in sanitary sewage resulting from the proposed action.

STORMWATER AND DRAINAGE MANAGEMENT

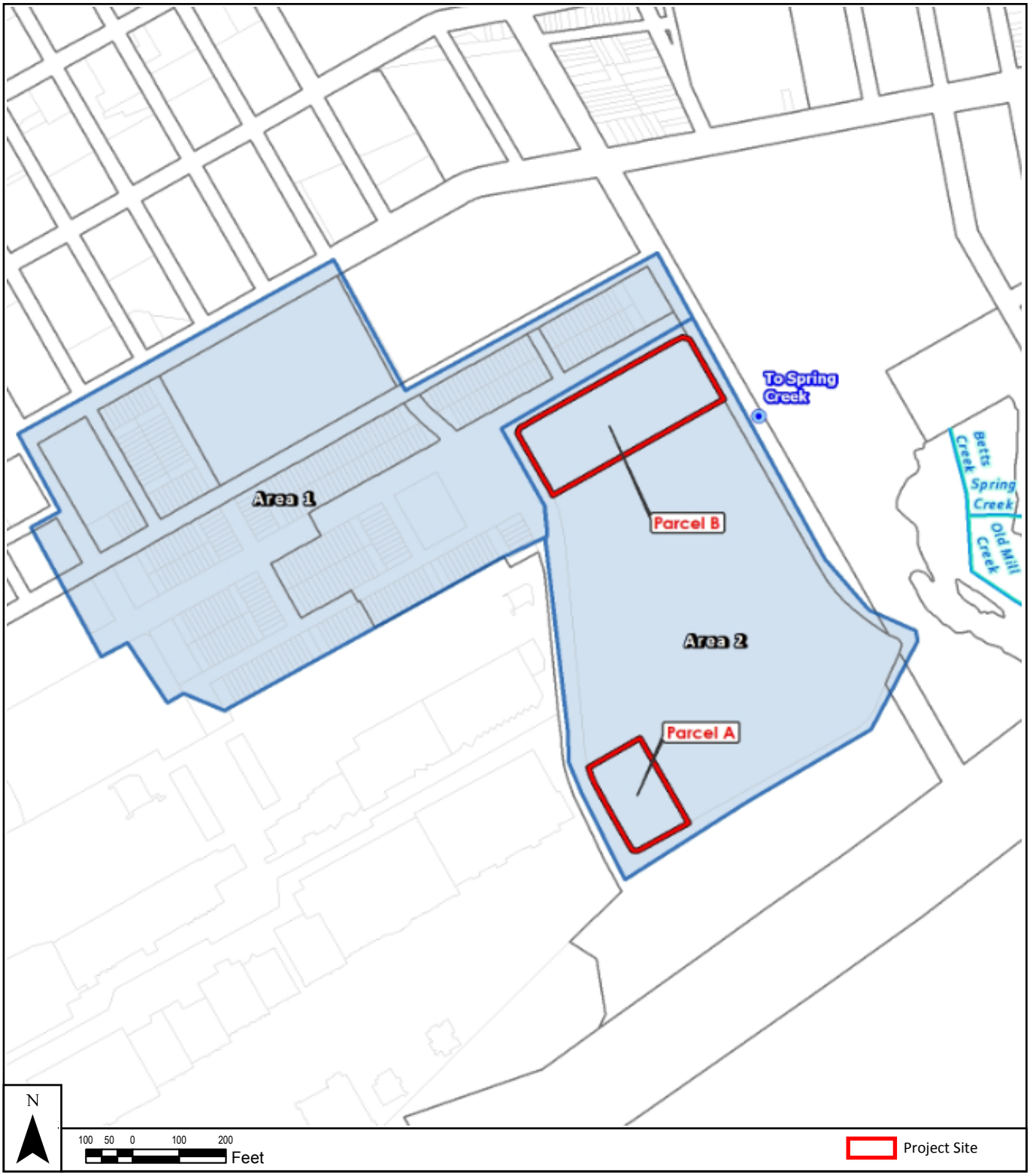
Table 11-10, "Proposed Runoff Calculations for the Study Area," presents projected stormwater flow from the BDC property as 124.3 cfs, which represents an increase of approximately 135 percent over the existing conditions. This is based on a weighted runoff coefficient "C" of 0.50 and a drainage area of 5.5 acres of previously undeveloped land that will not be impermeable. Figure 11-4, "Stormwater Flows with the Proposed Action 5-Year Storm Events," presents a map of the study area with the foot print of the project site (parcels A and B) within the BDC property that is associated with the change in soil cover permeability.

Table 11-10: Proposed Runoff Calculations for the Study Area

Map Area[1]	Description	Coefficient "C"	I, in/hr[4]	Area, acre	Flow, cfs	Increment
1	Gateway Estates	0.90	4.3	49.941	224.7	113%
2	BDC	0.50	4.3	40.091	124.3	135%

Notes:
1. Refers to map on Figure 11-2, "Water Main Connections."
2. Rational Formula Q=CiA, cfs is used for flow calculations
3. Storm intensity for 10 yrs-24 hrs design storm with 90 percent confidence interval.

Source NOAA PSD Server, Point Precipitation Frequency Estimates for Brooklyn, NY



Source: CSA Group, 2016.

Existing Outfall Stormwater

Hydrography

Area tributary to Spring Creek

Area 1 (Offsite):
C = 0.90; i = 4.3 in/hr;
Area = 49.941 acres; Q = 224.7 cfs

Area 2 (Onsite):
C = 0.50; i = 4.3 in/hr;
Area = 40.091 acres; Q = 124.3 cfs

Figure 11-4

STORMWATER FLOWS WITH THE PROPOSED ACTION 5-YEAR STORM EVENTS

Fountain Avenue Land Use Improvement and Residential Project

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Table 11-11, "Weighted Runoff Coefficients of Proposed Action," presents the weighted "C" coefficient of 1.0 for Parcel A, and 0.87 for Parcel B, which are representative of the lower soil permeability conditions that would occur at each parcel as a result of the proposed action. This condition would result in higher runoff flowrates expected at the project site as a result of the proposed action.

Table 11-11: Weighted Runoff Coefficients of Proposed Action

	Weighted Runoff Coefficient, C					
	Surface Type[1]	**Roof[2]**	**Pavement & Sidewalks**	**Other**	**Grass & Soft Scape**	**Total**
Site A	**Area, %**	100%	0%	0%	0%	100%
	Surface Area, Sf	87,120	0	0	0	87,120
	Runoff Coefficient	1.00	0.85	0.85	0.2	**1.00**
Site B	**Area, %**	76%	9%	1%	14%	100%
	Surface Area, Sf	157,664	19,476	2,204	29,215	208,559
	Runoff Coefficient	1.00	0.85	0.85	0.2	**0.87**

Notes:
1. Runoff coefficients for each surface type are as per NYCDEP.
2. Total roof areas onsite.
3. Identify any other surfaces onsite and obtain runoff coefficients from NYCDEP.

Source: NYCDEP, 2016.

Table 11-12, "Proposed Parcel Runoff Calculations," present the runoff calculations for parcels A and B using the weighted runoff coefficients. A 10-year design storm with an intensity of five inches per hour is used, together with weighted runoff coefficients that represent green areas with portions of pavement. The calculated stormwater runoff flow for Parcel A is 10.00 cfs, and for Parcel B is 20.88 cfs.

Table 11-12: Proposed Parcel Runoff Calculations

Parcel	Storm Intensity, i (in/hr)	Weighted Runoff Coefficient, C (unitless)[2]	Area (sf)	Area (acres)	Flow, Q (cfs)
A	5.0	1.00	87,120	2.00	10.00
B	5.0	0.87	208,559	4.79	20.88
Total	-	-	295,679	6.79	30.88

Notes:
1. Rational Formula Q=CiA, cfs is used for flow calculations
2. Runoff coefficients from WS1_Surfaces Calculation (*CEQR Technical Manual*)
3. Storm intensity for 10 yrs-24 hrs design storm with 90 percent confidence interval.

Source NOAA PSD Server, Point Precipitation Frequency Estimates for Brooklyn, NY

The Master Plan that has been prepared and approved by NYCDEP as part of the proposed action establishes the stormwater flowrates to be discharged from Parcel A and Parcel B. The Master Plan assumes that the existing project site is authorized to discharge a given stormwater flowrate based on the existing soil cover type, and that only the excess of flowrate resulting from the proposed action would

require treatment using a SMP. Table 11-13, "Master Plan Stormwater Connection Flowrates," shows the calculations of stormwater flowrate for each building within parcels A and B, using the Rational Formula, a runoff coefficient of 0.85, and a design storm intensity of five inches per hour.

To reduce the impact of higher runoff flowrates which would otherwise occur with the proposed action compared to the No Action conditions (as illustrated in previous Table 11-11, "Weighted Runoff Coefficients of Proposed Action," and Table 11-12, "Proposed Parcel Runoff Calculations") and to protect against overcoming infrastructure capacity, the proposed action would include the following SMPs to control the increment in stormwater runoff flowrate:

- Structural management practices in the form of detention tanks would capture and temporarily detain flow from building roof drains prior to discharging into existing storm sewers. Building A1 would include a 1,500 cubic foot ("cf") underground concrete tank equipped with an outlet pipe connecting to the existing storm sewer. Buildings A2, B1 and B5 would include similar tanks with capacities of 2,400, 1,000, and 1,000 cf, respectively.
- Non-structural management practices in the form of permeable pavers and grass gardens would be considered at the proposed Schroeders Walk, on Parcel B.
- Non-structural management practices in the form of green roofs would be included on certain buildings.

The structural SMPs that would be provided as part of the proposed action in conformity with the NYCDEP-approved Master Plan would be adequate to control the increment in stormwater runoff flowrate and not overcome infrastructure capacity; the non-structural SMPs would provide additional stormwater runoff control.

Table 11-13: Master Plan Stormwater Connection Flowrates

Parcel/Building	Development Area, sf	Development Area, acres	Stormwater Flow, cfs
Parcel A			
A1	36,002	0.826	3.51
A2	51,118	1.174	4.99
Total Parcel A	**87,120**	**2.00**	**8.50**
Parcel B			
B1	70,715	1.623	6.90
B2	18,001	0.413	1.76
B3	20,200	0.464	1.97
B4	20,843	0.478	2.03
B5	20,843	0.478	2.03
B6	20,200	0.464	1.97
B7	18,001	0.413	1.76
B8	19,756	0.454	1.93
Total Parcel B	208,559	**4.79**	**20.35**

Notes:
Coefficient "C" = 0.85
Design storm = 5 in/hr (Per Drainage Plan)
Rational Formula Q=CiA, cfs is used for flow calculations

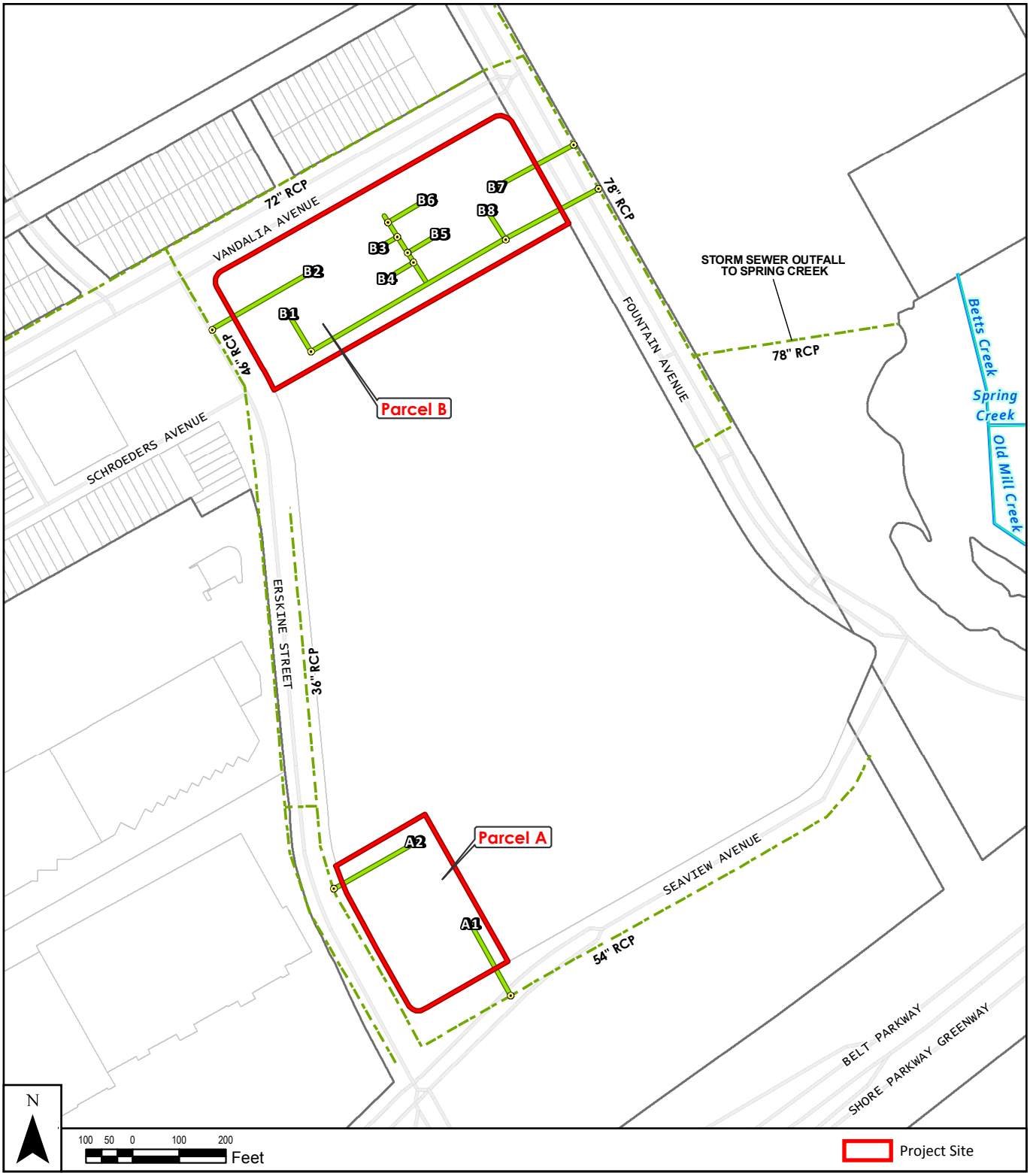
Source: NYCDEP – approved Master Plan, as prepared by Brooker Engineering Inc., 2016.

The calculated flowrates shown in Table 11-13, "Master Plan Stormwater Connection Flowrates," are associated with individual discharge connections to the existing stormwater collection system. The Master Plan approved as part of the proposed action includes the location of each building roof drain connection to the existing storm sewer infrastructure, together with storm water detention tanks.

The proposed connection points for stormwater drainage are listed below. Figure 11-5, "Storm Sewer Connections," presents a site map[7] with the proposed connections to the existing storm sewers.

- Direct connection of building A1 to a 54-inch Reinforced Concrete Pipe ("RCP") along Seaview Avenue, which discharges to Spring Creek.
- Direct connection of building A2 to a 46-inch RCP, which discharges to a 72-inch RCP along Vandalia and is connected to the 78-inch RCP on Fountain Avenue, which discharges to Spring Creek.
- Direct connection of building B7 to a 78-inch RCP along Fountain Avenue, which discharges to Spring Creek.

[7] Site Plan – Site Connection Proposal, and NYCDEP-approved Master Plans for Tax Lots 500 (Parcel A) and 200 (Parcel B), dated January 25, 2016, Brooker Engineering



Source: NYCDEP - approved Master Plan, as prepared by Brooker Engineering, Inc., 2016; CSA Group, 2016.

Figure 11-5

STORM SEWER CONNECTIONS

Hydrography
Proposed Connection
Existing Storm Sewer
Proposed Storm Sewer

Fountain Avenue Land Use
Improvement and Residential Project

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- Installation of a storm sewer collector pipe along Schroeders Walk and discharging into the 78-inch RCP located at Fountain Avenue, which discharges to Spring Creek.
- Individual building connections from B1, B3, B4, B5, B6 and B8 to the proposed storm sewer collector pipe.

To address stormwater quality impacts of the proposed action, the unified approach presented in Chapter 4, Section 4.2*, of the NYS SWM Design Manual* is used to calculate the parameters for the sizing of structural and non-structural SMPs. These SMPs are directed at meeting pollutant removal goals, reducing channel erosion, preventing overbank flooding, and helping control extreme floods. The WQv calculation is intended to improve water quality by capturing and treating runoff from small, frequent storm events that tend to contain higher pollutant levels. New York has defined the WQv as the volume of runoff generated from the entire 90th percentile rain event. Based on this approach, the WQv are calculated as 0.20 ac-ft for Parcel A and 0.41 ac-ft for Parcel B, based on the proposed locations and level of development (see Table 11-14, "Stormwater Water Quality Volume Calculations"). The new WQv represents an increment of 0.15 ac-ft for Parcel A, and 0.32 ac-ft for Parcel B.

Table 11-14: Stormwater Water Quality Volume Calculations

Condition/Formula	Factor	Existing Conditions (No Action Conditions)	Proposed Action (With Action Conditions)
Parcel A			
P = 90% Rainfall Event Number 1.25	P	1.25	1.25
Rv = 0.05+0.009*I	I	22%	100%
I = Percent Impervious Cover	Rv	0.25	0.95
A = Parcel Area in Acres	A, ac	2.0	2.0
P = 90% Rainfall Event Number = 1.25	WQv, ac-ft	0.05	0.20
INCREMENT	WQv, ac-ft	0.15	
Condition/Formula	**Factor**	**Existing Conditions (No Action Conditions)**	**Proposed Action (With Action Conditions)**
Parcel B			
P = 90% Rainfall Event Number 1.25	P	1.25	1.25
Rv = 0.05+0.009*I	I	14%	86%
I = Percent Impervious Cover	Rv	0.18	0.82
A = Parcel Area in Acres	A, ac	4.8	4.8
P = 90% Rainfall Event Number = 1.25	WQv, ac-ft	0.09	0.41
INCREMENT	WQv, ac-ft	0.32	

Source: 2015 New York State Stormwater Management Design Manual, Chapter 4, Section 4.2

A SWPPP would be developed for controlling runoff flowrate and pollutants from the project site during both the construction and the post-construction phases of the project. The SWPPP would be consistent

with the stormwater management strategies identified in NYCDEP's Jamaica Bay Watershed Protection Plan. These strategies include:

- Promote low-impact development and SMPs for new and existing development;
- Reduce the imperviousness of new and existing development; and
- Expand water conservation programs to achieve a greater reduction in water use.

In addition, green infrastructure, including garden areas within Schroeders Walk and green roofs on buildings would be included as part of the proposed action to improve stormwater quality.

In summary, the proposed action would be developed in compliance with the NYCDEP-approved Master Plan, and, accordingly, provide the structural SMPs necessary to ensure that the new development would not overburden the existing sanitary and stormwater infrastructure in the Jamaica Bay Watershed. Therefore, the proposed action would not result in any significant adverse impacts on the stormwater management systems during storm events. Further, in addition to the structural SMPs that would be incorporated into the proposed action, pursuant to the Master Plan, the proposed action would include the non-structural elements described previously. Therefore, the proposed action would be consistent with the Jamaica Bay Watershed Protection Plan and would not result in any significant adverse impact to water and sewer infrastructure.