3.2 WATER AND SEWER INFRASTRUCTURE

INTRODUCTION

This chapter provides an evaluation of the potential effect of the proposed action on the city's water supply, wastewater treatment, and stormwater management infrastructure. Based on the methodology set forth in the *CEQR Technical Manual*, the proposed action would not result in significant adverse impacts to these infrastructure systems.

Included is a description of the existing water supply and wastewater infrastructure in the study area and identified changes to water supply, stormwater, and wastewater conditions that would occur in the future with and without the proposed action. Other city infrastructure identified in the *CEQR Technical Manual*, including the waste and sanitation services and public transportation systems, are discussed in the *Webster Avenue Rezoning EAS*, presented in Appendix C, while effects to the transportation network are described in Chapter 3.3, "Transportation," of this EIS. The recently revised *CEQR Technical Manual* states that projects that would result in an incremental increase above 400 residential units or 150,000 square feet of commercial space in the Bronx require a preliminary analysis of water and sewer infrastructure. Accordingly, because the proposed project would result in an incremental increase of more than 400 residential units, a preliminary analysis was conducted which calculated the increases in sanitary and stormwater flows as compared to the existing conditions.

This chapter has been revised to include a Stormwater Best Management Practices (BMPs) Concept Plan which is intended to illustrate opportunities for development lots within rezoning areas and general large scale developments to incorporate onsite stormwater source controls during site planning and building design phases of project development in order to help achieve a stormwater release rate on each of the development sites of 0.25 CFS, or 10% of the allowable flow per the drainage plan, whichever is greater.

3.2.1 EXISTING CONDITIONS

Water Supply

The New York City water supply system is comprised of a network of reservoirs, lakes and aqueducts extending into the Catskill region and a pipe network that distributes water within the city. Because the Hudson River, Harlem River and the East River are not potable water sources, New York City obtains nearly all of its water from the Delaware, Catskill and Croton watersheds located within 125 miles north of the city. Water from the watersheds is stored at 19 reservoirs and three control lakes, having a combined capacity of approximately 580 billion gallons. The water is then carried into the city by a number of aqueducts. It enters the city via City Tunnel 1, which runs through the Bronx, Manhattan and Queens, and City Tunnel 2, which runs through the Bronx, Queens and Brooklyn. City Tunnel 3, partially complete, serves the Bronx,

Manhattan and Queens, and when fully complete, will terminate in Brooklyn. Staten Island obtains its water from the Richmond Tunnel, an extension of City Tunnel 2.

Once in the city, the three aqueducts distribute water into a network of water mains. Water mains up to 96-inches in diameter feed smaller mains, such as 8-, 12-, and 20-inch mains, that deliver water to their final destination. These are the same mains that provide water to fire hydrants. Nearly all of the water reaches its consumers by gravity alone although some four percent, generally located at the outer limits of the system where in-line pressure is the lowest, at high elevations or at a pressure extremity such as Far Rockaway, is pumped to its final destination. Pressure regulators throughout the city monitor and control the water pressure.

The New York City Department of Environmental Protection (NYCDEP) estimates that New York City consumes approximately 1.3 billion gallons of water per day. Given this supply capacity, the *CEQR Technical Manual* notes the unlikelihood that any particular action would result in a significant adverse impact on the city's water supply or water pressure.

In the existing condition, uses on the projected development sites include 10 dwelling units, 47,626 sf of retail space, 12,265 sf of office space, 3,000 sf of community facility space, and 84,238 sf of industrial/manufacturing area. The anticipated water usage for these areas is calculated using the consumption rates in the following table.

Based on the *CEQR Technical Manual* consumption rates, it is estimated that the existing facilities consume approximately 54,336 gallons per day (gpd) of water for domestic uses and 25,012 gpd of water for air conditioning for a total of 79,348 gpd (0.08 million gallons per day [mgd]) of water. These results are summarized in Table 3.2-1.

Table 3.2-1:
Existing Water Consumption and Wastewater Generation Due to Land Uses on the Projected Development Sites

Land Use	*Rate*[1]	*Existing Conditions*		
		Area (sf)	*Water/ Wastewater Generation (gpd)*	*Air Conditioning (gpd)*
Residential[2]	Domestic: 100 gpd/person (242 gpd/DU) Air Conditioning: 0 gpd/sf	10 DUs	2,420	N/A
Retail/ Public Use[3]	Domestic: 0.24 gpd/sf Air Conditioning: 0.17 gpd/sf	47,626	11,430	8,096
Office	Domestic: 0.10 gpd/sf Air Conditioning: 0.17 gpd/sf	12,265	1,227	2,085
Hotel[4]	Domestic: 120 gpd/rm/occup (0.60 gpd/sf) Air Conditioning: 0.17 gpd/sf	0	0	0
Community Facility[5]	Domestic: 0.17 gpd/sf Air Conditioning: 0.17 gpd/sf	3,000	510	510
Industrial/ Manufacturing[6]	Domestic: 2,000 gpd/acre (0.46 gpd/sf) Air Conditioning: 0.17 gpd/sf	84,238	38,749	14,320
Water Consumption Subtotals			**54,336**	**25,012**
Sewage Generation Subtotal		**54,336**		
Total Water Consumption		**79,348 (0.08 mgd)**		
Total Wastewater Generation		**54,336 (0.05 mgd)**		

Notes:
1- Consumption rates obtained from *CEQR Technical Manual* unless otherwise indicated.
2- Assumes 100 gpd/person. The average household size for the proposed rezoning area is 2.42 persons per dwelling unit (DU) (2000 Census). This equates to 242 gpd/DU.
3- Use group is comprised of retail, Food Retail Expansion to Support Health (FRESH) food stores, and restaurant space.
4- Assumes 120 gpd/room/occupant, 400 sf per room and 2 occupants per room, which equates to 0.60 gpd/sf.
5- Assumes retail/public use consumption rates.
6- Use group includes automotive-related, storage, and other (non-categorizable) uses. Source: Willets Point Development Plan FEIS, 2008.

Wastewater Treatment

According to the *CEQR Technical Manual* wastewater is considered to include sanitary sewage, wastewater generated by industries, and stormwater. Water used for air conditioning generates a negligible amount of wastewater for it is recirculated or evaporates in the cooling and heating process.

The majority of New York City's wastewater treatment system is comprised of the sewer network beneath the streets and the 14 water pollution control plants (WPCPs) located throughout the city. The majority of the New York City sewers are called combined sewers as they receive sanitary wastewater and stormwater runoff. Wastewater generated in a "drainage basin," the area served by a WPCP, is conveyed through a network of combined sewers to the WPCP.

During dry weather, the WPCP primarily treats sanitary sewage. The average daily flow during dry weather is known as the average "dry-weather flow." WPCPs have treatment capacities set at twice their dry-weather design flow for a limited amount of time. However, because the majority of New York City sewers are combined sewers, they are also the recipients of stormwater and rainwater runoff from impermeable surfaces that generally contain pollutants such as oil and floatable debris. During wet weather, stormwater enters the combined sewer system along with sanitary sewage, and are both treated at a WPCP. During wet weather, rainfall runoff can reach 10 to 50 times the dry weather flow, sometimes well above the WPCP design capacity. To avoid flooding the WPCPs, built-in regulators act as relief valves to direct the excess water to an outfall. During storm events, sanitary sewage entering or already in the combined sewer system, stormwater, and debris can be discharged (or overflowed) untreated into the nearest body of water. This untreated overflow is known as "combined sewer overflow" (CSO).

The proposed rezoning area is located within two northwest Bronx neighborhoods, Bedford Park and Norwood, and generally bounded by East Gun Hill Road to the north, East Fordham Road to the south, the Metro-North Railroad Harlem Line to the east, and Valentine and Rochambeau Avenues to the west (see Chapter 2.0, "Project Description"). The rezoning area is in a combined sewer area and contains some areas with direct drainage to the Bronx River. Wastewater generated in this area is treated at the Wards Island and Hunts Point WPCPs.

All 14 WPCPs in New York City have a State Pollution Discharge Elimination System (SPDES) permitted capacity of 1.8 billion gallons per day. The Wards Island WPCP is regulated by a SPDES permit to treat and discharge up to 275 mgd of wastewater. In 2009, Wards Island WPCP treated between 171 mgd to 210 mgd, an average flow of 184 mgd, with a 91 mgd available capacity. The Hunts Point WPCP has a permit to treat 200 mgd of wastewater daily. The Hunts Point WPCP treated between 105 mgd to 121 mgd, an average flow of 114 mgd, with a capacity of 86 mgd.

Based on the wastewater generation rates provided in Table 3.2-1 and the *CEQR Technical Manual*, existing uses on the projected development sites generate approximately 54,336 gpd (0.05 mgd) of wastewater (Table 3.2-1).

Stormwater Management

Stormwater runoff from impermeable surfaces is collected by catch basins along the street and conveyed by the city's combined sewer system to the Wards Island and Hunts Point WPCPs, as well as direct drainage to the Bronx River. During dry weather, regulators built into the combined sewer system direct flows to interceptor sewers leading to the WPCPs. However, during storm events, the regulators allow only twice the dry-weather design flow into interceptor sewers and the remaining flow is diverted as a CSO to the Bronx River.

In the existing condition, the total site area of the projected development sites consists of 280,374 sf, of which 37 percent (103,807 sf) has the permeability of rooftops, 54 percent (150,150 sf) is covered by hard surface, mostly parking structures, and nine percent (26,417 sf) is covered in grass/ softscapes. Table 3.2-2, "Existing Surface Calculations," contains a breakdown of surface area and runoff coefficient calculations by subcatchment area. For this analysis, the CEQR Sanitary and Stormwater Drainage Calculation Matrix was used to calculate the total volume from the proposed project area to the combined sewer systems during a range of storm events.

Table 3.2-2:
Existing Surface Calculations

	EXISTING					
	WEIGHTED RUNOFF COEFFICIENT, C					
	SURFACE TYPE[1]	**ROOF[2]**	**PAVT & WALKS**	**OTHER[3]**	**GRASS & SOFT SCAPE**	**TOTAL**
Ward's Island (WIB-068)	**AREA, %**	41%	0%	52%	7%	100%
	SURFACE AREA, SF	96,137	0	123,108	15,297	234,543
	RUNOFF COEFFICIENT	1.00	0.85	1.00	0.20	**0.95**
Hunts Point (HP-007)	**AREA, %**	12~~21~~%	0%	44~~75~~%	45~~36~~%	100%
	SURFACE AREA, SF	4,128 ~~6,103~~	0	15,094 ~~21,469~~	15,459~~934~~	34,681 ~~28506~~
	RUNOFF COEFFICIENT	1.00	0.85	1.00	0.20	**0.64** ~~**0.97**~~
Direct Drainage to Bronx River	**AREA, %**	32~~9~~%	0%	57~~0~~%	11~~91~~%	100%
	SURFACE AREA, SF	3,541 ~~1,566~~	0	6,375 ~~0~~	1,234 ~~15,759~~	11,150 ~~17,325~~
	RUNOFF COEFFICIENT	1.00	0.85	1.00	0.20	**0.91** ~~**0.27**~~

Notes:
1- Runoff coefficients for each surface type are as per NYCDEP.
2- Total roof areas onsite.
3- Other surfaces onsite primarily consist of parking lots which have a runoff coefficient of 1.0, as per NYCDEP.

The total combined stormwater and wastewater flow generated by the existing uses on the projected development sites are presented in Table 3.2-3 broken down by subcatchment area and direct drainage areas. Runoff in million gallons (MG) are shown in Table 3.2-3. As indicated in this table, the projected development sites together currently generate between ~~0.0001~~0.0086 and 0.43 MG of stormwater during a range of storm events.

Table 3.2-3:
Existing Combined Stormwater and Sanitary, and Direct Drainage Volumes from Project Area during Different Storm Events

Wards Island WPCP

Rainfall, in	Duration, hr	Total Area (A), acre	Weighted Runoff Coefficient (C)	Stormwater to CSS, MG	Daily Sanitary Sewage Generation per CEQR TM, MGD	Sanitary to CSS, MG
0.00	3.80	5.38	0.95	0.00	0.0523	0.0083
0.40	3.80	5.38	0.95	0.06	0.0523	0.0083
1.20	11.30	5.38	0.95	0.17	0.0523	0.0246
2.50	19.50	5.38	0.95	0.35	0.0523	0.0425

Hunts Point WPCP

Rainfall, in	Duration, hr	Total Area (A), acre	Weighted Runoff Coefficient (C)	Stormwater to CSS, MG	Daily Sanitary Sewage Generation per CEQR TM, MGD	Sanitary to CSS, MG
0.00	3.80	0.80~~0.65~~	0.64~~0.97~~	0.00	0.0006~~0.0015~~	0.0001~~0.0002~~
0.40	3.80	0.80~~0.65~~	0.64~~0.97~~	0.01	0.0006~~0.0015~~	0.0001~~0.0002~~
1.20	11.30	0.80~~0.65~~	0.64~~0.97~~	0.02	0.0006~~0.0015~~	0.0003~~0.0007~~
2.50	19.50	0.80~~0.65~~	0.64~~0.97~~	0.03~~0.04~~	0.0006~~0.0015~~	0.0005~~0.0012~~

Direct Drainage to Bronx River

Rainfall, in	Duration, hr	Total Area (A), acre	Weighted Runoff Coefficient (C)	Stormwater to CSS, MG	Daily Sanitary Sewage Generation per CEQR TM, MGD	Sanitary to CSS, MG
0.00	3.80	0.26~~0.40~~	0.91~~0.27~~	0.00	0.0014~~0.0005~~	0.0002~~0.0001~~
0.40	3.80	0.26~~0.40~~	0.91~~0.27~~	0.00	0.0014~~0.0005~~	0.0002~~0.0001~~
1.20	11.30	0.26~~0.40~~	0.91~~0.27~~	0.01~~0.00~~	0.0014~~0.0005~~	0.0007~~0.0002~~
2.50	19.50	0.26~~0.40~~	0.91~~0.27~~	0.02~~0.01~~	0.0014~~0.0005~~	0.0011~~0.0004~~

Individual development projects are required to manage on-site stormwater runoff in accordance with NYCDEP requirements. To be issued a permit to connect to a city sewer, NYCDEP requires that storm runoff from new developments and certain alterations in excess of the amount allowed under the applicable drainage plan be detained on-site. The method to be used to calculate this amount is described in the NYCDEP document "Criteria for Determination of Detention Facility Volume" (June 2002). Since most of the buildings in the area most likely pre-date NYCDEP requirements, it is likely that there is little or no on-site detention of stormwater within the proposed project area.

Water Conservation and WPCP Load Reduction

During the 1990s, the city instituted a range of water conservation measures in response to excess flow to the city's WPCPs that exceeded the dry weather flow allowed in their respective SPDES permits. Measures included equipping fire hydrants locks to prevent illegal use and requiring that all new plumbing fixtures in the city, including replacements in existing structures and new fixtures in new structures, be of a low-flow design (Local Law No. 29, 1989). The city also implemented a metering program, installing water meters at thousands of properties where water fees had previously been based on property frontage rather than usage. This metering provided a new financial incentive for consumers to conserve. The city also implemented leak detection programs to identify and repair leaks in the water distribution system.

These programs have reduced water demand and the load on the city's WPCPs. At many WPCPs, this reduction has been in an order of magnitude of several million gallons per day. NYCDEP projects that savings from the continued implementation of these conservation measures over the next decade would exceed any increase in water demand from consumers.

3.2.2 FUTURE WITHOUT THE PROPOSED ACTION

In the future without the proposed action, anticipated growth in the vicinity of the Bronx's Bedford Park and Norwood neighborhoods, and development that would occur on the 24 projected sites without the proposed action would result in additional demand for water, wastewater production and stormwater runoff. As identified in Chapter 2.0, "Project Description," the future development without the proposed action would consist of 219 dwelling units, 126,678 sf of retail/ public use space (including restaurants), 128,405 sf of office space, 27,612 of hotel, 40,164 sf of community facility, 168,999 sf of industrial use and 982 parking spaces. In the future without the proposed action, there are also three known developments in the study area that are taken into consideration in the analysis: the McSam Hotel at 3070 Webster Avenue, an NYCSCA Primary/ Intermediate School at 3177 Webster Avenue, the Doe Fund Affordable Housing at 3349/3365 Webster Avenue, and the Peter Jay Sharpe Parking Garage at 2960 Webster Avenue.

Water Supply

In the future without the proposed action, as shown in Table 3.2-4, the water consumption that would occur with the development sites would total approximately 352,643 gpd (0.35 mgd). This represents an increase from the existing conditions of approximately 273,295 gpd (0.27 mgd) or approximately 344 percent over the existing water demand for these sites. As noted previously, New York City consumes approximately 1.3 billion gallons of water per day. Given this level of consumption, this incremental demand of 0.27 mgd would not be large enough to significantly impact the ability of the city's water system to deliver water in the future without the proposed action.

Wastewater Treatment

As indicated on Table 3.2-4, in the future without the proposed action, 260,618 gpd (0.26 mgd) of wastewater would be generated, most of which (approximately 0.19 mgd) would go to Wards Island WPCP. This wastewater generation to Wards Island is 194,286 gpd or approximately 271 percent increment from existing generation. This increment ~~and~~ represents 0.16 percent of the 91 mgd available capacity of the plant. The Wards Island WPCP is, therefore, expected to continue to operate within its design capacity. The wastewater generation to Hunts Point would equal approximately ~~54,616~~62,842 gpd (~~0.055~~0.063 mgd), which represents ~~0.06~~0.07 percent of the 86 mgd available capacity of the plant. The Hunts Point WPCP is, therefore, expected to continue to operate within its design capacity. The remaining ~~0.012~~0.003 mgd would be directly discharged to the Bronx River.

Stormwater Management

In the future without the proposed action, stormwater runoff would continue to be collected and directed through the existing combined sewer system and then conveyed to the Wards Island and Hunts Point WPCPs for treatment or direct drainage to the Bronx River. No change in the amount of impervious surfaces is anticipated in the study area, as additional development is expected to occur at the project development sites. Without the proposed action in the future, the majority of sites would experience either new construction or conversion of existing uses. This development would include new residential, retail/ public use, office, community facility and storage/automotive-related uses.

Assuming that the area of impermeable surface within the study area would not change, and since there would be only minimal increase in sanitary flow to the combined sewer, it is anticipated that no significant change in the frequency or duration of CSO events would occur as a result of development within the study area in the future without the proposed action.

Table 3.2-4:
Water Consumption and Wastewater Generation in the Future Without the Proposed Action

Land Use	*Rate*	*Existing Conditions*			*Conditions in the Future Without the Proposed Action*			*Change in Conditions in the Future Without the Proposed Action Compared to Existing Conditions*		
		Area (sf)	*Water/ Wastewater Generation (gpd)*	*Air Conditioning (gpd)*	*Area (sf)*	*Water/ Wastewater Generation (gpd)*	*Air Conditioning (gpd)*	*Area (sf)*	*Water/ Wastewater Generation (gpd)*	*Air Conditioning (gpd)*
Residential	Domestic: 100 gpd/person (242 gpd/DU) Air Conditioning: 0 gpd/sf	10 DUs	2,420	N/A	359 DUs	86,878	N/A	349 DUs	84,458	N/A
Retail/ Public Use	Domestic: 0.24 gpd/sf Air Conditioning: 0.17 gpd/sf	47,626	11,430	8,096	126,678	30,403	21,535	79,052	18,973	13,439
Office	Domestic: 0.10 gpd/sf Air Conditioning: 0.17 gpd/sf	12,265	1,227	2,085	128,405	12,840	21,829	116,140	11,614	19,744
Hotel	Domestic: 120 gpd/rm/occup (0.60 gpd/sf) Air Conditioning: 0.17 gpd/sf	0	0	0	33,112	19,867	5,629	33,112	19,867	5,629
Community Facility	Domestic: 0.17 gpd/sf Air Conditioning: 0.17 gpd/sf	3,000	510	510	40,164	6,828	6,828	37,164	6,318	6,318
Industrial/ Manufacturing	Domestic: 2,000 gpd/acre (0.46 gpd/sf) Air Conditioning: 0.17 gpd/sf	84,238	38,749	14,320	212,351	97,682	36,100	128,113	58,932	21,779
Schools	Domestic: 10 gpd/ seat Air Conditioning: 0.17 gpd/sf	0	0	0	612 Seats	6,120	104	612 Seats	6,120	104
Water Consumption Subtotals			**54,336**	**25,012**		**260,618**	**92,025**		**206,282**	**67,013**
Sewage Generation Subtotal			**54,336**			**260,618**			**206,282**	
Total Water Consumption			**79,348 (0.08 mgd)**			**352,643 (0.35 mgd)**			**273,295 (0.27 mgd)**	
Total Wastewater Generation			**54,336 (0.05 mgd)**			**260,618 (0.26 mgd)**			**206,282 (0.21 mgd)**	

Notes:
* Refer to Table 3.2-1 for consumption rate assumptions.

3.2.3 FUTURE WITH THE PROPOSED ACTION

In the future with the proposed action, the existing water supply, wastewater treatment and stormwater management systems are expected to support the proposed action without incurring significant adverse impacts. The proposed action would facilitate more mixed-use commercial and residential development than would occur in the future without the proposed action. With the proposed action the rezoning area would include a total of 957 dwelling units, 198,316 sf of retail/public use (including FRESH food stores and restaurants) space, 144,978 sf of office space, 47,946 sf of community facility space, 90,847 sf of industrial/manufacturing and 756 parking spaces. Compared to the condition in the future without the proposed action, conditions in the future with the proposed action would add a net total 738 dwelling units, 71,638 sf of retail space, 16,573 sf of office, 7,782 sf of community facility space, and a decrease of 27,612 sf of hotel, 78,152 sf of industrial and manufacturing use, and 226 parking spaces.

Water Supply

The proposed action would not result in significant adverse impacts on the city's water supply system. As shown in Table 3.2-5, the proposed development would generate a water supply demand of approximately 497,234 gpd (0.50 mgd), an increase of 144,591 gpd (0.14 mgd) or approximately 41 percent, compared to demand in the future without the proposed action. Demand with the proposed action would represent less than 0.1 percent of the city's water supply demand. The incremental demand with the proposed action would, therefore, not adversely impact the city's water supply or system water pressure.

Wastewater Treatment

In the future with the proposed action, wastewater from the study area would continue to be treated by the Wards Island and Hunts Point WPCPs. The capacity of the plants would not change as a result of the proposed action and the facilities would retain their SPDES permitted capacities of 275 mgd and 200 mgd, respectively. As shown in Table 3.2-5, the proposed action would generate approximately 406,870 gpd of sanitary sewage. This sanitary sewage generation is a 146,252 gpd (0.15 mgd or 56 percent) increase from the amount of sanitary sewage that would be generated in the future without the proposed action. The increase represents ~~0.17~~0.13 percent of the reserve capacity of the Wards Island WPCP and ~~a decrease of 0.02~~ 0.03 percent of the reserve capacity of the Hunts Point WPCP compared to the future without the proposed action. Table 3.2-7 shows the additional wastewater generated in the subcatchment areas within the development sites. Since the demand associated with the proposed action is well within the capacity of the treatment plant, no significant adverse impacts to the city's wastewater treatment services would occur as a result of the rezoning.

Table 3.2-5:
Water Consumption and Wastewater Generation in the Future Without and With the Proposed Action

Land Use	*Rate*	*Conditions in the Future Without the Proposed Action*			*Conditions in the Future With the Proposed Action*			*Changes in Water Consumption and Wastewater Generated With the Proposed Action*		
		Area (sf)	*Water/ Wastewater Generation (gpd)*	*Air Conditioning (gpd)*	*Area (sf)*	*Water/ Wastewater Generation (gpd)*	*Air Conditioning (gpd)*	*Area (sf)*	*Water/ Wastewater Generation (gpd)*	*Air Conditioning (gpd)*
Residential	Domestic: 100 gpd/person (242 gpd/DU) Air Conditioning: 0 gpd/sf	359 DUs	86,878	N/A	1,097 DUs	265,474	N/A	738 DUs	178,596	N/A
Retail/ Public Use	Domestic: 0.24 gpd/sf Air Conditioning: 0.17 gpd/sf	126,678	30,403	21,535	198,316	47,596	33,714	71,638	17,193	12,178
Commercial/ Office	Domestic: 0.10 gpd/sf Air Conditioning: 0.17 gpd/sf	128,405	12,840	21,829	144,978	14,498	24,646	16,573	1,657	2,817
Hotel	Domestic: 120 gpd/rm/occup (0.75 gpd/sf) Air Conditioning: 0.17 gpd/sf	33,112	19,867	5,629	5,500	3,300	935	-27,612	-16,567	-4,694
Community Facility	Domestic: 0.17 gpd/sf Air Conditioning: 0.17 gpd/sf	40,164	6,828	6,828	47,946	8,151	8,151	7,782	1,323	1,323
Industrial/ Manufacturing	Domestic: 2,000 gpd/acre (0.46 gpd/sf) Air Conditioning: 0.17 gpd/sf	212,351	97,682	36,100	134,199	61,732	22,814	-78,152	-35,950	-13,286
Schools	Domestic: 10 gpd/ seat Air Conditioning: 0.17 gpd/sf	612 Seats	6,120	104	612 Seats	6,120	104	0	0	0
Water Consumption Subtotals			**260,618**	**92,025**		**406,870**	**90,364**		**146,252**	**-1,661**
Sewage Generation Subtotals		**260,618**			**406,870**			**146,252**		
Total Water Consumption		**352,643 (0.35 mgd)**			**497,234 (0.50 mgd)**			**144,591 (0.14 mgd)**		
Total Wastewater Generation		**260,618 (0.26 mgd)**			**406,870 (0.41 mgd)**			**146,252 (0.15 mgd)**		

Notes:
* Refer to Table 3.2-1 for consumption rate assumptions.

Stormwater Management

In the future with the proposed action, the development sites would total 280,374 sf of land, all of which would continue to be covered by impervious surface. Consequently, the stormwater runoff would be similar to that under existing conditions. Table 3.2-6 "Surface Calculations for the Future With the Proposed Action" contains a breakdown of surface area and runoff coefficient calculations by subcatchment area.

Table 3.2-6:
Surface Calculations for the Future With the Proposed Action

	WITH-ACTION SCENARIO (PROJECT + NO-ACTION SCENARIO)					
	WEIGHTED RUNOFF COEFFICIENT, C					
	SURFACE TYPE	**ROOF**	**PAVT & WALKS**	**OTHER**	**GRASS & SOFT SCAPE**	**TOTAL**
Ward's Island (WIB-068)	**AREA, %**	57%	0%	43%	0%	100%
	SURFACE AREA, SF	133,847	0	100,696	0	234,543
	RUNOFF COEFFICIENT	1.00	0.85	1.00	0.20	**1.00**
Hunts Point (HP-004)	**AREA, %**	78~~75~~%	0%	22~~25~~%	0%	100%
	SURFACE AREA, SF	27,004 ~~21,274~~	0	7,677 ~~7,232~~	0	34,681 ~~28,506~~
	RUNOFF COEFFICIENT	1.00	0.85	1.00	0.20	**1.00**
Direct Drainage to Bronx River	**AREA, %**	67~~76~~%	0%	33~~24~~%	0%	100%
	SURFACE AREA, SF	7,420 ~~13,026~~	0	3,730 ~~4,099~~	0	11,150 ~~17,125~~
	RUNOFF COEFFICIENT	1.00	0.85	1.00	0.20	**1.00**

Notes:
* Refer to Table 3.2-2 for assumptions.

Table 3.2-7:
Combined Stormwater and Sanitary, and Direct Drainage Volumes from Project Area during Different Storm Events in the Future With the Proposed Action

Wards Island

Rainfall, in	Duration, hr	Total Area, acre	Weighted Runoff Coefficient	Stormwater to CSS, MG	Daily Sanitary Sewage Generation per CEQR TM, MGD	Sanitary to CSS, MG
0.00	3.80	5.38	1.00	0.00	0.3164~~0.3515~~	0.0501 ~~0.0557~~
0.40	3.80	5.38	1.00	0.06	0.3164~~0.3515~~	0.0501 ~~0.0557~~
1.20	11.30	5.38	1.00	0.18	0.3164~~0.3515~~	0.1490 ~~0.1655~~
2.50	19.50	5.38	1.00	0.37	0.3164~~0.3515~~	0.2571 ~~0.2856~~

Hunts Point

Rainfall, in	Duration, hr	Total Area, acre	Weighted Runoff Coefficient	Stormwater to CSS, MG	Daily Sanitary Sewage Generation per CEQR TM, MGD	Sanitary to CSS, MG
0.00	3.80	0.80~~0.65~~	1.00	0.00	0.0848~~0.0351~~	0.0134 ~~0.0056~~
0.40	3.80	0.80~~0.65~~	1.00	0.01	0.0848~~0.0351~~	0.0134 ~~0.0056~~
1.20	11.30	0.80~~0.65~~	1.00	0.03~~0.02~~	0.0848~~0.0351~~	0.0399 ~~0.0165~~
2.50	19.50	0.80~~0.65~~	1.00	0.05~~0.04~~	0.0848~~0.0351~~	0.0689 ~~0.0286~~

Direct Drainage

Rainfall, in	Duration, hr	Total Area, acre	Weighted Runoff Coefficient	Stormwater to CSS, MG	Daily Sanitary Sewage Generation per CEQR TM, MGD	Sanitary to CSS, MG
0.00	3.80	0.26~~0.40~~	1.00	0.00	0.0056~~0.0202~~	0.0009 ~~0.0032~~
0.40	3.80	0.26~~0.40~~	1.00	0.00	0.0056~~0.0202~~	0.0009 ~~0.0032~~
1.20	11.30	0.26~~0.40~~	1.00	0.01~~0.01~~	0.0056~~0.0202~~	0.0027 ~~0.0095~~
2.50	19.50	0.26~~0.40~~	1.00	0.02~~0.03~~	0.0056~~0.0202~~	0.0046 ~~0.0164~~

A comparison of combined Stormwater Runoff and Wastewater flows in the future with the proposed action with existing combined flows and combined flows in the future without the proposed action is provided in Table 3.2-8. As shown in this table, the total combined stormwater and wastewater flows with the proposed action would result in an increase of the combined flows compared to the existing conditions during a range of storm events.

Table 3.2-8:
Combined Stormwater and Sanitary, and Direct Drainage Volumes from Project Area during Different Storm Events, Comparison of Existing Conditions to Future With the Proposed Action Conditions

Existing		Area = 234,543 SF (5.38 ACRES)				Area = 34,681 SF (0.80 ACRES)~~Area = 28,506 SF (0.65 ACRES)~~				Area = 11,150 SF (0.26 ACRES)~~Area = 17,325 SF (0.40 ACRES)~~			
		Wards Island				**Hunts Point**				**Direct Drainage**			
Rainfall Volume (in)	***Rainfall Duration (hr)[3]***	***Runoff Volume Direct Drainage (MG)[4]***	***Runoff Volume to CSS (MG)***	***Sanitary Volume to CSS (MG)***	***Total Volume to CSS (MG)***	***Runoff Volume to River (MG)***	***Runoff Volume to CSS (MG)***	***Sanitary Volume to CSS (MG)***	***Total Volume to CSS (MG)***	***Runoff Volume Direct Drainage (MG)[4]***	***Runoff Volume to CSS (MG)***	***Sanitary Volume to CSS (MG)***	***Total Volume to CSS (MG)***
0.00	3.80	0.0000	0.0000	0.0083	0.0083	0.0000	0.0000	0.00012	0.00012	0.0000	0.0000	0.00021	0.00021
0.40	3.80	0.0000	0.0554	0.0083	0.0637	0.0000	0.0056 ~~0.0069~~	0.00012	0.0057 ~~0.0072~~	0.0025 ~~0.0012~~	0.0000	0.00021	0.00021
1.20	11.30	0.0000	0.1663	0.0246	0.1909	0.0000	0.0167 ~~0.0208~~	0.00037	0.0170 ~~0.0215~~	0.0076 ~~0.0035~~	0.0000	0.00072	0.00072
2.50	19.50	0.0000	0.3464	0.0425	0.3890	0.0000	0.0348 ~~0.0433~~	0.000512	0.0353 ~~0.0445~~	0.0158 ~~0.0074~~	0.0000	0.001104	0.001104

Future		Area = 234,543 SF (5.38 ACRES)				Area = 34,681 SF (0.80 ACRES)~~Area = 28,506 SF (0.65 ACRES)~~				Area = 11,150 SF (0.26 ACRES)~~Area = 17,325 SF (0.40 ACRES)~~			
		Wards Island				**Hunts Point**				**Direct Drainage**			
Rainfall Volume (in)	***Rainfall Duration (hr)[3]***	***Runoff Volume Direct Drainage (MG)[4]***	***Runoff Volume to CSS (MG)***	***Sanitary Volume to CSS (MG)***	***Total Volume to CSS (MG)***	***Runoff Volume to River (MG)***	***Runoff Volume to CSS (MG)***	***Sanitary Volume to CSS (MG)***	***Total Volume to CSS (MG)***	***Runoff Volume Direct Drainage (MG)[4]***	***Runoff Volume to CSS (MG)***	***Sanitary Volume to CSS (MG)***	***Total Volume to CSS (MG)***
0.00	3.80	0.0000	0.0000	0.0501 ~~0.0557~~	0.0501 ~~0.0557~~	0.0000	0.0000	0.0134 ~~0.0056~~	0.0134 ~~0.0056~~	0.0000	0.0000	0.0009 ~~0.0032~~	0.0009 ~~0.0032~~
0.40	3.80	0.0000	0.0585	0.0501 ~~0.0557~~	0.1086 ~~0.1141~~	0.0000	0.0086 ~~0.0071~~	0.0134 ~~0.0056~~	0.0221 ~~0.0127~~	0.0028 ~~0.0043~~	0.0000	0.0009 ~~0.0032~~	0.0009 ~~0.0032~~
1.20	11.30	0.0000	0.1754	0.1490 ~~0.1655~~	0.3244 ~~0.3409~~	0.0000	0.0259 ~~0.0213~~	0.0399 ~~0.0165~~	0.0659 ~~0.0379~~	0.0083 ~~0.0130~~	0.0000	0.0027 ~~0.0095~~	0.0027 ~~0.0095~~
2.50	19.50	0.0000	0.3655	0.2571 ~~0.2856~~	0.6226 ~~0.6511~~	0.0000	0.0540 ~~0.0444~~	0.0689 ~~0.0286~~	0.1229 ~~0.0730~~	0.0174 ~~0.0270~~	0.0000	0.0046 ~~0.0164~~	0.0046 ~~0.0164~~

Notes:
1- If the proposed project crosses over several different CSO subcatchment areas, the above summary table should be completed for each CSO sub-catchment area.
2- If proposed project includes a phased implementation plan or discrete sites, assess volumes using additional cells above (e.g., Site B).
3- Based on ***Intensity/duration/Frequency Rainfall Analysis, New York City and the Catskill Mountain Water Supply Reservoirs,*** Vieux & Associates, Inc., April 4, 2006. The 24-hour rainfall volume is based on average rainfall intensity over 24-hours (inch/per) times 24 hrs. (Duration information provided by T. Newman & P. Jadhav, HydroQual).
4- The volume (calculated in WS2) of stormwater runoff from any portion of the proposed project site draining to a separate storm sewer or as overland flow directly to a water body should be entered here.

As the matrices demonstrate, the combined stormwater and sanitary volumes from the project area increase by approximately ~~64~~60 percent to ~~79~~290 percent above existing conditions dependent on subcatchment area and different storm events. Flows and volumes to the combined sewer system would increase from the project area. These increased volumes and flows would be conveyed to Hunts Point WPCP, Wards Island WPCP, or discharged directly to the Bronx River, dependent upon the storm event.

A BMP concept plan was developed and submitted to DEP between the draft and final EIS to illustrate the opportunities for development lots within rezoned areas to incorporate onsite stormwater source controls during site planning and building design phases of project development.

STORMWATER BEST MANAGEMENT PRACTICES CONCEPT PLAN SUMMARY

The following Stormwater Best Management Practices (BMPs) Concept Plan illustrates opportunities for development lots within the proposed rezoning areas to incorporate onsite stormwater source controls during site planning and building design phases of project development. and help achieve a target stormwater release rate of 0.25 CFS or 10% of the allowable flow per the drainage plan, whichever is greater. The concept plan addresses this primarily through a description of the proposed building form, first in the growth inducing aspect of the proposal along Webster Avenue and second in the neighborhood preservation areas of Bedford Park and Norwood.

Building Form on Webster Avenue

As described in the Project Description, building form on Webster Avenue is made up of R7D/C2-4, C4-5D and C4-4 districts. R7D/C2-4 district permits residential, commercial, and community facility development with maximum Floor Area Ratios (FAR) of 4.20, 2.00, and 4.20 respectively. There are 128 lots in the proposed R7D/C2-4, 18 of those are considered projected development sites and 35 are potential in the Reasonable Worst Case Development Scenario (RWCDS). C4-5D district permits residential, commercial, and community facility development at a maximum FAR of 4.20 for each. There are 9 lots in the proposed C4-5D, 4 of those are considered projected development sites and 4 are potential in the RWCDS. C4-4 districts can be major commercial centers located outside of the central business districts with a maximum commercial FAR of 3.40. C4-4 districts can also be used for residential and/or community facilities. There are 34 lots in the proposed C4-4, 3 of those are considered projected development sites and 7 are potential in the RWCDS.

BMPs suitable for these districts include green roofs and blue roofs, which would retain or release stormwater with slowed discharge rates to control peak run off rates. Blue roofs can be constructed on new roofs at limited additional cost to the developer, property manager or tenants. Trees planted per NYC's street tree requirements could also be constructed to capture and store water below the tree pit at low additional costs. Walkways, courtyards and other paved areas onsite could utilize porous concrete or asphalt. In full residential C4-4 districts other BMPs suitable include onsite rain gardens, infiltration swales and stormwater detention is possible, where open space is required. Subsurface vaults/tanks, stone beds, stormwater chambers, and perforated pipes allow storm water to seep into the ground, where site conditions allow, and store water for

gradual release during rain events freeing up capacity in combined and separate storm sewers are also recommended in C4-4 districts.

BMP concept plans for R7D/C2-4 and C4-5 districts show that blue and green roofs would be particularly suitable given that lot coverage by the building footprint and rooftop is typically 65-100% of the lot depending on whether residential rear yards are used or retail is provided on the ground floor. Tree plantings to capture stormwater as well as porous pavement for walkways, courtyards or other paved surfaces could also be utilized within these zoning lots and the characteristic uses of these zoning lots i.e., residential and commercial and the need for users to access the street, building and/or parking. C4-4 districts have a flexible building envelope because of the height factor regulations and therefore provide more opportunities for incorporating ground level BMPs, such as bioswales or other pervious surfaces.

Incorporation of the BMPs, summarized above, on the development sites should be designed to achieve a target stormwater release rate of 0.25 cfs or 10% of the allowable flow per the drainage plan, whichever is greater.

Contextual Districts

Contextual districts include R4A, R5A, R5B, R5D R6B, R7A, and R7B districts. These districts were described in detail in the Project Description. Generally, R4A and R5A districts only permit detached single- and two-family residences; R5B districts allow all housing types; R6B are typical row house districts which permit residential and community facility uses; and R7A and R7B districts permit residential and community facility uses. There are 14 lots in the proposed R4A; 209 lots in the proposed R5A; 400 lots in the proposed R5B; 175 lots in the proposed R6B; 95 lots in the proposed R7A; and 504 lots in the proposed R7B district.

BMPs suitable for R4A, R5A, R5B, R5D, R6B and R7A districts development include rain gardens, infiltration swales or subsurface open bottom detention systems where open space and yards are required. Subsurface vaults/tanks, stone beds, stormwater chambers, and perforated pipes to allow storm water to seep into the ground, where site conditions allow, and store water for gradual release during rain events freeing up capacity in combined and separate storm sewers. Walkways and other paved areas onsite could be constructed with permeable concrete or porous asphalt. In addition, rain barrels and cisterns could be connected to external downspouts where overflow is connected to the sewer system and stored water could be used to irrigate landscaped and grassed areas onsite. Green and blue roofs and planting strips and stormwater planters, designed to retain or detain stormwater runoff, should also be considered for R6B, R7A, and R7B districts.

The R4A, R5A, R5B, R5D, R6B, R7A and R7B districts result in buildings with ground level open spaces as a result of yard requirements or maximum lot coverage requirements. R4A, R5A, R5B and R6B district also have a planting requirement for the front yards which facilitates use of storm-water planter or planting strips. These buildings will allow for BMPs which utilize ground level open space for infiltration or detention. The R4A, R5A, R5B districts typically have 40 – 55% lot coverage and R5D,

R6B, R7A and R7B districts have typically 50 – 80% lot coverage. Therefore the zoning district with higher amount of open space/lesser lot coverage will have greater opportunities for ground level BMPs and those with greater lot coverage can better utilize roof based BMPs.

Additionally, buildings in the R4A and R5A districts are generally 1 -2 family houses which can potentially have pitched roofs. The pitched roofs in such buildings would preclude green roof/blue roofs however rainwater collection systems like downspouts connected to the sewer system or water storage can be applied. The R5B, R5D, R6B, R7A and R7B districts which are more likely to have flat roofs can utilize roof based BMPs.

Incorporation of the BMPs, summarized above, on the development sites should be designed to achieve a target stormwater release rate of 0.25 cfs or 10% of the allowable flow per the drainage plan, whichever is greater.

Enterprise Green Communities

The Department of Housing Preservation and Development (HPD) is mandating that all projects to use their funding sources are to be certified as green buildings by Enterprise Green Communities. This program either mandates or provides optional support for many on-site water retention or water management building technologies. It also requires that water conserving fixtures and appliances be used. The Inclusionary Housing program, which is being applied in the proposed R7D and C4-5 D zoning districts, would provide a power incentive for affordable housing to be built using HPD programs, which in turn would require many of the BMPs described above.

BMPs suitable for Enterprise Green Communities include green roofs and blue roofs, which would retain or release stormwater with slowed discharge rates to control peak run off rates. Blue roofs can be constructed on new roofs at limited additional cost to the developer, property manager or tenants. Trees planted could capture and store water below the tree pit at low additional costs. Walkways, courtyards and other paved areas onsite could utilize porous concrete or asphalt.

The proposed project may be inconsistent with the existing drainage plan, which is based on outdated zoning. Exiting sanitary sewers in some portions of the rezoning area may not be able to accommodate increased wastewater flows generated by increased zoning densities. To be issued a permit to connect to a city sewer, an applicant proposing a new development or expansion of an existing development within the proposed rezoning area may be required to submit a site-specific hydraulic analysis DEP for its review and approval. The site specific hydraulic analysis would establish the adequacy of the existing combined sewer systems that would serve the development lot. Based on this site-specific hydraulic analysis, sewer improvements or onsite detention that account for downstream and upstream zoning and related densities may be required of the applicant at the time of the house or site connection proposal.

Self-certification of house or site connection proposals will not be permitted by the Department of Buildings or DEP in connection with any proposed new developments or

expansions of existing development for which sewer connections are required including the Blocks and Lots listed in Tables 2.0-6a and b of this EIS.

Based on the analysis described above, conducted pursuant to CEQR Technical Manual methodologies, in concert with the measures described above, it is concluded that the proposed actions would not result in significant adverse impacts to the local water supply, sanitary wastewater treatment, or stormwater management infrastructure systems with the above measures in place.

CONCLUSION

Water Supply

In the future with the proposed action, development on the projected development sites would generate water supply demand of approximately 0.14 mgd greater than estimated in the future without the proposed action. This demand represents less than 0.1 percent of the city's overall water supply demand of 1.3 billion gallons per day. Therefore, since the proposed action would not result in developments that consume an exceptional amount of water, the proposed action would not result in a significant adverse impact on the city's water supply or water pressure.

Wastewater Treatment

The proposed action would generate approximately 0.15 mgd more sanitary sewage over the future without the proposed action, which is equivalent to ~~0.17~~0.13 percent of the 91 mgd reserve capacity of the Wards Island WPCP and ~~0.02~~0.03 percent of the 86 mgd reserve capacity of the Hunts Point WPCP. Therefore, the proposed action would not result in a significant adverse impact on the WPCP.

Sanitary and Stormwater Drainage and Management

~~The proposed action would not generate substantial additional runoff compared to the amount of runoff that would occur in the future without the proposed action. Because the amount of impervious surfaces (roofs, pavement, etc) on the projected development sites would not change substantially as compared to the existing and no build conditions, there would not be a substantial increase of stormwater runoff as a result of the action.~~

~~In order to better reflect the City's commitment to improving the capacity of the water and sewer infrastructure through green infrastructure investments, the lead agency will continue to coordinate with NYCDEP between the Draft EIS and Final EIS to undertake the following measures:~~

- ~~Apply to all projected and potential sites in the rezoning area a provision that would establish, for properties in the area, a rigorous infrastructure permitting procedure, such as:~~

~~Self-certification of sewer connection applications will not be permitted by the NYC DOB or NYC DEP in connection with any proposed development or enlargement of buildings for which sewer connection approval is required on all Blocks and Lots listed in Tables 2.0-6a and b. Prior to filing a House or Site Connection application, applicants may be required to submit a site-specific hydraulic analysis and a stormwater and water conservation best management practices concept plan to the NYC DEP for its review and approval, to establish the adequacy of existing sanitary and storm sewers to serve the proposed development or enlargement.~~

- ~~Prepare a generic, illustrative stormwater best management practices concept plan to exemplify additional measures for freeing up capacity in the affected combined sewer system.~~

~~Based upon our Water and Sewer Infrastructure analysis, in concert with the measures described above, we conclude that there would be no significant adverse infrastructure impacts as a result of the proposed actions.~~

~~Based on the analysis described above and conducted pursuant to *CEQR Technical Manual* methodologies, it is concluded that the proposed actions would not result in significant adverse impacts to the local water supply, sanitary wastewater treatment, or stormwater management infrastructure systems with the above measures in place.~~

As shown in Table 3.2-8 "Combined Stormwater and Sanitary, and Direct Drainage Volumes from Project Area during Different Storm Events, Comparison of Existing Conditions to Future With the Proposed Action Conditions," the increased volumes within the CSO subcatchment areas are a direct result of the increased densities and sanitary flows associated with the proposed action. The implementation of low-flow fixtures, as per the New York City Plumbing Code, Local Law 33 of 2007 and the US Environmental Protection Agency's WaterSense Program, will ensure sanitary flows are controlled to the maximum extent feasible.

Enhanced stormwater management throughout the City to improve water quality in adjacent waterways is consistent with recent policies including the *NYC Green Infrastructure Plan* and Mayor Bloomberg's *PlaNYC 2030* and *Sustainable Stormwater Management Plan*. The *NYC Green Infrastructure Plan*, released September 2010, includes a goal of capturing the first inch of rainfall on 10 percent of the impervious areas in combined sewer watersheds through detention or infiltration techniques over 20 years. Generally, *PlaNYC* calls for water quality improvements through stormwater source controls to expand recreation opportunities adjacent to and in the city's waterways. The *Sustainable Stormwater Management Plan*, which describes a framework for meeting this water quality goal, identified new development and redevelopment as a cost effective and feasible means of implementing greater source controls. The *Enterprise Green Communities* program, required for all projects using Department of Housing Preservation and Development (HPD) funding, provides optional support for many on-site water retention or water management building technologies. HPD is mandating that

all of the projects be certified as green buildings by *Enterprise Green Communities* which also requires that water conserving fixtures and appliances be used.

A BMP concept plan was developed and submitted to DEP between the draft and final EIS to illustrate the opportunities for development lots within rezoned areas to incorporate onsite stormwater source controls during site planning and building design phases of project development and to help achieve a target stormwater release rate of 0.25 CFS from the development lots. These measures would serve to avoid an exacerbation of existing CSOs discharged to the Bronx River. The Bronx River is one of the waterbodies highlighted in the CEQR Technical Manual as it is a waterbody of existing CSO volumes/frequencies of concern.

These measures may include the implementation of BMPs described in the *NYC Green Infrastructure Plan*, including blue and green roofs, subsurface detention, porous pavement, enhanced tree pits, rain gardens or infiltration swales and rain barrels. New development would be required to comply with DEP rules and regulations such as not allowing self-certification for site connection permits and by providing on-site detention to meet allowable flow requirements per the site connection proposal process. There are no plans to amend the drainage plan for the proposed affected area or upgrade the affected sewer system. However, additional water conservation and reuse strategies as well as rooftop, subsurface, or vegetated BMP's within the rezoning area would go further to reduce combined sewer flows from the area. Specifically, the BMPs, summarized above, should be designed to achieve a target stormwater release rate of 0.25 cfs or 10% of the allowable flow per the drainage plan, whichever is greater, on each of the development sites.

Based on the analysis described above, conducted pursuant to CEQR Technical Manual methodologies, in concert with the measures described above, it is concluded that the proposed actions would not result in significant adverse impacts to the local water supply, sanitary wastewater treatment, or stormwater management infrastructure systems with the above measures in place.