A. INTRODUCTION

This chapter analyzes the potential impacts of the proposed actions on the city's infrastructure systems. As defined by the *City Environmental Quality Review (CEQR) Technical Manual*, the city's "infrastructure" comprises the physical systems supporting its population, including water supply, wastewater treatment, and stormwater management. Other infrastructure components, such as solid waste management, energy, and transportation, are addressed separately under CEQR and are assessed in separate chapters of this EIS.

The addition of workers and residents to the study area as a result of the proposed actions would create new demands for drinking water and wastewater treatment. The potential effects on those municipal services are discussed in this chapter. Because new development is expected to occur on some of the projected development sites in the future without the proposed actions, this analysis examines the net difference between the future without and with the proposed actions.

PRINCIPAL CONCLUSIONS

The incremental demand for water supply from implementation of the proposed actions would not adversely affect the ability of the existing system to distribute water to, or maintain water pressure for, local users. Further, the increase in sanitary sewage and stormwater discharge resulting from the proposed development would not cause the Newtown Creek Water Pollution Control Plant (WPCP) to exceed its design capacity or its New York State Pollution Discharge Elimination System (SPDES) permit flow limit. Finally, the stormwater generated by the proposed development would not result in a significant adverse impact on the combined sewer system or the East River.

Overall, implementation of the proposed actions would not cause any significant adverse impacts to the water supply, sewage treatment, and stormwater discharge systems.

B. METHODOLOGY

WATER SUPPLY

In accordance with the *CEQR Technical Manual*, the study area for the water supply impact assessment includes the entire area serviced by the Croton gravity system in addition to pressure regulators from the Catskill/Delaware System. Water pressure regulators reduce the water pressure within the water mains to levels suitable for public use. The water supply system is a gravity-fed system, which relies on the elevation gradient between the heights of Hillview Reservoir in Yonkers for Catskill/Delaware Water and the Jerome Park Reservoir in the Bronx for Croton Water. Average daily water usage for existing and future conditions was calculated using rates given in the *CEQR Technical Manual*.

The proposed actions were evaluated to determine whether the generated water demand would overburden the existing supply system, or require a reconfiguration or modification to the water supply infrastructure. The city has initiated a comprehensive water conservation program with

the objective of reducing water use by implementing water metering programs and by requiring that existing and new structures be designed on the basis of low-flow criteria (Local Law No. 29, 1989). Additional measures, including leak detection programs and locking fire hydrants, are also intended to reduce water demand, as are plans by the New York City Department of Environmental Protection (DEP) to meter water usage in all buildings. The *CEQR Technical Manual* provides water usage rates that do not include the effects of these water conservation measures, which results in a conservative water consumption analysis.

SANITARY SEWAGE AND STORMWATER TREATMENT

In conformance with the *CEQR Technical Manual*, the study area for the sanitary sewage (or wastewater) analysis is the entire area served by the Newtown Creek Water Pollution Control Plant (WPCP). Consistent with *CEQR Technical Manual* guidance, the amount of sanitary sewage from the projected development sites to be treated at the Newtown Creek WPCP is assumed to be equal to the projected volume of potable water demand for the proposed actions. Wastewater generated from air conditioning use is minimal because of the recirculation and evaporation processes of water cooling systems and is therefore not included in the overall sanitary sewage volumes. The analysis includes an evaluation of whether the increased volume of sanitary sewage flows with the projected development sites to the Newtown Creek WPCP would be within the limits of the State Pollutant Discharge Elimination System (SPDES) permit. The SPDES permit is issued by the New York State Department of Environmental Conservation (NYSDEC). An adverse impact would occur if the proposed actions result in a volume of sanitary sewage that exceeds the limits of the SPDES permit.

C. EXISTING CONDITIONS

WATER SUPPLY

NEW YORK CITY

New York City's water supply system is composed of three watersheds—Croton, Delaware, and Catskill—and extends as far north as the Catskill Mountains. New York City water systems provide approximately 1.1 billion gallons per day to the five boroughs as well as Westchester, Putnam, Ulster, and Orange Counties. From these watersheds, water is carried to the city via a conveyance system made up of reservoirs, aqueducts, and tunnels extending as far as 125 miles north of the city. Within the city, a grid of water pipes distributes water to customers. The Croton system supplies an average of 22 million gallons per day (mgd), primarily to users in the lower-elevation portions of Manhattan and the Bronx. Groundwater from the Brooklyn Queens Aquifer supplies about 2 mgd, less than 1 percent of the average daily supply.

The Delaware and Catskill systems supply all five boroughs and deliver about 98 percent of the city's drinking water. The Delaware and Catskill water systems collect water from watershed areas in the Catskill Mountains and deliver it to the Kensico Reservoir in Westchester County. This reservoir acts as the seasonally balancing reservoir. Summer demand is usually greater than winter demand. From the Kensico Reservoir, water is sent to the Hillview Reservoir in Yonkers, which balances the daily fluctuations in water demand and pressure to the system. From there, water is delivered to the city through three tunnels, Tunnel Nos. 1, 2, and 3. Tunnel No. 1 carries water through the Bronx and Manhattan to Brooklyn; Tunnel No. 2 travels through the Bronx, Queens, Brooklyn, and then through the Richmond Tunnel to Staten Island; and Tunnel No. 3 goes through the Bronx and Manhattan, terminating in Queens.

PRIMARY STUDY AREA

Average daily water consumption in Manhattan is estimated at about 200 million gallons per day (mgd) and the average water pressure in the area surrounding the projected development sites is estimated by the New York City Bureau of Water and Sewer Operations to be 50 to 60 pounds per square inch (psi). A pressure of 20 psi is the minimum water pressure acceptable for uninterrupted service and for the Fire Department of the City of New York's (FDNY) service requirements. The trunk mains that would serve the study area run north to the south. Individual smaller mains (of 12 and 20 inches) branch out from the trunk mains to provide water sources to buildings and fire hydrants.

The projected development sites—including enlargement sites—in the primary study area currently contain approximately 667,869 square feet of retail, office, and other commercial uses and 300 dwelling units (DU). Based on recommended CEQR rates for water consumption (as shown in Table 13-1), the projected development sites currently consume an estimated 172,047 gpd. An additional 145,725 gpd of water is currently used for air conditioning on the projected development sites for a total consumption of 317,772 gpd.

Table 13-1

Existing Water Usage/Sewage Generation of Projected Development Sites

Use	Rate[1]	Area (sf)	Water Consumption and Sewage Generation (gpd)	Air Conditioning (gpd)[1]
Residential[2]	Domestic: 112 gpd/person Air conditioning: 0.17 gpd/sf	234,529 (300 DUs)	66,192	39,870
Retail and other commercial uses[3]	Domestic: 0.17 gpd/sf Air conditioning: 0.17 gpd/sf	558,118	94,880	94,880
Office	Domestic: 25 gpd/sf Air conditioning: 0.10 gpd/sf	109,751	10,975	10,975
		Subtotals	**172,047**	**145,725**
		Total Water Consumption	**317,772**	

Notes:
1 Usage and generation rates from the *CEQR Technical Manual.*
2 Assumes 1.97 persons per dwelling unit.
3 Usage and generation rates for retail were used as a conservative estimate for other commercial uses.

WATER CONSERVATION

During the 1990s, the city's various water pollution control plants came under increased scrutiny from federal and state agencies, primarily because the plants exceeded the dry weather flow allowed in their respective SPDES permits. As a result, the city instituted a variety of water conservation measures intended to reduce dry weather flow to these facilities. For example, fire hydrants were equipped with locks to prevent illegal use. In addition, all new plumbing fixtures in the city, including replacements in existing structures and new fixtures in new structures, are required to 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.

The programs above have, on the whole, been successful, in that they have reduced water demand and the load on the city's WPCPs. At many water pollution control plants, this reduction has been on the order of several million gallons per day. DEP projects, over the next decade, that

savings from the continued implementation of these conservation measures would exceed any increase in water demand from consumers.

SANITARY SEWAGE AND STORMWATER TREATMENT

Most sanitary sewage in the city is collected and conveyed through a combined sewer system operated and maintained by DEP. This system receives sanitary sewage from residences, businesses, and municipal buildings, as well as stormwater accumulated in catch basins along the streets, and the combined flow is sent for treatment at one of the city's WPCPs.

The projected development sites are entirely within the service area of DEP's Newtown Creek WPCP, located at Provost and Greenpoint Avenues along the Newtown Creek in Brooklyn. Constructed between 1965 and 1979, this WPCP is the largest wastewater treatment facility in the city and is currently undergoing a major expansion and upgrade intended to increase its capacity by 50 percent and extend secondary treatment to all its inflow. A SPDES permit issued by DEC regulates the quality and the quantity of effluent from this WPCP for the purposes of protecting the water quality of the East River and regional water quality as a whole. The Newtown Creek WPCP is currently designed and permitted to treat a monthly flow of 310 mgd. The rolling 12-month average monthly flow rate at the plant is 238 mgd, which is lower than the plant's design capacity (see Table 13-2).

Table 13-2
2006-2007 Average
Monthly Dry Weather Flows
at the Newtown WPCP

Month	Average Monthly Flow (mgd)
November 2007	229
October 2007	239
September 2007	233
August 2007	244
July 2007	258
June 2007	246
May 2007	227
April 2007	255
March 2007	237
February 2007	230
January 2007	230
December 2006	233
Total 12-month average	**238**
Newtown Creek WPCP SPDES permit limit	310

Source: New York City Department of Environmental Protection, December 2007.

The sewer system within the study area consists of combined sewers, regulators, and interceptors. Each trunk sewer feeds into the interceptor sewer through a regulator chamber that controls the flow from the trunk sewer to the interceptor. Generally, the wastewater within the primary study area flows east in collector and trunk sewers toward the 108-inch intercepting sewer under Avenue D. The purpose of a regulator is to divert sanitary flow from the existing combined sewers to the intercepting sewer during normal flow periods (dry weather), and limit

the flow to the intercepting sewer to twice dry weather flow during storm periods (wet weather). The existing tide gates placed on the combined sewer outfall (CSO) downstream of the regulators are designed to keep tide water from entering the existing combined sewers and the intercepting sewer. Tide gates can be part of the regulator structure or stand-alone chambers.

The intercepting sewers serving the study area include a series of 4' by 2'8" sewers, 3'9" by 4'3" sewers, 3' by 2'8" sewers, and 4' by 3' sewers extending west to east under the streets. The 108-inch interceptor sewer conveys the study area's sanitary sewage by gravity to the Newtown Creek WPCP. The sewers are constructed of brick or concrete in various sizes and shapes, ranging from elliptical to circular, and are generally located between 8 and 16 feet below the surface.

The primary study area is predominantly covered by rooftops (buildings) and vacant lots with generally impervious surfaces. Therefore, absorption of stormwater is minimal, and stormwater runoff is instead collected in catch basins along the streets and channeled to the combined sewer system. A typical outfall has regulators that divert the wastewater flow to interceptor sewers, which deliver wastewater to the Newtown Creek WPCP. The regulators are designed to allow two times the mean dry weather flow into the interceptor.

Consistent with *CEQR Technical Manual* guidance, the amount of sanitary sewage from the projected development sites to be treated at the Newtown Creek WPCP is assumed to be equal to the volume of potable water demand for the projected development sites. The current amount of sewage generated by the projected development sites is estimated to be 172,047 gpd. This volume is included in the total average estimated combined monthly flow treated at the Newtown Creek WPCP.

D. THE FUTURE WITHOUT THE PROPOSED ACTIONS

In the future without the proposed actions, the identified projected development sites are assumed to remain unchanged from existing conditions or become developed by uses that are as-of-right under the existing zoning. In total, there would be approximately 2,534 residential units (including 244 units on the projected enlargement sites, no change from existing conditions) and 450,928 square feet of commercial space on projected development sites. The net difference between the existing conditions and conditions in the future without the proposed actions is an increase of 2,234 dwelling units, an increase of 58,195 square feet of retail space, a decrease of 109,751 square feet of office space, and an increase of 60,919 square feet of hotel space.

WATER SUPPLY

As shown in Table 13-3, the projected development sites in the future without the proposed actions, would consume an estimated 686,675 gpd for domestic water use and 530,461 gpd for air conditioning use, yielding a total water consumption of 1,217,136 gpd (approximately 1.2 mgd). Sanitary sewage generated by these sites would be 686,675 gpd.

Table 13-3
Future Without the Proposed Actions: Water Usage/Sewage Generation on Projected Development Sites (No Build)

Use	Rate[1]	Existing			No Build		
		Area (sf)	Water Consumption and Sewage Generation (gpd)	Air Conditioning (gpd)	Area (sf)	Water Consumption and Sewage Generation (gpd)	Air Conditioning (gpd)
Residential	Domestic: 112 gpd/person[2] Air conditioning: 0.17 gpd/sf	234,529 (300 DUs)	66,192	42,585	2,468,210 (2,534 DUs)	559,102	419,596
Retail and other commercial uses[3]	Domestic: 0.17 gpd/sf Air conditioning: 0.17 gpd/sf	558,118	94,880	94,880	390,011	104,773	104,773
Office	Domestic: 25 gpd/person Air conditioning: 0.17 gpd/sf	109,751	10,975	10,975	0	0	0
Hotel	Domestic:150 gpd/room/occupant[4] Air conditioning: 0.10 gpd/sf	0	0	0	60,919 (152 rooms)	22,800	6,092
Subtotals			**172,047**	**145,725**		**686,675**	**530,461**
Total Water Consumption			**317,772**			**1,217,136**	

Notes:
1 Usage and generation rates from the *CEQR Technical Manual.*
2 Assumes 1.97 residents per DU (dwelling unit).
3 Usage and generation rates for retail were used as a conservative estimate for other commercial uses.
4 Assumes 400 square feet per hotel room.

In the future without the proposed actions, water usage for the reasonable worst-case development scenario (RWCDS) projected development sites would be approximately 0.7 mgd (0.6 mgd for water and 0.07 mgd for air conditioning), an increase of approximately 0.4 mgd from existing conditions (see Table 13-3). This incremental demand is not large enough to significantly impact the ability of the city's water system to deliver water in the future without the proposed actions (it is less than a 0.2 percent increase). The existing system and grid of water mains within the primary study area are expected to continue to provide adequate water supply and pressure in the future without the proposed actions.

SANITARY SEWAGE AND STORMWATER TREATMENT

In the future without the proposed actions, it is assumed that there would be development on the projected development sites as well background growth that would affect flows to the Newtown Creek WPCP through the 2017 analysis year. With respect to the development that is anticipated in the future without the proposed actions on the projected development sites, sewage flows are assumed to be the same as the domestic water demand (686,675 gpd), which represents about 0.29 percent of the average wastewater flows at the Newtown Creek WPCP. According to *DEP Interim Water Demand and Wastewater Flow Projections* (July 2006), the projected flows at this WPCP for the 2017 build year is 224 mgd. This projection is 91 mgd below the SPDES permitted and design capacity of the Newtown Creek WPCP. Thus, even with the projected increases in wastewater volumes in the future without the proposed actions, the added flows would allow the Newtown Creek WPCP to continue operation within its current design capacity and SPDES-permitted limits. Adding this flow from the No Build condition yields a projected 2017 flow of less than 1 mgd.

As stated above, the projected development sites in the primary study area are predominantly covered by rooftops (buildings) and vacant lots with generally impervious surfaces. In the future

without the proposed actions, no reduction in the amount of impervious surfaces is anticipated, as additional development is expected to occur at the sites. DEP requires stormwater detention in compliance with the drainage plan for existing or for new development fronting sewer-lined streets if storm flow exceeds the allowable flow of the drainage plan. As a result of these requirements, and given that the existing development sites are mostly covered with impervious surfaces and do not provide detention, it is expected that there would be some reduction in uncontrolled runoff from private development sites in the future without the proposed actions.

E. PROBABLE IMPACTS OF THE PROPOSED ACTIONS

As described in Chapter 1, "Project Description," it is anticipated that new development on the projected development sites—including enlargement sites—would consist of 3,917 residential units, including 348 affordable units, and 376,489 square feet of commercial space. Compared to conditions in the future without the proposed actions, this represents a net increase of 1,383 residential units (including 348 affordable units), and a net decrease of 74,439 square feet in commercial space (13,520 square feet of retail space and 60,919 of hotel use). The analysis presented below is based on these net incremental changes in development at the projected development sites.

WATER SUPPLY

As shown in Table 13-4, in the future with the proposed actions, total water usage on the projected development sites would be about 1.7 mgd, resulting in a net increase of approximately 0.5 mgd over anticipated water usage in the future without the proposed actions and an increase of 0.05 percent over the city's current daily water demand. This small incremental demand is not large enough to significantly impact the city's water system.

Table 13-4
Future With the Proposed Actions: Water Usage/Sewage Generation on Projected Development Sites (Build)

		No Build			Build		
Use	Rate[1]	Area (sf)	Water Consumption and Sewage Generation (gpd)	Air Conditioning (gpd)	Area (sf)	Water Consumption and Sewage Generation (gpd)	Air Conditioning (gpd)
Residential	Domestic: 112 gpd/person[2] Air conditioning: 0.17 gpd/sf	2,468,210 (2,534 DUs)	559,102	419,596	3,839,737 (3,917 DUs)	864,026	652,709
Retail	Domestic: 0.17 gpd/sf Air conditioning: 0.17 gpd/sf	390,011	104,773	104,773	376,491	102,475	102,475
Hotel	Domestic:150 gpd/room/occupant[3] Air conditioning: 0.10 gpd/sf	60,919 (152 rooms)	22,800	6,092	0	0	0
Subtotals			**686,675**	**530,461**		**966,501**	**755,184**
Total Water Consumption			**1,217,136**			**1,721,685**	

Notes:
1 Usage and generation rates from the *CEQR Technical Manual.*
2 Assumes 1.97 residents per DU (dwelling unit).
3 Assumes 400 square feet per hotel room.

SANITARY SEWAGE AND STORMWATER TREATMENT

Sanitary sewage flows in the future with the proposed actions at the projected development sites would be approximately 966,501 gpd, a net increase of approximately 279,826 gpd from flows projected in the future without the proposed actions. This increment represents about 0.12 percent of the current average wastewater flows at the Newtown Creek WPCP and less than

1 percent of its SPDES permitted flows. This increase is not expected to adversely impact the Newtown Creek WPCP nor cause it to exceed its design capacity or SPDES permit flow limit. Assuming a flow rate of 224 mgd in the future without the proposed actions and adding to that the incremental growth of 279,826 gpd yields a projected total flow of less than 225 mgd in 2017, which is within the permitted and design capacity of the WPCP. Thus, the Newtown Creek WPCP would continue to adequately treat wastewater effluent. It is noted that adding the proposed action growth into the projected flows is conservative, since the DEP flow projections already take into account population and employment growth within the Newtown Creek WPCP service area.

Under the RWCDS, the projected development sites would be covered by buildings and other impervious surfaces. As such, no measurable change to stormwater runoff is expected for these sites from those in the future without the proposed actions. As stated above, assuming that new development in the primary study area would be required to provide stormwater detention measures such as dry wells and seepage basins, current stormwater runoff patterns and flooding conditions in this area would improve. In addition, no new streets are proposed under the proposed actions, and DEP would continue to move forward with its amended drainage plan for the area and upgrading the sewer system to relieve local street flooding.

F. CONCLUSION

To summarize the above infrastructure analysis, the following is expected with respect to potential impacts of the proposed actions:

- The incremental additional water usage as a result of the proposed actions is expected to total 279,826 gpd. This added demand represents an increase of 0.05 percent over the city's current daily water demand and is not expected to overburden the city's water supply system. In addition, all new development must comply with Local Law No. 29 of 1989 with respect to water conservation measures.
- It is expected that there would be adequate treatment capacity at the Newtown Creek WPCP to handle the increased sanitary flows from the RWCDS development. In the future with the proposed actions, average monthly flow of just less than 225 mgd would be within the permitted and design capacity of the Newtown Creek WPCP.
- No measurable change in stormwater runoff from the new development as a result of the proposed actions is expected as projected development sites are already occupied by buildings or other impervious surfaces and new development would be required to comply with DEP rules and regulations for detention.

Based on the analysis pursuant to the *CEQR Technical Manual*, 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. ✷