Chapter 8: Water and Sewer Infrastructure

A. INTRODUCTION

This chapter evaluates the potential for significant adverse impacts on water and sewer infrastructure that could result from the proposed project. The project would consist of new retail facilities, a supermarket, community facility/non-profit space and light industrial facilities that would increase the project site's water demand and sewage generation from the current condition. The effect on the City's water supply, and wastewater and stormwater conveyance and treatment infrastructure is discussed in this chapter.

The size and location of the project (more than 150,000 square feet of commercial development in Brooklyn) warrants a preliminary sewer analysis per the 2010 *City Environmental Quality Review (CEQR) Technical Manual*. A preliminary sewer analysis is also warranted under the 2010 *CEQR Technical Manual* because the project site is over 5 acres and would result in an increase of impervious surfaces on the site.[1]

As described more fully below, the proposed project would result in an increased demand on the City's water supply, wastewater, and stormwater conveyance and treatment infrastructure. The increases due to the proposed project, however, are minimal and would not significantly impact the existing infrastructure. The amount of impervious surface on the 6.08-acre site would increase and the proposed project would be designed to meet the standards for LEED Silver Certification by the U.S. Green Building Council. To meet those standards, ~~a Best Management Practice (BMP) Plan would be developed and would identify BMPs that would be implemented,~~ best management practices (BMPs) would be designed and implemented in coordination with the New York City Department of Environmental Protection (DEP), including the ~~inclusion~~ incorporation of a green roof and both planted areas and permeable pavement within the proposed parking lot. These measures, along with others to be selected and implemented, would reduce the overall stormwater runoff generation, overall volume of stormwater runoff, and peak runoff rates into the combined sewer system. Accordingly, the proposed project would not be expected to result in any significant adverse impacts on the water supply, wastewater or stormwater conveyance and treatment infrastructure.

B. METHODOLOGY

This analysis follows the methodologies set forth in the 2010 *CEQR Technical Manual* and assesses current conditions, conditions in the future without the proposed project (No Action), and conditions in the future with the proposed project (With Action).

Water demands and sewage generation are calculated based on the proposed uses of the project and the generation rates set by the *CEQR Technical Manual*. The ability of the City's water and

[1] *CEQR Technical Manual*, May 2010, p. 13-9

sewer infrastructure to handle the anticipated demand is determined by comparing the existing conditions to the With Action and No Action conditions. The existing and With Action stormwater runoff and sanitary flows were calculated using DEP's Flow Volume Calculation Matrix.

C. EXISTING CONDITIONS

WATER SUPPLY

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. From these watersheds, water is carried to the City via a conveyance system made up of reservoirs, aqueducts, and tunnels. Within the City, a network of underground water pipes distributes water to customers. On average, the New York City water system delivers approximately 1.1 billion gallons per day (bgd) to the five boroughs and Westchester County.

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. The Delaware and Catskill systems supply all five boroughs and delivers approximately 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. 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. City Tunnel No. 2 serves the northern portion of Brooklyn where the project site is located.

The project site has readily available access to both domestic water and fire service. The site is served by 20-inch diameter water mains in both Navy Street and Nassau Street. Fire hydrants are located adjacent to the site on Nassau Street, tapping from the 20-inch water main.[1]

Currently, 20 buildings are located on the project site. All are vacant and, therefore, have no existing demand on the local water distribution system.

SANITARY SEWAGE

The proposed project site is located within the former Brooklyn Navy Yard and is adjacent to the Brooklyn Navy Yard industrial park, which has a combined sewer system. The existing vacant buildings located on the project site are connected to the Brooklyn Navy Yard industrial park combined sewer system, which is in the drainage area served by the Red Hook Wastewater Treatment Plant (WWTP). At the Red Hook WWTP, wastewater is fully treated by physical and biological processes before it is discharged into the East River. The quality of the treated wastewater (effluent) is regulated by a New York State Pollution Discharge Elimination System (SPDES) permit issued by the New York State Department of Environmental Conservation (DEC). A maximum daily capacity for each treatment facility in the City is set to ensure that the quality of effluent is acceptable to discharge into surrounding water bodies, and the maximum

[1] Information obtained from the DEP Bureau of Water and Sewer Operations Water Maps.

capacity for the Red Hook WWTP is 60 million gallons per day (mgd). **Table 8-1** lists the monthly flows to the Red Hook WWTP. The average monthly flow over the past 12 months is 28 mgd, well below the maximum permitted level of 60 mgd.

Table 8-1
Monthly Flows at Red Hook WWTP

Month	Flow (mgd)
April 2010	27
May 2010	28
June 2010	28
July 2010	27
August 2010	30
September 2010	28
October 2010	28
November 2010	26
December 2010	26
January 2011	28
February 2011	29
March 2011	31
12-Month Average	**28**

Notes: Permitted Limit: 60 mgd
Source: DEP Monthly Reports: Operating Efficiency Citywide Bubble

The area surrounding the project site has a network of combined sewers that convey both sanitary sewage and stormwater to the Red Hook WWTP. In periods of dry weather, the combined sewer conveys only sanitary sewage. During and immediately after wet weather, the sewers can experience a much larger flow. To control flooding at the Red Hook WWTP, regulators are built into the system to only allow approximately two times the amount of design dry weather flow into the interceptors, which take the flow to the Red Hook WWTP. The excess flow to the regulators is discharged to the nearest waterbody as combined sewer overflow (CSO).

The flow from the combined sewer system within the Brooklyn Navy Yard industrial park is conveyed to Regulator 27, which is connected to an interceptor that conveys flow to the Red Hook WWTP.[1]

STORMWATER

As discussed above, the area surrounding the project site is served by a combined sewer system within the Brooklyn Navy Yard industrial park. Stormwater runoff from the project site that is not infiltrated is collected in catch basins, which are connected to the Brooklyn Navy Yard industrial park's combined sewer system and conveyed by the City's combined sewers to the Red Hook WWTP.

The project site is approximately 6.08 acres. It is estimated that approximately 0.78 acres (13 percent) of the site is covered by impermeable building roof, 1.51 acres (25 percent) is paved,

[1] Information obtained from DEP.

and the remaining 3.79 acres (62 percent) are covered by grass or unpaved surface. **Table 8-2** describes the project site surfaces and surface areas, and how stormwater runoff is currently discharged from the project site.

Table 8-2
Project Site Surface Coverage: Existing Conditions

Surface Type	Surface Areas (sf)	Discharge Method
Building Roofs	33,882	Combined Sewer
Pavement and Roadway	65,741	Combined Sewer
Grass, Unpaved	165,153	Infiltration/Combined Sewer
Total	**264,776**	
Sources: Data provided by Brooklyn Navy Yard Development Corporation (BNYDC)		

The weighted runoff coefficient of the project site is calculated to be 0.46, which corresponds to the percentage of precipitation that becomes surface runoff.

D. THE FUTURE WITHOUT THE PROPOSED PROJECT

In the future without the proposed project, the buildings on the project site are expected to remain vacant. Water consumption, sanitary sewage generation, and stormwater runoff would not be expected to change from existing conditions.

WATER SUPPLY

In the future without the proposed project, the site would remain vacant and there would continue to be no water demand.

SANITARY SEWAGE

In the future without the proposed project, no sanitary sewage would be discharged from the project site. There have been several recent rezoning projects in the Red Hook WWTP drainage area including the Atlantic Yards, Carroll Gardens/Columbia Street, and the DUMBO Rezonings. The Atlantic Yards Arena and Redevelopment Project EIS (November 2006) projected that the incremental flow from the rezoning would be 1.7 mgd, which is approximately 6 percent of the average 28 mgd currently treated at the Red Hook WWTP. Together, these planned projects would result in a small increase above the average flow currently treated at the Red Hook WWTP and a total flow that is well below the 60 mgd permitted capacity of the Red Hook WWTP. Therefore, it is not expected that the cumulative effects of these rezoning projects would have any significant impacts on the Red Hook WWTP.

STORMWATER

Stormwater runoff amounts from the project site are not expected to change in the future without the proposed project. As pavement on the site continues to deteriorate, infiltration would increase slightly.

E. PROBABLE IMPACTS OF THE PROPOSED PROJECT

WATER SUPPLY

Table 8-3 summarizes the water consumption of the proposed project. The proposed uses on the project site are expected to have a water demand of 99,108 gallons per day (gpd).

As described above, existing 20-inch diameter water mains are located in both Navy Street and Nassau Street. The proposed project does not represent an exceptionally large water demand and is not located in an area that experiences low water pressure. Therefore, it is expected that these water mains would be adequate to provide water service for the proposed project.[1]

Table 8-3
Projected Water Consumption

Use	Size (Square feet)	Rate	Consumption (gallons per day)
Retail Stores, Supermarket			
Domestic	153,229	0.24 gpd/sf	36,775
Air Conditioning	153,229	0.17 gpd/sf	26,049
Light Industrial			
Domestic	127,364	0.10 gpd/sf	12,736
Air Conditioning	127,364	0.17 gpd/sf	21,652
Community Facility/Non-Profit			
Domestic	7,024	0.10 gpd/sf	702
Air Conditioning	7,024	0.17 gpd/sf	1,194
TOTAL	NA	NA	**99,108**

Notes: A usage rate for Light Industrial space was not available. Commercial/Office space usage rates were utilized.
Source: Rates from 2010 *CEQR Technical Manual.*

The projected water consumption for the proposed project of 99,108 gpd represents a small increase in demand on the New York City water supply system. The incremental demand due to the proposed project is 0.009 percent of the 1.1 bgd typically distributed within New York City and Westchester County. As a result, the proposed project would have no significant adverse impacts on the City's water supply.

SANITARY SEWAGE

The estimated amount of sanitary sewage generated by the proposed project would be 50,213 gpd. This estimated amount conservatively includes all water demand except that consumed by air conditioning, which is not discharged into the sewer system. The sanitary sewage generated by the proposed uses on the project site would be conveyed through the combined sewer system within the Brooklyn Navy Yard industrial park to the City's combined sewer system and treated at the Red Hook WWTP. The volume of sanitary sewage generated would be 0.18 percent of the average daily flow of 28 mgd at the Red Hook WWTP and would not result in an exceedance of the Red Hook WWTP's capacity, because of the small increase of sanitary flow to the combined sewer system.[2] Therefore, the proposed project would not create a significant adverse impact on the City's sanitary sewage treatment system. As in the future without the proposed project, it is

[1] *CEQR Technical Manual*, May 2010, p.13-8.

[2] *CEQR Technical Manual*, May 2010, p.13-16 and p.13-17.

not expected that the cumulative effects of the proposed project and the other recent rezoning projects within the Red Hook WWTP drainage area would have any significant impacts on the WWTP.

STORMWATER

Based on the proposed site plan, 42 percent (110,796 square feet) of the site would be roof surfaces, 49 percent (129,525 square feet) of the site would be occupied by asphalt pavement and concrete walkways, 4 percent (11,387 square feet) would be green roof, 1 percent (3,032 square feet) would be permeable pavement and the remaining 4 percent (10,036 square feet) of the site would be parking lot islands that are landscaped with trees and grass. The 11,387-square-foot green roof would be located on top of Retail Building C, which is proposed to front on Nassau Street. Based on this information, the weighted runoff coefficient was calculated to be 0.88. Using the existing and proposed site data, the DEP Volume Calculation Matrix was completed for the existing and With Action conditions. The summary tables, taken from the DEP Flow Volume Matrix, are included in **Table 8-4.**

Table 8-4
DEP Flow Volume Matrix – Existing and With Action Volume Comparison

		Existing				With Action				Project Increment	
		264,776 sf / 6.08 Acres				264,776 sf / 6.08 Acres					
Rainfall Volume (in.)	Rainfall Duration (hr.)	Runoff Volume Direct Drainage (MG)	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)	Increased Total Volume to CSS (MG)	Percent Increase From Existing Conditions (%)
0.00	3.80	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	*
0.40	3.80	0.00	0.03	0.00	0.03	0.00	0.06	0.01	0.07	0.04	133
1.20	11.30	0.00	0.09	0.00	0.09	0.00	0.17	0.02	0.20	0.11	122
2.50	19.50	0.00	0.19	0.00	0.19	0.00	0.36	0.04	0.40	0.21	111

Notes:
*0.01 MG increase from existing condition of 0.00 MG - cannot compute percent increase from 0.
CSS = Combined Sewer System; MG = Million Gallons

The calculations from the flow volume matrix help to determine the change in wastewater volumes to the combined sewer system from existing conditions to the With Action condition. Runoff volumes were calculated for four rainfall volume scenarios with varying durations. The overall increase in combined sewer discharge from the project site for the above rainfall volume-duration scenarios would be 0.01MG, 0.04MG (133 percent increase), 0.11MG (122 percent increase) and 0.21MG (111 percent increase), respectively. The majority of the increased flow would be represented by stormwater runoff generation.

BNYDC has proposed several BMPs to minimize runoff from roof and paved surfaces. Approximately 9 percent of the site surfaces would be green roof, permeable pavement and landscaped areas. The green roof on Building C would lower the potential runoff from this area through soil retention and evapotranspiration, which is the return of water to the atmosphere from surfaces (evaporation) and vegetation (transpiration). The parking lot area would also incorporate landscaped areas and plantings to reduce runoff through soil retention, evapotranspiration and infiltration and permeable pavement that would allow infiltration.

In coordination with DEP, ~~BNYDC and/or~~ the developer to be designated by BNYDC pursuant to a Request for Proposals (RFP) would develop ~~a BMP Concept Plan in coordination with DEP~~

~~to identify~~ and implement additional ~~potential~~ BMPs that would, in combination with the green roof and permeable pavement, achieve an overall release rate of 0.25 cubic feet per second (cfs) or 10 percent of the allowable flow rate (whichever is greater). BNYDC will make the development and implementation of BMPs a commitment in the lease or other legally binding agreement with the developer to be designated pursuant to the RFP. For the types of new development uses within the proposed M1-4 zoning district, there are a number of means for lowering the runoff coefficient. Green and blue roofs would be suitable for retaining or releasing stormwater with slowed discharge rates to control peak runoff rates. ~~Blue roofs can be constructed on new roofs at little to no additional cost. In addition, onsite rain gardens, infiltration swales and stormwater detention may be possible within the parking lot and landscaped areas of the site.~~ Subsurface vaults/tanks, stone beds, stormwater chambers, and perforated pipes, all of which could be located within the proposed parking lot, would allow stormwater to seep into the ground, where site conditions allow, and would store water for gradual release during rain events freeing up capacity in combined and separate storm sewers. Walkways, courtyards and other paved areas onsite could be constructed with permeable concrete or porous asphalt, and onsite rain gardens and infiltration swales within the parking lot and landscaped areas could be implemented to reduce the overall weighted runoff coefficient of the site. A reduced weighted runoff coefficient would aid in achieving an overall release rate of 0.25 cfs or 10 percent of the allowable flow rate (whichever is greater). BMPs that would reduce sanitary sewage volumes such as gray water reuse and low-flow fixtures also could be ~~included in the Concept Plan~~ implemented.

With the implementation ~~incorporation~~ of selected BMPs ~~and the implementation of the BMP Concept Plan~~, the increase in stormwater runoff would not be expected to have a significant impact on the downstream City combined sewer system or the City sewage treatment system. ✶