Chapter 11: Water and Sewer Infrastructure

A. INTRODUCTION

This chapter evaluates the potential for the Proposed Actions to result in significant adverse impacts on the City's water supply, as well as its wastewater and stormwater conveyance and treatment infrastructure. NYU has proposed an expansion of its academic core facilities located near Washington Square Park. The proposed project, to be completed by 2031, would consist of 2.5 million gross square feet (gsf) of new uses including academic, residential, retail, hotel/conference space, and a public school. These new uses and its users have the potential to increase the project site's water consumption, sewage generation, and stormwater runoff as compared to conditions in the future without the Proposed Actions, and therefore, water and sewer infrastructure analyses were conducted.

B. PRINCIPAL CONCLUSIONS

The preliminary assessments found that the Proposed Actions would not result in any significant adverse impacts on the City's water supply, wastewater or stormwater conveyance and treatment infrastructure.

WATER SUPPLY

By 2031 the proposed project (including development in both the Proposed Development Area and the Commercial Overlay Area) would generate an incremental water demand of 706,672 gallons per day (gpd) as compared with the future without the Proposed Actions. This represents a 0.06 percent increase in demand on the New York City water supply system. Based on the projected incremental demand, it is expected that there would be adequate water service to meet the proposed project's incremental water demand, and there would be no significant adverse impacts on the City's water supply.

SANITARY SEWAGE

By 2031 the proposed project (including development in both the Proposed Development Area and the Commercial Overlay Area) would generate an incremental 357,576 gpd of sewage over the future without the Proposed Actions. This incremental volume in sanitary flow to the combined sewer system would represent approximately 0.16 percent of the average daily flow to the Newtown Creek Wastewater Treatment Plant (WWTP). This volume would not result in an exceedance of the Newtown Creek WWTP's capacity, and therefore would not create a significant adverse impact on the City's sanitary sewage treatment system.

Per the New York City Plumbing Code (Local Law 33 of 2007) low-flow fixtures are required to be implemented and would help to reduce sanitary flows from the new buildings. Additionally, the proposed project is expected to achieve the LEED Silver certification as per NYU's *Sustainable Design Standards and Guidelines.* To achieve this certification, NYU would work to

implement a variety of sustainable design measures that could be included to reduce the overall sanitary sewage generation into the combined sewer system. Implementation of best management practices (BMPs) such as high-efficiency fixtures would reduce the overall sewage generated.

STORMWATER

The Proposed Actions would increase the total amount of impervious surfaces within the Proposed Development Area of the project site. However, with the incorporation of selected BMPs in redeveloped portions of the Proposed Development Area—including on-site detention and vegetated areas over underground structures—the proposed project would decrease the rate of stormwater runoff from the project site as compared to conditions without the Proposed Actions, and would not have a significant impact on the downstream City combined sewer system or the City sewage treatment system. Stormwater runoff discharges would not change in the Mercer Plaza Area or the Commercial Overlay Area.

C. METHODOLOGY

This analysis follows the methodologies set forth in the 2010 *City Environmental Quality Review (CEQR) Technical Manual.* According to the *CEQR Technical Manual,* a preliminary water analysis is needed if a project would result in an exceptionally large demand of water (over 1,000,000 gpd), or is located in an area that experiences low water pressure. The project site is not located in an area that experiences low water pressure (it is not located at the end of the water supply distribution system such as the Rockaway Peninsula and Coney Island), and the screening assessment reported in this chapter finds that the proposed project would not result in water demand exceeding 1,000,000 gpd. Therefore, further water analysis was not warranted; however, existing water infrastructure has been disclosed, and total water demand has been calculated for purposes of the preliminary sanitary analysis.

A preliminary sewer analysis is warranted if a project site is over 5 acres and would result in an increase of impervious services on the site; or if a project is located in a combined sewer area in Manhattan would result in the incremental development of 1,000 residential units or 250,000 square feet of commercial space. The proposed project meets both of these CEQR thresholds, and therefore a preliminary sewer analysis was conducted.

Existing and future water demands and sewage generation are calculated based on use generation rates set by the *CEQR Technical Manual*[1]. Stormwater runoff and sanitary flows were calculated using the New York City Department of Environmental Protection (DEP) Flow Volume Calculation Matrix. The ability of the City's water and sewer infrastructure to handle the proposed project's anticipated demand is assessed by estimating existing water demand and sewage rates, and then comparing the future with and without the Proposed Actions.

The sanitary sewage analysis evaluates development resulting from the Proposed Actions within the Proposed Development Area as well as the projected development in the Commercial Overlay Area; the Mercer Plaza Area is not analyzed because there is no proposed development in that area, and therefore water and sewer infrastructure would not be affected. The Proposed Development Area's reasonable worst case development scenario (RWCDS) for this analysis is the Maximum Hotel Scenario (RWCDS 3), because it was found to generate the largest water

[1] *CEQR Technical Manual*, May 2010, p.13-12.

demand. The incremental sewage generated from the proposed project is compared to the future without the Proposed Actions per *CEQR Technical Manual* methodology.

The stormwater analysis evaluates the development proposed in the Proposed Development Area and compares the future with the Proposed Actions to the existing condition per DEP Flow Volume Calculation Matrix methodology. A stormwater analysis was not conducted for the Commercial Overlay Area or the Mercer Plaza Area. The projected development resulting from the Proposed Actions in the Commercial Overlay Area would take place in existing buildings; the stormwater runoff collected from the buildings and discharged into the City sewers would not increase as a result of the Proposed Actions, and therefore, a stormwater assessment for the Commercial Overlay Area is not warranted. The Mercer Plaza Area is not analyzed because no development is proposed there.

D. 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. 1 serves the southern portion of Manhattan where the project site is located.

WATER CONSUMPTION

PROPOSED DEVELOPMENT AREA

There are 12-inch diameter DEP water mains present in all the roadways adjacent to the Proposed Development Area. Within LaGuardia Place, there are two 20-inch water mains in addition to the 12-inch diameter water main. There are a number of fire hydrants located in the roads adjacent to the project site. There are currently five residential buildings within the Proposed Development Area: 505 LaGuardia Place; Silver Towers I and II; and Washington Square Village 1&2 (one building); and Washington Square Village 3&4 (one building). There are also retail uses in the Morton Williams Supermarket building and LaGuardia Retail building. The Coles Sports and Recreation Center is considered equivalent to a retail use for the purposes

of the water consumption analysis.[2] **Table 11-1** summarizes the estimated water demand in the Proposed Development Area.

Table 11-1
Water Consumption in the Proposed Development Area: Existing Conditions

Use	Unit	Size (Square feet)	Rate	Consumption (gallons per day)
Residential				
Domestic	4,221 (people)	NA	100 gpd/person	422,100
Air Conditioning	NA	1,918,113	0.17 gpd/sf	326,079
Retail and Athletic Center				
Domestic	NA	199,203	0.24 gpd/sf	47,809
Air Conditioning	NA	199,203	0.17 gpd/sf	33,865
TOTAL	NA	NA	NA	**829,853**

Source: Rates from 2010 *CEQR Technical Manual.*

COMMERCIAL OVERLAY AREA

There are 12-inch diameter water mains the streets abutting the Commercial Overlay Area (West 4th Street, Washington Square East, Mercer Street, Waverly Place and Washington Place). There is also a 36-inch diameter water main located in West 4th Street. Although the Commercial Overlay Area encompasses a number of existing buildings, only the specific floor areas that are proposed to be redeveloped are analyzed (referred to as the "projected development sites"). This area is 23,236 square feet (sf) of ground floor retail uses within six NYU-owned buildings. Currently, these spaces include residential uses and NYU community facilities such as student lounges. **Table 11-2** summarizes the estimated water demand from projected development sites in the Commercial Overlay Area.

Table 11-2
Water Consumption at Projected Development Sites in the Commercial Overlay Area: Existing Conditions

Use	Unit	Size (Square feet)	Rate	Consumption (gallons per day)
Residential				
Domestic	21 (people)	NA	100 gpd/person	2,100
Air Conditioning	NA	10,000	0.17 gpd/sf	1,700
Commercial/Office				
Domestic	NA	13,236	0.10 gpd/sf	1,324
Air Conditioning	NA	13,236	0.17 gpd/sf	2,250
TOTAL	NA	NA	NA	**7,374**

Note: A usage rate for commercial/office space was utilized for the existing community facility uses.
Source: Rates from 2010 *CEQR Technical Manual.*

[2] There is no prescribed usage rate in the *CEQR Technical Manual* for athletic centers. A retail usage rate was chosen because the inclusion of lockers room and/or a pool would have a larger water demand then standard commercial/office spaces.

SANITARY SEWAGE

PROPOSED DEVELOPMENT AREA

Sanitary sewage from the Proposed Development Area is conveyed to combined sewers in the abutting streets. For purposes of this analysis, the amount of sanitary sewage is conservatively estimated as all water demand except that used by air conditioning, which is typically not discharged to the sewer system. The estimated amount of daily sanitary sewage currently generated in the Proposed Development is 469,909 gpd.

In periods of dry weather, the combined sewers convey only sanitary sewage. During and immediately after wet weather, the combined sewers can experience a much larger flow due to stormwater runoff collection. To control flooding at the Newtown Creek WWTP, where combined sewage from the project site is treated, regulators are built into the system to allow only approximately two times the amount of design dry weather flow into the interceptors. The interceptor takes the flow to the Newtown Creek WWTP, while the excess flow to the regulators is discharged to the nearest waterbody as combined sewer overflow (CSO).

A CSO outfall drainage area boundary runs east-west along Bleecker Street, resulting in two different combined sewer outfalls affected by flow from the Proposed Development Area (although all flow during dry weather is ultimately conveyed to Newtown Creek WWTP). During wet weather events, excess flow from the North Block and a portion of the South Block is conveyed to CSO outfall NC-076. The portion of the South Block that is conveyed to CSO outfall NC-076 is the area adjacent to Bleecker Street and the area adjacent to Mercer Street in between Bleecker Street and West Houston Street. Of the 13.17-acre site, approximately 10.37 acres are within the CSO outfall NC-076 drainage area. CSO outfall NC-076 is located at the bulkhead along the Hudson River adjacent to Clarkson Street. The remaining flow from a portion of the South Block is within the CSO outfall NC-075 drainage area. The NC-075 drainage area, which is approximately 2.80 acres, includes the areas adjacent to West Houston Street between Mercer Street and LaGuardia Place and the areas adjacent to LaGuardia Place between Bleecker Street to West Houston Street. CSO outfall NC-075 is located at the bulkhead along the Hudson River between Hoboken Street and Watts Street.

Once flow is conveyed via the interceptor to the Newtown Creek 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 capacity for the Newtown Creek WWTP is 310 million gallons per day (mgd). The average monthly flow over the past 12 months is 226 mgd, well below the maximum permitted level of 310 mgd.

COMMERCIAL OVERLAY AREA

The projected development within the Commercial Overlay Area is limited to 23,236 square feet (sf) of ground floor retail within existing buildings. The sanitary sewage generated from the existing uses within ground-floors of projected development sites is 3,424 gpd. All sanitary sewage from the Commercial Overlay Area is within the NC-076 CSO drainage area and is treated at Newtown Creek WWTP, as is described above.

STORMWATER

PROPOSED DEVELOPMENT AREA

As discussed above, the area surrounding the project site is served by a combined sewer system that conveys both sanitary and stormwater to Newton Creek WWTP. Stormwater runoff from the project site that is not infiltrated is collected in catch basins and conveyed by the City's combined sewers to the Newtown Creek WWTP.

The Proposed Development Area is approximately 13.17 acres in size. As described above, approximately 10.37 acres are within the CSO outfall NC-076 drainage area, which includes approximately the entire North Block and approximately half of the South Block (areas adjacent to Bleecker Street and Mercer Street). The combined sewer flow that is conveyed to the CSO outfall NC-075 drainage area is within a 2.80 acre drainage area the remaining half of the South Block (areas adjacent to LaGuardia Place and West Houston Street). **Table 11-3** describes the Proposed Development Area's surfaces and surface areas, and how stormwater runoff is currently discharged from the site.

Table 11-3
Surface Coverage in the Proposed Development Area
Existing Conditions

Affected CSO Outfall	Surface Type	Surface Areas (sf)/ Percent Coverage	Discharge Method
NC-076	Building Roofs	142,867/32%	Combined Sewer
	Paved Surfaces	203,602/45%	Combined Sewer
	Vegetation with underground structure (Green Roof)	50,497/11%	Combined Sewer
	Vegetation	54,800/12%	Infiltration/Combined Sewer
	Total	**451,766/100%**	
NC-075	Building Roofs	45,454/37%	Combined Sewer
	Paved Surfaces	41,392/34%	Combined Sewer
	Vegetation with underground structure (Green Roof)	22,642/19%	Combined Sewer
	Vegetation	12,296/10%	Infiltration/Combined Sewer
	Total	**121,784/100%**	

Sources: Langan Survey dated November 2010 and NYU site plans.

The weighted runoff coefficient of the Proposed Development Area is calculated for the area within the NC-076 drainage area as 0.80, and the area within the NC-075 drainage area as 0.81. These numbers correspond to the percentage of precipitation that becomes surface runoff. The Proposed Development Area does not currently have any on-site detention facilities; therefore all stormwater runoff that is not infiltrated is discharged to the combined sewer system as undetained flow.

COMMERCIAL OVERLAY AREA

The projected development resulting from the Proposed Actions in the Commercial Overlay Area would take place in existing buildings, and therefore the stormwater runoff collected from the buildings and discharged into the City sewers would not increase as a result of the Proposed Actions. Therefore, a stormwater analysis was not performed for the Commercial Overlay Area.

E. THE FUTURE WITHOUT THE PROPOSED ACTIONS

2021 PHASE 1

WATER SUPPLY

Proposed Development Area

In 2021 without the proposed project, all buildings in the Proposed Development Area would remain and would continue to be occupied by the same uses; therefore water demand would remain the same as in the existing condition.

Commercial Overlay Area

In the future without the Proposed Actions, by 2021 the approximately 10,000 sf of projected development space within the 15 Washington Place building would be converted to academic uses. Therefore, all of the projected development sites would contain academic uses in the future without the Proposed Actions. **Table 11-4** summarizes the estimated water demand from projected development sites in the Commercial Overlay Area.

Table 11-4
Water Consumption at Projected Development Sites in the Commercial Overlay Area
Future Without the Proposed Actions 2021

Use	Size (Square feet)	Rate	Consumption (gallons per day)
Commercial/Office			
Domestic	23,236	0.10 gpd/sf	2,324
Air Conditioning	23,236	0.17 gpd/sf	3,950
TOTAL	NA	NA	**6,274**

Note: A usage rate for commercial/office space was utilized for the existing Community Facility uses.
Source: Rates from 2010 *CEQR Technical Manual.*

SANITARY SEWAGE

Two rezoning actions within the CSO outfall NC-075 and NC-076 drainage areas were identified to analyze the cumulative impacts of additional sanitary flows to the combined sewer system. The recently-approved North Tribeca rezoning is partially located within the NC-075 drainage area. The projected development includes 693 dwelling units and additional retail space. The total increase in sanitary sewage as a result of the proposed development is anticipated to be 128,822 gpd. Because the locations of the proposed development sites are unknown, it is conservatively estimated that all sanitary sewage is conveyed to the NC-075 catchment area. The proposed Hudson Square rezoning (currently in the scoping phase) would, by 2022, result in projected development of 2,819 dwelling units and 773 dormitory beds (5,960 new residents) within its rezoning area. The projected development also includes retail, office and community facility uses. The increase in sanitary sewage discharged to the NC-075 and NC-076 drainage areas as a result of the projected development is estimated to be 432,996 gpd. The cumulative increase in flow as a result of both rezoning actions is 561,818 gpd, approximately 0.25 percent of the 226 mgd average daily flow to Newtown Creek WWTP.

Proposed Development Area

In 2021 without the proposed project, the sanitary sewage discharged from the Proposed Development Area would remain the same as the existing condition.

Commercial Overlay Area

In 2021 without the proposed project, the sanitary sewage discharged from the selected development sites within the Commercial Overlay Area is estimated to be 2,324 gpd.

STORMWATER

Projected development as a result of the recently-approved North Tribeca rezoning and the proposed Hudson Square rezoning (detailed above) would be expected to incorporate BMPs as a result of the DEP site connection permitting process.

Proposed Development Area

The surface coverage characteristics would remain the same as existing conditions. Stormwater runoff amounts from the Proposed Development Area would not be expected to change in the future without the Proposed Actions.

2031 PHASE 2

WATER SUPPLY

Proposed Development Area

In the future without the Proposed Actions, by 2031 the site of the existing Morton Williams supermarket would be redeveloped as-of-right as a mixed-use building with approximately 150,000 sf of NYU academic space and 25,000 sf of retail uses. All other uses in the Proposed Development Area would remain. As shown in **Table 11-5,** the water demand from the Proposed Development Area would be approximately 868,711 gpd.

Table 11-5
Water Consumption in the Proposed Development Area
Future Without the Proposed Actions 2031

Use	Unit	Size (Square feet)	Rate	Consumption (gallons per day)
Residential				
Domestic	4,221 (people)	NA	100 gpd/person	422,100
Air Conditioning	NA	1,918,113	0.17 gpd/sf	326,079
Commercial/Office				
Domestic	NA	150,000	0.10 gpd/sf	15,000
Air Conditioning	NA	150,000	0.17 gpd/sf	25,500
Retail and Athletic Center				
Domestic	NA	195,198	0.24 gpd/sf	46,848
Air Conditioning	NA	195,198	0.17 gpd/sf	33,184
TOTAL	NA	NA	NA	**868,711**

Source: Rates from 2010 *CEQR Technical Manual.*

Commercial Overlay Area

In the 2031 analysis year there are no additional planned projects within the projected development sites in the Commercial Overlay Area. Water demand would not be expected to change from the future without the Proposed Actions in 2021.

SANITARY SEWAGE

In 2031, the sanitary sewage discharged as a result of the recently-approved North Tribeca rezoning and the proposed Hudson Square rezoning would be expected to remain the same as the conditions described in the 2021 Phase 1 section above.

Proposed Development Area

The estimated amount of sanitary sewage generated in 2031 without the Proposed Actions would be 483,948 gpd. This estimated amount conservatively includes all water demand except that consumed by air conditioning, which is not discharged into the sewer system.

Commercial Overlay Area

Sanitary sewage discharged from the Commercial Overlay Area in 2031 would remain the same as the existing condition.

STORMWATER

Proposed Development Area

The as-of-right development at the site of the Morton Williams supermarket would be developed in approximately the same footprint as the existing building; therefore surface coverage characteristics and stormwater discharge would not change from the existing condition. The new building would be required to provide on-site detention facilities, so there would be a slight reduction in peak stormwater discharge from the area.

F. FUTURE WITH THE PROPOSED ACTIONS

2021 PHASE 1

WATER SUPPLY

Proposed Development Area

In the future with the Proposed Actions, by 2021 the proposed Zipper and Bleecker Buildings would be completed on the South Block, along with the proposed 30,000-sf temporary gymnasium on the North Block.

Table 11-6 summarizes the projected water consumption for the Proposed Development Area assuming RWCDS 3 (the maximum hotel scenario), which is the scenario that generates the largest water demand. The cumulative water demand—including existing residential uses that would remain on-site—would be 1,276,269 gpd. The incremental water demand generated by uses that would be introduced by the Proposed Actions would be 446,416 gpd.

Table 11-6
Water Consumption in the Proposed Development Area
Future With the Proposed Actions 2021

Use	Unit	Size (Square feet)	Rate	Consumption (gallons per day)
Residential				
Domestic	5,538 (people)[1]	NA	100 gpd/person	553,800
Air Conditioning	NA	2,313,113	0.17 gpd/sf	393,229
Commercial/Office				
Domestic	NA	233,000	0.10 gpd/sf	23,300
Air Conditioning	NA	233,000	0.17 gpd/sf	39,610
Retail[2]				
Domestic	NA	236,000	0.24 gpd/sf	56,640
Air Conditioning	NA	236,000	0.17 gpd/sf	40,120
Hotel				
Domestic	300 (rooms)	NA	120 gpd/room/occupant[3]	72,000
Air Conditioning	NA	180,000	0.17 gpd/sf	30,600
School				
Domestic	650 (seats)	NA	10 gpd/seat	6,500
Air Conditioning	NA	100,000	0.17 gpd/sf	17,000
Mechanical[4]				
Domestic	NA	161,000	0.10 gpd/sf	16,100
Air Conditioning	NA	161,000	0.17 gpd/sf	27,370
TOTAL	NA	NA	NA	**1,276,269**

Notes:
1. Includes existing residential uses to remain (4,221 residents occupying 1,918,113 sf of space and 1,317 new residents). New residents would be located in dormitories. Number of new residents calculated by using 300 sf per bed.
2. The temporary recreation center is accounted for as a retail use.
3. Assumes 2 occupants/room.
4. No rate for Mechanical Space provided therefore Commercial/Office Rate was used.

Source: Rates from 2010 *CEQR Technical Manual.*

The 446,416-gpd incremental demand represents a small increase in demand on the New York City water supply system—approximately 0.04 percent of the 1.1 bgd typically distributed within New York City and Westchester County. As a result, by 2021 the Proposed Actions would have no significant adverse impacts on the City's water supply.

Commercial Overlay Area

By 2021, an estimated 23,236 sf of ground floor retail uses would be developed within the Commercial Overlay Area. The total water demand would be 9,527 gpd as shown in **Table 11-7** and the incremental demand attributable to the Proposed Actions would be 3,253 gpd**.**

Table 11-7
Water Consumption at Projected Development Sites in the Commercial Overlay Area
Future With the Proposed Actions 2021

Use	Size (Square feet)	Rate	Consumption (gallons per day)
Retail			
Domestic	23,236	0.24 gpd/sf	5,577
Air Conditioning	23,236	0.17 gpd/sf	3,950
TOTAL	NA	NA	**9,527**

Source: Rates from 2010 *CEQR Technical Manual.*

The incremental water consumption of 3,253 gpd within the Commercial Overlay Area with the Proposed Actions represents a small increase in demand on the New York City water supply system—approximately 0.0003 percent of the 1.1 bgd typically distributed within New York City and Westchester County. As a result, by 2021 the Proposed Actions would have no significant adverse impacts on the City's water supply.

SANITARY SEWAGE

Proposed Development Area

The estimated amount of sanitary sewage generated by the Proposed Development Area, which includes the existing residential uses, would be 728,340 gpd. The incremental sanitary sewage generated by development resulting from the Proposed Actions is 258,431. The sanitary sewage generated by the proposed uses would be conveyed to Regulators M1 and M2, and during wet weather events, when combined sanitary sewage and stormwater flows exceed the regulators' capacities, the sanitary sewage would be directed to CSO outfalls NC-076 and NC-075. During dry weather, the incremental sanitary sewage would represent approximately 0.11 percent of the average daily flow of 226 mgd at the Newtown Creek WWTP, and would not result in an exceedance of the Newtown Creek WWTP's capacity. Therefore, the proposed project would not create a significant adverse impact on the City's sanitary sewage treatment system.

Per the New York City Plumbing Code (Local Law 33 of 2007) low-flow fixtures are required to be implemented and would help to reduce sanitary flows from the new buildings. Additionally, as a prerequisite under LEED Silver, the new buildings constructed within the Proposed Development Area would be required to implement strategies that would use 20 percent less water than the water use in a baseline case. These strategies may include the use of WaterSense certified fixtures and fixture fittings as well as high-efficiency fixtures.

Commercial Overlay Area

The estimated amount of sanitary sewage generated by the selected development sites would be 5,577 gpd. The incremental amount of sanitary sewage is 3,253 gpd in 2021 is 0.001 percent of the average daily flow to Newtown Creek WWTP; therefore the proposed project would not create a significant adverse impact on the City's sanitary sewage treatment system.

STORMWATER

Proposed Development Area

By 2021, construction of the proposed Zipper and Bleecker Buildings on the South Block would be complete, along with the 30,000-sf temporary gymnasium on the North Block. An approximately 10.37 acre area of the Proposed Development Area (the North Block and a portion of the South Block) is within the NC-076 drainage area, and a 2.80 acre portion of the South Block is within the NC-075 drainage area. The weighted runoff coefficient for the NC-076 drainage area would increase slightly from 0.80 to 0.81, and the weighted runoff coefficient of the NC-075 drainage area would remain the same as compared to the existing conditions. Overall, the weighted runoff coefficient of the entire Proposed Development Area would increase slightly.

Compared to existing conditions in the NC-076 drainage area, the amount of building roof increased and paved surfaces decreased. There would be very little change to the amount of underground garage with green roof and grassed surfaces because the temporary gymnasium and

the majority of the Zipper Building (northern portion of Zipper Building would be in NC-076 drainage area) and Bleecker Building would be constructed on existing paved surfaces.

Within the NC-075 drainage area, the amount of building roof decreased from the existing condition. The reason for this decrease is that the Zipper Building would be built up to the proposed property line, which includes a portion of an existing City street that is proposed to be demapped as a part of the Proposed Actions. Coles Sports and Recreation Center, however, is built at the current property line. Based on the drainage area divide, 43 percent of the Cole Sports and Recreation Center lies in the NC-075 drainage area while only 32 percent of the Zipper Building would be within the NC-075 drainage area. The underground garage with green roof and grassed areas would decrease slightly for the construction of a new playground.

Table 11-8 describes the Proposed Development Area's surfaces and surface areas, and how stormwater runoff would be discharged from the site.

Table 11-8
2021 Surface Coverage in the Future With the Proposed Actions: Proposed Development Area

Affected CSO Outfall	Surface Type	Surface Areas (sf)/ Percent Coverage	Discharge Method
NC-076	Building Roofs	183,807/41%	Combined Sewer
	Paved Surfaces	161,673/36%	Combined Sewer
	Vegetation with underground structure (Green Roof)	50,519/11%	Combined Sewer
	Vegetation	55,767/12%	Infiltration/Combined Sewer
	Total	**451,766/100%**	
NC-075	Building Roofs	40,233/33%	Combined Sewer
	Paved Surfaces	48,847/40%	Combined Sewer
	Vegetation with underground structure (Green Roof)	21,315/18%	Combined Sewer
	Vegetation	11,389/9%	Infiltration/Combined Sewer
	Total	**121,785/100%**	

Sources: Proposed 2021 Site Plan dated June 2011

Using the existing site plan and the proposed project's site plan, the DEP Volume Calculation Matrix was completed for the existing and 2021 Build conditions. 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 future with the Proposed Actions. Runoff volumes were calculated for four rainfall volume scenarios with varying durations. The summary tables, taken from the DEP Flow Volume Matrix, are included in **Table 11-9.**

As shown in **Table 11-9**, the percent increase in total combined sewer discharge to the NC-076 drainage area ranges from 18 to 46 percent. The percent increase in flow to the NC-075 drainage area ranges from 29 to 102 percent. The Flow Volume Matrix calculations do not, however, assume any on-site detention BMPs that would be used to control peak storm discharges. On-site detention would be required as a part of the DEP site connection approval process. The BMP Concept Plan at the end of this chapter summarizes the potential BMPs that would be suitable for implementation within the proposed project.

Table 11-9
DEP Flow Volume Matrix:
2021 Existing and Build Volume Comparison NC-075 and NC-076

NC-076		Existing				Build				NC-076 Increment	
		451,766 sf / 10.37 Acres				451,766 sf / 10.37 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	0.06	0.06	0.00	0.00	0.09	0.09	0.03	46
0.40	3.80	0.00	0.09	0.06	0.15	0.00	0.09	0.09	0.18	0.03	20
1.20	11.30	0.00	0.27	0.19	0.46	0.00	0.28	0.27	0.54	0.09	19
2.50	19.50	0.00	0.56	0.32	0.88	0.00	0.57	0.47	1.04	0.15	18
NC-075		**Existing**				**Build**				**NC-075 Increment**	
		121,784 sf / 2.80 Acres				**121,784 sf / 2.80 Acres**					
0.00	3.80	0.00	0.00	0.01	0.01	0.00	0.00	0.02	0.02	0.01	102
0.40	3.80	0.00	0.02	0.01	0.04	0.00	0.02	0.02	0.05	0.01	34
1.20	11.30	0.00	0.07	0.04	0.11	0.00	0.07	0.07	0.15	0.04	34
2.50	19.50	0.00	0.15	0.06	0.22	0.00	0.15	0.13	0.28	0.06	29

Notes:
CSS = Combined Sewer System; MG = Million Gallons

With the incorporation of selected BMPs in Phase 1, the increase in stormwater runoff generation would not be expected to have a significant impact on the downstream City combined sewer system or the City sewage treatment system. It is anticipated that a reduction in the stormwater flow rate would occur in the newly developed portions of the site as compared to existing conditions.

2031 PHASE 2

WATER SUPPLY

Proposed Development Area

Following the same methodology as the 2021 analysis year, the maximum hotel RWCDS was selected for the purposes of this analysis. By the 2031 analysis year, the full development program would be completed.

Table 11-10 summarizes the total water consumption of the Proposed Development Area. The proposed uses on the project site are expected to have a total water demand of 1,572,130 gallons per day (gpd). This cumulative water demand includes the water demand from the existing residential buildings to remain. The incremental water demand generated from the new uses within the Proposed Development Area over the future with no action is 703,419 gpd.

The incremental water demand from the Proposed Development Area over the future without the Proposed Actions is 703,419 gpd, which represents a small increase in demand on the New York City water supply system. The incremental demand due to the proposed project is 0.06 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.

Table 11-10
2031 Water Consumption in the Future With the Proposed Actions: Proposed Development Area

Use	Unit	Size (Square feet)	Rate	Consumption (gallons per day)
Residential				
Domestic	5,538 (people)[1]	NA	100 gpd/person	553,800
Air Conditioning	NA	2,313,113	0.17 gpd/sf	393,229
Commercial/Office				
Domestic	NA	1,106,895	0.10 gpd/sf	110,690
Air Conditioning	NA	1,106,895	0.17 gpd/sf	188,172
Retail[2]				
Domestic	NA	240,000	0.24 gpd/sf	57,600
Air Conditioning	NA	240,000	0.17 gpd/sf	40,800
Hotel				
Domestic	300 (rooms)	NA	120 gpd/room/occupant[3]	72,000
Air Conditioning	NA	180,000	0.17 gpd/sf	30,600
School				
Domestic	650 (seats)	NA	10 gpd/seat	6,500
Air Conditioning	NA	100,000	0.17 gpd/sf	17,000
Mechanical[4]				
Domestic	NA	376,814	0.10 gpd/sf	37,681
Air Conditioning	NA	376,814	0.17 gpd/sf	64,058
TOTAL	NA	NA	NA	**1,572,130**

Notes:
1. Includes existing residential uses to remain (4,221 residents occupying 1,918,113 sf of space and 1,317 new residents). New residents would be located in dormitories. Number of residents calculated by using 300 sf per bed.
2. The new recreation center is accounted for as a retail use.
3. Assumes 2 occupants/room.
4. No rate for Mechanical Space provided therefore Commercial/Office Rate was used.

Source: Rates from 2010 *CEQR Technical Manual.*

Commercial Overlay Area

In 2031 with the Proposed Actions, the water consumption within the projected development sites would remain the same as the demand in 2021, which is 9,527 gpd with an incremental amount attributable to the Proposed Actions of 3,253 gpd**.**

SANITARY SEWAGE

Proposed Development Area

In 2031, the estimated amount of sanitary sewage generated by the existing residential buildings and the proposed project buildings within the Proposed Development Area would be 838,271 gpd. This represents an increment of 354,323 gpd attributable to the Proposed Actions. The sanitary sewage generated by the proposed uses would be conveyed to Regulators M1 and M2, and during wet weather events, when combined sanitary sewage and stormwater flows exceed the regulators' capacities, the sanitary sewage would be directed to CSO outfalls NC-076 and NC-075. During dry weather, the total incremental volume of sanitary sewage generated would be 0.16 percent of the average daily flow of 226 mgd at the Newtown Creek WWTP, and would not result in an exceedance of the Newtown Creek WWTP's capacity. Therefore, the proposed project would not create a significant adverse impact on the City's sanitary sewage treatment system.

Per the New York City Plumbing Code (Local Law 33 of 2007) low-flow fixtures are required to be implemented and would help to reduce sanitary flows from the new buildings. Additionally, as a prerequisite under LEED Silver, the new buildings constructed within the Proposed Development Area would be required to implement strategies that would use 20 percent less water than the water use in a baseline case. These strategies may include the use of WaterSense certified fixtures and fixture fittings as well as high-efficiency fixtures.

Commercial Overlay Area

In 2031 with the Proposed Actions, the estimated amount of sanitary sewage generated would remain the same as 2021, which is 5,577 gpd with an incremental amount of sanitary sewage of 3,253 gpd.

STORMWATER

Proposed Development Area

By 2031, based on proposed project's site plan, the weighted runoff coefficient within the NC-076 drainage area would increase from 0.80 in the existing condition to 0.87. Within the NC-075 drainage area, the weighted runoff coefficient would be 0.81. The weighted runoff coefficient would remain the same from the existing to the proposed condition. Overall, the weighted runoff coefficient of the entire Proposed Development Area would increase from the existing condition.

The area of building roof within the NC-076 drainage area increased over the existing condition by approximately 9 percent primarily because of the construction of the Mercer and LaGuardia Buildings. The area of underground uses with green roof increased because of the grassed areas proposed above the below grade space in the North Block. The total area of paved surfaces and grass areas decreased from the existing condition. Within the NC-075 drainage area, the surface coverage would remain the same as 2021 because all construction on the South Block would be completed in Phase 1.

Table 11-11 describes the Proposed Development Area's surfaces and surface areas, and how stormwater runoff is currently discharged from the site.

Table 11-11
2031 Surface Coverage in the Future With the Proposed Actions: Proposed Development Area

Affected CSO Outfall	Surface Type	Surface Areas (sf)/ Percent Coverage	Discharge Method
NC-076	Building Roofs	183,818/41%	Combined Sewer
	Paved Surfaces	159,008/35%	Combined Sewer
	Vegetation with underground structure (Green Roof)	101,445/22%	Combined Sewer
	Vegetation	7,494/2%	Infiltration/Combined Sewer
	Total	**451,766/100%**	
NC-075	Building Roofs	40,233/33%	Combined Sewer
	Paved Surfaces	48,847/40%	Combined Sewer
	Vegetation with underground structure (Green Roof)	21,315/18%	Combined Sewer
	Vegetation	11,389/9%	Infiltration/Combined Sewer
	Total	**121,784/100%**	

Sources: Proposed 2031 Site Plan dated June 2011

Using the existing site plan and the proposed project's site plan, the DEP Volume Calculation Matrix was completed for the existing and 2031 Build conditions. 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 future with the proposed project. Runoff volumes were calculated for four rainfall volume scenarios with varying durations. The summary tables, taken from the DEP Flow Volume Matrix, are included in **Table 11-12.**

Table 11-12
DEP Flow Volume Matrix:
2031 Existing and Build Volume Comparison NC-075 and NC-076

NC-076		Existing 451,766 sf / 10.37 Acres				Build 451,766 sf / 10.37 Acres				NC-076 Increment	
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	0.06	0.06	0.00	0.00	0.11	0.11	0.05	73
0.40	3.80	0.00	0.09	0.06	0.15	0.00	0.10	0.11	0.21	0.05	35
1.20	11.30	0.00	0.27	0.19	0.46	0.00	0.29	0.32	0.61	0.16	35
2.50	19.50	0.00	0.56	0.32	0.88	0.00	0.61	0.55	1.16	0.28	32
NC-075		Existing 121,784 sf / 2.80 Acres				Build 121,784 sf / 2.80 Acres				NC-075 Increment	
0.00	3.80	0.00	0.00	0.01	0.01	0.00	0.00	0.02	0.02	0.01	102
0.40	3.80	0.00	0.02	0.01	0.04	0.00	0.02	0.02	0.05	0.01	34
1.20	11.30	0.00	0.07	0.04	0.11	0.00	0.07	0.07	0.15	0.04	34
2.50	19.50	0.00	0.15	0.06	0.22	0.00	0.15	0.13	0.28	0.06	29

Notes: CSS = Combined Sewer System; MG = Million Gallons

As shown in **Table 11-12**, the percent increase of total combined sewer discharge from the Proposed Development Area (within the NC-076 drainage area) ranges from 32 to 73 percent. The percent increase in total combined sewer from the site within the NC-075drainage area ranges from 29 to 102 percent. The flow volumes that would result in being discharged to the NC-076 drainage area increases from the volumes in the Phase 1 analysis because all of the permanent development on the North Block would be completed between 2021 and 2031. The sanitary and stormwater discharged to the NC-075 drainage area would remain the same as the Phase 1 analysis because all work completed within the NC-075 drainage area would be completed by 2021. The Flow Volume Matrix calculations do not, however, assume any on-site detention BMPs that would be used to control peak storm discharges. On-site detention would be required as a part of the DEP site connection approval process.

STORMWATER BMP CONCEPT PLAN

The following stormwater BMP concept plan is intended to illustrate opportunities to incorporate onsite stormwater source controls during site planning and building design phases of project development. The plan is applicable to both Phase 1 and Phase 2 of the proposed project. The proposed zoning is described within the concept plan to provide a guideline of suitable BMPs based on allowable building form. The typical BMP measures described would help to avoid exacerbation of existing CSOs discharged to the Hudson River. It is intended that the incorporation of selected BMPs would achieve a stormwater release rate to the combined sewer

from the redeveloped portions of the proposed project site of 0.25 cfs or 10 percent of the allowable flow (whichever is greater).

The proposed zoning in the Proposed Development Area is C1-7. A commercial overlay of C1-5 is proposed on the existing R7-2 zoning for the Commercial Overlay Area. See Chapter 2, "Land Use, Zoning, and Public Policy" for a description of the uses and regulations associated with C1-5 and C1-7 zoning. BMPs suitable for these types of development include green roofs and blue roofs, subsurface detention, porous pavement, enhanced tree pits, rain gardens or infiltration swales, and rain barrels.

Stormwater Source Controls

NYU plans on incorporating several BMPs that would substantially reduce the rate of peak discharge to the combined sewer system from the redeveloped portions of the Proposed Development Area. Stormwater management within the Proposed Development Area would be implemented through the use of BMPs including on-site detention facilities (underground storage tanks and tanks within the buildings) and vegetated areas over underground structures. On-site detention tanks would be used to store water for gradual release during rain events, freeing up capacity in combined sewers. BMPs may also include an open-bottom subsurface system with surface rain gardens, or a combination thereof, subject to compatibility with the proposed below-grade development. Infiltration of stormwater through subsurface soils is not feasible on the majority of the open space in the Proposed Development Area since most of the vegetated areas would be located above underground structures. Vegetated areas located above underground structures, however, would still lower the potential runoff through soil retention and evapotranspiration, which is the return of water to the atmosphere from surfaces (evaporation) and vegetation (transpiration). An Erosion and Sediment Control Plan would be developed and implemented during construction, which would minimize potential for off-site mitigation of sediment from the site.

The final BMP selection for implementation would be undertaken during detailed design, in coordination with NYCDEP, when site characteristics are better defined. The selected BMPs would be used together to achieve an overall release rate of 0.25 cfs or 10 percent of the allowable flow rate (whichever is greater) from the redeveloped portions of the Proposed Development Area.

With the incorporation of selected BMPs in both Phase 1 and Phase 2, 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. In 2031, it is anticipated that a reduction in the stormwater flow rate would occur in the newly developed portions of the site as compared to existing conditions. ✷