Chapter 10: Water and Sewer Infrastructure

10.1 Introduction

This chapter assesses the potential effects of the Proposed Actions on the City's water supply, wastewater (sanitary sewage), and storm water management infrastructure in accordance with the *CEQR Technical Manual.* The purpose of the Water and Sewer Infrastructure analysis is to determine whether the Proposed Actions may adversely affect the City's water distribution or sewer systems. The *CEQR Technical Manual* guidelines indicate that a preliminary infrastructure analysis is needed if the project would result in an exceptionally large demand for water (e.g., those that are projected to use more than one million gallons per day such as power plants, very large cooling systems, or large developments); or if the project is located in an area that experiences low water pressure (e.g., areas at the end of the water supply distribution system such as Rockaway Peninsula and Coney Island). New York City sewers are sized and designed based on area zoning and population density, as well as surface coverage characteristics; therefore the Proposed Actions, which would result in the introduction of new population to the rezoning area warrant a preliminary evaluation of the City sewers infrastructure.

As described in Chapter 1, "Project Description," the Jerome Avenue Rezoning consists of a series of land use actions (collectively, the "Proposed Actions") intended to facilitate the implementation of the objectives of the Jerome Avenue Neighborhood Plan (the "Plan"). The affected area comprises an approximately 92-block area primarily along Jerome Avenue and its east west commercial corridors in Bronx Community Districts (CDs) 4, 5, and 7 (the "rezoning area"). The rezoning area is generally bounded by 184th Street to the north and East 165th Street to the south, and also includes portions of 183rd Street, Burnside Avenue, Tremont Avenue, Mount Eden Avenue, 170th Street, Edward L. Grant Highway, and East 167th Street.

The following sections present the existing conditions, the future conditions without the Proposed Actions (Without-Action condition), and the future conditions with the Proposed Actions (With-Action condition). Calculations for water, wastewater, and stormwater flows are presented, and the expected impact is analyzed and discussed, based on standard City development requirements as well as regulatory conditions.

10.2 Principal Conclusions

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

According to the assessment of existing water, sewer, and wastewater treatment infrastructure, the Proposed Actions would not result in significant adverse impact on the City's water supply system. The 45 projected development sites are expected to generate 1,364,040 gallons per day (gpd), or an increment in water supply demand of 877,385 gpd compared to the demand in the Future Without the Proposed Action. Preliminary assessment of the impact of the Proposed Actions on the potable water infrastructure concluded that there would be no significant adverse impact because the increment in water demand is less than 1 million gallons per day (MGD) and it is expected that there would be adequate water service to meet the incremental demand.

WASTEWATER TREATMENT

With the RWCDS, development on the 45 projected development sites is expected to generate approximately 1,243,567 gpd of wastewater, an increase of 869,677 gpd over Future No-Action conditions. With the Proposed Actions, wastewater from the projected development sites would continue to be treated as it is now, in the Wards Island Waste Water Treatment Plant (WWTP). This additional flow of wastewater is not expected to cause a significant adverse impact to wastewater treatment infrastructure, because this WWTP has dry weather design flow capacity of 275 million gallons per day (MGD), and is currently receiving 201 MGD on average (see Table 10-2, "Monthly Average Daily Maximum Flows, Wards Island WWTP"). This average flow is calculated using the average monthly flow observed at the WWTP during the period from January and December 2016. Based on the average flow, the WWTP currently has an average reserve capacity of 74 MGD. Therefore, the Wards Island WWTP would continue to have a reserve in treatment capacity, even after full re-development of the 45 projected properties included in the Proposed Actions.

STORMWATER AND DRAINAGE MANAGEMENT

The 45 projected development sites identified in the RWCDS are located within the WI-R60/WI-R60A sub-catchment area of the Wards Island WWTP. Depending on the rainfall volume and duration, the total volumes to the WI-R60/WI-R60A combined sewers would range from 0.20 to 2.27 million gallons (MG). Compared to existing discharge volumes to the combined sewer systems, from the 45 projected sites,

sub-catchment area WI-R60/WI-R60A would have an increase of 0.14 to 0.83 MG, during storm events with up to 2.5 inches of rainfall. Because the 45 projected development sites are located along a 2.25 miles stretch along Jerome Avenue, this increased flow to the City's combined sewer system may be discharged as combined sewer overflows (CSOs) through one or more of the WI-R60/WI-R60A sub-catchment area outfalls that serve the Wards Island WWTP. The potentially impacted CSO outfall numbers are: 57, 58, 59, 60, 61, 62, and 63, all discharging to the Harlem River.

Based on detention requirements of the City's stormwater rule, it is concluded that the Proposed Actions would not result in significant adverse impacts to the wastewater and stormwater conveyance, and treatment infrastructure.

10.3 Methodology

The *CEQR Technical Manual* requires a preliminary water supply infrastructure analysis if the Proposed Actions results in an exceptionally large demand for water (higher than 1 MGD). In addition, a preliminary assessment for wastewater and stormwater conveyance and treatment is necessary when the proposed project is located in a combined sewer area, and if the project which is located in the Bronx County, exceeds the increment of 400 residential units (RUs), or 150,000 square feet (sf) of commercial development. The following methodology was conducted to assess the impact of the Proposed Actions based on the *CEQR Technical Manual*:

- Assess and describe the existing water, sewer and wastewater treatment infrastructure serving the rezoning area.
- Estimate the water demand and wastewater generation, as well as stormwater runoff from the projected development sites with the Existing, and No-Action Conditions. These calculations are based on generation rates provided in the *CEQR Technical Manual*. Stormwater runoff and wastewater flows are calculated using the volume Calculation Matrix, a spreadsheet-based procedure downloaded from the *CEQR Technical Manual* web site.
- Describe the planned No-Action infrastructure improvements, project components, and implementation schedules in the rezoning area, if any.
- Evaluate aerial photography using Google Earth, to determine the existing ground cover square footage (roof, pavement, and softscapes or green areas) present at each property. This information will enable the calculation of stormwater runoff generation.

- Calculate the projected water demand, and wastewater and stormwater generation from the projected developments that are part of the Proposed Actions in the Reasonable Worst-Case Development Scenario (RWCDS), based on the *CEQR Technical Manual*.
- Compare the effects of the With-Action scenario[1] with the No-Action condition to determine the expected impact on the City's sewer infrastructure using criteria established in the *CEQR Technical Manual*.

10.4 Existing Conditions

WATER SUPPLY

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

The higher-pressure Delaware and Catskill systems serve all five boroughs and higher elevations where the water pressure of the Croton system would be inadequate. Of the three systems, the Croton watershed supplies an average of 10 percent of the City's water, primarily to users in the lower elevation portions of Manhattan and the Bronx. The Delaware and Catskill systems supply all five boroughs and typically deliver about 90 percent of the City's drinking water. Water is distributed to the City through three tunnels: City Tunnel Number 1, through the Bronx and Manhattan to Brooklyn; and City Tunnel Number 2, through the Bronx, Queens, and Brooklyn. A third tunnel, City Tunnel Number 3, is under

[1] As described in Chapter 1, "Project Description," an existing DEP easement corridor passes under Potential Development Sites 56, 57, and 58; development within that corridor may be subject to additional requirements to be protective of the existing underground infrastructure. Due to requirements of an existing Restrictive Declaration, Potential Development Site 58 will not be developed in the future, either with or without the Proposed Actions. These three Potential Development Sites however, as they are identified in the RWCDS, are included in the calculations in this EIS, but not related to water and sewer infrastructure. Where doing so, it represents an added level of conservativeness in the conduct of analyses.

construction. The projected sites are located in an area that currently has a grid of water distribution mains that are available to serve the Rezoning Area.

Assessing the impact on water infrastructure from the Proposed Actions, requires to first estimate the water demand of the projected properties located in the project area. Estimates include residential, commercial, and institutional water demand for both domestic consumption and air conditioning. Table 10-1, "Water Demand and Wastewater Generation (Existing Conditions)," includes the calculation parameters obtained from the *CEQR Technical Manual*, and the resulting water demand flow (257,489 gpd). Upon inquiries to the NYDEP, it was determined that there is no insufficient water system capacity or collection system improvement needs in the near future affecting the project area.

Table 10-1: Water Demand and Wastewater Generation (Existing Condition)

Land Use	Water Demand & Wastewater Generation Rates[1]	Area (sf) or DUs	Domestic Water/Wastewater Generation (gpd)	Air Conditioning (gpd)
Residential	Domestic: 100 gpd/person[2]	106	32,436	0
Commercial/Office/ Retail[3]	Domestic: 0.24 gpd/sf	471,512	113,163	80,157
	A/C: 0.17 gpd/sf			
Community Facility[4]	Domestic: 0.10 gpd/sf	46,799	4,680	7,956
	A/C: 0.17 gpd/sf			
Industrial/ Warehouse	Domestic: 10,000 gpd/acre[5]	-47,795	10,972	8,125
	A/C: 0.17 gpd/sf			
Hotel	120 gpd/room/occupant	0	0	0
	A/C: 0.17 gpd/sf			
Total Water Demand			***257,489***	
Total Wastewater Generation			***161,251***	

Notes:

1. Consumption rates obtained from the 2014 *CEQR Technical Manual* Table 13-2, "Water Usage and Sewage Generation Rates for Use in Impact Assessment," unless otherwise noted.

2. Net residents were calculated by multiplying the number of dwelling units by the average household size of the development's Community District (The more conservative factor of 3.06 persons per DU was used, based on the following population calculation assumptions used for planning purposes: 2.87 persons per DU for residential units in Bronx Community District 7, 3.06 persons per DU for residential units in Bronx Community District 5, and 2.92 person per DU for residential units in Bronx Community District 4).

3. Uses comprise retail, supermarket, and restaurant.

4. Assumes same rate as commercial/office. Includes house of worship, day care, medical office, and community center uses.

5. Based on 2014 *East NY Rezoning FEIS.* Calculated based on total building floor area, assuming no additional water demand from open storage.

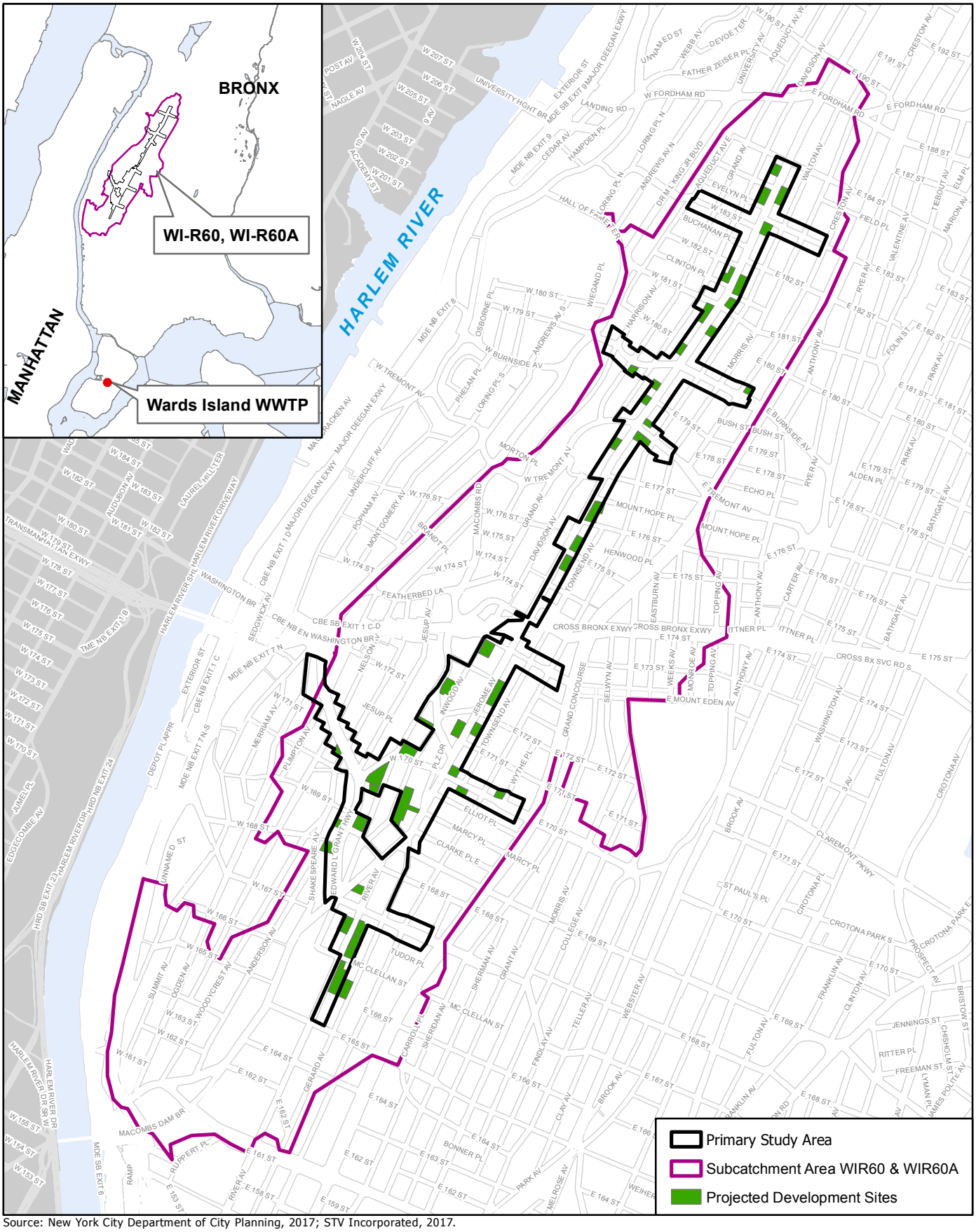
Source: CSA Group, 2017.

WASTEWATER TREATMENT

Wastewater collection in the project area utilizes a network of underground sewers installed underground along most of the streets in the project area. This network is composed of collectors, interceptors and trunk sewers convey the collected water to the Wards Island WWTP for final treatment and disposal. The sewers in the project area are combined (wastewater, and stormwater). Because stormwater runoff is directly proportional to rainfall events, there may be extreme events that the sewer would be incapable of handling. To ensure continual operation of the collection system and avoid flooding in the area, the excess flow is diverted to the Harlem River using flow regulators, and discharged through Combined Sewer Overflow (CSO) outfalls. The diverted flow of wastewater, stormwater, and debris is considered an untreated discharge. These CSOs are regulated through the State Permit Discharge Elimination System (SPDES) number NY0026131, and constant monitoring is conducted to record the number of outflows occurring per month.

The Wards Island WWTP is located on the southwest side of the combined Randall's and Wards Island between Harlem River and East River (see Figure 10-1). The Plant's sewershed (WI-R60/WI-R60A) area coverage includes an estimated population of 1,061,558 (year 2014) and approximately 900 acres of mostly developed land. The WWTP has a design dry weather flow capacity of 275 MGD, and a maximum wet weather flow capacity of 550 MGD. The Plant is an activated sludge facility, with capacity to treat up to 150 percent of its design dry weather flow, or 412.6 MGD through secondary treatment. Table 10-2, "Monthly Average Daily Maximum Flows, Wards Island WWTP," below presents the monthly average and daily max discharge flow as reported in discharge monitoring reports (DMR) to EPA. The monthly average flow is 201 MGD and the average of daily maximum flows is 397 MGD.

Assessing the impact on wastewater infrastructure from the Proposed Actions requires estimating the wastewater generation of the projected properties located in the rezoning area. Table 10-1, "Water Demand and Wastewater Generation Rates (Existing Condition)," above includes the calculation parameters obtained from the *CEQR Technical Manual*, and resulting wastewater generation flow 161,251 gpd. Upon inquiries to NYCDEP, it was determined that there is no insufficient sewer system capacity or collection system improvement needs in the near future affecting the project area.



Source: New York City Department of City Planning, 2017; STV Incorporated, 2017.

N

0 0.25 0.5 Mile

Figure 10-1

Table 10-2: Monthly Average Daily Maximum Flows, Wards Island WWTP

Date	Monthly Average Flow, MGD	Daily Max Flow, MGD
Apr-16	190	403
Mar-16	205	404
Feb-16	185	360
Jan-16	188	408
Dec-15	198	377
Nov-15	203	455
Oct-15	225	394
Sep-15	217	430
Aug-15	207	384
Jul-15	197	368
Jun-15	194	421
May-15	197	354
Average	**201**	**397**

Source: https://echo.epa.gov/effluent-charts#NY0026131; CSA Group, 2017.

STORMWATER AND DRAINAGE MANAGEMENT

Stormwater runoff is generated in developed land, as the ground surface cover is incapable of infiltrating rainfall in a short amount of time. This runoff is collected by the City's combined sewer system and conveyed to the Wards Island WWTP. Regulators built into the combined sewer system directs the collected flows to the WWTP, or to the Harlem River during wet weather events. These regulators allow only twice the dry weather design flow into interceptor sewers, and the remaining flow (overflow) is discharged into the Harlem River.

In analyzing the impact of the Proposed Actions on the stormwater infrastructure, it is important to assess the ground surface cover at each lot. Table 10-3, "Drainage Area Surface Cover Assessment," presents the results of the ground surface cover assessment, completed using aerial photography available through the Google Earth Pro service.

Table 10-3: Drainage Area Surface Cover Assessment

Site (Projected)	Lot Area, SF[1]	Roof, SF[2]	Pavement, SF[2]	Soft Scape/ Green Area, SF[2]	Site (Projected)	Lot Area, SF[1]	Roof, SF[2]	Pavement, SF[2]	Soft Scape/ Green Area, SF[2]
1	12,800	12,800	0	0	**25**	8,842	8,842	0	0
2	22,500	12,500	10,000	0	**26**	13,046	11,741	1,305	0
3	20,000	20,000	0	0	**27**	11,300	11,300	0	0
4	15,100	15,100	0	0	**28**	26,735	26,735	0	0
5	15,000	15,000	0	0	**29**	7,525	7,525	0	0
6	24,702	24,702	0	0	**30**	33,772	0	33,772	0
7	12,988	5,195	7,793	0	**31**	10,899	0	3,770	7,129
8	20,701	188	17,091	3,422	**32**	56,903	25,050	22,761	9,092
9	12,500	12,500	0	0	**33**	22,881	22,881	0	0
10	13,500	13,500	0	0	**34**	17,635	17,635	0	0
11	10,500	7,665	0	2,835	**35**	13,976	13,976	0	0
12	10,000	10,000	0	0	**36**	27,000	5,400	17,550	4,050
13	10,834	0	10,834	0	**37**	21,425	20,354	0	1,071
14	10,369	6,221	4,148	0	**38**	14,835	0	0	14,835
15	15,039	15,039	0	0	**39**	17,250	0	4,313	12,938
16	15,610	15,610	0	0	**40**	68,572	68,572	0	0
17	19,000	14,000	5,000	0	**41**	5,001	0	4,001	1,000
18	17,202	14,622	0	2,580	**42**	5,013	0	5,013	0
19	22,750	22,750	0	0	**43**	9,631	9,631	0	0
20	32,500	4,875	27,625	0	**44**	7,500	0	7,500	0
21	23,713	1,186	20,156	2,371	**45**	9,796	5,878	3,918	0
22	15,010	6,755	8,256	0	**TOTAL**	**811,032**	**525,058**	**224,651**	**61,323**
23	19,723	13,806	5,917	0	**Percentage**		**64.7%**	**27.7%**	**7.6%**
24	9,454	5,525	3,929	0					

Notes:
[1]Lot areas provided by DCP
[2]Ground cover areas calculated using Google Earth Pro

Source: CSA Group, 2017.

This information reveals that the existing condition at the projected properties in the rezoning areas of Jerome Avenue consist mainly of roofed or paved areas (92 percent), and there is minimal area dedicated to softscapes (8 percent). This means that the projected properties currently exhibit a high level of runoff generation potential.

10.5 The Future Without the Proposed Actions (No-Action Condition)

WATER SUPPLY

No infrastructure improvements or changes are planned for the water distribution system serving the area, and so the conditions related to infrastructure providing service to the rezoning area in the future without the Proposed Actions generally will resemble existing conditions.

Table 10-4, "Water Demand and Wastewater Generation (No-Action Condition)," includes revised development figures, together with the resulting daily estimates of water generated from the projected properties included in the study area for the No-Action condition. For this condition, the study area is expected to add: 674 DUs; 61,096 sf of commercial/office/retail areas; 36,120 sf of community facilities; and 0 sf of industrial/warehouse space. This condition results in the addition of 229,166 gallons per day (gpd) of water supply demand, when compared with the existing condition.

The existing water supply capacity available in the City is sufficient to supply the additional water demand in the No-Action condition without compromising the level of service or reducing pressures in the water distribution system.

Table 10-4: Water Demand and Wastewater Generation (No-Action Condition)

Land Use	Water Demand & Wastewater Generation Rates[1]	Area (sf) or DUs	Domestic Water/Wastewater Generation (gpd)	Air Conditioning (gpd)
Residential	Domestic: 100 gpd/person[2]	780	226,800	0
Commercial/Office/ Retail[3]	Domestic: 0.24 gpd/sf	532,608	127,826	90,543
	A/C: 0.17 gpd/sf			
Community Facility[4]	Domestic: 0.10 gpd/sf	82,919	8,292	14,096
	A/C: 0.17 gpd/sf			
Industrial/ Warehouse	Domestic: 10,000 gpd/acre[5]	47,795	10,972	8,125
	A/C: 0.17 gpd/sf			
Hotel	120 gpd/room/occupant	0	0	0
	A/C: 0.17 gpd/sf			
Total Water Demand			**486,655**	
Total Wastewater Generation			**373,890**	

Notes:

1. Consumption rates obtained from the 2014 *CEQR Technical Manual* Table 13-2, "Water Usage and Sewage Generation Rates for Use in Impact Assessment," unless otherwise noted.

2. Considers a population of 2,268 residents (data provided by Jerome Avenue Rezoning Reasonable Worst-Case Development Scenario).

3. Uses comprise retail, supermarket, and restaurant.

4. Assumes same rate as commercial/office. Includes house of worship, day care, medical office, and community center uses.

5. Based on 2014 East NY *Rezoning FEIS.* Calculated based on total building floor area, assuming no additional water demand from open storage.

Source: CSA Group, 2017.

WASTEWATER TREATMENT

No wastewater treatment improvements or changes are planned for the area, and so the conditions related to infrastructure providing service to the rezoning area in the future without the Proposed Actions generally will resemble existing conditions.

Table 10-4, "Water Demand and Wastewater Generation (No-Action Condition)," includes the wastewater generation estimates for the No-Action condition, which amounts to 212,639 gpd. In relation to this flow increment, there are no reports of insufficient sewer system capacity in the project area. Therefore, no impact is expected to the wastewater conveyance or treatment infrastructure in the No-Action condition in because of this increment in wastewater flow.

STORMWATER AND DRAINAGE MANAGEMENT

No infrastructure improvements or changes are planned for the stormwater and drainage management system serving the area, and so the conditions related to infrastructure providing service to the rezoning area in the future without the Proposed Actions generally will resemble existing conditions.

According the *CEQR Technical Manual*, it is not necessary to assess the impact of stormwater and drainage management in the future Without-Action scenario. The assessment of stormwater generation from the Proposed Actions includes a comparison with the existing conditions. However, because of the above mentioned finding regarding the existing level of development in the project area, there no adverse impact expected in stormwater generation from the Without-Action condition.

10.6 The Future with the Proposed Actions (With-Action Condition)

WATER SUPPLY

Table 10-5, "Water Demand and Wastewater Generation (With-Action Condition)," includes revised development figures for the With-Action condition, together with the resulting daily estimates of water generated from the projected properties included in the study area. In the future with the Proposed Actions, the study area is expected to add: 3,228 DUs; 20,866 sq of commercial/office/retail areas; 72,273 sf of community facilities; and to eliminate 47,795 sf of industrial/warehouse space. This condition results in the addition of 877,385 gallons per day (gpd) of water supply demand, when compared with the No-Action condition for the 45 projected development sites, representing an increase of approximately 80 percent for these 45 projected development sites, specifically, but only approximately 0.03 percent increase of the City's daily demand (1.2 billion gallons per day).

The existing water supply capacity available in the City is sufficient to supply the additional demand in the With-Action condition without compromising the level of service or reducing pressures in the water distribution system. Therefore, the Proposed Actions would result in no significant adverse impacts to water supply.

Table 10-5: Water Demand and Wastewater Generation (With-Action Condition)

Land Use	Water Consumption & Wastewater Generation Rates[1]	Area (sf) or DUs	Domestic Water/Wastewater Generation (gpd)	Air Conditioning (gpd)
Residential	Domestic: 100 gpd/person[2]	4,008	1,172,900	0
Commercial/Office/ Retail[3]	Domestic: 0.24 gpd/sf	553,474	55,347	94,091
	A/C: 0.17 gpd/sf			
Community Facility[4]	Domestic: 0.10 gpd/sf	155,192	15,519	26,383
	A/C: 0.17 gpd/sf			
Industrial/ Warehouse	Domestic: 10,000 gpd/acre[5]	0	0	0
	A/C: 0.17 gpd/sf		0	
Hotel	120 gpd/room/occupant	0	0	0
	A/C: 0.17 gpd/sf			
Total Water Demand			**1,364,040**	
Total Wastewater Generation			**1,243,567**	

Notes:

1. Consumption rates obtained from the 2014 *CEQR Technical Manual* Table 13-2, "Water Usage and Sewage Generation Rates for Use in Impact Assessment," unless otherwise noted.

2. Considers a population of 11,727 residents (data provided by Jerome Avenue Rezoning Reasonable Worst-Case Development Scenario).

3. Uses comprise retail, supermarket, and restaurant.

4. Assumes same rate as commercial/office. Includes house of worship, day care, medical office, and community center uses.

5. Based on 2014 *East NY Rezoning FEIS.* Calculated based on total building floor area, assuming no additional water demand from open storage.

Source: CSA Group, 2017.

WASTEWATER TREATMENT

The calculations in Table 10-5, "Water Demand and Wastewater Generation (With-Action Condition)," show that the Proposed Actions would generate an incremental flow of 869,677 gpd of wastewater. From this result, it is evident that the wastewater treatment provided by the existing infrastructure (Wards Island WWTP) would not be adversely impacted by the expected increment in wastewater flow of (0.87 MGD).

In terms of existing sewer facilities, it is recognized that the additional wastewater generation would be sparsely distributed along 2.25 miles of sewers extending along 25 street blocks, due to the linear alignment of properties along both side of Jerome Avenue. With 45 projected property lots included in the Proposed Actions, the wastewater flow increment 869,677 gpd would produce on average 19,326 gpd per property. To determine if the existing sewer system has sufficient hydraulic capacity, developers will be required to perform a hydraulic analysis to determine the system capacity at the time of connection.

STORMWATER AND DRAINAGE MANAGEMENT

To obtain a conservative estimate of the impact of stormwater runoff, it was assumed that all of the developed land would be converted to roofed covered ground surface. Table 10-6, "Runoff Coefficient Calculation," provides the runoff coefficient calculation for the Existing and With-Action conditions, using the *CEQR Technical Manual* Calculation Matrix. The runoff coefficient is a number ranging from 0.0 to 1.0 that is applied in the runoff volume calculations to represent the amount of rainfall that is not allowed to evaporate or infiltrate to the ground. Because the existing properties are fairly developed, as judged by the resulting existing runoff coefficient of 0.9, the Proposed Actions provides only a minor change in this coefficient by increasing it to 1.0.

Table 10-7, "Runoff and Wastewater Volume Calculations," provides the runoff and wastewater generation calculations based on the *CEQR Technical Manual* Calculation Matrix. Table 10-8, "Total Volume to Combined Sewer System," provides the total volume to the combined sewer system (CSS) calculations based on the *CEQR Technical Manual* Calculation Matrix. These calculations demonstrate that, compared to existing volumes discharged to the combined sewer systems from the 45 projected sites, sub-catchment area WI-R60/WI-R60A would have an increase of 0.14 to 0.83 MG, during storm events with up to 2.5 inches of rainfall. This increment over the No-Action condition, is primarily associated with dry weather flows and the increase in population density. This increase would be distributed over the 45 projected development sites on 25 city blocks along an approximately 2.25 mile corridor. Proposed development on the projected development sites will be required to prepare drainage plans to be evaluated and approved by DEP during the construction permitting phase, which would likely include hydraulic modeling work to assess the impact on the local sewer infrastructure. Therefore, the Proposed Actions would result in no significant adverse impacts to stormwater and drainage management.

Table 10-6: Runoff Coefficient Calculation

Existing Condition						
	Surface Type	**Roof**	**Pavt & Walks**	**Other**	**Grass**	**Total**
WI-R60/WI-R60A	**Area, (percent)**	65	28	0	8	100
	Surface Area, SF[1]	525,058	224,651	0	61,323	811,032
	Runoff Coefficient	1.00	0.85	0.85	0.20	0.90
With-Action Condition						
	Surface Type	**Roof**	**Pavt & Walks**	**Other**	**Grass**	**Total**
WI-R60/WI-R60A	**Area, (percent)**	100	0	0	0	100
	Surface Area, SF[1]	811,032	0	0	0	811,032
	Runoff Coefficient	1.00	0.85	0.85	0.20	1.00

Notes:

1. Values obtained from evaluation of aerial photography using Google Earth.

Source: WS1_Surfaces Calculations, Calculation Matrix spreadsheet, *2014 CEQR Technical Manual*; NYCDEP; CSA Group, 2017.

Table 10-7: Runoff and Wastewater Volume Calculations

Existing Condition: WI-R60/WI-R60A Sewershed						
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	18.62	0.90	0.00	0.37	0.06
0.40	3.80	18.62	0.90	0.18	0.37	0.06
1.20	11.30	18.62	0.90	0.55	0.37	0.18
2.50	19.50	18.62	0.90	1.14	0.37	0.30
With-Action Condition: WI-R60/WI-R60A Sewershed						
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	18.62	1.00	0.00	1.24	0.20
0.40	3.80	18.62	1.00	0.20	1.24	0.20
1.20	11.30	18.62	1.00	0.61	1.24	0.59
2.50	19.50	18.62	1.00	1.26	1.24	1.01

Notes:

1. RUNOFF VOLUMES for EXISTING and WITH-ACTION condition have been calculated as follows:

Q_{VOL} = [R_{VOL} x A x RC x 7.48GAL/1,000,000 MGD per GAL] - S_{VOL} ; where

Q_{VOL} = Total Volume of Rainfall for 24-hour storm event discharged offsite (either to River or into CSS), in MG

R_{VOL} = RAINFALL VOLUME, in Inches, for the corresponding RAINFALL RETURN PERIOD listed in WS2 in the EXISTING and PLAN Tables.

A = SITE AREA, in SQ. FT., as indicated in WS1 EXISTING and WITH-ACTION Tables for the various site areas.

RC = RAINFALL RUNOFF COEFFICIENT for each of the applicable Site Areas as per EXISTING and WITH-ACTION tables (refer to WS1).

2. RAINFALL RUNOFF COEFFICIENTS used are composite rates as shown in WS1 in the EXISTING and WITH-ACTION tables

Source: WS2_Volume Calculations, Calculation Matrix spreadsheet, *2014 CEQR Technical Manual*; NYCDEP; CSA Group, 2017.

Table 10-8: Total Volume to Combined Sewer System (CSS)

Existing Condition WI-R60/WI-R60A Sewershed					
Rainfall Volume (in)	**Rainfall Duration (hr)[1]**	**Runoff Volume Direct Drainage (MG)**	**Runoff Volume to CSS (MG)**	**Sanitary Volume to CSS (MG)**	**Total Volume to CSS (MG)**
0.00	3.80	0.00	0.00	0.06	0.06
0.40	3.80	0.00	0.18	0.06	0.24
1.20	11.30	0.00	0.55	0.18	0.73
2.50	19.50	0.00	1.14	0.30	1.44
With-Action Condition: WI-R60/WI-R60A Sewershed					
Rainfall Volume (in)	**Rainfall Duration (hr)[1]**	**Runoff Volume Direct Drainage (MG)**	**Runoff Volume to CSS (MG)**	**Sanitary Volume to CSS (MG)**	**Total Volume to CSS (MG)**
0.00	3.80	0.00	0.00	0.20	0.20
0.40	3.80	0.00	0.20	0.20	0.40
1.20	11.30	0.00	0.61	0.59	1.20
2.50	19.50	0.00	1.26	1.01	2.27

Notes:
1. 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).

Source: Summary Table, Calculation Matrix spreadsheet, *2014 CEQR Technical Manual*; NYCDEP; CSA Group, 2017.

STORMWATER BEST MANAGEMENT PRACTICES

Pursuant to Chapter 31 of Title 15 of the Rules of the City of New York (RCNY), as amended in 2012, for a new development, the stormwater release rate limit is 0.25 cubic feet per second (cfs) or ten percent of the allowable flow. For alterations, the stormwater release rate for the altered areas will be directly proportional to the ratio of the altered area to the total site area, and no new points of discharge are permitted. Therefore, any new developments or alterations in the With-Action condition requiring a connection to the sewer system would be required to achieve the new flow restrictions. In order to meet these restrictions, it is likely that on-site detention of stormwater would be incorporated on all of the 45 projected development sites.

Joint NYCDEP and New York City Department of Buildings (DOB)[2] guidelines are available to ensure the proper design and construction in the early stages of site planning and building design. This guidelines document includes performance standards to allow for a wide range of management techniques, costs, and space considerations with regards to Best Management Practices (BMPs). With the 2012 RCNY amendment, self-certification of house or site connection proposals is not permitted in connection with

[2] http://www.nyc.gov/html/dep/pdf/green_infrastructure/stormwater_guidelines_2012_final.pdf

any proposed new development or expansions of existing developments as per Title 15, Chapter 31, "Rule Governing House/Site Connections to the Sewer System."

NYCDEP is currently working with other City agencies on City Hall's Rezoning coordination efforts, and it is expected that an Amended Drainage Plan (ADP) will be prepared for the rezoning area. In order to be issued a permit to connect to the City sewer within the rezoning area, an applicant proposing a new development or expansion of an existing development may be required to submit a site-specific hydraulic analysis. Sewer improvements and/or incorporation of BMPs may also be required of the applicant at the time of the house or site connection proposal.

A broad range of BMPs could be implemented on the development lots within the rezoning area to facilitate stormwater source controls and limit the stormwater release rate to the required 0.25 cfs or ten percent of the allowable flow per the drainage plan, whichever is greater. The increased flow to the combined sewer system would be a direct result of the increased densities and sanitary flows associated with the RWCDS for the Proposed Actions. The implementation of low-flow fixtures, as per the New York City Plumbing Code, Local Law 33 of 2007, and the U.S. Environmental Protection Agency's WaterSense Program, would help to control sanitary flows.

The Proposed Actions would increase flows to the City's combined sewer system that may be discharged as CSOs into the Harlem River during rain events, as a result of increases in wastewater flows. Because of the available treatment capacity of the Wards Island WWTP, the projected increased flows to the combined sewer system would not have a significant adverse impact on the WWTP. Based on this analysis and the required BMP measures that would be implemented on each projected development site by their respective developer in accordance with City site connection requirement, and therefore, the Proposed Actions would not result in an adverse impact to the conveyance infrastructure.