Chapter 11: Water and Sewer Infrastructure

A. INTRODUCTION

New York City's water and sewer network is fundamental to the operation, health, safety, and quality of life of the City and its surrounding environment, and it must be sized to fit the City's users and surface conditions in order to function adequately. Ensuring these systems have adequate capacity to accommodate land use or density changes and new development is critical to avoiding environmental and health problems such as sewer back-ups, street flooding, or pressure reductions.

This chapter assesses the potential effects of the Proposed Actions on the City's water supply, wastewater treatment, and stormwater management infrastructure in accordance with the 2014 *City Environmental Quality Review (CEQR) Technical Manual*.

PRINCIPAL CONCLUSIONS

The Proposed Actions would not result in a significant adverse impact on the City's water supply, wastewater treatment, and stormwater management infrastructure, as described in the following analysis and summarized below.

WATER SUPPLY

The Proposed Actions would not result in significant adverse impacts on the City's water supply system. Projected Development resulting from the Proposed Actions would be expected to generate a water demand of approximately 2,708,370 gallons per day (gpd) in the With Action Condition, an increase of 1,492,452 gpd, or approximately 1.5 million gallons per day (mgd) compared with demand in the No Action Condition. Future incremental demand from the Projected Development Sites would be dispersed throughout the Project Area and would represent approximately 0.15 percent of the City's average daily water supply of approximately one billion gpd.

WASTEWATER TREATMENT

In the With Action Condition, wastewater from the Projected Development Sites would continue to be treated by the Wards Island Wastewater Treatment Plant (WWTP). Developments on the Projected Development Sites in the With Action Condition are expected to generate a total of approximately 1,627,022 gpd of sanitary sewage, an increase of 902,870 gpd over the No Action Condition. With an existing average flow of 200 mgd and the addition of approximately 0.9 mgd on the Projected Development Sites, the Wards Island WWTP would continue to have reserve capacity. Therefore, no significant adverse impacts to the City's wastewater treatment services would occur as a result of the Proposed Actions.

STORMWATER AND DRAINAGE MANAGEMENT

All Projected Development Sites are located within eight subcatchment areas of the Wards Island WWTP. With the increase in sanitary flow resulting from denser development, as well as the increase in fully impervious rooftop area, the Proposed Actions would result in increased flow to the combined sewer system in all subcatchment areas during rainfall events. Increased volumes and flows would be conveyed to the Wards Island WWTP or discharged directly to the East River, depending on rainfall volume and duration. Because of the available capacity of the Wards Island WWTP, the projected increased flows to the combined sewer system would not have a significant adverse impact on water quality. With the incorporation of stormwater source control best management practices (BMPs) that would be implemented on each Projected Development Site in accordance with the City's site connection requirements, the peak stormwater runoff rates would be reduced as compared with existing conditions (the development sites are unlikely to provide significant detention in their current condition). Therefore, the Proposed Actions would not result in a significant adverse impact related to the City's sanitary sewage conveyance and treatment system.

B. METHODOLOGY

According to the *CEQR Technical Manual***,** a preliminary water supply infrastructure analysis is needed if a project would result in an exceptionally large demand for water (e.g., more than one million gpd) or is in an area that experiences low water pressure (e.g., areas at the end of the water supply distribution system). Although the Project Area is not in an area that experiences low water pressure, the Proposed Actions would result in net water demand of approximately 1.5 mgd (compared with the No Action Condition[1]), therefore, an assessment of water supply is warranted.

For wastewater and stormwater conveyance and treatment, the *CEQR Technical Manual* indicates that a preliminary assessment is needed if a project is in a combined sewer area and would exceed the following incremental development of residential units or commercial space above the No Action Condition: (a) 1,000 residential units or 250,000 square feet (sf) of commercial space in Manhattan; or (b) 400 residential units or 150,000 sf of commercial space in the Bronx, Brooklyn, Staten Island, or Queens. As the Proposed Actions would result in a net increase of more than 1,000 residential units compared with the No Action condition, an assessment of wastewater and stormwater infrastructure is provided.

To assess the potential impacts of the Proposed Actions on water and sewer infrastructure, this chapter:

- Describes the existing water and sewer infrastructure serving the Project Area and estimates water demand and sewage generation on the Projected Development Sites under Existing and No Action conditions. Existing and future water demand and sewage generation are based on use generation rates provided in the *CEQR Technical Manual* and the 2016 *East New York Rezoning Proposal Final Environmental Impact Statement (FEIS)*. Stormwater runoff and sanitary flows are calculated using the New York City Department of Environmental Protection's (DEP) Volume Calculation Matrix;

[1] See water demand estimates in **Tables 11-4 and 11-5.**

- Describes planned No Action infrastructure improvements in the Project Area, project components, and current schedules;
- Forecasts water demand and sewage and stormwater generation by the projected developments induced by the Proposed Actions under the Reasonable Worst Case Development Scenario (RWCDS) based on *CEQR Technical Manual* guidelines; and
- Assesses the effects of the With Action water demand and sewage and stormwater generation on the City's water and sewer infrastructure, pursuant to *CEQR Technical Manual* guidelines.

C. EXISTING CONDITIONS

WATER SUPPLY

The New York City water supply system comprises a network of reservoirs, lakes, and aqueducts extending into the Catskill region and a pipe network that distributes water within the City. Because the Hudson, Harlem, and East Rivers are not potable water sources, New York City obtains nearly all of its water from the Delaware, Catskill, and Croton watersheds, which are within 125 miles of the City. Water from the watersheds is stored at 19 reservoirs and three control lakes, having a combined capacity of approximately 550 billion gallons. The water is then carried into the City by a number of aqueducts. The water enters the City via City Tunnel 1 (which runs through the Bronx, Manhattan, and Queens) and City Tunnel 2 (which runs through the Bronx, Queens, and Brooklyn). The partially completed City Tunnel 3 currently serves the Bronx, Manhattan, and Queens, and, when fully complete, will terminate in Brooklyn. Staten Island obtains its water via the Richmond Tunnel, which is an extension of City Tunnel 2.

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

As discussed in Chapter 1, "Project Description," a RWCDS has been developed in conjunction with the Proposed Actions. **Table 11-1** shows the existing uses on the 68 Projected Development Sites and their associated water consumption and wastewater generation rates. Based on the presented water consumption rates, it is estimated that the existing uses on the Projected Development Sites currently consume approximately 354,142 gpd, including approximately 202,985 gpd for domestic uses and approximately 151,157 gpd for air conditioning.

Table 11-1
Existing Water Consumption

Land Use[1]	Water Consumption and Wastewater Generation Rates[2]	Area/Units	Domestic Water/Wastewater Generation (gpd)	Air Conditioning (gpd)
Residential	Domestic: 100 gpd/person[3] A/C: 0.17 gpd/sf	523,687 sf (512 DU)	123,300	89,027
Retail	Domestic: 0.24 gpd/sf A/C: 0.17 gpd/sf	284,527 sf	68,286	48,370
Commercial/Office	Domestic: 0.10 gpd/sf A/C: 0.17 gpd/sf	55,526 sf	5,553	9,439
Auto-related	Domestic: 0.23 gpd/sf[4] A/C: 0.17 gpd/sf	15,600 sf	3,588	2,652
Manufacturing	Domestic: 0.23 gpd/sf[4] A/C: 0.17 gpd/sf	9,817 sf	2,258	1,669
Total Water Demand				**354,142**
Total Wastewater Generation				**202,985**

Notes: Totals may not sum due to rounding. DU = dwelling unit

1. Projected development sites currently contain approximately 83,231 sf of storage uses, which are assumed to not consume water or generate wastewater for purposes of analysis. Estimates also do not include vacant properties.
2. Consumption rates from *CEQR Technical Manual* Table 13-2, "Water Usage and Sewage Generation Rates for Use in Impact Assessment," unless otherwise noted.
3. Assumes 2.41 residents per DU (2010 Census average household size for Manhattan Community District [CD] 11).
4. Based on *East New York Rezoning Proposal FEIS* (equal to 10,000 gpd/acre); calculated based on total building floor area.

WASTEWATER TREATMENT

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

Much of New York City's wastewater treatment system comprises the sewer network underneath the streets and the 14 WWTPs throughout the City. Most of the City's sewers are combined sewers that collect both sanitary sewage and stormwater. In periods of dry weather, the combined sewers (sized to convey an amount of sanitary sewage that is based on density levels according to zoning regulations) convey only sanitary sewage. During and immediately after wet weather, combined sewers can experience a much larger flow due to stormwater runoff collection. To control flooding at the WWTPs, regulators built into the system serve as relief valves, allowing only approximately two times the amount of design dry weather flow into the interceptors (larger sewers that convey wastewater to the WWTPs). The interceptors then takes the allowable flow to the WWTPs, while the excess flow is discharged untreated to the nearest waterbody as combined sewer overflow (CSO).

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

have reduced water demand and load at the City's WWTPs. At many WWTPs, this reduction has been in the order of magnitude of several million gpd. Overall, actual water demand is down more than 30 percent since the 1990s, despite population growth. DEP projects that savings from the continued implementation of these and other conservation measures over the next decade will exceed any increases in water demand from consumers.

The Project Area is within a combined sewer area that is served by the Wards Island WWTP, where wastewater is fully treated by physical and biological processes before it is discharged as effluent into the East River. The quality of the effluent is regulated by a SPDES permit issued by the New York State Department of Environmental Conservation (NYSDEC), which establishes limits for effluent parameters (i.e., suspended solids, fecal coliform bacteria, and other pollutants). Since the volume of flow to a WWTP affects the level of treatment a plant can provide, the SPDES permit also establishes a maximum permitted capacity: for the Wards Island WWTP, the maximum permitted capacity is 275 mgd. The average monthly flow to the Wards Island WWTP over the past 12 months is 200 mgd,[2] which is approximately 73 percent of the permitted capacity.

As shown in **Figure 11-1**, the 68 Projected Development Sites are served by eight of the Wards Island WWTP subcatchment areas. **Table 11-2** shows the estimated existing wastewater generated on the Projected Development Sites within each of the affected subcatchment areas.

Table 11-2
Existing Wastewater Generation on the Projected Development Sites by Subcatchment Area

Subcatchment Area	Domestic Water/Wastewater Generated on the Projected Development Sites (gpd)[1]
WI-R23	24,582
WI-R24	23,487
WI-R25	18,581
WI-R31	2,523
WI-R33	888
WI-R35	31,419
WI-R37	101,506
WI-R38	0

Note: 1. See **Table 11-1** for domestic water/wastewater generation methodology.

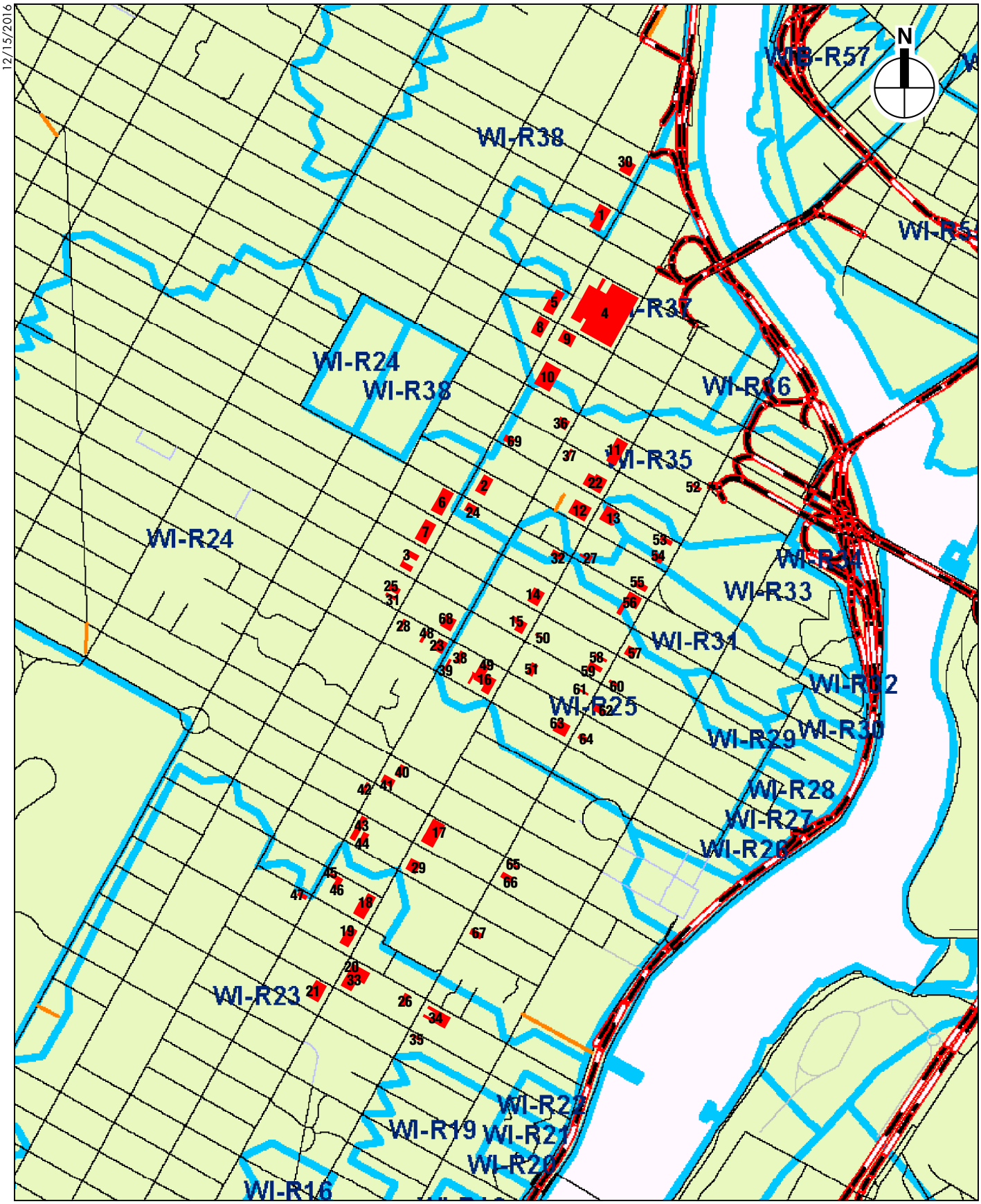
STORMWATER AND DRAINAGE MANAGEMENT

Stormwater runoff from impermeable surfaces on the Projected Development Sites is collected and conveyed by the City's combined sewer system to the Wards Island WWTP. As noted above, regulators allow only twice the dry weather design flow into interceptors; during storm events, excess flow is discharged as CSO. The analysis of stormwater management typically focuses on the body of water into which stormwater is discharged during a CSO event—in this case, CSO from the Project Area is discharged through outfalls to the East River.

The 68 Projected Development Sites within the Project Area are a mix of buildings, paved areas (such as surface parking lots), and pervious unpaved or vegetated land. The combined total area of the Projected Development Sites is approximately 17.98 acres. **Table 11-3** summarizes the

[2] Twelve-month period through October 2016.

12/15/2016



Subcatchment Drainage Areas

Projected Development Sites

0 1,000 FEET

Wards Island WWTP Subcatchment Areas

Figure 11-1

EAST HARLEM REZONING

surfaces and surface areas within each subcatchment area, as well as the weighted runoff coefficient (the fraction of precipitation that becomes surface runoff for each surface type).[3]

Table 11-3
Existing Surface Coverage

Subcatchment Area	Surface Type	Roof	Pavement and Walkways	Other	Grass and Soft Scape	Total
WI-R23	Area (percent)	74%	8%	0%	18%	100%
	Surface Area (acres)	1.68	0.18	0.00	0.42	2.29
	Runoff Coefficient*	1.00	0.85	0.85	0.20	0.84
WI-R24	Area (percent)	48%	35%	0%	17%	100%
	Surface Area (acres)	1.85	1.34	0.00	0.67	3.87
	Runoff Coefficient*	1.00	0.85	0.85	0.20	0.81
WI-R25	Area (percent)	68%	16%	0%	16%	100%
	Surface Area (acres)	1.48	0.34	0.00	0.36	2.18
	Runoff Coefficient*	1.00	0.85	0.85	0.20	**0.84**
WI-R31	Area (percent)	48%	39%	0%	13%	100%
	Surface Area (acres)	0.41	0.33	0.00	0.11	0.85
	Runoff Coefficient*	1.00	0.85	0.85	0.20	**0.84**
WI-R33	Area (percent)	85%	13%	0%	2%	100%
	Surface Area (acres)	0.08	0.01	0.00	0.00	0.10
	Runoff Coefficient*	1.00	0.85	0.85	0.20	**0.97**
WI-R35	Area (percent)	68%	16%	0%	16%	100%
	Surface Area (acres)	1.70	0.40	0.00	0.39	2.50
	Runoff Coefficient*	1.00	0.85	0.85	0.20	**0.85**
WI-R37	Area (percent)	22%	41%	0%	37%	100%
	Surface Area (acres)	1.20	2.27	0.00	2.03	5.50
	Runoff Coefficient*	1.00	0.85	0.85	0.20	**0.64**
WI-R38	Area (percent)	32%	66%	0%	2%	100%
	Surface Area (acres)	0.23	0.47	0.00	0.01	0.71
	Runoff Coefficient*	1.00	0.85	0.85	0.20	**0.89**

Notes: Totals may not sum due to rounding.
* Weighted Runoff Coefficient calculations based on the Flow Volume Calculation Matrix provided in the *CEQR Technical Manual*.

D. THE FUTURE WITHOUT THE PROPOSED ACTIONS

In the 2027 future without the Proposed Actions (No Action condition), the identified Projected Development Sites are assumed to either remain unchanged from existing conditions, or become redeveloped as-of-right under zoning. It is anticipated that, in the No Action condition, there would be a total of approximately 2,978,556 sf of built floor area on the 68 Projected Development Sites. Under the RWCDS, the total No Action development would comprise 2,472 residential dwelling units (DUs), 385,009 sf of retail space (including local and destination retail space and grocery store space), 76,559 sf of office space, 32,974 sf of hotel space, 10,592 sf of auto-oriented commercial uses, 57,614 sf of commercial storage, 7,395 sf of community facility uses, and 22,777 sf of industrial space.

[3] Lot coverage (rooftop, paved area, and unpaved softscape) for each development site was estimated using City land cover data and aerial photography.

WATER SUPPLY

As indicated in **Table 11-4**, in the No Action Condition, the total water consumption on the Projected Development Sites would be approximately 1,215,919 gpd. This represents an increase of approximately 861,777 gpd over existing conditions (see **Table 11-1**).

Table 11-4
No Action Condition Water Consumption

Land Use[1]	Water Consumption and Wastewater Generation Rates[2]	Area/Units	Domestic Water/Wastewater Generation (gpd)	Air Conditioning (gpd)
Residential	Domestic: 100 gpd/person[3] A/C: 0.17 gpd/sf	2,357,439 sf (2,472 DU)	596,000	400,765
Retail	Domestic: 0.24 gpd/sf A/C: 0.17 gpd/sf	385,009 sf	92,402	65,452
Commercial/Office	Domestic: 0.10 gpd/sf A/C: 0.17 gpd/sf	76,559 sf	7,656	13,015
Hotel	Domestic: 120 gpd/person[4] A/C: 0.17 gpd/sf	32,974 sf (82 rooms)[5]	19,680	5,606
Auto-related	Domestic: 0.23 gpd/sf[6] A/C: 0.17 gpd/sf	10,592 sf	2,436	1,801
Manufacturing	Domestic: 0.23 gpd/sf[6] A/C: 0.17 gpd/sf	22,777 sf	5,239	3,872
Community Facility[7]	Domestic: 0.10 gpd/sf A/C: 0.17 gpd/sf	7,395 sf	740	1,257
Total Water Demand				**1,215,919**
Total Wastewater Generation				**724,152**

Notes: Totals may not sum due to rounding.
1. Projected development sites in the No Action Condition would contain approximately 57,614 sf of storage uses, which are assumed to not consume water or generate wastewater for purposes of analysis.
2. Consumption rates from *CEQR Technical Manual* Table 13-2, "Water Usage and Sewage Generation Rates for Use in Impact Assessment," unless otherwise noted.
3. Assumes 2.41 residents per DU (2010 Census average household size for Manhattan Community District [CD] 11)
4. Assumes two occupants per hotel room, based on *East New York Rezoning Proposal FEIS.*
5. Assumes 400 sf per hotel room, ba *East New York Rezoning Proposal FEIS.*
6. Based on *East New York Rezoning Proposal FEIS* (equal to 10,000 gpd/acre); calculated based on total building floor area.
7. Assumes same rate as commercial/office, based on *East New York Rezoning Proposal FEIS.*

INFRASTRUCTURE IMPROVEMENTS

There are currently no planned infrastructure improvement projects within the Project Area.

WASTEWATER TREATMENT

In the No Action Condition, wastewater generated on the 68 Projected Development Sites would total 724,152 gpd (see **Table 11-4**), an increment of 521,167 gpd over existing conditions. This additional sanitary discharge to the Wards Island WWTP would be well within the 75 mgd of capacity available at the plant on average, and, therefore, the WWTP would continue to operate within its design capacities.

STORMWATER AND DRAINAGE MANAGEMENT

In the 2027 No Action Condition, stormwater runoff from the Projected Development Sites would continue to be collected and directed through the combined sewer system and then conveyed to the Wards Island WWTP for treatment. As new development is anticipated on 59 of the 68 Projected Development Sites under the No Action Condition, the amount of lot area

comprising roofs would increase in all eight affected subcatchment areas, with corresponding decreases in the area comprised of pavement/walks and grass/softscape. As a result, the amount of stormwater runoff generated on the Projected Development Sites would increase, as compared with existing conditions.

As discussed in greater detail below, DEP requires stormwater detention in compliance with the applicable drainage plan for new developments, if the developed site's storm flow is expected to exceed the allowable flow of the drainage plan. As a result of these requirements, given that the existing development sites most likely do not provide detention, it is expected that there would be a reduction in uncontrolled runoff on the 59 Projected Development Sites where new construction is anticipated in the No Action Condition. However, no improvements to stormwater detention or retention, such as green roofs, blue roofs, or seepage basins, are expected on the remaining eight Projected Development Sites that are expected to remain unchanged in the No Action Condition.

E. THE FUTURE WITH THE PROPOSED ACTIONS

In the 2027 With Action Condition, under the Proposed Actions, the total development expected to occur on the 68 Projected Development Sites would consist of approximately 6,433,375, sf of built floor area, including approximately 5,960 DUs, a substantial proportion of which are expected to be affordable, 507,551 sf of retail space, 219,771 sf of office space, 112,437 sf of community facility uses and 155,171 sf of industrial use. In total, this would represent an increment of 3,488 DUs, 122,542 sf of retail space, 143,212 sf of office space, 105,042 sf of community facility space, and 132,394 sf of manufacturing space, with a net reduction of commercial storage, hotel, and auto-oriented commercial uses, as compared with the No Action Condition.

WATER SUPPLY

The Proposed Actions would not result in significant adverse impacts on the City's water supply system. As indicated in **Table 11-5**, the Projected Development Sites are expected to generate a water demand of approximately 2,708,370 gpd in the With Action Condition, an increase of 1,492,452 gpd, or approximately 1.5 mgd, compared with demand in the No Action Condition. Future incremental demand from the Projected Development Sites in the With Action Condition would be dispersed throughout the Project Area and would represent approximately 0.15 percent of the City's average daily water supply of approximately one billion gpd.

Table 11-5
With Action Condition Water Consumption

Land Use	Water Consumption and Wastewater Generation Rates[1]	Area/Units	Domestic Water/Wastewater Generation (gpd)	Air Conditioning (gpd)
Residential	Domestic: 100 gpd/person[2] A/C: 0.17 gpd/sf	5,365,940 sf (5,960 DU)	1,436,300	912,210
Retail	Domestic: 0.24 gpd/sf A/C: 0.17 gpd/sf	507,551 sf	121,812	86,284
Commercial/Office	Domestic: 0.10 gpd/sf A/C: 0.17 gpd/sf	219,771 sf	21,977	37,361
Manufacturing	Domestic: 0.23 gpd/sf[3] A/C: 0.17 gpd/sf	155,171 sf	35,689	26,379
Community Facility[4]	Domestic: 0.10 gpd/sf A/C: 0.17 gpd/sf	112,437 sf	11,244	19,114
Total Water Demand				**2,708,370**
Incremental Water Demand (No Action to With Action)				**1,492,452**
Total Wastewater Generation				**1,627,022**
Incremental Wastewater Generation (No Action to With Action)				**902,870**

Notes: Totals may not sum due to rounding.
1. Consumption rates from *CEQR Technical Manual* Table 13-2, "Water Usage and Sewage Generation Rates for Use in Impact Assessment," unless otherwise noted.
2. Assumes 2.41 residents per DU (2010 Census average household size for Manhattan Community District [CD] 11)
3. Based on *East New York Rezoning Proposal FEIS* (equal to 10,000 gpd/acre); calculated based on total building floor area.
4. Assumes same rate as commercial/office, based on *East New York Rezoning Proposal FEIS*.

WASTEWATER TREATMENT

In the With Action Condition, wastewater from the Projected Development Sites would continue to be treated at the Wards Island WWTP. The capacity of the plant would not change as a result of the Proposed Actions, and the facility would continue to operate within its SPDES-permitted capacity of 275 mgd.

As indicated in **Table 11-5**, under the RWCDS, development on the 68 Projected Development Sites is expected to generate a total of approximately 1,627,022 gpd of sanitary sewage, divided among the eight affected subcatchment areas (summarized in **Table 11-6**). In total, the With Action sanitary sewage generation would represent an increase of 902,870 gpd, or approximately 0.9 mgd, to the Wards Island WWTP over the No Action Condition (see **Table 11-4**).

Table 11-6
With Action Condition Wastewater Generation on the Projected Development Sites by Subcatchment Area

Subcatchment Area	Domestic Water/Wastewater Generated on the Projected Development Sites (gpd)[1]
WI-R23	259,360
WI-R24	391,982
WI-R25	197,469
WI-R31	78,834
WI-R33	6,610
WI-R35	265,637
WI-R37	383,775
WI-R38	43,356

Notes: 1. See **Table 11-5** for domestic water/wastewater generation methodology.

With an existing average flow of 200 mgd and the addition of approximately 0.9 mgd on the Projected Development Sites, the Wards Island WWTP would continue to have reserve capacity. Pursuant to *CEQR Technical Manual* guidelines, as the demand associated with the Proposed Actions would be well within the capacity of the affected treatment plant, no significant adverse impacts to the City's wastewater treatment services would occur as a result of the Proposed Actions.

STORMWATER AND DRAINAGE MANAGEMENT

In the With Action Condition, it is anticipated that the amount of surface area comprised of roofs would increase over existing conditions as vacant lots and underutilized properties (such as surface parking lots) are developed with new larger developments. As shown in **Table 11-7**, roof area is estimated to comprise between 94 and 100 percent of most of the Projected Development Sites' surface areas in the eight affected subcatchment areas.[4] Although some or all of the projected developments would feature landscaped areas, the amount and location of landscaped areas is not known at this time; therefore, for the purposes of a conservative analysis, all lot area on the development sites that is not rooftop area (such as side and rear yards) is assumed to be pavement area, which features a higher runoff coefficient than landscaped area (aka softscape).

As a result of these anticipated surface area changes, the weighted runoff coefficients for the Projected Development Sites within each of the affected subcatchment areas are expected to increase over existing conditions. As shown in **Table 11-7**, the subcatchment areas are expected to have weighted runoff coefficients of between 0.94 and 1.00 in the With Action Condition.

[4] The rooftop area is lower in subcatchment area WI-R37 (58 percent), as this area contains Projected Development Site 4, which is located on a New York City Housing Authority (NYCHA) campus that contains larger open areas.

Table 11-7
With Action Condition Surface Coverage

Subcatchment Area	Surface Type	Roof	Pavement and Walkways	Other	Grass and Soft Scape	Total
WI-R23	Area (percent)	98%	2%	0%	0%	100%
	Surface Area (acres)	2.24	0.05	0.00	0.00	2.29
	Runoff Coefficient*	1.00	0.85	0.85	0.20	**1.00**
WI-R24	Area (percent)	96%	4%	0%	0%	100%
	Surface Area (acres)	3.72	015	0.00	0.00	3.87
	Runoff Coefficient*	1.00	0.85	0.85	0.20	**0.99**
WI-R25	Area (percent)	100%	0%	0%	0%	100%
	Surface Area (acres)	2.18	0.00	0.00	0.00	2.18
	Runoff Coefficient*	1.00	0.85	0.85	0.20	**1.00**
WI-R31	Area (percent)	99%	1%	0%	0%	100%
	Surface Area (acres)	0.85	0.01	0.00	0.00	0.85
	Runoff Coefficient*	1.00	0.85	0.85	0.20	**1.00**
WI-R33	Area (percent)	100%	0%	0%	0%	100%
	Surface Area (acres)	0.10	0.00	0.00	0.00	0.10
	Runoff Coefficient*	1.00	0.85	0.85	0.20	**1.00**
WI-R35	Area (percent)	94%	6%	0%	0%	100%
	Surface Area (acres)	2.33	0.15	0.00	0.00	2.50
	Runoff Coefficient*	1.00	0.85	0.85	0.20	**0.99**
WI-R37	Area (percent)	58%	42%	0%	0%	100%
	Surface Area (acres)	3.16	2.33	0.00	0.00	5.49
	Runoff Coefficient*	1.00	0.85	0.85	0.20	**0.94**
WI-R38	Area (percent)	96%	4%	0%	0%	100%
	Surface Area (acres)	0.68	0.03	0.00	0.00	0.71
	Runoff Coefficient*	1.00	0.85	0.85	0.20	**0.99**

Notes: Totals may not sum due to rounding.
* Weighted Runoff Coefficient calculations based on the Flow Volume Calculation Matrix provided in the *CEQR Technical Manual*.

Using the sanitary and stormwater flow calculations, the Flow Volume Calculation Matrix was completed for the existing conditions and the With Action condition for each subcatchment area. The calculations from the Flow Volume Calculation Matrix help to determine the change in wastewater flow volumes to the combined sewer system from existing conditions to With Action conditions, and include four rainfall volume scenarios with varying durations. The summary tables of the Flow Volume Calculation Matrices are included in **Table 11-8**.

Table 11-8
Flow Volume Matrix: Existing and With Action Volume Comparison

Subcatchment Area	Total Area (Acres)	Rainfall Volume (in.)	Rainfall Duration (hr.)	Existing: Weighted Runoff Coefficient	Existing: Runoff Volume to Direct Drainage (MG)	Existing: Runoff Volume to CSS (MG)*	Existing: Sanitary Volume to CSS (MG)	Existing: Total Volume to CSS (MG)	With Action: Weighted Runoff Coefficient	With Action: Runoff Volume to River (MG)	With Action: Runoff Volume to CSS (MG)*	With Action: Sanitary Volume to CSS (MG)	With Action: Total Volume to CSS (MG)	Increased Total Volume to CSS (MG)*
WI-R23	2.29	0.00	3.80	0.84	0.00	0.00	0.00	**0.00**	1.00	0.00	0.00	0.04	**0.04**	0.04
		0.40	3.80		0.00	0.02	0.00	**0.02**		0.00	0.02	0.04	**0.07**	0.05
		1.20	11.30		0.00	0.06	0.01	**0.07**		0.00	0.07	0.12	**0.20**	0.13
		2.50	19.50		0.00	0.13	0.02	**0.15**		0.00	0.15	0.21	**0.37**	0.22
WI-R24	3.87	0.00	3.80	0.81	0.00	0.00	0.00	**0.00**	0.99	0.00	0.00	0.06	**0.06**	0.06
		0.40	3.80		0.00	0.03	0.00	**0.04**		0.00	0.04	0.06	**0.10**	0.06
		1.20	11.30		0.00	0.10	0.01	**0.11**		0.00	0.13	0.18	**0.31**	0.20
		2.50	19.50		0.00	0.21	0.02	**0.23**		0.00	0.26	0.32	**0.58**	0.35
WI-R25	2.18	0.00	3.80	0.84	0.00	0.00	0.00	**0.00**	1.00	0.00	0.00	0.03	**0.03**	0.03
		0.40	3.80		0.00	0.02	0.00	**0.02**		0.00	0.02	0.03	**0.05**	0.03
		1.20	11.30		0.00	0.06	0.01	**0.07**		0.00	0.07	0.09	**0.16**	0.09
		2.50	19.50		0.00	0.12	0.02	**0.14**		0.00	0.15	0.16	**0.31**	0.17
WI-R31	0.85	0.00	3.80	0.84	0.00	0.00	0.00	**0.00**	1.00	0.00	0.00	0.01	**0.01**	0.01
		0.40	3.80		0.00	0.01	0.00	**0.01**		0.00	0.01	0.01	**0.02**	0.01
		1.20	11.30		0.00	0.02	0.00	**0.02**		0.00	0.03	0.04	**0.06**	0.04
		2.50	19.50		0.00	0.05	0.00	**0.05**		0.00	0.06	0.06	**0.12**	0.07
WI-R33	0.10	0.00	3.80	0.97	0.00	0.00	0.00	**0.00**	1.00	0.00	0.00	0.00	**0.00**	0.00
		0.40	3.80		0.00	0.00	0.00	**0.00**		0.00	0.00	0.00	**0.00**	0.00
		1.20	11.30		0.00	0.00	0.00	**0.00**		0.00	0.00	0.00	**0.01**	0.00
		2.50	19.50		0.00	0.01	0.00	**0.01**		0.00	0.01	0.01	**0.01**	0.00
WI-R35	2.50	0.00	3.80	0.85	0.00	0.00	0.00	**0.00**	0.99	0.00	0.00	0.04	**0.04**	0.04
		0.40	3.80		0.00	0.02	0.00	**0.03**		0.00	0.03	0.04	**0.07**	0.04
		1.20	11.30		0.00	0.07	0.01	**0.08**		0.00	0.08	0.13	**0.21**	0.13
		2.50	19.50		0.00	0.14	0.03	**0.17**		0.00	0.17	0.22	**0.38**	0.21
WI-R37	5.50	0.00	3.80	0.64	0.00	0.00	0.02	**0.02**	0.94	0.00	0.00	0.06	**0.06**	0.04
		0.40	3.80		0.00	0.04	0.02	**0.05**		0.00	0.06	0.06	**0.12**	0.07
		1.20	11.30		0.00	0.12	0.05	**0.16**		0.00	0.17	0.18	**0.35**	0.19
		2.50	19.50		0.00	0.24	0.08	**0.32**		0.00	0.35	0.31	**0.66**	0.34
WI-R38	0.71	0.00	3.80	0.89	0.00	0.00	0.00	**0.00**	0.99	0.00	0.00	0.01	**0.01**	0.01
		0.40	3.80		0.00	0.01	0.00	**0.01**		0.00	0.01	0.01	**0.01**	0.00
		1.20	11.30		0.00	0.02	0.00	**0.02**		0.00	0.02	0.02	**0.04**	0.02
		2.50	19.50		0.00	0.04	0.00	**0.04**		0.00	0.05	0.04	**0.08**	0.04

Notes: * Assumes no on-site detention or BMPs for purposes of calculations.
CSS = Combined Sewer System; MG = Million Gallons.
Totals may not sum due to rounding.

As shown in **Table 11-8**, in all rainfall volume scenarios flow to the combined sewer system would increase; the largest increases would occur within subcatchment areas WI-R24 and WI-R37 (up to 0.35 and 0.34 million gallons, respectively, during storm events with up to 2.5 inches of rainfall). The increases in flow are attributable to the increase in sanitary flow resulting from denser development (particularly residential development) and the increase in fully impervious rooftop area on the Projected Development Sites with the Proposed Actions. Increased volumes and flows would be conveyed to the Wards Island WWTP or discharged directly to the East River, depending on rainfall volume and duration. However, the table does not account for the DEP-regulated stormwater flow rate: in particular, as described in greater detail below, DEP requires substantial stormwater detention for developments or building alterations if the developed sites' storm flows exceed the allowable flow of the drainage plan. As a result of these

requirements, given that the existing development sites are unlikely to provide significant detention, it is expected that there would be an increase in on-site detention and retention as a result of the Proposed Actions.

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 is the greater of 0.25 cubic feet per second (cfs) or 10 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 rate. Flexibility in achieving this rate is provided to the development community through a variety of approvable systems, including subsurface and rooftop systems. Joint DEP and New York City Department of Buildings (DOB) guidelines are available to ensure the proper design and construction in the early stages of site planning and building design. This performance standard allows for a wide range of management techniques, costs, and space considerations. With the 2012 RCNY amendment, self-certification of house or site connection proposals is not permitted in connection with any proposed new development or expansions of existing developments as per Title 15, Chapter 31, "Rule Governing House/Site Connections to the Sewer System."

Because the City's sewers are sized and designed based on the designated zoning of an area, and related population density and surface coverage characteristics, the proposed rezoning may result in development that is inconsistent with the design of the existing built sewer system. It is expected that an Amended Drainage Plan (ADP) will be prepared for the Project Area. 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 site connection proposal.

STORMWATER BEST MANAGEMENT PRACTICES

A broad range of BMPs could be implemented on the development sites within the Project Area to facilitate stormwater source controls and limit the stormwater release rate to the required 0.25 cfs or 10 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 United States Environmental Protection Agency's (EPA's) WaterSense Program, would help to control sanitary flows. To further offset these increases, on-site stormwater control measures of BMPs would be implemented to retain or slowly release stormwater runoff with controlled discharge rates to the City's combined sewer system.

Enhanced stormwater management throughout the City is consistent with recent policies, including the NYC Green Infrastructure Plan and PlaNYC. The NYC Green Infrastructure Plan, released in September 2010, includes a goal of capturing the first inch of rainfall on 10 percent of the impervious areas in combined sewer watersheds through detention or infiltration techniques over a 20-year period.

For each Projected Development Site, developers would be required to incorporate BMPs to limit stormwater from the site to the sewer system to the greater of 0.25 cfs or 10 percent of the

allowable flow. To achieve this release rate, stormwater could be managed by utilizing one or a combination of detention or infiltration techniques identified in the NYC Green Infrastructure Plan. Green technologies, such as green roofs and blue roofs, susbsurface detention and infiltration, and permeable pavement, would retain or release stormwater with slowed discharge rates to control peak runoff rates. Trees planted per the City's street tree requirement could also be utilized to capture and store water below an enhanced tree pit. These BMPs, among other potential measures, would help to avoid an exacerbation of existing CSO discharge.

The Proposed Actions would increase flows to the City's combined sewer system that may be discharged as CSOs into the East River during rain events. Because of the available capacity of the Wards Island WWTP, the projected increased flows to the combined sewer system would not have a significant adverse impact on water quality. Based on the analysis and the required BMP measures that would be implemented on each Projected Development Site by its respective developer in accordance with City site connection requirement, it is concluded that the Proposed Actions would not result in significant adverse impacts to local water supply or wastewater and stormwater conveyance and treatment infrastructure. ✷