Chapter 8: Water and Sewer Infrastructure

A. INTRODUCTION

This chapter evaluates the potential for the proposed Memorial Sloan-Kettering Cancer Center (MSK)/The City University of New York (CUNY)-Hunter project to result in significant adverse impacts on the City's water supply, as well as its wastewater and storm water conveyance and treatment infrastructure. As described in Chapter 1, "Project Description," MSK and CUNY are partnering to acquire a 66,111-square-foot (1.5 acre) City-owned site on the Upper East Side of Manhattan (Block 1485, Lot 15). MSK proposes to build a new ambulatory care center (MSK ACC), while CUNY proposes to build the Hunter College Science and Health Professions Building (CUNY-Hunter Building). The MSK ACC would stand approximately 23 stories on a footprint of 39,667 square feet (sf) on the eastern portion of the site and would contain state-of-the-art ambulatory care facilities, including various clinics, a pharmacy, and conference rooms, as well as up to 250 accessory parking spaces on the lower levels. The CUNY-Hunter Building would stand approximately 16 stories tall on a footprint of 26,444 sf. It would house teaching and research laboratories, class rooms, a learning center, a single 350-seat lecture hall, faculty offices, and a vivarium to house research animals.

PRINCIPAL CONCLUSIONS

The aforementioned new uses, and associated project-generated clinic visitors, students, employees, and other users, would increase the project site's water consumption, sewage generation, and storm water runoff as compared to conditions in the future without the proposed project (the "No Build" condition). However, the following analysis finds that the proposed project would not result in any significant adverse impacts on the City's water supply, wastewater or storm water conveyance and treatment infrastructure.

WATER SUPPLY

By the 2019 analysis year, the proposed project would generate an incremental water demand of 293,090 gallons per day (gpd) as compared to the future without the proposed project. This represents an increase in demand on the New York City water supply system, since the site is currently largely vacant and does not currently generate any water demand. Nevertheless, 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 the 2019 analysis year, the proposed project would generate an incremental 239,540 gpd of sewage over the future without the proposed project. This incremental volume in sanitary flow to the combined sewer system would represent approximately 0.09 percent of the average daily flow to the Wards Island Wastewater Treatment Plant (Wards Island WWTP). This volume would not result in an exceedance of the Wards Island WWTP's capacity, as per the plant's State Pollutant Discharge Elimination System (SPDES) permit, and therefore would not create a significant adverse impact on the City's sewage conveyance or treatment systems.

STORM WATER

The overall volume of storm water runoff and the peak storm water runoff rate from the project site is anticipated to increase slightly, due to the replacement of the existing paved parking area with more impervious building rooftop. With the incorporation of selected best management practices (BMPs), the peak storm water runoff rates would be reduced from the future without the proposed project and would not have a significant impact on the City's sewage conveyance or treatment systems.

B. METHODOLOGY

This analysis follows the methodologies set forth in the *City Environmental Quality Review* (*CEQR) Technical Manual* (June 2012 edition). 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 (i.e., at the end of the water supply distribution system such as the Rockaway Peninsula or Coney Island). The project site is not located in an area that experiences low water pressure and the proposed project would not result in water demand exceeding 1,000,000 gpd. Therefore, further water analysis was not warranted; however, 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 located in a combined sewer area in Manhattan would result in the incremental development of 1,000 residential units or 250,000 sf of commercial, public facility and institution and/or community facility space. The proposed project would result in the development of 1,134,159 gross square feet (gsf), and therefore a preliminary sewer analysis was conducted.

Existing and future water demands and sanitary sewage generation are calculated based on use generation rates set by the *CEQR Technical Manual*.[1] The New York City Department of Environmental Protection (DEP) Flow Volume Calculation Matrix was then used to calculate the overall combined sanitary sewage and storm water runoff volume discharged to the combined sewer system for four rainfall volume scenarios with varying durations. 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 generation rates, and then comparing the future with and without the proposed project. In addition, this chapter compares the incremental water demand and sewage generated from the proposed project to the future without the proposed project per *CEQR Technical Manual* methodology.

C. EXISTING CONDITIONS

WATER SUPPLY

New York City's water supply system is composed of three watersheds—Croton, Delaware, and Catskill—and extends as far north as the Catskill Mountains. From these watersheds, water is carried to the City via a conveyance system made up of reservoirs, aqueducts, and tunnels. Within the City, a network of underground water pipes distributes water to customers. On average, the New York City water system delivers approximately 1.1 billion gallons per day (bgd) to the five boroughs and Westchester County.

[1] *CEQR Technical Manual*, January 2012, p.13-12.

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 deliver 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.

WATER DISTRIBUTION AND CONSUMPTION

City water mains are present in all the roadways adjacent to each of the development sites. The project site is largely vacant with standing remnants of the walls of the former garage structure and currently does not generate any water demand.

SEWER SYSTEM

The project site is located in an area of New York City served by a combined sewer system which collects both sanitary sewage and storm water. In periods of dry weather, the combined sewers in the streets adjacent to the project site—which sized to convey an amount of sanitary sewage that is based on zoning regulations—convey only sanitary sewage. Since the project site is largely vacant, it does not currently generate any sanitary sewage, however sanitary sewage from the project site would be conveyed via combined sewers in the abutting East 73rd and East 74th Streets to Regulators 1 and 2B, structures that control the flow of sewage to interceptors, larger sewers that connects the combined sewer system to the city's sewage treatment system. The nearest interceptor to the project site runs east of the project site under the Franklin Delano Roosevelt (FDR) Drive.

From there, flow would be conveyed to the Manhattan Grit Chamber at East 110th Street, where solids are strained from the wastewater flow before it is conveyed to the Wards Island WWTP. At the WWTP, wastewater is fully treated by physical and biological processes before it is discharged into the upper 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). The SPDES permit establishes limits for effluent parameters (i.e. suspended solids, fecal coliform bacteria, other pollutants). Since the volume of flow to a WWTP affects the level of treatment a plant can provide, the maximum permitted capacity for the Wards WWTP is 275 mgd. The average monthly flow over the past 12 months is 206 mgd, well below the maximum permitted level.

During and immediately after wet weather, the combined sewers can experience a much larger flow due to storm water runoff collection. To control flooding at Wards Island WWTP the regulators built into the system to allow only approximately two times the amount of design dry weather flow into the interceptors. The interceptor then takes the allowable flow to the Wards Island WWTP, while the excess flow is discharged to the nearest waterbody as combined sewer overflow (CSO). The project site falls within two CSO drainage areas. In wet weather, sanitary and storm water runoff from 50 percent of the site (the southern portion) is conveyed via sewers in East 73rd Street to Regulator 1, which in turn conveys excess flow to CSO outfall WIM-002. The wet weather flow from the northern 50 percent of the site would be conveyed in a combined sewer under East 74th Street, to

Regulator 2B. Excess flow would be conveyed to CSO outfall WIM-003, which is located at the foot of East 74th Street.

SANITARY FLOWS (DRY WEATHER)

Since the project site is largely vacant, it does not currently generate any sanitary sewage

STORM WATER FLOWS (WET WEATHER)

The project site is approximately 66,111 sf (1.52 acres), comprising approximately 40 percent paved surface (existing parking lot) and 60 percent standing remnants of the walls of the former garage structure. **Table 8-1** describes the surfaces and surface areas of the development sites, and how storm water runoff is currently discharged from the sites. The weighted runoff coefficient calculated for each of the CSO subcatchment areas is listed in **Table 8-1**. These numbers correspond to the percentage of precipitation that becomes surface runoff.

Table 8-1
Existing Surface Coverage

Affected CSO Outfall	Surface Type	Surface Areas (sf)/ Percent Coverage	Discharge Method	Weighted Runoff Coefficient
WIM-003	Building Roofs	0%		
	Paved Surfaces	33,056/100%		
	Other	0%		
	Grass/Softscape	0%		
	Total	**33,056/100%**	**Combined Sewer**	**0.85**
WIM-002	Building Roofs	0%		
	Paved Surfaces	33,056/100%		
	Other	0%		
	Grass/Softscape	0%		
	Total	**33,056/100%**	**Combined Sewer**	**0.85**

Source: AKRF, 2013

D. THE FUTURE WITHOUT THE PROPOSED PROJECT

In the future without the proposed project, existing conditions on the project site would not change. The site would continue to be largely vacant and underutilized.

E. PROBABLE IMPACTS OF THE PROPOSED PROJECT

WATER SUPPLY DEMAND

The proposed project would result in the full development of the site with two large buildings. The proposed buildings would be built to an overall FAR of 12.0, which would be 793,332 sf of zoning floor area (zfa), with full lot coverage over the project site. Any existing structures on the site would be demolished; the existing parking lot would also be removed and replaced by new development.

Table 8-2 summarizes the projected water consumption in the future with the proposed project.

Table 8-2
The Future With the Proposed Project: Water Consumption

Use	Users	Rate (gallons per day)	Consumption (gallons per day)
MSK			
Patient Domestic	1,335	100	133,500
Visitor Domestic	2,670	10	26,700
Staff Domestic	1,539	10	15,390
Academic Space Domestic	600	10	6,000
Process water	n/a	n/a	7,500
Cooling tower makeup water	n/a	n/a	40,500
		SUBTOTAL	**229,590**
CUNY			
Domestic	2,400	10	24,000
Lab/Vivarium/Specialy Use	2,400	5	12,000
Cooling tower makeup water	n/a	n/a	22,500
Process water	n/a	n/a	5,000
		SUBTOTAL	**63,500**
		TOTAL	**293,090**

Notes: Domestic water refers to general tap water use, including potable water
Sources: Jaros, Baum & Bolles (JBB), 2013

The cumulative water demand from both buildings would be 293,090 gpd. Since there is currently no water demand generated on-site, the incremental water demand over the No Build condition generated by uses that would be introduced by the proposed project would be 293,090 gpd.

The incremental water demand represents a small increase in demand on the New York City water supply system—approximately 0.03 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.

SEWER SYSTEM AND WWTP TREATMENT CAPACITY DEMAND

SANITARY FLOWS

The estimated amount of sanitary sewage generated by the proposed development would be 239,540 gpd. The sanitary flow would be generated from domestic water use (general tap water use by staff, patients, visitors, and students), MSK ACC process water (water used for equipment sterilizers, washers, ice makers, etc), water used in the research animal lab at the CUNY-Hunter building, and cooling tower make-up water for both buildings, 15 percent of which would be drained to the sanitary sewer as blow-down water. Since there is currently no water demand generated on-site, the incremental sanitary sewage over the No Build condition generated by the proposed development would be 239,540 gpd. This amount would represent approximately 0.09 percent of the average daily flow of 275 mgd at the Wards Island WWTP, and would not result in an exceedance of the plant's capacity. Therefore, the proposed project would not create a significant adverse impact on the City's sanitary sewage conveyance and treatment system. In addition, per the New York City Plumbing Code (Local Law 33 of 2007) low-flow fixtures would be required to be implemented and would help to reduce sanitary flows from the new buildings.

STORM WATER FLOWS

As a result of the replacement of surface parking and vacant land with buildings, the weighted runoff coefficient of two of the CSO outfall subcatchment areas (WIM-003 and WIM-002)

would increase, since roof surfaces are less permeable than asphalt and concrete (see **Table 8-3** for incremental changes to the weighted runoff coefficients**)**.

Table 8-3
Proposed Surface Coverage

Affected CSO Outfall	Surface Type	Surface Areas (sf)/ Percent Coverage	Discharge Method	Existing Weighted Runoff Coefficient	Post-construction Weighted Runoff Coefficient	Incremental Change in Runoff Coefficient
WIM-003	Building Roofs	33,056/100%				
	Paved Surfaces	0%				
	Other	0%				
	Grass/Softscape	0%				
	Total	**33,056/100%**	Combined Sewer	0.85	1.00	+0.15
WIM-002	Building Roofs	33,056/100%				
	Paved Surfaces	0%				
	Other	0%				
	Grass/Softscape	0%				
	Total	**33,056/100%**	Combined Sewer	0.85	1.00	+0.15

Using these sanitary and storm water flow calculations, the DEP Flow Volume Calculation Matrix was completed for the existing conditions and conditions with the proposed project (the "Build" condition). The calculations from the Flow Volume Calculation Matrix help to determine the change in wastewater flow volumes to the combined sewer system from existing to Build conditions. The Flow Volume Calculation Matrix includes four rainfall volume scenarios with varying durations. The summary tables, taken from the DEP Flow Volume Calculation Matrix, are included in **Table 8-4.**

Table 8-4
DEP Flow Volume Matrix:
Existing and Build Volume Comparison

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 (%)
WIM-003		Existing				Build				**WIM-003 Increment**	
		33,056 sf / 0.76 Acres				33,056 sf / 0.76 Acres					
0.00	3.80	0.00	0.00	0.00	**0.00**	0.00	0.00	0.02	**0.02**	0.02	*
0.40	3.80	0.00	0.01	0.00	**0.01**	0.00	0.01	0.02	**0.03**	0.02	288%
1.20	11.30	0.00	0.02	0.00	**0.02**	0.00	0.02	0.06	**0.08**	0.06	286%
2.50	19.50	0.00	0.04	0.00	**0.04**	0.00	0.05	0. 10	**0.15**	0. 11	240%
WIM-002		Existing				Build				**WIM-002 Increment**	
		33,056 sf / 0.76 Acres				33,056 sf / 0.76 Acres					
0.00	3.80	0.00	0.00	0.00	**0.00**	0.00	0.00	0.02	**0.02**	0.02	*
0.40	3.80	0.00	0.01	0.00	**0.01**	0.00	0.01	0.02	**0.03**	0.02	288%
1.20	11.30	0.00	0.02	0.00	**0.02**	0.00	0.02	0.06	**0.08**	0.06	286%
2.50	19.50	0.00	0.04	0.00	**0.04**	0.00	0.05	0.10	**0.15**	0.11	240%

Notes:
*Percent increase computed for rainfall events only.
** Assumes no on-site detention/BMPs for purposes of calculations
CSS = Combined Sewer System; MG = Million Gallons

As shown in **Table 8-4**, the percent increase for each subcatchment area is over two times the amount shown under the existing conditions, since the development of both buildings would add sanitary flow to a site where no flow is currently generated; in the Build Condition, the site will also be covered with roof surfaces, which are less permeable than the existing asphalt and concrete coverage.

However, the Flow Volume Matrix calculations do not reflect the use of any sanitary and storm water source control best management practices (BMPs) to reduce sanitary and storm water runoff volumes to the combined sewer system; BMPs would be required as a part of the DEP site connection approval process. Both the MSK ACC and the CUNY-Hunter buildings would include storm water harvesting tanks of 45,000 gallons and 30,000 gallons, respectively. The storm water collected in these tanks would be available for reuse as makeup water for the building cooling towers, reducing both water demand and discharge of storm water to the combined sewer system. The design of both buildings would also incorporate the use of limited green roofs to detain the flow of storm water during wet weather conditions. BMPs to reduce water consumption and sanitary sewer discharges (such low-flow fixtures) would also be included.

With the incorporation of these select BMPs, the overall volume of sanitary sewer discharge and storm water runoff, and the peak storm water runoff rate would be reduced. As sewer conveyance near the project site and and wastewater treatment capacity at Wards Island WWTP is sufficient to handle wastewater flow from the proposed project, the project would not result in any significant adverse impacts on wastewater treatment or storm water conveyance infrastructure. ✷