Chapter 9: Water and Sewer Infrastructure

A. INTRODUCTION

This chapter evaluates the potential for the proposed actions in connection with the proposed Vanderbilt Corridor and One Vanderbilt development to result in significant adverse impacts on the City's water supply, as well as its wastewater and stormwater conveyance and treatment infrastructure.

The proposed actions would facilitate the development of an approximately 1.8-million-gross-square-foot (gsf), (1,299,390-zoning-square-foot [zsf]), 30.0 floor area ratio (FAR) building (the proposed One Vanderbilt development) on the One Vanderbilt site that is owned by Green 317 Madison LLC (317 Madison). The proposed One Vanderbilt development would contain a mix of uses including offices, trading floors, retail, restaurant, transit access, a transit hall at ground level; and rooftop amenity space, and would utilize floor area bonuses pursuant to the Grand Central Public Realm Improvement for developments in the Vanderbilt Corridor for public space and transit improvements and landmark transfer special permits. As part of the proposed One Vanderbilt development, 317 Madison would provide improvements to the Vanderbilt Avenue public place dedicated to pedestrian uses.

According to the 2014 *City Environmental Quality Review (CEQR) Technical Manual*, projects that increase density or change drainage conditions on a large site require a water and sewer infrastructure analysis. Specifically, developments that would result in an exceptionally large demand for water (more than one million gallons per day [gpd]) or that are located in an area that experiences low water pressure require an analysis of potential impacts on the water supply system; developments located in a combined sewer area exceeding incremental development thresholds of 1,000 residential units or 250,000 square feet of commercial, public facility, institutional and/or community facility space require an analysis of potential impacts on the wastewater and stormwater conveyance and treatment system. The One Vanderbilt site is located in a combined sewer area and the proposed development would be approximately 996,966 gsf of commercial space larger than the building that would be constructed on the site absent the proposed actions. Therefore, following the guidelines of the *CEQR Technical Manual*, an analysis of the proposed One Vanderbilt development's potential impacts on the wastewater and stormwater conveyance and treatments system was performed.

The proposed zoning text amendments are also expected to facilitate the redevelopment of additional sites within the Vanderbilt Corridor with new buildings containing commercial space, which would also increase density. Because each development on those additional sites facilitated by the proposed text amendment would be subject to its own site-specific environmental review under CEQR, an analysis of the potential impacts of such additional development in 2021 and by 2033 on water and sewer infrastructure is included in Chapter 19, "Conceptual Analysis."

PRINCIPAL CONCLUSIONS

The proposed One Vanderbilt development would result in an increase in water consumption and sewage generation on the One Vanderbilt site as compared with the No-Action condition. Its construction would require the removal of a sewer line located underneath the site and the re-pitching of the East 43rd Street sewer to direct flow west, then south along Madison Avenue, with the flow continuing to be directed to Regulator NC-M45 and the First Avenue interceptor. During wet weather, combined sewer overflow (CSO) would continue to be directed to outfall NCM-037. The analysis finds that the proposed One Vanderbilt development would not result in any significant adverse impacts on the City's water supply or wastewater or stormwater conveyance and treatment infrastructure.

SANITARY SEWAGE

The proposed One Vanderbilt development would generate 164,900 gpd of sanitary sewage, an increase of 81,193 gpd above the No-Action building. This incremental increase in sewage generation is approximately 0.04 percent of the average daily flow at the Newtown Creek Wastewater Treatment Plant (WWTP) and would not result in an exceedance of the plant's permitted capacity. Therefore, the proposed One Vanderbilt development would not result in a significant adverse impact to the City's sanitary sewage conveyance and treatment system.

STORMWATER

The overall volume of stormwater runoff and the peak stormwater runoff rate from the One Vanderbilt site is expected to decrease slightly due to the decrease in fully impervious rooftop area on the site. With the incorporation of selected stormwater source control best management practices (BMPs) that would be required as part of the site connection approval process, subject to the review and approval of the New York City Department of Environmental Protection (DEP), the peak stormwater runoff rates would be reduced. Overall, the proposed One Vanderbilt development would not result in significant adverse impacts on the City's sewage conveyance or treatment systems.

B. METHODOLOGY

This analysis follows the *CEQR Technical Manual* guidelines that recommend a preliminary water analysis if a project would result in an exceptionally large demand of water (over one million gpd), or is located in an area that experiences low water pressure (i.e., in an area at the end of the water supply distribution system such as the Rockaway Peninsula or Coney Island). The One Vanderbilt site is not located in an area that experiences low water pressure, and the proposed development would generate an incremental water demand of 208,845 gpd compared with the No-Action condition.[1] While this would represent an increase in demand on the New York City water supply system, it does not meet the *CEQR Technical Manual* threshold requiring a detailed analysis. Therefore, an analysis of water supply is not warranted since it is expected that there would be adequate water service to meet the incremental water demand and that there would be no significant adverse impacts on the City's water supply.

[1] See **Tables 9-1** and **9-3**, which include calculations of the One Vanderbilt site's total water demand in the No-Action condition (206,100 gpd) and in the With-Action condition (414,945 gpd).

As described above, the One Vanderbilt site is located in a combined sewer area and the proposed One Vanderbilt development would be approximately 996,966 gsf of commercial space larger than the No-Action building, which exceeds the *CEQR Technical Manual* threshold of 250,000 square feet. Therefore, following the guidelines of the *CEQR Technical Manual*, an analysis of the proposed One Vanderbilt development's potential impacts on the wastewater and stormwater conveyance and treatments system was performed. Existing and future water demand and sanitary sewage generation are calculated based on use rates set by the *CEQR Technical Manual*.[1] The DEP Flow Volume Calculation Matrix is then used to calculate the overall combined sanitary sewage and stormwater runoff volume discharged to the combined sewer system for four rainfall volume scenarios with varying durations. The ability of the City's sewer infrastructure to handle the anticipated demand from the proposed One Vanderbilt development is assessed by estimating existing sewage generation rates, and then comparing these existing rates with the No-Action and With-Action conditions, per *CEQR Technical Manual* methodology.

C. EXISTING CONDITIONS

CONVEYANCE SYSTEM

The One Vanderbilt site is located in a part of New York City served by a combined sewer system that collects 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) located in the adjacent streets convey only sanitary sewage. The four existing buildings on the One Vanderbilt site are served by a sewer line running east along East 43rd Street, to the north of the site, then crossing the northeast corner of the site and running south underneath the building on Lot 27, then running east along East 42nd Street. An additional pipe located underneath the sidewalk along East 42nd Street connects the building on Lot 20 to the sewer line where it crosses Vanderbilt Avenue. The sewer line serving the One Vanderbilt site then runs south along Park Avenue and east along East 41st Street to Regulator NC-M45. Regulators are structures that control the flow of sewage to interceptors, i.e., larger sewers that connect the combined the sewer system to the City's sewage treatment system. From Regulator NC-M45, flow is conveyed to an interceptor running south along the approach roads to the Queens Midtown Tunnel and First Avenue and across the East River to the Newtown Creek WWTP, the largest of the City's 14 WWTPs.

At the Newtown Creek WWTP, wastewater is fully treated by physical and biological process before it is discharged into the East River. The quality of the treated wastewater (effluent) is regulated by a State Pollutant Discharge Elimination System (SPDES) permit issued by the New York State Department of Environmental Conservation (DEC), 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 maximum permitted capacity for the Newtown Creek WWTP is 310 million gallons per day (mgd). The average monthly flow over the past 12 months is 215 mgd,[2] which is well below the maximum permitted capacity.

During and immediately after wet weather, combined sewers can experience a much larger flow due to stormwater runoff collection. To control flooding at the Newtown Creek WWTP, the regulators built into the system allow only approximately two times the amount of design dry

[1] *CEQR Technical Manual*, March 2014, Table 13-2.

[2] 12-month period through June 2014.

weather flow into the interceptors. The interceptor then takes the allowable flow to the WWTP, while the excess flow is discharged to the nearest waterbody as CSO. The One Vanderbilt site is located within one CSO drainage area: in wet weather, santitary flow and stormwater runoff is conveyed to CSO outfall NCM-037, located at the foot of East 41st Street.

SANITARY FLOWS

For purposes of analysis, the amount of sanitary sewage is estimated as all water demand generated by the existing buildings on the One Vanderbilt site excepting water used by air conditioning, which is typically not discharged to the sewer system. With 583,569 gsf of office space[1] and 45,978 gsf of retail space, the existing buildings generate an estimated 69,392 gpd of daily sanitary sewage with a total water demand of 176,415 gpd (see **Table 9-1**).

Table 9-1
Existing Water Consumption and Sewage Generation

Use	Floor Area (gsf)	Rate*	Consumption (gpd)
Retail			
Domestic	45,978	0.24 gpd/sf	11,035
Air Conditioning	45,978	0.17 gpd/sf	7,816
Commercial Office			
Domestic	583,569	0.10 gpd/sf	58,357
Air Conditioning	583,569	0.17 gpd/sf	99,207
Total Water Supply Demand			**176,415**
Total Sewage Generation			**69,392**
Notes: * Rates are from the *CEQR Technical Manual*, Table 13-2.			

STORMWATER FLOWS

The One Vanderbilt site has a lot area of approximately 56,133 square feet (1.29 acres). This includes the four lots that are currently developed with commercial buildings (43,313 square feet) and the portion of Vanderbilt Avenue located between East 42nd and East 43rd Streets that would be designated as a public place as part of the proposed actions (12,820 square feet). The surface area is building rooftops (the four existing buildings on the development site) and pavement (Vanderbilt Avenue). **Table 9-2** summarizes the surfaces and surface areas, as well as the weighted runoff coefficient (the fraction of precipitation that becomes surface runoff for each surface type).

Table 9-2
Existing Surface Coverage

Affected CSO Outfall	Surface Type	Roof	Pavement and Walkways	Other	Grass and Soft Scape	Total
NCM-037	Area (percent)	77%	23%	0%	0%	**100%**
	Surface Area (sq. ft.)	43,313	12,820	-	-	**56,133**
	Runoff Coefficient*	1.00	0.85	0.85	0.20	**0.97**
Notes: * Weighted Runoff Coefficient calculations based on the DEP Flow Volume Calculation Matrix provided in the *CEQR Technical Manual*, retrieved June, 2014.						

[1] The existing buildings contain a total of 142,615 gsf of core mechanical space that is not included in the calculation of water demand and sewage generation.

D. THE FUTURE WITHOUT THE PROPOSED ACTIONS

As described in Chapter 1, "Project Description," absent the proposed actions the One Vanderbilt site will be redeveloped with a new commercial building under the existing C5-3 and Special Midtown District regulations, which permit commercial development up to a maximum floor area ratio (FAR) of 15.0. The No-Action building will contain 636,312 gsf of office space and 83,648 gsf of retail space.

CONVEYANCE SYSTEM

In order to accommodate the No-Action building, the sewer line running underneath the site between East 43rd Street and Vanderbilt Avenue will be removed. The No-Action building will utilize a site connection on East 43rd Street; the sewer line will be re-pitched to flow to the west, connecting to an existing drop manhole and the sewer line running south along Madison Avenue. Some of the catch basins located along 43rd Street and Vanderbilt Avenue will be re-piped to connect to the Madison Avenue sewer (the catch basins located downstream from the removed sewer line would utilize their existing connections).[1] From the Madison Avenue sewer line, flow will continue along East 41st Street to Regulator NC-M45 and the First Avenue interceptor. During wet weather, CSO will continue to be directed to outfall NCM-037.

SANITARY FLOWS

Table 9-3 summarizes the water and sewage generation of the No-Action building. The No-Action building is expected to generate an estimated 83,707 gpd of daily sanitary sewage with a total water demand of 206,100 gpd.

Table 9-3
No-Action Water Consumption and Sewage Generation

Use	Floor Area (gsf)	Rate*	Consumption (gpd)
Retail			
Domestic	83,648	0.24 gpd/sf	20,076
Air Conditioning	83,648	0.17 gpd/sf	14,220
Commercial Office			
Domestic	636,312	0.10 gpd/sf	63,631
Air Conditioning	636,312	0.17 gpd/sf	108,173
Total Water Supply Demand			**206,100**
Total Sewage Generation			**83,707**

Notes: * Rates are from the *CEQR Technical Manual*, Table 13-2.

STORMWATER FLOWS

Since the No-Action building will occupy the full One Vanderbilt site, replacing the four existing commercial buildings, the surface area of the development site will remain fully rooftop area. Similarly, the portion of Vanderbilt Avenue to be designated as a public place will remain fully paved area. The surface areas and the weighted runoff coefficient will remain as shown in **Table 9-2**.

[1] These changes to the sewer and stormwater conveyance system are subject to the approval of DEP's Bureau of Water and Sewer Operations (BWSO).

E. THE FUTURE WITH THE PROPOSED ACTIONS

The proposed One Vanderbilt development would contain 442,688 gsf more office space and 51,352 gsf more retail space (includes retail, restaurant, and rooftop amenity space) than the No-Action building, and would therefore consume more water and generate more sewage. The results of the analysis of the proposed One Vanderbilt development on water and sewer infrastructure is described in the sections below.

CONVEYANCE SYSTEM

As in the case of the No-Action building, the sewer line running underneath the One Vanderbilt site would be removed in order to accommodate the proposed One Vanderbilt development. Similar to the No-Action building, the proposed One Vanderbilt development would utilize a connection to the East 43rd Street sewer, which would be re-pitched to flow to the west to connect to the Madison Avenue sewer, and some of the catch basins located along 43rd Street and Vanderbilt Avenue would be re-piped to connect to the Madison Avenue sewer. Flow from the proposed One Vanderbilt development would continue to be directed to Regulator NC-M45 and CSO outfall NCM-037.

SANITARY FLOWS

For the purposes of analysis, the office space and trading floor space within the proposed One Vanderbilt development (1,325,000 gsf total) are assumed to consume water and generate sewage and at the commercial office rates included in Table 13-2 of the *CEQR Technical Manual*. The retail, restaurant, and rooftop amenity space (135,000 gsf total) are assumed to consume water and generate sewage at the retail rates. Other spaces within the proposed One Vanderbilt development, in particular the below-grade and ground level circulation space (including the transit hall) as well as mechanical, core, back-of-house, and loading areas, are assumed to not result in any water demand or sewage generation. As shown on **Table 9-4**, the proposed One Vanderbilt development is expected to generate 164,900 gpd of daily sanitary sewage with a total water demand of 413,100 gpd.

Table 9-4
One Vanderbilt Development Water Consumption and Sewage Generation

Use	Floor Area (gsf)	Rate*	Consumption (gpd)
Retail			
Domestic	135,000	0.24 gpd/sf	32,400
Air Conditioning	135,000	0.17 gpd/sf	22,950
Commercial Office			
Domestic	1,325,000	0.10 gpd/sf	132,500
Air Conditioning	1,325,000	0.17 gpd/sf	225,250
Total Water Supply Demand			**413,100**
Total Sewage Generation			**164,900**
Notes: * Rates are from the *CEQR Technical Manual*, Table 13-2.			

The incremental sanitary sewage generated by the proposed One Vanderbilt development, as compared with the No-Action building, would be 81,193 gpd. This incremental increase in sewage generation would is approximately 0.04 percent of the average daily flow at the Newtown Creek WWTP (215 mgd) and would not result in an exceedance of the plant's

permitted capacity of 310 mgd. In addition, in accordance with the New York City Plumbing Code (Local Law 33 of 2007), the proposed One Vanderbilt development would be required to utilize low-flow plumbing fixtures, which would reduce sanitary flows to the plant. Therefore, the proposed One Vanderbilt development would not result in a significant adverse impact to the City's sanitary sewage conveyance and treatment system.

STORMWATER FLOWS

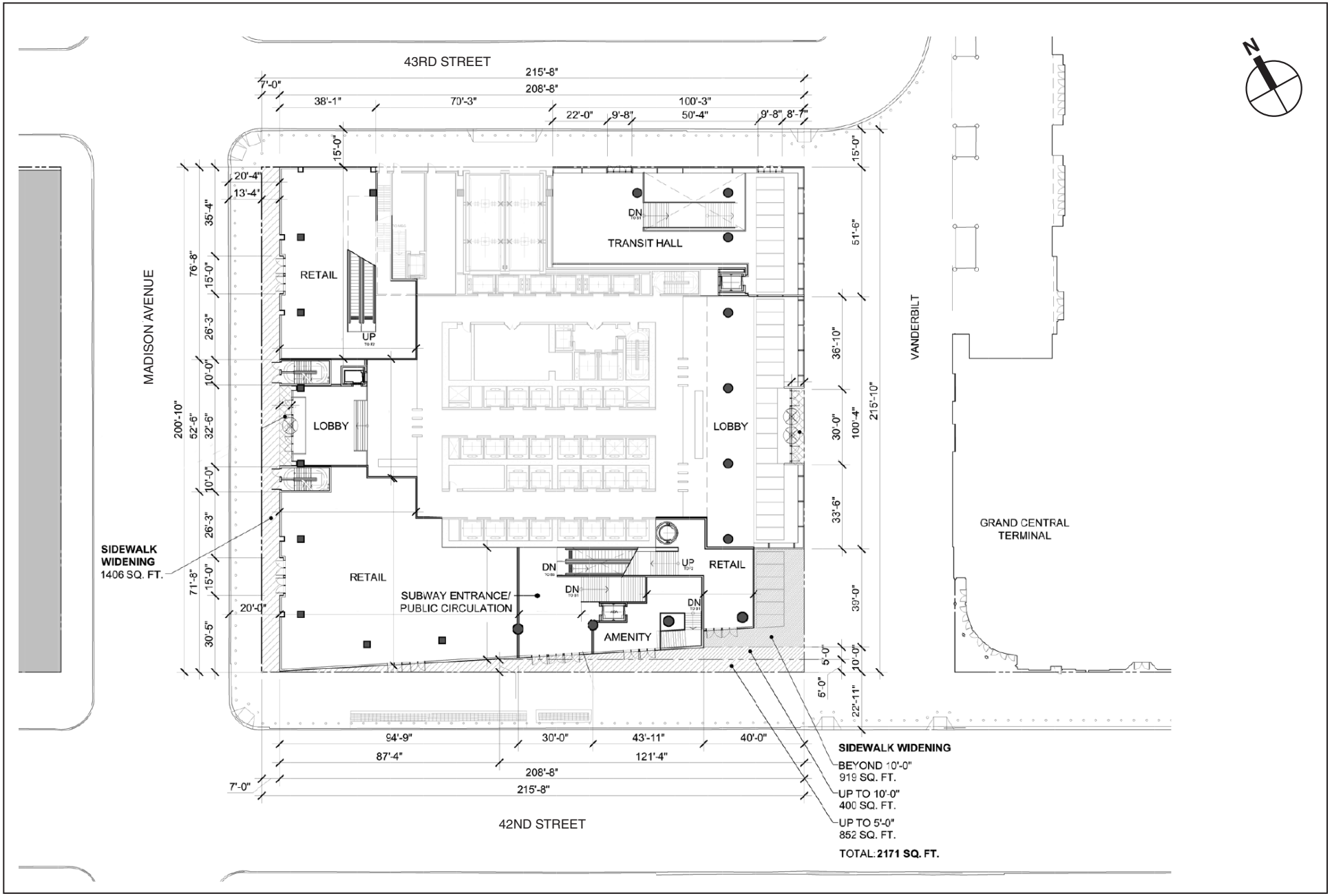
The proposed One Vanderbilt development is designed with features that would improve pedestrian circulation in the heavily trafficked area around Grand Central Terminal. The southern side of the building has been designed with an angled podium set back from the property line by approximately 10 feet in order to provide a widened sidewalk along East 42nd Street; in addition, the southeast corner of the building would be recessed from the property line to provide circulation space at the corner of East 42nd Street and Vanderbilt Avenue. These widened sidewalk areas would result in 2,171 square feet of paved surface area on the One Vanderbilt site, with the remaining 41,142 square feet on the site remaining rooftop space (see **Figure 9-1**).[1] In addition, with the proposed actions the 12,820-square foot portion of Vanderbilt Avenue located adjacent to the One Vanderbilt site would be closed to vehicular traffic and converted into a proposed public place. Although the creation of the proposed public place is expected to include landscaping features such as planters, for the purposes of analysis it is assumed that it would remain a paved surface area and would not contain any new permeable surfaces. Therefore, the proposed public place and widened sidewalk areas would have a total of 14,991 square feet of paved surface area, and the weighted runoff coefficient would decrease slightly (see **Table 9-5**).

Table 9-5
One Vanderbilt Development Surface Coverage

Affected CSO Outfall	Surface Type	Roof	Pavement and Walkways	Other	Grass and Soft Scape	Total
NCM-037	Area (percent)	73%	27%	0%	0%	**100%**
	Surface Area (sq. ft.)	41,142	14,991	-	-	**56,133**
	Runoff Coefficient*	1.00	0.85	0.85	0.20	**0.96**
Notes:	* Weighted Runoff Coefficient calculations based on the DEP Flow Volume Calculation Matrix provided in the *CEQR Technical Manual*, retrieved June, 2014.					

Using these sanitary and stormwater flow calculations, the DEP Flow Volume Calculation Matrix was completed for the existing conditions and the proposed One Vanderbilt development (the With-Action 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 With-Action conditions, and include four rainfall volume scenarios with varying durations. The summary tables of the Flow Volume Calculation Matrix are included in **Table 9-6**.

[1] The western side of the building podium would also be set back by seven feet to provide a widened sidewalk along Madison Avenue; however, above the third floor, the building would extend over the setback area by a cantilever. Therefore, the widened sidewalk along Madison Avenue would not result in a reduction of rooftop area.



SOURCE: KPF

NOTE: FOR ILLUSTRATIVE PURPOSES ONLY

Proposed One Vanderbilt Building Podium

Vanderbilt Corridor and One Vanderbilt

Figure 9-1

Table 9-6
DEP Flow Volume Matrix: Existing and Build Volume Comparison

Rainfall Volume (in.)	Rainfall Duration (hr.)	Runoff Volume to 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)*
NCM-037		Existing				With-Action				**NCM-037 Increment**
		56,133 square feet (1.29 acres)				56,133 square feet (1.29 acres)				
0.00	3.80	0.00	0.00	0.01	**0.01**	0.00	0.00	0.03	**0.03**	0.02
0.40	3.80	0.00	0.01	0.01	**0.02**	0.00	0.01	0.03	**0.04**	0.02
1.20	11.30	0.00	0.04	0.03	**0.07**	0.00	0.04	0.08	**0.12**	0.05
2.50	19.50	0.00	0.08	0.06	**0.14**	0.00	0.08	0.13	**0.22**	0.08

Notes: * Assumes no on-site detention or BMPs for purposes of calculations
CSS = Combined Sewer System; MG = Million Gallons

As shown in **Table 9-6**, in all rainfall volume scenarios flow to CSO outfall NCM-037 would increase. The increase in flow is attributable to the increase in sanitary flow resulting from the increased commercial density on the One Vanderbilt site.[1] Due to the increase in paved sidewalk area and reduction of rooftop area, the proposed One Vanderbilt development would result in a slight reduction in fully impervious surface area.

The Flow Volume Matrix calculations do not reflect the use of any sanitary and stormwater source control best management practices (BMPs) to reduce sanitary flow and stormwater runoff volumes to the combined sewer system. As noted above, the proposed One Vanderbilt development would incorporate low-flow plumbing fixtures to reduce sanitary flow in accordance with the New York City Plumbing Code. In addition, stormwater BMPs would be required as part of the DEP site connection approval process in order to bring the building into compliance with the required stormwater release rate. Based on the DEP Guidelines for the Design and Construction of Stormwater Management Systems, dated July 2012, and the DEP Criteria for Detention Facility Design, dated June 6, 2012, the required stormwater release rate for the proposed One Vanderbilt development is expected to be 0.25 cubic feet per second (cfs). Specific BMP methods will be determined with further refinement of the building design and in consultation with DEP, but are anticipated to include approximately 6,000 cubic feet of on-site stormwater detention. On-site detention systems may include planted rooftop spaces ("green roofs") and/or vaults.

The incorporation of the appropriate sanitary flow and stormwater source control BMPs that would be required as part of the site connection approval process, with the review and approval of DEP, would reduce the overall volume of sanitary sewer discharge and stormwater runoff as well as the peak stormwater runoff rate from the One Vanderbilt site. Sewer conveyance near the One Vanderbilt site and the treatment capacity at the Newtown Creek WWTP is sufficient to handle wastewater flow resulting from the proposed One Vanderbilt development; therefore, there would be no significant adverse impacts on wastewater treatment or stormwater conveyance infrastructure. ✷

[1] As noted above, the Flow Volume Calculation Matrix compares runoff and sanitary flows between existing and With-Action conditions and does not account for the changes to the One Vanderbilt site expected to occur in the No-Action condition. The No-Action building on the site would generate a higher level of sanitary flow than the existing buildings on the site; therefore, the incremental increase in sanitary flow resulting from the proposed One Vanderbilt development is slightly smaller than is indicated in Table 9-6.