11

Water and Sewer Infrastructure

This chapter evaluates the potential for the Proposed Actions in connection with the Proposed Project to result in significant adverse impacts on the City's water supply, as well as its wastewater and stormwater conveyance and treatment infrastructure.

Introduction

The Applicant proposes to redevelop the Development Site with a mixed-use community on the campus of the Christian Cultural Center (CCC). Comprised of affordable housing, local retail, a Performing Arts Center (PAC), a variety of other commercial/community facility uses (trade school, day-care, medical office or senior center), and parking facilities, the Proposed Project would be approximately 2,162,808 gross square feet (gsf) of development. The proposed building program includes approximately 1,645,820 gsf of residential space containing 2,050 units; approximately 79,970 gsf of retail space, including a grocery store (approximately 14,300 gsf) and local retail (approximately 65,670 gsf); 131,504 gsf of other commercial/community facility space, including a trade school (approximately 14,100 gsf) located in one wing of the existing CCC building, a new PAC (approximately 16,500 gsf), a day care (approximately 12,320 gsf), other community facility uses such as a senior center or medical office (approximately 9,900 gsf) and the remainder of the existing CCC facility (78,684 gsf); and 305,514 gsf of parking, including residential parking and structured parking for the retail and community facility uses.

According to the *2021 CEQR Technical Manual,* discretionary actions that would increase density or change the drainage conditions may warrant a water and sewer infrastructure analysis. Specifically, development that would result in an exceptionally large demand for

water (more than a million gallons per day (mgd)) or that is located in an area that experiences low water pressure require an analysis of potential impacts on the water supply system. Additionally, developments located in combined sewered areas exceeding incremental development thresholds (above the predicted No-Action condition) of 400 residential units or 150,000 square feet (sf) or more of commercial, public facility, and institution, and/or community facility space in Brooklyn would warrant a sewer infrastructure analysis.

Principal Conclusions

The Proposed Project would result in a total daily water demand of approximately 0.55 mgd; therefore, no analysis of the water supply system is warranted. The Proposed Actions would result in a net incremental increase of 2,050 residential units and 211,474 sf of commercial/public and institution/community facility space, as compared with the No-Action condition, in a primarily combined sewered area. An analysis of the Proposed Actions' potential impacts on the City's wastewater and stormwater conveyance and treatment system is therefore warranted and is provided below.

As described below, a preliminary assessment was conducted and determined that the Proposed Actions would not result in a significant adverse impact on the City's water and sewer infrastructure. Although the Proposed Actions would create new demand for water and treatment of sewage in comparison to the No-Action condition, based on the methodology set forth in the *CEQR Technical Manual*, the incremental increases would be well within the capacity of the City's systems, and the effects would not be considered significant or adverse.

Methodology

This analysis follows the *CEQR Technical Manual* guidelines that recommend a preliminary water analysis be completed 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 Project Area is not located in an area that experiences low water pressure, and the Proposed Project would generate a water demand of 547,438 gpd. Therefore, the Proposed Project does not meet the *CEQR Technical Manual* threshold requiring a detailed analysis. It is anticipated 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.

Existing and future water demand and sanitary sewage generation are calculated based on use rates set by the *CEQR Technical Manual*. The New York City Department of Environmental Protection (DEP) Flow Volume Calculation Matrix is then used to calculate the overall stormwater runoff volume for four rainfall volume scenarios with varying durations. The ability of the City's sewer infrastructure to handle the anticipated demand from the Proposed Project 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.

Existing Conditions

The Development Site is currently improved with the two-story, 92,784 gsf CCC, a large, non-denominational house of worship constructed in 1997, which is situated on the western portion of the Development Site and is surrounded by a surface parking lot containing approximately 385 parking spaces, accessed via a curb cut along Flatlands Avenue immediately opposite of Alabama Avenue and via two existing curb cuts along Louisiana Avenue. The eastern portion of the Development Site is unimproved land, serving as a location for overflow parking during church services and other events at the CCC and otherwise not used.

Water Supply

The New York City water supply system consists of a network of reservoirs, lakes, and aqueducts extending north into the Catskill region, and a grid of underground distribution mains that distributes water within the City. As mentioned earlier, approximately 1.3 billion gpd of water are consumed by New York City through this water supply system.

Most of New York City obtains water from three surface water supply systems operated by DEP – Delaware, Catskill, and Croton. The watersheds of the three systems cover almost 2,000 square miles, with 19 reservoirs and three control lakes, which have a combined storage capacity of approximately 550 billion gallons.

Two of the three surface water systems, the Delaware and Catskill systems, collect water from watershed areas in the Catskill Mountains and deliver it to the Hillview Reservoir in Yonkers. From there, it is distributed to the City through three tunnels: City Tunnel 1, which runs through the Bronx and Manhattan to Brooklyn; City Tunnel 2, which goes through the Bronx, Queens, and Brooklyn (and from there through the Richmond Tunnel to Staten Island); and City Tunnel 3 (Stage 1), which goes through the Bronx and Manhattan and ends in Queens. Stage 2 of City Tunnel 3 is currently under construction in Queens and Brooklyn.

The third surface water system, the Croton system, collects water from watershed areas in Dutchess, Putnam, and Westchester 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.

Once in the City, the aqueducts distribute water into a network of water mains. Water mains up to 96 inches in diameter feed smaller mains, such as 20, 12, and 8-inch mains, which deliver water to their destination, including to fire hydrants along many of the City's streets. Nearly all of the water reaches consumers by gravity alone, with roughly four percent (generally located at the outer limits of the system where in-line pressure is lowest, at high elevations, or at pressure extremity such as Far Rockaway) being pumped to its final destination. Water pressure throughout the City's water supply system is monitored and controlled by pressure regulators. Hydrant flow tests were conducted along Flatlands Avenue on April 30, 2021, as part of a data collection effort in accordance with DEP.

New York City consumes approximately 1.3 billion gallons of water per day from a reservoir system with a total storage capacity of approximately 550 billion gallons.[1, 2] The total water usage anticipated as a result of the Proposed Actions is calculated to equal approximately 0.55 mgd, which is an increment of approximately 0.52 mgd, compared to the No-Action condition's projected demand of approximately 0.03 mgd. As the total water usage would result in less than 1 mgd, the Proposed Actions would not have a significant adverse impact on the City's water supply or system water pressure.

Water consumption and wastewater generation rates were derived from the *CEQR Technical Manual* and are provided in **Table 11-1**. Existing water consumption and sewage generation for the site is shown in **Table 11-2**.

Table 11-1 Water Consumption and Wastewater Generation Rates

	Rate			
Land Use	**Domestic[1]**	**Units**	**Air Conditioning[1]**	**Units**
Residential	100	gpd/person	0.00	gpd/sf
Retail	0.24	gpd/sf	0.17	gpd/sf
Schools	10	gpd/seat	0.17	gpd/sf
Community Facility[2]	0.10	gpd/sf	0.17	gpd/sf

Notes:

[1] Consumption rates obtained from the *2021 CEQR Technical Manual* Table 13-2 "Water Usage and Sewage Generation Rates for Use in Impact Assessment"

[2] Consistent with the *Stevenson Commons EIS*, the water consumption and wastewater generation rates for Community Facility utilizes the same CEQR rates as office space

Table 11-2 Existing Water Consumption and Sewage Generation

Land Use	**Area (sf)**	**Dwelling Units/Seats**	**Domestic Water/Wastewater Generation (gpd)**	**Air Conditioning (gpd)**
Community Facility	92,784	-	9,278	15,773
Water Consumption Subtotals			9,278	15,773
Sewage Generation Subtotal			9,278	
Total Water Consumption			25,052	
Total Wastewater Consumption			9,278	

Conveyance System

The Project Area is in a part of New York City that is served by combined sewer systems. The stormwater runoff is collected by inlets located on Flatlands Avenue into a 96-inch box relief combined sewer line. The church sanitary flows into the 96-inch box relief sewer and flows west towards Combined Sewer Outfall (CSO) 26W-003. Pennsylvania Avenue has a separate sewer system. The 24-inch storm sewer flows south into a 60-inch storm sewer on Vandalia

[1] Source: New York City's Wastewater Treatment System, New York City Department of Environmental Protection (DEP); https://www1.nyc.gov/site/dep/water/

[2] Source: *2021 CEQR Technical Manual.*

Avenue and flows west. The stormwater flows towards Louisiana Avenue and then flows south, away from the site. The 10-inch sanitary sewer on Pennsylvania Avenue flows south and then east on Vandalia Avenue towards the 26th Ward WWTP.

At the 26th Ward WWTP, wastewater is fully treated by physical and biological processes before it is discharged into Jamaica Bay. The quality of the treated wastewater (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 maximum permitted capacity for the 26th Ward WWTP is 85 mgd.

Sanitary Flows

For purposes of analysis, the amount of sanitary sewage is calculated as all water demand generated by the existing uses on the Development Site except water used by air conditioning, which is typically not discharged to the sewer system.

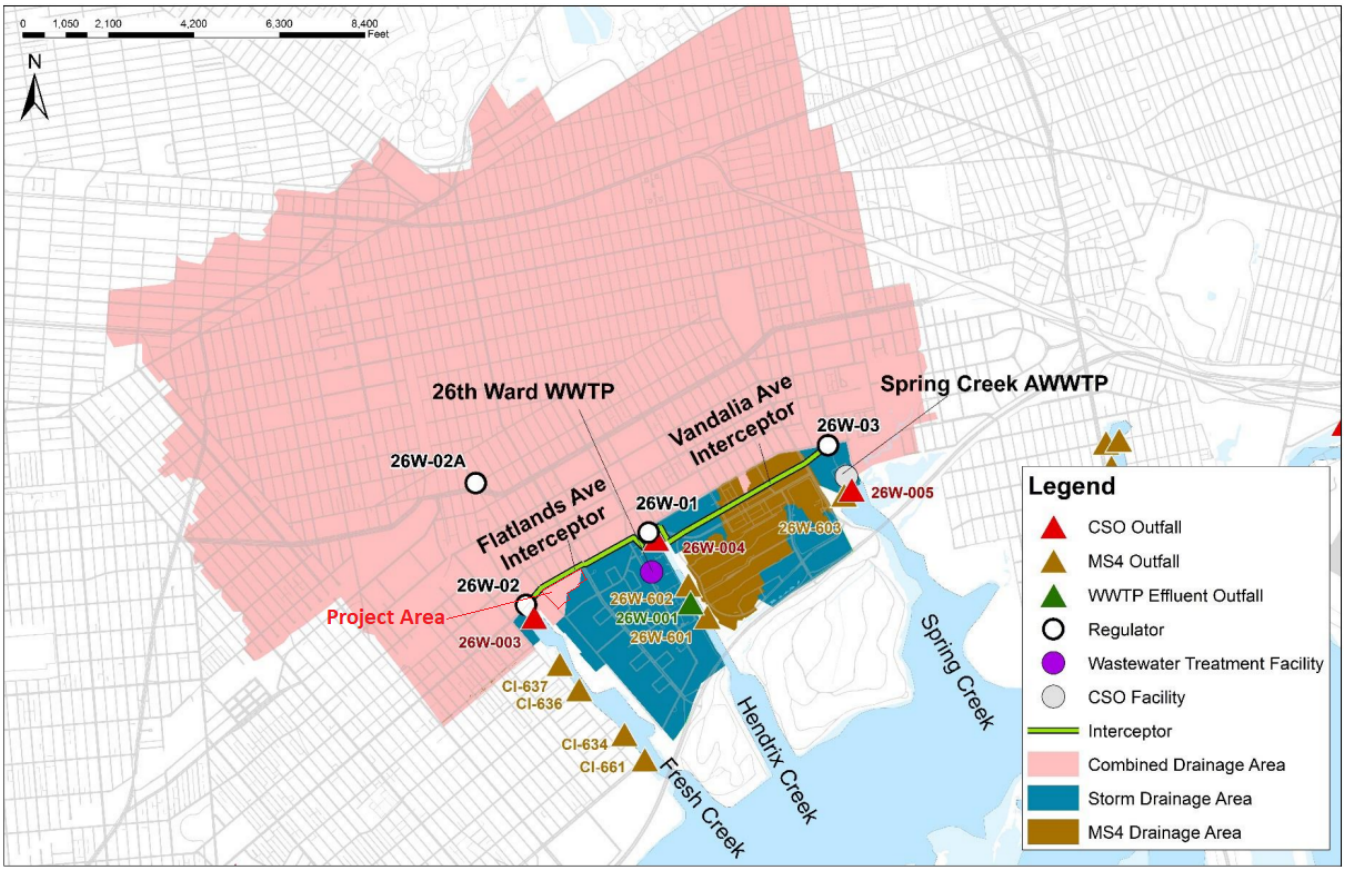
Sanitary sewage generated by the Proposed Actions would discharge to the 26th Ward Wastewater Treatment Plant (WWTP), which has a State Pollutant Discharge Elimination System (SPDES)-permitted dry weather flow capacity of 85 mgd (see **Figure 11-1**). The average monthly flow to 26th Ward WWTP over a 12-month period is 47.7 mgd (see **Table 11-3**). The Proposed Actions have the potential to result in a total generation of 0.51 mgd of sanitary sewage discharge, an increment of 0.50 mgd over the No-Action total sewage generation, which is estimated at 0.01 mgd. This incremental increase in sanitary flow would represent approximately a 0.59 percent of the 26th Ward WWTP's SPDES-permitted capacity. As the projected increase in sanitary sewage would not cause the 26th Ward WWTP to exceed its operational capacity or the SPDES-permitted capacity, the Proposed Actions would not result in significant adverse impacts to sanitary sewage conveyance and treatment.

Table 11-3 26th Ward Average Monthly Flows

Month (2020)	Flow (MGD)
January	45
February	45
March	48
April	48
May	41
June	40
July	48
August	48
September	48
October	52
November	52
December	57
Average	**47.7**

Note:
[1]Average Monthly flows were provided by DEP

Figure 11-1 26th Ward WWTP Collection System



Source: DEP's Combined Sewer Overflow Long Term Control Plan for Jamaica Bay Tributaries, June 2018

Stormwater Flows

As described above, the Development Site consists of a 92,784 gsf church building, accessory surface parking lots and some private open space. **Table 11-4** 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).

As described below, the Project Area is served by a combined sewer system. Stormwater runoff flows primarily to the north, collecting in inlets located on Flatlands Avenue into a 96-inch box relief combined sewer flowing west towards the Combined Sewer Overflow (CSO) Outfall 26W-003, as depicted in **Table 11-4**. The total area to be redeveloped exceeds one acre.

Table 11-4 Existing Surface Coverage

Affected Outfall	Surface Type	Roof	Pavement and Walkways	Other	Grass and Soft Scope	Total
26W-003[2]	Area (%)	14%	80%	0%	6%	100%
	Surface Area (sf)	61,700	359,597	0	27,733	449,030
	Runoff Coefficient[1]	1.00	0.85	0.85	0.20	-

Notes:
[1] Runoff coefficients for each surface type as per DEP
[2] Source: CSO Locations in New York City's Waterways, CSO Locations in New York City's Waterways (arcgis.com)

The Future Without the Proposed Actions

As described in **Chapter 1, Project Description**, absent the Proposed Actions, the Development Site is assumed to remain in its existing condition with only the CCC operational on the site. Therefore, the stormwater runoff, water demand, and wastewater generation calculations would remain unchanged.

The Future with the Proposed Actions

The With-Action condition would result in the development of 2,050 affordable residential units (1,645,820 gsf), 79,970 gsf of commercial retail and grocery space, and 131,504 gsf of other commercial/community facilities (including a trade school, day-care, the existing CCC building, and the PAC). The results of the analysis of the With-Action condition on water and sewer infrastructure is described below.

Sanitary Flows

As shown in **Table 11-5**, the Proposed Project is expected to have a total water demand of 547,438 gpd, with approximately 511,488 gpd of daily sanitary sewage generated under the With-Action condition.

Table 11-5 With-Action Water Consumption and Sewage Generation

Land Use	Area (sf)	Dwelling Units/Seats	Domestic Water/Wastewater Generation (gpd)	Air Conditioning Rates
Residential	1,645,820	2,050	479,700[1]	-
Retail	79,970	-	19,193	13,595
School	26,420[2]	209[3]	2,087	4,491
Other Commercial/ Community Facility[4]	105,084	-	10,508	17,864
Water Consumption Subtotals			511,488	35,951
Sewage Generation Subtotal			511,488	
Total Water Consumption			547,438	
Total Wastewater Consumption			511,488	

Notes:
[1] The number of residents is based on an average household size of 2.34.
[2] Includes 12,320 sf for day-care and 14,100 sf for trade school.
[3] Assumes 100 sf per person in day-care, 165 sf per person in trade school.
[4] Consistent with the Stevenson Commons EIS, the water consumption and wastewater generation rates for Community Facility utilizes the same CEQR rates as office space.
[5] Consumption rates obtained from the *2021 CEQR Technical Manual* Table 13-2 "Water Usage and Sewage Generation Rates for Use in Impact Assessment."

The incremental sanitary sewage generated by the With-Action condition, as compared with the No-Action condition, would be 502,210 gpd. This increase in wastewater generation would be approximately 0.59 percent of the 26th Ward WWTP capacity of 85 mgd.

In accordance with the New York City Plumbing Code (Local Law 33 of 2007), the Proposed Project would be required to utilize low-flow plumbing fixtures, which would reduce sanitary flows to the plant. Therefore, the With-Action condition would not result in a significant adverse impact to the City's sanitary sewage conveyance and treatment system.

Stormwater Flows

The With-Action condition consists of the addition of ten proposed buildings and new streets, sidewalks, and new publicly accessible open space. **Table 11-6** summarizes the surface areas and weighted runoff coefficient for the With-Action conditions.

Table 11-6 With-Action Surface Coverage

Affected Outfall	Surface Type	Roof	Pavement and Walkways	Other	Grass and Soft Scope	Total
26W-003[2]	Area (%)	57%	35%	0%	8%	100%
	Surface Area (sf)	254,540	155,550	0	38,940	449,030
	Runoff Coefficient[1]	1.00	0.85	0.85	0.20	-

Source: DCP Building Footprint; aerial photographs
Notes:
[1] Runoff coefficients for each surface type as per DEP
[2] Source: CSO Locations in New York City's Waterways,
CSO Locations in New York City's Waterways (arcgis.com)

The DEP Flow Volume Calculation Matrix was completed for the existing and the With-Action conditions. The calculations from the Flow Volume Calculation Matrix help to determine the change in wastewater flow volumes to the combined sewer system from existing 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 11-7** and **Table 11-8**.

Table 11-7 DEP Flow Volume Matrix – Existing Conditions

Rainfall (inches)[1]	Duration (hours)	Total Area (acres)[2]	Weighted Runoff Coefficient[3]	Stormwater Runoff (MG)[4]	Sanitary to CSS (MG)[5]	Total Volume to CSS (MG)
0.00	3.80	10.31	0.83	0.000	0.001	0.001
0.40	3.80	10.31	0.83	0.090	0.001	0.091
1.20	11.30	10.31	0.83	0.280	0.004	0.284
2.50	19.50	10.31	0.83	0.580	0.007	0.587

Notes:
[1] Storm event rainfalls per DEP Volume Calculation Matrix.
[2] Total surface area onsite for Projected Development sites within subcatchment area.
[3] Runoff coefficients for surface type area as per DEP.
[4] Stormwater runoff derived from DEP Volume Calculation Matrix.
[5] Sanitary volumes derived using methodology and consumption rates per the *2021 CEQR Technical Manual*
MG = million gallons

Table 11-8 DEP Flow Volume Matrix – With-Action Conditions

Rainfall (inches)[1]	Duration (hours)	Total Area (acres)[2]	Weighted Runoff Coefficient[3]	Stormwater Runoff (MG)[4]	Sanitary to CSS (MG)[5]	Total Volume to CSS (MG)
0.00	3.80	10.31	0.88	0.000	0.081	0.081
0.40	3.80	10.31	0.88	0.100	0.081	0.181
1.20	11.30	10.31	0.88	0.300	0.241	0.541
2.50	19.50	10.31	0.88	0.620	0.415	1.035

Notes:
[1] Storm event rainfalls per DEP Volume Calculation Matrix.
[2] Total surface area onsite for Projected Development sites within subcatchment area.
[3] Runoff coefficients for surface type area as per DEP.
[4] Stormwater runoff derived from DEP Volume Calculation Matrix.
[5] Sanitary volumes derived using methodology and consumption rates per the *2021 CEQR Technical Manual*
MG = million gallons

As shown in **Table 11-7**, depending on the rainfall volume and duration, the total volume to the combined sewer system from the Development Site under the existing conditions would be between approximately 0.001 mgd and 0.587 mgd. As shown in **Table 11-8**, for the With-Action condition, the combined sewer system flow would be between 0.081 mgd and 1.035 mgd.

Table 11-9 compares the estimated stormwater flows under existing and With-Action conditions using the DEP Flow Volume Calculation Matrix. As shown in the table, depending on the rainfall volume and duration, the With-Action increment would be between 0.080 and 0.448 mgd. Typically, an increase of five percent or more at the site over existing conditions would warrant further review by DEP, in which the implementation of BMPs would help mitigate that increase. Although the five percent threshold is exceeded, these increments represent only a 0.09 to 0.53 percent increase of the 26th Ward WWTP capacity.

Table 11-9 Existing and With-Action Combined Stormwater Runoff Generation

		Total Volume to Combined Sewer System (MG)		
Rainfall (inches)[1]	Duration (hours)	Existing Conditions	With-Action Condition	Increment
0.00	3.80	0.001	0.081	0.080
0.40	3.80	0.091	0.181	0.090
1.20	11.30	0.284	0.541	0.257
2.50	19.50	0.587	1.035	0.448

The Flow Volume Matrix calculations do not reflect the use of any sanitary and stormwater source control BMPs to reduce sanitary flow and stormwater runoff volumes to the combined sewer system. As noted above, the Proposed Project 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 each of the proposed buildings into compliance with the required stormwater release rate. Based on the DEP Guidelines for the Criteria for Detention Facility Design, dated November 19, 2012, for new developments, the required stormwater

release rate for the Proposed Project would be the greater of 0.25 cubic feet per second (cfs) or 10 percent of the allowable flow, unless the allowable flow is less than 0.25 cfs, in which case the stormwater release rate is equal to the allowable flow.[3] 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 and blue roofs, subsurface detention and infiltration, and permeable pavement, could be implemented to retain or release stormwater with slowed discharge rates to control peak runoff rates. Specific BMP methods will be determined with further refinement of the building design and in consultation with DEP.

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 Development Site. Sewer treatment capacity at the 26th Ward WWTP is enough to handle wastewater flow resulting from the Proposed Project.

Additionally, as part of the site connection approval process, a hydraulic analysis of the existing sewer system may be required to determine whether the existing sewer system is capable of supporting higher density development and the related increase in wastewater flow. In addition, there may be a need to prepare a drainage proposal to support the hydraulic analysis calculation, demonstrating the sewer demand of the project relative to existing sewers and their capacity. This analysis would be undertaken prior to construction of the Proposed Project and would be coordinated with DEP for review and approval. Therefore, there would be no significant adverse impacts on wastewater treatment or stormwater conveyance infrastructure.

[3] Source: https://www1.nyc.gov/assets/dep/downloads/pdf/about/water-and-sewer-forms/criteria-determination-detention-facility-volume.pdf