

**Fiscal Year 2022**

# CO-CONSULTING ENGINEERING REPORT

April 2022



Front cover:  
Lower Manhattan and NY Harbor  
<http://www.nyc.gov/dep>

April 8, 2022

Ms. Olga Chernat  
Executive Director  
New York City Municipal Water Finance Authority  
255 Greenwich Street  
New York, NY 10007

Re: New York City Municipal Water  
Finance Authority  
**Fiscal Year 2022 Co-Consulting Engineering Report**

Dear Ms. Chernat:


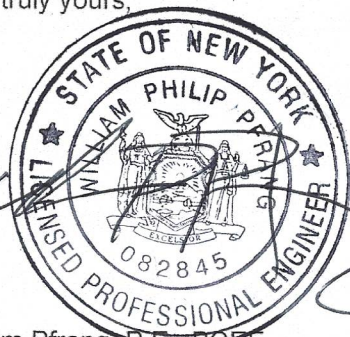
AECOM USA, Inc. ("AECOM") and Macan Deve Engineers, DPC. ("MDE") herewith submit the Fiscal Year (FY) 2022 Co-Consulting Engineer's Report on the operation of the Water and Sewer System of the City of New York (hereinafter referred to as "The System"). This Report addresses the condition and operation of The System as it presently stands, as well as the adequacy of capital and operating programs for FYs 2022 and 2023.



It is the joint opinion of AECOM and MDE that The System condition is adequate and that it continues to be managed by the New York City Department of Environmental Protection (NYCDEP) in a professional and prudent manner. The current capital budget allocations for FY 2022 and FY 2023 are adequate for the immediate needs of The System while facing continued challenges as discussed in the report. The opinions provided throughout the report reflect the joint opinion of AECOM and MDE.

The information presented in this report is based on the Preliminary Budget released on February 16, 2022. It is important to note that budgetary planning will continue past the date of this report and revisions may be made. It is our opinion, however, that meaningful observations and conclusions can be drawn at this time, although the final budget allocations may change during the budget finalization process.

We are not required to update this Report for events and circumstances occurring after the date of this Report.

Very truly yours,

  
  
William Pfrang, P.E., BCEE  
Vice President, NY Metro Water, AECOM  
Co-Consulting Engineer for  
Municipal Water Finance Authority

  
  
Donna Hager, P.E., BCEE  
President, MDE  
Co-Consulting Engineer for  
Municipal Water Finance Authority

**THE NEW YORK CITY MUNICIPAL WATER  
FINANCE AUTHORITY**

**FISCAL YEAR 2022 CO-CONSULTING  
ENGINEER'S REPORT**

**PREPARED BY:**

**AECOM and MDE**

**April 8, 2022**



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## **1.0 EXECUTIVE SUMMARY**

This Report addresses the condition of The System and the adequacy of the capital program and operating budgets for Fiscal Years 2022 and 2023 as presented in the New York City Department of Environmental Protection (NYCDEP) Preliminary Budget released on February 16, 2022.

The NYCDEP is charged with the responsibility of the overall operation and maintenance of the vast water and wastewater infrastructure serving New York City (NYC). NYCDEP's vision is *"to be a world class water and wastewater utility, while building a sustainable future for all New Yorkers"*. The critical mission of NYCDEP is to enrich the environment and protect public health for all New Yorkers by providing high quality drinking water, managing wastewater and stormwater, and reducing air, noise and hazardous materials pollution in NYC<sup>1</sup>. The scope of this report focusses on the water and wastewater systems. NYCDEP remains vigilant in providing operation and maintenance of water and wastewater infrastructure comprising significant capital assets and providing long-term planning of future needs. NYCDEP has implemented new programs and additional infrastructure to meet more stringent regulatory requirements (Biological Nitrogen Removal (BNR) for wastewater resource recovery facilities, Combined Sewer Overflow (CSO) treatment facilities, and water treatment facilities). While providing these infrastructure improvements, NYCDEP is also tasked to maintain its water and wastewater infrastructure to comply with strict regulations and avoid critical failure of processes and assets. Considering climate change, it is essential for NYCDEP to continue its efforts to maintain a resilient and sustainable water and wastewater system. NYCDEP must manage risks and prioritize competing needs of The System to achieve its objectives. In addition to these competing needs, NYCDEP continues to face many challenges due to the ongoing global pandemic and must manage risk associated with operating and managing a large and complex system. Considering the magnitude of the overall infrastructure, the operational service required, and the ongoing challenges created by the global pandemic, it is our opinion that:

- The System continues to be managed in a professional and prudent manner with an appropriate regard for the level of service afforded to the users within the available funding.
- The physical condition of The System receives an "adequate rating", our highest rating. Due to the size and complexity of The System, NYCDEP requires future capital investments for the continuous replacement and/or repair of aging infrastructure in a systematic and cost-effective manner.
- NYCDEP capital and expense budget projections for FY 2022 satisfy the immediate needs for The System. This includes legally mandated<sup>2</sup> projects, which comprise approximately 23% of the capital budget for FY 2022.
- NYCDEP capital budget projections for FY 2023 satisfy the immediate needs for the System including legally mandated projects, which comprise approximately 32% of the capital budget for FY 2023. Expense budget projections for FY 2023 are currently being evaluated based upon the projected new needs of The System and may require adjustment when the evaluation is complete.

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<sup>1</sup> NYCDEP 2018 Strategic Plan, *Enriching Our Legacy*.

<sup>2</sup> Mandates and mandated projects throughout this report refer to projects required due to negotiated Consent Orders or agreements or other regulatory requirements between NYCDEP and regulatory agencies.

- NYCDEP capital planning is an ongoing iterative process addressing priorities and needs of The System. The NYCDEP is responsive to the long-term requirements of the service area.
- Staffing levels have dropped to approximately 87% of approved allocations, which reflects a significant loss of staff. Currently there are 832 vacancies, NYCDEP wide. The hiring freeze policy that was implemented across NYC in March 2020 through June 2020, and the hiring restrictions that are currently in effect (the 2 for 1 hiring policy whereby for every two departures DEP is allowed to hire one individual) have created a challenge for the operation and delivery of the Capital Plan. Due to these hiring restrictions, NYCDEP has implemented a mitigation program based on increasing overtime and reallocation of resources to critical operating vacancies. However, these are short-term measures, and not sustainable over the long-term operation and Capital Plan delivery. Critical staffing hires have been approved in select areas of the overall NYCDEP agency; however, Agency wide staffing and hiring continues to be a significant ongoing concern that needs to be further evaluated/addressed, so that NYCDEP operations are sustainable in the near and long term. Specifically, NYCDEP needs to continue to progress discussions with DCAS and OMB regarding the need to update job classifications and salary requirements in order to fulfil existing staffing needs for long-term sustainable operation and maintenance of The System.

## **2.0 PURPOSE AND SCOPE OF THE REPORT**

The purpose of this report is to provide engineering information pertinent to the condition of The System serving NYC and the adequacy of the proposed Capital Improvement Program (CIP) funds. In 1984, the NYC Municipal Water Finance Authority (Authority) was formed following studies and analyses used in developing the information included in the Municipal Water Finance Authority Official Statements under the captions: “CAPITAL IMPROVEMENT AND FINANCING PROGRAM — Preliminary Ten-Year Capital Strategy, Current Capital Plan and the Capital Improvement Program”, “THE SYSTEM — The Water System”, and “THE SYSTEM — The Sewer System”. AECOM (formerly Metcalf & Eddy) provided engineering services related to the NYC Water and Wastewater Operations Evaluation Study (Study) in 1983, and has continued to provide services to the NYC Municipal Water Finance Authority (Authority) since its origin in 1984. Since July 2021, Macan Deve Engineers, DPC (MDE) has been working with AECOM as Co-Consulting Engineers to the MWFA. MDE is an established small WBE engineering and architectural firm. AECOM and MDE have jointly performed ongoing evaluations of the condition of The System, which has included independently reviewing the capital and operating programs pertaining to water and wastewater, reviewing select pertinent studies associated with the long-term development of The System, and conducting Due Diligence interviews with key individuals responsible for managing the activities of the NYCDEP.

This report addresses the issues listed below:

- present physical condition of The System,
- Fiscal Year (FY) 2022<sup>3</sup> capital budget and FY 2023 projected capital budget for The System,
- FY 2022 expense budget and FY 2023 projected expense budget relative to operation and maintenance of The System,
- overview of the Preliminary Four-Year Current Capital Plan for FYs 2023 to 2026 and
- management of The System.

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<sup>3</sup> The NYCDEP Fiscal Year begins on July 1 and ends on June 30. FY 2022 began on July 1, 2021 and ends on June 30, 2022.

### 3.0 METHODOLOGY FOR ANALYSIS

The analyses conducted by AECOM and MDE were accomplished utilizing the following methods:

- Due Diligence interviews with representatives of the NYCDEP and discussions with representatives of the Authority,
- Review of documents related to the ongoing budgetary process,
- Review of the status of ongoing major programs and review of select reports and presentations provided by NYCDEP,
- Information gathered from visiting operating facilities and major on-going construction projects,
- Consideration of national and local trends in the water and wastewater industry (federal, state and local regulations, resource recovery, aging infrastructure, resiliency, climate change impacts, energy programs), and
- Consideration of COVID-19 related impacts and current economic impacts to water/ wastewater operations, the capital program, and business operations.

The budgetary process for the current capital and expense budgets was not concluded by the time of this report's publication. It is anticipated that the Executive Plan will be released in May 2022. Observations and conclusions presented herein are therefore based on budget data as it stood at the date of this report. It is our opinion that these observations and conclusions are meaningful with respect to The System. It should be noted, however, that these observations and conclusions are subject to change based on the final outcome of the budgetary process.

## **4.0 COVID-19 GLOBAL PANDEMIC**

The World Health Organization (WHO) declared the outbreak of the 2019-Novel Coronavirus disease (COVID-19) a global pandemic. The New York State (NYS) Governor declared a state of emergency in NYS on March 7, 2020 and the New York City (NYC) Mayor declared a state of emergency in NYC on March 12, 2020. These state of emergency orders are still in effect. All NYC employees, including NYCDEP employees, must be fully vaccinated (with some exclusions), otherwise employment with the City is terminated. As vaccinations became widely available in early 2021, the COVID-19 cases and deaths decreased significantly, however, due to the Delta and Omicron variants, cases increased again in mid to late 2021. Currently, COVID-19 cases have been declining.

Operation of NYCDEP water and wastewater treatment facilities have continued throughout the global pandemic. NYCDEP operations are deemed an essential service and NYCDEP continued to fulfill its mission of providing operation of services 24 hours per day/ 7 days per week. Drinking water quality, water distribution, water supply, wastewater collection and wastewater treatment capacities have not been impacted significantly. Currently, there is no evidence that coronavirus survives the disinfection process for drinking water and wastewater<sup>4</sup>. In April 2020, the Water Environment Federation (WEF) convened a Blue-Ribbon panel of experts that concluded the occupational risk of infection to wastewater workers from the SARS-CoV-2 virus is low, and not greater than those from other pathogens in the wastewater<sup>5</sup>.

In March 2020, NYCDEP quickly focused on COVID-19 containment measures and followed the appropriate guidance, safety measures, and protocols. These measures include wearing personal protective equipment (PPE), disinfecting work areas, use of hand sanitizers and hand washing, staggering work schedules to allow for social distancing, contact tracing for positive cases, and continued communication. The essential workers continued to report to field sites for the operation and maintenance of facilities. The majority of the NYCDEP office staff were working from home (WFH) to adhere to social distancing and other COVID-19 safety guidelines during the first year of the pandemic. In May 2021, NYCDEP office staff returned to work in the offices in a hybrid model and then in September 2021, the NYCDEP office staff returned to working in person on a full-time basis.

The pandemic has impacted other aspects of NYCDEP operations, such as water consumption, revenues of The System, inflation, and supply chain issues. NYCDEP has experienced a decrease in residential water consumption citywide (about 1.8% to 3.6% decrease compared to February 2019 baseline), but a more significant decrease in non-residential consumption (about 16.2% to 20.5% decrease compared to February 2019 baseline), throughout the pandemic. However, the overall decrease in water consumption (based upon water billed for residential and non-residential) ranged from 4.1% to 5.7%, compared to the February 2019 (pre-pandemic) baseline. The change in water use patterns is attributed to the stay-at-home orders, limited operation of a significant number of business

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<sup>4</sup> <https://www.cdc.gov/coronavirus/2019-ncov/faq.html#Food-and-Water>  
<https://www.wef.org/news-hub/current-priorities/coronavirus/>

<sup>5</sup> <https://www.accesswater.org/publications/-10027929/protecting-wastewater-professionals-from-covid-19-and-other-biological-hazards>

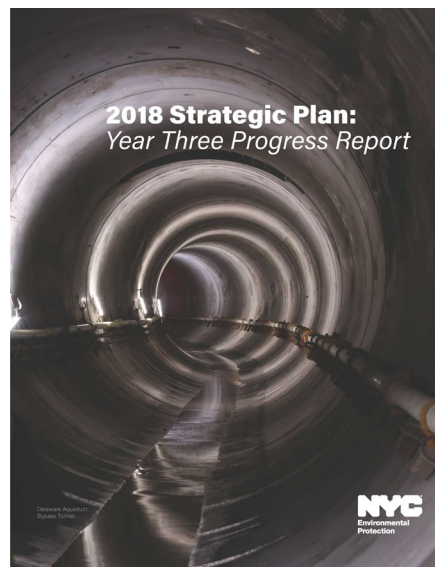
and office buildings, and prolonged closures of businesses throughout NYC. Some water consumption trends have started to rebound to pre-pandemic usage. NYCDEP continues to monitor the water consumption trends closely. Costs for commodities have increased due to inflation. Due to ongoing supply chain issues NYCDEP has experienced longer lead times for some deliveries. The economic uncertainty caused by COVID-19 and the impact on NYCDEP capital planning and delivery and staffing hiring restrictions are discussed later in the report, in Sections 8.1 and 10.0, respectively.

Research by both academia and utilities has determined that the presence of SARs-COVID can be found in wastewater and can be used as a leading indicator for the presence of the disease within sewersheds, prior to communities and individuals getting tested or becoming symptomatic of the virus. NYCDEP began testing for the presence of the COVID-19 RNA in the NYC wastewater, at the 14 WRRFs in August 2020 and the testing continues. NYCDEP provides this data to the New York City Department of Health and Mental Hygiene (NYCDOHMH). The RNA signal detected in the wastewater correlates well with the presence of COVID-19 clinical cases in the communities within the NYCDEP sewersheds. The success of the NYCDEP wastewater surveillance program is in part due to the collaboration of academic partners, water utilities, and research foundations. Local Law 28 of 2021 (LL28) requires NYCDEP and NYCDOHMH to establish a program to quantify levels of SARS-Cov-2 in the influent wastewater stream at each New York City WRRFs. In February 2022, NYCDEP and NYCDOHMH released a report, *Analysis of the Effectiveness of a Pilot Program to Monitor SARS-CoV-2 Presence in Wastewater in New York City*, as required by LL28.

## 5.0 MANAGEMENT AND OPERATION OF THE NYCDEP SYSTEM

### NYCDEP Strategic Plan

NYCDEP released its Strategic Plan in June 2018, entitled the *2018 Strategic Plan Enriching Our Legacy*. NYCDEP updated the mission and vision of the organization to reflect the shifting priorities and to meet new objectives. The Plan identifies eight core values that pertain to how NYCDEP conducts business; these core values are safety, integrity, service, diversity, support, transparency, sustainability, and innovation. NYCDEP has published annual updates of the Strategic Plan for the past three years, with the most recent update released in July 2021, the *2021 Strategic Plan Progress Report* (**Figure 5-1**). The annual updates monitor their performance and provide accountability of their progress in implementing the Strategic Plan goals. The 2021 Progress Report provides an update on the forty-three specific initiatives that will guide NYCDEP to focus on their priorities.



**Figure 5-1: NYCDEP Strategic Plan  
2021 Update**

NYCDEP is on schedule for about 98% of the strategic initiatives within the third year of the Plan, including five initiatives that have been completed. NYCDEP considered a wide range of factors in the development and implementation of the Plan, including current and anticipated mandates, institutional knowledge of The System, financial planning, technology and industry trends, workforce demographics, customer service, and the economic impact of water rates to customers. The Strategic Plan will evolve over the years to reflect emerging and changing trends in the industry while adhering to the NYCDEP visionary goals.

### Reorganization Structure

Mayor Eric Adams was elected the 110<sup>th</sup> Mayor of NYC on November 3, 2021 and took office on January 1, 2022. Mayor Adams announced the NYC Climate Leadership Team on January 31, 2022, which consolidates multiple agencies to unite the policy team and operations team to implement and execute comprehensive action on climate sustainability, environmental justice, and resiliency. Rohit Aggarwala was appointed to two roles, as both New York City's Chief Climate Officer, and as NYCDEP Commissioner. NYCDEP's previous commissioner, Vincent Sapienza, will remain with NYCDEP as the Chief Operations Officer (COO) and will report to Commissioner Aggarwala. These organizational changes became effective February 14, 2022. NYCDEP maintains an ongoing close collaboration among all bureaus since many complex programs impact multiple disciplines and operating bureaus. The NYCDEP is currently organized into the following Offices and Bureaus (**Figure 5-2**):



## Interim Organizational Chart Effective Feb 14, 2022

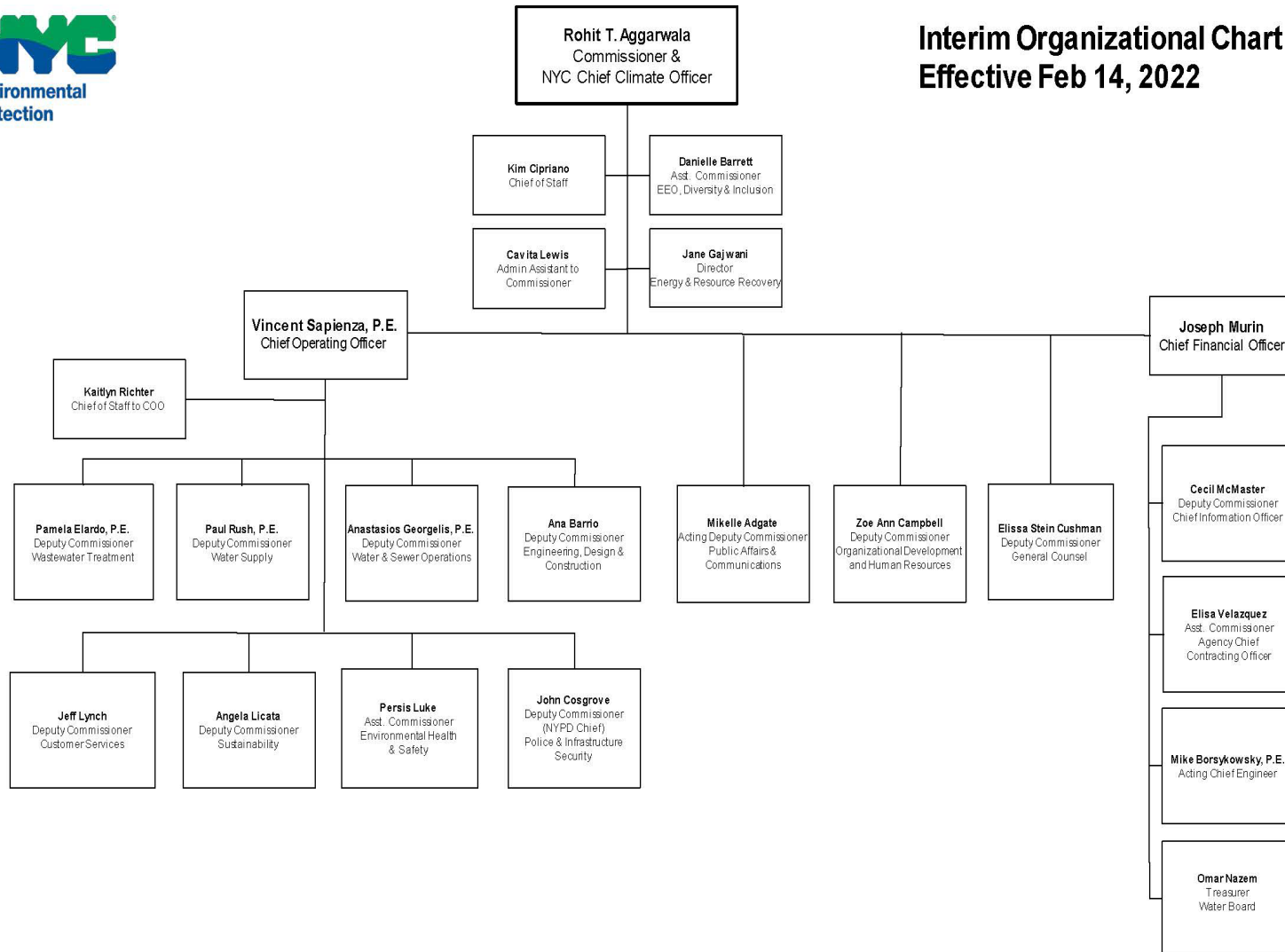


Figure 5-2: NYCDEP Executive Level Organizational Chart

**THE NEW YORK CITY MUNICIPAL WATER FINANCE AUTHORITY**  
***Fiscal Year 2022 Co-Consulting Engineer's Report***

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The following offices and bureaus report directly to the Commissioner:

- the Chief Operating Officer (COO), which under the reorganized agency design acts as an oversight office, responsible for administering and coordinating the activities of NYCDEP's engineering and operational bureaus. The following offices and bureaus report directly to the COO: Bureau of Wastewater Treatment (BWT); Bureau of Water Supply (BWS); Bureau of Water and Sewer Operations (BWSO); Sustainability; Bureau of Engineering, Design, and Construction (BEDC); Environmental Health & Safety (EH&S); Bureau of Customer Services; and Police and Infrastructure Security.
- the office of the Chief Financial Officer (CFO), which in addition to the budget and finance functions, includes contracts and procurement, information technology, rate setting, and treasury functions. The CFO oversees the Budget Office; the Office of the Agency Chief Engineer (OACE); the Office of Agency Chief Contracting Officer (ACCO); Information Technology, as well as the water and sewer rate setting and treasury functions encompassed by the Water Board
- the Office of Energy and Resource Recovery Programs (OERR); the Chief of Staff; Public Affairs and Communications; EEO, Diversity and Inclusion; General Counsel; and Organizational Development and Human Resources.

The Bureaus and Offices will be described in more detail below:

- The three Operating Bureaus consist of the BWS, the BWSO, and the BWT. The Deputy Commissioner of each Operating Bureau reports to the COO. The key responsibilities of each operating bureau are described as follows:
  - The mission of BWS is to reliably deliver a sufficient quantity of high-quality drinking water to protect public health and enhance the quality of life of New York City. It is organized into the seven directorates that report to the Deputy Commissioner of BWS (Water Quality and Innovation; Planning; Watershed Protection Programs; Source Water Operations; Water Treatment Operations; Water, Management Services/Budget; and Environmental Health/Safety). The Research Application section, within Water Quality and Innovation, focuses on applying national and international research developments to best practices and to help prepare for future challenges. The Water Treatment Operations Directorate focuses on the treatment of water leaving the reservoirs before it moves toward the distribution system. Once the water leaves the Hillview Reservoir and Croton Water Filtration Plant (WFP), it enters the distribution system that is operated and maintained by BWSO. BWS' responsibilities include the management, operation and maintenance of the Croton WFP, Catskill/Delaware Ultraviolet (Cat/Del UV) Disinfection Facility, Hillview Reservoir, Jerome Park Reservoir, and Chlorination and Fluoridation at Kensico Reservoir Shaft 18, Pleasantville Alum Plant and all associated dams, aqueducts, shafts, waterworks and support systems. The Source Water Operations Directorate is responsible for the storage and transmission of drinking water, maintenance of reservoirs, dams and other infrastructure, downstream releases and treatment at upstate wastewater treatment plants. BWS conducts extensive monitoring of water quality, both within the city's distribution system and throughout the upstate watersheds. BWS is also responsible for the overall management and implementation of the City's Watershed Protection Program and for complying with NYC's Filtration Avoidance Determination (FAD) program. In April 2020, BWS released a Strategic Plan for water supply planning and operation for 2020 through 2024, which aligns with the Agency Strategic Plan discussed in the previous section.
  - BWSO is responsible for the operation and maintenance of the portions of the City's drinking water distribution system that are within City lines, wastewater collection system, and Bluebelts. BWSO field operations are responsible for the following: (1) that residences

and businesses have an adequate supply of potable water (joint responsibility along with BWS), (2) that there is sufficient water for fire protection, and (3) that the wastewater collection system is properly functioning. BWSO coordinates closely with the New York City Department of Design and Construction (NYCDDC), since NYCDDC has the responsibility for the construction of the water mains and sewers that BWSO operates and maintains. BWSO is heavily focused on stormwater management issues and has an intensive program to alleviate chronic flooding in Southeast Queens. BWSO has initiated implementing online permitting for water, sewer and stormwater connections. The online permitting is known as Permitting and Review Information System (PARIS).

- The BWT Mission statement is “We safely convey and treat wastewater, manage stormwater, and recover valuable resources to protect public health and enhance the environment to sustain the economy and quality of life for all who live, work and play in NYC”. The BWT Vision statement is “Advance a state of good repair through engaged employees and responsible asset management and become a leader in wastewater resource recovery.” BWT is responsible for the operation and maintenance of the 14 in-city Wastewater Resource Recovery Facilities (WRRF), the City’s 96 wastewater pump stations, interceptors, CSO regulators, biosolids dewatering facilities, fleet of marine vessels, laboratories, and the control of discharges from combined sewer overflows. Capital Planning/Delivery and Wastewater/Resource Recovery Operations report directly to the Deputy Commissioner. BWT plans to further drive decision-making through data driven analytics. Because of the energy-intensive nature of its facilities, BWT coordinates closely with the OERR Programs. BWT’s Research and Development Plan focuses on innovation, one of NYCDEP’s core values. BWT continues to focus on organizational development planning to identify and evaluate the current and future staffing and skill set needs of BWT operations. Seven Area Facility Managers (two WRRFs per Facility Manager) provide senior leadership in the operation of the 14 WRRFs. The Area Facility Managers report to the Director of Plant Operations. Working with the Chief Operators of the individual plants, the Area Facility Managers provide overall operational consistency. Each Area Facility Manager has an assigned Reliability Centered Maintenance Engineer (RCME) who coordinates maintenance operations.
- Capital Improvement Program Delivery is executed by BEDC. BEDC is organized into the following directorates: Water System Capital Program, Wastewater Capital Program, and In-House Design (IHD). Within IHD, there are two groups - the Design Service Division and the Engineering Services Division. BEDC has a Sustainability Group that incorporates sustainability into BEDC projects by integrating Climate Resiliency Design Guidelines into Standard Operating Procedures. BEDC is responsible for project delivery consisting of the design and construction of capital improvement projects, including major water transmission facilities, water treatment facilities, WRRFs, wastewater pumping stations, and stormwater/CSO facilities. BEDC implements many of these projects with contract services for planning, design, construction and construction management, along with the IHD group. BEDC continues to find ways to improve business practices that will have a positive impact on project implementation, such as streamlining procurement processes for improved efficiency and the development of front-end business cases.
- The Bureau of Sustainability at NYCDEP is responsible for the development and implementation of environmental policy and strategy, including water and air quality, the noise code, and other quality of life issues. The Group includes the Bureau of Environmental Planning and Analysis (BEPA), Hazardous Materials and Superfund Planning & Analysis, and the Bureau of Environmental Compliance (BEC). Implementing, coordinating and tracking the many elements of the Green Infrastructure Plan occurs within BEPA. The Green Jobs/Green Infrastructure Maintenance are part of BEPA. BEPA is also responsible for conducting environmental reviews for NYCDEP, providing technical assistance for the preservation of natural resources, conducting long range planning (population/employment, consumption and demand/flow), conducting

strategic planning to provide appropriate forecasting, trend analysis, regulatory review, scientific modeling, and research. BEPA continues the work of the climate change task force and helps NYCDEP plan for the new growth stimulated by rezoning throughout the city. The Sustainability Group coordinates with the Mayor's Office of Climate and Environmental Justice (MOCEJ) on initiatives. The Hazardous Materials and Superfund Planning & Analysis group coordinates Superfund Programs. BEC is made up of the Division of Air & Noise Policy, Permitting and Enforcement and the Asbestos Control Program. BEC is responsible for responding to air and noise code complaints, maintaining the database of facilities containing hazardous and toxic material, overseeing remediation of hazardous waste municipal landfills, managing investigation of contaminated sites and responding to hazardous material emergency incidents.

- The OERR Programs is responsible for the coordination of energy management for all operating bureaus and overall NYCDEP energy initiatives and works closely with NYC Department of Citywide Administrative Services (DCAS). OERR guides and oversees NYCDEP's energy, biosolids and residuals, organics/ food waste, resource recovery, and greenhouse gas (GHG) policy, planning, research and studies. OERR advises on energy and GHG related expense and capital funding, in addition to seeking outside funding sources for projects, such as those available through DCAS. OERR is also managing the development of the Energy and Carbon Neutrality (ECN) Plan. The NYCDEP has recently appointed the Agency Chief Decarbonization Officer.
- The main function of the OACE is planning, capital funding and program prioritization and optimization within NYCDEP. The OACE is organized within the following directorates: Capital Budget; Wastewater Integrated Planning; Water Supply and Distribution Integrated Planning; Asset Management and Data Analytics; Business Analysis and Optimization; and Engineering Guidelines and Standards. The OACE coordinates with the Capital Planning section of the Operating Bureaus (BWS, BWT and BWSO). The OACE also collaborates with BEDC, BWS, BWT, BWSO, Sustainability, and OERR to integrate projects and set priorities across all NYCDEP.

## **6.0 OVERVIEW OF THE SYSTEM**

NYCDEP is charged with the operation, maintenance and management of a vast complex system of water, wastewater and stormwater infrastructure.

### **6.1 Water Supply System**

The NYC water is supplied from three upstate watersheds (Delaware, Catskill and Croton), which extend as far as 125 miles north of NYC, consisting of 18 collecting reservoirs (in the Delaware, Catskill, and Croton Systems), three controlled lakes (in the Croton System), and three additional balancing and distribution reservoirs (Kensico, Hillview and Jerome Reservoirs) as shown in **Figure 6-1**. The NYC water supply system has a total available storage capacity of 570 billion gallons. NYCDEP maintains operational flexibility to vary the water supply from all three water systems, as it deems necessary.

NYCDEP also owns wells in Queens; however, this groundwater supply system has not been providing water to the NYC distribution network since 2007 and the upstate surface water supply is the primary source water for NYC. NYCDEP has submitted groundwater renewal permits so that the groundwater will be available as a back-up water supply, if necessary.

#### **Croton System**

The Croton water supply system, the NYC's oldest water supply, was put into service in 1842 with the construction of the Old Croton Aqueduct delivering water to the City and it has continued to expand. It now includes several reservoirs (New Croton, Croton Falls Main, Cross River, West Branch, Titicus, Amawalk, East Branch, Muscoot, Bog Brook, Middle Branch, Boyds Corner, Croton Falls Diverting), all of which now feed into the New Croton Aqueduct.

The Croton System delivers water by gravity from the New Croton Reservoir through the New Croton Aqueduct to the Jerome Park Reservoir in the Bronx. The water is then sent to the Croton WFP, which came online in May 2015. The Croton WFP has a maximum capacity of 290 MGD and is divided into Plant A and Plant B. The water treatment processes consist of chemical addition, dissolved air flotation (DAF), and filtration followed by UV disinfection. The Croton WFP is located beneath Van Cortlandt Park in the Bronx. It is the largest underground water filtration plant in the United States. The Croton WFP is also the largest stacked DAF filter plant in the United States. After treatment, the water is conveyed through concrete lined pressure water tunnels to the distribution service areas. Use of the Croton WFP varies based upon NYCDEP's operational needs. The Croton WFP provides NYCDEP with a valuable and flexible resource.

#### **The Catskill System**

The Catskill system was put into service in 1915 and provided water to all five boroughs by 1917. The Catskill system is made up of the Schoharie Reservoir and the Ashokan Reservoir, which feed water to the City by gravity via the Catskill Aqueduct. The balancing reservoir at Kensico, and the distribution reservoir at Hillview were implemented as part of the Catskill system. The System also includes City Tunnel No.1 which conveys water from Hillview Reservoir by gravity to the City and which was put into

This map illustrates the Catskill/Delaware Watersheds and the Croton Watershed, which supply water to New York City. The Catskill/Delaware Watersheds are shown in green, covering parts of Delaware, Schoharie, and Schoharie counties. The Croton Watershed is shown in light green, covering parts of Westchester and Dutchess counties. The map highlights various reservoirs, including Schoharie, Shandaken, Ashokan, Rondout, Neversink, and several in the Croton watershed. It also shows major water infrastructure such as the Delaware Aqueduct, Catskill Aqueduct, and various tunnels and canals. The map includes a scale bar (0 to 125 miles) and a north arrow.



MACAN DEVELOPMENT

operation in 1917. City Tunnel No. 1 is a deep rock tunnel which connects into the water supply distribution network via a series of riser shafts.

The Catskill Aqueduct is, for most of its length, a near surface aqueduct, with pressure tunnels only where the aqueduct alignment encounters low terrain, the most significant being the Hudson River valley. The near surface portions of the aqueduct have recently been cleaned to improve capacity, and plans are underway to investigate methods to reduce leakages in the pressure tunnel portions of the aqueduct.

### **The Delaware System**

Construction of the Delaware system began in 1937. The Delaware watershed was put into service in phases and is comprised of four reservoirs - Cannonsville Reservoir completed in 1964, Pepacton Reservoir completed in 1955, Neversink Reservoir completed in 1954 and Rondout Reservoir completed in 1950. The Rondout Reservoir receives water by gravity from the other reservoirs in the Delaware System. Delaware water is conveyed by gravity to Kensico Reservoir by the Delaware Aqueduct, via Shafts 17 and 18. The Delaware Aqueduct continues to Hillview Reservoir via the Eastview site and was connected into the balancing storage at Hillview by two new gate chambers with connecting conduits to the existing chambers at the reservoir. At that time City Tunnel No. 2 was constructed, which is a deep rock tunnel connected to the city distribution network by a series of riser shafts. The Delaware Aqueduct is a deep concrete lined pressure tunnel which passes about 600 feet below the Hudson River. Over the years, leakage has developed at some sections of the pressure tunnel, most notably at the Hudson River crossing. A bypass tunnel is presently under construction at the Hudson River which will allow the leaking portion of the aqueduct to be taken out of service. This major capital construction repair project will be discussed later in the report, in Section 8.4.

### **Filtration Avoidance of Catskill and Delaware Water Supplies**

Water from the upstate reservoirs is conveyed by gravity through an extensive system of tunnels and aqueducts. The 92-mile Catskill Aqueduct conveys water from the Ashokan Reservoir to the Kensico Reservoir and the 85-mile Delaware Aqueduct conveys water from the Rondout Reservoir to the West Branch Reservoir and then to the Kensico Reservoir. Because of the high-quality water in the upstate reservoirs and well-protected water supply, the US Environmental Protection Agency (USEPA) granted NYC a waiver from the federal requirement to filter drinking water originating from surface water supplies. As a result, the Delaware and Catskill watersheds do not require filtration and the watersheds are protected by a Filtration Avoidance Determination (FAD), which specifies disinfection requirements and identifies watershed source protection requirements to maintain its high level of water quality. Water entering the distribution system is treated with chlorine (disinfectant), fluoride (to prevent tooth decay), food-grade phosphoric acid (to create a protective film on pipes to reduce the release of metals such as lead from household plumbing) and sodium hydroxide (to raise the pH and reduce corrosivity). BWS disinfects Catskill and Delaware water systems at Kensico Reservoir Shaft 18 and additional chlorine disinfection occurs prior to entering the distribution system at Hillview Reservoir.

A condition of the FAD required NYCDEP to provide UV treatment to Catskill and Delaware water. Accordingly, a UV facility was completed in 2012 at the 153-acre Eastview site which is on the alignment of both the Delaware Aqueduct and the Catskill Aqueduct. The Catskill/Delaware Ultraviolet Disinfection (Cat/Del UV) Facility, which treats water from the Kensico Reservoir, feeds water to NYC through the Hillview Reservoir. The Cat/Del UV Facility has a capacity of 2.4 Billion Gallons per Day (BGD) and is the largest UV facility in the United States. At present the UV facility at Eastview can only be supplied via the Delaware Aqueduct from Shaft 18 on the Kensico Reservoir. Hydraulic limitations prevent the use of the Catskill Aqueduct for this purpose. In order to provide system redundancy, NYCDEP is in the process of designing an additional tunnel from the Kensico Reservoir to the UV facility at Eastview. This is referred to as the Kensico Eastview Connection (KEC) Tunnel, and is further discussed later in the report, in Section 8.4.

### **Connection to the Distribution System**

Both the Kensico Reservoir (30.6 billion gallons storage capacity) and the Hillview Reservoir (900 million gallons storage capacity) serve as balancing reservoirs for the water system, handling the daily and hourly fluctuations of water demand, respectively. Located downstream of the UV facility at Eastview, the Hillview reservoir is an uncovered reservoir and as such is not in compliance with Federal Regulations that require finished water reservoirs to be covered. Under a 2019 Consent Decree, NYCDEP is presently undertaking planning studies to evaluate alternative ways of achieving compliance. The Hillview Reservoir will be further discussed later in the report, in Section 8.4.

Water from the Hillview Reservoir is conveyed by gravity to the city through three tunnels as indicated on **Figure 6-2**. City Tunnel No. 1 was constructed as part of the Catskill system, and City Tunnel No. 2 as part of the Delaware system. City Tunnel No. 3, which is partially in operation and partially under construction, first came into operation in 1996. All three tunnels are deep concrete lined tunnels which connect into the surface distribution network by a series of riser shafts.

Most of the water from the Croton WFP is pumped into the city tunnels, with some water conveyed by gravity to the lower supply areas. The water distribution system from the three city tunnels consists of a network of approximately 7,000 miles of water mains, as well as valves, fire hydrants, distribution facilities, gatehouses, pump stations, water quality monitoring stations, laboratories and maintenance and repair yards.

The average daily NYC water delivered for FY 2021 was 987.1 million gallons per day (MGD)<sup>6</sup>, which provides for more than 8.8 million residents of NYC, and transients consisting primarily of tourists and daily commuters. It should be noted that there was a significant reduction of business operations, commuters and tourists in NYC beginning in March 2020 due to stay-at-home orders and restrictions due to the COVID-19 global pandemic, and at this time these impacts to water use should be considered short-term trends. It should also be noted that the current average daily water delivery in NYC is about 32% less than the average delivery levels experienced in the 1990s, due to long-term conservation trends. If the conservation measures currently in place remain effective there will be no

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<sup>6</sup> Water delivery data provided by NYCDEP BWS

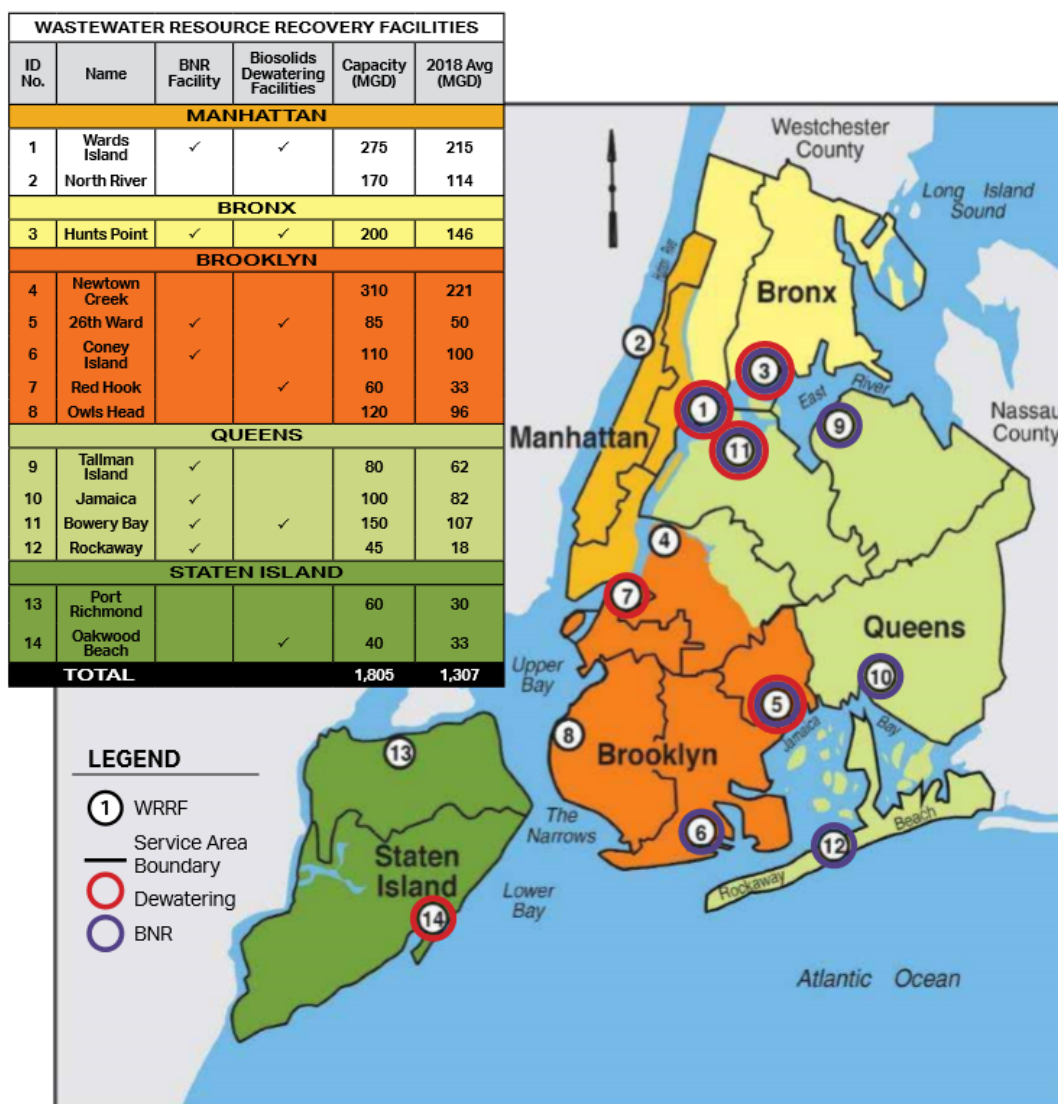
immediate need for NYC to develop additional long-term water sources to meet normal demand. The Water System also provides potable water (approximately 105 MGD) to upstate consumers in parts of Westchester, Putnam, Ulster, and Orange Counties (population approximately one million people).



Figure 6-2: New York City Water Conveyance Infrastructure

## 6.2 Wastewater System

The NYCDEP wastewater treatment system is comprised of 14 in-city WRRFs that discharge into receiving bodies surrounding NYC, as indicated in **Figure 6-3**, and is operated by the BWT. In addition, seven upstate WRRFs and one community septic system which are necessary to protect the NYC upstate watersheds are also operated by BWS. The in-city WRRFs have an average design capacity of 1.8 BGD and are currently treating approximately 1.31 BGD of wastewater consisting of municipal sewage and some stormwater from combined sewers.



**Figure 6-3: New York City Wastewater Resource Recovery Facilities**

The NYC sewage collection system is divided into 14 sewersheds, which correspond to each of the 14 WRRFs. The sewage collection system comprises approximately 152 miles of intercepting sewers and 7,500 miles of sewer pipes of varying size and material, which are classified as sanitary, storm or combined sewers. Much like many other older cities, the NYC collection system consists primarily of combined sewers (approximately 60% of NYC land area is served by combined sewers). During dry

weather, the combined sewers carry municipal wastewater to the WRRFs. During a wet weather event, in addition to municipal wastewater, rainwater from surface water runoff is also collected in the combined sewers. Most of the flow is sent to the WRRFs while combined sewer flow discharges to the receiving water as combined sewer overflow (CSO) during major wet weather events. Approximately 426 permitted CSO outfalls are located along the shoreline of NYC, along with four CSO retention facilities (Paerdegat, Alley Creek, Spring Creek, Flushing Bay) that provide screening, settling and storage of the CSO before discharging. The combined sewage remaining in the CSO facilities after the wet weather event is then directed to the WRRFs for treatment.

The in-city WRRFs provide secondary treatment in accordance with their State Pollutant Discharge Elimination System (SPDES) permits. Additionally, eight of the WRRFs are required to provide nitrogen removal to meet Total Maximum Daily Load (TMDL) regulatory requirements that have been set to protect the Upper East River and Jamaica Bay receiving waters. Four of the Upper East River WRRFs and three of the Jamaica Bay WRRFs are currently operating in Step Feed biological nitrogen removal (BNR) mode. Step Feed BNR is a biological nutrient removal process designed to eliminate excessive nitrogen in the effluent discharge. The primary effluent is introduced at multiple points along the aeration tanks to optimize the biological removal process. The Coney Island WRRF just completed a BNR retrofit, and BNR operations will commence in the near future at Coney Island WRRF. The liquid biosolids produced during wastewater treatment processing are transported by five DEP-owned, inner-harbor sludge vessels to centralized biosolids dewatering facilities. Dewatering facilities are currently located at six WRRFs, however BWT is planning to consolidate dewatering operations for some facilities. Dried biosolids and other treatment by-products are collected by third-party contractors who take responsibility for final disposal.

Additional NYCDEP infrastructure that supports the wastewater system includes 96 wastewater pump stations, two in-stream aeration facilities, 497 flow regulators, 148,000 stormwater catch basins, and six testing laboratories.

Until recently, the WRRFs were referred to as Wastewater Treatments Plants (WWTPs). This nomenclature described the primary function of the facilities, which was to treat municipal wastewater so that the treated effluent could be discharged to the receiving waters surrounding NYC without negatively impacting water quality in accordance with the regulatory requirements set by the New York State Department of Environmental Conservation (NYSDEC). The facilities are now being referred to as Wastewater Resource Recovery Facilities (WRRFs), highlighting a new focus on the opportunities to recover valuable resources from municipal wastewater. Recovered resources include reclaimed water which can be used to meet non-potable water demand, wastewater biosolids suitable for agricultural reuse, and methane gas which can be used as a green energy source. The wastewater industry has adopted this change from wastewater treatment to resource recovery, focusing on the products and benefits that can be extracted from the wastewater beyond simply removing pollutants from the effluent flow.

The transition from WTP to WRRF is further necessitated by the combination of mayoral directives and executive orders, Climate Mobilization Act of 2019 directives, and NYCDEP Strategic Plan goals

to minimize NYC's reliance on fossil fuels and intent to minimize GHG emissions. This will require NYCDEP in general, and BWT specifically, to upgrade facilities to meet scheduled goals. Studies are currently underway to identify the future capital investment necessary to meet these goals.

## 7.0 CLIMATE CHANGE, ENERGY EFFICIENCY, AND RESILIENCY

### 7.1 NYCDEP Sustainability Initiatives

NYCDEP continues to further implement sustainability in planning, design, construction of new facilities and everyday operations of current facilities. Sustainability is a core value identified in the *2018 Strategic Plan*, which supports the NYCDEP vision to “*be a world-class water and wastewater utility, while building a sustainable future for all New Yorkers*”. One of the seven goals of the *2018 Strategic Plan* is to reduce GHG emissions and mitigate the effects of climate change. NYCDEP has identified four strategic initiatives (SI) to achieve this sustainability goal:

- Reduce greenhouse gas emissions and expand renewable energy sources (SI#20).
- Restore natural habitats throughout New York Harbor (SI#21).
- Expand the green infrastructure program (SI#22).
- Expand integrated water management through water conservation, water reuse, and resource recovery (SI#23).

Many sustainability local laws have been passed in NYC over the past several years that impact water supply and WRRF operations. Recently, more aggressive goals have been set for energy and carbon neutrality that impact many city agencies. Therefore, NYCDEP continues to evaluate current and future facility operations and long-term planning.

The NYCDEP Panel for Sustainable Infrastructure (PSI) is made up of representatives from BWT, BWSO, BEDC, BEPA, OACE, and the Commissioner's Office. The PSI looks at sustainable planning, design, construction and operations for water and wastewater infrastructure projects by evaluating environmental, social, and economic standards throughout the project life cycle and into operations. Some of the ways the PSI strives to incorporate sustainability across NYCDEP-initiatives is through inter-bureau networking, sustainability local law compliance and tracking, generation of best practices, and site visits to assess evolving technologies.

### 7.2 Greenhouse Gas Reduction and Energy Efficiency Planning

In 2019, the New York City Council passed eight sustainability-focused local laws entitled the “Climate Mobilization Act”. Local Law 97 requires 40% reduction in City government GHG emissions by 2025 from the 2006 baseline, and a 50% reduction by 2030, which is a more aggressive target from what was originally planned. These aggressive reduction goals are interim measures that must be achieved in advance of the long-term energy and carbon neutrality outlined in OneNYC2050, 80% citywide reduction in green-house gas emissions from FY 2006 baseline by 2050 (also known as “80 by 50”). Although the GHG and energy reduction targets are citywide, NYCDEP has a significant role since NYCDEP’s energy-intensive operations makes them the second largest municipal emitter of GHG and the third largest municipal energy consumer. Local Law 94 requires installation of green roofs or solar photovoltaic electricity generating systems on certain buildings. NYCDEP projects are evaluating these

recent local law requirements. In response to climate change, the NYCDEP Strategic Plan and recent NYC local laws, NYCDEP initiated an Energy and Carbon Neutrality (ECN) Plan about two years ago.

The ECN Plan is an aggressive multi-agency multi-phase plan to address short-term (40% GHG emissions by 2025), mid-term (50% GHG emissions by 2030), and long-term (80% GHG emissions by 2050) goals for significant GHG reductions and energy usage throughout all NYCDEP operations. The main focus areas of the ECN Plan include: NYCDEP-wide Energy and Carbon Neutrality; Energy Neutrality at the 14 in-city WRRFs; Biosolids/ Residuals Optimization; Energy, GHG and Biosolids Data Management; and Energy, GHG and Biosolids Demonstration Projects. Significant collaboration and coordination across all NYCDEP Bureaus, along with other City agencies and external stakeholders is essential for a successful ECN Plan. Energy bureau liaisons within each Bureau coordinate with the Office of Energy and Resource Recovery (OERR). For NYCDEP to comply with the Climate Mobilization Act and to become carbon and energy neutral in the long-term, NYCDEP will need to make aggressive changes to all aspects of NYCDEP project implementation from prioritization, decision-making, planning, and design to construction, operation and maintenance.

NYCDEP intends to continue to pursue achieving the reduction goals with the following three strategies: (1) eliminating fugitive digester gas emissions and maximizing production and beneficial reuse of digester gas, (2) expanding renewable energy options, and (3) continuing to find beneficial reuse for NYCDEP biosolids to avoid landfills. A Biosolids Master Plan is underway to evaluate strategies beyond 2030. The ECN Plan continues to evaluate carbon management and net energy neutrality of the NYCDEP operations. In order for the NYCDEP to become net energy neutral, a cost-effective analysis is required to evaluate energy efficiencies, energy generation and renewable energy initiatives. The results will form NYCDEP's strategic plan to achieve energy neutral operations. Preliminary findings indicate that ECN will require significant investment and will be operationally challenging.

With new systems and facilities coming on-line, NYCDEP OERR Programs will assist in the planning of reliable sources of power, both from conventional and renewable sources. NYCDEP is evaluating the incorporation of energy efficiency with State-of-Good-Repair (SOGR) projects and energy conservation measures (ECMs). NYCDEP continues to look for synergies to coordinate SOGR upgrades with GHG reduction opportunities. For example, the energy intensive centrifuges at Newtown Creek WRRF will be replaced with gravity belt thickeners and will be funded by DCAS.

NYCDEP is participating in an innovative resource recovery program at the Newtown Creek WRRF. As part of the Newtown Creek/National Grid public/private partnership, NYCDEP will send anaerobic digester gas (ADG) to a digester gas conditioning system to be owned and operated by National Grid. The product gas, referred to as renewable natural gas, will be pipe-line quality gas and will be added to National Grid's natural gas distribution network. This project will improve local air quality, reduce citywide greenhouse gas emissions, reduce fossil fuel consumption, and supplement the citywide natural gas supply. This project is anticipated to be operational in the summer of 2022. Another public private partnership ongoing at Newtown Creek WRRF is with Waste Management (WM), Inc. Newtown Creek WRRF is accepting food waste from NYC public schools, NYC residents, the green markets, and commercial establishments. The pre-processed food waste delivered by WM is added to the

digesters to increase the production of ADG. Pre-COVID-19, NYCDEP had been co-digesting up to 200 tons per day (tpd) of food waste at Newtown Creek. There was a drastic reduction of food waste availability when schools were shut down and the NYC Sanitation Department stopped curbside food waste collection. However, the food waste collection has started to increase again, and NYCDEP is currently co-digesting approximately 130 tpd of NYC food waste. NYCDEP anticipates returning to the pre-COVID level of 200 tpd when feasible. Approximately 500 tpd of food waste is the estimated capacity for co-digestion of food waste at Newtown Creek. The food waste co-digestion and the ADG sent to National Grid projects at Newtown Creek serve as a model for integrating renewable energy in a dense urban environment. Food waste co-digestion has also been evaluated for the new digesters at Hunts Point WRRF.

OERR will continue to coordinate with the Department of Citywide Administrative Services (DCAS) for additional sources of funding or co-funding with NYCDEP for energy projects. Other energy projects that NYCDEP is implementing are cogeneration facilities and solar panels at NYCDEP facilities. A combined heat and power facility is currently under construction at North River WRRF. Solar panels (1.2-megawatt MW system) were installed at the Port Richmond WRRF in Staten Island in 2015. NYCDEP is currently working with NYPA and DCAS for solar installations at the Wards Island WRRF, Spring Creek CSO Facility, the Cat/Del UV Facility, Kingston office, and two upstate WRRFs (Pine Hill and Margaretville). These installations will contribute 12.3 MW to the NYC goal of 100 MW of solar power installed on public buildings by 2025.

NYCDEP completed a feasibility study to determine the viability of a hydroelectric facility at Cannonsville Dam. Based upon the study, design has been initiated on a 6-MW hydroelectric facility. This smaller revised plan qualifies for a license exemption from the Federal Energy Regulatory Commission. The facility will be licensed by NYC. The hydroelectric facility will use water that is continuously released downstream of the Cannonsville Reservoir. The proposed hydroelectric plant consists of two 3-MW generators inside a 4,400 square-foot powerhouse, adjacent to the West Delaware Release Chamber. The NYCDEP Current Capital Plan includes \$8 million in funding for a hydroelectric facility at the Cannonsville Reservoir, and DCAS is providing additional funding for the Cannonsville Hydroelectric Facility. NYCDEP's main priorities continue to be dam safety, maintaining operational control over the dams and the ability to meet flow management agreements. A feasibility study has also been completed for hydroelectric potential at Shaft 4, (the Catskill Aqueduct and Delaware Aqueduct Interconnection) and the Croton Gatehouse.

NYCDEP OERR collaborates with the New York State Climate Leadership and Community Protection Act Waste Advisory Panel, which allows NYCDEP to provide knowledge sharing and advocacy work on the state level.

### **7.3 Climate Change Adaptation**

NYCDEP has been actively focused on the effects of climate change to both the water supply and wastewater system, in particular the impact of rising sea levels and changes to the intensity and frequency of precipitation events throughout the upstate watershed and in-city.

The New York City Panel on Climate Change (NPCC) is an independent body that advises the city on climate risks and resiliency. In February 2015, Mayor de Blasio announced the release of the NPCC 2015 report titled *Building the Knowledge Base for Climate Resiliency*. This report provides climate projections for temperature, precipitation and sea level rise through year 2100. The NPCC recommends setting up a climate change monitoring system, so that resiliency measures can be adapted as changes continue to evolve. The NPCC has identified that the City has been experiencing climate change impacts and expects those impacts to become more acute in the future. Some climate change impacts include extreme weather, coastal flooding and droughts that could impact the operation of the water and wastewater system.

In September 2020, the Mayor's Office of Climate Resiliency (MOCR) released *Climate Resiliency Design Guidelines* version 4.0. The Guidelines were developed based on the NPCC's regional climate projections that inform New York City resiliency policy. The NPCC published an updated report in March 2019.

NYCDEP has been planning and evaluating climate change adaptation requirements for the past several years, well before Superstorm Sandy impacted the NYC area. Adaptation refers to those actions that must be taken to allow NYCDEP facilities to meet their intended functions when considering projected sea level rise and more intense storm events. In May 2008, NYCDEP released its Climate Change Program Assessment and Action Plan. Following its release, the NYCDEP began studying the effects of climate change on the city's stormwater/wastewater collection system in more detail to determine what level of infrastructure and policy modifications are necessary to alleviate potential damage from more intense, more frequent storm events and projected rising sea levels. In May 2010, the NYC Panel on Climate Change released a report titled *Climate Change Adaptation in New York City: Building a Risk Management Response*, which among other important information, includes climate trends and projections for NYC, which NYCDEP has used for analysis and planning.

After Superstorm Sandy significantly impacted the New York City area in October 2012, NYCDEP strengthened its work on climate change adaptation and resiliency. In December 2012, the Mayor's Office formed the Special Initiative for Rebuilding and Resiliency (SIRR). In June 2013, NYC released a comprehensive document entitled *A Stronger, More Resilient New York*, which covered citywide infrastructure impacts and community rebuilding and resiliency plans. Subsequently, NYCDEP released the *NYC Wastewater Resiliency Plan, Climate Risk Assessment and Adaptation Study* in October 2013. This Plan provided a comprehensive assessment of wastewater infrastructure at risk from future storms with proposed measures to protect equipment to reduce the risk of damage and loss of service. The study evaluated infrastructure at the NYCDEP WRRFs and wastewater pump stations to identify and prioritize facilities most at risk for flood damage. The framework used for this study consisted of climate analysis, risk analysis and adaptation analysis. The possible adaptation strategies ranged in varying degrees of resiliency, effectiveness, and cost.

Climate change adaptation evaluations are also taking place for other parts of The System. BWS is focused on climate change impacts on the water supply side using its Operation Support Tool (OST) models, the watershed protection program, and improving flexibility in operations with increased water

supply interconnections. The OST is a computerized decision-making support system that BWS uses for water supply operations and planning. BWS is also conducting extensive research on the impact that climate change will have on the current and future water supply system. NYCDEP is co-sponsoring a study (along with the Delaware River Basin Commission) of the F.E. Walter Reservoir in White Haven, PA, in order to plan for climate change, sea level rise and the future management of water resources in the Delaware River Basin. The United States Army Corps of Engineers (USACE) study will evaluate if the F.E. Walter Reservoir can help the Delaware River deal with future droughts, sea level rise, and saltwater intrusion because of climate change.

NYCDEP's Green Infrastructure Program provides a comprehensive adaptive approach to stormwater management. The plan is based on implementing citywide green infrastructure improvements to reduce the volume of stormwater that reaches the engineered (grey infrastructure) stormwater collection system. NYCDEP continues to focus on climate change as it evaluates its stormwater management needs.

NYCDEP maintains strong involvement with the climate change science community on the city, state, national and international level. On the national level, NYCDEP maintains utility membership and actively engages with the Water Utility Climate Alliance (WUCA) and the National Association of Clean Water Agencies. NYCDEP was one of the founding members of WUCA and today there are 12 water utility members across the US that share the mission of sharing knowledge and advancing resilient water practices. WUCA recently released a report, entitled *Leading Practices in Climate Adaptation* that focuses on five leading practices - engage, understand, plan, implement, and sustain. Several NYCDEP projects are highlighted in this report as examples of successful climate change adaptation implementation measures.

Climate change adaptation is a challenge facing all water and wastewater utilities and should be considered in short-term and long-term utility planning. There is uncertainty inherent in climate science due to the magnitude, variability, timing and frequency of localized events and their impacts on the overall System. However, despite the uncertainty of climate change prediction, rational capital investments must be considered to protect NYCDEP facilities. NYCDEP is evaluating climate change impacts for all new project elements and implementing climate resiliency measures. Some resiliency measures are stand-alone projects, and some are built into existing projects. NYCDEP expects that additional resiliency projects will be identified, and additional funding will be required.

## **7.4 Resiliency**

### **Coastal Resiliency**

The NYCDEP Resiliency Program continues to implement resiliency projects across 14 WRRFs and 96 pump stations. NYCDEP is obtaining funding and financing through the NYSDEC Storm Mitigation Loan Program and through the Federal Emergency Management Agency (FEMA) for these resiliency upgrades. Prioritizing the resiliency capital projects is an important step in the planning process. The criteria being used for prioritization of projects and needs include operational, environmental, social and financial metrics. NYCDEP has adopted new design standards to account for the critical flood

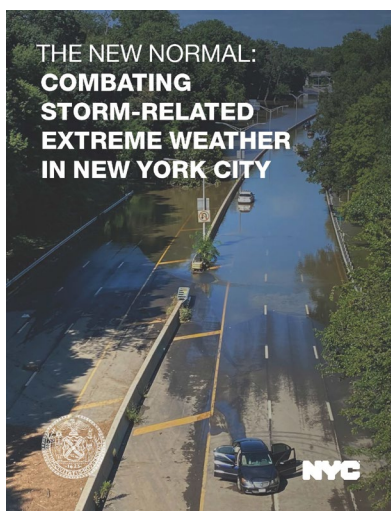
elevation with FEMA maps. NYCDEP has developed *Resiliency Design Guidelines*. As part of the October 2013 study, Storm Surge Guidance was also developed for all 14 NYCDEP WRRFs to assist NYCDEP staff in preparing for another storm.

Resiliency improvements are ongoing to protect facilities from projected sea level rise and increasing storm intensities due to changing weather patterns. Other large inter-agency and multi-faceted coastal resiliency projects are underway throughout NYC that will require continued NYCDEP coordination.

The Mayor's Office of Resiliency (MOR) is coordinating many coastal resiliency projects in NYC, including the Lower Manhattan Coastal Resiliency and Eastside Coastal Resiliency (ESCR) projects. The USACE is working on the Staten Island seawall project. Along with many other NYC agencies, NYCDEP will play a role in these coastal resiliency projects. OACE and BEDC are coordinating NYCDEP's efforts. The CIP includes approximately \$360 million for NYCDEP's funding of a portion of the ESCR and USACE coastal resiliency projects in NYC. Additional funding may be required as these coastal resiliency programs progress. These large coastal resiliency projects are a collaborative effort among many city agencies and NYC agencies are in discussions about the future operations of these projects. Additional staff will be required for their future operations.

### Storm Resiliency

Climate change is causing more intense storms, more storm variability, and more intense precipitation events. Hurricane Ida reached NYC in the evening of September 1, 2021 and caused devastating flooding within the city, and surrounding areas. The National Weather Service (NWS) declared a flash flood emergency in New York City on September 1, 2021, for the first time in history. The storm exceeded the record rainfall that fell within one hour in the city (3.15 inches in one hour). The total rainfall that fell in one day was 7.13 inches. The NYC sewer system could not handle the significantly greater storm intensity of Ida, as the NYC system is designed for 1.5-2 inches per hour rainfall intensity. The intense storm flooded streets, subways, and homes, and tragically caused loss of life.



**Figure 7-1 Post Hurricane Ida  
New Normal Report**

An Extreme Weather Task Force was assembled immediately after the storm comprised of leaders from several city agencies, including NYCDEP. NYC issued a report on September 27, 2021 entitled *The New Normal Report – Combating Storm-Related Extreme Weather in NYC*, based upon the recommendations put forth by the Task Force. Several recommendations were identified for many city agencies. NYCDEP's role on the Task Force was to address short-term infrastructure, long-term infrastructure, and subway flooding jointly with other agencies. The short-term infrastructure for which NYCDEP has responsibility includes accelerating high-level storm sewer upgrades; adding 50 acres of porous pavement in the East Bronx; increasing catch basin inspection frequency in commercial areas; accelerating GI projects citywide; and finding drainage solutions for community driveways. The long-term infrastructure for which NYCDEP has responsibility includes improving the legacy

sewer system for the future by the following: incorporating projected future rainfall into drainage planning; supplementing the existing sewer system; accelerating the sewer replacement cycle; and upgrading storm sewer outfalls. NYCDEP is working closely and cooperatively with MTA and NYCDOT in weekly Task Force meetings to address flooding in the subways in priority locations. Monthly updates entitled *The New Normal Report – Combatting Storm-Related Extreme Weather* have been released to track progress. BWSO and DDC are also working very closely together to maintain progress on projects. Additional funding of \$2.1 billion (over FY22 to FY31) was included in the October 2021 budget release to support the recommendations in the report. Of the \$2.1 billion over ten years, \$1.7 billion will support BWSO work for new and replaced sewers and high level sewers, and other drainage projects. The Current Capital Plan includes funding of \$165 million for cloudburst projects, including 30% design for ten sites and the full design and construction for four cloudburst projects in four high priority neighborhoods. The high priority areas will be chosen based upon the vulnerability of locations to flood prone areas, while evaluating environmental justice issues. Cloudburst projects use a combination of green and grey infrastructure strategies to slow, delay, and divert stormwater to minimize nuisance flooding and damage to property and infrastructure and typically manage more stormwater than traditional green infrastructure. An additional \$200 million in funding has been allocated for additional green infrastructure projects, including the Tibbets Brook daylighting project and porous pavement projects in the Bronx.

## 8.0 CAPITAL IMPROVEMENT PROGRAM (CIP)

### 8.1 Overview

Budgeting is a lengthy and comprehensive process, especially for an agency operating such a large and complex system as the NYCDEP. NYCDEP budgeting is an ongoing, iterative process that considers significant and substantial needs including regulatory requirements, legal mandates, mayoral initiatives, state-of-good-repair (SOGR), energy projects, capacity enhancements, dependability, environmental, health, and safety (EH&S) compliance requirements, localized community drivers, security measures, increased storm intensity, and additional climate change adaptation/resiliency improvements. These many needs must be met within the funding limitations. NYCDEP seeks opportunities for synergies with project implementation such as addressing SOGR needs along with energy and resource recovery and flood resiliency requirements. Project schedules, cost estimate updates, technical issues, regulatory updates, emergency events, recurring events and legal issues may impact project prioritization and the overall budgeting process. NYCDEP is continuously evaluating projects to prioritize NYCDEP's most critical needs first. This challenging budget exercise requires NYCDEP to evaluate project elements and scheduling to efficiently address the most immediate needs. As the projects are fully developed, scheduling modifications are necessary within the 10-Year Capital Strategy. As such, the 10-Year Capital Strategy is constantly being adjusted and published every two years.

The NYCDEP CIP consists of the Preliminary Ten-Year Capital Strategy for FY 2022 through FY 2031 and the Current Capital Plan for FY 2022 through FY 2026. The Current Capital Plan was published on February 16, 2022, and is updated quarterly. The Ten-Year Capital Strategy is updated every two years. The next Ten-Year Capital Strategy will be released in January 2023. This report reviews the CIP, including the capital budget for FY 2022, which ends on June 30, 2022, and the preliminary capital budget for FY 2023, which ends on June 30, 2023. AECOM and MDE have reviewed the Preliminary Current Capital Plan and met with key individuals responsible for budgetary planning to provide an assessment of its adequacy. It is anticipated that the Mayor will issue the Executive Budget in late April 2022. Our findings are summarized in the following paragraphs.

### FY 2022 Capital Budget

The FY 2022 capital budget is set at \$2.34 billion. Approximately 22.8% of the funding supports regulatory mandated projects, consisting primarily of green and grey infrastructure (both CSO and MS4 projects), the FAD program, wastewater pump stations, intercepting sewers, and total residual chlorine (TRC) reduction program. Significant funding is also included for NYCDEP priority projects such as emergency contracts for water and sewer work, the Southeast Queens storm sewer buildout program, water distribution system and wastewater collection sewer work, WRRF SOGR projects (replacement of the Hunts Point WRRF digesters), water supply infrastructure SOGR projects, and Bluebelt land acquisition and construction.

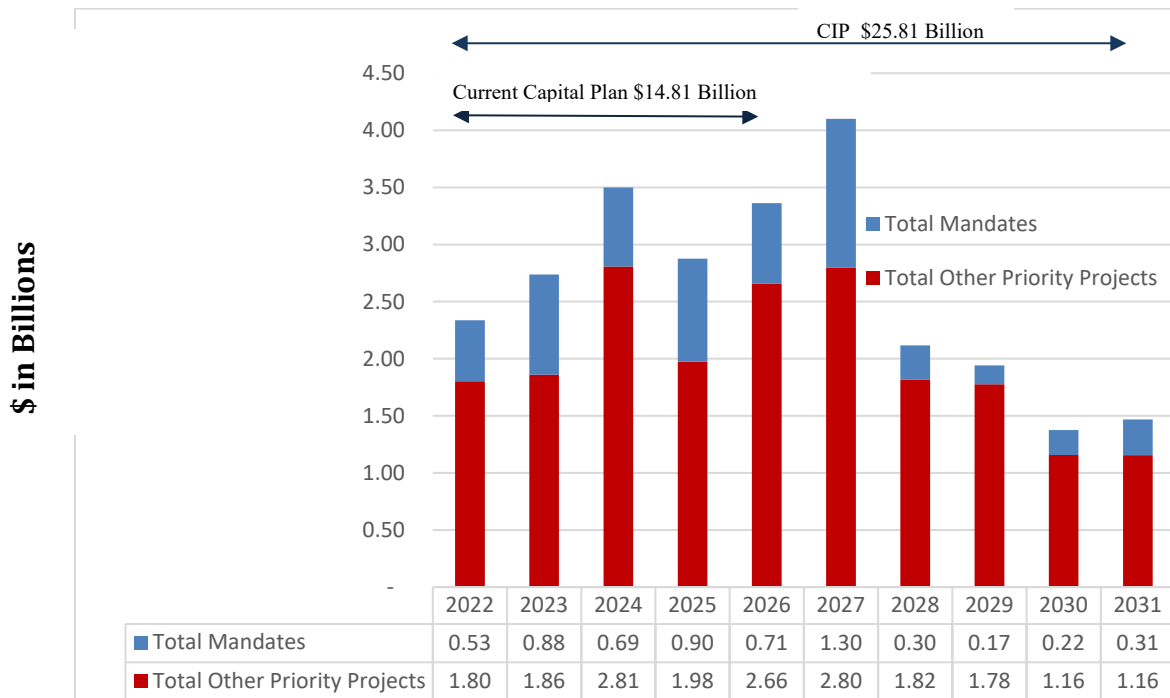
### **FY 2023 Preliminary Capital Budget**

The FY 2023 preliminary capital budget is set at \$2.74 billion. Approximately 32% of the funding supports regulatory mandated projects, such as construction of the Gowanus Superfund CSO Red Hook tank, green infrastructure, and the FAD program. Significant funding is also included in FY 2023 for NYCDEP priority projects such as emergency contracts for water and sewer work, the Southeast Queens storm sewer buildout program, water distribution system and wastewater collection sewer work, WRRF SOGR projects, and water supply infrastructure SOGR projects.

### **Current Capital Plan for FY 2022 to FY 2026**

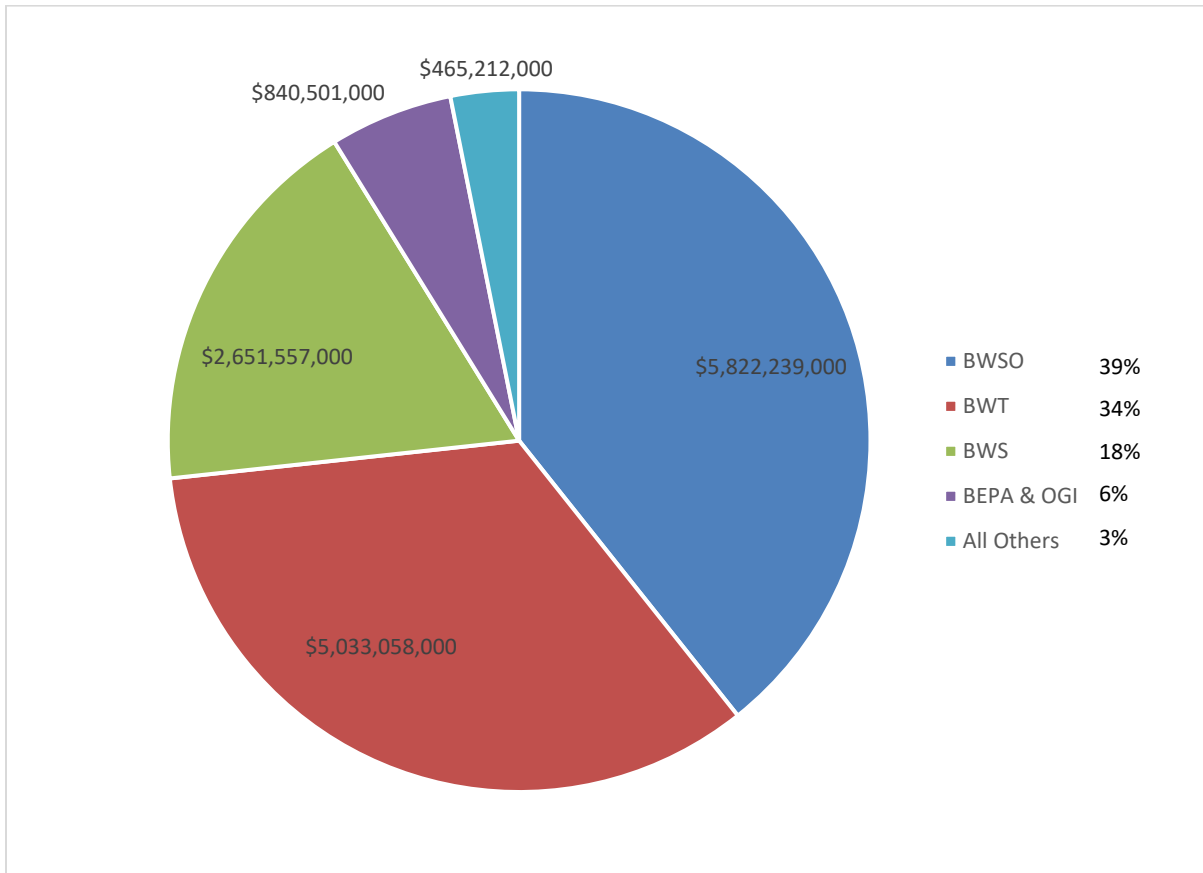
**Figure 8-1** shows the funding allocated per fiscal year in the CIP for FY 2022 through FY 2031. This report focuses on the Current Capital Plan, which consists of the FY 2022 through FY 2026. The Current Capital Plan for FY 2022-FY 2026 funding is \$14.81 billion. The CIP for FY 2022 through FY 2031 consists of \$25.81 billion in funding. Mandated and other NYCDEP priority project funding is shown per fiscal year. Approximately 25% of the total funding for FY 2022 through FY 2026 is dedicated to regulatory mandated projects, and approximately 22% of the total funding for FY 2022 through FY 2031 is dedicated to regulatory mandated projects. As shown in **Figure 8-1**, the funding for mandated projects varies from year to year, pending Consent Decree milestones and requirements. Most of the mandated projects in FY 2022 through FY 2031 consist of the green and grey CSO-related infrastructure, Gowanus Superfund CSO tank, the KEC tunnel, the Hillview Reservoir upgrades and chamber modifications, the FAD program, and the TRC program. The majority of the remaining capital improvement program for FY 2022 through FY 2031 must be planned and budgeted based solely on its importance to the overall System and NYCDEP prioritization as determined by NYCDEP. These projects include the SOGR needs of the older assets in The System, City Tunnel #3 completion and activation, the Southeast Queens storm sewer buildout program, and significantly more BWSO water main replacement/installation and sewer work, and emergency contracts for emergency water and sewer work.

Due to projects being deferred, there was a decrease in funding of \$558.7 million for FY22-26, but an overall increase in funding of \$413 million for the 10 Year period of FY22 – FY31, when compared to the previous capital plan release in October 2021. Procurement slowdowns have caused delays in projects.



**Figure 8-1: CIP (\$ in billions) for FY 2022 – FY 2031**

**Figure 8-2** shows how the funding is allocated by each operating bureau for the Current Capital Plan, FY 2022 – FY 2026. BWSO's funding is the largest part of the total CIP and covers water and sewer main replacement, the Southeast Queens Stormwater Program, City Tunnel #3 completion, Bluebelts, emergency water and sewer contracts, and other BWSO SOGR projects. BWT's funding is next and covers SOGR needs for wastewater infrastructure, the CSO Program, the Gowanus Superfund program, resiliency projects, the TRC Program, and other BWT SOGR projects. BWS's funding covers SOGR needs for water supply infrastructure, FAD requirements, the KEC tunnel, Hillview Reservoir upgrades and modifications and other BWS projects. The OGI and BEPA's funding covers the green infrastructure program and BEPA projects. The remaining funding includes projects within BEDC, BCS, Police and Security, Facilities Management, Fleet, Office of Information Technology, Department of Parks and Recreation and other bureaus.



**Figure 8-2: Current Capital Plan by NYCDEP Operating Bureaus**

NYCDEP is continuously finding a balance between funding mandates and funding SOGR needs. When mandated projects are accelerated, this typically causes SOGR projects to be deferred. As discussed later in this report, the mandated CSO Program, the Superfund Program and the Hillview Reservoir Cover will require additional funding in the future and will extend beyond the next 10-year planning horizon. It is anticipated that there will be a continuous need to fund regulatory mandated projects. There will also be an increased and continuous need for SOGR funding due to the age of the NYCDEP infrastructure and the enhanced ability to more readily identify needs using Asset Management tools. Based upon the age of the infrastructure, there will be a need to replace wastewater and water system assets in accordance with a proactive, systematic, data-driven plan that minimizes reactive replacements brought about by asset failures.

As described in the beginning of the report, there have been many impacts to NYCDEP due to COVID-19. The ability to get capital projects out for bid, awarded and initiated was significantly impacted by the global pandemic. Procurements have been delayed since the Spring of 2020, and many projects that were planned to be committed in FY 2020 and FY 2021 were delayed. Procurement delays continue to impact capital project delivery. Many NYCDEP scheduled priority projects have been rescheduled for subsequent years, in FY 2021, FY 2022 and FY 2023. NYCDEP has prioritized projects critical to its core mission to provide clean drinking water and to collect and treat wastewater in accordance with the regulatory requirements of the Safe Drinking Water and Clean Water Acts and to

protect water quality. In addition to COVID-19 schedule impacts, NYCDEP is in ongoing negotiations with the regulators for potential revisions for implementation of mandated projects and evaluating the integration of multiple programs. The ongoing negotiations will be addressed later in this section under specific programs. Pending the results of the ongoing negotiations, some adjustments to the Capital Program may be required for funding in specific FYs to reflect the potential program revisions. Although NYCDEP's top priority is to provide funding for critical infrastructure necessary for operation and maintenance of the water and wastewater system, the funding allocation timing may be dependent upon regulatory relief from NYSDEC and USEPA mandated projects. Although there are some economic uncertainties caused by COVID-19, NYCDEP remains committed to be compliance-focused, addressing short-term needs while continuing long-term planning.

## **8.2 Recent Program Accomplishments**

There are a number of program accomplishments during the past year that are noteworthy. These items play an essential role in the development and advancement of the CIP and provide for prudent and professional management of The System.

- NYCDEP completed installation of the final concrete liners of the by-pass tunnel of the Delaware Aqueduct RWB tunnel under the Hudson River.
- The fourth and final planned Catskill Aqueduct shutdown began in October 2021 and the shutdown was completed in January 2022, in preparation for the Delaware Aqueduct shutdown.
- The construction contract was recently awarded for the new Hunts Point WRRF digesters.
- Coney Island WRRF met the BNR completion milestone in the Administrative Consent Order.
- NYCDEP recently completed a \$50 million project delivering more than six miles of new sewers and water mains to alleviate flooding of homes and streets in Rochdale, Southeast Queens.

## **8.3 Asset Management/ State of Good Repair (SOGR)**

As is the case in most US cities and municipalities, the NYCDEP water and wastewater infrastructure is aging. Therefore, it is necessary to refurbish or replace infrastructure in a planned manner to cost effectively minimize risk of failure. The NYCDEP continues to refine and implement its Asset Management program to better set priorities for the continued refurbishment of its physical assets. The Asset Management program provides a uniform methodology for a comprehensive evaluation of capital assets throughout The System and allows a systematic approach to schedule preventive maintenance and upgrade physical assets so that capital improvements can progress in an orderly manner. To further improve upon this effort, a pilot program at the Port Richmond WRRF is underway to take a more detailed appraisal of its asset management program. The pilot program will help BWT identify needs by assessing life cycle costs of equipment and will provide a bottom up approach to identify needs for equipment repair/replacement. BWT plans to expand the Asset Management tools to all 14 WRRFs. NYCDEP has formed an Asset Management Working Group to coordinate and strengthen all asset management activities. BWT has initiated a Strategic Asset Management Plan to drive BWT

toward the new Asset Management system, with the goal of striving toward industry standard best practices in Asset Management.

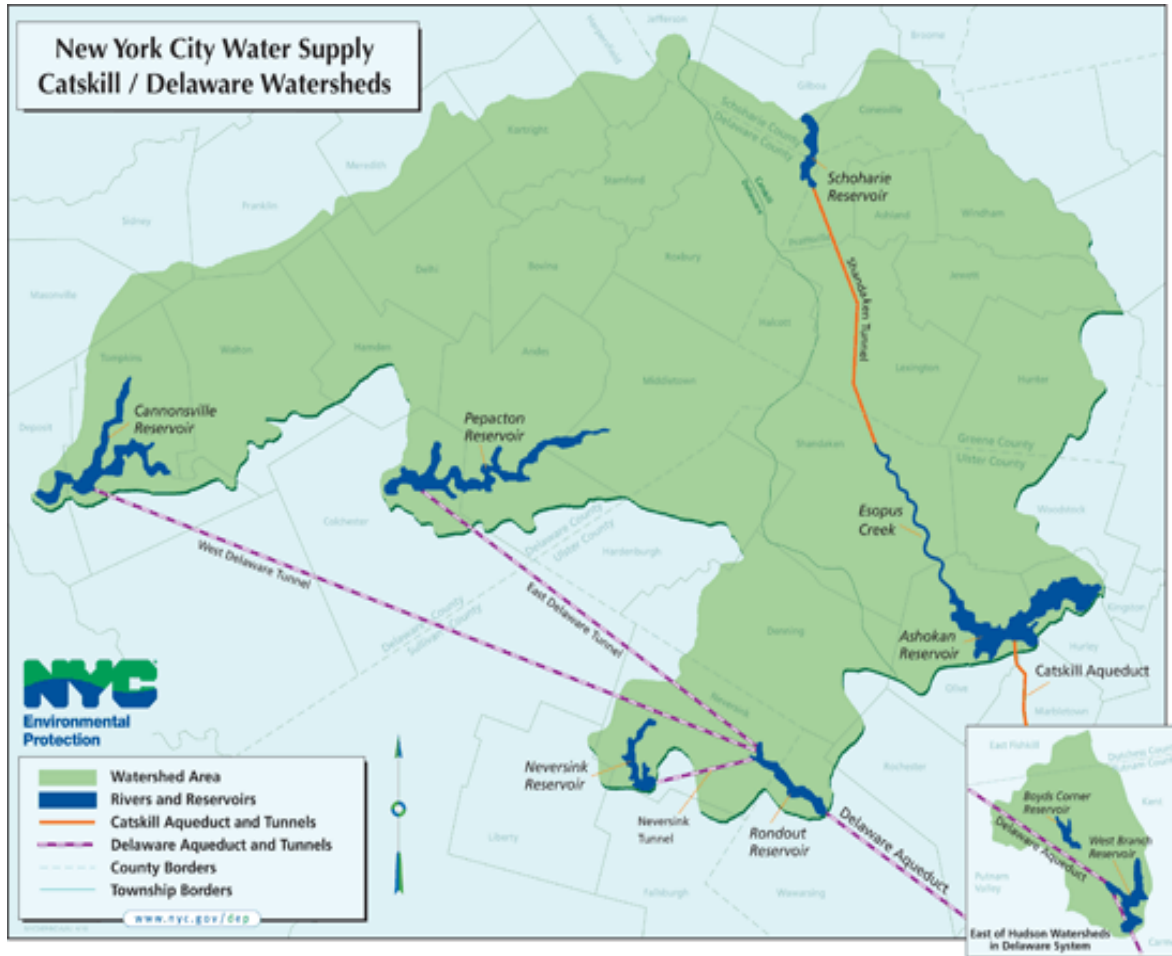
The NYCDEP Asset Management program includes the majority of the water and wastewater infrastructure. The program will be used in the development of the funding needs for the SOGR for future capital budgets. Utilizing the asset management tools, the operating bureaus submit business cases to OACE for review and prioritization. This effort is based upon a collaborative approach between the operating bureaus and OACE so that all stakeholders have input throughout the process. Business case project prioritization is based upon a scoring of the following criteria: physical condition, performance/process condition, regulatory/environmental, service level/reliability, efficiency/energy, O&M, hazard, community, public image and financial. NYCDEP will perform continuous real time updating of the status of the many NYCDEP physical assets to reflect completion of improvement projects and condition survey updates for operating assets. The principles of Asset Management have been effectively applied to many water and wastewater utilities worldwide and the NYCDEP's progress in Asset Management is a positive development. The continued integration of the Asset Management program with the CIP is evolving such that DEP is improving their ability to prioritize and integrate SOGR projects into the CIP planning process.

Due to the age of the infrastructure, there are significant SOGR needs throughout the water and wastewater system. In particular, significant BWT SOGR funding needs for the wastewater system across various WRRFs include sludge handling and dewatering, WRRFs settling tanks (primary and secondary), collection systems (pumping stations and regulators), power distribution (generators/engines), and main sewage pump systems.

#### **8.4 Capital Improvement Program Highlights for the Water System (Supply, Treatment, and Conveyance Programs)**

A number of NYCDEP projects and programs for the water system are in various stages of implementation (planning, design, and construction). The most significant of these programs are described below.

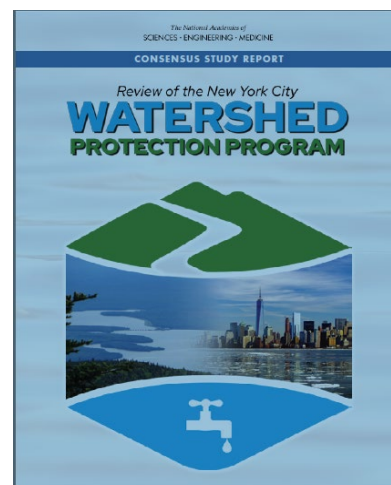
Catskill/Delaware Water Supply System Filtration Avoidance



**Figure 8-3: Filtration Avoidance Determination (FAD) for the Delaware and Catskill Watersheds**

On December 28, 2017, the New York State Department of Health (NYSDOH) issued another 10-year FAD, known as the 2017 FAD to the NYCDEP for the Catskill and Delaware watersheds (**Figure 8-3**). The 2017 FAD consists of a watershed protection program for 2017-2027. The FAD requires NYCDEP to continue its core watershed protection programs that are already established and in place, such as land acquisition in the protected watershed, whole farm planning, stream management and various upgrades to wastewater infrastructure in the watersheds. In addition, the FAD contains new requirements, which include expanding the small business septic system rehabilitation and replacement program in the Catskills, development of a community wastewater treatment facility for the hamlet of Shokan near Ashokan Reservoir and protecting additional streamside lands through the Conservation Reserve Enhancement Program and the Streamside Acquisition Program. The FAD has several milestones and implementation schedules for the required programs.

The National Academies of Sciences, Engineering, and Medicine expert panel completed a review of the current NYCDEP FAD programs and published a report titled *Review of the New York City Watershed Protection Program* (**Figure 8-4**). The panel performed a comprehensive review and evaluation of the NYCDEP's Watershed Protection Program to determine if the programs are adequate to comply with the Surface Water Treatment Rule now and into the future. The report was released August 10, 2020 and provides a number of conclusions and recommendations for specific programs of the FAD, including the land acquisition program, watershed agricultural program, stream management program, wastewater programs, ecosystem protection and management programs, public health programs, along with monitoring, assessment and modeling. NYCDEP has thoroughly reviewed and addressed the expert panel review recommendations, including revising the land acquisition program and continuing to focus on climate change impacts to the water supply. The results of this expert panel review were taken into account as part of the five-year mid-term review of the 2017-2027 FAD. NYCDEP submitted the 2021 Long-Term Watershed Protection Plan to NYSDOH in December 2021. It is expected that the NYSDOH will release the 2022 FAD in the near future, and then it will undergo a 60-day public comment period. It is anticipated that the mid-term FAD update will be finalized in mid-2022.



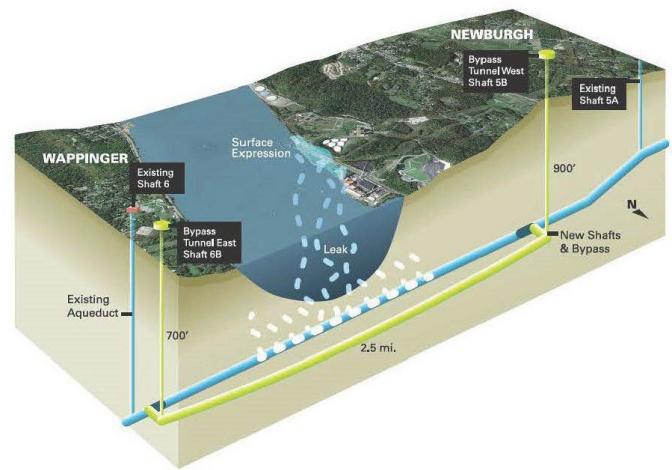
**Figure 8-4: Report on the Watershed Protection Program Expert Panel Review**

Funding for FAD programs comes from both the NYCDEP capital budget and the annual expense budgets. The continuation of the existing FAD program is currently funded in the Current Capital Plan at a level of approximately \$188.6 million. Additional capital funding will be required in the later years of the 10 Year Capital Planning Strategy for the second half of the ten-year FAD to continue to support FAD programs. It is anticipated that funding for the FAD will also be included in the NYCDEP expense budget for the duration of the FAD.

As part of the continuous long-term planning efforts, NYCDEP will update its planning level studies, to identify the capital investment and operating cost impact if it became necessary to build a water treatment plant for the Delaware and Catskill water supply. NYCDEP is planning a comprehensive review of filtration methods and technologies, which will result in the development of a new conceptual design for a filtration facility, and updated cost estimates. The NYCDEP capital and expense financial investment in FAD programs are a more cost-effective means to protect the Catskill/ Delaware water supply than building a filtration plant with high up-front capital constructions costs, as well as recurring operation and maintenance costs.

### Delaware Aqueduct Rondout-West Branch Tunnel (RWBT)

After extensive thorough evaluations and study of several repair alternatives, NYCDEP developed a long-term comprehensive plan to address the leaks in the Delaware Aqueduct RWBT. The plan consists of building a two-and-a-half-mile bypass tunnel under the Hudson River between Newburgh and Wappinger to address the leaking section of the Delaware Aqueduct in the area of Roseto, NY, and to perform repairs of the concrete liner in upstream areas near Awarding, NY (Figure 8-5). In 2013, NYCDEP began construction of two new shafts, Shaft 5B (in the Town of Newburgh) and Shaft 6B (in the Town of Wappinger). Construction of the two vertical shafts has been completed (contract BT#1).



**Figure 8-5: Delaware Aqueduct RWB Tunnel Program**

The tunnel construction contract (contract BT#2) was initiated in the summer of 2015. A tunnel boring machine (TBM) was utilized for the construction of the new tunnel between the two shafts. The TBM began tunnel construction in January 2018, and the tunneling was completed in August 2019. The bypass tunnel steel-liner installation was completed in May 2020. A second layer of concrete lining has



**Figure 8-6: Delaware Aqueduct Bypass Tunnel Triple Pass Design**

been added inside the steel liner. The concrete was placed inside the tunnel at a pace of about 80 linear feet per day. The final concrete liner was completed in February 2021. A total of 29,600 cubic yards of concrete was used for the finished lining. The concrete was formed by a system of rolling formwork that was moved through the tunnel by a specially designed trolley and rail system. This triple pass design (concrete, steel, concrete) of the bypass tunnel is intended to provide structural stability and prevent future leaks (Figure 8-6). The Delaware Aqueduct RWB bypass tunnel is the largest repair project in the history of the NYC's water supply system.

A strong organizational structure is in place within BEDC and across all operating bureaus (with designated liaisons) and executive management, to continue with the construction, implementation and risk management of the program due to its magnitude and complexity. A significant portion of the funding for this bypass tunnel has been committed in previous years. Approximately \$26 million is committed for the continued construction of bypass tunnel and repairs. Engineering studies conducted during the project development have identified improvements that will result in shorter shutdown

periods and less required water supply augmentation reducing the overall program cost, compared to the original program. NYCDEP is currently implementing demand management measures and has completed improvements to the Upper Catskill Aqueduct to increase its capacity. NYCDEP completed the fourth and final shutdown of the Catskill Aqueduct to repair and rehabilitate the Upper Catskill Aqueduct (from Ashokan Reservoir to Kensico Reservoir). The recent Catskill Aqueduct shutdown started in October 2021 and was completed in December 2021. The overall Catskill Aqueduct Repair and Rehabilitation project that necessitated the shutdown consisted of inspection, implementation of mechanical and structural upgrades, and removal of the biofilm of the Catskill Aqueduct. Catskill Aqueduct shutdowns require close coordination with the upstate users to maintain sufficient water quantity during the shutdown.

Construction to connect the bypass tunnel with the existing Delaware Aqueduct will be performed by drill and blast. These connections will require taking the Delaware Aqueduct out of service and dewatering the aqueduct. Shutdown of the Delaware Aqueduct is currently planned for October 2022. NYCDEP is currently completing necessary pre-cursor projects and finalizing planning operations for The System during Delaware shutdown. As the overall work will take several months, it will be scheduled during the low water demand season to minimize the possibility of water shortages.

#### **Catskill Aqueduct Rondout Pressure Tunnel**

NYCDEP began monitoring the Catskill Aqueduct pressure tunnel due to leaks beneath the Rondout Creek using a remote operated vehicle inserted into the operating aqueduct. United States Geological Survey is monitoring the area and performing an investigation study for the pressure tunnels along the Catskill Aqueduct. Funding of \$23 million is included in the Current Capital Plan for repair of the tunnel leaks identified in the Rondout Creek area. Once the Delaware repairs are completed, it is anticipated that NYCDEP will further address these leaks in the Catskill Aqueduct tunnel sections. A long-term solution will need to be devised to address the other suspected leaks in the pressurized tunnel portion of the Catskill Aqueduct.

#### **Hillview Reservoir**

Federal regulations administered by USEPA, Long Term 2 Enhanced Surface Water Treatment Rule (LT2) requires the Hillview Reservoir (**Figure 8-7**) to be covered. However, a series of compliance agreements with several commitments to cover the Hillview Reservoir between NYCDEP and the regulators dating back to 1996 predate the LT2 requirement.



**Figure 8-7: Hillview Reservoir Located in Yonkers**

In 2017, the USEPA declined to reconsider the requirement to cover finished water reservoirs such as Hillview. NYCDEP requested that NYSDOH and USEPA further extend the deadline to complete construction of the cover to enable NYCDEP to complete two higher priority water supply infrastructure capital improvements: construction of the Kensico Eastview Connection (KEC) tunnel and Hillview Reservoir Improvements. NYSDOH and USEPA agreed to extend the schedule for commencing operation of the cover (of the West Basin) to 2049. A federal Consent Decree, known as the Hillview Consent Decree, was approved by the federal court in May 2019. The Hillview Consent Decree provides new deadlines for covering the reservoir, along with design and construction milestones for the KEC tunnel, the Hillview Reservoir Improvements, and stipulated penalties to enforce such milestones. The Consent Decree also includes a \$1 million civil penalty payable to the United States and a \$250,000 penalty to the State (\$50,000 in cash and \$200,000 as an environmental benefit project).

NYCDEP is undertaking a facility planning study which will allow NYCDEP to analyze alternative ways to achieve LT2 compliance. NYCDEP plans to evaluate cover alternatives to identify the most cost-effective solution before committing capital investment funding. The Facility Plan report is due to be completed and submitted to the regulators in 2024 in accordance with the Hillview Consent Decree. Pending the results of LT2 compliance feasibility planning study, significant additional funds will most likely be necessary beyond the 10-year budget planning period. Funding for the pre-cursor projects that are mandated in the Hillview Consent Decree is also included in the CIP.

The Hillview Reservoir Improvements include significant SOGR work for the ancillary facilities, which includes modification of chambers, chemical addition upgrades, flow control improvements, and other upgrades. The Hillview Modifications Basis of Design Report was submitted to the regulators in April 2020, as required by the Hillview Order. Funding is included in the Current Capital Plan for \$346 million for this work at Hillview, and additional funding is in the outer years of the CIP. Some additional funding is required for construction.

### **Kensico Eastview Connection (KEC) Tunnel**

NYCDEP has determined that the KEC tunnel is essential to improve redundancy and increase operational flexibility by having a secondary means to convey water from the Kensico Reservoir to the CAT/DEL UV Facility. The Catskill Aqueduct has not been able to convey water between Kensico and the UV Facility due to hydraulic limitations. As a result, the Delaware Aqueduct has been the only means to convey water from Kensico to the UV plant. The KEC tunnel project will add another connection between these two vital components of the water supply. This is an important high priority project for NYCDEP. Funding of \$827 million is included in the Current Capital Plan, and additional funding is in the outer years of the CIP. The tunnel project is currently in the design phase, and some additional funding is required for construction. The KEC tunnel project has been determined to be a precursor project which is part of the Hillview Cover Consent Order, and the KEC tunnel is considered to be a mandated project.

The KEC tunnel will be approximately two miles in length, starting at an intake chamber on the western side of the Kensico Reservoir to a connection point at the UV Facility. The finished tunnel will be

approximately 27 feet in diameter and 400 to 500 feet below ground. The tunnel will be designed for a peak capacity of 2.6 billion gallons of water per day. Its design accounts for future growth in the City and Westchester County, the potential addition of treatment facilities, and the need to periodically take other aqueducts out of service for maintenance or inspection.

The project also includes new facilities and site work at Kensico Reservoir and the UV Facility. The intake chamber that draws water from Kensico will be upgraded and increased to connect to the new tunnel. Kensico Reservoir's shoreline around that intake will also be improved to prevent sediment from entering the tunnel. The chemical feed systems at Kensico Reservoir will be upgraded to meet the needs of the Delaware Aqueduct and the new tunnel.

### **Dam Safety**

Upstate reservoir dams are critical infrastructure for NYCDEP operations and the safety of the surrounding communities. New York State requires existing dams to be capable of safely passing half of the probable maximum flood (PMF). The PMF is the flood that can be expected from the most severe combination of critical meteorological and hydrologic conditions that are reasonably possible in a particular area. When capital improvements are made at dams, NYCDEP evaluates the ability of the dams to safely pass half of the PMF and the full PMF.

Due to significant SOGR needs to provide continued dam safety, funding is provided for the Olive Bridge Dam, part of the Ashokan Century Program, as described below. The full long-term rehabilitation upgrades for the Gilboa Dam that brought the dam into compliance with the NYSDEC dam safety guidelines have been completed. The remaining upgrades at Gilboa Dam and Schoharie Reservoir are funded at approximately \$28.5 million in the Current Capital Plan. The New Croton Dam requires reconstruction and is funded in the Current Capital Plan with \$145.5 million. NYCDEP is evaluating Delaware system dams and expects to add funding for these upgrades in future capital planning budgets.

NYCDEP has installed additional equipment at several upstate dams to enhance the monitoring capacity during and after storms. In addition to capital programs, NYCDEP maintains an inspection and maintenance program to support dam safety. NYCDEP continues their dam inspection program using engineering contracts and in-house NYCDEP inspectors. NYCDEP operates and maintains a safe dam system for upstate and in-city dams, based upon capital upgrades, inspection and maintenance programs, and emergency action plans.

### **Ashokan Century Program**

In 2017, as part of their commitment to SOGR upgrades in the watershed, NYCDEP announced the Ashokan Century Program. This program will upgrade all infrastructure associated with the Ashokan Reservoir in the Catskill watershed. In addition to the upgrade to the Olive Bridge Dam, this program will include upgrades to the Ashokan Reservoir spillway, dividing weir bridge, and the Ashokan Reservoir headworks. The Current Capital Plan includes \$187.5 million in funding for the Olive Bridge Dam and the Ashokan Reservoir upgrades, and significant additional funding is included in the outer

years of the CIP. This program was originally estimated at \$750 million. However, the Ashokan Century Program costs have increased and is currently estimated at \$1.1 billion as further evaluations have been undertaken.

### **City Tunnel No. 3, Stage 2**

Most of the tunneling work for City Tunnel No. 3, Stage 2 has been completed. The Current Capital Plan includes funding of \$188.6 million for the completion, activation and shaft work (Shafts 17B and 18B) for City Tunnel No. 3, Stage 2 Brooklyn/Queens leg. The Notice to Proceed (NTP) for the first contract was issued in January 2021, and work is proceeding. As of December 2017, City Tunnel No. 3 Brooklyn/Queens leg achieved activation-readiness, which means it is available in case of an emergency. NYCDEP maintains a Stakeholder Management Plan for continuous internal and external communications. Significant ongoing coordination is required with NYCDOT and other city agencies. Full operation of City Tunnel No. 3 Brooklyn/Queens leg is expected once the funded construction contracts are completed. Design is also underway for the connection of the Brooklyn/Queens leg of City Tunnel No. 3 to the Richmond Downtake Chamber, which will connect City Tunnel No. 3 to Staten Island. NYCDEP plans to conduct inspections of CT#1 and then CT#2 once CT#3 is fully in service.

### **Water Main and Sewer Replacement**

The Current Capital Plan includes \$2.53 billion for water main and sewer work (new and replacement) throughout the City, and significant additional funding in the outer years of the CIP. Approximately \$1.38 billion funds sewer work and \$1.15 billion funds water mains in the Current Capital Plan. The spending varies per FY, however, over \$500 million per FY is anticipated for water and sewer work in the Current Capital Plan. BWSO coordinates closely with NYCDDC and other city agencies for water and sewer projects. NYCDEP utilizes several parameters for the selection of water main and sewer replacement, including the age, size, material, and historical performance of the current pipes. The construction of new water and sewer pipes is coordinated with other utility underground infrastructure construction projects. NYCDEP is working to develop a predictive model to forecast the likelihood of future water main breaks.

As discussed in Section 7, additional funding was provided in the October 2021 budget for additional sewer replacement, based upon the action items and recommendations in *The New Normal Report – Combatting Storm-Related Extreme Weather*.

## **8.5 Capital Improvement Program Highlights for the Wastewater and Stormwater System**

Several NYCDEP projects and programs for the wastewater and stormwater system are in various stages of planning, design, and construction. Many of these significant programs are described below.

### **Combined Sewer Overflow (CSO) Program**

The 2012 CSO Consent Order Modification incorporates a hybrid approach of green and grey infrastructure control strategies. The modified Consent Order is based upon an adaptive management approach to solving the CSO water quality issues which incorporates the Green Infrastructure (GI)

Planning. The CSO Order contains milestones and schedules governing the planning, design and construction of a significant number of projects for NYCDEP's Citywide CSO Program. As required by the Order, NYCDEP has developed multiple waterbody-specific Long-Term Control Plans (LTCPs) to control CSOs and improve water quality in NYC's waterbodies and waterways. **Figure 8-8** shows the locations of the combined sewer areas associated with each LTCP waterbody. The goal of each LTCP is to identify appropriate CSO controls necessary to achieve waterbody-specific water quality standards, consistent with the Federal CSO Policy and the water quality goals of the federal Clean Water Act (CWA).

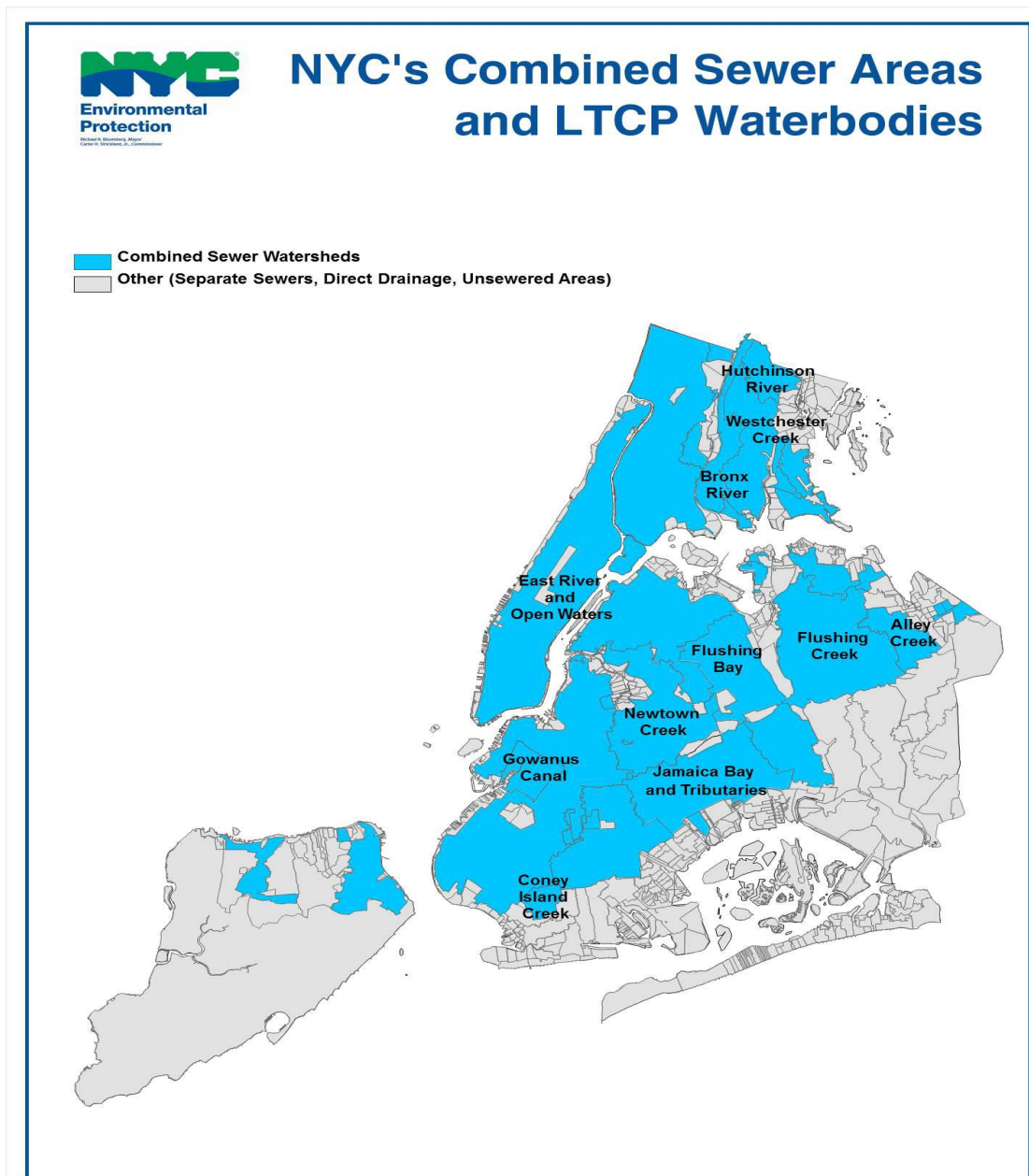


Figure 8-8: Combined Sewer Areas and CSO LTCP Waterbodies

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NYCDEP has submitted eleven LTCPs to NYSDEC, nine of which have been approved. Each approved LTCP identifies plans at each CSO LTCP waterbody. **Figure 8-9** along with **Table 8-1** present the status of the LTCPs.

**Table 8-1: Status of CSO Long Term Control Plans**

<b>Waterbody/LTCP</b>	<b>Status of LTCP</b>
Alley Creek	Approved March 2017
Westchester Creek	Approved August 2017
Hutchinson River	Approved March 2017
Flushing Creek	Approved March 2017
Bronx River	Approved March 2017
Gowanus Canal	Approved March 2017
Flushing Bay	Approved March 2017
Coney Island Creek	Approved April 2018
Newtown Creek	Approved June 2018
Jamaica Bay and Tributaries	Submitted June 2018, Pending approval
Citywide/Open Waters	Submitted September 2020, Pending approval



**Figure 8-9: Status of CSO LTCPs**

NYCDEP submitted a Force Majeure letter to NYSDEC identifying potential delays to the implementation to the CSO Program due to COVID-19 schedule impacts. NYCDEP and NYSDEC are in the midst of ongoing negotiations for revising milestones for CSO projects and any other changes to the CSO projects.

The Current Capital Plan includes approximately \$1.38 billion in funding for grey infrastructure capital projects for implementation of the CSO Program, which includes \$895 million for the CSO Gowanus Superfund facility. The design for Newtown Creek CSO tunnel is funded in FY 22. Additional funding may be required in the outer years of the CIP and beyond the current budget planning period to implement infrastructure required as part of the approved LTCPs.

The LTCPs were based upon water quality criteria in effect at the time the individual LTCPs were developed. Those criteria have evolved over the course of the LTCP program, and the NYSDEC promulgated amendments to 6 NYCRR § 703.4, titled "*Water quality standards for coliforms, enterococci, and E. coli*", effective October 6, 2021. The amendments add site-specific criteria to select Class I and Class SD waterbodies. The new criteria use *Enterococcus* bacteria as a fecal indicator. USEPA has indicated that they are working on their own rulemaking with respect to these waters. NYCDEP may be required to revise the LTCPs based upon *Enterococcus* bacteria rather than the fecal coliform standard. NYCDEP is evaluating the proposed changes to determine the impact on the approved LTCPs.

### **Green Infrastructure (GI)**

Green infrastructure is an approach to wet weather management that is sustainable and environmentally friendly. Many cities across the country have implemented green infrastructure as part of programs for wet weather management and water quality control. Since the release of NYC's Green Infrastructure Plan in 2010, NYCDEP has been planning and implementing green infrastructure. The GI Plan is an adaptive approach to incorporating green infrastructure into NYCDEP's overall CSO program. The initial goal was to capture the first inch of rainfall on 10% of the impervious areas in combined sewer watersheds through detention or infiltration over a 20-year period. As the GI Program has advanced, the goal has evolved to a metric of a 1.67 billion gallons per year reduction in CSO by 2030. NYCDEP's adaptive management strategy includes regular monitoring of green infrastructure performance, continuous evaluation of lessons learned in the field, furthering the understanding of green infrastructure co-benefits, and development of additional cost-effective tools to implement GI. NYCDEP's ongoing Research and Development Program assists in this effort.

The implementation of the GI Program in NYC focuses on three distinct locations: (1) public right of way (ROW) rain gardens, (2) GI on public property, and (3) GI on private properties. NYCDEP has implemented ROW GI assets in partnership with the NYCDOT. The ROW GI assets include the rain gardens (standard and Type D inlets), infiltration basins, and permeable pavements. Infiltration basins have recently been added to the ROW GI asset toolbox. They retain stormwater on site similar to a rain garden, however they do not include a tree. They are installed along street curbs and are designed to mimic existing conditions found throughout the City, with either a concrete or grass strip top (Figure 8-10). The GI assets are designed to manage up to 2,500 gallons each during a storm event. Updated ROW Green Infrastructure Design Standards for new and revised ROW GI have been published. Over 11,000 GI assets have either been constructed or are currently in construction throughout NYC, with 1,500 total equivalent green acres. A “greened acre” represents a volume of runoff managed by a green infrastructure project. It is the same as an “equivalent impervious acre”, which is the term referenced and used in the CSO Consent Order. The “greened acre” was derived from the Performance Metrics Report, since the “greened acre” represents the metrics and targets of green infrastructure projects in a volumetric unit. NYCDEP anticipates the GI Program to reduce approximately 500 million gallons of CSO volume per year in the near future. This is a significant step toward the Consent Order goal of 1.67 billion gallons per year of CSO reduction by 2030. NYCDEP is currently in negotiations with DEC regarding the GI Program. NYCDEP submitted the 2020 Contingency Plan in June 2021. In December 2021, NYCDEP submitted certification of the 1.5% application rate milestone of the GI Program for the CSO Order to the NYSDEC. The submittal includes the constructed assets and corresponding greened acres and CSO volume reduction, that meet the 1.5% application rate of 1,181 greened acres and 507 MGY in compliance with the CSO Order and the Contingency Plan.



**Infiltration Basin with Grass Top**

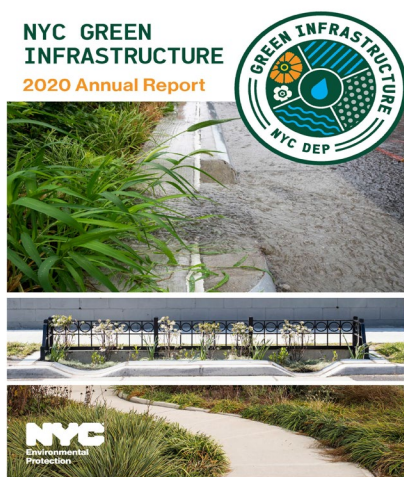


**Infiltration Basin with Concrete Top**

**Figure 8-10: Green Infrastructure Infiltration Basin**

The proposed Unified Stormwater Rule amendments were publicly reviewed and then published as final Rule on February 15, 2022. This Rule includes amendments to Chapter 31 and Chapter 19.1 of

Rules of the City of New York, changing requirements for how stormwater is managed on all new and redevelopment sites that discharge to City sewers. This new rule will update and align stormwater regulations for both separate and combined sewage drainage areas across the City. The Unified Stormwater Rule will provide a consistent stormwater policy and will require new construction to manage more stormwater onsite. It is intended to benefit both the CSO Program and the MS4 programs, as it unifies requirements for both sewage drainage areas. With the implementation of the new rule, greater CSO reductions are expected to further improve water quality and to achieve CSO Consent Order requirements of the 1.67 BGY of CSO reductions by 2030.



**Figure 8-11: Green Infrastructure Annual Report**

NYCDEP coordinates with many city agencies and partnering agencies to implement green infrastructure on public property, including parks, schools, and city housing facilities. NYCDEP engages with partnerships to implement the GI Program across the City, including Trust for Public Land, Department of Education, School Construction Authority, NYC Housing Authority, NYC Department of Parks and Recreation, NYCDDC, Economic Development Corporation, and other city agencies. NYCDEP is introducing the Private Property Green Infrastructure Retrofit Incentive Program in order to aggressively expand green infrastructure retrofits on private property. The GI program will fund large cost-effective stormwater capture opportunities on private property.

The NYCDEP submits an annual report updating NYSDEC on the progress of the GI Plan. The 2020 Annual Report was submitted April 30, 2021 (**Figure 8-11**). It provides a comprehensive summary of the green infrastructure program in NYC. The next update, the Annual Report for 2021, is expected to be released on April 30, 2022. NYCDEP has implemented a database, known as NYC Green HUB for green infrastructure tracking (geographic location, cubic feet of stormwater managed, soil classification, permeability data, year constructed, and other data).

The Current Capital Plan includes approximately \$708 million in funding for green infrastructure projects. Components of the GI program are also funded through the expense budget, including maintenance of the GI assets, research and development and partner agency support. NYCDEP is continuously looking for ways to optimize the GI Program.

### **Southeast Queens Stormwater Infrastructure**

NYCDEP is continuing a comprehensive program to improve drainage to address flooding issues in Southeast Queens. NYC has made a commitment of \$1.9 billion to construct infrastructure projects in Southeast Queens (Community Districts 12 and 13) to build out the drainage program and reduce flooding. In the Current Capital Plan, \$1.2 billion is funded for the Southeast Queens storm sewer program, and additional funding in the outer years of the CIP. The Southeast Queens Program consists of 51 projects which are in various stages of implementation (20 projects have been completed, 6 projects currently in active construction, 5 projects in procurement, 16 projects in design, and 4 projects

in pre-design). NYCDEP has also developed an interactive online map that shows the completed and ongoing projects in Southeast Queens. NYCDEP has developed an approach to continue to address the flooding issues in the area, which consists of quick fixes in areas with the most severe flooding, construction of neighborhood sewers, construction of larger trunk sewers, and the evaluation of opportunities to reduce groundwater flooding. NYCDEP plans to initiate a demonstration project to further evaluate groundwater flooding in the area. NYCDEP is aggressively working on this storm sewer build-out program in Southeast Queens. NYCDEP plans to implement projects in a phased approach, on a priority basis. Green infrastructure and Bluebelts are also being constructed in Southeast Queens to help manage stormwater. NYCDEP has also identified locations in Southeast Queens to implement “cloudburst projects.” Cloudburst projects use a combination of green and grey infrastructure strategies to slow, delay, and divert stormwater to minimize nuisance flooding and damage to property and infrastructure and typically manage more stormwater than traditional green infrastructure.

NYCDEP provides annual updates that show progress of the implementation of the Southeast Queens Plan to the Mayor and City Council. NYCDEP also provides continuous public outreach and program updates to the Southeast Queens community. The buildout of the drainage system in Southeast Queens is a collaboration between NYCDEP, NYCDDC and NYCDOT. NYCDEP continues to maintain close coordination with other city agencies.

#### **Combined Heat and Power (CHP) Facility at North River WRRF**

A project for a Cogeneration Facility at North River WRRF was developed as a sustainability project to provide significant GHG emission reductions and replace the engine-driven main sewage pumps and engine blowers that are near the end of their useful life. The North River WRRF Cogeneration Facility is currently under construction. Additional funding of approximately \$20.6 million is included in the Current Capital Plan in FY 2022. The project consists of replacing the engines driving the main sewage pumps with electric motors, and the existing engine-driven aeration blowers with new aeration blowers that use electric motors. The new cogeneration facilities will provide new gas driven engines and generators which will provide electricity to drive the main sewage pumps and the nine high speed turbo aeration blowers, and heat for digester and building heating. The new engines will operate on both digester gas and natural gas. Fuel oil will no longer be required at the WRRF.

#### **Hunts Point WRRF Digesters and Sludge Thickening**

NYCDEP is planning a major sludge processing upgrade at the Hunts Point WRRF that will improve digestion performance, enhance biosolids quality to enable more beneficial reuse, and increase biogas production. Replacement and upgrade of the digesters at Hunts Point WRRF is funded in the CIP at a level of \$340 million in FY 2022. The upgrade to the sludge thickening equipment is an integral part of the overall sludge processing facilities and improved thickening will make the digesters operate more efficiently. Design funding for the sludge thickeners at Hunts Point is in the Current Capital Plan at a level of \$26 million in FY23. Funding for construction is in FY27.

The sludge thickeners reduce the volume of water that passes through the digesters, which reduces the energy required for heating and increases solids retention time sufficiently. The sludge thickeners

are an important step to produce a product that meets the criteria for Class “B” Biosolids, so that the full program goals are attained.

As discussed earlier in the report, NYCDEP is evaluating potential energy projects in collaboration with SOGR needs. It is anticipated that digesters and sludge thickening at other WRRFs will be evaluated.

### **Citywide Nitrogen Removal Program**

The Upper East River (UER) WRRFs (Hunts Point, Bowery Bay, Tallman Island, and Wards Island WRRFs) and two of the Jamaica Bay WRRFs (26<sup>th</sup> Ward and Jamaica WRRFs) have been operating in Step Feed BNR mode as required by the Nitrogen Consent Judgment for the Phase I Facility Plan and a Stipulation and Order Modifying the Nitrogen Consent Judgment.

NYCDEP and NYSDEC entered into the First Amended Nitrogen Consent Judgement (FANCJ) in 2011 which requires, among other things, nitrogen removal upgrades at the Jamaica Bay WRRFs, construction milestones for the Jamaica Bay WRRFs, and interim nitrogen effluent discharge limits for Jamaica Bay. Coney Island WRRF recently completed construction for BNR upgrades. Construction was completed at Rockaway WRRF for BNR upgrades in 2020, and the completion was accepted by NYSDEC. NYCDEP is evaluating alternatives for future use and operations at the Rockaway WRRF facility. The interim nitrogen load limits for the Jamaica Bay WRRFs are currently being met. The final performance-based nitrogen limit for Jamaica Bay will go into effect 19 months after the last construction completion of nitrogen control upgrades at the Coney Island WRRF. NYCDEP submitted a Jamaica Bay Feasibility Study in January 2020 to evaluate the available nitrogen removal technologies and optimization techniques for existing infrastructure, to identify potential measures to reduce nitrogen discharges from the Jamaica Bay WRRFs and to improve dissolved oxygen (DO) water quality in Jamaica Bay.

Glycerol has been implemented as the supplemental carbon source for additional nitrogen removal. The supplemental carbon addition for Phase II BNR at the UER WRRFs (Hunts Point, Bowery Bay, Tallman Island and Wards Island WRRFs) and the Jamaica Bay WRRFs (Jamaica and 26<sup>th</sup> Ward WRRFs) is operational. NYCDEP and NYSDEC are in ongoing negotiations for a new Nitrogen Consent Order which is anticipated to address optimizing nitrogen removals at the WRRFs and continuation of nitrogen research and development programs. The budget includes funding of \$29 million for the nitrogen program, which includes the conversion of the Sharon demonstration facility at Wards Island to another nitrogen removal process, as part of the BWT's ongoing Research and Innovation Program.

### **Total Residual Chlorine (TRC)**

Prior to discharge to a receiving body, wastewater effluent is disinfected with chlorine at the WRRFs. Excessive residual chlorine can be toxic to aquatic life in the receiving water body. A TRC modified Consent Order between NYSDEC and NYCDEP became effective March 2018, which includes interim TRC limits, proposed final TRC limits and a compliance schedule for the TRC upgrade projects required at the WRRFs. NYCDEP submitted a Force Majeure letter to NYSDEC regarding the COVID-19

pandemic, potential schedule impacts and economic uncertainties. NYCDEP requested a 12-month pause on open TRC Order milestones for the Owls Head, Oakwood Beach, 26<sup>th</sup> Ward, Hunts Point, Tallman Island, and Port Richmond WRRFs. NYCDEP also performed a technical review of the TRC Program which includes a more holistic approach to the TRC projects in the Order. NYCDEP is evaluating options to achieve TRC compliance with plant optimization. NYSDEC and NYCDEP are currently negotiating potential modifications to the TRC Order. NYCDEP is still required to meet the final water quality-based effluent limit for TRC that is required in the current TRC Order, however it is anticipated that alternative solutions and revised schedules will be negotiated. The Current Capital Plan currently includes \$67.4 million for the TRC program.

### Bluebelts

NYCDEP has been successful in developing effective Bluebelt sites in the South Shore of Staten Island since the 1990s. Over the last 25 years, NYCDEP has built more than 70 Bluebelts across Staten Island, with additional sites currently in construction and design. **(Figure 8-12)**. Bluebelts are an innovative stormwater drainage system made up of wetlands, creeks, streams and ponds, which are optimized to help control and filter stormwater from surrounding neighborhoods. NYCDEP is evaluating expansion of the program to sites on the North Shore of Staten Island, Queens and the Bronx, where they would also be effective. Approximately \$435 million is included in the Current Capital Plan for land acquisition and construction to expand the Bluebelts for stormwater management.



**Figure 8-12: Bluebelt Program in Staten Island**

### 8.6 Superfund Designations

NYC has been identified as a potential responsible party (PRP) for the following three Superfund sites: Gowanus Canal, Newtown Creek, and Wolff-Alport Chemical Company. This may have future potential financial impacts to NYC; however, the extent to which NYC will be responsible has not yet been fully determined for the Newtown Creek and the Wolff-Alport Chemical Company sites. The term PRP still applies to NYC for the Gowanus Superfund site although financial responsibility has been identified, as described below.

In March 2010, the Gowanus Canal was declared a Superfund site and USEPA notified NYC that they are considered a Potential Responsible Party (PRP) for hazardous waste under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). On September 30, 2013, USEPA issued its Record of Decision (ROD) for the Gowanus Canal, establishing the dredging, capping and

source control requirements. The ROD requires NYC to build two CSO retention tanks as part of the source control component due to the CSO contribution at Gowanus Canal. In May 2014, USEPA issued a Unilateral Administrative Order requiring the City to design major components of the remedy for the Gowanus Canal, including the CSO retention tanks. In June 2016, USEPA issued a memorandum stating that the size of the two CSO storage tanks should be 8 million gallons at outfall RH-034 (RH tank) and 4 million gallons at outfall OH-007 (OH tank). In March 2020, NYCDEP submitted a Force Majeure letter to the USEPA identifying potential delays to the implementation to the Superfund Gowanus tanks due to COVID-19 schedule impacts. USEPA issued a Unilateral Order to the City in March 2021, requiring the City to design and construct both CSO tanks by March 2029, to complete design and construction of a new bulkhead, and to implement additional stormwater controls in the Gowanus Canal sewershed. Funding of approximately \$895 million is included in the Current Capital Plan for the Gowanus Canal CSO retention facility. Construction contracts for the RH tank are expected to start in FY 2023. Additional funding of \$329 is included in the outer years of the CIP. NYCDEP is continuing with design of the OH tank. The design costs of the in-canal portion of the remediation (dredging and capping of sediments) have been allocated between NYC and twenty other parties. In January 2020, the USEPA issued a Unilateral Order to the six largest PRPs to implement the in-canal remediation in the upper reach of the Canal, the first of three portions where this work will occur.

In September 2010, Newtown Creek was declared a Superfund site. In July 2011, NYCDEP entered into an Administrative Settlement Agreement and Order on Consent with EPA, along with five other PRPs that own or operate facilities adjacent to Newtown Creek in the investigation of conditions in Newtown Creek and the evaluation of feasible remedies. The investigation and feasibility study are currently ongoing and is expected to continue until 2023. The City's financial share has not yet been determined. The settlement does not cover any remediation that might eventually be required by USEPA to address the contamination identified as a result of the investigation and evaluation. NYCDEP has initiated a support contract for the Gowanus and Newtown Creek Superfund Programs.

In May 2014, the USEPA listed Wolff-Alport Chemical Company in Queens as a Superfund site, based upon radioactive contamination at the site. USEPA has indicated that the Superfund process would include an investigation of impacts to the NYCDEP sewer system from operations at the chemical company site. Radioactive material was disposed on-site and also into the sewer system. In September 2017, USEPA issues its ROD requiring jet washing and replacement of sewers and excavation of contaminated portions of the right-of-way. In December 2017, USEPA notified NYC of its status as a PRP for the work on City property pertaining to this Superfund site. In September 2019, the USEPA issued a Unilateral Administrative Order requiring the City to perform additional investigatory work and develop a remedial design in accordance with the ROD. NYCDEP is developing a work plan for the pre-design investigation. NYCDEP is also coordinating with NYCDOT and NYCDCC on this Superfund site.

NYC operated a wastewater treatment plant in the Town of Mt. Kisco which was decommissioned in the 1960s. Elevated radiation levels have been detected throughout the site. These levels are most likely due to the operations of Canadian Radium & Uranium Corporation (CRUC) which processed radioactive materials in Mt. Kisco and most likely sent wastewater to the Mt. Kisco WWTP. Based upon

NYCDEP's former operation of the Mt. Kisco WWTP, NYCDEP signed an Order of Consent with NYSDEC which committed NYCDEP to fund an environmental study of the site. NYCDEP completed the preliminary environmental study and submitted to NYSDEC. A new or amended Order is anticipated between NYCDEP and NYSDEC that may require further investigations and actions. NYCDEP may be required to fund remedial design and remedial action at the site, along with waste disposal, which could amount to significant costs.

## **8.7 Potential Future Long-Term Water and Wastewater Projects Beyond Current Budget Planning**

### **Consolidation Plans for Jamaica Bay WRRFs - Rockaway WRRF**

NYCDEP has evaluated alternatives for future operation of the Rockaway WRRF for several years. NYCDEP completed a Facility Plan for the Rockaway WRRF in 2014, which analyzed alternatives for future Rockaway WRRF operations. NYCDEP revisited this consolidation option and expanded the options to evaluate eight alternatives. As a result of the recent analysis, the recommended alternative is the consolidation of Rockaway and 26<sup>th</sup> Ward WRRF, with a discharge to the Atlantic Ocean, including the flow from the Jamaica WRRF. The consolidation of Rockaway and 26<sup>th</sup> Ward flows would be treated at the 26<sup>th</sup> Ward WRRF, and the Rockaway WRRF would be taken out of operation. This plan would require a new effluent pump station at 26<sup>th</sup> Ward WRRF to pump the consolidated 26<sup>th</sup> Ward and Jamaica WRRF effluent to the Atlantic Ocean for discharge. This recent Rockaway Consolidation Plan Update analysis has determined this option to be the most economical solution to address a series of water quality issues (limit of technology for nitrogen, ammonia toxicity in Hendrix Creek, etc.).

### **Renewable Rikers**

In 2019, City Council passed legislation for the closing of the Rikers Island Detention Facility by 2026. Subsequently, City Council introduced legislation that requires studies to be completed to determine future use of Rikers Island, known as Renewable Rikers. NYCDEP will conduct a feasibility study to evaluate the relocation and consolidation of the four Upper East River (Bowery Bay, Tallman Island, Hunts Point, Wards Island) WRRFs to Rikers Island (**Figure 8-13**). Rikers Island consists of 413 acres and is located in the East River between the Bronx and Queens (**Figure 8-14**).



**Figure 8-13: Location of Rikers Island and Four NYCDEP WRRFs**

The WRRF consolidation under consideration, the Reimagined Rikers Island WRRF, would potentially provide a step toward reaching city-wide goals for greenhouse gas reduction, carbon neutrality, and energy efficiency while meeting the challenges of increasing population and climate change. A formal public outreach process regarding the study to obtain community input will commence in Spring of 2022.

NYC Mayor's Office of Sustainability will conduct a feasibility study to evaluate different types of renewable energy sources combined with battery storage to be located on Rikers Island.



**Figure 8-14: Rikers Island**

#### **Potential Further Nitrogen Removal in NYC WRRFs**

The USEPA Long Island Sound Study is evaluating further nitrogen reductions for the Long Island Sound. The results of this analysis have the potential to impact NYCDEP UER WRRFs by requiring further nitrogen removals. NYCDEP continues to remain involved and will provide meaningful input throughout this Nitrogen Reduction Strategy.

### City Tunnel No. 3, Stage 3 and Stage 4

The long-term planning for the next phase of City Tunnel No. 3 is the Stage 3 (known as Kensico City Tunnel) and the Stage 4 extension. The Stage 3, Kensico City Tunnel would extend from Kensico Reservoir to Tunnel 3, south of Hillview Reservoir. Stage 4 would deliver additional water to the eastern parts of the Bronx and Queens. It would extend southeast from the northern end of Stage I in the Bronx to Queens and then southwest to interconnect with the Queens portion of Stage 2. City Tunnel No. 3 Stage 4 will enable The System to maintain full service even if Tunnel 1 or 2 were shut down. NYCDEP must decide on its next long-term priorities and needs, and therefore a schedule or budget for this anticipated next phase will have to be developed. These stages would incur beyond the current CIP planning period.

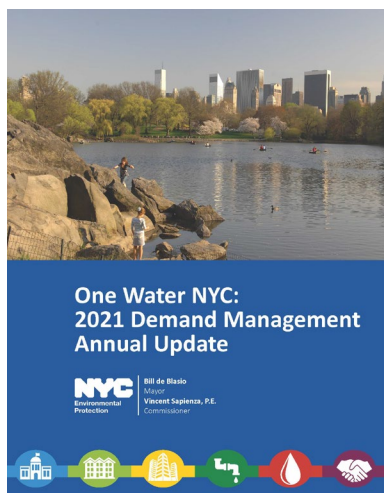
## **9.0 EXPENSE BUDGET**

The FY 2022 expense budget released in the Preliminary Plan is \$1.591 billion. The proposed FY 2023 expense budget in the Preliminary Plan is \$1.48 billion. Expense budget projections for FY 2023 are currently being evaluated based upon the new needs of The System and will require adjustment when the evaluation is complete. The FY 2023 expense budget is expected to increase and be updated in the Executive Budget, to be released in late April 2022. The anticipated increase of the \$1.48 billion proposed FY 2023 expense budget is primarily due to identified new needs of the System and inflation. The expense budget is made up of both Personal Services (PS) costs and Other than Personal Services (OTPS) costs. The PS budget is made up of staff salary, fringe benefits and pension costs. The OTPS costs make up the remaining expense budget, including taxes, chemicals, supplies, fuel oil, gasoline, biosolids, equipment, contract services, leases, FAD, training, and other requirements/needs.

There are many competing needs within the Expense budget each year; therefore, NYCDEP must continue to evaluate all requirements of the water and wastewater system when completing the expense budget. In accordance with applicable regulations and directives, NYC decides the projects (or elements of a project) that are eligible for capital funding. The remaining needs are covered in the expense budget. In addition to the day-to-day requirements to operate and maintain the NYCDEP system, the expense budget must also cover planning studies that are necessary to prioritize capital investments, but the studies themselves are not capital eligible. Planning studies/Facility Plans are important aspects of long-term management of The System and should be carried out before any significant capital funds are committed to a specific project or facility.

## 10.0 OPERATIONAL PERFORMANCE OVERVIEW

### One Water NYC – Water Conservation



**Figure 10-1: Water Demand Management 2021**

NYCDEP released *One Water NYC: 2021 Demand Management Annual Update* in May 2021 (**Figure 10-1**). NYCDEP's current Water Demand Management Plan has achieved significant water savings. The plan focuses on the following key strategies for managing water demand: The Municipal Water Efficiency Program, the Residential Water Efficiency Program, the Non-Residential Water Efficiency Program, Water Distribution System Optimization, Water Supply Shortage Management, and Wholesale Customers Demand Management. NYCDEP created an interactive online map identifying the location of water conservation projects, the estimated demand savings, and the estimated energy and greenhouse gas reductions anticipated from each project.

The average daily consumption for FY 2021 was 978 MGD. **Figure 10-2** presents the annual water consumption for the City for almost three decades. Water conservation measures taken by NYCDEP in the 1990s have resulted in a steady reduction in the overall water demand. Water demand has decreased by approximately 36% since the 1990s. More recent declines in water consumption have been noted most likely attributed to continued conservation measures, water usage metering, availability of easily accessible data for tracking, and weather patterns. New York's per capita water demand has declined from its peak of 213 gallons a day per person in 1979 to 118 gallons per day per person in 2020. This change reflects a 45% reduction in per capita water demand.<sup>7</sup> It is anticipated that strategies identified in the NYCDEP Water Demand Management Plan will continue to reduce the water demand.

<sup>7</sup> One Water NYC: 2021 Demand Management Annual Update, NYCDEP.

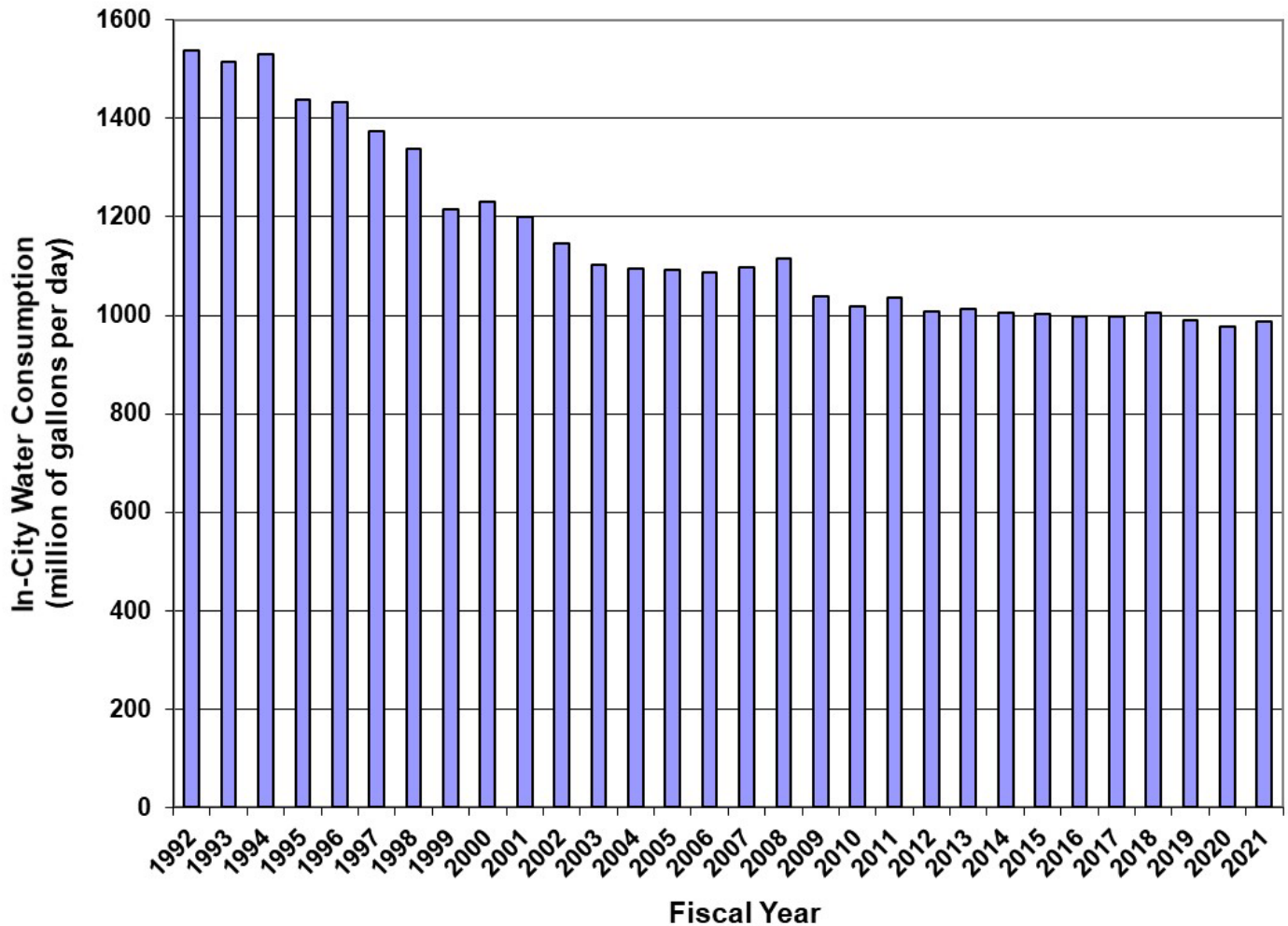
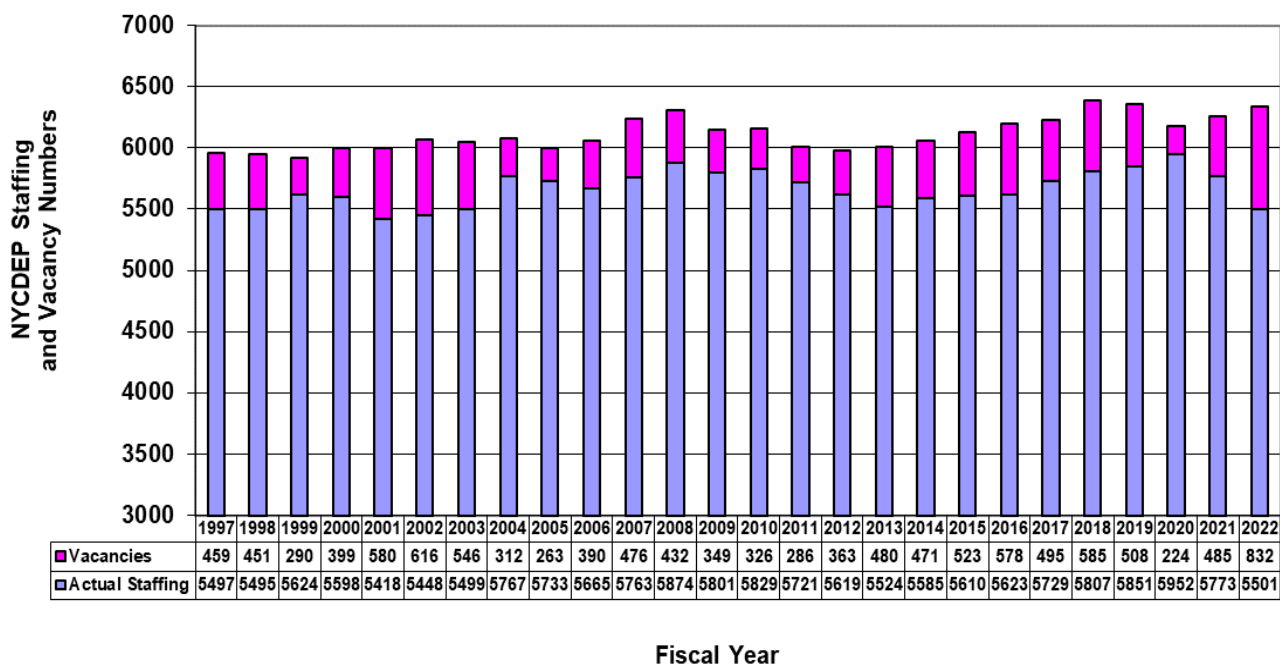


Figure 10-2: New York City Average Daily Water Demand in Million Gallons per Day (MGD)

### System Staffing Levels

**Figure 10-3** shows the NYCDEP approved staffing positions and vacancies for the past 25 years. Over the last year, the total approved staffing positions have increased by 75, however there was a decrease in approved positions in BWS and BWT. The total number of NYCDEP vacancies has increased by 72%, from 485 in FY 2021 to 832 in FY 2022. Of the 832 vacancies within NYCDEP, over 60% of the staff vacancies are from the Operating Bureaus - BWT, BWS and BWSO. NYCDEP has faced a significant number of retirements and departures, along with challenges in the hiring process.



**Fiscal Year**  
**Figure 10-3: NYCDEP – Staffing and Vacancy Levels FY 1997-2022**

*Bureau of Wastewater Treatment.* BWT must have the ability to successfully fill Sewage Treatment Worker (STW) positions. The overlap between new hires and retiring employees is essential for knowledge transfer, and mentoring programs that encourage the interaction between experienced staff and new hires are extremely important. In addition, BWT has identified new operation and maintenance staffing needs as new facilities come on-line. BWT has also identified additional staff needs to provide timely preventive maintenance for critical equipment and avoid more costly corrective maintenance when critical equipment fails. Currently, BWT uses continuous overtime to fill ongoing operational needs. Other significant vacancies also exist throughout BWT.

*Bureau of Water Supply.* Retention of skilled staff and succession planning is challenging particularly for licensed operators of the new water treatment facilities and particularly the Croton WFP. Currently, the Croton WFP is operating at less than full capacity. In preparation for the Delaware Aqueduct shutdown, this facility will have to operate both Plant A and Plant B in advance of October 2022. When the Delaware Aqueduct is taken out of service, the Croton WFP will have to operate both Plant A and Plant B for several months in order to meet water supply demands. Staff recruitment and retention are influenced by aligning civil service titles with specific job duties, in addition to the overall compensation and benefits package NYCDEP is able to offer.

*Bureau of Water and Sewer Operations.* New staffing needs have been identified in order to expand the pro-active inspection of water mains. BWSO plans to add three additional crews to improve valve inspection and exercising so that they can meet their stated goal, which is consistent with industry standards. By increasing the valve inspection, crews will be more able to promptly shut off water when water main breaks occur. New staff needs have been identified for increased catch basin cleaning/inspection.

*Sustainability.* The NYCDEP will need to increase seasonal Green Jobs that perform maintenance of green infrastructure assets throughout the City, as the number of green assets have increased. Over the next few years, GI assets are expected to increase in NYC, at the same time as GI staffing vacancies are also increasing. NYCDEP is currently posting jobs for seasonal GI employees to help care for its constructed green infrastructure assets and plans to hire soon.

The hiring restrictions have put a strain on NYCDEP's resources and continue to challenge operations, planning and engineering. NYCDEP continues to operate water and wastewater facilities 24 hours per day, 7 days a week with essential workers/operators. DEP's Mitigation Plan calls for increased overtime and re-allocation of staff to critical positions. However, the mitigation measures taken are short term solutions that are not sustainable over long term operations. The current staffing level is not sustainable for future safe operation and management of The System.

The current hiring restrictions are not sustainable and can become more problematic if allowed to continue. There is an increased risk for long-term operational impacts, compliance (permit and Consent Order), and safety concerns. The hiring restrictions have required NYCDEP to operate inefficiently, requiring significant overtime. NYCDEP will need to resume hiring additional staff to offset the reduction in staff due to attrition. Although the impact of the hiring restrictions and the pandemic on the NYCDEP workforce is comparable that experienced by the economy as a whole, the civil service job classifications and respective salary ranges for many of the available positions appear to be unique challenges to NYCDEP's ability to recruit and retain qualified personnel. NYCDEP will need to continue discussions with DCAS and OMB to improve recruitment and retention and bring vacancies more in line with historical levels.

## Operational Performance Indicators

Many operational parameters can be reviewed to assess the effectiveness of operating programs. Several performance indicators for water and sewer operations are summarized below. However, other parameters can impact these indicators, such as localized weather patterns.

A total of 445 water main breaks were reported in FY 2021, which translates to 6.4 breaks per 100 miles of main over a 12-month period (see **Figure 10-4**). The range of water main breaks that NYC has recently experienced remains much lower than the average frequency of water main breaks experienced by other municipalities in the United States (various studies show overall average annual break rates for all pipe materials average 25 breaks per 100 miles, 21-25 breaks per 100 miles, 14 breaks per 100 miles depending upon the study and utilities surveyed). NYCDEP BWSO operations continue a preventive maintenance program to target pressure reducing valves by exercising valves, inspecting regulators and utilizing predictive modeling to help prevent the occurrence of water main breaks, costly repairs, leaks and disruption of service. In addition, BWSO prioritizes replacement of water mains based upon those with the greatest risk of breakage. The majority of water main breaks occur in the winter since the water mains are impacted by the freeze/thaw cycles in the colder temperatures. NYCDEP restores water to residents following a break within an average of 4.1 hours after confirming the water main break.

NYCDEP's goal is to target a 1% or 100-year annual water main replacement cycle (approximately 65 miles/year). Utilities have a 125-year water main replacement rate as a national average, which is an average of 0.8% of installed pipe replacement each year. NYCDEP achieved approximately 38.7 miles of new water main replacement or reconstruction in 2021, and an average of 46.4 miles of new water main replacement or reconstruction over the past 20 years. NYCDEP's goal is to target a 0.75% or 133-year annual sewer replacement cycle (approximately 52.5 miles/year). NYCDEP completed construction or reconstruction of 27.9 miles of sewer lines in 2021, and an average of 26.7 miles of sewer line construction or reconstruction over the past 20 years. BWSO plans to accelerate the sewer replacement cycle. The amount of water main replacement and sewer replacement varies from year to year based upon funding and other factors. The average sewer replacement per year is typically less than the water main replacement due to operating conditions and pipe materials.

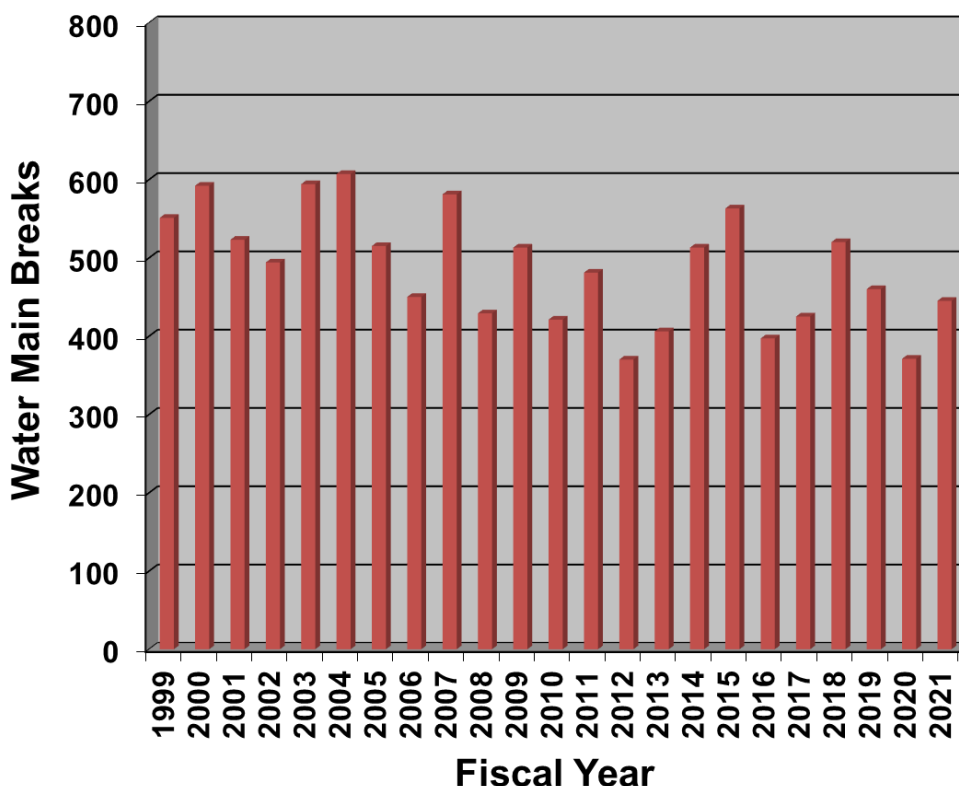
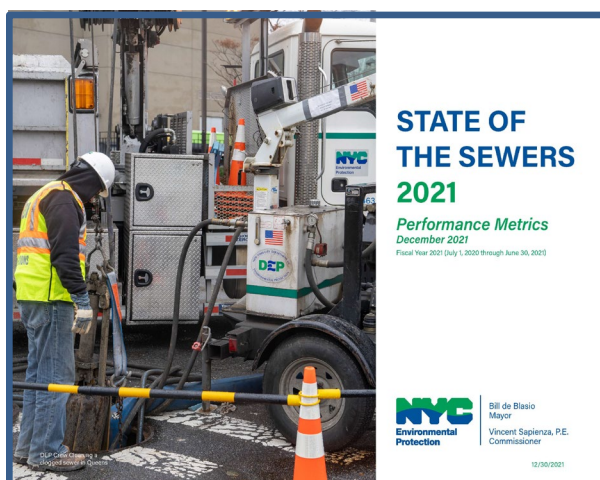
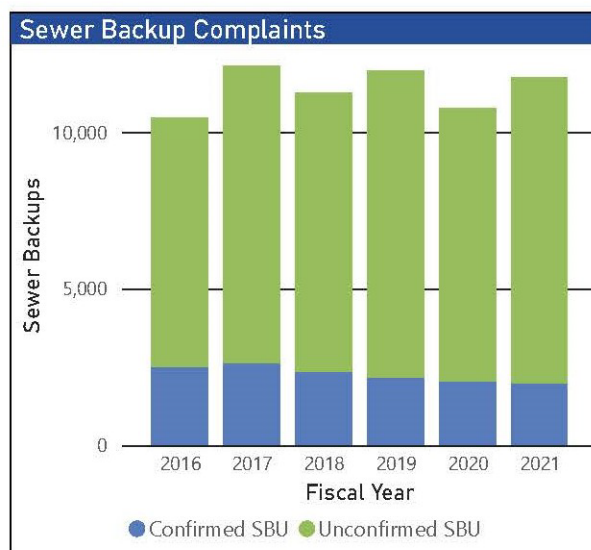


Figure 10-4: Total NYCDEP Water Main Breaks per Fiscal Year

A total of 27,189 catch basins were cleaned by NYCDEP in FY 2021. BWSO field crews are using tablets in the field to track catch basin cleaning data. The number of catch basins that were surveyed and inspected in FY 2021 was 29.8% of the total (148,000 catch basins), which is a reduction from FY 2019 due to the sunset of Local Law 48 of 2015. LL 48 mandated the annual inspections of all catch basins for FY 2017, FY 2018 and FY 2019. Following the LL 48 sunset, BWSO had planned to return to the previous inspection frequency of once every three years; however, BWSO recently changed plans to increase catch basin frequency in specific areas and to clean when necessary.

As shown in **Figure 10-5**, NYCDEP received 11,752 sewer backup (SBU) complaints in FY 2021, which includes confirmed SBUs (on NYCDEP infrastructure) and unconfirmed SBUs (not on NYCDEP infrastructure or not found). Response time for SBUs was 2.7 hours on average, an improvement on prior years, and well below the target of seven hours. NYCDEP has found that the significant majority of confirmed sewer backups can be attributed to fats, oils and grease (FOG) buildup in the sewers. NYCDEP has continued to implement and expand aggressive operational and public outreach

initiatives to address the FOG problem in the sewers. NYCDEP continues to use a public outreach campaign to educate the public what should not be flushed down the toilet (wipes, cooking oil, and many other personal hygiene products) as they impact the operation of sewers and treatment plants. This campaign is known as **Trash It. Don't Flush It. FatbergFree.nyc**.



**Figure 10-6: State of the Sewers 2021**

BWSO issued their annual *State of the Sewers 2021 Report*, which documents several metrics on sewer operations across the five boroughs (Figure 10-6).

NYCDEP continues to use a data-driven proactive approach to operate and maintain the sewer system.

#### Operational and Maintenance Program Summary and Updates

*Water Supply and Treatment Operations.* NYCDEP strives to increase the reliability, flexibility and redundancy of overall water supply operations. The interconnection of the Delaware

Aqueduct with the Catskill Aqueduct at Shaft #4, which allows water from the Delaware Aqueduct to be diverted to the Catskill Aqueduct, has been operational since 2015. This interconnection provides operational flexibility and an additional tool in dealing with turbidity incidents following high rainfall in the Catskill watershed. The upgrades at the Croton Falls Pump Station and the Cross River Pump Station provide conveyance flexibility to NYCDEP and provide the ability for Croton water to be supplied to the Delaware Aqueduct, if required in emergencies or when parts of The System are out of service for planned or unplanned maintenance, as needed. NYCDEP must receive NYSDOH approval prior to

operating Croton Falls and Cross River Pump Stations. In addition, the connection between the Catskill Aqueduct and Croton allows blended water to be sent to the Croton WFP if necessary. NYCDEP strives to maintain/ increase operational flexibility in the operations of the vast network of upstate reservoirs and aqueducts in order to reliably deliver safe drinking water to NYC on a continuous basis.

**Croton Operations.** The Croton WFP began sending treated drinking water to the NYC distribution network in May 2015. In November 2015, Croton demonstrated operations at its full water production rate (290 MGD). Depending upon the water supply demands, NYCDEP will continue to vary water production at the Croton WFP. Croton WFP has been operational during the Catskill Aqueduct shutdowns, and as needed to provide BWS with operational flexibility. During the upcoming Delaware shutdown, Croton WFP will be operating Plant A and Plant B for an extended period. NYCDEP scientists and engineers continue to evaluate seasonal variations in water quality from the Croton watershed. In 2020, BWS installed new filter media at Croton WFP by removing the old anthracite filtering and replacing it with granular activated carbon (GAC) filters to address the taste and odor issues.

**UV Operations.** The Cat/Del UV Facility has been in operation since October 2012. NYCDEP BWS Operations staff successfully took over 100% control of the facility on June 15, 2013. The UV facility is the largest UV water disinfection facility in the world with a capacity to disinfect 2.4 billion gallons per day. It is currently receiving and providing UV disinfection to all Cat/Del waters. Currently, water is transferred from the Kensico Reservoir to the Cat/Del UV Facility via the Delaware Aqueduct.

**Drinking Water Quality and Quantity.** NYCDEP released the *New York City Drinking Water Supply and Quality Report for 2021* on February 28, 2022 (**Figure 10-7**). NYCDEP conducts significant monitoring of the source water and in-city water quality. In FY 2021, NYCDEP collected 32,900 samples from the



**Figure 10-7: New York City Drinking Water Supply and Quality Report 2021**

distribution system and performed approximately 392,000 analyses, meeting all state and federal monitoring requirements. In addition, NYCDEP collected more than 11,400 samples and performed approximately 164,000 analyses from the upstate reservoirs and watersheds. Approximately 2.9 million robotic monitoring measurements were made to support FAD watershed protection programs and to optimize water quality. Microbiologists, chemists and other scientists with the BWS test water from key locations across the watershed and the City at NYCDEP laboratories. NYCDEP water quality laboratories are located in Hawthorne, Kingston, Grahamsville and Queens. As of April 5, 2022, the overall storage in NYC's water supply system stands at 99.2% of capacity, compared to the normal levels at this time of 97.2% of capacity.

**HAA5.** NYCDEP had recent exceedances for Haloacetic Acids (HAA5). HAA5 is a disinfection by-product that is caused by the reaction of chlorine and organic matter. The exceedance is not an immediate health risk; however, customers have a right to know why this happened and what NYCDEP is doing to correct this situation. If this had been an immediate public health concern, customers would have been notified within 24 hours. An average of four quarterly samples at each location is used to determine compliance with a level of 0.060 milligrams/liter (mg/L). On November 3, 2021, three samples exceeded the standard (two in Staten Island and one in Brooklyn). On February 1, 2022, one sample exceeded the standard (located in Staten Island). In response to this exceedance, NYCDEP is taking corrective actions, including reducing chlorine, reconfiguring water distributions, continuing research and running a pilot program. NYCDEP expects to be in compliance by May 2022, as the HAA5 standard is an annual average of quarterly results.

**Emerging Contaminants.** NYCDEP BWS implemented an Emerging Contaminant Monitoring Project (ECMP) throughout the NYC watershed in 2019. Over 140 emerging contaminants were tested, including per- and polyfluoroalkyl substances (PFAS), including perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS). The results were posted quarterly on the NYCDEP website. These materials were often not detected, or they were detected at levels below New York State's maximum contaminant levels for drinking water of 10 parts per trillion (ppt) for the PFOS and PFOA.

**Operation Support Tool.** NYCDEP utilizes the Operation Support Tool (OST) for various decision making and operating modes. The OST model links water quality and water quantity models, uses near real-time data for reservoir levels, stream flows entering reservoirs, snowpack and water quality in streams and reservoirs, and it includes National Weather service forecasts.

**Wastewater Operations.** BWT utilizes predictive maintenance methods in order to better identify maintenance and replacement cycles and increase overall reliability of the WRRF equipment. Examples of predictive maintenance include measuring mechanical wear on equipment parts and using thermographic cameras to examine electrical systems. This program is anticipated to save on capital replacement and energy costs.

**BNR Operations at the Wastewater Resource Recovery Facilities.** NYCDEP has been operating in Step Feed BNR mode at several of the NYCDEP WRRFs (Hunts Point, Bowery Bay, Tallman Island, Wards Island, 26<sup>th</sup> Ward, Rockaway, and Jamaica WRRFs). Due to the long-term planning and significant capital projects that have been implemented, NYCDEP operations have been achieving the final total nitrogen (TN) removals established for the Upper East River. Due to the required upgrades at the plants, the UER WRRFs have seen a significant reduction in TN in the effluent. The final TN load for Jamaica Bay will be performance-based and will go into effect 19 months after construction completion of the BNR upgrades at the Coney Island WRRF.

**Harbor Water Quality.** NYC has been collecting and maintaining records of water quality data for over 100 years. The New York Harbor Water Quality Survey currently consists of 89 sampling stations harbor-wide, with 40 located in open waters and another 49 located in tributaries. NYCDEP has increased the number of monitoring sites throughout the harbor and at the mouth of key tributaries in order to evaluate the effectiveness of the NYCDEP stormwater management and CSO control projects.

The number of water quality parameters measured has increased from five at the start of the New York Harbor Water Quality Survey Program to 27 water quality parameters at present.

*Sludge Vessels.* In FY 2014, NYCDEP commissioned three new sludge vessels, the Motor Vessel (M/V) Hunts Point, the M/V Port Richmond and the M/V Rockaway. The three new ships join the M/V North River and the M/V Red Hook sludge vessels. The sludge vessels transport liquid sludge from the six WRRFs not served by onsite dewatering facilities to those WRRFs with dewatering facilities.

*Biosolids.* NYCDEP typically produces 1,400 wet tons per day of biosolids from the wastewater treatment operations at the 14 WRRFs. NYCDEP is developing a Biosolids Strategic Plan to identify alternative end uses for NYCDEP biosolids. The majority of biosolids from NYCDEP WRRFs have been landfilled in recent years, however, NYCDEP is transitioning to beneficial reuse. BWT plans to continue to increase the beneficial reuse of biosolids, with the goal of 40% beneficial reuse by 2025. NYCDEP continues to increase the amount of beneficial reuse contracts going forward. Beneficial reuse of biosolids supports the OneNYC Mayoral initiative of zero waste to landfills by 2030 due to the significant environmental and sustainability benefits it provides.

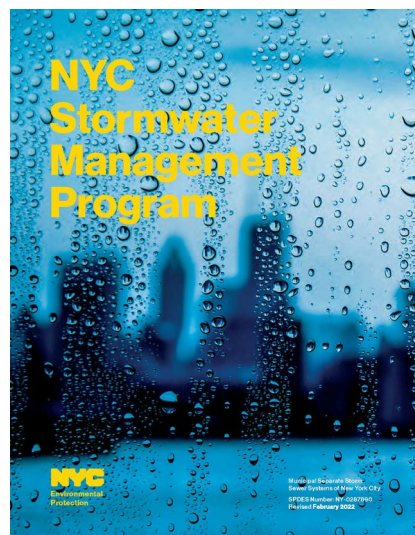
*Environmental Health & Safety (EH&S).* NYCDEP maintains a robust and comprehensive EH&S program across all bureaus throughout the NYCDEP. NYCDEP provides consistent EH&S training so that staff can carry out their work responsibilities safely and in compliance with the many local, state and federal regulations. The EH&S Group is responsible for a comprehensive EH&S compliance program, all EH&S training, audits, EH&S employee surveys and the NYCDEP internal compliance office. EH&S is carried out by in-house NYCDEP management and staff as well as EH&S contracts. Safety is one of NYCDEP's core values as identified in the Strategic Plan. Over the past decade, NYCDEP has created a culture where safety comes first for every employee, contractor and the public.

Safety has remained a priority for NYCDEP during these ongoing challenging times during the global pandemic. NYCDEP continues to put safety as a top priority and is committed to creating the safest workplace for everyone involved in their work at NYCDEP.

### **Permit Updates**

*Wastewater Treatment.* In 2020, NYCDEP completed the comprehensive State Pollutant Discharge Elimination System (SPDES) Permit Renewal Applications for the 14 NYC WRRFs. NYCDEP is in the final stages of negotiations with NYSDEC for revised and renewed SPDES permits. The current SPDES permits for the 14 WRRFs expired in 2020; however, NYCDEP received an Administrative extension, as negotiations are ongoing for new SPDES permits. NYCDEP is operating in accordance with the current SPDES permits. Based upon diligent wastewater treatment plant operations, 99.8% of the NYCDEP wastewater treatment plant effluent met state pollutant discharge elimination standards in FY 2021. For the first four months of FY 2022, measurement of effluent samples drawn from the plants indicated that 99.8% of the NYCDEP wastewater plant effluent met state pollutant discharge elimination standards. The new permits will require testing for *Enterococcus* and free cyanide, and compliance limits will be imposed.

**Stormwater.** NYSDEC issued a final municipal separate storm sewer system (MS4) permit for NYC on August 1, 2015. NYSDEC published a new draft Citywide MS4 permit on January 5, 2022 for public review and comment. It is anticipated that the new MS4 final permit will be issued in the near future. A portion of New York City has separate storm and sanitary sewer systems. The storm sewers are addressed under the MS4 permit and the separate sanitary sewers send flows to the WRRFs, which operate under the SPDES permits. NYC is the permit holder since the MS4 requirements cover 14 city-chartered agencies. However, NYCDEP coordinates all required activities under the permit. In October 2013, an Executive Order was signed addressing coordination and implementation of stormwater controls and MS4 permit requirements for NYCDEP and other NYC agencies. Memorandums of Understanding (MOUs) have been developed between NYCDEP and the chartered city agencies that are impacted by the MS4 permit. As required by the MS4 permit, NYC established legal authority in 2017 with the passage of Local law 97. The city has established a Stormwater Controls Working Group that includes representatives from each agency that meet quarterly to discuss stormwater program development tasks and permit-related information. The MS4 permit includes robust requirements, which significantly expand the city's obligations to reduce pollutants discharging to the storm sewers. The MS4 permit requires NYC to submit a Stormwater Management Program (SWMP) Plan within three years of the effective date of the permit. The original SWMP was submitted August 1, 2018. Key components of the SWMP include public education and outreach, mapping, illicit discharge detection and elimination (IDDE), construction site stormwater runoff control, post-construction stormwater management, pollution prevention and good housekeeping for municipal operations, industrial stormwater sources, control of floatables and settleable debris, monitoring and assessment of controls, and impaired waters. The SWMP Plan was approved by NYSDEC in March 2019. In the fall of 2021, the City updated the SWMP to reflect the current status of program implementation and the City's compliance with the 2015 MS4 Permit. The updated SWMP was released in February 2022 (**Figure 10-8**). The MS4 Permit includes annual reporting requirements. NYCDEP plans to highlight major programmatic changes in the next MS4 Annual Report, which is due September 30, 2022. As discussed previously in the report, the Unified Stormwater Rule will benefit MS4 areas by requiring more on-site stormwater management.



**Figure 10-8: SWMP Plan**

## **11.0 OTHER NOTEWORTHY ISSUES AND COMMENTS**

### **Lead**

The finalized rule of the Lead and Copper Rule Revisions (LCRR) became effective December 16, 2021. The LCRR includes a three-year period to achieve compliance; compliance must be achieved by October 16, 2024. On December 16, 2021, USEPA announced that they will be issuing Lead and Copper Rule Improvements, which will further revise the rule, before the 2024 compliance date. Some of the requirements NYCDEP has already been implementing and some will require new programs. There are significant and complex changes to the LCRR that will have an impact on NYCDEP and will make compliance more stringent and challenging.

Compliance and associated actions are based upon two different levels in the LCRR. Although the lead action level remains at 15 ug/L, the LCRR establishes a new trigger level of 10 ug/L. Another significant change to the LCRR is that only homes with lead service lines (LSL) will count toward compliance, whereas homes with copper pipes and lead solder were included in the monitoring pool for the current Lead and Copper Rule. The sampling methodology has changed also. The current rule requires collection of a first liter sample after 6-hour stagnation; however, the revised rule requires an additional fifth liter sample, which would represent water sitting in the lead service line. Additional requirements of the LCRR include annual updates of the LSL inventory, additional sampling in elementary schools and childcare facilities, and additional public education elements.

The drinking water supply is lead-free when it leaves the upstate reservoir system. The city-owned distribution system is also lead free. NYCDEP is currently in compliance with the current Lead and Copper Rule. NYCDEP has an active corrosion control program in place in order to reduce lead absorption from service lines and internal plumbing. NYCDEP treats the water with food grade phosphoric acid and sodium hydroxide. Sodium hydroxide is added to raise the pH and reduce corrosivity, which prevents the leaching of lead from pipes into the drinking water. Phosphoric acid is added to create a protective film on pipes that reduces the release of metals, such as lead, from household plumbing. In certain cases, privately owned infrastructure contains lead such as the LSL that connects the homes to the city-owned water mains. Under the current federal Lead and Copper Rule, mandated at-the-tap lead monitoring is conducted at select households throughout New York City. The at-the-tap monitoring results are presented in the annual *New York City Drinking Water Supply and Quality Report*. NYC residents can request a free lead kit to test their water.

NYCDEP has been engaged with the National Drinking Water Advisory Council (NDWAC) Lead and Copper Rule Working Group, Water Research Foundation expert panel, and others. NYCDEP has taken a pro-active approach and has initiated studies to further optimize corrosion control, better understand lead exposure and help prepare for the LCRR. BWS is continuing a pilot program in City Island in the Bronx to further optimize corrosion control treatment by increasing the orthophosphate (PO<sub>4</sub>) dosage.

In January 2019, a plan called LeadFreeNYC was released, which is a comprehensive roadmap to eliminating lead exposure in NYC children. A NYS Health Department grant of \$5.3 million has been

given to NYC for NYCDEP to pilot a program to replace lead service lines for low-income single-family homeowners. As part of this LeadFreeNYC program, NYCDEP has also posted a map of NYC with potential lead service lines on the LeadFreeNYC website.

### **Awards**

NYCDEP capital program, operations and customer service have been recognized throughout the industry by professional and trade organizations.

The Catskill Aqueduct Rehabilitation project has earned the Tappan Zee Award, a recognition given by the Lower Hudson Valley Branch of the American Society of Civil Engineers (ASCE) for the best large project of the year. The rehabilitation of the 92-mile Catskill Aqueduct has been one of the most complex upgrades in the history of the NYC water supply. The project spans 74 miles across four counties and 17 individual municipalities. The work has focused on three main components—cleaning the inside of the aqueduct, repairing leaks, and replacing century-old valves that are connected to the aqueduct.

The American Water Works Association (AWWA) New York Section recognized NYCDEP with a “Utilities Helping Utilities” award for its role in distributing face coverings during the early part of the COVID-19 pandemic. During late April 2020, the NYCDEP BWS became the central distribution point for 50,000 face coverings set aside by the federal government for water and wastewater workers throughout New York State.

The American Council of Engineering Companies (ACEC) of New York awarded a Gold Award as part of its 2022 Engineering Excellence Awards to a NYCDEP project that transformed a former bowling alley property into a wetland. The creation of the wetland in Westchester County was a means to help offset construction-related impacts on wetlands elsewhere in the area.

### **Design Build**

NYCDEP is interested in design build as an alternate project delivery method to save time with project implementation and delivery. The NYS legislation that allows for projects to be delivered using design build construction contracts in NYC has been extended. NYCDEP is currently in the process of selecting an owner advisor consultant to assist NYCDEP in developing an implementation plan for a design build program. NYCDEP has decided to implement design build as pilot project initially, and the pilot projects are currently being determined. The information gathered for the pilot project will help NYCDEP determine if design build will be used for larger projects in the future.

### **Water Rate Study**

NYCDEP is in the midst of a Sustainable Rate Structure Analysis (SRSA) which will analyze water and wastewater rate structure options and customer assistance and credit programs. Recommendations from this SRSA will be completed in 2023.

### Long Island Water Supply Feasibility Study

NYSDOH is funding and conducting a feasibility study to evaluate the possibility of Long Island purchasing water from the NYC water supply. There are many issues that require evaluation including technical issues, operational issues, legal framework and governance, as well as questions around the rate structure that would be applicable.

## **12.0 SUMMARY AND CONCLUSIONS**

The past year has been extremely challenging year due to the COVID-19 global pandemic, however NYCDEP continued to operate facilities to provide essential services of water and wastewater treatment and delivery. Considering the magnitude of the overall infrastructure and the level of operational service required, it is our opinion that:

- The System continues to be managed in a professional and prudent manner with an appropriate regard for the level of service afforded to the users within the available funding.
- The physical condition of The System receives an “adequate rating”, our highest rating. Due to the size and complexity of The System, NYCDEP requires future capital investments for the continuous replacement and/or repair of aging infrastructure in a systematic and cost-effective manner.
- NYCDEP capital and expense budget projections for FY 2022 satisfy the immediate needs for The System. This includes legally mandated projects, which comprise approximately 23% of the capital budget for FY 2022.
- NYCDEP capital budget projections for FY 2023 satisfy the immediate needs for the System including legally mandated projects, which comprise approximately 32% of the capital budget for FY 2023. Expense budget projections for FY 2023 are currently being evaluated based upon the projected new needs of The System and may require adjustment when the evaluation is complete.
- NYCDEP capital planning is an ongoing iterative process addressing priorities and needs of The System. The NYCDEP is responsive to the long-term requirements of the service area.

### **Staffing Conclusions**

Currently, there are 832 vacancies in the NYCDEP organization, which brings staffing to approximately 87% of the approved allocations. This is a significant increase in vacancies over previous years which has been exacerbated due to the COVID Pandemic, a high level of retirements due to an aging workforce, and difficulties in recruiting new talent in a very competitive job market.

The COVID pandemic resulted in a City-wide hiring freeze that spanned from March 2020 through June 2020. DEP is currently faced with hiring restrictions under the “City’s two for one hiring policy,” whereby for every departure of two staff, DEP is only allowed one new hire.

NYCDEP has done a commendable job in the short-term performing within the staffing limitations that they have faced. Some of the short-term measures that have been taken include reallocation of staff and consistent overtime.

A long-term sustainable solution is required to “Right-Size” the organization and redefine job vacancies to attract qualified staff in a competitive job market. Over the years, DEP operating facilities have been upgraded to include higher quality equipment and more automation. Finding highly qualified new hires in a competitive market is difficult.

Specifically, NYCDEP needs to work closely with OMB and DCAS to:

- Redefine total head count given the increase in physical assets under DEP's control and the impacts of automation on day-to-day operations.
- Redefine job classifications to enhance NYCDEP's ability to recruit and retain qualified personnel.

### **Regarding System Management**

In our opinion, The System continues to be managed in a professional and prudent manner with an appropriate regard for the level of service afforded to the users. The physical condition of The System receives an "adequate" rating. In our opinion, the NYCDEP facilities and infrastructure are in adequate condition. NYCDEP faces similar issues to many other large urban areas nationwide, such as aging infrastructure, strict regulatory requirements and ongoing climate change resiliency concerns. NYCDEP continues to successfully manage the overall operations of NYC's large and complex water and wastewater system, and prioritizes the most important projects and programs. An Asset Management program is being used by NYCDEP that better identifies the needs and costs for infrastructure upgrades. Capital funding will need to be allocated to address the state of good repair of aging infrastructure in order to avoid critical failure of essential processes. These needs will have to continue to be addressed and implemented in a systematic way. NYCDEP is taking a proactive approach, prioritizing its needs and spending money (capital investment and operating expenses) where it will have the greatest impact to the water and wastewater system operations, reliability and redundancy, and to the water quality in the upstate watershed and the surrounding NYC waterways. Projects that address climate change impacts and adaptation to The System are in various stages of implementation (feasibility planning, design and construction) based upon sound cost-effective analysis and this process will need to continue as additional resiliency projects are identified. Prioritization of greatest need is a significant factor in moving forward with implementation of climate change resiliency. NYCDEP must remain diligent to make sure operational needs continue to be met while capital programs are identified and implemented in a timely manner. Because of the vast and extensive nature of the NYCDEP facilities and its aging infrastructure, continued diligence and future capital improvements will continue to be required in the near term and long term.

### **Regarding the Capital Improvement Program (CIP)**

Projects/Programs that will require additional funding in future budgets include:

- **SOG:** As indicated throughout the report, significant additional funding in future budgets will be required for the continuation of SOGR projects due to the aging infrastructure throughout the wastewater and water system and to support critical infrastructure projects required for the safe and continuous operation of the water and wastewater system. This is required in the near and long term.
- **FAD:** Once the five-year mid-term review of the FAD is finalized, it is anticipated that additional funding will be identified for continued implementation of the ten-year FAD.

- *Climate Change Adaptation, Resiliency, Energy Carbon Neutrality, and Sustainability Projects:* NYCDEP is seeking supplemental funding mechanisms for climate change resiliency and energy carbon neutrality projects. There may be a need in the future for additional NYCDEP funding to pursue these projects. This might result in an incremental cost added to some state of good repair projects or entirely new projects. Additional funding needs will continue to be identified in future budgeting cycles.
- *Combined Sewer Overflow (CSO) Program:* NYCDEP has submitted eleven Long Term Control Plans (LTCPs). Additional funding will continue to be required for implementation of the CSO projects that have been identified in the LTCPs in the future budget cycles beyond the ten-year horizon. Also, additional funding will be required for the continuation of the Green Infrastructure Program.
- *Hillview Cover:* Based upon the schedule and the results of the feasibility planning study in the Hillview Consent Decree, significant funding will need to be added to future capital plans.

### **13.0 LIST OF ACRONYMS**

ACCO	Agency Chief Contracting Officer
ADG	Anaerobic Digester Gas
AMWA	Association of Metropolitan Water Agencies
ASCE	American Society of Civil Engineers
AUV	automated underwater vehicle
AWWA	American Water Works Association
BEC	Bureau of Environmental Compliance
BEDC	Bureau of Engineering, Design, and Construction
BEPA	Bureau of Environmental Planning and Analysis
BGD	Billion Gallons per Day
BGY	Billion Gallons per Year
BNR	Biological Nitrogen Removal
BWS	Bureau of Water Supply
BWSO	Bureau of Water and Sewer Operations
BWT	Bureau of Wastewater Treatment
CAG	Community Advisory Group
CARES	Coronavirus Aid, Relief, and Economic Security
Cat/Del	Catskill/Delaware
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFO	Chief Financial Officer
CHP	Combined Heat and Power
CIP	Capital Improvement Program
CMOM	Capacity, Management, Operations and Maintenance
COO	Chief Operating Officer
COVID-19	2019-Novel Coronavirus
CRUC	Canadian Radium & Uranium Corporation
CSI	Collection Systems Investigations
CSO	Combined Sewer Overflow
CWA	Clean Water Act
CY	calendar year
DAF	Dissolved Air Flotation
DCAS	Department of Citywide Administrative Services
DOHMH	Department of Health and Mental Hygiene
DPR	Department of Parks and Recreation
ECM	Energy Conservation Measure
ECMP	Emerging Contaminant Monitoring Project
ECN	Energy Carbon Neutrality
EIS	Environmental Impact Statement
ESCR	Eastside Coastal Resiliency
ePMIS	Enterprise Project Management Information System
EH&S	Environmental Health & Safety
FAD	Filtration Avoidance Determination
FDNY	New York City Fire Department

**THE NEW YORK CITY MUNICIPAL WATER FINANCE AUTHORITY**  
***Fiscal Year 2022 Co-Consulting Engineer's Report***

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FEIS	Final Environmental Impact Statement
FEMA	Flood Emergency Management Agency
FOG	fats, oils and grease
FY	Fiscal Year (NYCDEP Fiscal Year begins on July 1 and ends on June 30)
GAC	granular activated carbon
GHG	greenhouse gas
GI	Green Infrastructure
HAA5	haloacetic acids
HDD	Horizontal Directional Drilling
IHD	In-House Design
ISI	Institute for Sustainable Infrastructure
KEC	Kensico Eastview Connection Tunnel
KPI	Key Performance Indicator
LCR	Lead and Copper Rule
LCRR	Lead and Copper Rule Revisions
LEED	Leadership in Energy and Environmental Design
LIRR	Long Island Railroad
LL	Local Law
LSL	lead service line
LT2	Long Term 2 Enhanced Surface Water Treatment Rule
LTCPs	Long Term Control Plans
LTR	Long-Term Revisions
mg/L	milligrams per liter
MGD	Million Gallons per Day
MOCEJ	Mayor's Office of Climate and Environmental Justice
MOR	Mayor's Office of Resiliency
MOU	Memorandums of Understanding
MS4	Municipal Separate Storm Sewer System
MSP	main sewage pump
MTA	Metropolitan Transit Authority
MTBM	micro-tunnel boring machine
MW	megawatt
M/V	Motor Vessel
NDWAC	National Drinking Water Advisory Council
NOV	Notice of Violation
NYC	New York City
NYCDDC	New York City Department of Design and Construction
NYCDEP	New York City Department of Environmental Protection
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
NPCC	New York City Panel on Climate Change
NRDC	Natural Resources Defense Council
NSC	National Safety Council
NTP	Notice to Proceed

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NWS	National Weather Service
NYCDOT	New York City Department of Transportation
NYPA	New York Power Authority
NYS	New York State
NYSDOH	New York State Department of Health
NYSERDA	New York State Energy Research and Development Authority
OACE	Office of the Agency Chief Engineer
OERR	Office of Energy and Resource Recovery
OST	Operation Support Tool
OTPS	Other than Personal Services
PARIS	Permitting and Review Information System
PDC	Public Design Commission
PFOA	perfluorooctanic acid
PFOS	perfluorooctanesulfonic acid
PFAS	per- and polyfluoroalkyl substances
PM/CM	preventive maintenance/corrective maintenance
PMF	probable maximum flood
PO <sub>4</sub>	orthophosphate
PPE	personal protective equipment
ppt	parts per trillion
PRP	Potential Responsible Party
PS	Personal Services
ROD	Record of Decision
ROV	remote operated vehicle
ROW	Right of Way
RWBT	Rondout-West Branch Tunnel
SBU	Sewer Backup
SCADA	Supervisory Control and Data Acquisition
SIRR	Special Initiative for Rebuilding and Resiliency
SOG	State of Good Repair
SPDES	State Pollutant Discharge Elimination System
SMLP	Storm Mitigation Loan Program
SRSA	Sustainable Rate Structure Analysis
SWMP	Stormwater Management Program
TBM	tunnel boring machine
TMDL	Total Maximum Daily Load
tpd	tons per day
TRC	Total Residual Chlorine
UER	Upper East River
µg/L	micrograms/L
ULURP	Uniform Land Use Review Procedure
USACE	United States Army Corp of Engineers
USDOJ	United States Department of Justice
USGS	United States Geological Survey

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USEPA	United States Environmental Protection Agency
UV	Ultraviolet
WEF	Water Environment Federation
WHO	World Health Organization
WM	Waste Management
WFF	Water for Future
WFH	work from home
WFP	Water Filtration Plant
WRRF	Wastewater Resource Recovery Facility
WWTP	Wastewater Treatment Plant
WRRF	Wastewater Resource Recovery Facility
WUCA	Water Utility Climate Alliance

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AECOM

Contact:  
125 Broad Street  
New York, NY 10004  
[www.aecom.com](http://www.aecom.com)

MDE

Contact:  
410 N. Broadway  
White Plains, NY 10603  
[www.macandever.com](http://www.macandever.com)