Water Demand Management Plan June 2019 Annual Update

NYC Environmental Protection

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Please print this plan using the double-sided printer setting.

Cover photograph: Cannonsville Reservoir

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Introduction

In June 2018, the New York City Department of Environmental Protection (DEP) released One Water NYC: 2018 Water Demand Management Plan, marking 5 years of progress since releasing the 2013 Water Demand Management Plan, and highlighting DEP's success in implementing water conservation projects across the city and Upstate with our wholesale customer utility partners. After one year of implementation of the 2018 Water Demand Management Plan, DEP has continued to build on past success, using established partnerships to implement and identify new conservation projects, and to continue ongoing programs to ensure that we reach our water conservation goals.

The main driver for DEP's focus on demand reduction is to help prepare the City for aqueduct repairs, but also to optimize our water supply during times of drought, and reduce wastewater flows, energy, and greenhouse gas emissions associated with pumping and treatment of both our water supply and wastewater flows. In 2018, New York City had an average distribution of 1,008 million gallons of water per day (MGD), which was higher than 2017 distribution (Figure 1). However, without the 10 MGD of savings achieved through DEP's Water Demand Management Program, this number would likely have been higher. Water conservation is an important strategy to help mitigate these typical year-to-year fluctuations.

Additionally, water conservation saves energy and reduces our carbon footprint, and can help us prepare for the impacts of climate change on our water systems. DEP estimates that the achieved 10 MGD of potable water demand savings also saves 40 metric tons (MT) CO_2 equivalent (CO_2e) per year on the water supply side, plus an additional 110 MT CO_2e per year from reductions of wastewater volume to DEP's Wastewater Resource Recovery Facilities, for a total savings of 150 MT CO_2e per year. To further illustrate the connection between conservation and energy reduction, DEP created an interactive online map that shows the location of DEP's

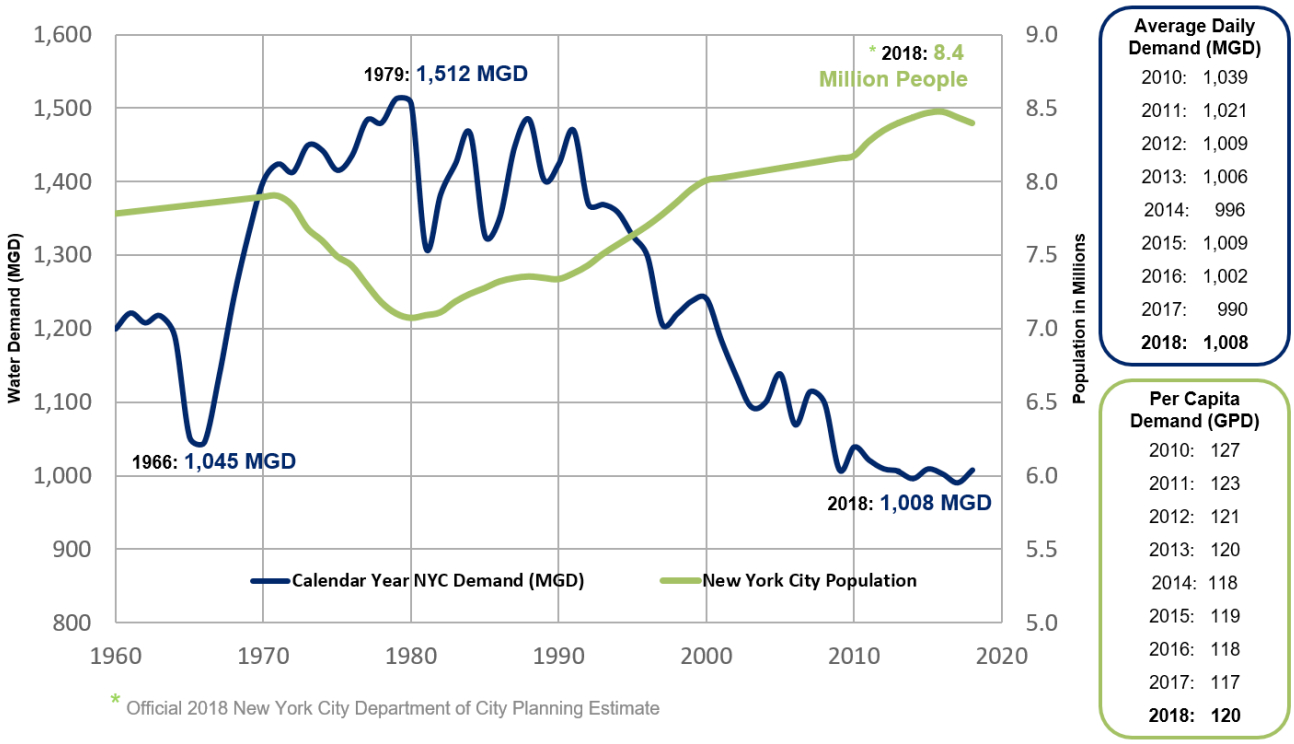


Figure 1: New York City Water Demand and Population Growth

water conservation projects, the estimated demand savings, and the estimated energy and greenhouse gas reductions from each project. The map is available to the public through a link on DEP's website: nyc.gov/dep/conservation. Additional information, including a screen shot of the map, is included as an appendix (page 28).

This annual report captures DEP's program highlights from the past year, measures progress toward our 20 MGD by 2022 savings goal, and describes newly-funded initiatives first established in the 2018 Water Demand Management Plan. Additionally, this report summarizes the achievements and lessons learned from the Toilet Replacement Program following five years of implementation, as it nears completion in June 2019.

DEP continues to advance initiatives under each of our six strategies for water demand reduction, and will focus on implementing our newly-funded initiatives including retrofits in municipal buildings, water conservation in parks, as well as ongoing best practices such as leak detection and optimizing our own infrastructure. Using a multi-pronged approach to water conservation, we will continue to advance the sustainability and resiliency of New York City's water systems.

East Basin of the Ashokan Reservoir

Municipal Water Efficiency Program

The goal of the Municipal Water Efficiency Program (MWEP) is to ensure that all City agencies are using water efficiently and effectively when carrying out their mission. Six years into implementation, the largest share of savings from the Water Demand Management Program comes from MWEP initiatives.

Many partnerships outlined in the 2018 Water Demand Management Plan continue to move forward, and new projects will begin construction in the near future. Several initiatives underway include retrofitting fixtures in City-owned hospitals and municipal buildings. Some large capital projects – including a water recirculation project in Central Park, capital upgrades at DEP's Wastewater Resource Recovery Facilities, and an expansion of DEP's successful initiative to retrofit fixtures in New York City public school facilities – are currently being further developed for implementation in the coming years. Through MWEP, DEP will continue to advance water efficiency, metering, education, and water loss control in City-owned facilities.

New York City Department of Education

Savings Achieved (May 2019): 3.31 MGD

Potential Savings by 2022: 4.71 MGD

Since 2013, DEP has been upgrading bathroom fixtures in Department of Education (DOE) facilities. Since the program began, 402 facilities have been retrofitted with over 34,000 new and efficient fixtures. Specifically, older toilets that utilize 3.5 gallons per flush (GPF) or more were replaced with 1.6 and 1.28 GPF models, and 1.0 GPF urinals were replaced with 0.125 GPF models. DEP

has identified up to 400 additional facilities that could be retrofitted, for an additional savings of 1.4 MGD. DEP is currently coordinating with the Division of Schools Facilities at DOE and the School Construction Authority to begin retrofitting facilities in Fiscal Year 2020.

Wastewater Resource Recovery Facilities

Savings Achieved (May 2019): 1.83 MGD

Potential Savings by 2022: 2.73 MGD

In July 2018, DEP completed its fourth Water Challenge to Wastewater Resource Recovery Facilities (WRRFs) to encourage water reduction in DEP's own facilities. All 14 WRRFs have participated in a Water Challenge, and seven achieved a 10% reduction or more over their baseline average. DEP plans to initiate a fifth challenge in 2020, encouraging all 14 WRRFs to reduce demand by an additional 10%. DEP also expanded water hose replacement by doubling the number of hoses replaced with high-efficiency models used to clean equipment at each WRRF. Additionally, DEP is currently working to assess water use and identify opportunities for saving both water and energy, such as replacing inefficient water pumps and other equipment with high-efficiency models. More information on these water audits is available in the case study (on page 11). DEP is starting to consider the upgrades and retrofits outlined in these audits for implementation, beginning in Fiscal Year 2020.

New York City Health and Hospitals Corporation

Savings Achieved (May 2019): 0.07 MGD

Potential Savings by 2022: 1.22 MGD

The New York City Health and Hospitals Corporation (HHC) operates the City's public hospitals and clinics and is the largest municipal healthcare system in the United States. In general, hospital facilities are water-intensive, making HHC an important partner for DEP and a top candidate for water efficiency upgrades.

Harlem Hospital, located in Manhattan, partnered twice with DEP to reduce their water usage. First, Harlem

North River Wastewater Resource Recovery Facility

Hospital participated in and was a winner of the Water Challenge to Hospitals. Second, in 2018 DEP and Harlem Hospital kicked off a partnership to retrofit fixtures through MWEP. Retrofits at Harlem Hospital, including toilets, urinals, faucet aerators, ice machines, and an industrial dishwasher will be complete in summer 2019, for a savings of approximately 0.07 MGD.

In the next few years, DEP and HHC will expand the program by retrofitting additional HHC facilities. HHC hospitals identified for upgrades include but are not limited to Elmhurst Hospital, Metropolitan Hospital, Woodhull Hospital, and Bellevue Hospital. In 2018 HHC's contractor completed a survey of Bellevue Hospital, and identified over 700 fixtures eligible for upgrade. DEP plans to continue surveying and retrofitting additional hospitals through 2022.

New York City Department of Citywide Administrative Services

Savings Achieved (May 2019): 0 MGD

Potential Savings by 2022: 0.24 MGD

The New York City Department of Citywide Administrative Services (DCAS) manages, leases, and purchases property for the City; operates, manages, and repairs courthouses and other City-owned public buildings; administers an energy conservation program; purchases supplies, materials and equipment for use by City agencies; is responsible for citywide fleet management including operation and maintenance of a motor vehicle pool; and supports government recruitment.

DCAS's direct portfolio includes approximately 50 public buildings throughout the city, including courts and City office buildings that have both full time employees and a large number of daily visitors. In 2018, partnering with DEP, DCAS surveyed 10 buildings within their portfolio: City Planning Building; Excelsior Building; Court Square Building; Supreme Courthouse; Civil Courthouse; Family Courthouse; Bronx Family Court; Queens Criminal Court; Queens Borough Hall; and Bronx County Court. In total, the surveys indicate that over 1,300 fixtures (toilets and urinals) are inefficient and eligible for retrofit. In summer 2019, DEP anticipates beginning these retrofits. DEP will also continue to coordinate with DCAS to survey additional buildings to help achieve the estimated potential savings through this partnership by 2022.

New York City Department of Cultural Affairs - Cultural Institutions Group

Savings Achieved (May 2019): 0.058 MGD

Potential Savings by 2022: 0.07 MGD

In the 2018 Water Demand Management Plan, DEP identified a potential partnership with the American Museum of Natural History, one of the 33 members of the Cultural Institutions Group (CIG), a division within New York City Department of Cultural Affairs. Since the release of the Plan, DEP continues to coordinate with the Department of Cultural Affairs to identify a suite of water conservation projects among the 33 CIG members. Each member is located on City-owned property, offering promising opportunities for water efficiency upgrades and other projects, including water reuse. DEP is reviewing water use among the 33 members to target the largest users, and is continuing to explore potential projects with the American Museum of Natural History, Bronx Zoo, Metropolitan Museum of Art, and other CIG members.

Brooklyn Botanic Garden

The Brooklyn Botanic Garden (BBG), a member of the Cultural Institutions Group, is a 52-acre urban botanic garden, located adjacent to the Brooklyn Museum and Prospect Park. Created in 1910, the site includes outdoor gardens, a conservatory with a bonsai museum, three temperature-controlled plant pavilions, an aquatic plant house, and an art gallery. The garden is open year-round, is home to nearly 15,000 kinds of plants, and hosts approximately 800,000 visitors annually. In 2015, DEP helped support funding for a pump system as part of a stream corridor restoration project to conserve water and reduce discharge to the combined sewer system.

The stream corridor restoration project at the Brooklyn Botanic Garden, called Belle's Brook, was recently completed in April 2019. Previously, the Garden's stream system was fed by a combination of groundwater and City water inputs originating at the Japanese Hill-and-Pond and ending at one of the City's combined sewer

Belle's Brook at the Brooklyn Botanic Garden

outfalls. The restoration increased the stormwater catchment area from 15.46 acres to 34.59 acres by regrading and daylighting the water stream that exits the Japanese Pond and creating a new feature, the Shelby White and Leon Levy Water Garden, at the lowest point of the garden. The innovative new infrastructure filters and recirculates rainwater collected throughout a significant portion of the grounds and channels it through the new brook system that connects various catchment areas and distributes the water to the Water Garden and the Japanese garden. The Water Garden also serves as a stormwater management basin. Using a smart water control system, water levels will be dropped immediately before rain events to create a reservoir for detaining runoff during wet weather. In doing so, the garden reduces loading into the City's combined sewer, helping to mitigate the occurrence of combined sewer overflows. The project will reduce BBG's outdoor City water consumption for its water features from 22 million gallons to less than one million gallons per year (a nearly 96% decrease), a reduction of 57,800 gallons per day.

New York City Department of Parks and Recreation

Savings Achieved (May 2019): 1.1 MGD

Potential Savings by 2022: 2.73 MGD

The New York City Department of Parks and Recreation (DPR) is the steward of more than 30,000 acres of land — 14 percent of New York City — including more than 5,000 individual properties. DEP has partnered with DPR since 2013 on water conservation projects in City parks, beginning with retrofitting 400 spray showers and nine recreation centers citywide. DEP will continue this partnership and with water conservation initiatives in Central Park and Prospect Park.

Central Park

DEP has been coordinating with Central Park Conservancy (CPC) on potential water savings strategies within Central Park since 2017. In 2018, CPC completed a feasibility study for recirculating water between the park's northern waterbodies: Harlem Meer, The Loch, and 100th Street Pool. These waterbodies are fed with potable water and kept at a particular height by an unknown inflow, which CPC believes to be approximately 620,000 gallons per day. This system has been in place for decades, and helps maintain the health and aesthetics of these waterbodies.

To save this potable water while still maintaining health and aesthetics, DEP is coordinating with CPC and DPR to design and construct a recirculation system, as outlined in the feasibility study. The system would connect the Harlem Meer outflow, which typically spills from the Meer into the combined sewer system, to the Jackie Onassis Reservoir, to recirculate stormwater in the park's northern waterbodies (The Loch and 100th Street Pool). This closed loop system would allow DEP to valve off the original inflow and save water, while also reducing water that currently enters the combined sewer system and can contribute to combined sewer overflow events during wet weather. This project would achieve a potential demand savings of 0.83 MGD, and reduce combined sewer overflows by an estimated 63 million gallons per year.

Prospect Park

Prospect Park Lake is supplied with an estimated 1 MGD or more of potable water, and experiences the highest usage during the summer months when the greatest evaporation occurs. The service line that supplies the water has a shutoff valve that cannot be turned off due to its age and condition. To lower the water in the lake system during rain events, Prospect Park Alliance (PPA) staff discharge Prospect Park Lake water into the combined sewer system. DEP estimates that approximately 2 MGD is discharged to the combined sewer system, between 24 and 70 days each year. DEP

will work with PPA and DPR to excavate and remove the existing valve and replace it with a new valve system that is easier for DPR and PPA staff to access. This project would achieve a potential demand savings of 0.8 MGD and would also prevent 48 to 140 million gallons of water each year from entering the combined sewer system.

Waterfall in Prospect Park

Manhattan Viewed from Across the Central Park Reservoir (Jacqueline Kennedy Onassis Reservoir), Looking South

Case Study: New York City's Water Energy Nexus Phase II – Trade Offs and Opportunities

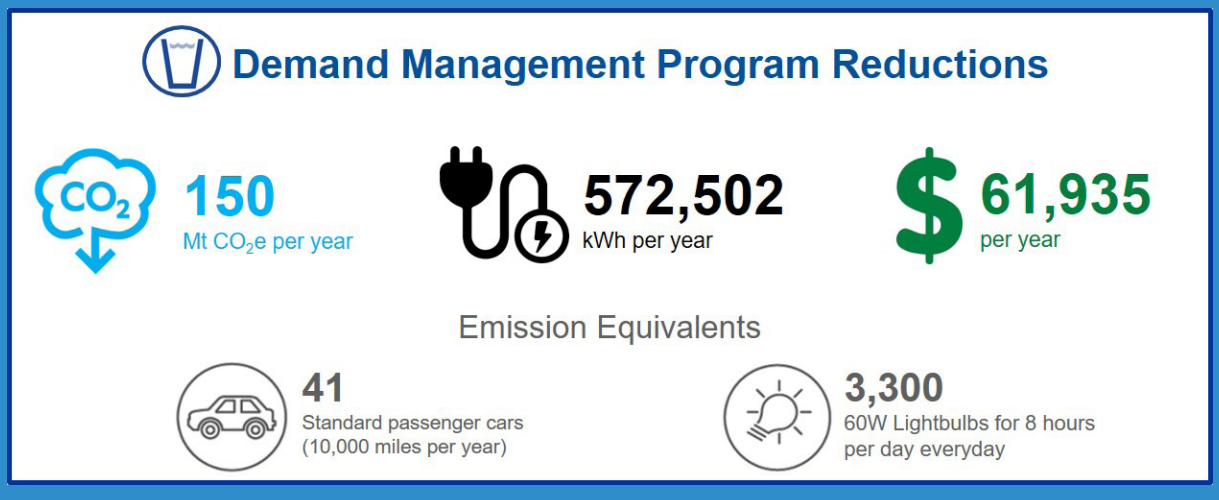
To advance New York City's position as a global leader in sustainability, DEP continues to track and reduce greenhouse gas (GHG) emissions to meet citywide climate change objectives. DEP's water supply, stormwater, and wastewater management facilities currently account for 17 percent of total GHG emissions from New York City government buildings. To help offset our emissions and provide indirect energy co-benefits, DEP has invested in a number of sustainability programs, including water demand management.

In 2016, DEP began a Water-Energy Nexus Study to calculate the relationship between decreasing water demand and reducing GHG emissions. As part of the study, experts developed a tool that accurately estimates the GHG emissions that are avoided as New Yorkers curtail their demand for water. Utilizing the Water-Energy Nexus Tool, DEP discovered that its water efficiency programs have successfully reduced GHG emissions.

As of May 2019, DEP's water efficiency programs have led to a reduction of 40 metric tons (MT) CO2 equivalent (CO2e) per year from reductions of potable water demand and 110 MT CO2e per year from reductions of volume to Wastewater Resource Recovery Facilities (WRRFs). Overall, DEP's water efficiency programs have reduced carbon emissions by over 150 MT CO2e per year and energy use by 572,502 kWh/year. This is equivalent to 41 standard passenger cars (10,000 miles per year) or 3,300 60-Watt lightbulbs (used for 8 hours per day, every day), and a total cost savings of $61,935 per year.

DEP's commitment to achieving the Mayor's OneNYC goal of reducing GHG emissions 80 percent by 2050 (relative to the 2005 baseline) is driving changes in the way DEP operates. As such, DEP recently expanded upon the 2016 Water-Energy Nexus work, and launched the Water-Energy Nexus Phase II Study, to evaluate the carbon footprint and energy tradeoff impacts associated with potable water conservation measures implemented at WRRFs.

DEP owns and operates 14 WRRFs with a collective wastewater treatment capacity of 1.8 billion gallons per day (BGD). These facilities collectively treat an average 1.2 BGD of wastewater (dry weather flow) and utilize large volumes of City water for various treatment applications. Utilizing plant effluent instead of City water, where possible, as well as using City water more efficiently only where high quality water is required,



Greenhouse Gas, Energy, and Associated Cost Savings from DEP's Water Demand Management Program

would decrease potable water demand at WRRFs, offering opportunities for potential energy savings. These energy savings can be directly tied to DEP's overall operational energy use and GHG emissions in the form of avoided emissions related to reduced energy requirements from less treatment.

From November 2018 to March 2019, audits were performed for three case study WRRFs to develop a better understanding of City water usage within the plants. The case study WRRFs – North River, Wards Island, and Newtown Creek – are the three largest consumers of City water from DEP's portfolio of fourteen WRRFs, with a combined average daily flow of 3.38 million gallons a day of City water in 2018. The water audits served to quantify how City water is distributed within the plants as non-potable service water in support of various WRRF processes, which are not typically sub-metered. The audits combined estimates obtained via survey of plant operators during November 2018, and direct measurements performed using pipe flow metering between December 7, 2018 and January 17, 2019. Through this study, DEP identified water conservation opportunities that can be achieved at each case study WRRF and quantified the potential carbon footprint impacts of implementing these water conservation improvements.

The Water-Energy Nexus Phase II study resulted in proposed recommendations for cost-effective water conservation measures to be implemented at case study plants, as well as an update to the Water-Energy Nexus Tool. The tool captures the carbon footprint and energy benefits of water conservation improvements made at each WRRF, allowing users to model the potential benefits of making additional plant improvements in the future. DEP is considering the recommendations of the study for implementation at WRRFs as part of the Municipal Water Efficiency Program.

DEP's WRRFs collectively treat an average 1.3 BGD of wastewater and utilize large volumes of city water for various treatment applications. However, not all treatment applications require high-quality drinking water. Using city water more efficiently helps decrease potable water demand and offers opportunities for water savings that translate to energy savings for the avoided treatment of potable water.

Residential Water Efficiency Program

Although New York City's per capita consumption continues to remain low compared to other large US cities, residential properties accounted for 83 percent of the city's total billed water demand in Fiscal Year 2018 (Figure 2), making it the highest water user by land use type. To target this customer class, DEP has promoted toilet efficiency citywide since the 1990s through two incentive programs: the 1994-1997 Toilet Rebate Program, under which 1.3 million toilets were replaced citywide, and the current Toilet Replacement Program, which began in 2014 and concludes in June 2019.

DEP's Toilet Replacement Program has been one of New York City's most actively used programs for increasing sustainability in multi-family buildings. In addition to the Toilet Replacement Program, DEP, with support from Honeywell, conducts complementary apartment-level household water surveys in single- and multi-family buildings each year to promote water conservation and identify leaks. DEP and Honeywell also distribute home water savings kits to these customers.

Existing Project	Savings to Date (MGD) (May 2019)	Potential Savings by 2022 (MGD)
Toilet Replacement Program	0.57	0.89
Home Water Savings Kits	0.40	0.40
Total	**0.97**	**1.29**

Table 1: Savings Achieved and Potential Savings from Residential Water Efficiency Program

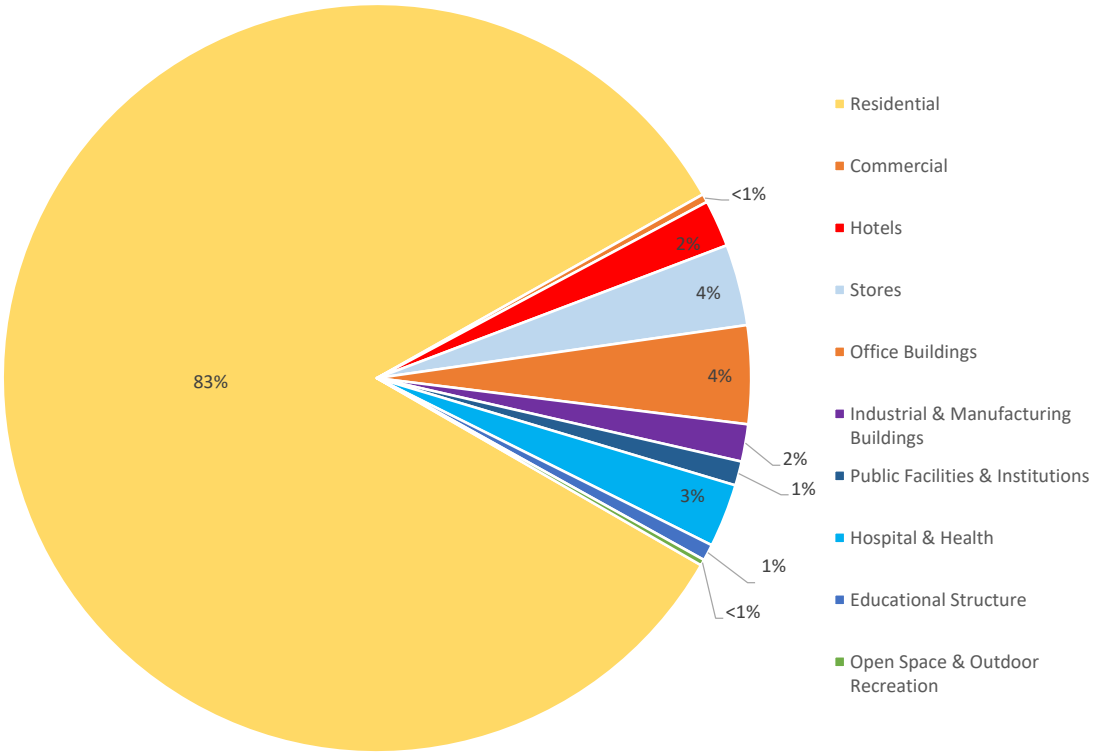


Figure 2: Fiscal Year 2018 Metered Consumption by Land Use

Toilet Replacement Program

Savings Achieved (May 2019): 0.57 MGD

As the Toilet Replacement Program (TRP) progressed, DEP expanded TRP to key customer classes, including Homeowner Water Assistance Program (HWAP) customers, and all customers who coordinate with the New York City Retrofit Accelerator (Retrofit Accelerator). DEP's collaboration with Retrofit Accelerator provided customers with one-on-one assistance to create MyDEP accounts and sign up for TRP. Retrofit Accelerator also assisted customers with submitting documentation to meet TRP qualifications, and ensuring that customers were in compliance with DEP's Multi-Family Conservation Program.

Additionally, DEP hosts outreach events around the city, giving customers the opportunity to apply for TRP and obtain vouchers. Eligible customers are also invited to visit DEP's offices for one-on-one assistance, and to obtain more information on the program and its advantages for property owners.

To date, over 1,100 vouchers have been redeemed for the replacement of over 14,000 toilets since 2014 (Table 2), accounting for 0.57 MGD of savings. As the program comes to a close in 2019, DEP continues to work with TRP-eligible customers to ensure they participate before the program deadline.

After nearly five years of implementation, DEP has learned a lot from administering TRP, including but not limited to the following:

• Customer Service: Providing complete information to customers who were interested in TRP was important, and reduced confusion about the program. Talking through the program process with individual customers was also important in achieving higher participation numbers.

• Partnerships: Forming and maintaining partnerships was important to the success of TRP. DEP's partnerships with Retrofit Accelerator and NYC Housing Authority (NYCHA) not only increased program participation, but also increased general water conservation awareness among Retrofit Accelerator and NYCHA customers.

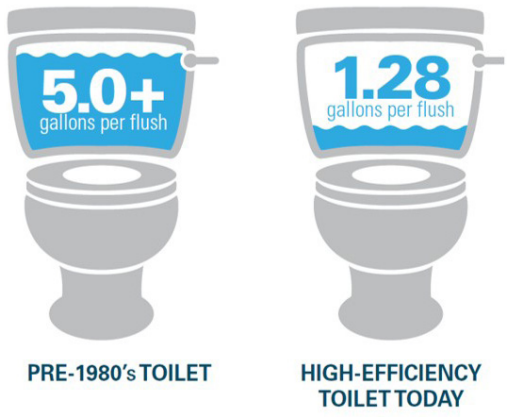
• Outreach: DEP used several outreach strategies for TRP, including mailings, robocalls, and outreach events. DEP found that robocalls were more effective and received a larger response than mailings, because customer phone numbers are typically updated more regularly than mailing addresses. Outreach events at DEP's borough offices were also more effective than mailings, but only when scheduled during regular business hours, as opposed to after business hours. In addition, through TRP outreach, DEP informed many customers

Borough	Number of Deactivated/ Redeemed Vouchers	Number of Retrofitted Toilets
Manhattan	219	3,329
Bronx	229	4,607
Brooklyn	552	3,951
Queens	139	2,239
Staten Island	3	21
Total	**1,142**	**14,147**

Table 2. TRP Participation by Borough, 2014 to May 2019

about MyDEP Account, which lead to an increase in customers signing up for MyDEP and tracking their water consumption online.

• Program Administration: Replacing over 14,000 toilets in numerous residential buildings citywide is a tremendous undertaking and would not have been possible without an established system. DEP created and used an electronic tracking system to seamlessly administer the program. First, the system was used to determine customer eligibility for TRP. From there, the system was used to track when customers obtain their toilet vouchers, when they redeem or "deactivate" the vouchers with a DEP-approved toilet vendor, and finally, when customers successfully install the new, high-efficiency toilets. The innovative tracking system was integral to the overall performance and success of the program and for tracking program budget. Additionally, the tracking system was helpful in identifying potential leaks in participating properties, and alerting customers accordingly.



A pre-1980s Toilet Used Over Five Gallons of Water per Flush. The High-Efficiency Toilets Provided Through DEP's Toilet Replacement Program Use 1.28 Gallons per Flush.

Home Water Savings Kits

Savings Achieved (May 2019): 0.4 MGD

In addition to establishing the Toilet Replacement Program, DEP works with Honeywell to provide building owners with complimentary household water conservation surveys. The surveys assist building owners with identifying opportunities for water savings and detecting leaks. In 2018, Honeywell conducted surveys in 4,115 individual apartments in 1,993 single-family apartment buildings. Honeywell also surveyed 254 multi-family buildings, and 4,202 individual units within these properties.

A DEP Home Water Savings Kit, Provided to Customers Upon Request and at Select Outreach Events

Customers Participating in Fix A Leak Week, Where Home Water Savings Kits Were Distributed

Non-Residential Water Efficiency Program

Photo Credit: Maciek Lulko

To increase water efficiency in non-residential buildings, DEP provides incentives to non-residential property owners through cost-sharing and voluntary programs. DEP began offering its cost-sharing On-site Water Reuse Grant Pilot Program in 2016 to incentivize the construction of on-site water recycling systems. In addition, to spur voluntary conservation, DEP has engaged various commercial customers since 2013 through sector-specific Water Challenges, including hotels, restaurants, hospitals, and most recently, universities.

Water Conservation and Reuse Grant Pilot Program

Potential Savings by 2022: 1.0 MGD

DEP is expanding its existing On-site Water Reuse Grant Pilot Program to support and incentivize a broader range of water efficiency technologies and to establish more achievable water savings targets. Originally launched in November 2016, the On-site Water Reuse Grant Pilot Program helps offset a portion of the capital costs for construction of both building-scale and district-scale water reuse systems. Based on feedback received from potential applicants, the required water savings targets were too high for the types of projects that potential applicants were interested in implementing.

With an anticipated launch of July 2019, the Water Conservation and Reuse Grant Pilot Program will target a broader range of private sector water customers than the previous grant program. The new program will also lower the minimum water savings requirement to 2,740 gallons per day, or one million gallons per year. Additionally, the new program will incentivize commercial and residential fixture retrofits, plus technologically-innovative water conservation projects, including on-site water reuse. The grant will cover up to 100% of equipment costs and for owner-identified water conservation projects, such as on-site rainwater harvesting, the funding amount will be up to $10 per gallon per day saved.

Water Challenge to Universities

Potential Savings by 2022: 0.05 MGD

DEP launched the Water Challenge to Universities on August 1, 2018. Like previous Water Challenges, the goal of this Challenge is for participants to achieve a 5 percent reduction in water consumption. The six participants are Fordham University: Lincoln Center Campus, The New School, Long Island University: Brooklyn Campus, Pace University, St. John's University, and Weill Cornell Medicine. Through both voluntary reductions and permanent upgrades, New York City universities can realize significant water savings. Due to the large scale and complexity of university campuses, the Challenge duration is two years to allow participants to understand their seasonal water usage and have the opportunity to make capital improvements.

As part of this Challenge, DEP hosts quarterly workshops to give participants the tools to perform water audits, identify strategies to achieve savings, and to create water demand management campaigns for their students. The Challenge kicked off with information on how participants can track their water consumption through the My DEP web portal. Subsequent workshops have featured presentations from experts from the Alliance for Water Efficiency's College Water Efficiency Group, the Environmental Protection Agency's WaterSense program, and specialists in leak detection, sub-metering, sustainability outreach campaigns, and behavior-change data and analysis.

Several participants have already identified water saving strategies. For example, following the first workshop, Weill Cornell Medicine participants identified lab equipment that was continuously running water. Using an example shared in the workshop, they were able to change the equipment settings so that the equipment would only use water during hours of operation. Another Challenge participant, Pace University, is exploring the possibility of recycling Con Edison steam condensate for cooling tower makeup water, and Fordham University is revising their cleaning and maintenance operations manual to address water conservation.

This Challenge is an opportunity to foster a water conservation ethic among participating university students and administrators alike. As such, DEP is developing water conservation tip posters that will be distributed across the participant campuses. The posters will encourage students to save water and to share their water conservation efforts on social media. Currently, Challenge participants are planning student outreach campaigns for the upcoming 2019-2020 academic year.

Water Challenge to Universities Workshop #3, May 2019: Conservation Campaigns

Water Distribution System Optimization

Each day, an average of one billion gallons of water are delivered from Upstate reservoirs to over 830,000 service lines that connect DEP's system to New York City residents. DEP strives to employ the best technology for maintaining its vast distribution system, and a considerable amount of specialized technology is used to monitor and maintain this underground infrastructure. To ensure this water is tracked through the system, DEP has a Universal Metering Program that allows both DEP and its customers to monitor water usage, detect leaks through Automated Meter Reading (AMR) software, and track water demand citywide.

Leak Detection Program

Savings Achieved (May 2019): 1.89 MGD

DEP's field operations personnel track leaks in two distinct ways, by both responding to calls through the City's 311 system, and through preventative maintenance. In the past few years, DEP has implemented a strategic organization by creating borough-based teams properly trained in leak detection that target specific areas served by older network mains that are more likely to need preventive or corrective maintenance. These teams can respond rapidly to problems compared to when DEP relied on one consolidated resource center. In 2018, DEP surveyed 1,793 miles of water mains for leaks.

Hydrant Maintenance and Controlling Illegal Use

New York City has over 109,500 hydrants located throughout the five boroughs. These important assets are intended for fire suppression. At times, residents may open hydrants to cool off in the summer, which spray up to 1,000 gallons per minute and reduce water pressure in the local area. DEP sponsors the Hydrant Education Action Team (HEAT) to educate communities about the dangers of opening hydrants illegally.

DEP ensures proper maintenance by performing assessments, testing pressure, and repairing hydrants when necessary. In 2018, DEP repaired 7,481 hydrants, replaced 1,164, and provided other maintenance services for 8,531 additional hydrants.

Optimize Pressure Management

DEP has been working to improve maintenance of the pressure zones within the water distribution system. In 2018, the number of breaks per 100 miles was 7.4, slightly above the City's 10-year average of 6.5, but still well below the accepted industry average of 25 breaks per 100 miles annually.

In 2018, DEP completed 5,560 preventive maintenance inspections/calibrations on pressure regulating valves.

Hydrant Maintenance

DEP also overhauled 51 of the 447 pressure regulating valves that are in use citywide.

Automatic Meter Reading Infrastructure

In 2009, DEP launched its AMR program and largely completed that effort in 2012. To date, DEP has over 97 percent of its customers in its AMR infrastructure. DEP is working to further optimize metering and AMR by installing this technology for DEP's few remaining unmetered accounts.

Optimize Metering and Replace Large Water Meters

DEP's efforts to achieve universal metering of all DEP water and sewer accounts is motivated by the need to reduce non-revenue water and promote conservation among water users by providing accurate consumption information. The universal metering initiative is also critical to measuring the success of many other demand management strategies. Accurate consumption data enables DEP to determine whether target consumer groups have achieved projected consumption reductions or how demand management strategies may be adapted to improve their effectiveness. DEP replaced 416 large meters in 2018 (i.e., those over 1.5 inches in diameter).

Another group of customers that typically have large meters are the New York City Housing Authority (NYCHA) multi-family buildings. The majority of NYCHA buildings were metered in 2005. In 2015, DEP initiated a multi-million dollar effort to install water meters in remaining unmetered NYCHA buildings to gain a more accurate representation of the water consumption trends of these customers. These buildings are located in Brooklyn, Queens and the Bronx, and contain approximately 50,000 housing units. As of April 2019, 511 meters have been installed out of a planned 517. This project is expected to be completed in Spring 2019.

Provide Customers with Easy and Timely Access to Water Usage Data

DEP has invested in technology and through the Bureau of Customer Services, provides customers with information related to their water consumption. This service enables customers to view their water consumption on a daily basis so they can identify leaks and other inefficiencies. By becoming familiar with their consumption information, customers can then correct leaks to save water and money.

DEP Crews Working on Optimization Repairs

As of March 2019, 418,800 customers have signed up for My DEP to view their bills, water usage, and payment history online. This service also allows customers to pay online and sign up for automatic billing (eBills); currently, 106,000 customers have signed up for eBills.

Customers who sign up for My DEP also have the option to receive leak alerts, which are sent if consumption triples for five consecutive days. To date, over 306,000 customers have signed up for leak alerts. DEP will continue to promote MyDEP and leak detection alert enrollment as an ongoing initiative.

Water Supply Shortage Management

Since 2013, DEP has been re-evaluating existing water use restriction mechanisms to adapt to future conditions including the planned Delaware Aqueduct shutdown, changing hydrologic conditions due to climate change, and aging infrastructure. New York City has experienced approximately nine drought periods of record, as recently as 2001, and water shortage management plays an important role in reducing demand when supply is limited. Although this strategy does not provide permanent demand savings, Water Supply Shortage Management—including communication and outreach campaigns—could provide temporary savings during planned, non-emergency infrastructure repair and also during unplanned water supply shortages.

Develop a Communications Strategy

In March 2019, DEP began developing a communications campaign for outreach efforts in the months leading up to the Delaware Aqueduct shutdown to increase water conservation awareness and achieve non-emergency temporary demand savings ahead of the shutdown. As part of this effort, DEP is researching similar water conservation campaigns and strategies in other cities to learn more about best practices, challenges, and lessons learned.

Additionally, DEP will develop a three-step communication strategy as part of a public information and education campaign, in the event a water supply shortage emergency is triggered during the planned

shutdown of the Delaware Aqueduct. The three steps are as follows:

Step 1: Determine who the audience is and which vehicle or combination of vehicles is most appropriate and likely to reach the intended audience.

Step 2: Deliver the message and coordinate with the other agencies and groups that can help amplify the message.

Step 3: Determine if the audience has been reached.

The public information and education campaign would utilize media announcements, social and digital media posts, direct mailing and distribution of hard copy materials, 311 services, phone calls, and other methods for communicating to customers during a water supply shortage emergency, regarding the situation and their role in helping to conserve water and reduce overall demand.

Updated Rules and Plan to Allow for Planned Infrastructure Repairs

DEP is in the process of amending the "Drought Emergency Rules" (15 RCNY Chapter 21). The rulemaking process in New York City, called City Administrative Procedure Act (CAPA), began in July 2013 for this effort and in December 2016, the Mayor's Office of Operations and the City Law Department certified DEP's revisions to the "Drought Emergency Rules." The proposed revised title is "Water Shortage Emergency Rules," replacing the narrower focus of the previous title. In summary, the proposed revisions address water shortage emergencies due to circumstances not limited to natural drought conditions, including planned and unplanned infrastructure outages and repairs. The proposed revisions also add, remove, and change certain water use prohibitions during the different stages of a water shortage emergency, to better reflect DEP's current understanding of city water use. Although the proposed action would not apply to routine residential water use such as drinking and bathing, or dishwashing, DEP expects that public awareness of the restrictions would lead to decreased residential water use during a water shortage. DEP expects to promulgate this rule before the Delaware Aqueduct shutdown.

Ashokan Reservoir

Wholesale Customers Water Demand Management Program

In 2014, DEP launched the Wholesale Customers Demand Management Program for up to 10 of DEP's largest customers (Utility Partners) who purchase water from DEP. The participating Utility Partners are the Town of Greenburgh (Greenburgh), the City of Mount Vernon (Mount Vernon), the Town of New Windsor (New Windsor), the Village of Ossining (Ossining), the Village of Scarsdale (Scarsdale), SUEZ Water Westchester (SUEZ), the Village of Tarrytown (Tarrytown), the City of White Plains (White Plains), Westchester Joint Water Works (WJWW), and the City of Yonkers (Yonkers). The goal of this program is for Utility Partners to implement demand management projects to reduce demand by 5% from their 2013 baseline demand, by October 2022.

To accomplish this goal, DEP collaborated with the Utility Partners to develop custom Water Demand Management Plans (WDMPs), tailored to each Utility Partner's water system. Each WDMP includes a water system profile, a non-revenue water analysis, a summary of current demand management practices, an evaluation of potential demand management measures, and an implementation plan comprised of selected demand management measures for implementation. The demand management measures selected by each Utility Partner were chosen based on feasibility, cost-effectiveness, and combined ability to achieve the 5% reduction goal. To ensure implementation of each WDMP, DEP provides partnership funding (DEP Funding) to each Utility Partner through an intergovernmental funding agreement. As implementation progresses, DEP will continue to track demand reductions achieved by October 2022.

In 2018, Ossining began implementing their WDMP and DEP made significant progress in coordinating with the other nine Utility Partners to finalize their WDMPs. WDMP implementation is poised to begin in 2020 for Greenburgh, Scarsdale, Tarrytown, White Plains, WJWW, and Yonkers.

Additionally, during the planning stages of the Wholesale Customers Water Demand Management Program, Utility Partners have increased their attention to water demand management and water loss control. Since 2014, the combined water demand of participating Utility Partners has decreased, while demand of wholesale customers not participating in the program has increased. In 2018, the participating Utility Partners achieved demand reductions for that time period, but continuing to implement the Wholesale Customers Demand Management Program is crucial to ensure these water savings are sustained through October 2022 and beyond.

Wholesale Customer Progress

Greenburgh

Savings Goal: 0.32 MGD

Greenburgh's finalized WDMP includes water loss control, a residential toilet replacement voucher program, and transition to monthly billing. As a larger system, Greenburgh's water loss control plan involves completing three comprehensive leak detection surveys and a pressure survey, conducting ongoing maintenance leak detection surveys, and making continuous repairs. Greenburgh's toilet replacement program calls for distributing 800 vouchers for up to $225 each.

To finalize Greenburgh's WDMP, DEP and the Greenburgh Department of Public Works relied on the guidance of Greenburgh's public and voluntary Water Advisory Committee. This team of community members was crucial in vetting the feasibility of the selected demand management measures, and offering insight into programs that rely on public participation, including the residential toilet replacement voucher program.

Mount Vernon

Savings Goal: 0.38 MGD

In addition to a robust water loss control program, Mount Vernon's WDMP focuses on residential and municipal building fixture replacements. For their residential fixture replacement voucher program, Mount Vernon plans to distribute 1,000 vouchers to eligible customers. For their municipal fixture upgrade program, up to 410 fixtures in municipal buildings would be replaced. Additionally, Mount Vernon's commitment to begin billing municipal buildings, which previously received free water, is crucial to further reducing water demand.

New Windsor

Savings Goal: 0.15 MGD

New Windsor's WDMP is unique because it includes a strategy to reduce demand at an existing water filtration plant by completing upgrades to pressure reduction valves and improving backwash efficiency. In addition to these filtration plant upgrades, New Windsor's WDMP includes a water loss control program.

In Fall 2018, New Windsor completed a separate program to discontinue purchasing water from the NYC water supply system and begin using alternate water sources. Thus, DEP continues to evaluate New Windsor's participation in this program.

Ossining

Savings Goal: 0.13 MGD

Ossining began implementing their WDMP in early 2018, by launching a residential toilet replacement voucher program for Village residents. Ossining worked with DEP to develop an application process for participants and a program brochure, which includes participation eligibility requirements.

Ossining advertised the program, but due to initial low participation rates, DEP and Ossining strategized on how to increase participation. In 2019, Ossining expanded the program to water customers in the Town of Ossining, as well as condo and co-op owners in the Village and Town. Within weeks of this expansion, Ossining reported that they distributed vouchers to 44 participants, a nearly 10-fold increase in participation from 2018.

Additionally, in 2019, Ossining hired a consultant to perform their initial American Water Works Association (AWWA) M36 Water Loss Audit. Following completion of the audit, Ossining will begin active leak detection and leak repairs using DEP Funding.

Scarsdale

Savings Goal: 0.16 MGD

The primary focus of Scarsdale's WDMP is to install Automated Metering Infrastructure (AMI) throughout their entire water system by 2021, and fully transition their customers to monthly billing by 2022. Scarsdale began installing AMI in 2015, and plans to use DEP Funding to complete this effort. Scarsdale will then utilize this new system-wide AMI to facilitate their transition to monthly billing.

Scarsdale Homes

Scarsdale will also use DEP Funding to enhance their existing water loss control efforts by conducting two comprehensive leak detection surveys and ongoing maintenance leak detection surveys, while making continuous repairs to leaks identified by the surveys.

SUEZ

Savings Goal: 1.05 MGD

In 2018, DEP assessed that SUEZ's full transition to monthly billing in 2015 and robust water loss control efforts helped SUEZ achieve their 5% water savings goal, prior to finalizing their WDMP. As such, SUEZ's WDMP now calls for SUEZ to enhance their water loss control efforts, and estimates that SUEZ could potentially achieve an 8% total demand reduction from their baseline 2013 demand.

Tarrytown

Savings Goal: 0.09 MGD

DEP noted that Tarrytown's non-revenue water had been steadily increasing since 2015, despite Tarrytown conducting routine leak detection surveys and making repairs. In 2018, Tarrytown realized that noise from streams might hinder traditional noise-logging leak detection efforts. Thus, Tarrytown began to look for leaks using different methods, including analyzing metered water reads in different parts of Tarrytown's service area. Using this method, Tarrytown detected a substantial leak under a stream, and repaired it in June 2018. This single leak repair saved Tarrytown 0.4 MGD, a value which exceeds their 5% savings goal of 0.09 MGD.

Recognizing that water loss control is an ongoing effort, Tarrytown plans to use DEP Funding to continue actively looking for leaks and making repairs. Tarrytown will also use DEP Funding to implement a residential fixture replacement voucher program, for the replacement of up to 200 fixtures.

Westchester Joint Water Works

Savings Goal: 0.45 MGD

WJWW's WDMP includes full AMI installation with a transition to monthly billing, and a water loss control program. To complete the AMI installation and transition to monthly billing, DEP Funding will be used to purchase AMI software and hardware, and purchase and install meter transmitters. Additionally, DEP Funding will be used for the consulting and programming services

Downtown Mamaroneck, Served by WJWW

	Water Loss Control	Automated Metering Infrastructure + Monthly Billing	Municipal Upgrades	Residential Indoor Fixture Replacement Vouchers	Water Filtration Plant Upgrades
Greenburgh	✔	✔		✔	
Mount Vernon	✔		✔	✔	
New Windsor	✔				✔
Ossining	✔			✔	
Scarsdale	✔	✔			
SUEZ	✔				
Tarrytown	✔			✔	
WJWW	✔	✔			
White Plains	✔				
Yonkers	✔	✔			

Water Savings Strategies for Wholesale Customers
Water Conservation Strategies to be Implemented by Each Utility Partner

needed to transfer the new AMI data into a monthly billing schedule.

The water loss control program for WJWW calls for completing two comprehensive leak detection surveys, conducting ongoing maintenance leak detection surveys, and making ongoing leak repairs. These combined efforts have the potential to exceed WJWW's 5% savings goal.

White Plains

Savings Goal: 0.40 MGD

White Plains joined the program in Spring 2018, and completed their WDMP in Fall 2018. White Plains' WDMP includes a water loss control program that focuses on service leak repairs. Under this program, White Plains will utilize their comprehensive leak detection surveys to identify service lines with substantial leaks, and contract out to leak repair companies to repair the leaks.

Yonkers

Savings Goal: 1.31 MGD

Yonkers' WDMP includes a robust water loss control program, and calls for completing six comprehensive leak detection surveys biannually, by October 2022. This strategy was developed from a component loss analysis completed for Yonkers in 2017, which determined that the Yonkers water system was large enough to warrant increased leak detection surveys. Completing two comprehensive leak detection surveys annually could allow Yonkers to undertake two rounds of leak repairs annually, including repairing any leaks initially masked by previous surveys. Additionally, Yonkers is planning to use DEP Funding to add customer alerts to their existing AMI software, to alert customers to potential leaks.

DEP Programmatic Support

During WDMP implementation, DEP will provide Utility Partners with ongoing support and program guidance, as DEP recognizes that issues can arise during implementation. Thus, DEP is taking an active role in supporting Utility Partners by holding periodic status meetings and scheduling additional meetings and conference calls on an as-needed basis. Additionally, DEP will track Utility Partner water demand through quarterly and annual reporting, to ensure program efficacy.

AWWA Water Audit Training and Validation

As part of the program, each Utility Partner will conduct annual AWWA audits to identify year-to-year improvements they can make to reduce water loss.

Following a Water Loss Control Workshop co-hosted by DEP and the Water Research Foundation in February 2019, the following Utility Partners participated in AWWA audit training sessions: Greenburgh, Ossining, Scarsdale, Tarrytown, WJWW, White Plains, and Yonkers. Beyond the training sessions and to provide further support, DEP will validate and provide feedback on each Utility Partner's annual audit. With this support, Utility Partners will be able to complete AWWA audits beyond October 2022 to achieve sustained water savings beyond the conclusion of this program.

Steve Johnson and Jim Macri (Scarsdale) Working with Peter Mayer (WaterDM) on an AWWA Water Loss Audit

Appendix A

New York City per capita water consumption has remained steady since the first Water Demand Management Plan was released in 2013, from 119 gallons per day per person, to 120 gallons in 2018, due to a decrease in estimated population in 2018. As DEP continues to expand AMR and volumetric meter-based billing, overall water demand is expected to remain stable or decrease. This trend could be affected in the future by factors including, but not limited to, annual temperature fluctuations, weather, climate, potential drought, and population fluctuations.

To explore these trends, DEP conducts water demand data analyses for our system each year. These analyses help the agency with water supply and wastewater infrastructure planning; revenue analysis; affordability studies; new growth and rezoning assessments; and analyzing and understanding the effects of water demand on agency operations. Since Fiscal Year 2013, DEP has used American Water Works Association (AWWA) M36 water audit software to assess system water balance. The table below illustrates the results of DEP's Fiscal Year 2018 audit. Since using the software, DEP has seen a decrease in non-revenue water from 17.5 percent in Fiscal Year 2013 to 14.6 percent in Fiscal Year 2018.

AWWA Free Water Audit Software:
System Attributes and Performance Indicators

WAS v5.0
American Water Works Association.
Copyright©2014, All Rights Reserved.

Water Audit Report for:	NYC Department of Environmental Protection
Reporting Year:	2018 — 7/2017 - 6/2018

*** YOUR WATER AUDIT DATA VALIDITY SCORE IS: 78 out of 100 ***

System Attributes:

	Apparent Losses:	17,252.353	MG/Yr
+	Real Losses:	27,969.638	MG/Yr
=	**Water Losses:**	**45,221.991**	MG/Yr
	? Unavoidable Annual Real Losses (UARL):	4,088.56	MG/Yr
	Annual cost of Apparent Losses:	$227,632,217	
	Annual cost of Real Losses:	$14,823,908	Valued at **Variable Production Cost**

Return to Reporting Worksheet to change this assumpiton

Performance Indicators:

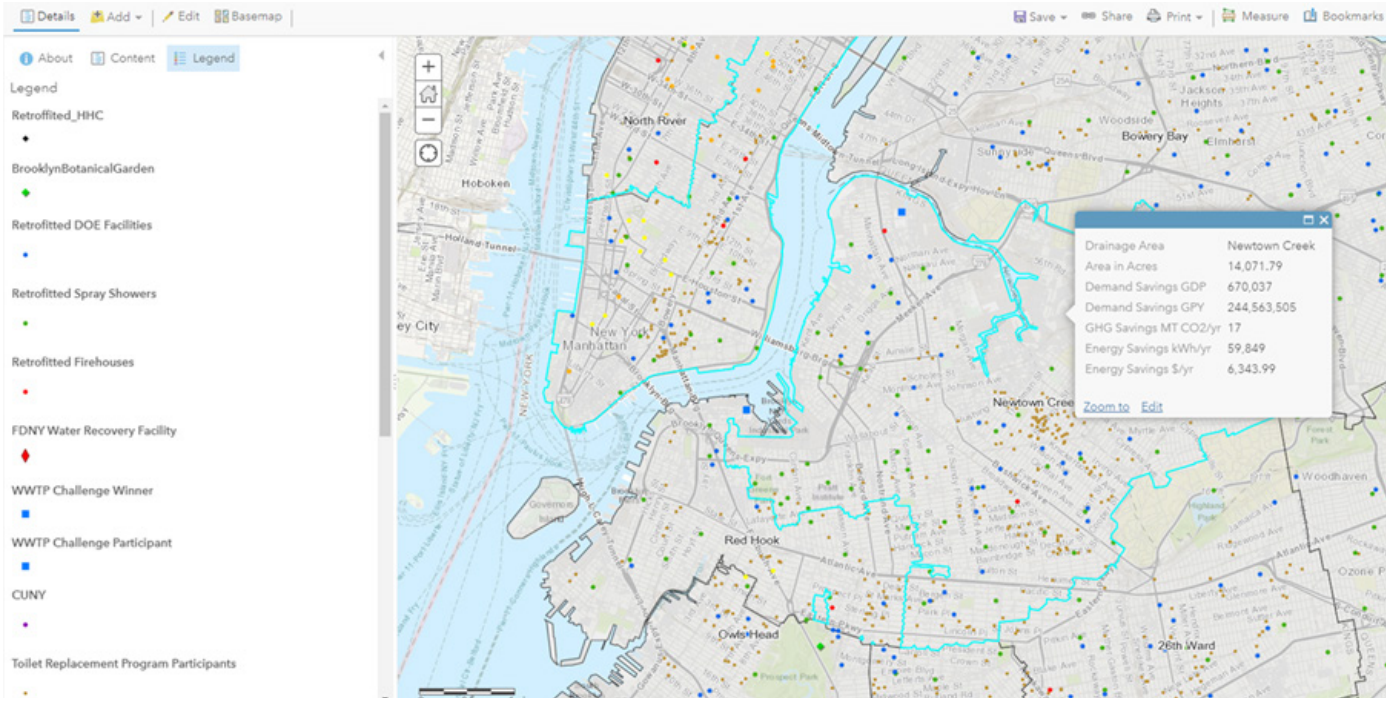
Financial:	Non-revenue water as percent by volume of Water Supplied:	14.6%	
	Non-revenue water as percent by cost of operating system:	16.6%	Real Losses valued at Variable Production Cost
Operational Efficiency:	Apparent Losses per service connection per day:	56.66	gallons/connection/day
	Real Losses per service connection per day:	91.86	gallons/connection/day
	Real Losses per length of main per day*:	N/A	
	Real Losses per service connection per day per psi pressure:	1.53	gallons/connection/day/psi
	From Above, Real Losses = Current Annual Real Losses (CARL):	27,969.64	million gallons/year
	? Infrastructure Leakage Index (ILI) [CARL/UARL]:	6.84	

* This performance indicator applies for systems with a low service connection density of less than 32 service connections/mile of pipeline

AWWA Water Audit Results for Fiscal Year 2018

Appendix B

Starting in 2018, DEP released a public map of its water conservation projects across New York City. All projects and their respective savings have been mapped and are available to view through DEP's water conservation website. In addition, DEP has used the Water-Energy Nexus Tool (refer to page 11) to estimate the energy savings and benefits of water conservation, including the reduction in electricity and greenhouse gases that would have been required to process and treat the water. A screenshot of this interactive map showing conservation projects and associated energy and greenhouse benefits is shown below.



Demand Management Interactive Map