



# OUR WATER

METRO WATER SERVICES

2019 ANNUAL REPORT



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## Letter from the Director

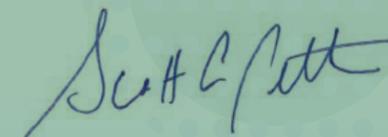
As this Metro Water Services (MWS) Annual Report reaches you, our organization is transitioning to a “One Water” management model. Fundamentally, One Water recognizes the interrelation between the water cycle, proper stormwater management, drinking water treatment and distribution, and wastewater collection and treatment. This holistic approach is backed by MWS fundamental values – public health, safety, integrity and excellence – to be a leading utility committed to enhancing quality of life in Nashville.

Every day we provide over 209,000 customers with clean, safe drinking water and reclaim the used water from 212,000 customers, clean it again, and return the water to the river. In this public report, which we have titled Our Water to reflect the vital responsibility that MWS has for the residents of Davidson County, you can read about our 18-month long pilot project, energy savings program and new substation, and other technological advances and investments we have made for the health and safety of our community.

Our employees’ commitment to excellence is demonstrated by the fact that over the past five years, our treatment plants have been 100 percent compliant with the Safe Drinking Water Act and 99.5 percent compliant with the Clean Water Act. Due to the efforts of our dedicated and professional employees, our area creeks and streams and the Cumberland River are healthier than ever. Their efforts are truly impressive.

Throughout the watershed, Metro Water Services is leading the way to protect our residents and the environment. As Nashville grows, our stormwater management group works diligently to ensure that new development does not increase flooding of neighboring properties or increase pollution in our waterways.

I invite you to read this annual report, Our Water, representing Metro Water Services’ dedication to the future of our community and the future of our watershed.



SCOTT A. POTTER, P.E.  
Director of Metro Water Services

The Allis-Chalmers Pumping Engine installed in 1909 was capable of pumping 20 million gallons per day.

**Our mission:**  
**SUPPLY, TREAT, MANAGE,**  
**AND PROTECT OUR**  
**WATER RESOURCES IN A**  
**SUSTAINABLE MANNER**  
for the benefit of all who  
live, work, and play in our  
community.

# Our History

Nashville's water system infrastructure first began in 1826 in downtown. New and improved facilities have been added and expanded upon ever since.

Nashville had what could be considered, a water system as early as 1826, consisting of a pump at the foot of Spring Street (now Church Street), which pumped water into a reservoir on the north side of Church Street, just below the present 5th Avenue. Wooden pipes delivered water from the reservoir to the square. However, this system burned in 1830, and a second water system was constructed on the grounds of the old General Hospital Building on Hermitage Avenue in the fall of 1833. This system functioned for many years, but muddy water from the Cumberland River was an ever-present challenge.

After several cholera outbreaks, the Board of Health determined in 1876 a sufficient amount of water was being secured, but the quality of the water was sub-standard. It became apparent in 1887 that a new reservoir was necessary.

What is now known as the 8th Avenue Reservoir was constructed on Kirkpatrick's Hill, and a new pumping station was built at the "Upper Island," near the natural filtering galleries in the Cumberland River. Both were completed in 1889 and remain in use today.

The 51 million gallon reservoir divided into two 25.5 million gallon

compartments by a cross wall, allowed for muddy water to be pumped into one chamber for settling and then allowed to flow into the other basin through a weir on the cross wall for storage and distribution.

In 1908, the use of alum and hypochlorite of lime began to facilitate settling of particles and sterilization of the water, and in 1920, chlorine replaced the hypochlorite of lime for disinfection.

A grit chamber was installed near the pumping station in 1921, and the first filtration plant began operations in 1929. This complex, known as Omohundro, now treats up to 90 million gallons of water per day and sends clear disinfected water to the 8th Avenue Reservoir for storage.

In 1953, the pumping station was modernized by removing the coal-fired steam boilers and turbines and converting them to electrically powered equipment. Much of the original equipment is still being used today.

Nashville's second water treatment plant, K.R. Harrington, was placed into service in 1978 and also treats up to 90 million gallons of water per day.



The George Reyer Pumping Station built in 1889 (on left) and Boiler House built in 1926 (on right)

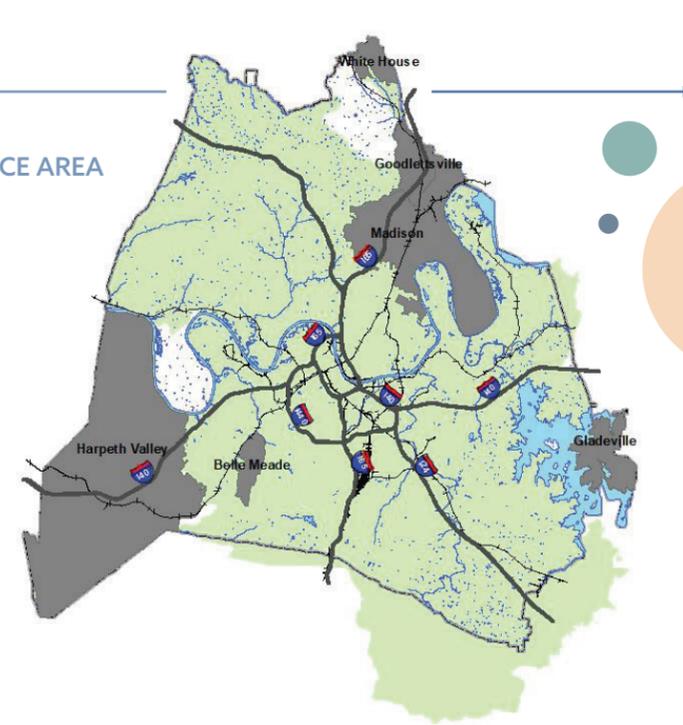
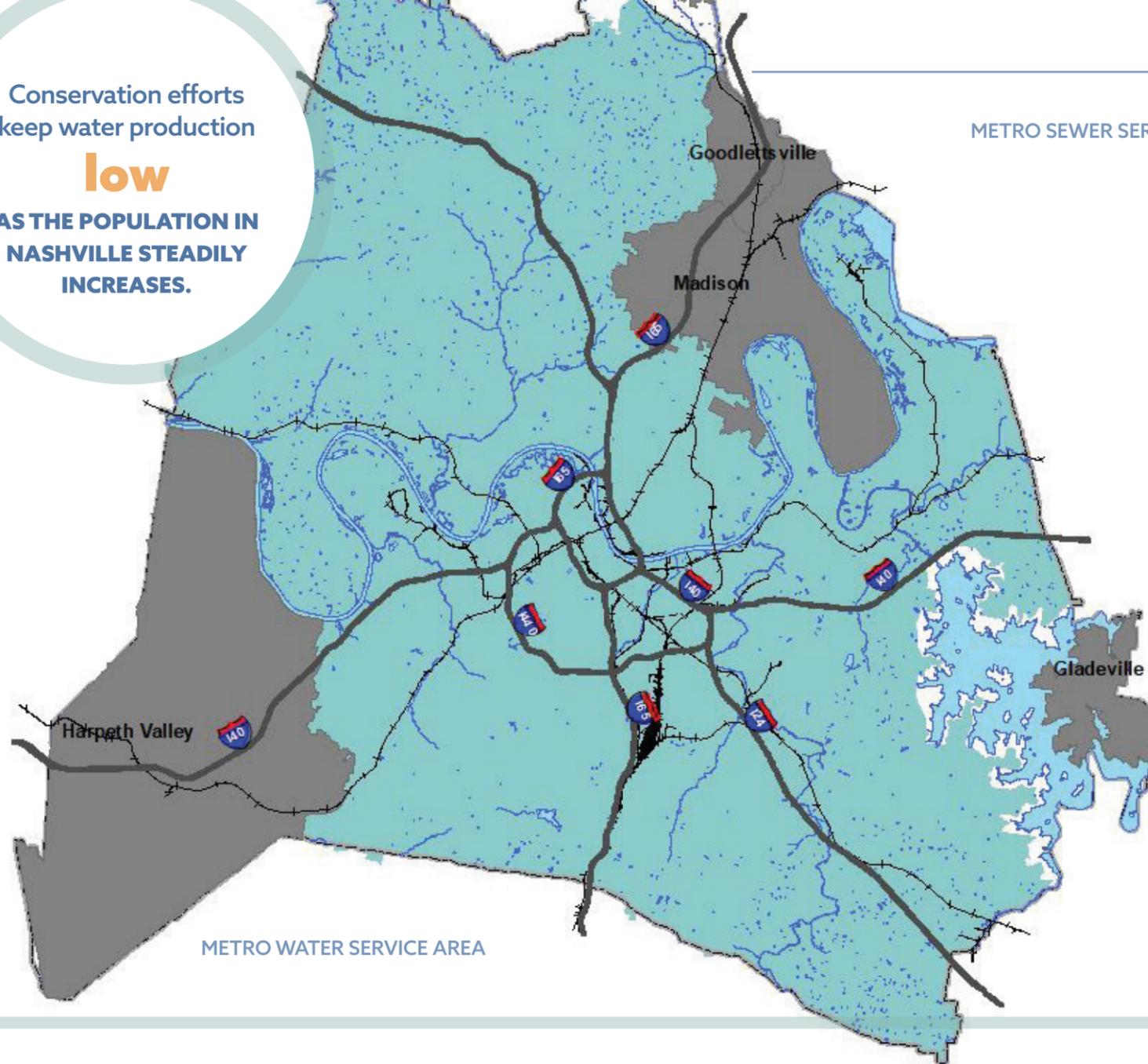
# Growth

Conservation efforts keep water production **low** AS THE POPULATION IN NASHVILLE STEADILY INCREASES.

Nashville continues to be a highly desired city to live and prosper. Over the last several years, Davidson County and surrounding counties have grown at a rapid pace. While living in a booming city can be exciting, it also brings concerns regarding the impact of that growth on the existing community and infrastructure. Water supply, in particular, is among metro leadership's chief concerns. Table 1 illustrates the growth in customer connections for the water and sewer systems of Metro Water Services since the late 1960s. As shown in the graph, the number of customers has continued to increase since the utility started tracking the data. While the number of sewer customers shows a relatively steady increase, the number of water customers shows a more dramatic increase, beginning in the year 2000 to present. This does not include the growth in satellite cities in which there are wholesale customers to the utility.

Interestingly, while the number of water customers has increased steadily since the early 2000s, the average water pumped into the distribution system by the two water treatment plants has not seen an overall increase. In fact, the average water production has slightly decreased when compared to the water treatment plant production between 2005 and 2012, as shown, on page 7, in **Table 2 - Customer Growth vs. WTP Production.**

Nashville is not an anomaly. Utilities around the country have reported seeing a similar phenomenon, and the United States Geologic Survey reported a decrease in



the total water withdrawals for public water supply across the country from 44.4 billion gallons per day (BGD) in 2005, to 42.0 BGD in 2010, to 39.0 BGD in 2015. While the individual explanations for the decrease may vary somewhat by utility and region of the country, the general trend is likely due in large part to conservation efforts.

In Nashville, the decrease in water production at the water treatment plants in the last 15 years is likely due to a combination of factors. Considerable construction is occurring around Nashville. Fixtures in older homes and buildings are being replaced with new low-flow water fixtures and toilets. Newer, efficient washing machines are being installed. Installing pressure reducing valves (PRVs) is good practice in efficiency, and new construction is widely utilizing PRVs. Another likely factor is the Metro Water Services leak detection program, which started in 2005 and surveys every mile of water main within the distribution system each year for leaks. The combination of these factors - utilization of low-flow fixtures and the implementation of a program within MWS to find leakage in the distribution system - is likely the reason why the increase in population in Nashville has not impacted the water supply to the community.

TABLE 1 - SYSTEM GROWTH

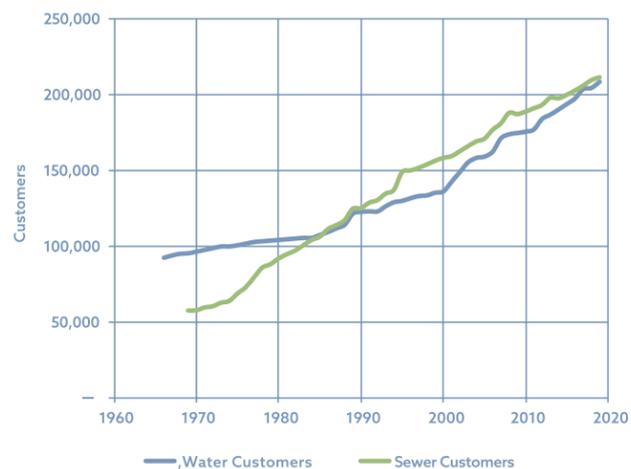
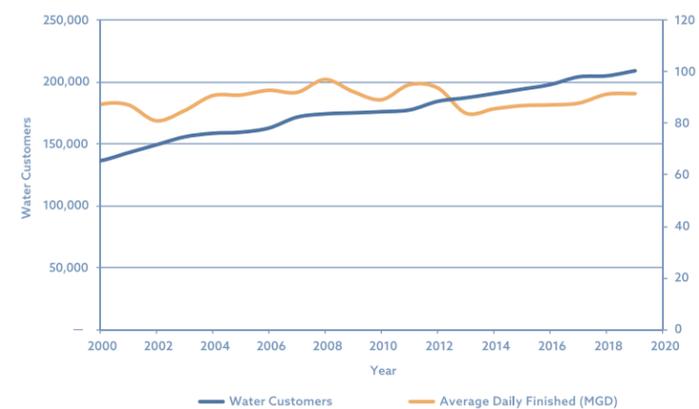


TABLE 2 - CUSTOMER GROWTH VS. WTP PRODUCTION



# Energy Management

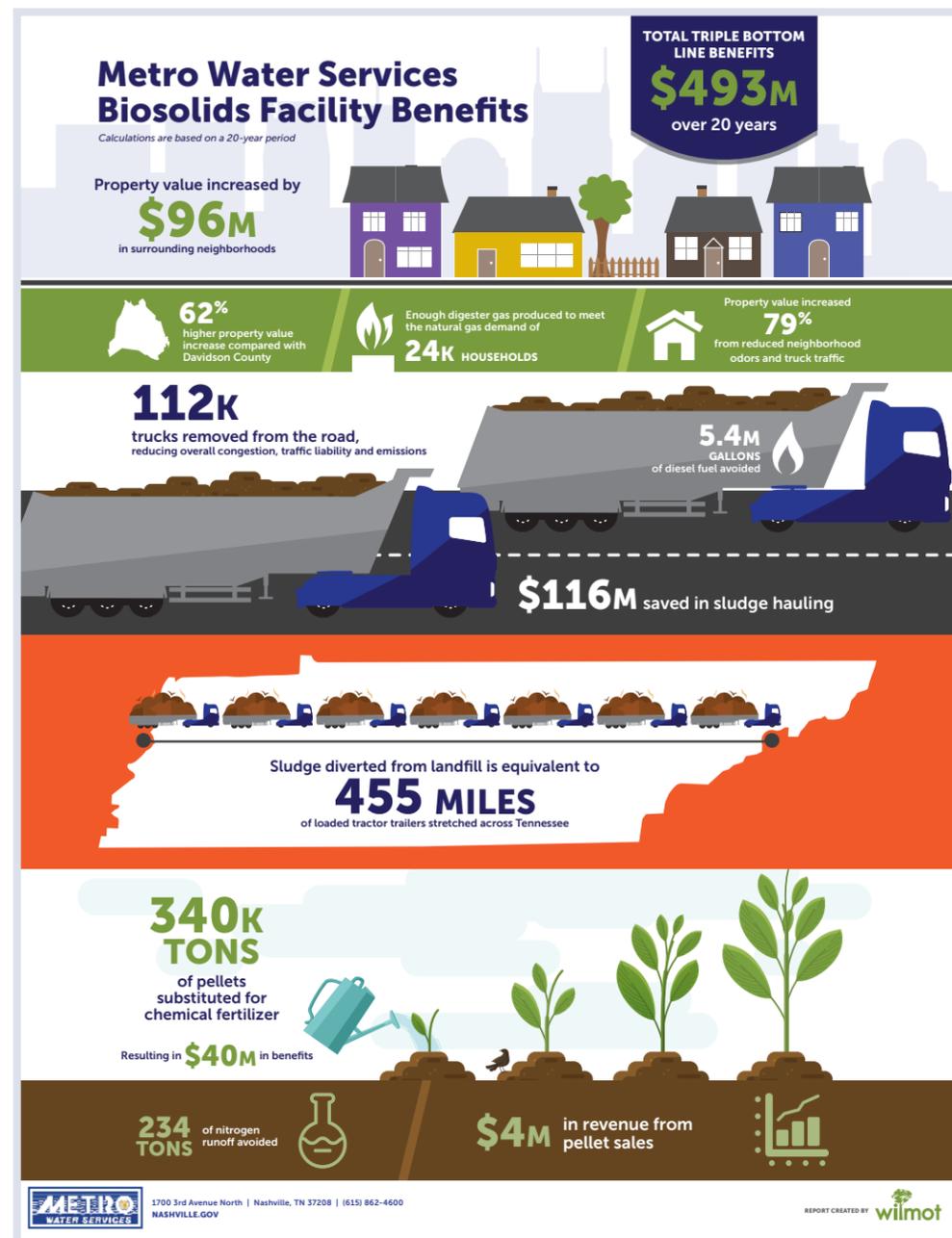
Metro Water Services Energy Management Program began nearly a decade ago with the sole focus of improving the efficiency of energy use and optimizing energy production. The goal of the program is to bring about an energy-focused culture while maintaining the core functions of the department, which are to supply our customers with quality water, reclaim wastewater, and manage stormwater.

MWS spends nearly \$18 million per year on electrical expenses alone. Although we cannot control the cost of energy, we can control our overall usage and the rate at which we consume electricity. Various projects, programs, and upgrades at our facilities have allowed MWS to save over \$1 million per year in electrical costs alone.

Similarly, process and operational improvements at our Biosolids facility have had a significant impact on our dependence on natural gas. The biogas produced during digestion is being used onsite to power various process equipment, which once depended on natural gas to operate. Overall, the improvements have saved the department over \$900,000.

MWS Energy Management Program has several projects slated to assist with future savings for the department. Plans include green energy projects, process improvements, and energy-conscious design efforts to reduce our overall use of electricity. Upon completion, it is projected the projects will save an additional \$1.25 million per year on electrical costs.

**3,181 + 706**  
STUDENTS ADULTS  
toured our facilities and  
learned about our  
environment initiative



Ongoing energy efficiency program has achieved annual electricity cost savings of **\$1 million+** A YEAR AT MWS FACILITIES

Over the past year, the MWS Energy Management Program conducted a Triple Bottom Line Analysis of the Biosolids facility that was constructed nearly a decade ago. The substantial capital investment has allowed for operational ease for our utility; however, the benefits of the investment do not stop there. The Biosolids facility has helped reduce truck traffic, reduce foul odor, and positively impact the Germantown area. Some highlights from the report are captured in the infographics to the left.

# Clean Water Nashville



In 2011, the Metropolitan Government through the Department of Water Services began an ambitious program to fulfill Clean Water Act requirements by planning, designing and constructing wastewater system improvements in a cost-effective manner to enhance water quality for Nashville.

Known as Clean Water Nashville, this program continues an MWS commitment to reduce wastewater overflows into the environment. The Cumberland River and area creeks and streams form an abundant water system that is one of Nashville's greatest natural resources.

Renewing an aged existing system is just as vital as planning and building into new-growth areas of our city. In some cases, the sewer pipes we are repairing were installed anywhere from 75 to 100 years ago. Now in its ninth year, Clean Water Nashville has achieved considerable advancement for both environmental compliance and overall system improvements across the county.

**Program highlights so far include:**

- Elimination of the downtown Broadway and Van Buren combined sewer overflow locations that had previously allowed wastewater to overflow into the Cumberland River for more than 100 years;
- Capacity increases of the Dodson Chapel, Driftwood, Ewing Creek, Mill Creek/Opryland and West Park equalization facilities to prevent sewer overflow discharges into area waterways resulting from heavy wet weather events;



*Clean Water Nashville is an ongoing program to renew Nashville's water & wastewater infrastructure*

- Renewal of 8,500 service lateral connections, rehabilitation or replacement of 145 miles of sewer pipe, and rehabilitation of 4,500 manholes.

More work lies ahead. Each project makes an incremental contribution to improving water quality and improvement of the publicly owned system to benefit future generations of Nashvillians.



**MWS, PARKS COLLABORATE ON WEST PARK IMPROVEMENTS**

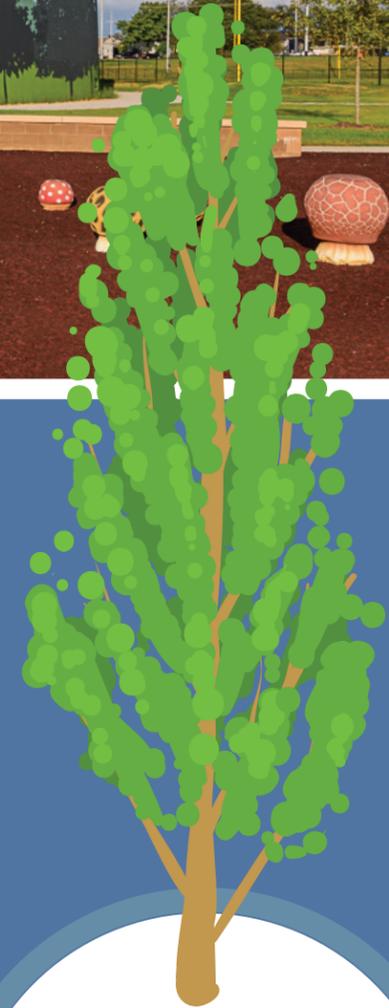
The Clean Water Nashville Program completed major improvements at West Park on August 18, 2018. Enhancements to West Park, which began in 2015 as a collaborative project between Metro Parks and MWS, included new recreation amenities, as well as, an updated wastewater system infrastructure to improve water quality in Richland Creek.

The project delivered numerous new features and options for park users, including a new softball field, which was dedicated in memory of Luis Cisneros, a victim of child abuse who never got to experience playing ball in the park. A basketball court, a playground, and a picnic pavilion were also added. Additional improvements to the park included a new trail, which will have future connectivity to the local greenway system.

The Park's improvements were conducted in conjunction with an expansion of the West Park Equalization Facility. The facility now consists of a pump station and two storage tanks. As part of this expansion project, a circular, 260-foot diameter, 21 million gallon wet weather storage

tank was constructed. The new storage tank, which includes a mural by artist Eric Henn, is used when sewer flows exceed the capacity of the existing West Park Pump Station. The reservoir stores excess wastewater until the flows in the sewer system recede, and the stored volume can be conveyed through the pump station to treatment. The expanded storage capacity reduces sanitary sewer overflows into Richland Creek.

In addition to the park features and storage tank, more than 200 trees were planted on the site, and landscape features were designed to capture stormwater runoff. Because of the numerous sustainable features incorporated into the design and construction, the project earned the Envision Platinum Award from the Institute for Sustainable Infrastructure. This award was accepted by the Mayor during the reopening of the park.



**200+**  
**TREES WERE PLANTED ON SITE**  
**to help capture stormwater runoff at Metro West Park.**



New generators totaling 10 megawatts of emergency back-up power.

# Omohundro Substation

Following the historical 2010 Flood, Metro Water Services evaluated critical infrastructure to prioritize process areas that were in need of additional infrastructure, improvements, or both to increase reliability, sustainability, and mitigate the risks associated with natural disasters. This evaluation led to the design and construction of the \$43.2 million Omohundro Campus Substation and Generation Facility Project.

Prior to the inception of this project, the Omohundro Water Treatment Plant (Omohundro WTP) site electrical system was showing signs of aging. It lacked backup power generation when the plant lost electrical service from the utility, and there were ongoing voltage dip issues, which were largely due to the low distribution services and smaller wires throughout the site. In addition, the electrical loading resulted in a lack of redundancy within the system.

Development of the project began at the adjacent MWS Omohundro South campus, which has a significantly higher elevation. The project

infrastructure upgrades to the entire power distribution system included: an upgraded high voltage electrical service; a new substation; step-down transformers; medium voltage duct bank loops; communication and control bank loops; new switchgear and generator building, gas-insulated switchgear; 10 megawatts (MW) of backup power generation; and a new site access road for flood mitigation purposes.

The benefits of these improvements include providing electrical service to Omohundro WTP, Omohundro South, and adjacent facilities as well as the elimination of voltage

dips; lightning protection due to the heavier construction and underground installation; and lower power rates and standby power to all the buildings on both campuses. The new site access road also offers alternate access to Omohundro WTP during emergencies, such as the 2010 Flood.

Overall, the project replaces aging electrical infrastructure, ensuring resiliency, and is designed for both Omohundro WTP and Clean Water Nashville future expansions. Most importantly, it provides standby and continuous run generators for backup power to Omohundro WTP, Omohundro South, and adjacent CWN equalization facilities. The new infrastructure allows MWS to supply drinking water to customers even during electrical power outages and mitigates the risks associated with the existing system.

# Pilot Plant

In April of 2018 MWS began a Pilot Plant project to explore new water treatment technologies. Piloting, or testing, different treatment options prior to full scale implementation is the best way to ensure we get the data needed to make critical decisions about the future of water treatment at MWS. Full scale water treatment plants were modeled using smaller scale equipment to collect data on which treatment option performs the best with our source water. The pilot plants were located at the K.R. Harrington Water treatment plant and the list of piloted treatment options includes pre-ozone, post ozone, granular activated carbon (GAC) filtration, ultraviolet (UV) treatment, biologically active filtration (BAF), and different combinations of these treatment techniques. Data collection concluded at the end of September 2019 and each piloted option is currently being evaluated using the following criteria.



## WATER QUALITY

- 1| Finished water Total Organic Carbon (TOC) improvements
- 2| Reduction of formation of Disinfection By-Products (DBPs)
- 3| Removal of taste and odor compounds 2-methylisoborneol (MIB) and Geosmin
- 4| Effectiveness in removal of a broad range of Emerging Contaminants

Findings will be compiled into a final report and then analyzed with the support of the MWS Water Master Planning Group. These efforts will provide the pathway for the future of water treatment at MWS and ensure resources are allocated efficiently and our water meets the highest standards now and into the future.

## PROCESS ENHANCEMENTS

- 1| Upfront Capital Cost
- 2| Operations and Maintenance Cost
- 3| Process and Operational Enhancements
- 4| Ease of Operations



## Stormwater

Metro Water Services' National Pollutant Discharge Elimination System (NPDES) section oversees all Municipal Separate Storm Sewer System (MS4) permit compliance activities to ensure permit compliance within the various facets of Metro government. NPDES is a section within the Stormwater Division. It is responsible for performing specific permit requirements such as public education activities, illicit discharge investigations, runoff discharge sampling, construction site inspections, field screening inspections, industrial inspections, etc.

The objective of this Stormwater Management Program is to implement specific pollution prevention programs designed to improve the quality of our water resources.

The full MS4 Annual Report is posted on our website.

MWS' NPDES program was formally recognized as the **Best Organization with a population of 10,000 or more** BY THE WATER ENVIRONMENT FEDERATION'S STORMWATER CONGRESS.

# Financials

Metro Water Services collects its primary revenues from charges for water and sewerage services provided to customers.

Activities are funded entirely from revenues generated from its operations, with no tax revenues from the Government. All revenues are required to be used for the benefit of the ratepayers.

In 2019, current water and sewer assets increased by \$5.7 million to \$158.5 million and current liabilities increased by \$70.1 million to \$287.1 million yielding a current ratio of 0.552. Water and sewer capital assets, net of accumulated depreciation of \$1.49 billion, increased by \$130 million in 2019 to \$2.09 billion. These increases are from a combination of infrastructure deeded to the Department by developers, Clean Water Nashville projects and the Department's efforts to maintain and improve the system. The Department has an ongoing program

to improve both the water and sewer infrastructure by cleaning and/or relining existing pipes, as well as replacing and extending facilities.

In 2009, the Metropolitan Government established a Stormwater Division of the Department as a stand-alone enterprise fund with its own set of service fees, which are now an itemized part of the water bill. Stormwater operations is funded solely through stormwater fees and any associated bonds supported by those fees. This financial statement does not include stormwater.

Please note that this information is a summary and does not contain all of this information available in the full Comprehensive Financial Annual Report (CAFR) at <https://www.nashville.gov/Finance/Financial-Operations/Comprehensive-Financial-Reports.aspx>.

## CONDENSED FINANCIAL INFORMATION (as of June 30, 2019)

### Statements of Net Position

	2019	2018
<b>ASSETS</b>		
Total Current Assets	\$158,507,166	\$152,817,023
Total Capital and other non current assets	\$5,906,689,493	\$5,777,712,089
Total Assets	\$6,065,196,659	\$5,930,529,112
Deferred charge on refunding	\$2,667,744	\$3,875,115
Pensions	\$8,452,367	\$5,758,511
Total deferred outflows of resources	\$11,120,111	\$9,633,626
<b>LIABILITIES</b>		
Total current liabilities	\$287,091,882	\$217,036,735
Total noncurrent liabilities	\$888,922,626	\$932,408,179
Total liabilities	\$1,176,014,508	\$1,149,444,914
Pensions	\$12,813,821	\$10,780,535
Total deferred intflows of resources	\$12,813,821	\$10,780,535
<b>TOTAL NET POSITION</b>	<b>\$1,307,096,202</b>	<b>\$1,302,869,230</b>

## CONDENSED FINANCIAL INFORMATION (as of June 30, 2019)

### Statement of Revenue, Expenses, and Changes in Net Position

	2019	2018
<b>OPERATING REVENUES</b>	<b>\$227,648,685</b>	<b>\$223,840,989</b>
Depreciation (expense)	(\$90,316,161)	(\$86,137,563)
Other operating (expenses)	(\$111,335,275)	(\$113,857,694)
Operating income	\$25,997,249	\$23,845,732
<b>NON-OPERATING REVENUES (EXPENSES):</b>		
Investment income	\$5,866,244	\$ 2,498,141
Interest expense	(\$34,816,690)	(\$32,285,970)
Other	\$435,667	\$465,356
<b>CAPITAL GRANTS AND CONTRIBUTIONS</b>	<b>\$20,652,395</b>	<b>\$18,752,603</b>
<b>TRANSFERS TO OTHER FUNDS OF THE METROPOLITAN GOVERNMENT, NET</b>	<b>(\$13,907,893)</b>	<b>(\$16,138,329)</b>
Change in net Position	\$4,226,972	(\$2,862,467)
<b>NET POSITION, BEGINNING OF YEAR</b>	<b>\$1,302,869,230</b>	<b>\$1,305,731,697</b>
<b>NET POSITION, END OF YEAR</b>	<b>\$1,307,096,202</b>	<b>\$1,302,869,230</b>

## BY THE NUMBERS

The data presented here reflects the initiatives and hard work delivered by Metro Water Services to maintain a high quality water program.

STORMWATER	DEVELOPMENT SERVICES	ENGINEERING
SW requests 2,803	Feet of Approved Water 72,740	Miles of new water main 18.1
Inspections 3,120	Feet of sewer plans approved 171	Miles of new sewer main 81.6
Work orders completed 1,828	Feet of approved sewer 89,863	Miles of water main inspected for leak detection 3,437
Homes removed from flood risk areas 16	Feet of water plans approved 107	<b>CONSTRUCTION INSPECTIONS</b>
Miles of streets swept 18,055	<b>FLEET</b>	Inspections 3,380+
Tons of debris collected 4,286	Vehicles/equipment in fleet 526	<b>CUSTOMER SERVICES</b>
Miles of stream evaluation 24	Miles logged 3,378,631	Customer bills generated 2,572,363
<b>STORMWATER QUALITY</b>	<b>OPERATIONS</b>	Water customers 209,051
Illicit discharge investigations 143	Average daily water delivery 90.34 MG	Sewer customers 212,061
Discharge 122	Peak water delivery 115.07 MG (5/29/19)	Calls taken 668,458
Spill 21	Avg water temp leaving plants 66° F	Answered by CSC 236,973
Stream adoptions 23	Avg water temp in distribuon system 68.2° F	Answered by IVR 417,307
New 12	Average daily wastewater treatment 188.4 MG	Answered by Emergency 14,178
Renewing 11	Peak wastewater treatment 457 MG (2/23/19)	<b>CLEAN WATER NASHVILLE PROGRAM</b>
Stream miles adopted 21.36	Notices of Violation issued 115	Miles of sewer main rehabbed/lined (CIPP) 10.25
SW control measure inspections 3,106	Trees planted 5,359	Feet of sewer internal inspections 622,701
Grading permits issued 327	Grading permit inspections 7,962	Feet of sewer cleaned 313,195
Water quality sample events 277	Construction complaint investigations 380	<b>SYSTEM SERVICES</b>
Grading permit inspections 7,962		Public fire hydrants 21,110
Construction complaint investigations 380		Breaks per 100 miles of pipe 12



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