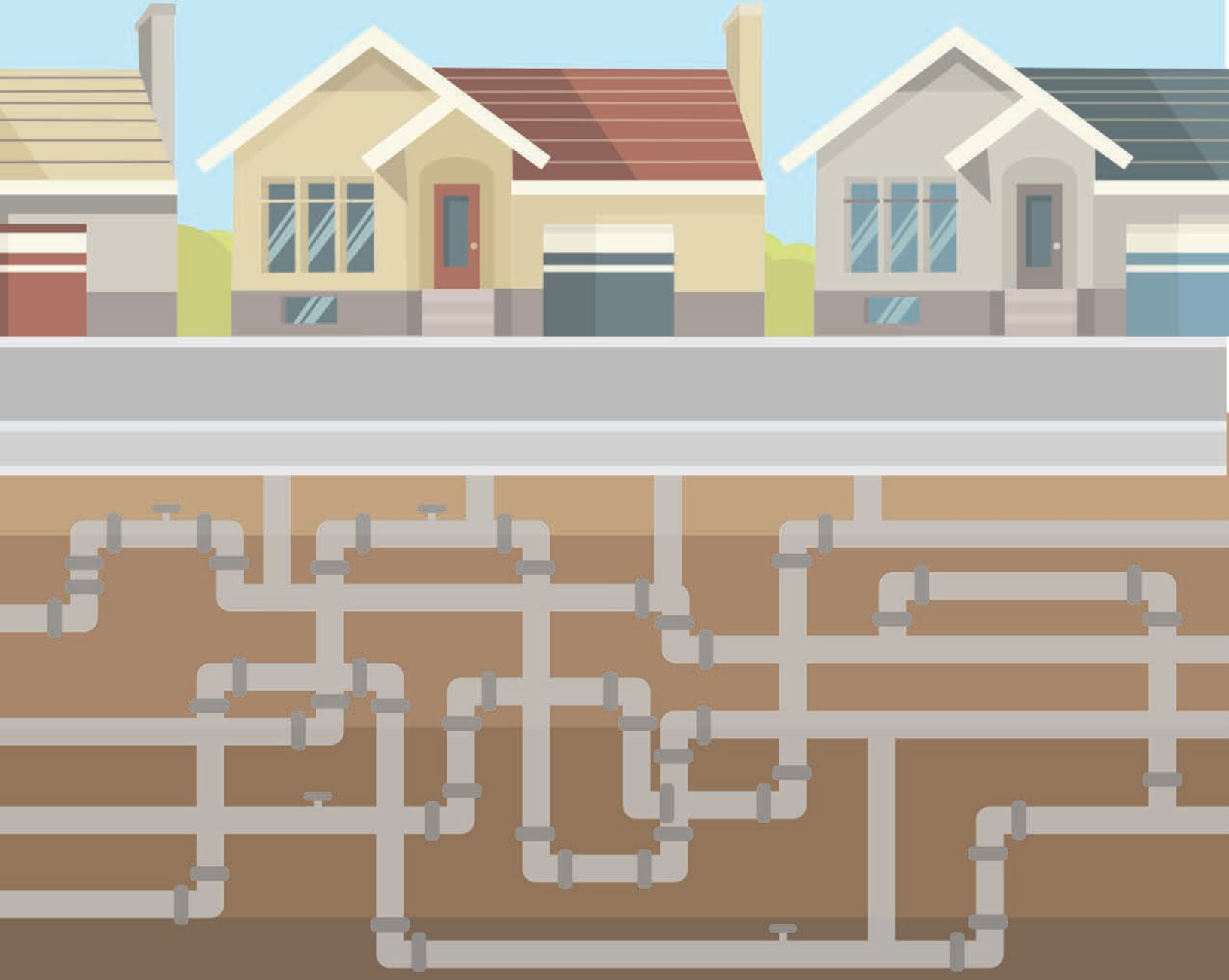
BENEATH THE STREETS:

THE OUTLOOK FOR METRO MILWAUKEE'S LARGEST WATER AND SEWER INFRASTRUCTURE ASSETS



PUBLIC POLICY FORUM

ABOUT THE PUBLIC POLICY FORUM

The Milwaukee-based Public Policy Forum, established in 1913 as a local government watchdog, is a nonpartisan, nonprofit organization dedicated to enhancing the effectiveness of government and the development of Southeastern Wisconsin through objective research of regional public policy issues.

PREFACE AND ACKNOWLEDGMENTS

This report was undertaken to provide citizens and policymakers in the Milwaukee region with an understanding of the condition of water, sewer, and wastewater treatment assets owned by the Milwaukee Metropolitan Sewerage District (MMSD) and the City of Milwaukee and the financial capacity of each jurisdiction to finance rehabilitation and replacement of those assets in the near-term future. We hope that policymakers and community leaders will use the report's findings to inform discussions during upcoming policy debates and budget deliberations at the local, State, and federal levels.

Report authors would like to thank officials and staff from MMSD, the City of Milwaukee Department of Public Works, and Milwaukee Water Works for their assistance in providing information on infrastructure condition and financial matters, and for patiently answering our questions.

In addition, we wish to acknowledge and thank the several entities that are providing financial support for our series of reports on local infrastructure condition and need. They are the Herzfeld Foundation, Wisconsin Housing and Economic Development Authority, MMSD, City of Milwaukee, Fund for Lake Michigan, and Brico Fund. We also thank the Northwestern Mutual Foundation and the Rockwell Automation Charitable Corporation for their long-standing support of our local government finance research.

BENEATH THE STREETS:

The outlook for Metro Milwaukee's largest water and sewer infrastructure assets

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INTRODUCTION

"Infrastructure — we're going to start spending on infrastructure big. Not like we have a choice. It's not like, oh gee, let's hold it off." – President Donald Trump to a group of governors at the White House, February 27, 2017

One of the few issues on which the two nominees for President agreed during the 2016 campaign was the need to substantially increase federal investment in the nation's infrastructure. That consensus was advanced, in part, by the water crisis in Flint, Michigan, which arose when improperly treated water from the Flint River caused lead from aging pipes to leach into the city's drinking water supply. To many, it was emblematic of an egregious indifference to aging roads, bridges, and pipes throughout the nation, which was now endangering the health and welfare of all U.S. citizens.

While the President and Congress play a substantial role in funding infrastructure repair and replacement, local governments bear ultimate responsibility for ensuring that the infrastructure within their borders is in good working order. Yet, the capacity of many local governments to appropriately fulfill this critical part of their mission is being challenged.

In a May 2016 report, the National League of Cities asserted that "declining funding, increasing mandates, and misaligned priorities at the federal and state levels have placed responsibility squarely on local governments to maintain roads, upgrade water and wastewater systems, and accommodate growing transit ridership."[1] Yet, according to the report, the ability of many local governments to meet their growing infrastructure obligations is restricted by statutory limitations on the amounts of local tax revenues they can raise.

To what extent are the largest local governments in Greater Milwaukee effectively addressing their infrastructure needs, and do they have the financial capacity to meet their infrastructure challenges going forward? Those are questions the Public Policy Forum hopes to answer in a multi-part series of reports on local government infrastructure in metro Milwaukee.

In our first report (*A Fork in the Road?*[2]), released in September 2016, we focused on transportation infrastructure owned by Milwaukee County and the City of Milwaukee. The report examined the condition of city streets and bridges, county trunk highways and bridges, and Milwaukee County-owned buses, and assessed the financial wherewithal of the two governments to address their most pressing repair and replacement needs. We found that both "face formidable challenges" that resulted not only from aging infrastructure, but also from limited borrowing capacity and "the competing capital needs of other governmental functions."

In this report – our second in the series – we explore water and wastewater treatment infrastructure owned by the Milwaukee Metropolitan Sewerage District (MMSD) and the City of Milwaukee, focusing on the following research questions:

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[1] "Paying for Local Infrastructure in a New Era of Federalism," National League of Cities, May 2016.

[2] The report can be accessed at http://publicpolicyforum.org/research/fork-road-outlook-transportation-infrastructure-city-and-county-milwaukee.

- How do the government entities identify and assess their infrastructure needs, and what is the general condition of their infrastructure?
- How are the governments financing their capital projects and what is the current status of their debt loads and overall finances?
- How much would it cost to fully fund identified repairs and improvements over the next five years (the typical window used by local governments to project long-term capital improvement needs), and what is the capacity of each government to cover future costs while complying with capital budgeting and debt management pressures and policies?

The various types of infrastructure addressed in this report are maintained by three distinct governmental entities: MMSD, the City's Department of Public Works (DPW), and the City-owned Milwaukee Water Works (MWW), a self-financing water utility. Yet, they share several similarities and are intertwined in several important ways.

For example, Lake Michigan plays a central role in the functioning of each entity in that water from the lake is withdrawn for consumption and then discharged back to where it originated. MWW pump stations bring lake water into one of two water treatment facilities through its network of pipes (called "mains"), where it undergoes an engineered cleaning process. The water then is pumped out into a distribution system, which connects to private properties through service lines.

Similarly, wastewater flows from privately-owned properties through DPW's sanitary sewers, which are comprised of an intricate network of sewer pipes. Those sewers ultimately connect to MMSD's Metropolitan Interceptor Sewer system, which transports wastewater to MMSD's water reclamation facilities, where it is treated and discharged back into Lake Michigan. Common infrastructure elements among the entities, therefore, include not only hundreds of miles of pipes, but also pumping equipment and, in the case of MWW and MMSD, storage and treatment facilities.

In the pages that follow, we analyze the capital needs and finances of these major wastewater, sewer, and water systems. While essential to human and environmental health in our region, these systems are out of sight and typically go unnoticed unless major problems arise. Included in this report are several pages of analysis of MWW's lead service line challenge, which should by no means be equated with the public health crisis in Flint, but which nonetheless will significantly impact the City of Milwaukee's finances and the pocketbooks of property owners for many years to come.

The full series of reports – which also will include installments on buildings and structures, parks and recreation, and a wrap-up piece – will be completed sometime next year. Our overall intent is to catalogue and describe the infrastructure challenges of the major local governments in our region and to assess the resulting financial implications. We hope this research will be used as a tool for policymakers and civic leaders as they consider local government spending priorities and the larger revenue structure that is used to support local governments in Wisconsin.

DATA AND METHODOLOGY

All of the data utilized for this report were provided by Milwaukee Metropolitan Sewerage District (MMSD), Milwaukee Water Works (MWW), and City of Milwaukee Department of Public Works (DPW) staff or publicly available financial documents. We conducted no original research or inspections related to the state of sewer and water infrastructure, facilities, or equipment. While this limited our analysis of current asset condition and future needs to those identified and communicated to us by the governmental entities, the fact that we are policy researchers – and not engineers – restricted us in this regard.

For the purposes of this report, sewer and water infrastructure are defined as capital assets owned by MMSD and the City of Milwaukee that provide for the conveyance, sanitation, and treatment of wastewater and drinking water. Capital assets in this definition include MMSD and DPW wastewater conveyance pipes (often referred to as “sewer” pipes), MWW mains and service lines, MMSD reclamation facilities, MWW treatment plants, and vital equipment that support the processes of treatment and sanitation.

This report relies on best practices cited by the Government Finance Officers Association (GFOA) on asset maintenance and replacement as a standard to understand how MMSD, DPW, and MWW maintain and replace capital assets. We couple those best practices with publicly available ratings for conveyance pipes, water mains, buildings, and equipment to help understand the methods employed by public infrastructure inspectors to document and assess the condition of capital assets. Our assessment represents a "snapshot in time" and its results will change as additional needs are identified and/or project work is completed.

Finally, in assessing the needs of MMSD, DPW, and MWW with regard to their sewer and water assets, we focus on "capital" needs, as opposed to minor repair and maintenance needs that would be addressed in operating budgets. Capital needs typically refer to major repairs, rehabilitation, reconstruction, or replacement of facilities or equipment, and projects associated with those needs typically have a useful life of several years (and often several decades). In contrast, minor repairs and maintenance projects are included in annual operating budgets and typically include items like minor leaks and equipment parts replacement.

CAPITAL ASSET MANAGEMENT: A BRIEF OVERVIEW

GFOA defines capital assets as "major facilities, infrastructure, equipment, and networks that enable delivery of public sector services."[3] Effectively managing capital assets involves rigorous and time-consuming effort to continuously assess their condition; plan for their maintenance, repair, and replacement; and develop sustainable financial mechanisms to assure that needed work is conducted on a timely basis.

The Public Policy Forum often uses documented best practices prescribed by respected organizations like the GFOA to serve as a measuring stick when assessing the performance of local governments. The GFOA issued a "best practice" memo on asset maintenance and replacement in 2010. That memo describes a series of practices that local governments should establish for assessing and managing their capital assets, including the following:

- *Inventory* – it is important for local governments to keep useful inventories of capital assets that include a regular assessment of the condition of each asset. GFOA suggests that a formal policy be developed to spell out inventory requirements and how measurement of the physical condition of assets will take place. Condition ratings should be updated every one to three years.

- *Reporting* – regular and effective communications on the state of capital assets is an integral part of effective management. In order to allocate funding for necessary projects, decision-makers must be fully aware of infrastructure needs. An effective reporting structure and strategy ensures that policymakers and the public have up-to-date information and understanding of capital assets' states of repair.

- *Capital planning and budgeting practices* – GFOA suggests that local governments prepare multi-year capital plans and establish ongoing sources of funds for repair and renewal needs. Capital plans and annual budgets should include sufficient funds not only for new projects and major repairs and replacement, but also for condition assessment and preventative maintenance.

GFOA Best Practice	Description
Capital inventory	A catalog(s) of publicly-owned capital assets containing information describing the type of asset, value, costs, rating, usage, useful life, etc.
Reporting	Structure and plan to report current conditions to elected officials.
Capital planning/budgeting	A plan that budgets for capital projects in a span of several years in order to maintain infrastructure at useful and safe levels.
Financial policies	Dedicated fees or other revenues solely for capital projects.

[3] GFOA, "Best Practice: Asset Maintenance and Replacement," 2010. Accessed at: http://www.gfoa.org/asset-maintenance-and-replacement

CAPITAL FINANCE: A BRIEF OVERVIEW

Most local governments that own large inventories of physical assets maintain separate capital budgets and rely on financing strategies to support those assets that are distinct from those used to support general operations. Two key funding strategies often used by governments for capital repairs/replacement are borrowing and establishment of dedicated revenues.

The use of borrowing – which can be in the form of General Obligation (G.O.) bonds, revenue bonds, or loans from the state or federal government – ensures that investment in asset creation, repair, or replacement can be paid off over multiple years.[4] This means both today's taxpayers and future taxpayers pay for infrastructure assets, which is logical as both will benefit.

Often, governments use specific fees or forms of taxation that are distinct from general revenue sources to pay principal and interest related to capital borrowing. Such strategies also can be used to "cash finance" capital projects that are not subject to borrowing. In either case, the use of such dedicated revenues ensures that debt service and/or capital needs are guaranteed a steady source of support that is not subject to annual budget deliberations.

What is a capital project?
There is often confusion among non-government finance experts regarding capital versus operating budgets and projects. Generally speaking, capital projects (i.e. projects that appear in capital budgets as opposed to operating budgets) are those that involve construction, expansion, renovation, or replacement of a new or existing facility; purchase of a major piece of equipment that has a useful life of several years; or a major maintenance or rehabilitation project that has an economic life of several years. In each of these cases, there often is a dollar threshold (e.g. the project or equipment purchase has to exceed $10,000 or $50,000). In contrast to capital projects, "maintenance" projects are included in annual operating budgets and include minor repairs and equipment parts replacement.

There are several reasons why most large governmental entities maintain separate processes for planning, budgeting, and financing capital projects – and why they engage in borrowing to support those projects – including the following:

[4] General Obligation (G.O.) bonds are municipal bonds commonly used by local governments that are secured by the government's pledge to use its taxing power to repay bond holders. These differ from "revenue bonds" in that they are not secured with a specific form or revenue (such as fees from users of the capital project), but instead are backed with the government's general credit and taxing authority.

- Infrastructure, equipment, and other physical assets can be very expensive to acquire, repair, or replace, and such costs can be prohibitive if addressed in a single payment in an annual operating budget, especially when dedicated funding is unavailable.

- Capital assets have useful lives that can extend for decades. Consequently, multi-year forms of financing ensure that those benefiting from the assets in the years following their creation or replacement share in their costs.

- There often is a significant unplanned component to capital budgets, as the need to replace or repair assets can emerge quickly despite best efforts to monitor their condition and plan for replacement. Consequently, it would be difficult to accommodate such needs in the annual operating budget, where resources typically do not grow significantly from year to year and where most new resources are needed for ongoing service delivery.

- Launching and completing infrastructure projects can take several years, which means that a financing mechanism that provides expenditure authority over a multi-year period can be more suitable than an up-front cash payment in an annual operating budget.

In determining how often to issue debt and how much debt is affordable to issue, local governments take into account a variety of considerations, including the size of their tax base and the ability of annual operating budgets and revenue structures to accommodate principal and interest payments. Often, the ability to issue new debt in a given year is predicated by the amount of old debt that is retired in that year. Also, in many jurisdictions – including municipalities and counties in the State of Wisconsin – state law prescribes debt limits for local governments based on outstanding debt as a total of equalized property value.

Capacity for future borrowing often is gauged with multi-year capital plans and budgetary forecasts, which catalog future capital needs and project how they will need to be financed. Borrowing projections can be compared to projections of future debt service payments and the amount of debt that is scheduled to come off the government's books. Borrowing capacity also can be impacted by the interest rates associated with G.O. bonds and other forms of debt, as those determine the affordability of annual debt service payments.

MILWAUKEE METROPOLITAN SEWERAGE DISTRICT

The Milwaukee Metropolitan Sewerage District (MMSD) is a regional government that provides sewer and wastewater treatment services to about 1.1 million residents in Milwaukee County and parts of surrounding counties. MMSD serves 28 municipalities, including 18 of the 19 municipalities in Milwaukee County, which are considered district members (South Milwaukee is the exception). Another 10 communities outside Milwaukee County receive MMSD services but are not members.

MMSD has legal authority to levy taxes on property within the district's legal boundary. However, unlike other local governments in the region and state, MMSD uses its property tax revenue only to fund capital expenditures – or, more specifically, debt service costs that are included in its capital budget. Its operational expenditures are financed mostly by user charges.

MMSD also is distinctive in that its annual spending on capital needs (excluding debt service) slightly exceeds its operating expenditures. In contrast, Milwaukee County's 2017 operating budget is nearly 10 times larger than its capital budget, while the City of Milwaukee's General Fund budget is about four times the size of its capital budget. MMSD's higher ratio of capital spending is linked to the magnitude of its capital assets; in our 2011 report on MMSD's finances (*Downstream Accomplishments, Upstream Challenges*[5]), we found that MMSD's net assets were valued at $3.3 billion, or about twice as much as the City's and more than three times as much as the County's.

[5] The report can be accessed at http://publicpolicyforum.org/sites/default/files/MMSDFiscalConditionUpdated.pdf.

INFRASTRUCTURE CONDITION

In this section, we provide a broad overview of the current condition of MMSD's conveyance and treatment infrastructure. It is important to note that for neither MMSD nor the other governmental entities reviewed in this report did we conduct independent inspections or undertake original research to formulate our condition assessment; instead, we relied upon inspection/evaluation methodologies used by each governmental entity and the condition data they provided to us. Nevertheless, we believe the analysis in this section provides a reliable condition assessment that offers useful context for our subsequent fiscal analysis of the infrastructure needs of each entity and their financial capacity to address those needs.

Snapshot: MMSD Infrastructure Condition

Sewers (MIS)

The majority of MIS conveyance pipes are in very good condition. We find that 178 miles (70%) of MIS pipes currently have a PACP score of 0-3, which means they have approximately 70 to 100 years of useful life remaining.

Sewers (ISS and NWSRS)

A 2012 inspection yielded no deficiencies or concerns that prompted recommendations for repair or rehabilitation of the ISS tunnel. While an inspection report for the NWSRS tunnel has not yet been completed, we believe the likelihood that it will need repair or rehabilitation within the five-year timeframe considered in this report is very low.

Reclamation Facilities

Two of the seven asset types we analyzed –building structures and clarifiers – are in very good condition. However, sizable percentages of the remaining assets either have exceeded their expected replacement year or will do so within the next five years.

MMSD's capital assets portfolio consists of several different classes, categories, and types of infrastructure. For our analysis, we opted to focus on the condition of major assets that reflect the District's highest priorities: the conveyance system and water reclamation facilities.

- The **conveyance system** (i.e. "sewers") is the system of large pipes that move wastewater from collector sewers owned by municipalities within the district to one of two reclamation facilities: the Jones Island facility in Milwaukee or the South Shore facility in Oak Creek. The Metropolitan Interceptor Sewer (MIS) system – which is the main portion of the conveyance system – is comprised of seven subsystems. This comprehensive system of sewer pipes often is referred to simply as *sewers*.

  The Inline Storage System (ISS) – otherwise known as the Deep Tunnel – and the Northwest Side Relief Sewer (NWSRS) are a part of MMSD's conveyance system, although these storage tunnels

are treated as separate capital assets. Combined, they are 28.5 miles of tunnels that can hold 521 million gallons of wastewater. When the MIS system overflows, the ISS and NWSRS are there to catch the excess flows so they do not discharge into area rivers and/or Lake Michigan.

- The District's **water reclamation facilities** are where wastewater is treated for discharge back into Lake Michigan. We discuss the condition of crucial water reclamation facility components such as building support structures, clarifiers, electrical motors, pumps, and storage tanks (where the main cleaning occurs).

Capital Asset Management

MMSD uses asset management software to catalog capital assets. This software helps tabulate input provided by MMSD engineers based on assessments they conduct for a variety of assets. Currently, the most comprehensive portion of their catalog is assessments of the conveyance system. For other assets, MMSD instead has relied mainly on knowledge of the age of the asset and/or its installation date to estimate its remaining useful life. About five years ago, MMSD initiated a move toward more robust methods of assessment that will involve transition to actual condition ratings for most asset categories. Because this transition still is ongoing, however, our ability to use such data was limited only to certain segments of MMSD's capital assets.

MMSD's capital asset management efforts involve diligent capital financial planning. The District uses a six-year Capital Improvement Program (CIP) and Long-Range Financing Plan to identify specific projects and to lay out for policymakers and the public its plans to finance those projects over the six-year period. The CIP is based on longer-range facilities plans that are formulated every 10 years or so, as well as broader strategic plans and projects identified through regular maintenance and inspections. Both the CIP and financial plan are updated each year as part of the budget process.

MMSD is unique when compared with many local governments, including the City of Milwaukee and Milwaukee County, in that it accompanies its long-range capital program with a specific financing plan that outlines the mix of borrowing and tax levy that will be needed to effectuate the program. This not only provides transparency for taxpayers, but it also allows policymakers to clearly see how adding or subtracting capital projects in a given year will impact capital finances in the future.

Sewers

The District utilizes three levels of information when evaluating sewer pipes, which reflects its belief that age is not the only factor that determines priority for replacement or rehabilitation. Level 1 relies on the age of the pipeline segment, including rehabilitation and replacement dates; Level 2 uses information from a completed Pipeline Assessment Certification Program (PACP) inspection via closed circuit television (CCTV) cameras; and Level 3 involves more detailed evaluation of the inspection by MMSD engineers.

The PACP inspection yields a score from 0 to 10 that reflects the current condition of conveyance pipes.[6] The lowest score indicates that a pipe's sewer life is in its earliest stages, whereas the highest score indicates a pipe that has reached the end of its useful life and should be replaced immediately. A score of 9 indicates a useful life of 10 years, a score of 8 reflects a useful life of 20 years, etc.

For the most part, MMSD tends to favor rehabilitation when a pipe's condition score is at 9 or 10. Moreover, PACP scores, which are used to calculate a pipe's Likelihood of Failure (LOF), are coupled with a Consequence of Failure (COF) score in order to determine the Business Risk Exposure (BRE). The BRE helps to establish priorities in scheduling rehabilitation and replacement projects.[7]

It is important to note that the MIS system is the only portion of conveyance pipes that are evaluated using PACP. As such, MMSD engineers were able to provide extensive condition information for the MIS system only. All other conveyance system subsystems, such as the Inline Storage System (ISS) and the Northwest Side Relief Sewer (NWSRS), rely on age and expected lifespan for condition assessment, as well as maintenance inspections.

Reclamation Facilities

Currently, MMSD is working on condition ratings for reclamation facility buildings and equipment to have a better understanding of the current state of these capital assets. The catalog was not fully updated by the time this report was published; as such, we use the current methodology, which involves assessing available build, purchase, and/or installation dates against a given asset's estimated useful life, i.e. its Level 1 information.

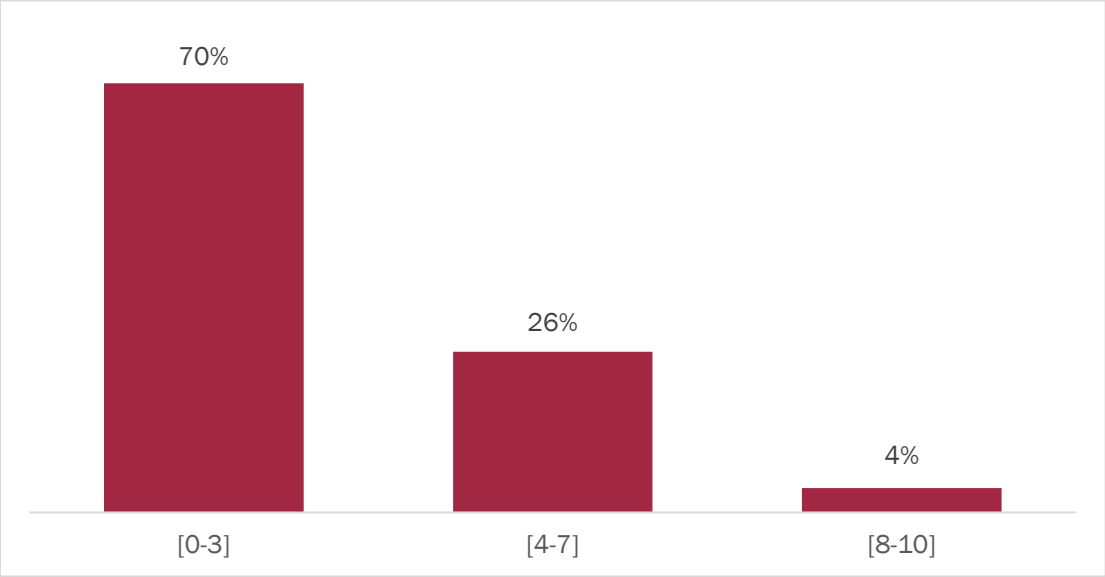
Infrastructure Assessment

Sewers (MIS)

A review of the MIS system's 254 miles tells us that **the majority of MIS conveyance pipes are in very good condition**. As shown in **Chart 1**, 178 miles (70%) of MIS pipes currently have a PACP score of 0-3, which means they have approximately 70 to 100 years of useful life remaining. Meanwhile, 67 miles (26%) have PACP scores of 4-7 and 10 miles (4%) have scores of 8-10. This suggests a rather robust rehabilitation and replacement program is keeping sewers in very good shape.

[6] Veolia, which currently contracts with MMSD to operate its assets, uses PACP ratings from 1-5. Those are then converted to the 0-10 scale by MMSD for internal assessment purposes.
[7] For pipes that are not assessed with PACP, remaining useful life is determined based on Level 1 information.

Chart 1: PACP scores of MMSD Metropolitan Interceptor Sewer (MIS) pipes



Sewers (ISS and NWSRS)

The ISS tunnel began operating in 1994 after construction was initiated in the mid 1980s (a 2-mile extension also was constructed in 2010). The NWSRS tunnel, which is 7.1 miles, was constructed in 2006. Because the ISS and NWSRS tunnels are bored through bedrock and lined with concrete for prevention of infiltration, they are made to last a very long time. In fact, according to MMSD, the useful lives of these tunnels should be a minimum of 100 years, though it is more likely that they should last for hundreds of years, as the chances of the bedrock failing is very low.

The ISS was inspected in 2002 and in 2012, while the NWSRS tunnel was inspected in 2016 through early 2017. **There were no deficiencies or concerns that prompted recommendations for repair or rehabilitation for the ISS tunnel.** At the time of this report, the inspection information of the NWSRS still was being prepared for review. **Because of its age and size, we believe it is safe to assume that the likelihood that the NWSRS tunnel will need repair or rehabilitation within the five-year timeframe considered in this report is very low.**

Reclamation Facilities

As previously mentioned, MMSD has initiated a process to catalogue all of its assets in a manner that will yield assessments of condition similar to level 2 assessments for sewers. Because this is a work in progress, we opted to utilize MMSD's level 1 system of information – which relies largely on the age of the asset – for condition assessment purposes.[8] Our assessment used this information to determine the number of years remaining before each asset ideally should be replaced.

[8] It is important to note that even level 1 data were not available for all of the asset types we analyzed. Generally speaking, 56 to 96% of the assets in each asset type did have level 1 information that we could access.

There are several asset types for which we gathered information. **Table 1** cites and provides a description of each of those assets.

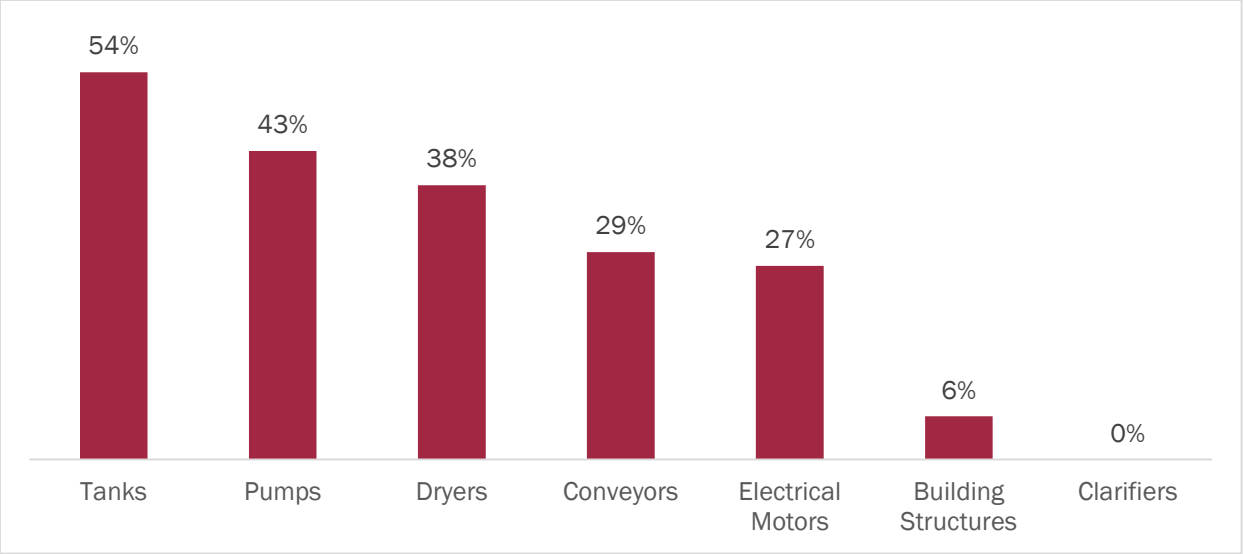
Table 1: Types of Reclamation Facility Assets[9]

Capital Asset	# of Assets	Description
Building Structures	126	Foundation and structural make-up of a building. Can be concrete or metal.
Clarifiers	63	Settling tanks used to remove solid waste from liquid.
Conveyors	308	Sludge produced by wastewater treatment is carried by conveyors to equipment that initiates the process for recycling it into Milorganite.
Dryers/Associated Equipment	34	Dryers heat sludge as a key component of the Milorganite manufacturing process; the drying process also uses belt filter presses to de-water the sludge.
Electrical Motors	187	Motors for mixing, boosting, transferring, compressing, and ventilating. Several applications.
Pumps	391	Pumps for wastewater and sludge transfer through treatment facilities.
Storage Tanks	111	Storage vessels with walls, floors, and tops used for material, liquid, or gas storage. Typically constructed of metal, plastic, composite, or concrete.

We found that **two of the seven asset types we analyzed –building structures and clarifiers – were in very good condition**, with only 6% of building structures found to be past their expected replacement years and none of the assets in the other two categories falling into that condition. For the five remaining asset types, we find a different situation. Electrical motors, pumps, and storage tanks make up a large portion of the assets found within MMSD's water reclamation facilities and play very important roles in the water cleaning and discharge process. Dryers and conveyors, meanwhile, are essential to the production of Milorganite, a fertilizer manufactured by the District. Yet, as shown in **Chart 2**, **sizable percentages of these remaining assets either have exceeded their expected replacement year or will do so within the next five years**.

[9] While every pump contains a motor, the number of motors citied in the table is not equivalent to the number of pumps because MMSD only catalogues the condition of motors in its larger pumps.

Chart 2: Percentage of assets exceeding expected replacement currently or within five years



With regard to electric motors, over a quarter have exceeded their expected replacement year or are within five years of doing so. Although not unexpected given the shorter lifespan of these assets and not a cause for alarm (motors typically are expected to last about 20 years as compared to several decades for many other MMSD assets), MMSD will have to consider overhauling or replacing these motors soon. It is also important to note that only 56% of the electric motors have been catalogued, so it is likely that the number that have exceeded or soon will exceed their replacement year is even higher.

Pumps play a crucial role in moving wastewater around treatment facilities and discharging water back into Lake Michigan at a faster pace during inclement weather. Approximately 43% of MMSD's pumps have exceeded their expected replacement year or will do so within five years. This may result in a need for overhauling and/or replacing more than 160 pumps in the coming years.

MMSD's water reclamation facilities depend on storage tanks for chemicals and other liquid or gas storage. Of the 111 storage tanks that MMSD utilizes in its daily operations, 60 (54%) have surpassed their expected replacement year or will do so within five years. Again, this suggests the need for near-term rehabilitation or replacement of a sizable number of storage tanks or, at minimum, near-term assessment that will provide information similar to level 2 assessments for sewers.

Finally, conveyors move sludge produced by the wastewater treatment process to dryers, where it is turned into fertilizer. About 38% of MMSD's dryers (and associated equipment) and 29% of its conveyors have reached their expected replacement year or will do so within five years, posing another near-term challenge for the district.[10]

[10] There are different types of conveyors, most of which have a 20-year lifespan. Screw-type conveyors have an expected lifespan of 30 years.

Again, for each of the asset types, it should be noted that the expected replacement years for a substantial number of assets have yet to be catalogued. Consequently, replacement needs may grow once all asset information is recorded.

Summary

MMSD is shifting to a more robust form of cataloging and assessing its capital assets. While still a work in progress for assets associated with reclamation facilities, existing data sources provide for meaningful asset management and were sufficient for us to make a current condition assessment for purposes of this report. The fact that MMSD has established a thorough capital budget planning process also speaks to its effective capital asset management.

Our analysis shows that most of MMSD's capital assets, and particularly those associated with the District's conveyance system, are in good condition. MMSD's biggest potential challenge comes from its water reclamation facilities, where we found that a large number of assets have exceeded or will soon exceed their expected replacement dates. This is not a cause for alarm, as age is not the determining factor of an asset's condition. However, MMSD will need to inspect these assets on a more detailed level to determine which should be overhauled or replaced, and which may only need maintenance. The bottom line is that much of the mechanical equipment is past its life cycle and soon will require overhaul or replacement.

CAPITAL FINANCE CAPACITY

In this section, we explore the state of MMSD's capital finances in an effort to determine the District's capacity to address the infrastructure needs identified in the previous section. By reviewing previous capital spending trends, six-year capital budget forecasts, and the factors that limit or constrain MMSD's capital spending, we can provide insight into the affordability of future capital needs and potential impacts on taxpayers.

Snapshot: MMSD Fiscal Capacity

MMSD engages in detailed financial planning and has a realistic six-year plan in place to address its major infrastructure needs. That plan is built on an assumption that property taxes will increase by 4% annually. Such increases would substantially exceed the projected growth in inflation, thus casting some doubt on their political achievability.

Capital Finance Overview

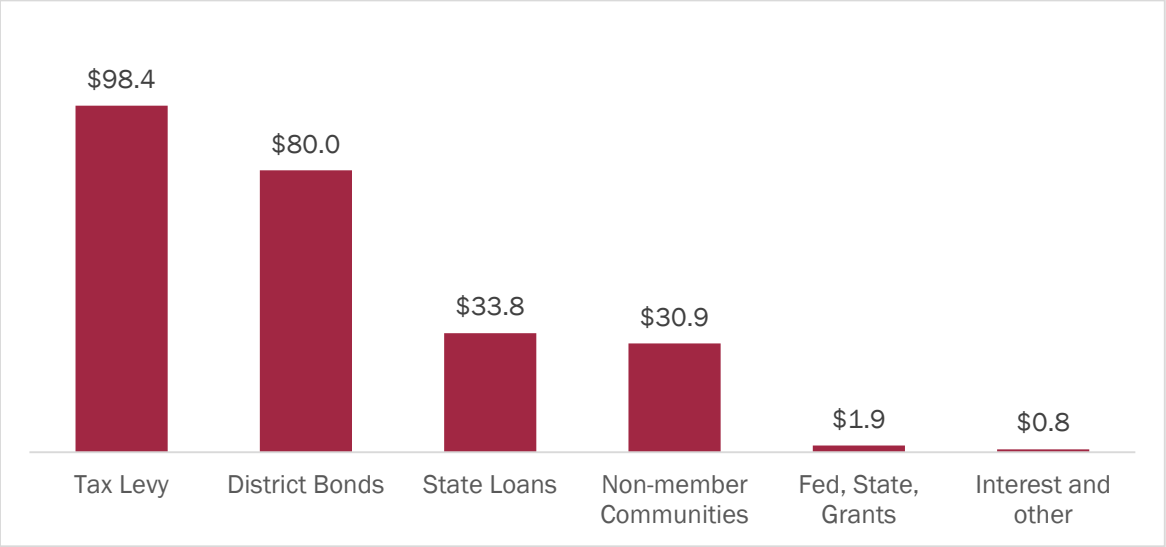
In 2017, MMSD's adopted budget totals $309.6 million, with Operations & Maintenance (O&M) at $90.4 million and capital (including debt service) at $219.2 million. The vast majority (79%) of revenues in the O&M budget come from user charges, which are billed to each of the 28 municipal members, who then bill their own residential and industrial users. Another major source of revenue comes from sales of Milorganite (about $8.4 million).

MMSD's capital budget, on the other hand, receives a substantial share of its support from property tax levy and payments from non-member communities (MMSD is not legally permitted to levy property taxes on the non-member communities but instead bills those communities at rates that approximate what their residents would pay if property taxes were levied). As shown in **Chart 3**, those sources comprise 53% of the revenues in MMSD's capital budget for 2017.[11] Borrowing – which consists of a mix of bonds and loans from the State's Clean Water Fund[12] – comprises 46% of the total. According to MMSD officials, the District typically issues G.O. bonds for projects that are less than $2 million or involve watercourse and flood management, while seeking Clean Water Fund loans for remaining projects.

[11] The revenue totals in **Chart 3** exceed the total capital budget of $219.2 million because MMSD plans to replenish its available fund balance with $26.6 million in excess revenues. MMSD typically uses a portion of its available fund balance to supplement other capital budget revenues in years when it does not issue bonds and replenishes fund balance in years when it does. Bonds typically are issued every other year.

[12] The State's Clean Water Fund Program, which is a part of the Environmental Improvement Fund, provides low-interest loans to local government agencies to support wastewater treatment facilities and urban stormwater runoff projects. The Environmental Fund also houses a Safe Drinking Water Loan Program that provides low-interest loans to water utilities for water supply infrastructure. Both programs are administered by the Department of Natural Resources.

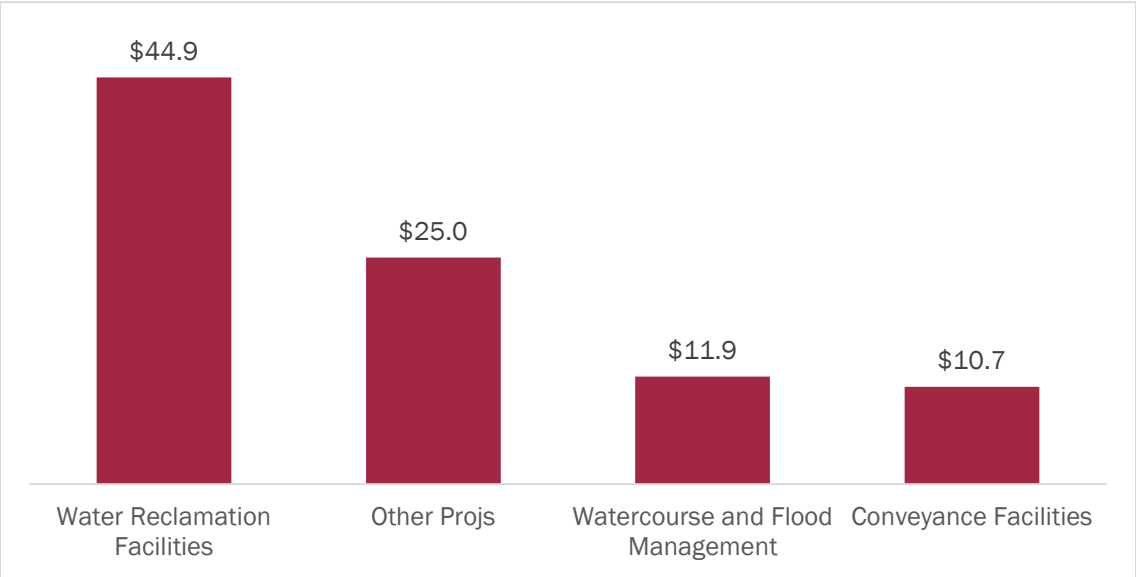
Chart 3: 2017 MMSD capital budget sources of revenue (in millions)



With regard to expenditures, the capital budget includes both expenditures on new capital projects or programs ($92.6 million) and payments to service debt on bonds and Clean Water Fund loans ($126.6 million) that relate to projects initiated in previous years.

Chart 4 breaks down MMSD's $92.6 million in expenditures on new capital projects and programs. As shown, $44.9 million (49%) is earmarked for the District's two water reclamation facilities. The Watercourse and Flood Management category – which includes a variety of projects linked to preventing flooding and erosion in the six watersheds within MMSD's service area – is budgeted to receive 12.9% of the total, while projects related to conveyance will receive 11.6%. The Other Projects category, which takes up approximately 27% of the budget, covers a variety of different projects and programs that support District planning and management.

Chart 4: 2017 MMSD capital expenditures by asset category (in millions)



MMSD's $126.6 million in debt service in 2017 will be paid primarily with property tax levy and cash on hand that is available from typical swings in cash flow that relate to the collection of contributions from non-member communities, receipt of bond premiums, and unanticipated changes in the timing of projects that are initiated or completed in a given year. It is worth noting that the District's entire tax levy is pledged and used entirely for debt service when debt service exceeds or equals the tax levy amount. This continues to occur from 2017 through 2021; starting in 2022, the tax levy is projected to exceed the debt service amount.

Like all local governments in Wisconsin, MMSD has a State-mandated limit on the amount of debt it is allowed to hold at any one time for its own purposes. This outstanding debt limit is capped at 5% of the equalized value of property within the district, but MMSD has established its own internal policy goal that caps outstanding debt at 2.5% of equalized value. As of August 2016, MMSD's total outstanding debt of $904.7 million was about 1.6% of the value of its taxable property, leaving it about $1 billion below the self-imposed goal and $1.9 billion below the State limit.

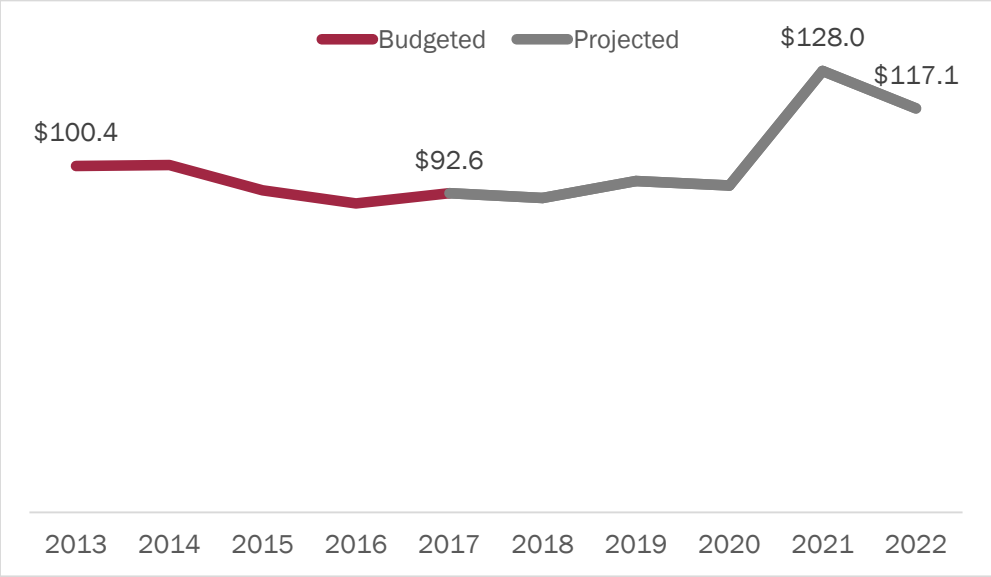
A less formal – but perhaps more important – constraint on capital spending is its aforementioned connection with MMSD's property tax levy. Planning for the six-year capital program is based on careful deliberations regarding the amount of annual property tax levy that will be required to service projected debt in each of the six years based on the projects that are deemed necessary, along with projected interest rates and the mix of bonds and loans. To the extent that the inclusion of major projects in a given year would increase outstanding debt to a level that would require levy increases that are deemed intolerable, those projects may be deferred or eliminated.

Capital Finance Trends/Forecast

Our review of MMSD's recent budgeted and projected capital spending[13] indicates that after several years of diminishing or flat expenditures, the capital budget is anticipated to inch upward in 2019 and then grow substantially in 2021, as shown in Chart 5. In fact, the $35.4 million increase between the 2017 budgeted amount and the 2021 projected amount would constitute growth of 38%.

[13] In this report we use budgeted – as opposed to actual – capital spending amounts for previous years because they provide a better indicator of financial capacity by showing what policymakers intended to spend in those years. Actual spending amounts may reflect unanticipated project delays or other factors that have little to do with financial capacity.

Chart 5: MMSD capital expenditures, 2013-2022 (in millions)



According to MMSD officials, the District evaluates various financing strategies – including level debt service structures and front-end interest-only payment structures – to determine the appropriate use of financing given project needs. An example is a decision made a decade ago to refinance a significant portion of the District's debt. MMSD officials conducted the refinancing in a manner that allowed the District to refrain from making principal payments over a five-year period, which in turn provided the wherewithal to allow for a surge in capital spending from 2008-2012 to address several pressing capital needs. Because so many projects were initiated and completed over those five years, the District was able to maintain lower levels of capital spending from 2013-2017, which coincided with its return to making principal payments on its refinanced debt.

The District currently is preparing its 2050 facilities plan, which will provide an initial plan to address capital expenditure needs over a long-term horizon. Some impact might be seen in the 2018 budget, but it is more likely that new spending identified in the 2050 plan will begin to materialize in the 2019 budget and long-range financing plan. Because much of the equipment in the two water reclamation facilities is nearing or at the end of its planned useful life, it is anticipated that many new capital needs will be identified.

As shown in Charts 6, 7, and 8, each of the major categories of capital spending accommodate substantial increases at some point between 2019 and 2022. At this point, MMSD officials are not certain about the specific projects, but both the CIP and the financial plan reflect the increase in spending and have served to alert policymakers to this need.

Chart 6: Water reclamation facility expenditures, 2013-2022 (in millions)

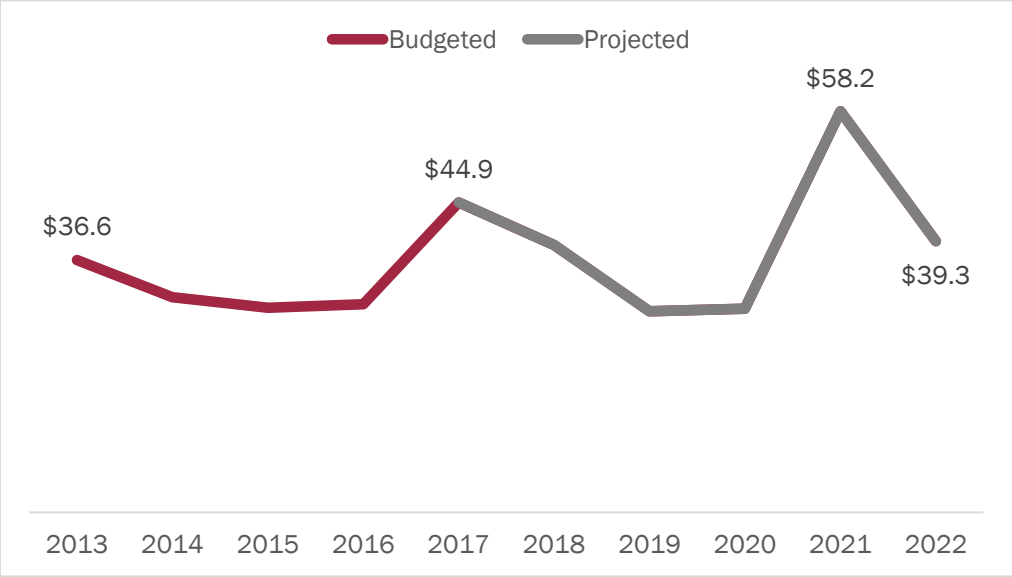


Chart 7: Conveyance system expenditures, 2013-2022 (in millions)

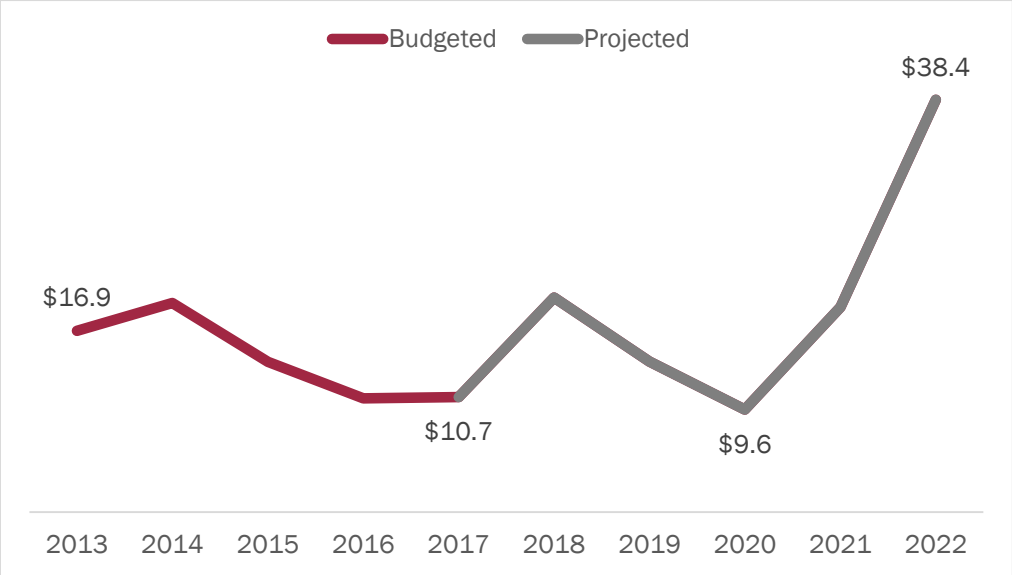
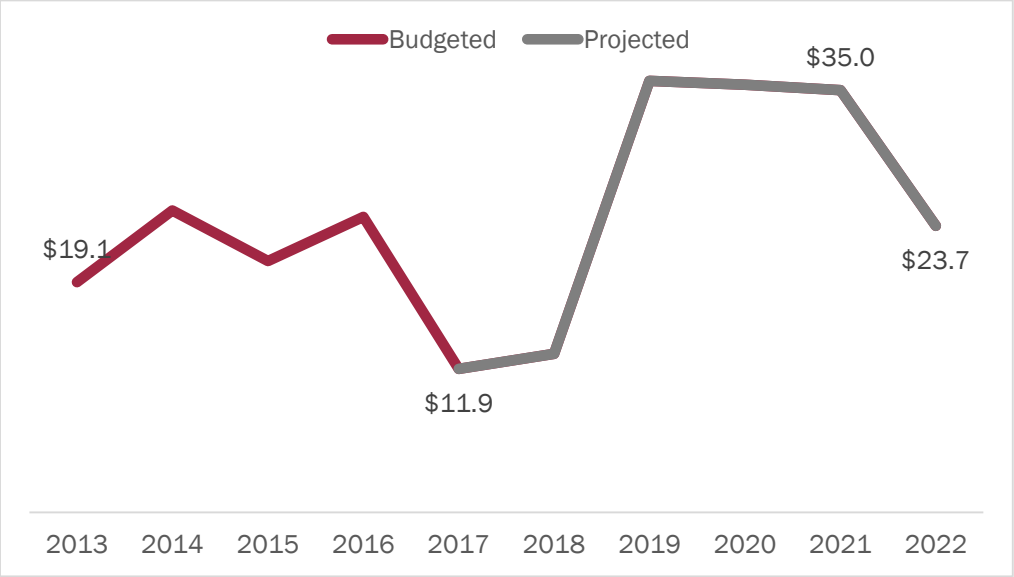
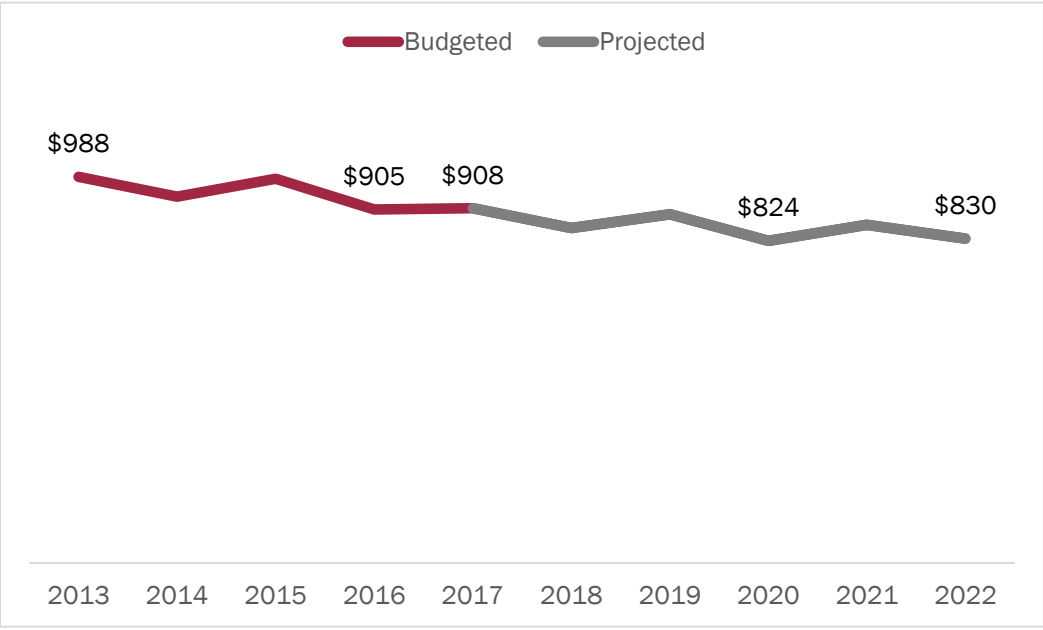


Chart 8: Water course and flood management expenditures, 2013-2022 (in millions)



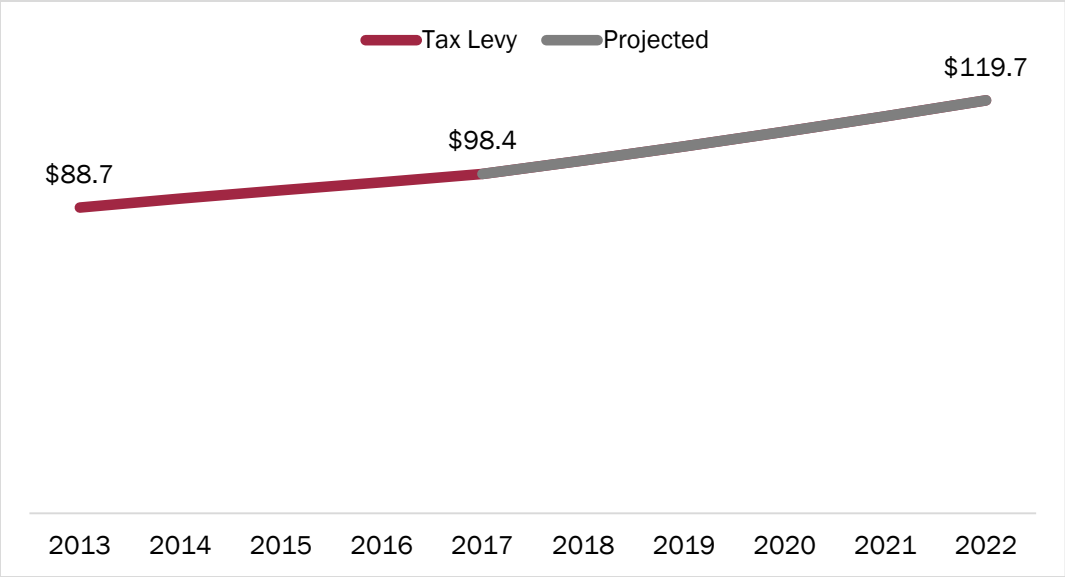
Given the potential projected boost in capital spending of nearly 40% over the current budget by 2021, it is important to consider the impacts on debt and on property tax-supported debt service. With regard to the former, MMSD has seen its outstanding debt shrink by 8% since 2013 (from $988 million to $908 million), as shown in **Chart 9**. The chart also reveals that outstanding debt will continue to diminish over the next five years, dropping to about $830 million by 2022. Hence, **this would appear to position MMSD to be able to effectively absorb increased borrowing if the major surge in capital spending occurs in 2021 and 2022**, though several successive years of enhanced borrowing after 2022 could threaten that proposition.

Chart 9: Outstanding debt, 2013-2022 (in millions)



The impact on property taxpayers would be more severe, however. To accommodate projected debt service needs produced by anticipated borrowing amounts, **the Long-Range Financing Plan projects annual 4% growth in the District's property tax levy between 2018 and 2022**. As shown in **Chart 10**, that would exceed the rate of levy growth during the 2013-2017 timeframe, as well as projected growth in inflation.[14]

Chart 10: MMSD property tax levy, 2013-2022 (in millions)



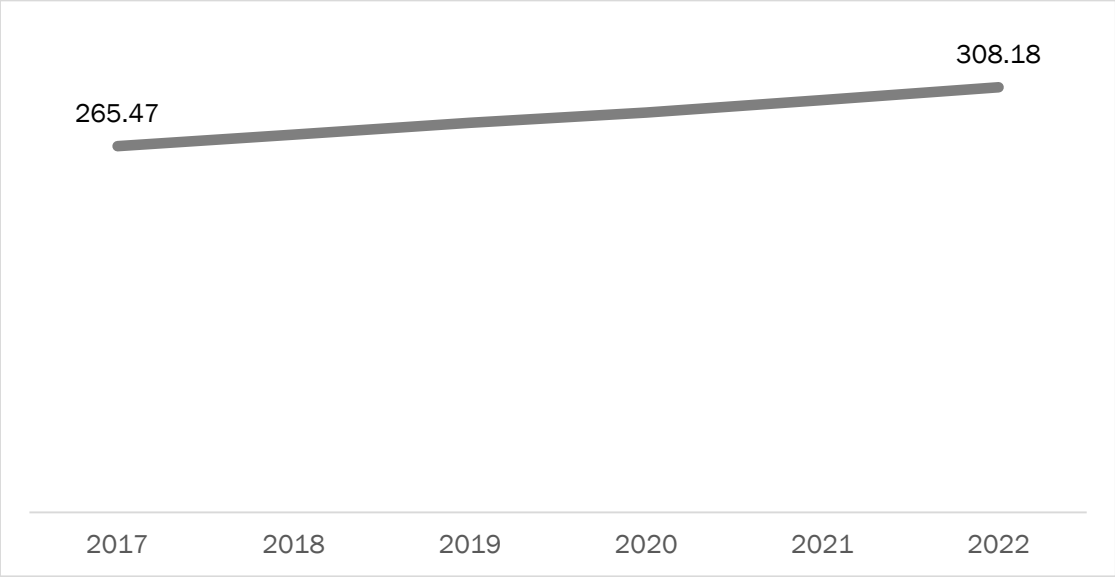
It should be noted that MMSD consistently has kept its annual property tax levy increases under 4% since 2008. The projected 4% increases going forward assume that expenditure reductions do not materialize and/or that MMSD policymakers will not elect to defer projects included in the capital plan.

To provide additional perspective on the potential impact of 4% property tax levy increases, **Chart 11** shows that the owner of a median-valued home in the MMSD service area will pay $265.48 in property taxes to support the District in 2017.[15] Assuming that the median home value increases 2% per year and that MMSD's property tax rate increases per the Long-Range Financing Plan, the average property taxpayer would pay $308.18 in 2022 (an increase of $42.70).

[14] Per the Federal Reserve, the 2017 inflation rate is projected to be 1.9% with rates of 2% forecast for the following two years.

[15] This figure was calculated by applying MMSD's 2017 property tax rate to the median home value in Milwaukee County, which was $151,700 in 2015, the latest year for which U.S. Census data are available.

Chart 11: Projected MMSD share of property tax bill for median-valued home, 2017-2022



Summary

While MMSD's capital needs are not urgent because of diligent capital planning and consistent investment, the sheer magnitude of the District's capital assets and its aggressive approach to watercourse and flood management demand an ambitious capital program in the next six years. The good news is that MMSD has maintained manageable debt levels, and that it is able to spread the initiation of major projects over multiple years. Consequently, available fund balances and overall debt loads should remain at acceptable levels throughout the six-year period.

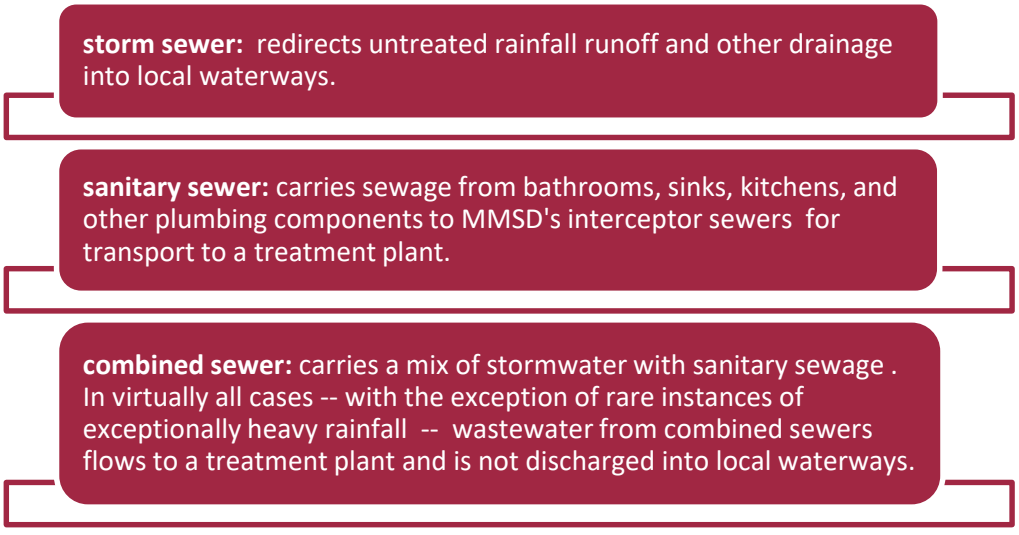
The bad news is that achieving those objectives could require annual property tax levy increases of 4%. That is not an outrageous demand on taxpayers, but it does exceed the typical ask of other local governments in the region, and it is likely to exceed the rate of inflation. It could be argued that such is the cost associated with expensive infrastructure, and that taxpayers at least can take solace in the fact that MMSD is responsibly addressing its capital needs and not setting up future taxpayers for even more onerous demands.

CITY OF MILWAUKEE SEWERS

The City of Milwaukee owns and maintains approximately 2,461 miles of sewers. Milwaukee's sewers play a vital role in the wastewater treatment process, collecting residential, commercial, and manufacturing wastewater; and discharging it into MMSD's interceptor system, from which it flows to MMSD's water reclamation facilities. As the largest municipality located in the MMSD jurisdiction, Milwaukee's sewer system was the logical choice for analysis of a municipal sewer system that engages with the District.

The City uses a Sewer Maintenance Fund to pay for operations and capital improvement projects related to its publicly-owned sewers.[16] The Sewer Maintenance Fund operates as an **enterprise fund**. Such funds commonly are defined as funds within larger governmental budgets that function independently and that are supported entirely (both operating and capital) from fees for services and other self-generated income.[17] While technically part of the City budget, the Sewer Maintenance Fund functions as an independent entity and does not receive any of the City's local property tax levy. The City's Department of Public Works (DPW) maintains the Sewer Maintenance Fund, into which usage fees from residential and commercial users are deposited; and from which they are then allocated to operate, maintain, repair, and rehabilitate the City's sewer system.

Milwaukee's nearly 2,500 miles of sewers are comprised of three different sewer types: stormwater, sanitary, and combined sewers (see diagram below for definitions). While playing a key role in conveyance, the City's sewers do not include a treatment component, as that function is left to MMSD.



[16] Publicly-owned sanitary sewer mains connect to private properties through privately-owned laterals. In this section, we focus exclusively on the publicly--owned portions.

[17] Enterprise fund definition: http://www.municipalconsultants.net/enterprise_fund_accounting_systems.aspx

INFRASTRUCTURE CONDITION

The City's sewer infrastructure consists primarily of the sewers themselves (typically referred to as "collection systems") and facilities that provide for conveyance. For our analysis, we focus mainly on sewers but also provide brief assessment of pumps and lift stations given their critical role in preventing floods during heavy rainstorms.

Snapshot: Milwaukee Sewers Infrastructure Condition

Sewers

More than a quarter of the City's rated sewers (104 miles) are deemed worthy of consideration for replacement, which is a manageable number given DPW's current goal of repairing or replacing 27 miles of sewers per year. However, because only 16% of the total 2,461 miles of sewers have been rated, it is difficult for us to make a definitive assessment.

Pump & Lift Stations

Over 90% of individually inspected components of pump and lift stations are in good condition, indicating that 5-year repair and replacement needs are manageable.

Capital Asset Management

DPW keeps a categorized database of its sewer-related capital assets that records the age and condition of pipes, and that is used to prioritize capital repair and replacement projects. Inspections of sewers typically are limited to older sewers, those associated with reported leaks or damage, or those that may be impacted by other public works projects.

With regard to capital planning, the Department prepares a five-year capital plan that is updated each year. Unlike MMSD's multi-year capital plan, DPW's is not derived from a larger strategic planning process or facilities plan, but is produced from projects identified through annual monitoring and from goals associated with meeting DPW's ideal replacement cycles.

From a financial standpoint, DPW's multi-year plan for the sewer system similarly is not based on detailed analysis of specific needs or projects. Instead, it is essentially predicated on what the Department deems affordable and practical to request based on previous years' requests and the desire to hold annual fee increases to reasonable levels.

Sewers

When inspections are conducted, DPW engineers use CCTV cameras that are placed inside sewers to assess pipe condition. An index rating is calculated using a scale of 0 to 100 (with zero signifying collapse and 100 new). If a sewer's index rating is less than 65, then it is considered for replacement

or rehabilitation. In addition, the City has established a goal of replacing or lining at least 27 miles of sewers annually to meet an ideal replacement cycle of 90 years.[18]

The decision on whether to schedule a sewer for repair or replacement also considers other factors, including aldermanic requests for service, requirements associated with state regulatory agencies, and whether sewer pipes may be impacted by paving or other public works activities. The highest priority is to prevent sewer pipes from leaking or collapsing, which can cause potential flooding of nearby basements. Ultimately, however, the final decision on whether to pursue a capital project to repair or replace a sewer pipe also is based on funds available for that year.

It should be noted that City engineers do not examine sewers that are less than 40 years of age unless a resident or City employee has noticed a leak, or unless a paving project will expose the sewer. Typically, DPW schedules inspections of sewers that are closer to or have exceeded the 90-year expected life. In addition, it is important to understand that a sewer's age is not necessarily the most important indicator of its condition, as there are sewers well above 90 years of age that still are in good shape. For this reason, DPW engineers, similar to their counterparts at MMSD, use index ratings calculated from their observations of their sewers to determine which sewers most justify monitoring and corrective action.

Pumps

The City owns 83 sanitary bypass pumps which are used to control or alter the flow of wastewater, including during inclement weather as a means of preventing flooding. In addition, the City owns seven sanitary lift stations which are used to pump wastewater from a low elevation area up to an area served by gravity sewers. Each is tested by contractors on a monthly basis, meaning that 1,092 tests are conducted annually. Inspections are a combination of electrical measurements and visual examination. Visual inspections produce a rating on a binary scale of "good" and "bad" for various system components. The inspection data help DPW staff develop a prioritization list for capital projects involving pumping facilities.

Infrastructure Assessment

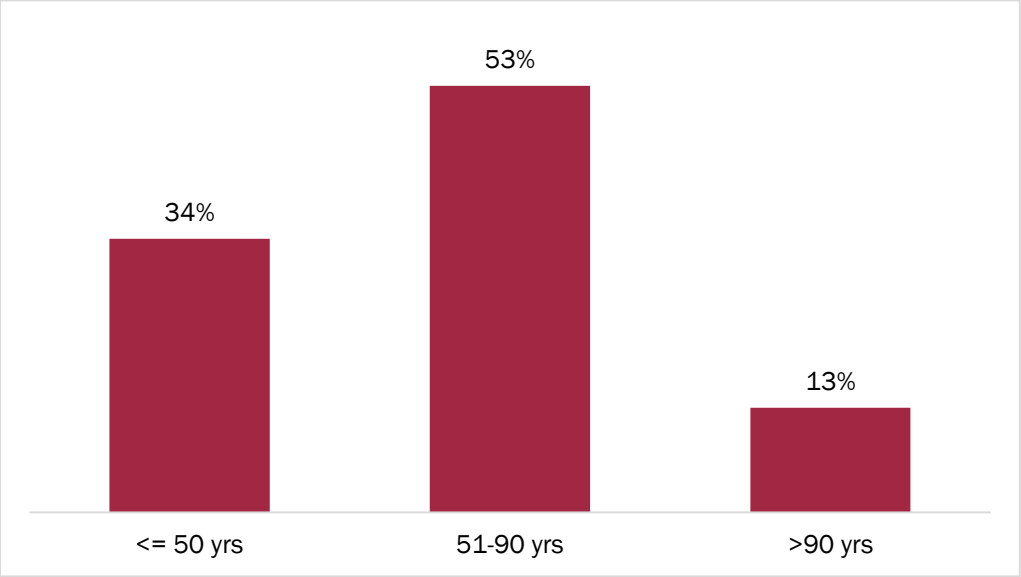
Sewers

As previously mentioned, the City of Milwaukee owns and maintains approximately 2,461 miles of stormwater, combined, and sanitary sewers. As shown in **Chart 12**, more than half of the City's sewers are between 50 and 91 years old; 13% are more than 90 years old, which is the typical useful life of a sewer, according to DPW engineers.[19]

[18] Lining is a common rehabilitation method for sanitary sewers but is less common for combined sewers and very rare for storm sewers.

[19] Most older sewers are large diameter brick sewers, which are considered to be very sturdy. Due to their size and material, they also are significantly more costly to replace.

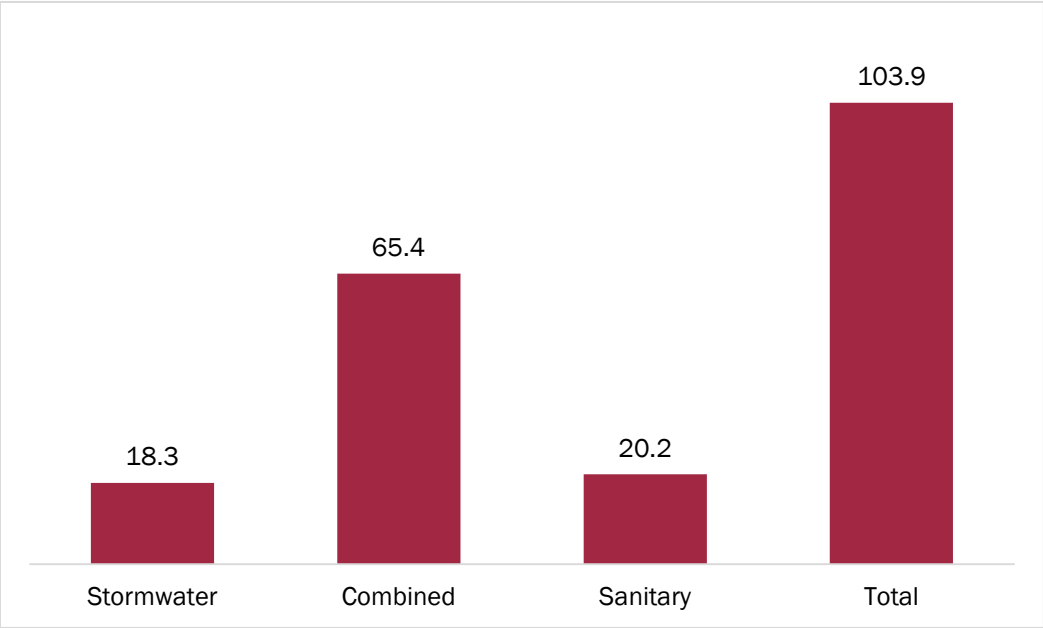
Chart 12: Age ranges of City of Milwaukee sewers



As of November 2016, approximately 395 miles of City sewers had been inspected and rated (about 16% of the total). As explained above, DPW focuses its inspection efforts on those that are older and for which there have been reported problems or upcoming paving projects (the Department tries to avoid having to replace a sewer in a newly paved street). Of the sewers that have been rated, 56% are between 50 and 91 years old, and 22% are over 90 years of age.

As discussed above, sewers that receive an index rating of 65 or below are placed on a list of those needing rehabilitation or replacement. Of all rated sewers, we find that approximately 104 miles – about 26% of the 395 miles that have been rated – fall below that threshold. Considered a different way, that amounts to 4.2% of the 2,461 total miles of City-owned sewers. **Chart 13** breaks down the total by type of sewer and shows that more than three fifths are combined sewers.

Chart 13: Miles of sewers with an index rating of 65 or below by type of sewer



Overall, the fact that 13% of the City's 2,461 miles of sewers have exceeded their typical useful life and that 104 miles have received a rating of 65 or below (we acknowledge there is overlap in those two numbers) would indicate a challenging situation for City leaders, but not one that is cause for panic. If DPW is able to live up to its goal of lining or replacing 27 miles of sewers per year, then it would be able to rehabilitate or replace all 104 miles in four years. Of course, additional sewers outside of those 104 miles that have not been rated already may be in need of attention or may fail during those four years, so it is difficult to make a definitive condition assessment. However, **based on our discussions with DPW staff and other subject matter experts, we would assess this to be a manageable situation going forward**.

Pump and Lift Stations

As noted above, pump and lift stations – and their components – are inspected primarily on a binary condition rating of "good" and "bad." According to DPW data, 1,685 of the individually inspected 1,862 components (90.5%) are currently assessed as being in good condition, while 177 (9.5%) are noted as being in "bad" condition.[20] Not every component labeled in bad condition needs repairs or replacement, as that rating could indicate that the component is in working order but needs to be monitored. Taken together, **this leads us to believe that the City's sewer pump and lift stations are being well-maintained**.

[20] 98 condition ratings were not used due to errors in the condition rating process, such as a camera not being able to continue through a sewer; these were not included in the final count.

Summary

DPW limits its sewer inspections to older sewers and those for which issues have been reported or those in streets that are scheduled for paving or related projects. Outside of inspections, the Department relies heavily on age to assess the condition of its sewers and to determine when repair or replacement is warranted. To manage its sewer assets, DPW strives to achieve a 90-year replacement cycle for its pipes and uses that goal as a primary basis for its capital budgeting. Ideally, capital planning would be more closely linked to a more scientific assessment of repair and replacement needs. The approach that is being taken reflects the City's 2,461 miles of sewers and its staff's capacity.

Of the sewers that were rated, we found that over a quarter (104 miles) should be considered for replacement, which does not appear to be an unmanageable number given DPW's current goal of repairing or replacing 27 miles of sewers per year. However, because only 16% of DPW's sewers have been rated, it is difficult for us to make a definitive assessment. For its pump and lift stations, DPW provides a very robust assessment. Considering that over 90% of individually inspected components are in good condition, we find that DPW's pump and lift stations are on a sustainable path.

CAPITAL FINANCE CAPACITY

To explore the Sewer Maintenance Fund's capacity to address the infrastructure needs identified above, we again review previous capital spending trends, projected long-range capital budget forecasts, and factors that may limit the Fund's capital spending, as we did for MMSD. In this case, however, the question of affordability also must be considered within the context of the larger City of Milwaukee capital finance structure and potential impacts on users who are the subject of fees, as opposed to property taxpayers.

Snapshot: Milwaukee Sewer Maintenance Fund Fiscal Capacity

A recent surge in capital spending in response to flooding from historic rainfalls in 2008-10 has positioned DPW to ramp down capital spending for the next five years. Nevertheless, increasing debt service payments and the need to continue to line or replace at least 27 miles of sewers per year will continue to put pressure on stormwater and sewer fees, which already have increased steadily during the past five years.

Capital Finance Overview

With operating expenditures budgeted at $70.2 million in 2017 and capital projects at $38.7 million, the Sewer Maintenance Fund is 7% of the City's $1.5 billion budget. The two fees that support the Sewer Maintenance Fund are sewer maintenance and stormwater management fees. The sewer maintenance fee is charged based on usage, while the stormwater management fee is charged based on a property's amount of impervious surface.

Combined, the two fees are budgeted to generate $62 million in 2017. On the operating side, those fees support general operations as well as a $19.6 million payment to the City's General Fund that reimburses the City for street sweeping, leaf and brush collection, and pruning services that are requirements in the City's Stormwater Discharge Permit from the Department of Natural Resources.

On the capital side, the two fees mainly support debt service on borrowing for sewer-related capital projects from previous years. Most of the Sewer Maintenance Fund's annual borrowing is linked to loans from the State's Clean Water Fund, with the remainder typically coming from revenue bonds issued by the City, as opposed to G.O. bonds (in fact, revenue bonds have been used exclusively since 2005). The difference is that revenue bonds are backed by a specified revenue source – in this case the sewer maintenance and stormwater management fee revenues – as opposed to being backed by the property tax. In 2017, about $27 million in fee revenue will service outstanding Clean Water Fund and revenue bond debt and $3.4 million will be transferred to the City's Debt Fund to service outstanding G.O. debt.

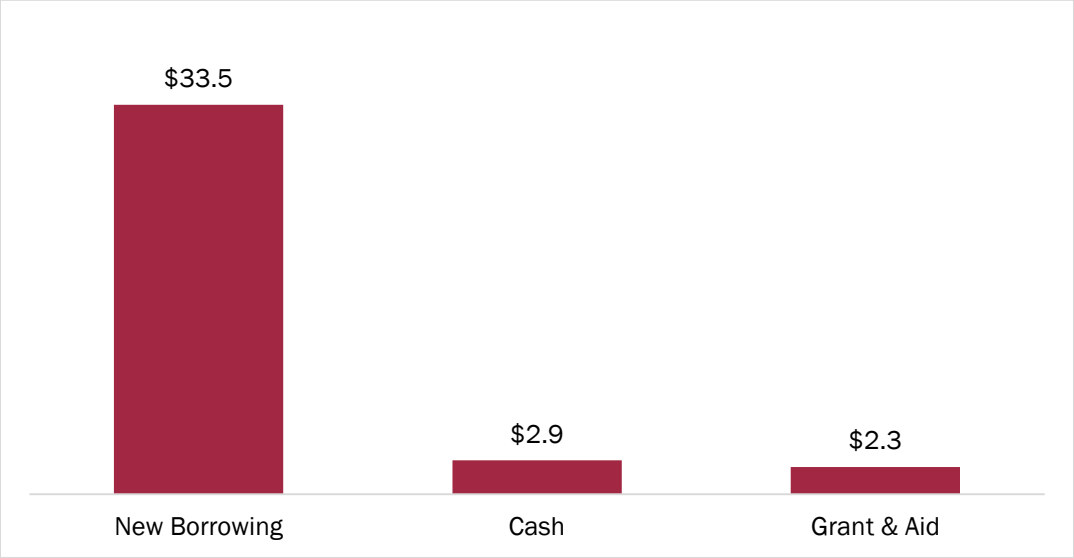
Annual borrowing by the City of Milwaukee as a whole is constrained by a formal statutory debt service limit (no more than 5% of the value of taxable property) and an informal policy goal stating that the amount of property tax levy-supported debt issued in a given year should not exceed the amount of such debt retired in that year. Because the Sewer Maintenance Fund operates as an

enterprise fund – and because the Fund no longer issues G.O. debt – the overall limitations on the City's levy-supported debt do not act as a restraint on the Fund's borrowing capacity to meet future capital needs. Instead, future borrowing is constrained primarily by the willingness of City leaders to raise fees to service the debt.

The Sewer Maintenance Fund's $38.7 million capital budget in 2017 is funded with $33.5 million in proceeds from borrowing, as shown in **Chart 14**, of which $26 million is expected to come from the State's Clean Water Fund. The remaining $7.5 million may come from revenue bonds, though it is possible that this amount of borrowing (or any borrowing) may not be needed. The City Comptroller's office makes an annual mid-year determination as to whether a revenue bond issuance is required based on the amount of work that can be completed that year and the availability of retained earnings from previous years' fee collections to contribute to capital costs.

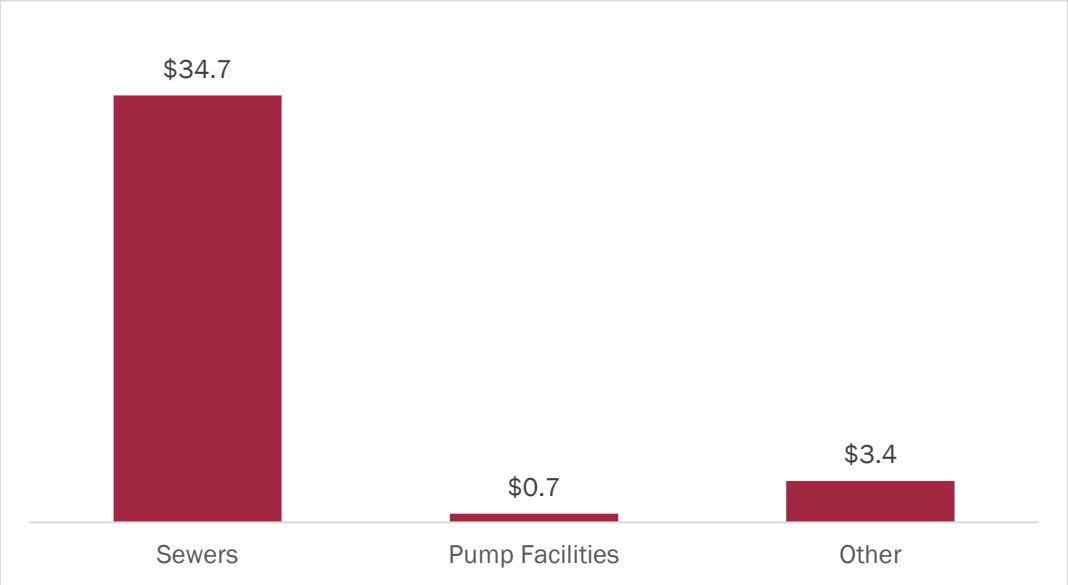
The availability of fund balance from previous years also may allow DPW to budget for cash contributions to the capital program at the beginning of the year. That is the case in 2017, as $2.9 million has been budgeted for cash financing. The Department also expects to receive $2.3 million in outside grants to support capital projects.

Chart 14: 2017 Sewer Maintenance Fund sources of capital revenues (in millions)



With regard to capital expenditures, as shown in **Chart 15**, DPW is budgeted to spend $34.7 million in 2017 for sewer replacement and lining, $700,000 for pump facilities, and the remaining $3.4 million on assorted other projects, including flood mitigation and water quality.

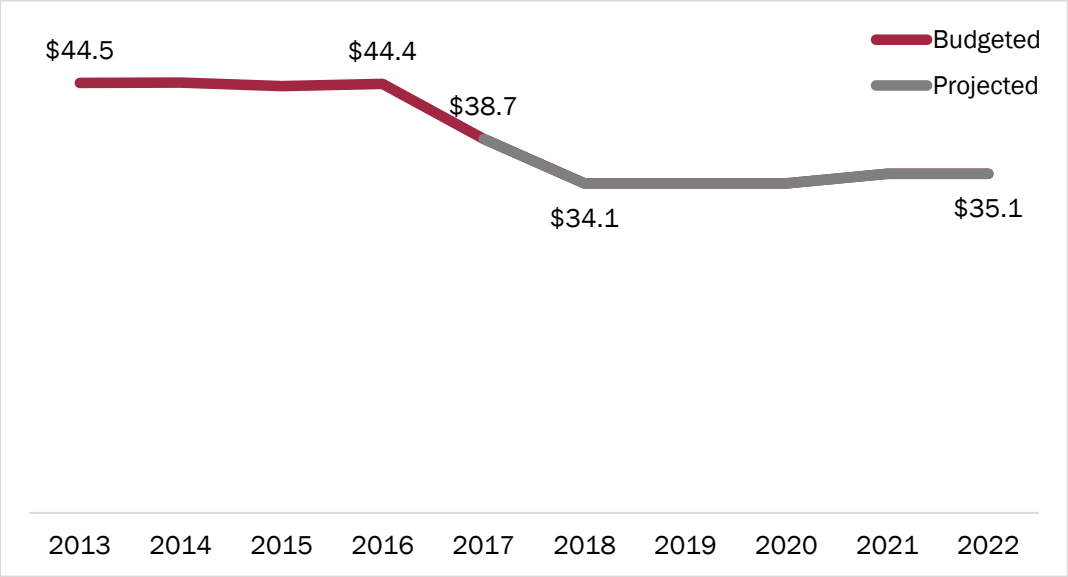
Chart 15: 2017 Sewer Maintenance Fund capital expenditures by project type (in millions)



Capital Finance Trends/Forecast

The Sewer Maintenance Fund's capital expenditures exceeded $44 million annually from 2013-2016 before declining by nearly $6 million in 2017, as shown in **Chart 16**. DPW's five-year capital plan shows that the Fund's capital spending is projected to decrease again in 2018 and remain relatively flat through 2022.

Chart 16: Sewer Maintenance Fund capital expenditures, 2013-2022 (in millions)



According to DPW officials, historic rainstorms in 2008-2010 revealed significant capital needs that led to an aggressive push to conduct sewer lining and replacement over the 2011-2014 timeframe. In fact, according to the 2017 City budget, the Department has replaced or lined an average of 40 miles of sewers per year since 2009, significantly exceeding the 27-mile annual goal to maintain a 90-year replacement cycle. In addition, the City spent heavily on a pair of major sewer-related flood control projects in Milwaukee County parks during the past two years. With this initial surge of work taken care of, DPW now has the ability to lower capital spending from the Sewer Maintenance Fund over the next five years.

As noted above, DPW does not base its five-year capital plan on specific projects or extensive assessment of asset condition, but instead gauges the number of miles of sewers it hopes to replace or line each year based on a reasonable expectation of need and the available resources that can be derived from its fee structure. If circumstances dictate the need to move more aggressively with either sewer replacement/lining or capital projects involving other assets, then requests may be made in annual budgets that exceed amounts indicated in the five-year plan.

It is also possible – as is occurring in 2017 – that the need to replace a large diameter sewer will reduce amounts allocated to other replacement or lining projects, thus reducing the total miles addressed in a given year. (Alternatively, such a circumstance could create the need to add funds to the projected capital budget if the number of miles of linings and replacements cannot be reduced or other projects cannot be delayed.)

Finally, DPW officials caution that new environmental standards (such as Total Maximum Daily Loads) may create an imperative to move more aggressively on certain capital needs involving City sewers. At this point, such a potential need is not reflected in the five-year plan.

As shown in **Charts 17**, **18**, and **19**, annual spending in each of the asset categories is projected to be lower in the next five years than it was during the previous five (with the exception of the "Other" category, which saw a large boost from 2015-17 from the aforementioned parks projects but was funded at only $660,000 in 2013).

Chart 17: Sewer replacement and lining capital expenditures, 2013-2022 (in millions)

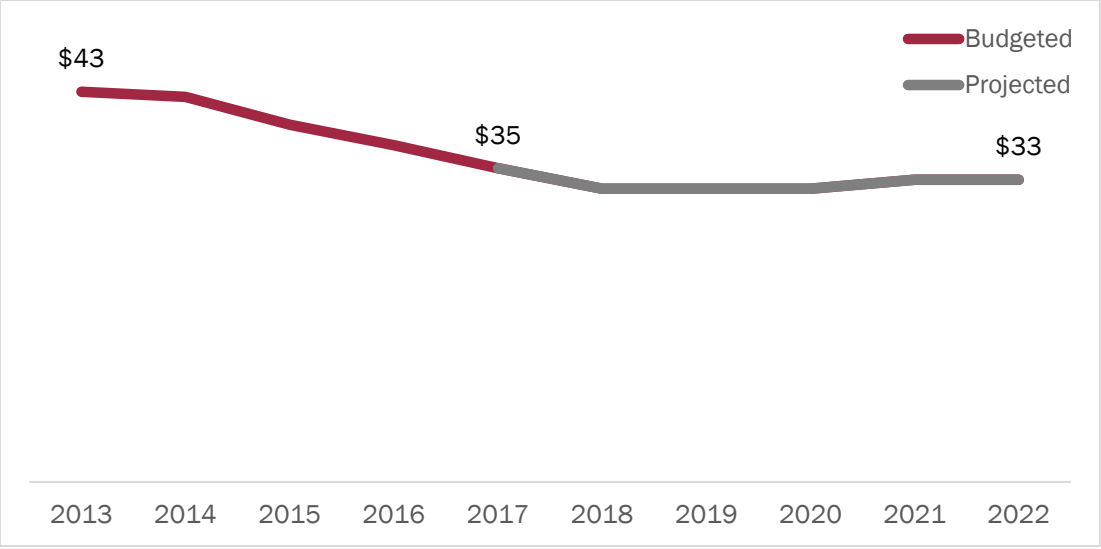


Chart 18: Pump facilities capital expenditures, 2013-2022 (in millions)

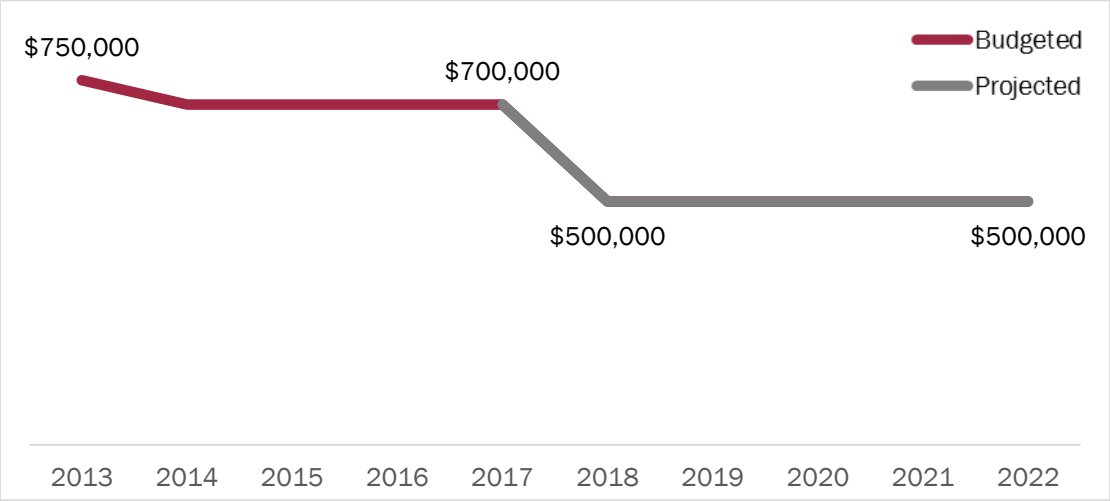
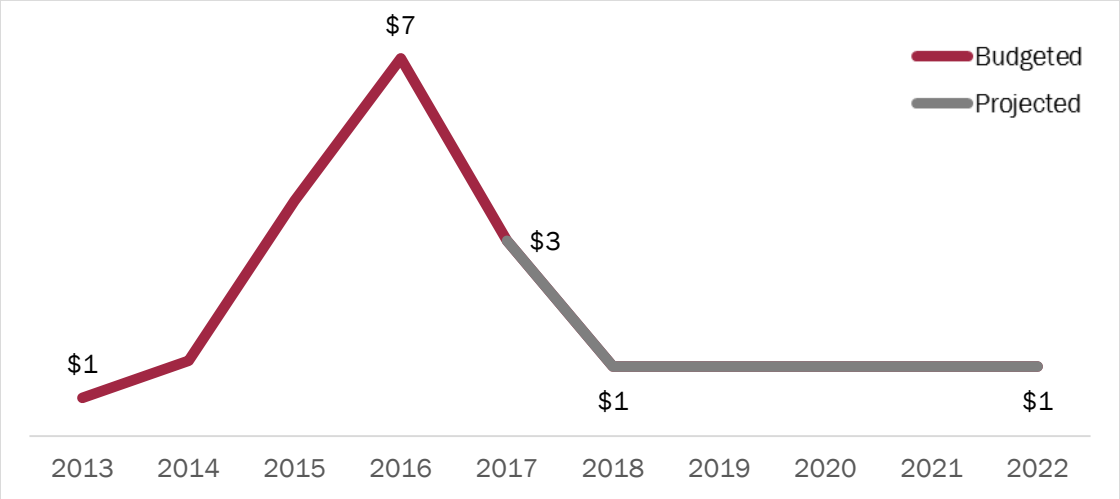
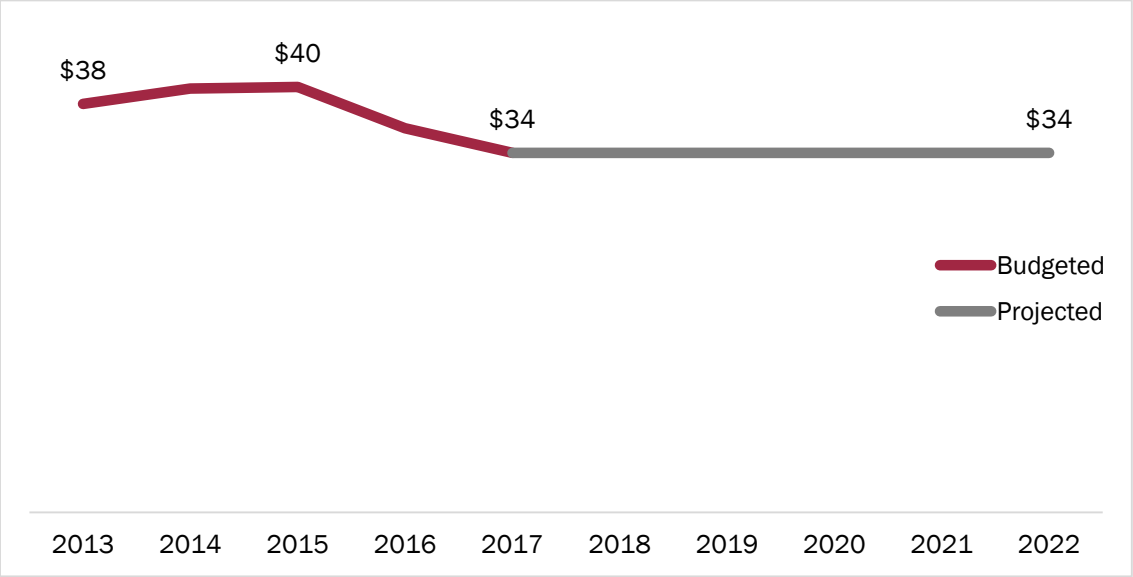


Chart 19: Other capital expenditures, 2013-2022 (in millions)



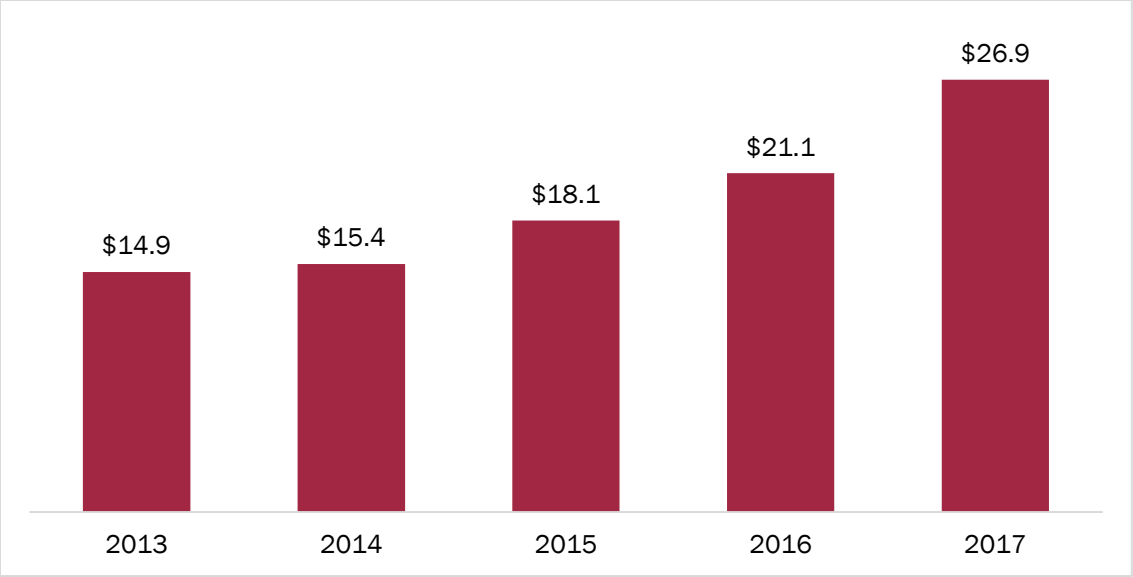
When spending surged in the wake of the severe storms of 2008-2010, the Sewer Maintenance Fund increased its borrowing. As shown in **Chart 20**, borrowing levels were in the $38-$39 million range from 2013-2016 before declining to $33.5 million this year. The five-year capital plan assumes that borrowing will remain at the 2017 level for each year of the five-year timeframe.

Chart 20: Proceeds from borrowing, 2013-2022 (in millions)



The increase in borrowing has produced an increase in debt service related to Clean Water Fund loans and revenue bonds, as shown in **Chart 21**. At the same time, the Fund has gradually been retiring its older G.O. debt, which has tempered the increase in overall debt service payments. Nevertheless, the increases shown in the chart have placed pressure on the Fund's fee structure, and increased debt service payments will continue to exert such pressure for the foreseeable future.

Chart 21: Sewer Maintenance Fund debt service, 2013-17 (in millions)



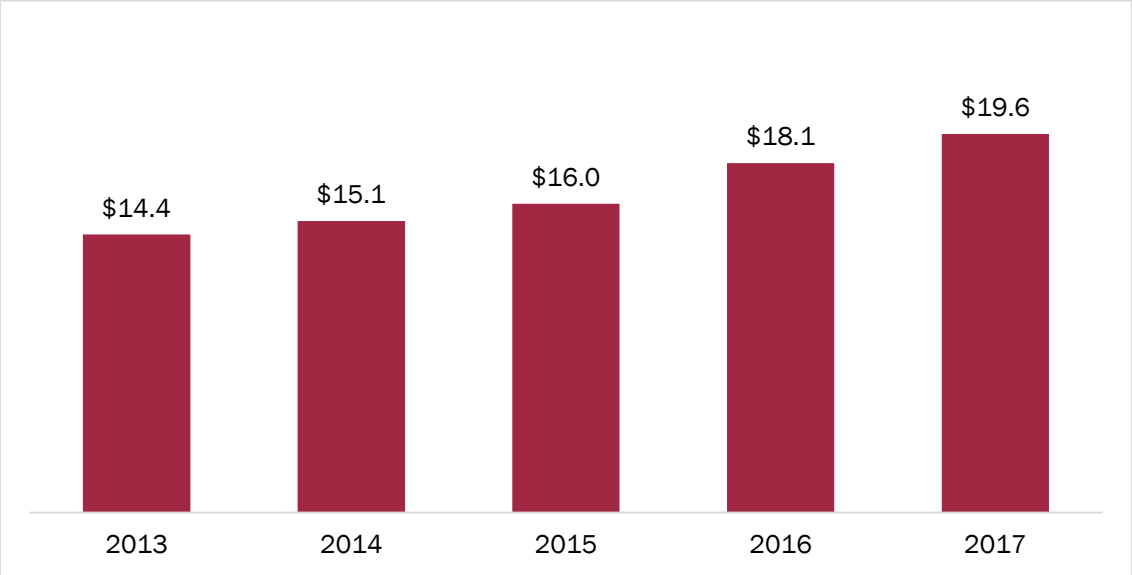
The projected future impact on City residents and businesses – who pay for the Sewer Maintenance Fund's capital spending and related debt service through stormwater and sewer fees – is difficult to gauge. Both fees have increased steadily during the past five years, including a 5% increase in the stormwater management fee and a 3% increase in the local sewer charge in 2017. The annual cost

to the average residential user has grown from $64.52 to $80.72 for stormwater and from $87.19 to $93.28 for sewers during that period (decreases in usage attributed to water-efficient appliances and other factors have mitigated the impact of increased sewer charges for the typical resident).

DPW officials expect to request 3-5% annual increases in both fees going forward. We cannot project the precise impacts on homeowners should those increases materialize, as water usage will impact the amount of the sewer charge. However, increases of 3-5% likely would exceed the rate of inflation and, therefore, will continue to exert financial pressure on residents and businesses.

It should be noted that the impetus to raise fees comes not only from the capital program, but also from the operational needs of the Sewer Maintenance Fund and those of DPW as a whole. As noted above, a substantial amount of fee revenue is transferred to the General Fund each year to reimburse DPW for street sweeping, leaf and brush collection, and pruning services. As shown in Chart 22, those transfers have been steadily increasing, and pressure to continue such increases also could influence decision-making on fee hikes.

Chart 22: Transfers from the Sewer Maintenance Fund to the General fund, 2013-17 (in millions)



Finally, the fact that the City found a way to substantially increase its commitment to addressing its sewer needs in the wake of the 2008-09 severe rainfalls bodes well for its ability to do likewise should a need for increased investment materialize in the future. Also, while fee increases may not be an optimal way of accommodating increased sewer spending, City leaders have little choice but to rely on that approach given State-imposed limits on property taxes and the absence of other local revenue options.

Summary

A surge in capital spending over the 2011-2016 timeframe has positioned DPW to ramp down capital spending for the next five years. Nevertheless, increasing debt loads and the need to continue to line or replace at least 27 miles of sewers per year will continue to put pressure on

stormwater management and sewer fees, which already have increased steadily during the past several years. Also, an unanticipated major project or projects involving large diameter sewers could place added pressure on both spending and fees.

Overall, the Sewer Maintenance Fund appears able to handle its five-year capital needs while reducing borrowing from levels experienced earlier in the decade. Given the age of the City's sewers and the potential that new needs could surface from major storm events or tighter regulatory requirements, however, this situation could change quickly. City leaders will need to be mindful of that fact and its potential impact on fee payers.

MILWAUKEE WATER WORKS

The Milwaukee Water Works (MWW) is a regional provider of drinking water that serves not only the City of Milwaukee, but also 10 suburban communities in Milwaukee County and five suburban communities in Ozaukee and Waukesha counties.[21] MWW maintains 1,960 miles of water mains that carry more than 100 million gallons of treated water to 860,000 customers on an average day. Additionally, the utility owns more than 170,000 smaller service lines, 13 pumping stations, two elevated storage tanks, and two water treatment facilities.

While MWW's service area is regional in nature, it is housed within the City of Milwaukee government, where it functions similar to the Sewer Maintenance Fund as an enterprise fund. A key difference, however, is that MWW is considered a publicly-owned utility and is regulated by the Public Service Commission (PSC) and the Wisconsin Department of Natural Resources. MWW's operating expenditures are financed primarily through fees charged to water users, which are derived from rates that are subject to PSC review and approval.

[21] MWW directly serves four of those suburban communities as a retail supplier and acts as a wholesale supplier to 11 others who distribute the water themselves.

INFRASTRUCTURE CONDITION

Similar to MMSD, MWW's capital assets portfolio consists of several different types of infrastructure that involve both distribution and treatment. For our analysis, we focus on two types of pipes that comprise the distribution system – water mains and service lines – as well as treatment facilities, pumping stations, and storage tanks. Each of these components plays a critical role in fulfilling the utility's mission of purifying Lake Michigan Water and delivering it for consumption to 16 communities in the Metro Milwaukee region.

Snapshot: Milwaukee Water Works Infrastructure Condition

Water mains

MWW has approached or exceeded the industry standard for the number of annual water main breaks in recent years and the PSC is requiring an increase in annual miles of water main repairs/replacements in light of their age and condition.

Service lines

MWW owns 76,000 lead service lines (45% of its total number of service lines). While, according to MWW, these do not pose an immediate public health threat if not disturbed, there is widespread consensus that they should be replaced. Doing so is likely to take several decades.

Water treatment facilities

Condition ratings show that the Linnwood plant is in fair condition and the Howard facility is in good condition; an increase in repair and replacement work is projected from 2018-2022.

Pumping stations

The vast majority of the utility's pumping stations appear to be in relatively good shape, with 11 of the 13 rated at or above a 3 (signifying at least fair condition). Work on one of the two that failed to meet that standard is underway.

Storage tanks

While neither of MWW's storage tanks have fallen below fair condition, both experienced declines in 2016. This trend is one that bears watching and that may have to be addressed in the near-term in MWW's capital budgeting.

Capital Asset Management

MWW keeps a catalogue of its capital assets and uses ratings to assess and keep track of the condition of certain classes of assets. A notable exception involves water mains and service lines. For water mains, condition is catalogued based on age, while for service lines it is catalogued based on the composition of the line (lead or copper). For both classes of assets, close attention also is

paid to patterns of breaks and leakages. Breaks/leakage, history, age, and material are primary determinants of repair and replacement priorities.

MWW prepares a six-year capital plan that is updated annually. For some classes of assets, the plan contains specific capital projects with delineated dollar amounts that are identified through annual condition assessments. For water mains, an overall dollar amount is identified that reflects replacement goals in terms of annual miles to be replaced. Funding for service line repair and replacement traditionally has come from the utility's operating budget as need has arisen from observed damages and leaks. In light of the need for extensive replacement of lead service lines going forward, however, MWW plans to include a funding amount to cover the cost of scheduled replacements in the capital budget beginning in 2018 (funding for replacements that are not scheduled but arise from leaks or damage would continue to come from the operating budget).

From a financial standpoint, MWW's multi-year plan takes into account both project need and consideration of the capital dollars that the utility believes will be available each year based on affordability for ratepayers and previous years' requests. As will be discussed in our consideration of financial capacity, however, a far more intensive capital planning process currently is underway to determine how the substantial need that has arisen to replace mains and service lines will be accommodated.

Water mains

Water mains are an integral part of MWW's operation, as they are the delivery system by which customers access water. Mains vary in size and length as well as material; the smaller class of main is made of iron, while the largest classes are constructed out of iron or concrete.

MWW assesses the condition of a main largely based on the year in which it was installed and the number of breaks similar mains installed in that year have experienced. The national standard is that no more than 25-30 breaks should occur per 100 miles of water mains per year, where a break is defined as a structural deficiency of the pipe.

It is difficult for MWW engineers to conduct a robust assessment of water mains because they are pressurized and buried underground. While sewers can be assessed using closed-circuit television scans, that is not possible for MWW mains. Instead, MWW must rely on assessing patterns of failures and post-failure evaluations to determine which installation years and materials are suffering the most frequent breaks and to set repair and replacement schedules accordingly.

Service lines

Service lines are smaller diameter pipes that connect water mains to private properties. These are made of copper or lead. The section of the service line from the water main to the curb stop is owned by MWW and also is known as a "public service line," while the section from the curb stop to the residential or commercial/industrial structure itself is owned by the property owner and is known as a "private service line."

As with water mains, MWW engineers cannot use closed-circuit television scans to assess the condition of service lines, but instead must rely upon knowledge of composition and age. There are no condition standards for service lines.

Water treatment facilities

MWW's water treatment facilities are where Lake Michigan water is pumped and treated before being pumped back out to users and storage tanks. When assessing its two water treatment plants, MWW engineers look at several categories that help identify the condition of the facility's different features. For example, to assess a facility's filtration system, they look not only at the filtration equipment itself, but also at the condition of the building in which the equipment is housed; the condition of pipes and valves leading to the system; the condition of the electrical equipment associated with the system; and information that the Supervisory Control and Data Acquisition system (SCADA) software has recorded.

The following are examples of processes that take place in water treatment facilities:

- Ozonation – Infusion of ozone into lake water to destroy microorganisms.
- Flocculation – Using a chemical to cause small particles in the water to come together, or floc together, to become heavy enough to settle.
- Sedimentation – Flocculated particles move to sedimentation tanks, where they settle at the bottom and are collected by rotating scrapers.

The several assets that make up the treatment plants are evaluated on a scale of 1 to 5, with 1 indicating poor condition and 5 indicating excellent condition. When an asset is assessed as a 1, rehabilitation or replacement is prioritized. Assets rated as 2's may need rehabilitation or replacement in the next year, while a rating of 3 identifies assets that should be monitored, but that are not considered priorities for rehabilitation or replacement. The ratings are averaged to give a total score that is used as an overall parameter for condition assessment of treatment plants.

Pumping stations

MWW's pumping stations help move drinking water from Lake Michigan to the utility's water treatment plants and further out into storage tanks and to municipalities within the service area. These assets also are rated on a 1-5 scale. The stations' structures, electrical infrastructure, pumps, pipes, and valves are given condition ratings, which are then averaged to determine an overall condition rating.

Storage tanks

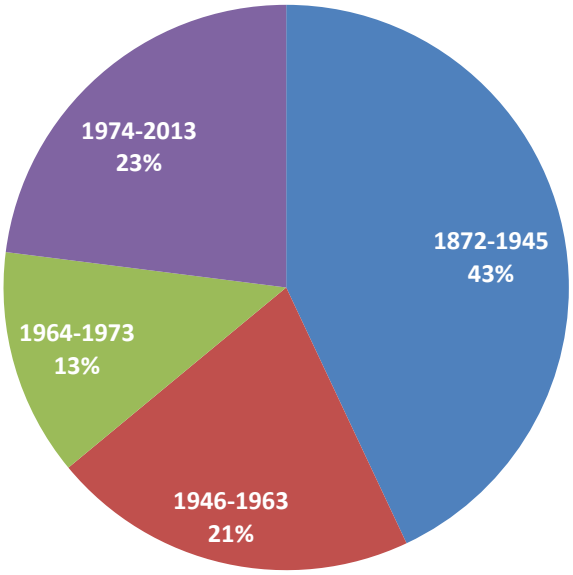
A similar condition methodology is used for MWW's two elevated storage tanks, which are located in Milwaukee and Greenfield. Storage tanks are used not only to store water, but also to keep the system pressurized. The condition ratings help engineers ensure that storage conditions are sufficient to fulfill both purposes.

Infrastructure Assessment

Water Mains

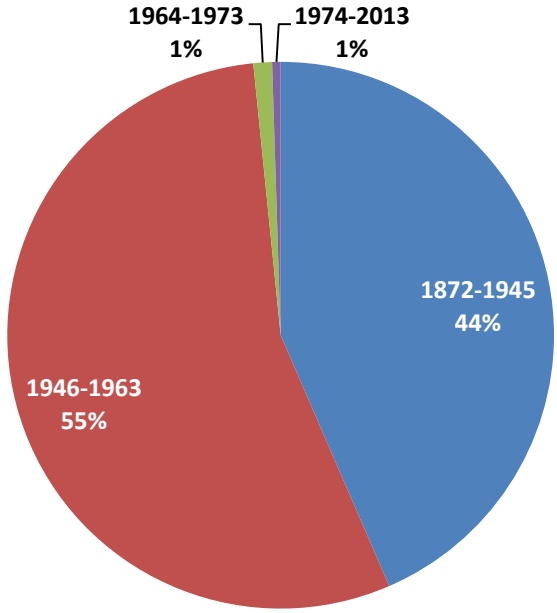
As shown in **Chart 23**, as of 2015, 43% (841 miles) of MWW's 1,960 miles of water mains were at least 70 years old, with installation occurring between 1872 and 1945. About 23% were installed within about the past 40 years, while the remainder had an age range of roughly 40 to 70 years.

Chart 23: Mile of mains by year of installation



Knowing when water mains were installed conveys the types of materials and methods that were used. This knowledge helps engineers identify patterns of breaks and can be helpful in predicting which mains soon may experience breaks. Interestingly, as shown in **Chart 24**, the oldest mains are not necessarily those that are most susceptible to breakage. Over MWW's history (through 2015), 55% of its water main breaks have involved mains installed from 1946 to 1963, despite the fact that those mains comprise only 21% of MWW's total water mains. In contrast, mains installed between 1872 and 1945 – which comprise 43% of all mains – have accounted for 44% of the breaks.

Chart 24: Water main breaks by year of installation

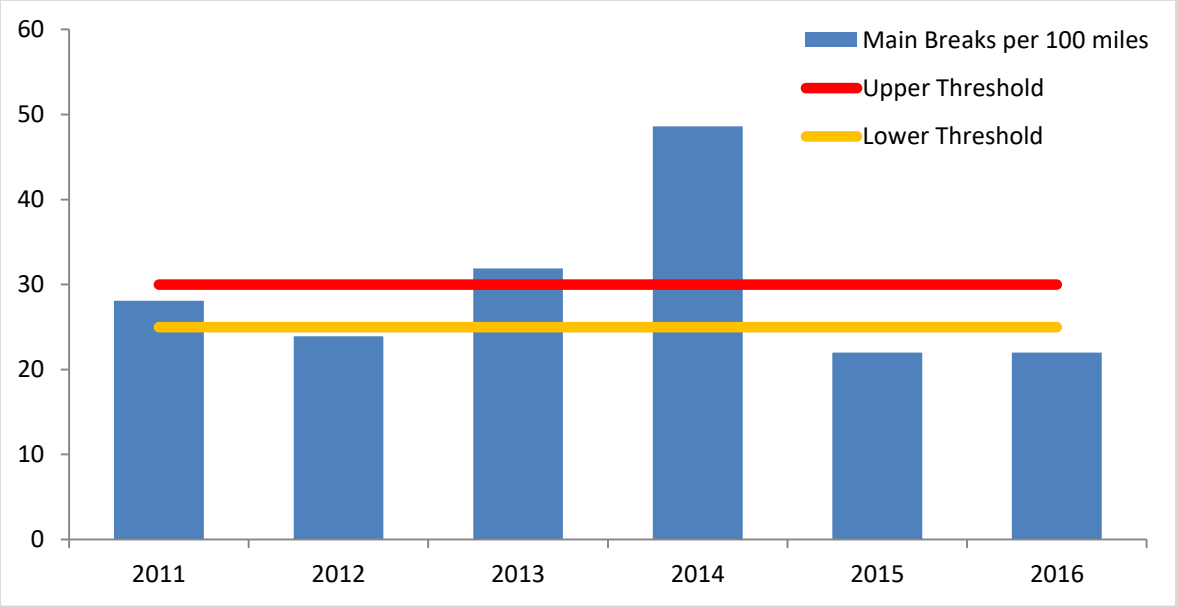


The age of MWW's water mains and the frequency with which breaks have been occurring for those installed between 1946 and 1963 illustrates the nature of the challenge facing MWW. More than 40% of its water mains exceed 70 years of age, which would suggest that they will need to be replaced sooner rather than later; and more than a fifth were installed during the period of time that is linked to the majority of breakages. **Consequently, this would suggest that about 60% of MWW's existing water mains may need attention in the coming decades.**

Another means of assessing the condition of water mains is to consider the number of breaks that are occurring each year. As noted earlier, MWW has cited a national standard suggesting that a healthy water utility should experience no more than 25-30 breaks per 100 miles in a given year. As shown in **Chart 25,** from 2011 to 2016, the number of water main breaks experienced by MWW generally fell close to that range, with the exception of 2014, when 49 breaks per 100 miles occurred.[22] The fact that annual water main breakages have been close to exceeding (or have exceeded) the national standard again suggests that it will be important for MWW to conduct an active replacement schedule going forward.

[22] The large increase in 2014 was attributed, in part, to a major leak in a water main at the Texas Avenue pumping station, which caused crews to shut down the facility as well as the Howard Avenue treatment plant. To maintain pressure in the system, flow from the Linnwood plant was increased, and that caused a rash of water main breaks (76 in the first five days) on the city's northwest side. In addition, 2014 was the year of the polar vortex, which also contributed to the large number of breaks.

Chart 25: Water main breaks per 100 miles, 2011-2016



Finally, it is worth noting that in 2015, the Public Service Commission – which has regulatory authority over MWW – instructed MWW to replace 15 miles of water mains and to increase that amount to 20 miles by 2020 as a condition of its approval of future rate increases. This reflects the PSC's determination that the age/condition of MWW's water mains was of sufficient concern to require a more aggressive replacement schedule. MWW has retained a consultant to conduct a comprehensive condition assessment of the utility's water mains to add further clarity to this issue. The consultants' report will be released in late spring or early summer. As will be detailed in our financial analysis later in this section, MWW already has plans to substantially increase the pace of water main replacement in the next five years.

Service Lines

As previously stated, service lines are pipes that connect water mains to private properties. The portion of the line from the main to the curb stop is owned by MWW, while the section that leads from the curb stop to the property itself is owned by the property owner. Service lines have received national attention over the past year after it was discovered that lead service lines in Flint, MI, had corroded from the inside, causing a public health emergency.

According to MWW, there are 169,000 service lines in the City of Milwaukee, of which it estimates 76,000 are made of lead (70,000 connecting to residential properties and 6,000 to commercial properties). Since 1996, MWW has added a corrosion-inhibiting chemical to its drinking water to prevent lead pipes from corroding to the point that lead particles would seep into the water. Consequently, it has not pursued an aggressive policy to replace lead lines.

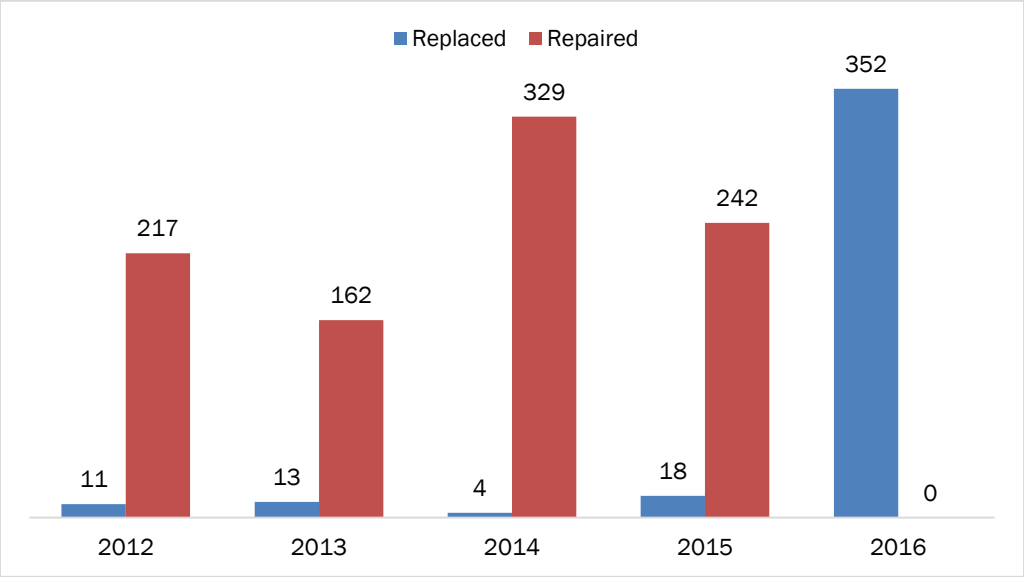
Beginning in 2017, however, City officials are implementing a far more aggressive approach by mandating that lead service lines be replaced – as opposed only to being repaired – whenever a leak

or break is discovered on either the privately-owned or MWW-owned section; or if work on the utility-owned section (or another infrastructure project that may disturb the line) already has been scheduled on a planned or emergency basis.[23] In addition, the 2017 budget includes an initiative to replace lead service lines at 300 licensed child care facilities and eight private schools (replacements will occur at an additional 85 child care and school facilities in 2018).

The average cost of replacing the MWW-owned portion of a lead service line generally has ranged from $5,000 to $6,700 in the first three months of 2017. Replacements associated with leaks have been more expensive than those that MWW has planned (e.g. at child care facilities) because the utility must pay for time and materials for each leak, as opposed to being able to get a bulk price per linear foot under a service contract. Utility officials hope the price will come down as the volume of repairs increases, and as its contractors gain more experience and enhance their efficiency with service line replacement.

Chart 26 tracks MWW's repair and replacement of *utility-owned* service lines from 2012-2016 in response to a leak or damage. Prior to 2016, as shown in the chart, MWW typically *repaired* most of the lines that had incurred damage or leakage. Beginning in 2016, however, MWW initiated a policy that dictated it only would *replace* (instead of repair) a line it owned when a leak or damage was discovered. It also is important to note that lead lines fail at a much greater frequency than copper lines; in fact, all replacements in 2016 involved lead lines.[24]

Chart 26: Repair and replacement of publicly-owned service lines 2012-2016



[23] A City ordinance that went into effect in January 2017 mandated that replacement of the private portion of a lead service line had to accompany replacement of the publicly-owned portion (given that replacing the public portion could cause lead particles to leach from the private portion), with the City paying for two thirds of the private costs and also offering long-term financing opportunities for the remaining one third. City officials also have urged residents living in homes with lead pipes to obtain water filtration products, and the City has partnered with the United Way of Greater Milwaukee & Waukesha County and A.O. Smith to provide such products to residents.

[24] Current practice is to replace lead service lines with copper lines.

MWW will proactively replace a minimal number of service lines in 2017 besides those noted above involving child care facilities and private schools. For private properties, the utility will take action only when leakage or damage is discovered or when nearby replacement of water mains or other infrastructure work may impact the service line (it is expected that will involve about 300 to 400 replacements).

MWW officials plan more scheduled replacements beginning next year. The current plan is to schedule 100 replacements in 2018, which means that approximately 400-500 replacements will take place when combined with those that will need to occur anyway via damage or leaks. Because of MWW's plan to increase the pace of water main replacement, the pace of replacement for nearby service lines also will need to increase in future years; additional service line replacements also will be scheduled on top of that need in an effort to ultimately replace all lead service lines as resources allow.

Ideally, MWW would like to get to the point where it can replace 1,400 lead service lines per year, a pace that could require $7 to $8 million of annual investment on top of MWW's other needs, yet one that still would mean full replacement of all publicly-owned lead service lines would take more than 50 years. Also, it is important to note that the above cost estimate only represents MWW's cost for the service lines it owns; if the City makes good on its current commitment to finance two-thirds of the cost of lead-based service line replacement for private homeowners, then it would face a substantial additional cost that would impact the general purpose budget (we conduct a more thorough analysis of financial impacts below).

Assessing this situation in terms of infrastructure condition is difficult because such an assessment involves a subjective judgment about the urgency of replacing the 76,000 lead service lines. If, on the one hand, it is considered acceptable from a public health perspective simply to replace lead service lines at a measured pace over several decades, then that would appear to be a manageable endeavor and would suggest that MWW's array of 169,000 service lines as a whole is in relatively good condition. Conversely, if policymakers determine that the entire inventory of 76,000 lead service lines needs to be replaced on an expedited basis, then that would convey a substantial operational/logistical challenge, as well as a major financial challenge for the City and property owners.

It is important to note that just because a service line is made of lead does not mean it is susceptible to leakage or damage. In this case, the need to replace is being driven by public health concerns, which MWW has been controlling through treatment and other means before the condition of the infrastructure requires it to be replaced.

While we are not public health professionals, the body of knowledge regarding the health risks involved with lead – as well as statements made by City officials themselves – certainly would appear to indicate that replacing the 76,000 lead service lines will be a high priority for City officials, though one that will take several decades to accomplish. **Consequently, we rate this to be an area of substantial concern given the magnitude of the task at hand.**

Water Treatment Facilities

There are several components of a water treatment facility, and each of those are evaluated and rated by MWW engineers. As noted above, major components are rated from poor to excellent (1-5). In **Charts 27** and **28**, we average the scores of those components for MWW's two water treatment facilities for the 2012-2016 timeframe.

Chart 27: Average of condition ratings for Linnwood treatment facility components, 2012-16

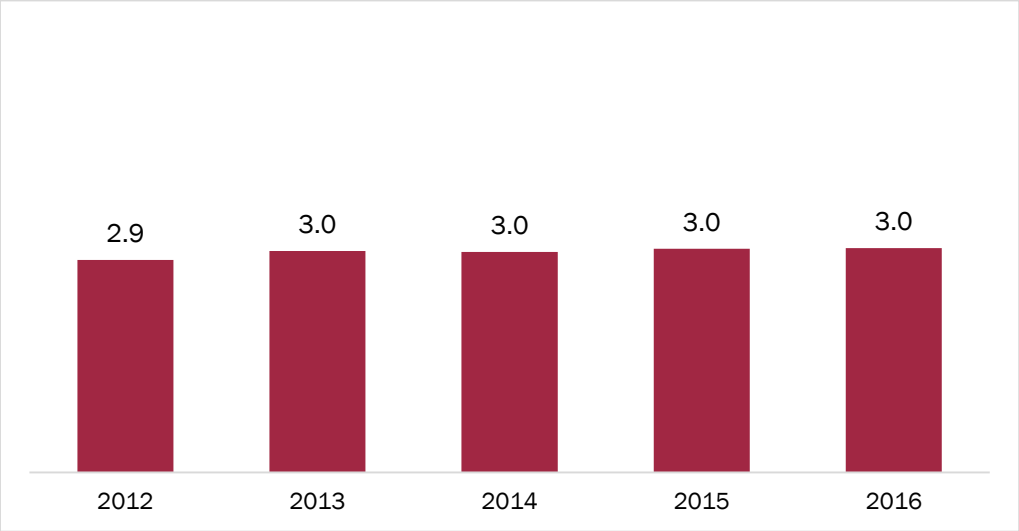
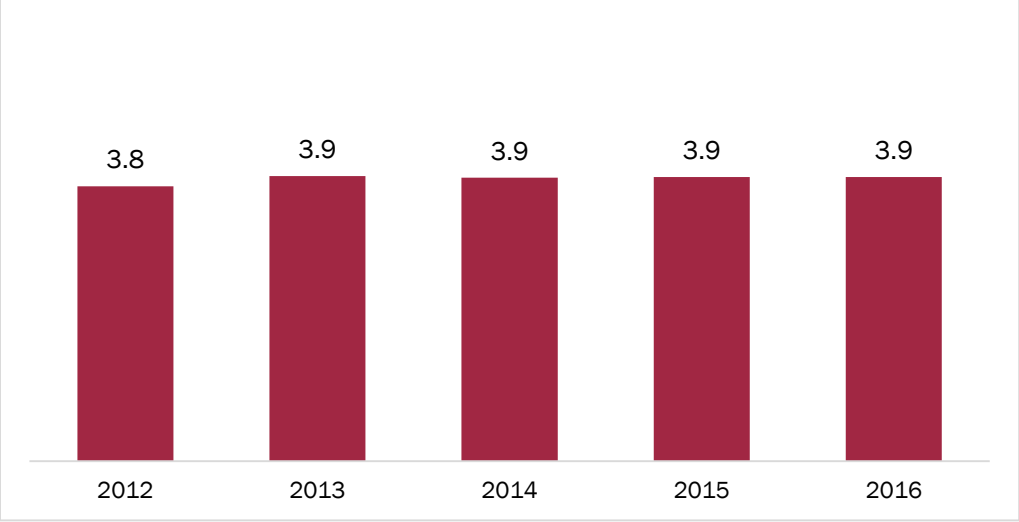


Chart 28: Average of condition ratings for Howard treatment facility components, 2012-16

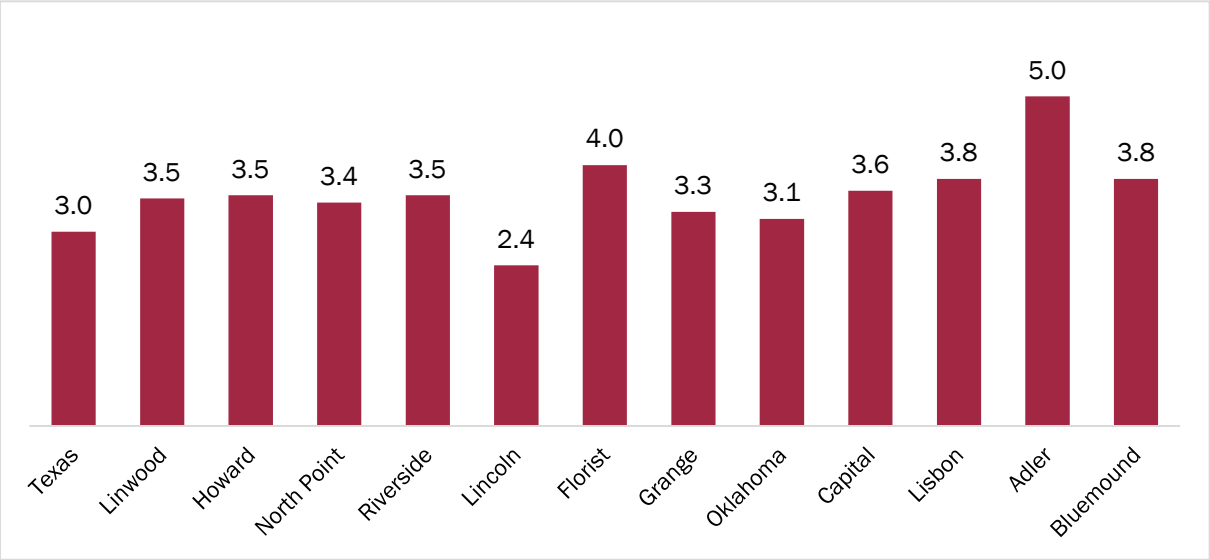


We find that, during this period, both facilities showed minor improvement. This analysis also shows that **the Linnwood plant appears to be in fair condition**, which means that MWW engineers are keeping up with and monitoring capital asset needs in an adequate manner; and that **the Howard facility is in good condition.** Substantial repair and replacement work is anticipated during the next five years.

Pumping stations

As shown in **Chart 29**, as of 2016, 11 of MWW's 13 pumping stations were rated at or above a 3, which signifies at least fair condition (the exceptions are Texas and Lincoln). Although not shown in the chart, the Howard, Bluemound, Lisbon, and North Point stations have experienced an improvement in condition from 2012 to 2016. Overall, while the Lincoln pumping station appears to merit near-term attention, **the vast majority of the utility's pumping stations appear to be in relatively good shape.** Also, it should be noted that capital repair and replacement at the Lincoln station is underway and should be completed within the next two years.

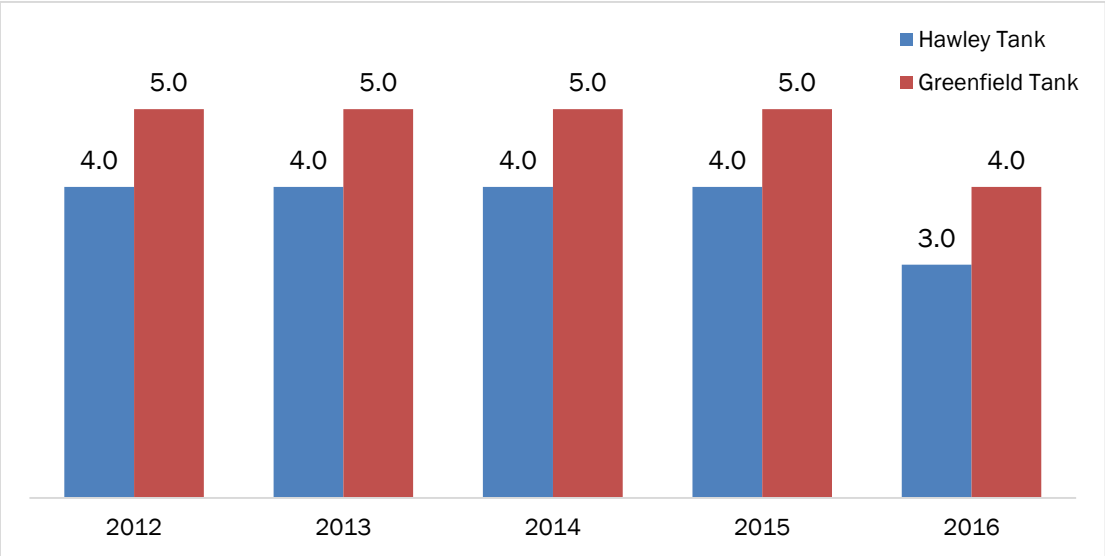
Chart 29: Condition ratings for pumping stations, 2016



Storage tanks

Storage tanks are inspected for corrosion, among other deficiencies. While neither of MWW's storage tanks have fallen below fair condition, **Chart 30** shows that both experienced declines in 2016. The Hawley storage tank has fallen from good to fair, while the Greenfield tank has declined from excellent to good condition. **This trend is one that bears watching and that may have to be addressed in the near-term in MWW's capital budgeting.**

Chart 30: Condition ratings for storage tanks, 2012-2016



Summary

MWW's annual and six-year capital budgets have reflected the number of miles of water mains the utility believes it will need to replace in a given year while delineating specific projects for other capital assets. Service line repairs and replacements have been addressed in the operating budget, though that will change in future years. MWW typically has not accompanied its six-year capital budgets with detailed financial plans, but that too will change. The utility is preparing a detailed 10-year financial plan that will lay out options for accommodating the need to vastly increase replacement of both mains and service lines in future capital budgets, as well as to address other infrastructure needs.

For water mains, the need for enhanced replacement activity is linked to the fact that breaks have hovered at or above the standard of no more than 25-30 breaks per 100 miles over the past five years and to a directive from the PSC for MWW to increase its pace of replacements. The need to commit significant capital resources to replacing service lines, meanwhile, is based on the lead composition of about 45% of the utility's 169,000 miles of service lines. Together, this represents a very formidable infrastructure challenge, though there is no threat of immediate failure. MWW's water treatment facilities, along with its pumping stations and water storage tanks, largely are in good or manageable condition going forward.

CAPITAL FINANCE CAPACITY

As in previous sections, our analysis of MWW's capacity to address identified infrastructure needs looks at capital spending trends, long-term capital budget forecasts, and potential constraints on capital spending. A complicating factor is the role of the PSC, which regulates the utility and its rates, and whose role must therefore be taken into account when considering the utility's capacity to meet its capital spending needs. In addition, the City of Milwaukee's broader financial structure comes into play, particularly when considering MWW's plans for replacing lead service lines and the possibility that General Fund resources may be called upon to assist with that endeavor.

Snapshot: Milwaukee Water Works Fiscal Capacity

MWW's need to increase its annual capital spending by nearly 50% between now and 2020 is a daunting challenge. Fortunately, the utility currently enjoys a low level of overall debt, but a rapidly growing debt burden would require substantial rate increases that the Public Service Commission must approve. MWW is engaged in an intensive financial modeling exercise that will spell out these challenges and (presumably) lay out a recommended path forward by this Fall.

Capital Finance Overview

MWW's 2017 budget totals $131.2 million, with $102 million for operations and $29.2 million for capital expenditures. As noted above, operating expenditures are financed primarily through fees charged to water users, including both retail and wholesale customers. Fee revenues comprise $92.4 million of the $102 million in operating revenues, with the remainder derived from miscellaneous smaller charges and retained earnings.

To fund its capital expenditures, MWW typically has relied on cash financing. Each year, the capital budget contains a transfer of retained earnings from the operating budget to finance a portion of the capital program. The remainder is left to a determination by the City's comptroller (which ultimately must be approved by the Common Council and Mayor) as to whether to borrow any additional funds that are needed, or instead to use additional retained earnings from previous years. Only in rare instances over the past several years has traditional borrowing been used by the City on behalf of MWW (this can take the form of G.O. debt, revenue bonds, or loans from the State's Safe Drinking Water Loan Program). One of those cases did occur in 2016, however, when the City issued $10 million in revenue bonds to help finance MWW's capital expenditures.

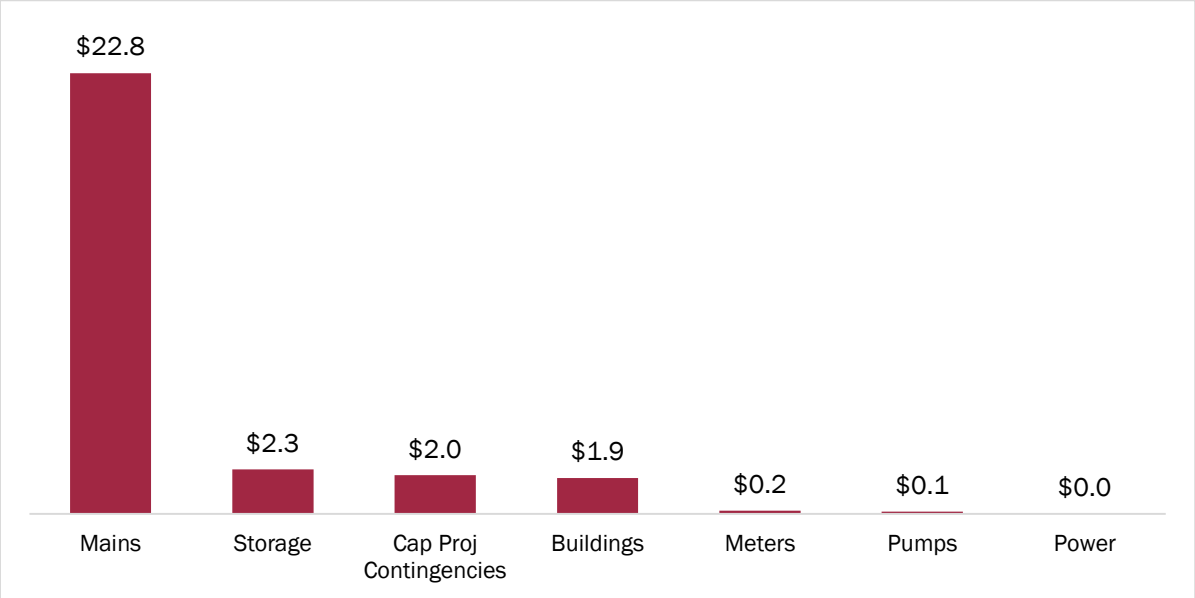
In 2017, MWW's capital budget assumes a $7.3 million transfer from operations, while the remaining $21.9 million potentially would be generated from additional borrowing. According to MWW officials, however, it is unlikely that such borrowing will occur this year, as sufficient cash flow from retained earnings likely will be identified to pay for the additional capital expenditures during the year. Borrowing will take place after the projects have been completed in a subsequent year.

The reluctance of City and MWW officials to borrow means that the utility holds a very low level of capital-related debt for an enterprise its size. As of the end of 2015, MWW held $36.3 million in outstanding debt, which the Fitch ratings agency recently referred to as "minimal."[25] The utility is prohibited from directly using user fee revenue to pay for debt service; instead, it essentially uses its "rate of return" (i.e. its annual "profit") for that purpose. In 2017, MWW's debt service will total $5.4 million. It will make a $1.3 million transfer to the City's debt service fund for debt on previous G.O. bonds issued by the City on its behalf, and it has budgeted another $4.1 million to service Safe Drinking Water loan and revenue bond debt.

Similar to the Sewer Maintenance Fund, because MWW's debt is not backed by the property tax levy, it is not impacted by the City's policy goal that places limits on levy-supported debt. Also similar to the Sewer Maintenance Fund, the principal constraint on MWW borrowing is the ability to charge ratepayers at sufficient levels to service the debt, though in this case that constraint is affected by the affordability considerations of both elected officials and the PSC. It also should be noted that MWW's need to prepare capital spending and financing plans without knowing how the PSC will respond to its rate requests provides an added level of complexity to the utility's capital planning that is not experienced by other City departments and enterprises.

With regard to 2017 budgeted capital expenditures, MWW plans to spend $22.8 million on water main projects, as shown in **Chart 31**. That expense is expected to grow substantially in the coming years because of a planned increase in annual main replacements. The remaining $6.4 million in expenditures consists largely of projects related to storage and buildings, as well as capital project contingencies.

Chart 31: 2017 MWW capital expenditures by project type (in millions)



[25] Fitch Ratings report on MWW's $10 million revenue bond issue, November 28, 2016.

Finally, it should be noted that MWW contributes about $13 million annually to the City in the form of a payment in lieu of taxes (PILOT). It is a common practice for water utilities to make such payments to municipal governments in recognition of the fact that utilities benefit from municipal services but do not pay property taxes. According to information prepared by the PSC, MWW's PILOT equated to 14.7% of its water revenue in 2015, which was below the average of 15.6% for other municipal water utilities in Wisconsin. While this payment does not have a direct impact on MWW's capital finance capacity, it has an indirect impact in that PILOT payments to the City are a substantial operating budget line item and impact MWW's rates.

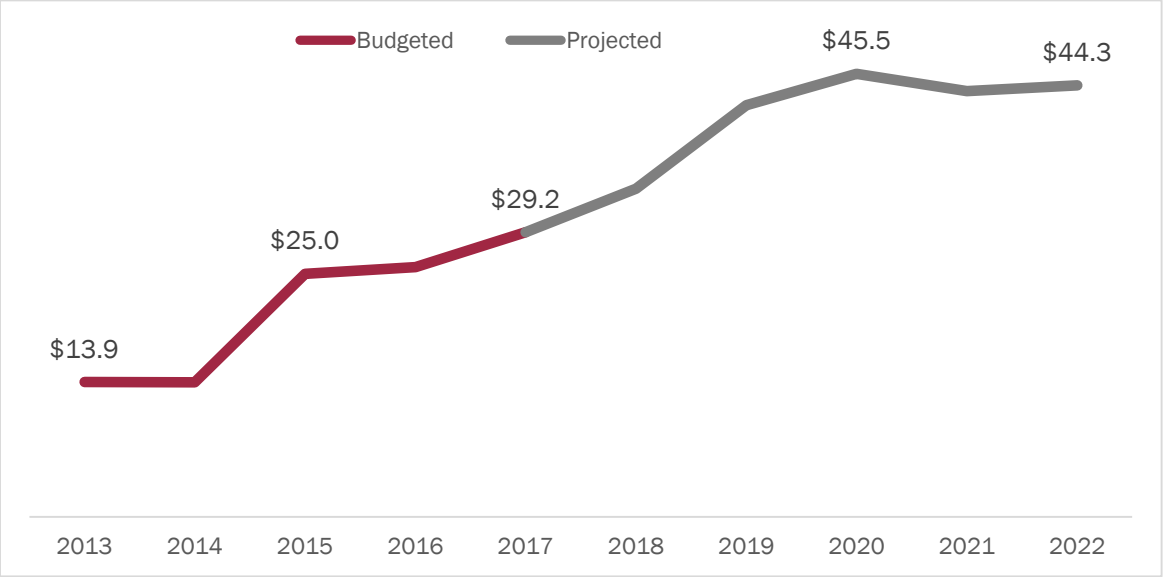
Chart 32 shows that MWW's PILOT payments have increased by about $700,000 over the past five years. If City leaders were to significantly increase MWW's PILOT as a means of buttressing the City's General Fund in future years, then this could have an impact on the utility's capital finance capacity in that it could further the need for rate increases.

Chart 32: MWW PILOT Payments , 2013-2017 (in millions)

Capital Finance Trends/Forecast

As shown in **Chart 33**, MWW experienced a substantial increase in capital spending over the 2013-2017 timeframe, jumping from less than $15 million in 2013 and 2014 to about $25 million in the following two years. According to MWW's latest capital planning projections, after additional increases this year to more than $29 million and next year to more than $33 million, the utility's capital expenditures are projected to skyrocket to more than $40 million annually for the following four years.

Chart 33: MWW capital expenditures, 2013-2022 (in millions)



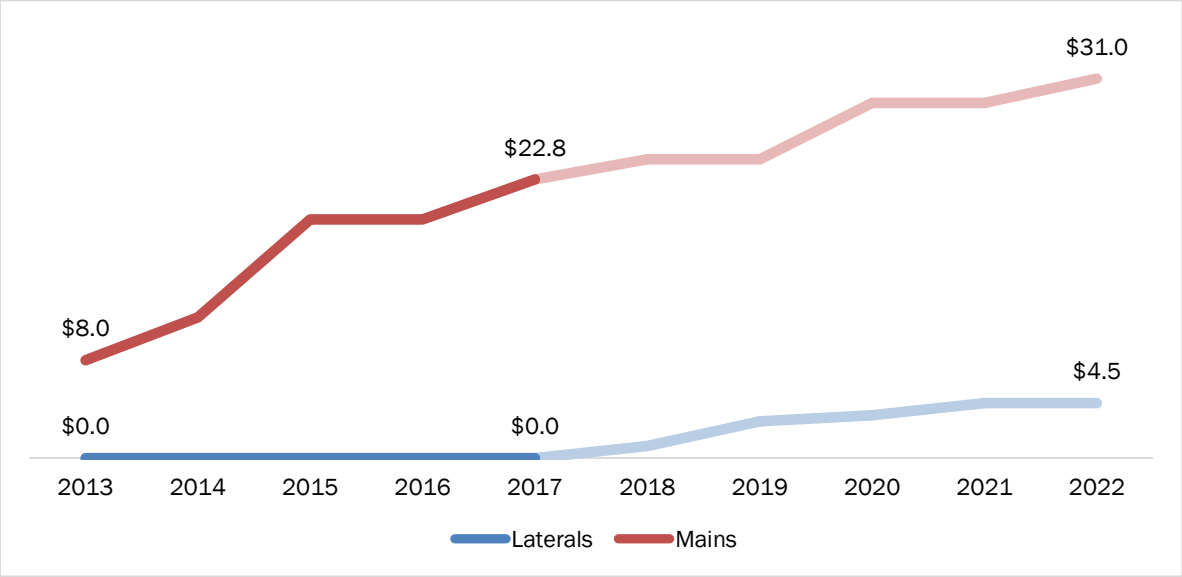
The huge surge in capital spending in the coming years stems primarily from MWW's plans to substantially increase its repair and replacement of water mains and – at the same time – to initiate a concerted effort to replace lead service lines. The two initiatives are related because service line replacements will focus, in part, on those lines that are impacted by water main work. Also, as discussed above, MWW will continue its policy of replacing – as opposed to repairing -- all lead service lines that are identified as damaged or leaking.

Chart 34 tracks the increase in annual capital spending on both water mains and service lines that has occurred since 2013 and the sizable increases that are anticipated over the next five years (prior to 2018 capital spending only involved water mains). As shown in the chart, combined annual capital spending for replacement of water mains and utility-owned service lines will increase from $22.8 million this year to more than $35 million by 2022.[26] These figures do not include funds from MWW's operating budget that also will be devoted to replacing service lines.[27]

[26] The chart only speaks to MWW's share of service line replacement for the publicly-owned portions and does not include private or City General Fund contributions to the private portions.

[27] MWW anticipates devoting about $12 million in operating budget monies to service line replacement between 2018 and 2022. Operating funds also are used for a water meter replacement program, and utility officials hope that as all meters are replaced (perhaps by 2022), operating funds from that initiative can be redirected to service line replacement.

Chart 34: Mains and service lines capital expenditures, 2013-2022 (in millions)



MWW plans to increase its annual miles of water main replacement to 18 miles in 2018 (up from 15 miles this year) and then to 20 miles in 2020. Scheduled lead service line replacement, meanwhile, is projected to grow from 100 in 2018 to 700 by 2021. This will be accompanied by plans to use operating funds to replace up to 550 lead service lines that are linked to leaks, damage, repairs to other nearby infrastructure, etc., for a total of 1,250 projected lead service line replacements per year by 2022. As noted above, while this is a significant increase, it still would mean that replacement of all 76,000 lead service lines would take more than 50 years (assuming MWW ultimately gets up to 1,400 replacements per year, which is its current goal).

As shown in **Charts 35**, **36**, and **37**, MWW's treatment facilities and pump stations also will see sizable increases in capital spending in the next five years, while storage tanks will see a reduction in spending over the period. Also, not shown in these charts is a $5 million capital expenditure the utility plans to make in both 2019 and 2020 for new customer information software.

Chart 35: Water treatment facilities capital expenditures, 2013-2022 (in millions)

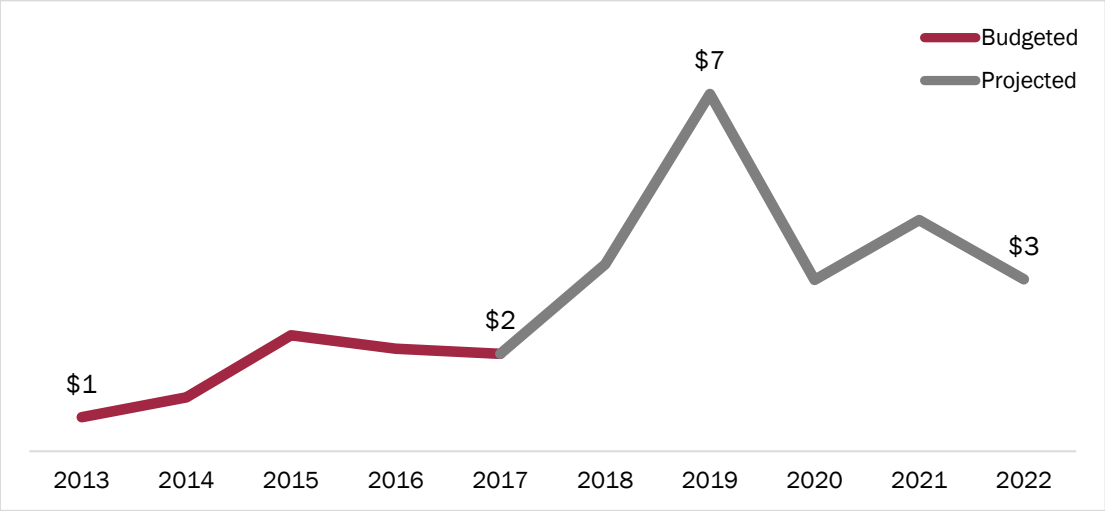


Chart 36: Pump stations capital expenditures, 2013-2022 (in millions)

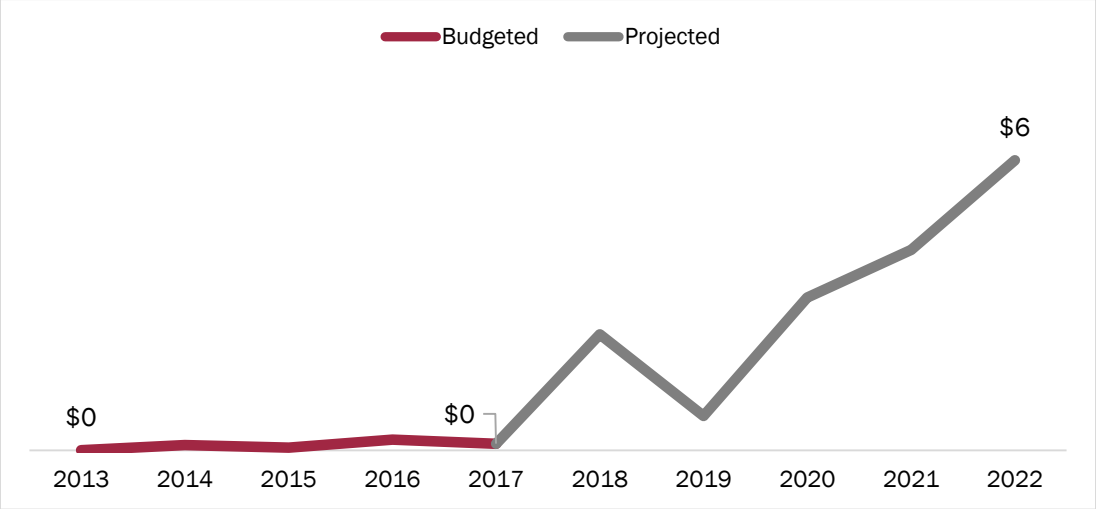
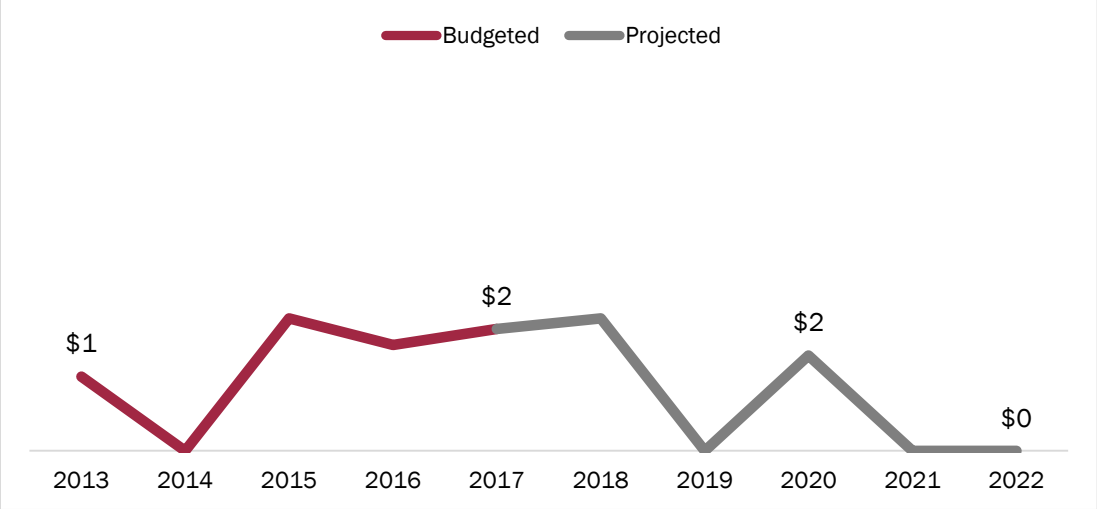


Chart 37: Storage tanks capital expenditures, 2013-2022 (in millions)



The need to increase total capital spending from the $29.2 million budgeted this year to annual totals of more than $40 million from 2019 through 2022 obviously creates a significant financial challenge for MWW. Also, while not shown in our charts, capital spending is projected to continue its ascent over the subsequent four years to reach an annual total of nearly $55 million by 2026.

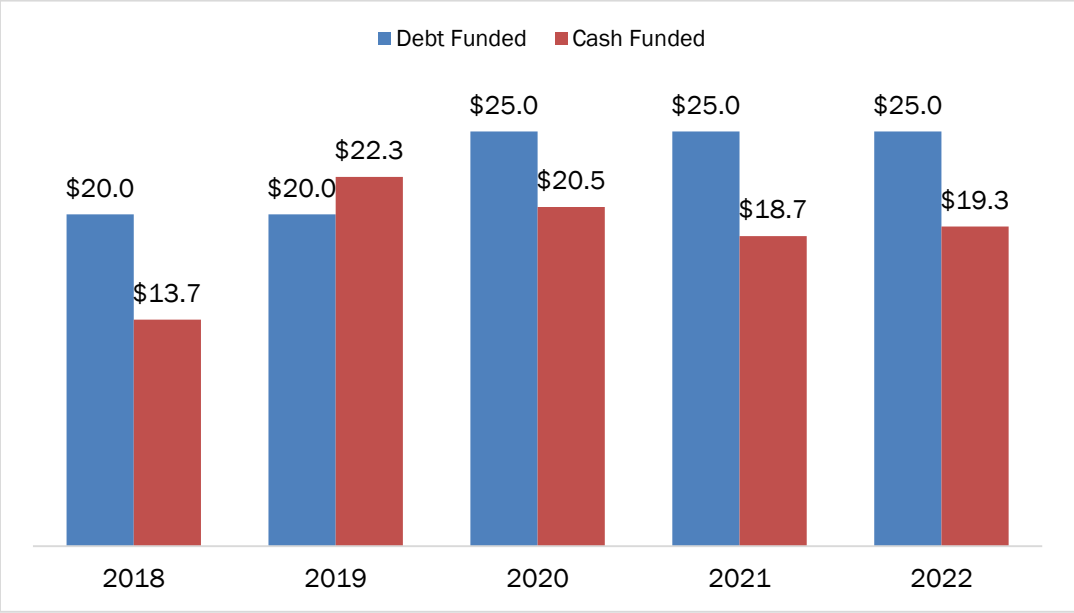
Understanding the depth of that challenge and possible strategies to meet it requires financial modeling that takes into account different options for financing MWW's capital needs. That modeling, in turn, is complicated by the need to make a series of assumptions regarding what the PSC will or will not approve with regard to MWW's rates and its treatment of depreciation costs.

As noted above, MWW recently has initiated such a modeling exercise, which will include officials from the City budget office and Comptroller's office. The goal is to produce concrete options for policymakers by this fall, when they will be considering the 2018 City budget. At the present time, MWW is considering four possible scenarios that differ with regard to assumptions on cash financing vs. borrowing as well as differing approaches for depreciating assets and setting rates.

For the purposes of this analysis, we will discuss one possible scenario – that MWW plans for a substantial increase in annual debt-funded capital spending and seeks a "rate case" in both 2019 and 2022 that would result in PSC approval of higher rates to help finance the increased debt service. As noted above, MWW typically has relied only minimally on borrowing, instead using retained earnings to finance its capital needs. However, the imperative to vastly increase capital spending in the years ahead, coupled with diminishing retained earnings, likely will require a significant shift in that policy.

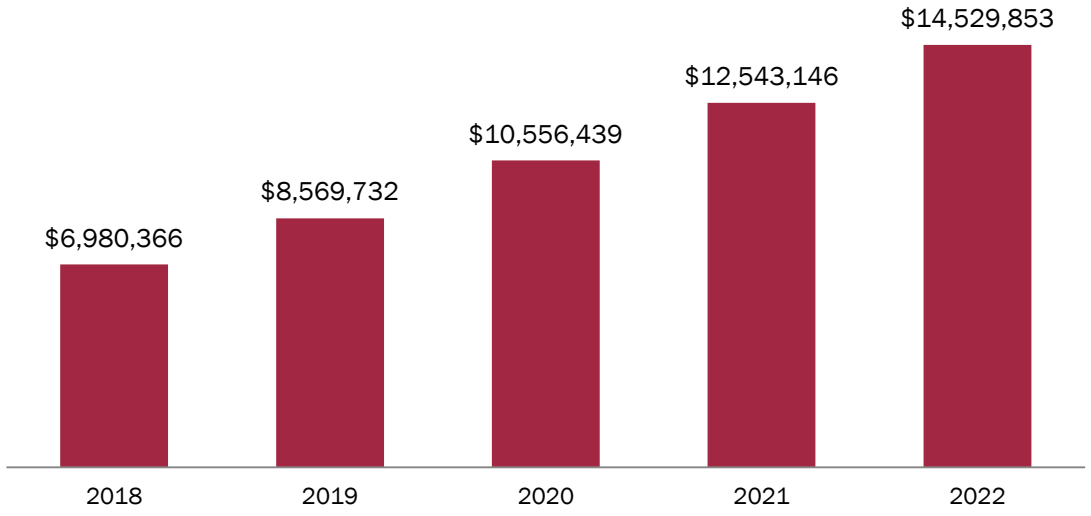
One of the financial models being prepared by MWW and its financial consultants would call for issuing $20 million of revenue bonds in 2018 and 2019 and $25 million from 2020-2022 to supplement cash and help finance capital needs. **Chart 38** shows how total capital spending would be broken down between cash and borrowing under such a scenario.

Chart 38: Projected capital funding mix, 2018-2022 (in millions)



The sharp increase in borrowing obviously would have a corresponding impact on MWW's debt. As shown in **Chart 39**, annual debt service potentially would grow from $7 million in 2018 to $14.5 million in 2022. If MWW were to continue to borrow upwards of $25 million annually for the entirety of its 10-year plan, then debt service could reach $20 million by 2026.[28]

Chart 39: Projected debt service, 2018-2022



Whether a long-range plan that would entail issuing these amounts of debt – and handling these amounts of debt service – is practical and achievable will depend on several variables that are largely out of MWW's control:

- The first is **whether the Mayor and Common Council would approve MWW's recommendation for rate increases** that will be necessary to accommodate the planned capital spending and borrowing (or simply the planned spending if no borrowing is involved). While elected officials understandably will be hesitant to sign off on substantial rate increases, they may not have much choice if capital needs dictate them. It should be noted that the City is lobbying the State to continue a program that provides grant funds for lead service line replacement to disadvantaged communities; that would provide some relief, but it would not eliminate the need for significant rate increases.

- The second is the **willingness of the PSC to accept MWW's arguments for rate increases** (assuming that the Mayor and Council agree). There is little question that sizable rate increases will be needed during the next five years, though the variety of factors that are used by the PSC to determine acceptable rates precludes us from estimating the precise size. It also is unknown at this time whether MWW would seek one or two large increases during the five-year period, or

[28] These are rough estimates based on information provided by MWW during the early stages of preparing a new 10-year financial plan. Our estimates use the $5.4 million of budgeted debt service in 2017 as a baseline and add debt service amounts derived from materials provided by MWW. It should be noted that these are only rough estimates and they are subject to change.

whether it would seek to "smooth" the impact through a series of smaller increases every year (it has already requested a 3% increase for July 1, 2017). Presumably, the PSC would have little choice but to approve the rate increases requested by MWW if its commissioners are convinced of the necessity of the proposed capital spending, but rate cases are complicated endeavors that offer little certainty. It also should be noted that while MWW also is modeling a strictly cash financing option, that option likely would require even larger short-term rate increases.

- A third variable is the **ability of the City's General Fund to accommodate assistance to property owners** to replace the privately-owned portions of lead service lines. If MWW reaches its goal of 1,250 lead service line replacements by 2022, then close to 1,250 privately-owned service lines also would be replaced. If the City continues its commitment to pay two-thirds of the cost of the privately-owned portions of those service lines and to help property owners finance the other third with no-interest loans, then the City could be required to issue nearly $5 million of additional G.O. debt per year annually for the foreseeable future. Whether that is possible would be predicated on other G.O. borrowing needs.[29]

Finally, it is possible that MWW will be able to reduce the severity of the financial challenge by implementing operational cost-cutting efficiencies or using new technology to reduce the cost of lead service line remediation. For example, the City is just beginning to consider a new technological approach in which lead service lines might be injected with a coating that prevents lead particles from leaching into drinking water and eliminates the need to replace the line. Such an approach could be far less expensive than replacement, though its consideration still is at a very early stage.

Summary

MWW has a daunting capital finance challenge on its hands. It needs to increase its annual capital spending by nearly 50% between now and 2020 (that would mean annual spending would more than triple since 2013), which may require it to issue $20 to $25 million of new debt annually for the foreseeable future. Fortunately, the utility currently enjoys a low level of overall debt, which results from the fact that in recent years, it has been issuing very little debt at all. Still, a rapidly growing debt burden will necessitate substantial rate increases, as will a scenario in which cash is used for capital improvements instead.

Overall, MWW is in a very precarious financial position, facing severe pressure on the one hand to shore up its water mains and pursue an aggressive replacement schedule for lead service lines, but facing uncertainty as to the likelihood of PSC approval for rate increases that will accommodate those actions. Also uncertain is the predisposition of City policymakers to accept such increases and to support extra G.O. borrowing to assist homeowners with the privately-owned portions of service lines. To its credit, MWW is engaged in an intensive financial modeling exercise that will spell out

[29] It should be noted that the Wisconsin Legislature is considering a change in State law that would allow city utilities to incorporate costs associated with private service line replacement into the rate-setting process (as if they were public costs). If such legislation was adopted, then the General Fund challenge would be eliminated, but the size of needed rate increases would grow.

these challenges and (presumably) lay out a recommended path forward. That exercise should be completed by the fall.

A final level of uncertainty involves potential action at the federal or State level. There has been discussion in Congress and the White House about providing enhanced aid to local governments to help address lead service lines. Also, as noted above, cities are lobbying the State Legislature for similar assistance. On the other hand, the financial challenge could worsen if the Environmental Protection Agency or other regulatory bodies place strict timelines on local governments to replace lead service lines (or if such a policy is adopted by City policymakers themselves).

CONCLUSION

Our analysis of water, sewer, and wastewater treatment infrastructure owned by the City of Milwaukee and the Milwaukee Metropolitan Sewerage District finds that the vast majority of that infrastructure is being properly managed and that the financing of future repair and replacement needs is being properly planned. Unfortunately, while adherence to sound capital asset management practices is important, it will not soften the impact of those repairs and replacements on local property taxpayers and ratepayers, which will be substantial.

Simply put, it is expensive to appropriately care for water and sewer pipes and treatment facilities. That is particularly true when the infrastructure is aging (as it is in Milwaukee); as standards for clean water become more ambitious; as water consumption decreases, thus diminishing revenue streams; and as the public health implications associated with lead service lines become better understood.

We find that each of the forms of infrastructure examined in this report – MMSD sewers and wastewater treatment facilities, DPW sewers, and MWW water mains, service lines, and treatment plants – has growing challenges. It is not surprising that MMSD seems to be in the strongest position to address those challenges, given that it is a freestanding governmental entity whose primary purpose is to oversee the integrity of its infrastructure and the means to finance it. DPW and the Sewer Maintenance Fund also appear to be relatively well-positioned to meet upcoming five-year needs, thanks (in part) to increased investment from 2011-16 after severe rainfalls exposed deficiencies.

It also should be no surprise that MWW faces the most formidable set of challenges given the age of its infrastructure, its previous low reliance on borrowing (which suggests a relatively modest capital program), and the emergence of the lead service line issue. Indeed, given the breadth of the problem (a need to eventually replace 76,000 lead service lines) and the number of years and financial resources it will take to address it, this will be one of the foremost infrastructure challenges facing any local government in southeast Wisconsin for many years to come.

Specific key findings emanating from our review of water, sewer, and wastewater infrastructure owned by MMSD and the City of Milwaukee include the following:

- **MMSD's capital assets largely are in good condition, but keeping them that way demands a healthy commitment from property taxpayers.** Our analysis shows that MMSD conducts intensive capital planning, stays on top of needed infrastructure repairs, and has a firm handle on what it will take to finance its infrastructure challenges over the next several years. We also find, however, that MMSD's annual capital expenditures are projected to surge to $128 million in 2021 (up 38% from the $92.6 million budgeted in 2017), and that addressing the needs of its extensive array of capital assets could require annual property tax levy increases of 4% in each of the next five years.

- **The age and condition of DPW's sewers demands an ambitious lining and replacement schedule that will continue to put pressure on sewer and stormwater fees.** We find that over a quarter of the City's rated sewer pipes (104 miles) should be considered for replacement.

That is a manageable amount given the City's goal of lining or replacing 27 miles of sewers per year, but meeting that goal likely will require annual rate increases in sewer and stormwater fees of 3-5% going forward.

- **MWW must aggressively ramp up capital spending to address the condition of its aging water mains.** The age and rate of breakage of MWW's water mains will require it to increase the annual miles of replacement from the current 15 to 20 three years from now. This will necessitate $29 million in capital spending in 2020, which is an $8.2 million (36%) increase from 2017 and more than triple the amount spent in 2013. Meeting that expenditure threshold likely will require MWW to petition the PSC for sizable rate increases to cover costs associated with borrowing or cash financing.

- **Replacement of MWW's lead service lines may take decades to accomplish and will impose a significant and prolonged impact on ratepayers and taxpayers.** MWW intends to expedite its replacement of lead service lines in light of public health concerns, with current plans calling for an increase from the current 300-400 replacements per year to 1,250 by 2022. Such an effort could cost ratepayers an additional $7 million or more annually for the publicly-owned portion of the service lines, and it would take more than 50 years to complete in light of the City's 76,000 lead service lines. Meanwhile, the City's commitment to pay two-thirds of the cost of replacing the private portion of those service lines – and to finance the remaining share with no-interest loans – could require nearly $5 million of annual property tax levy-supported borrowing for the next several decades.

It is important to note that these challenges could be alleviated by actions in Madison and Washington. For example, the Wisconsin Department of Natural Resources has established an aid program for municipalities seeking to replace lead service lines that could be sustained or even grow in the coming years. Meanwhile, wastewater and water treatment projects have been cited for possible inclusion in a federal infrastructure bill discussed by the Trump Administration.

Yet, barring a substantial infusion of funds from outside sources – or uses of new technology to dramatically reduce the cost of lead service line replacement – there is little question that local taxpayers and ratepayers will be called upon to dedicate substantial and growing amounts of resources to taking care of their water and wastewater systems for the foreseeable future. An important lesson is that while water and sewer infrastructure needs receive far less attention than those related to higher-profile cultural facilities and entertainment venues, these needs must be a higher priority for local governments and undoubtedly will be more expensive to address.

This report is the second in a series of reports on local government infrastructure. Our objective was to identify the current state of water, sewer, and wastewater infrastructure owned by MMSD and the City of Milwaukee, and to assess the challenges faced by those entities in financing identified needs. Consequently, while we raise several important questions, we do not provide answers.

In future reports, we will conduct similar analyses of buildings, parks, and other infrastructure owned by our largest local governments. After we have a sense of the state of this collective set of local government infrastructure, we then will turn to the question of what new policies or strategies might be considered to address current needs and future challenges.

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